

**PURCHASING DEPARTMENT**

***CONTRACT FOR PUBLIC BUILDINGS***

**PROJECT MANUAL**

**NEWTON COMMONWEALTH GOLF COURSE-  
MAINTENANCE FACILITY IMPROVEMENTS & RENOVATIONS  
INVITATION FOR BID #24-65**

**Pre-Bid Walk Through: April 10, 2024, at 10:00 AM**

**Final Bid Questions no later than: April 17, 2024, by 12:00 PM**

**Filed Sub-Bid Opening: April 25, 2024, at 10:00 AM**

**General Contractor Bid Opening Date: May 2, 2024, at 10:00 AM**

**ARCHITECT  
Raymond Design Associates, Inc.  
60 Ledgewood Place  
Rockland, Massachusetts 02370  
781-421-3480**

**April 2024**

**Ruthanne Fuller, Mayor**

**CITY OF NEWTON  
PROJECT MANUAL  
TABLE OF CONTENTS  
NEWTON COMMONWEALTH GOLF COURSE –  
MAINTENANCE FACILITY IMPROVEMENTS & RENOVATIONS**

|   | <u>Page #</u>     |
|---|-------------------|
| Cover Page  | 1                 |
| Table of Contents   | 2                 |
| 1. - Invitation for Bid   | 3-4               |
| 2. - Instructions to Bidders  | 5-8               |
| 3. - Bidder Forms   |                   |
| ▪ <b>Bid Form for General Contractor</b>  | 9-11              |
| ▪ General Bidders Qualification and References Form                             | 12-13             |
| ▪ Certificate of Non-Collusion  | 14                |
| ▪ Certification of Tax Compliance   | 15                |
| ▪ Certificate of Foreign Corporation  | 16                |
| ▪ Debarment Letter  | 17                |
| ▪ IRS Form W-9  | 18                |
| ▪ Business Category Information Form  | 19                |
| ▪ <b>Bid Form for Sub-Bids</b>  | 20-21             |
| ▪ Sub Bidders Qualification and References Form                                 | 22-23             |
| ▪ Certificate of Non-Collusion  | 24                |
| ▪ Certificate of Tax Compliance   | 25                |
| ▪ Certificate of Foreign Corporation  | 26                |
| ▪ Debarment Letter  | 27                |
| ▪ IRS Form W-9  | 28                |
| ▪ Business Category Information Form  | 29                |
| 5. - Contract Forms (Informational only. Not required at time of bid submittal) | 30                |
| ▪ City - Contractor Contract  | 31-35             |
| ▪ Certificate of Authority - Corporate  | 36                |
| ▪ Performance Bond  | 37                |
| ▪ Payment Bond  | 38                |
| 6. - General Conditions of the Contract   | 39-94             |
| 7. - Section 00 27 00 Unit Prices   | 95-96             |
| 8. - Wage Rate Requirements   | 97                |
| ▪ Department of Labor Prevailing Wages  | 98-138            |
| ▪ Notice to Awarding Authorities and Contractors                                | 139               |
| ▪ Statement of Compliance   | 140               |
| ▪ Weekly Payroll Report Form  | 141               |
| 9. - Technical Specifications (1013 pages)                                      | Separate Document |
| 10. - Drawings (55 pages)   | Separate Document |

**END OF SECTION**

**CITY OF NEWTON  
PURCHASING DEPARTMENT  
INVITATION FOR BID #24-65**

The City of Newton (City) invites sealed bids in accordance with M.G.L. c. 149 from Contractors for

**NEWTON COMMONWEALTH GOLF COURSE  
MAINTENANCE FACILITY IMPROVEMENTS & RENOVATIONS**

Pre-bid walk through will be held on site at: **April 10, 2024 at 10:00 AM (Not Mandatory)**  
**212 Kenrick Street, Newton, MA 02485**

**Additional Walk Throughs are offered by appointment only. To set up an appointment time, contact Rafik Ayoub at 617.796.1621 or [rayoub@newtonma.gov](mailto:rayoub@newtonma.gov).**

**Neither the Pre-Bid nor Walk Throughs are mandatory.**

**Filed Sub-Bid Opening: Thursday, April 25, 2024 at 10:00 AM**  
**Newton City Hall, Room 108**

**General Bid Opening: Thursday, May 2, 2024 at 10:00 AM**  
**Newton City Hall, Room 108**

**Written Request for Information Requirements: Submit written request for clarification and interpretation to Purchasing Department at [purchasing@newtonma.gov](mailto:purchasing@newtonma.gov) no later than: Wednesday, April 17, 2024 at 12:00 PM.**

**The General Contractor (“GC”) shall maintain its bid and allow up to 60 days for “execution of contract” or “notice to proceed.” The term of the contract shall extend from the contract execution or Notice to Proceed date through June 12, 2025.**

**Award of a contract is estimated to be two (2) weeks after the GC bids are received. Project phases are as follows:**

**Phase 1 – Submittal / Procurement Period: May 8, 2024, through September 30, 2024**

**Phase 2 – On-site mobilization / start of construction: Oct 1, 2024**

**Phase 3 – Substantial Completion of the Newton Commonwealth Golf Course Maintenance Facility Renovations - April 11, 2025.**

**Phase 4 – Final Completion of the project including all closeout requirements - June 12, 2025.**

This Invitation For Bids (IFB) includes “Part 2-Project Technical Sections Specifications” (1,013 pp.) and Drawings (55 pp.) issued herewith and made a part hereof.

Newton Commonwealth Golf Course – Maintenance Facility Improvements and Renovations (Project) is being administered by the City and its Architect (Raymond Design Associates, Inc. ). Based on the Project dollar amount and the dollar amount of the filed sub-trades, there will be two bid openings, one for the filed Sub-Bids and one for General Bids (collectively, “Bids”). The City will first accept and open Sub-Bids, and then issue a filed sub-bid tabulation sheet so that general bidders may prepare their bids based on sub-bids from responsible and eligible sub-bidders.

Forms for the General Bid and Sub-Bids are included in this Invitation For Bid 24-65 at pp. 9 and 20, respectively. Bidders must also provide unit prices for three (3) options. These are prices which the Bidder will charge for additional requested work but, while the option prices shall be included in the successful Bidder’s contract, option prices shall not be considered in determining the lowest bid.

Bids will not be accepted nor may submitted Bids be corrected, modified or withdrawn after the deadlines for their submission. Following the submission deadline, all Bids received within the time specified will be publicly opened and read aloud.

Contract Documents will be available **online at the City’s website: [www.newtonma.gov/bids](http://www.newtonma.gov/bids)** or for pickup at the Purchasing Department after: **10:00 a.m., April 4, 2024**. There will be no charge for the first copy of the contract documents. Award will be made to the GC with the lowest total contract price, including any accepted alternates, that has been deemed responsible and eligible. **All Bids shall be submitted as one (1) ORIGINAL and two (2) COPIES.**

All **General Bids** must be accompanied by a copy of a Prime/General Certificate of Contractor Eligibility issued by the Department of Capital Asset Management and Maintenance (DCAMM ) and a Prime/General Contractor Update Statement completed and signed by the bidder. The category of work for which the Bidder must certified is: **General Building Construction. General bidders must also complete and submit the Unit Price Sheet at pp. 99-100 below. The Unit Price Sheet prices set rates for supplies and services not included in the General Bid but which may be requested by the City after execution of the contract. Unit Price Sheet prices should NOT be included in General Bids and will not be factored into the contract award.**

All **Sub Trade Bids** must be accompanied by a copy of a “Certificate of Eligibility” and Contractor “Update Statement” issued by the DCAMM. The fifteen (15) categories of work for which the Sub Trade Bidders must be certified are: **Masonry, Misc. Metals, Tiling, Painting, Fire Protection, Plumbing, HVAC, Electrical & Resilient Flooring**

All Bids must be accompanied by a bid deposit in an amount that is not less than five percent (5%) of the value of the Bid, including all alternates. Bid deposits, payable to the City of Newton, shall be either in the form of a bid bond, or cash, or a certified check, or a treasurer's or cashier's check issued by a responsible bank or trust company. Bidders are reminded that the bid deposit covers the City for damages when a bidder withdraws its bid after the bid submission date. **Be advised that to the extent permitted by law the City will retain all bid deposits for withdrawn bids.**

All bids are subject to the provisions of M.G.L. c.149, §§44 A to 44J. **Wages are subject** to minimum wage rates determined by the Massachusetts Department of Labor Standards pursuant to M.G.L. c149, §§26 to 27H. The schedule of wage rates applicable to this contract is included in the bidding documents. In addition, the prevailing wage schedule will be updated annually for all public construction projects lasting longer than one (1) year or at each renewal, as applicable. You will be required to pay the rates set out in any updated prevailing wage schedule. Increases in prevailing wage schedules will not be the basis for change order requests. The successful bidder will be required to provide a Certificate of Insurance demonstrating current coverage of the type and amounts set forth in the Project Manual. The successful bidder will be required to furnish both a **Performance Bond** and a **Labor and Materials Payment Bond**, each in the amount of **100% of the contract total.**

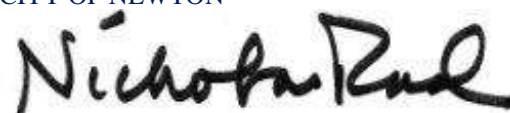
Note that Massachusetts law imposes certain documentation requirements for public contracts, including but not limited to, contractor DCAMM certification, bid, performance and payment bonds, and non-collusion and tax certifications. A contract is not effective until it is signed by the City Mayor, and the Mayor will not sign until all documentation requirements have been met. Once an award is made, a contract must be executed promptly so the City can start scheduled work. The City cannot pay for work done without a contract. If a vendor unduly delays submitting all required paperwork, the City will be under no obligation to pay a vendor promptly even after a contract is effective, it could bar the vendor from future bids as not responsible and may require the City to obtain services from another vendor or contractor.

Bidders’ attention is directed to the requirements of the City of Newton Supplemental Equal Employment Opportunity, Anti-Discrimination and Affirmative Action Program and also to the Minority/Women Business Enterprise Plan, December 1999. Copies of the Plans and Program referred to in Sections 3.1 and 3.2 are available at: [www.newtonma.gov/purchasing](http://www.newtonma.gov/purchasing). In the event of conflict between any of the above listed policies, the stricter policy shall apply

Addenda will be available online within the original bid document as well as a separate file. Once you’ve downloaded this bid from the internet website ([www.newtonma.gov/bids](http://www.newtonma.gov/bids)), I strongly suggest you email ([purchasing@newtonma.gov](mailto:purchasing@newtonma.gov)) your company’s Name, address, EMAIL, phone, fax and the INVITATION FOR BID NUMBER (#24-65) and Project Title, so that we may add you to the Bidders List and you will be notified of any/all addendums.

The City will reject any and all bids in accordance with the above referenced General Laws. In addition, the City reserves the right to waive any informalities in any or all bids, or to reject any or all bids (in whole or in part) if it be in the public interest to do so.

CITY OF NEWTON



Nicholas Read  
Chief Procurement Officer  
April 4, 2024

**CITY OF NEWTON**  
**DEPARTMENT OF PURCHASING**  
**INSTRUCTIONS TO BIDDERS & SUB-BIDDERS**

**ARTICLE 1 - BIDDER'S REPRESENTATION**

- 1.1 Each General and Filed Sub-Bidder (hereinafter referred to collectively as the "Bidder") by making a bid or sub-bid (hereinafter collectively referred to as "bid") represents that:
1. The Bidder has read and understands the Bidding Documents, Contract Forms, General Conditions, Conditions of the Contract, General Requirements and Project Specifications (collectively, referred to as the "Contract Documents") and the bid is made in accordance therewith.
  2. The Bidder has been given the opportunity to visit the work site and is familiar with the local conditions under which the work has to be performed.
- 1.2 Failure to so examine the Contract Documents or visit the work site will not relieve any Bidder from any obligation under the bid as submitted.

**ARTICLE 2 - REQUEST FOR INTERPRETATION**

- 2.1 Bidders shall promptly notify the City of any ambiguity, inconsistency, or error which they may discover upon examination of the Contract Documents, the site, and local conditions.
- 2.2 Bidders requiring clarification or interpretation of the Contract Documents shall make a written request to the *Chief Procurement Officer*, at [purchasing@newtonma.gov](mailto:purchasing@newtonma.gov) or via facsimile (617) 796-1227. The City will only answer such requests from Sub-Bidders and from General Bidders if received **by Wednesday, April 17, 2024 at 12:00 PM noon**.
- 2.3 Interpretation, correction, or change in the Contract Documents will be made by addendum which will become part of the Contract Documents. The City will not be held accountable for any oral communication.
- 2.4 Addenda will be emailed to every individual or firm on record as having taken a set of Contract Documents.
- 2.5 Copies of addenda will be made available for inspection at the location listed in the Invitation for Bids (IFB) where Contract Documents are on file, in addition to being available online at [www.newtonma.gov/bids](http://www.newtonma.gov/bids).
- 2.6 Bidders or proposers contacting ANY CITY EMPLOYEE regarding this IFB outside of the Purchasing Department, once the IFB has been released, may be disqualified from the procurement process.
- 2.7 Bidders downloading information off the internet web site are solely responsible for obtaining any addenda prior to the bid opening. If the Bidder makes itself known to the Purchasing Department, at [purchasing@newtonma.gov](mailto:purchasing@newtonma.gov) or via facsimile (617) 796-1227, it shall be placed on the bidder's list. Bidders must provide the Purchasing Department with their company's name, street address, city, state, zip, phone, fax, email address and **INVITATION FOR BID #24-65**.

**ARTICLE 3 - MBE PARTICIPATION**

- 3.1 Notice is hereby given that the Mayor's Affirmative Action Plan for the City of Newton in effect at the time of this solicitation is applicable to all construction contracts in excess of \$10,000.00.
- 3.2 Notice is hereby given that the City of Newton Minority/Women Business Enterprise Plan and the Supplemental Equal Employment Opportunity Anti-Discrimination and Affirmative Action Program in effect at the time of this solicitation are applicable to all City contracts for goods and services in excess of \$50,000.00.
- 3.3 Copies of the Plans and Program referred to in Sections 3.1 and 3.2 are available at: [www.newtonma.gov/purchasing](http://www.newtonma.gov/purchasing).

**ARTICLE 4 - PREPARATION AND SUBMISSION OF BIDS**

- 4.1 Bids shall be submitted on the attached "Form For Sub Bid #24-65" or "General Bid Form #24-65," as appropriate.

- 4.2 All entries on a Bid Form shall be made by typewriter or in ink.
- 4.3 Where so indicated on a Bid Form, sums shall be expressed in both words and figures. Where there is a discrepancy between the bid sum expressed in words and the bid sum expressed in figures, the words shall control.
- 4.4 Bid Deposits shall be submitted in the amount specified in the IFB. They shall be made payable to the City and shall be either in the form of cash, certified check, treasurer's or cashier's check issued by a responsible bank or trust company, or a bid bond issued by a surety licensed to do business in the Commonwealth of Massachusetts; and shall be conditioned upon the faithful performance by the principal of the agreements contained in the bid. Bidders are reminded that the bid deposit covers the City for damages when a bidder withdraws its bid after the bid submission date. **Be advised that to the extent permitted by the law the City will retain all bid deposits for withdrawn bids.**

Bid deposits of the three (3) lowest responsible and eligible Bidders shall be retained until the execution and delivery of the City-Contractor agreement.

4.5 Each Bid, including the bid deposit shall be enclosed in a sealed envelope with the following plainly marked on the outside:

- \* SUB-BID OR GENERAL BID FOR: **#24-65**
- \* NAME OF PROJECT: **Newton Commonwealth Golf Course – Maintenance Facility Improvemets and Renovations**
- \* BIDDER'S NAME, BUSINESS ADDRESS, AND PHONE NUMBER
- \*IF A FILED SUB-BID, THE CATEGORY OF WORK TO WHICH THE SUB-BID RELATES.

- 4.6 Date and time for receipt of sub-bids and bids is set forth in the Invitation for Bids.
- 4.7 Timely delivery of a sub-bid or bid at the location designated shall be the full responsibility of the Bidder. In the event that Newton City Hall is closed on the date or at the time that bids are due, the date and time for receipt of bids shall be on the next business day following that the Newton City Hall and the Purchasing Department are open.
- 4.8 Sub-bids and bids shall be submitted with one (1) **original** and two (2) **copies**.
- 4.9 Massachusetts law requires all employees who work on Massachusetts public works construction sites must have no Less than 10 hours of OSHA-approved safety and health training. See M.G.L. c.30, §39M( c), M.G.L. c.30, §39S(a)(1), M.G.L. c.149, §44E(2) & M.G.L. c.149, §44F(2).
  1. This requirement will apply to any general bid or sub bid submitted.
  2. This law directs the Massachusetts Attorney General to restrain the award of construction contracts to any contractor who is in violation to this requirement and to restrain the performance of these contracts by non-complying contractors.
  3. The contractor and all subcontractors on this project must certify on the Bid Form compliance with the applicable requirement. Non-compliance with this law will disqualify the bidder.

**ARTICLE 5 - ALTERNATES**

- 5.1 Each Bidder shall acknowledge alternates (if any) in Section C on the Bid Form.
- 5.2 In the event an alternate does not involve a change in the amount of the base bid, the Bidder shall so indicated by writing "No Change", or "N/C" or "0" in the space provided for that alternate.
- 5.3 Bidders shall enter on the Bid Form a single amount for each alternate which shall consist of the amount for work performed by the Contractor.
- 5.4 The low Bidder will be determined on the basis of the sum of the base bid and the accepted alternates.

**ARTICLE 6 - WITHDRAWAL OF BIDS**

- 6.1 Any bid may be withdrawn prior to the time designated for receipt of bids on written or electronic request. Electronic withdrawal of bids must be confirmed over the Bidder's signature by written notice postmarked on or before the date and time set for receipt of bids.
- 6.2 Withdrawn bids may be resubmitted up to the time designated for the receipt of bids.
- 6.3 No bids may be withdrawn within sixty (60) days, Saturdays, Sundays and legal holidays excluded, after the opening of the bids.

#### ARTICLE 7 - CONTRACT AWARD

- 7.1 Sub Bids shall be submitted on Form For Sub Bid #24-65 at pp. 20-21 below. The City shall award the contract to the General Bidder submitting the lowest Total Base Bid Price for labor and materials as set forth in Bid Form For General Bid #24-65 (pp. 9-11 below). General Bidders may, if properly certified in a sub trade, self perform that subtrade. Prior to the the opening of the General Bids, the City shall receive and screen all filed sub-bids and prepare a tabulation sheet which shall be sent to all contractors that have expressed an interest in IFB 24-65. The sheet will also be posted on the City's website. General Bidders may select sub-bidders for inclusion in their bids. A contract will be awarded within sixty (60) days, Saturdays, Sundays, and legal holidays excluded, after the opening of bids.
- 7.2 The City reserves the right to waive minor informalities in or to reject any or all Bids if it be in the public interest to do so.
- 7.3 The City reserves the right to reject any bidder who has failed to pay any local taxes, fees, assessments, betterments, or any other municipal charge, unless the bidder has a pending abatement application or has entered into a payment agreement with the collector-treasurer.
- 7.4 As used herein, the term "lowest responsible and eligible Bidder" shall mean the Bidder (1) whose bid is the lowest of those bidders possessing the skill, ability and integrity necessary for the faithful performance of the work; (2) who has met all the requirements of the invitation for bids; (3) who shall certify that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (4) who, where the provisions of section eight B of chapter twenty-nine apply, shall have been determined to be qualified thereunder.
- 7.5 Subsequent to the award and within five (5) days, Saturday, Sundays and legal holidays excluded, after the prescribed forms are presented for signature, the successful Bidder shall execute and deliver to the City a contract in the form included in the Contract Documents in such number of counterparts as the City may require.
- 7.6 In the event that the City receives low bids in identical amount from two or more responsive and responsible Bidders, the City shall select the successful Bidder by a blind selection process chosen by the City such as flipping a coin or drawing names from a hat. The low Bidders who are under consideration will be invited to attend and observe the selection process.

#### ARTICLE 8 - TAXES

- 8.1 The Bidder shall not include in this bid any tax imposed upon the sale or rental of tangible personal property in this Commonwealth, such as any and all building materials, supplies, services and equipment required to complete the work.
- 8.2 The City is exempt from payment of the Massachusetts Sales Tax, and the Bidder shall not include any sales tax on its bid. The City's exemption Number is E-046-001-404.

#### ARTICLE 9 – PROPRIETARY SPECIFICATIONS

- 9.1 The City has used a proprietary specification to describe the supply listed in the specifications. Such specifications are permitted under M.G.L. c. 30, §39M(b), provided that the City state in writing that use of the proprietary specification is in its best interest and that it will accept an "equal" of the item specified. An item is considered equal if (i) it is at least equal in quality, durability, appearance, strength, and design; (ii) will perform the intended function at least equally; and (iii) conforms substantially, even with deviations, to the detailed requirements contained in the specifications. Bidders wishing to provide an equal item should do so with their bids. The City shall have the sole right to determine whether or not said item is equal.
- 9.2 The required determination and justification have been duly prepared, and a copy may be requested in accordance with Massachusetts Public Records Law, M.G.L. c. 66, §10.

**END OF SECTION**

**CITY OF NEWTON  
PURCHASING DEPARTMENT  
BID FORM FOR GENERAL BID #24-65**

**NEWTON COMMONWEALTH GOLF COURSE –**



## MAINTENANCE FACILITY IMPROVEMENTS & RENOVATIONS

**TO THE AWARDING AUTHORITY:**

A. The undersigned proposes to furnish all labor and materials required to

**NEWTON COMMONWEALTH GOLF COURSE –  
MAINTENANCE FACILITY IMPROVEMENTS & RENOVATIONS**

in Newton, Massachusetts in accordance with the accompanying plans and specifications for the contract price specified below, subject to additions and deductions according to the terms of the specifications.

B. This bid includes addenda number(s) \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_.

C. The TOTAL BASE BID PRICE\* is: \$ \_\_\_\_\_

TOTAL BASE BID PRICE in words \_\_\_\_\_

*\*On any change order, the General Contractor will be allowed only (i) a ten percent (10%) mark up for Overhead and Profit (O&P) for its work and (ii) a five percent (5%) mark up for O&P on sub-contractors' work. The sub-contractors will be allowed a ten percent (10%) mark up for O&P for their work. For both the General Contractor and sub-contractors, any increase in the cost of a bond will be added to the change order at direct cost.*

COMPANY: \_\_\_\_\_

The sub-division of the TOTAL BASE BID PRICE is as follows:

**Item 1.** The work of the General Contractor, being all work other than that covered by Item 2

**Total of Item 1:** \$ \_\_\_\_\_

**Item 2.** Sub-bids as follows:

| Sub-Trade                         | Name of Sub-bidder | Amount   | Bond Required ?<br>(Yes or No) |
|-----------------------------------|--------------------|----------|--------------------------------|
| Masonry                           | _____              | \$ _____ | _____                          |
| Ornamental and Miscellaneous Iron | _____              | \$ _____ | _____                          |
| Tile                              | _____              | \$ _____ | _____                          |
| Painting                          | _____              | \$ _____ | _____                          |
| Fire Protection                   | _____              | \$ _____ | _____                          |
| Plumbing                          | _____              | \$ _____ | _____                          |
| HVAC                              | _____              | \$ _____ | _____                          |
| Electrical Work                   | _____              | \$ _____ | _____                          |
| Resilient Flooring                | _____              | \$ _____ | _____                          |

**Total of Item 2:** \$ \_\_\_\_\_

**TOTAL BASE BID PRICE (Sum of Item 1 + Item 2):** \$ \_\_\_\_\_

\_\_\_\_\_  
*(TOTAL BASE BID PRICE in words)*

COMPANY: \_\_\_\_\_

**D.** The undersigned has completed and submits herewith the following documents:

- General Bidder's Qualifications and References Form, 2 pages
- DCAMM Certificate of Eligibility, Form CQ 7, Supplied by Bidder
- DCAMM Update Statement, Form CQ-3, Supplied by Bidder
- Certificate of Non-Collusion, 1 page
- Signed Bid Form, 3 pages
- Certificate of Tax Compliance, 1 page
- Certificate of Foreign Corporation (if applicable), 1 page
- IRS W9 Form, 1 page
- Debarment Letter, 1 page
- Business Category Information Form, 1 page
- A five percent (5%) bid deposit.
- Section 00 27 00 Unit Prices, 2 pages

**E.** The undersigned agrees that each of the above named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for the performance and payment bonds furnished by sub-bidders as requested herein and that all of the cost of all such premiums is included in the amount set forth in Item 1 of this bid.

The undersigned agrees that if s/he is selected as general contractor, s/he will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

**F.** The undersigned agrees that, if s/he is selected as general contractor, s/he will within five days, Saturdays, Sundays and legal holidays excluded, after presentation thereof by the awarding authority, execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials payment bond, each of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority and each in the sum of the contract price, the premiums for which are to be paid by the general contractor and are included in the contract price.

The undersigned hereby certifies that s/he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that s/he will comply fully with all laws and regulations applicable to awards made subject to M.G.L. c.30, §39M.

The undersigned certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed in the work; (2) that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (“OSHA”) that is at least 10 hours in duration at the time the employee begins work and who shall furnish documentation of successful completion of said course with the first certified payroll report for each employee; and (3) that all employees to be employed in the work subject to this bid have successfully completed a course in construction safety and health approved by the United States OSHA that is at least 10 hours in duration. The undersigned understands that any employee found on a worksite subject to this section without documentation of successful completion of a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 hours in duration shall be subject to immediate removal.

The undersigned further certifies that s/he intends to comply with the City of Newton Minority/Women Business Enterprise Plan, dated December 19, 1999 to further expand business opportunities for minority firms.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word “person” shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of M.G.L. c29, §29F or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date : \_\_\_\_\_

\_\_\_\_\_  
(Name of General Bidder)

BY: \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Printed Name and Title of Signatory)

\_\_\_\_\_  
(Business Address)

\_\_\_\_\_  
(City, State Zip)

\_\_\_\_\_  
E-mail address

\_\_\_\_\_/\_\_\_\_\_  
(Telephone) (FAX)

**NOTE:** If the bidder is a corporation, indicate state of incorporation under signature, and affix corporate seal; if a partnership, give full names and residential addresses of all partners; and if an individual, give residential address if different from business address.

**END OF SECTION**

**CITY OF NEWTON**

**GENERAL BIDDER'S QUALIFICATIONS AND REFERENCES FORM**

All questions must be answered, and the data given must be clear and comprehensive. Please type or print legibly. If necessary, add additional sheet for starred items. This information will be utilized by the City for purposes of determining bidder responsiveness and responsibility with regard to the requirements and specifications of the Contract.

- 1. FIRM NAME: \_\_\_\_\_
- 2. WHEN ORGANIZED: \_\_\_\_\_
- 3. INCORPORATED? \_\_\_\_\_ YES \_\_\_\_\_ NO DATE AND STATE OF INCORPORATION: \_\_\_\_\_
- 4. IS YOUR BUSINESS A **MBE**? \_\_\_\_\_ YES \_\_\_\_\_ NO **WBE**? \_\_\_\_\_ YES \_\_\_\_\_ NO or **MWBE**? \_\_\_\_\_ YES \_\_\_\_\_ NO
- \* 5. LIST ALL CONTRACTS CURRENTLY ON HAND, SHOWING CONTRACT AMOUNT AND ANTICIPATED DATE OF COMPLETION:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- \* 6. HAVE YOU EVER FAILED TO COMPLETE A CONTRACT AWARDED TO YOU?  
\_\_\_\_\_ YES \_\_\_\_\_ NO  
IF YES, WHERE AND WHY?  
\_\_\_\_\_  
\_\_\_\_\_
- \* 7. HAVE YOU EVER DEFAULTED ON A CONTRACT? \_\_\_\_\_ YES \_\_\_\_\_ NO  
IF YES, PROVIDE DETAILS.  
\_\_\_\_\_  
\_\_\_\_\_
- \* 8. LIST YOUR VEHICLES/EQUIPMENT AVAILABLE FOR THIS CONTRACT:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- \* 9. IN THE SPACES FOLLOWING, PROVIDE INFORMATION REGARDING CONTRACTS COMPLETED BY YOUR FIRM SIMILAR IN NATURE TO THE PROJECT BEING BID. A MINIMUM OF FOUR (4) CONTRACTS SHALL BE LISTED. PUBLICLY BID CONTRACTS ARE PREFERRED, BUT NOT MANDATORY.  
  
PROJECT NAME: \_\_\_\_\_  
OWNER: \_\_\_\_\_  
CITY/STATE: \_\_\_\_\_

DOLLAR AMOUNT: \$ \_\_\_\_\_ DATE COMPLETED: \_\_\_\_\_  
PUBLICLY BID? \_\_\_\_\_ YES \_\_\_\_\_ NO  
TYPE OF WORK?: \_\_\_\_\_  
CONTACT PERSON: \_\_\_\_\_ TELEPHONE #: (\_\_\_\_) \_\_\_\_\_  
CONTACT PERSON'S RELATION TO PROJECT?: \_\_\_\_\_  
(i.e., contract manager, purchasing agent, etc.)

PROJECT NAME: \_\_\_\_\_  
OWNER: \_\_\_\_\_  
CITY/STATE: \_\_\_\_\_  
DOLLAR AMOUNT: \$ \_\_\_\_\_ DATE COMPLETED: \_\_\_\_\_  
PUBLICLY BID? \_\_\_\_\_ YES \_\_\_\_\_ NO  
TYPE OF WORK?: \_\_\_\_\_  
CONTACT PERSON: \_\_\_\_\_ TELEPHONE #: (\_\_\_\_) \_\_\_\_\_  
CONTACT PERSON'S RELATION TO PROJECT?: \_\_\_\_\_  
(i.e., contract manager, purchasing agent, etc.)

PROJECT NAME: \_\_\_\_\_  
OWNER: \_\_\_\_\_  
CITY/STATE: \_\_\_\_\_  
DOLLAR AMOUNT: \$ \_\_\_\_\_ DATE COMPLETED: \_\_\_\_\_  
PUBLICLY BID? \_\_\_\_\_ YES \_\_\_\_\_ NO  
TYPE OF WORK?: \_\_\_\_\_  
CONTACT PERSON: \_\_\_\_\_ TELEPHONE #: (\_\_\_\_) \_\_\_\_\_  
CONTACT PERSON'S RELATION TO PROJECT?: \_\_\_\_\_  
(i.e., contract manager, purchasing agent, etc.)

PROJECT NAME: \_\_\_\_\_  
OWNER: \_\_\_\_\_  
CITY/STATE: \_\_\_\_\_  
DOLLAR AMOUNT: \$ \_\_\_\_\_ DATE COMPLETED: \_\_\_\_\_  
PUBLICLY BID? \_\_\_\_\_ YES \_\_\_\_\_ NO  
TYPE OF WORK?: \_\_\_\_\_  
CONTACT PERSON: \_\_\_\_\_ TELEPHONE #: (\_\_\_\_) \_\_\_\_\_  
CONTACT PERSON'S RELATION TO PROJECT?: \_\_\_\_\_  
(i.e., contract manager, purchasing agent, etc.)

10. The undersigned certifies that the information contained herein is complete and accurate and hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the City in verification of the recitals comprising this statement of Bidder's qualifications and experience.

DATE: \_\_\_\_\_ BIDDER: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

**END OF SECTION**

## CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee club, or other organization, entity, or group or individuals.

---

(Signature of individual)

---

Name of Business

**CERTIFICATION OF TAX COMPLIANCE\*\***

Pursuant to M.G.L. c.62C, §49A and requirements of the City, the undersigned acting on behalf of the Contractor certifies under the penalties of perjury that the Contractor is in compliance with all laws of the Commonwealth relating to taxes including payment of all local taxes, fees, assessments, betterments and any other local or municipal charges (unless the Contractor has a pending abatement application or has entered into a payment agreement with the entity to which such charges were owed), reporting of employees and contractors, and withholding and remitting child support.\*

\_\_\_\_\_  
Signature of Individual (Mandatory)      \*\*\* Contractor's Social Security Number  
or Federal Identification Number

Print Name: \_\_\_\_\_ Date: \_\_\_\_\_

\_\_\_\_\_  
Corporate Name

By: \_\_\_\_\_ Date: \_\_\_\_\_  
Corporate Officer  
(Mandatory, if applicable)

Print Officer Name: \_\_\_\_\_

\* The provision in this Certification relating to child support applies only when the Contractor is an individual.

\*\* Approval of a contract or other agreement will not be granted until the City receives a signed copy of this Certification.

\*\*\* Your social security number may be furnished to the Massachusetts Department of Revenue to determine whether you have met tax filing or tax payment obligations. Providers who fail to correct their non-filing or delinquency will not have a contract or other agreement issued, renewed, or extended.

**CERTIFICATE OF FOREIGN CORPORATION**

**The undersigned hereby certifies that it has been duly established, organized, or chartered as a corporation under the laws of:**

---

**(Jurisdiction)**

**The undersigned further certifies that it has complied with the requirements of M.G.L. c. 30, §39L (if applicable) and with the requirements of M.G.L. c. 156D, §15.03 relative to the registration and operation of foreign corporations within the Commonwealth of Massachusetts.**

---

**Name of person signing proposal**

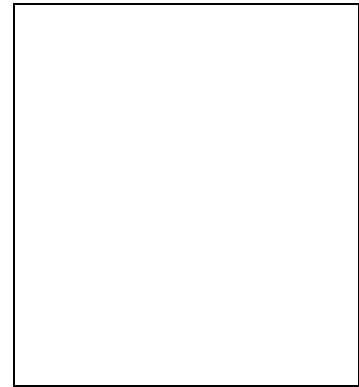
---

**Signature of person signing proposal**

---

**Name of Business (Please Print or Type)**

*Affix Corporate Seal here*





**City of Newton**



Mayor  
Ruthanne Fuller

**Purchasing Department**  
Nicholas Read ☎ *Chief Procurement Officer*  
1000 Commonwealth Avenue  
Newton Centre, MA 02459-1449  
purchasing@newtonma.gov

Telephone  
(617) 796-1220  
Fax:  
(617) 796-1227  
TDD/TTY  
(617) 796-1089

Date

Vendor

Re: Debarment Letter for Invitation For Bid #24-65

As a potential vendor on the above contract, the City requires that you provide a debarment/suspension certification indicating that you are in compliance with the Federal Executive Order below. Certification can be done by completing and signing this form.

**PART 1 - Debarment:**

**Federal Executive Order (E.O.) 12549 “Debarment and Suspension“ requires that all contractors receiving individual awards, using federal funds, and all sub-recipients certify that the organization and its principals are not debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency from doing business with the Federal Government.**

I hereby certify under pains and penalties of perjury that neither I nor any principal(s) of the Company identified below is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

\_\_\_\_\_ (Name)  
\_\_\_\_\_ (Company)  
\_\_\_\_\_ (Address)  
\_\_\_\_\_ (Address)

PHONE \_\_\_\_\_ FAX \_\_\_\_\_  
EMAIL \_\_\_\_\_

\_\_\_\_\_ Signature

\_\_\_\_\_ Date

If you have questions, please contact Nicholas Read, Chief Procurement Officer at (617) 796-1220.

## Request for Taxpayer Identification Number and Certification

**Give form to the  
 requester. Do not  
 send to the IRS.**

Print or type  
See Specific instructions on page 2.

|   |   |
|---|---|
| Name (as shown on your income tax return)   |   |
| Business name, if different from above  |   |
| Check appropriate box: <input type="checkbox"/> Individual/sole proprietor <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership<br><input type="checkbox"/> Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶ ..... <input checked="" type="checkbox"/> Exempt payee<br><input type="checkbox"/> Other (see instructions) ▶ |   |
| Address (number, street, and apt. or suite no.)   | Requester's name and address (optional) |
| City, state, and ZIP code   |   |
| List account number(s) here (optional)  |   |

### Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

**Note.** If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

|                                |
|--------------------------------|
| Social security number         |
| or                             |
| Employer identification number |

### Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

**Certification instructions.** You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

|                  |                            |        |      |
|------------------|----------------------------|--------|------|
| <b>Sign Here</b> | Signature of U.S. person ▶ | Date ▶ | Name |
|------------------|----------------------------|--------|------|

### General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

#### Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

**Note.** If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

**Definition of a U.S. person.** For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

**Special rules for partnerships.** Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,

## Business Category Information Form\*

IFB No. 24-65

### Newton Commonwealth Golf Course Maintenance Facility Improvements & Renovations (GC'S)

| Business Type Categories*                                       | Select All That Apply |
|---|-----------------------|
| MBE: Minority-Owned Business Enterprise                         |                       |
| WBE: Women-Owned Business Enterprise                            |                       |
| VBE: Veteran Business Enterprise                                |                       |
| SDVOBE: Service-Disabled Veteran-Owned Business Enterprises     |                       |
| DOBE: Disability-Owned Business Enterprise                      |                       |
| LGBTBE: Lesbian, Gay, Bisexual, Transgender Business Enterprise |                       |

\*Information is being collected as part of a City initiative to open contract opportunities to underrepresented vendors.

I do not wish to complete this form.

There is no penalty for persons who do not complete this Form, and whether or not the Form is completed will not be taken into consideration in awarding a bid.

I certify that the foregoing information is true and correct.

Company Name: \_\_\_\_\_

By: \_\_\_\_\_

Date: \_\_\_\_\_

**CITY OF NEWTON**

**PURCHASING DEPARTMENT  
 BID FORM FOR SUB-BID #24-65**

To all General Bidders Except those Excluded:

- A. (1) For All Sub-bidders: The Undersigned proposes to furnish all labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified in Section No. \_\_\_\_\_ of the specifications and in any plans specified in such section, prepared by Raymond Design Associates, Inc. for the Newton Commonwealth Golf Course – Maintenance Facility Improvements and Renovations in Newton, Massachusetts, for the contract sum of \_\_\_\_\_ dollars (\$\_\_\_\_\_).

TOTAL BASE BID: \$ \_\_\_\_\_ \*

*\*On any change order, sub-contractors will be allowed a ten percent (10%) mark up for O&P for their work. For both the General Contractor and sub-contractors, any increase in the cost of a bond will be added to the change order at direct cost.*

- B. This sub-bid includes addenda numbered \_\_\_\_\_

- C. This sub-bid

may be used by any general bidder except:

\_\_\_\_\_

may only be used by the following general bidders:

\_\_\_\_\_

[To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded.]

- D. The undersigned agrees that, if he is selected as a sub-bidder, he will, within 5 days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested so to do in the general bid by the general bidder, who shall pay the premiums therefor, or if prequalification is required pursuant to section 44D 3/4, furnish a performance and payment bond of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.

- E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the specifications for this sub-trade require a listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specifications, the name of each such class of work or part thereto and the bid price for such class of work or part thereof are:

| Name  | Class of Work | Bid price |
|-------|---------------|-----------|
| _____ | _____         | _____     |
| _____ | _____         | _____     |
| _____ | _____         | _____     |
| _____ | _____         | _____     |
| _____ | _____         | _____     |

[Do not give bid price for any class or part thereof furnished by undersigned.]

- F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinbefore described plans, specifications and addenda and that, if the undersigned is awarded the contract, they will be used for the work indicated at the amounts stated, if satisfactory to the awarding authority.

G. The undersigned further agrees to be bound to the general contractor by the terms of the hereinbefore described plans, specifications, including all general conditions stated therein, and addenda, and to assume toward him all the obligations and responsibilities that he, by those documents, assumes toward the owner.

H. The undersigned offers the following information as evidence of his qualifications to perform the work as bid upon according to all the requirements of the plans and specifications: –

1. Have been in business under present business name \_\_\_\_\_ years.

2. Ever failed to complete any work awarded? \_\_\_\_\_

3. List one or more recent buildings with names of the general contractor and architect on which you served as a sub-contractor for work of similar character as required for the above-named building.

|     | Building | Architect | General Contractor | Amount of Contract |
|-----|----------|-----------|--------------------|--------------------|
| (a) | _____    | _____     | _____              | _____              |
| (b) | _____    | _____     | _____              | _____              |
| (c) | _____    | _____     | _____              | _____              |

4. Bank reference \_\_\_\_\_

I. The undersigned hereby certifies that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work and that he will comply fully with all laws and regulations applicable to awards of subcontracts subject to section forty-four F.

The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

Date : \_\_\_\_\_

\_\_\_\_\_  
(Name of Sub Bidder)

BY: \_\_\_\_\_  
(Signature)

\_\_\_\_\_  
(Printed Name and Title of Signatory)

\_\_\_\_\_  
(Business Address)

\_\_\_\_\_  
(City, State Zip)

\_\_\_\_\_  
E-mail address

\_\_\_\_\_  
(Telephone) (FAX)

**END OF SECTION**

**CITY OF NEWTON**

**SUB-BIDDER'S QUALIFICATIONS AND REFERENCES FORM**

All questions must be answered, and the data given must be clear and comprehensive. Please type or print legibly. If necessary, add additional sheet for starred items. This information will be utilized by the City for purposes of determining bidder responsiveness and responsibility with regard to the requirements and specifications of the Contract.

- 1. FIRM NAME: \_\_\_\_\_
- 2. WHEN ORGANIZED: \_\_\_\_\_
- 3. INCORPORATED? \_\_\_\_\_ YES \_\_\_\_\_ NO DATE AND STATE OF INCORPORATION: \_\_\_\_\_
- 4. IS YOUR BUSINESS A **MBE**? \_\_\_\_\_ YES \_\_\_\_\_ NO **WBE**? \_\_\_\_\_ YES \_\_\_\_\_ NO or **MWBE**? \_\_\_\_\_ YES \_\_\_\_\_ NO
- \* 5. LIST ALL CONTRACTS CURRENTLY ON HAND, SHOWING CONTRACT AMOUNT AND ANTICIPATED DATE OF COMPLETION:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- \* 6. HAVE YOU EVER FAILED TO COMPLETE A CONTRACT AWARDED TO YOU?  
\_\_\_\_\_ YES \_\_\_\_\_ NO  
IF YES, WHERE AND WHY?  
\_\_\_\_\_  
\_\_\_\_\_
- \* 7. HAVE YOU EVER DEFAULTED ON A CONTRACT? \_\_\_\_\_ YES \_\_\_\_\_ NO  
IF YES, PROVIDE DETAILS.  
\_\_\_\_\_  
\_\_\_\_\_
- \* 8. LIST YOUR VEHICLES/EQUIPMENT AVAILABLE FOR THIS CONTRACT:  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- \* 9. IN THE SPACES FOLLOWING, PROVIDE INFORMATION REGARDING CONTRACTS COMPLETED BY YOUR FIRM SIMILAR IN NATURE TO THE PROJECT BEING BID. A MINIMUM OF FOUR (4) CONTRACTS SHALL BE LISTED. PUBLICLY BID CONTRACTS ARE PREFERRED, BUT NOT MANDATORY.  
  
PROJECT NAME: \_\_\_\_\_  
OWNER: \_\_\_\_\_  
CITY/STATE: \_\_\_\_\_

DOLLAR AMOUNT: \$ \_\_\_\_\_ DATE COMPLETED: \_\_\_\_\_  
PUBLICLY BID? \_\_\_\_\_ YES \_\_\_\_\_ NO  
TYPE OF WORK?: \_\_\_\_\_  
CONTACT PERSON: \_\_\_\_\_ TELEPHONE #: (\_\_\_\_) \_\_\_\_\_  
CONTACT PERSON'S RELATION TO PROJECT?: \_\_\_\_\_  
(i.e., contract manager, purchasing agent, etc.)

PROJECT NAME: \_\_\_\_\_  
OWNER: \_\_\_\_\_  
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DOLLAR AMOUNT: \$ \_\_\_\_\_ DATE COMPLETED: \_\_\_\_\_  
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CITY/STATE: \_\_\_\_\_  
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(i.e., contract manager, purchasing agent, etc.)

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(i.e., contract manager, purchasing agent, etc.)

10. The undersigned certifies that the information contained herein is complete and accurate and hereby authorizes and requests any person, firm, or corporation to furnish any information requested by the City in verification of the recitals comprising this statement of Bidder's qualifications and experience.

DATE: \_\_\_\_\_ BIDDER: \_\_\_\_\_

SIGNATURE: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

**END OF SECTION**

## CERTIFICATE OF NON-COLLUSION

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee club, or other organization, entity, or group or individuals.

---

(Signature of individual)

---

Name of Business





**CERTIFICATE OF FOREIGN CORPORATION**

**The undersigned hereby certifies that it has been duly established, organized, or chartered as a corporation under the laws of:**

---

**(Jurisdiction)**

**The undersigned further certifies that it has complied with the requirements of M.G.L. c. 30, §39L (if applicable) and with the requirements of M.G.L. c. 156D, §15.03 relative to the registration and operation of foreign corporations within the Commonwealth of Massachusetts.**

---

**Name of person signing proposal**

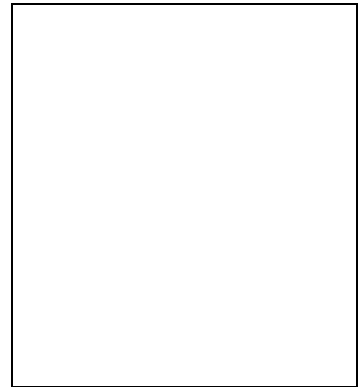
---

**Signature of person signing proposal**

---

**Name of Business (Please Print or Type)**

*Affix Corporate Seal here*



City of Newton



Mayor  
Ruthanne Fuller

**Purchasing Department**  
Nicholas Read ☎ *Chief Procurement Officer*  
1000 Commonwealth Avenue  
Newton Centre, MA 02459-1449  
purchasing@newtonma.gov

Telephone  
(617) 796-1220  
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(617) 796-1089

Date

Vendor

Re: Debarment Letter for Invitation For Bid #24-65

As a potential vendor on the above contract, the City requires that you provide a debarment/suspension certification indicating that you are in compliance with the Federal Executive Order below. Certification can be done by completing and signing this form.

PART 2 - Debarment:

**Federal Executive Order (E.O.) 12549 “Debarment and Suspension“ requires that all contractors receiving individual awards, using federal funds, and all sub-recipients certify that the organization and its principals are not debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency from doing business with the Federal Government.**

I hereby certify under pains and penalties of perjury that neither I nor any principal(s) of the Company identified below is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.

\_\_\_\_\_ (Name)  
\_\_\_\_\_ (Company)  
\_\_\_\_\_ (Address)  
\_\_\_\_\_ (Address)  
PHONE \_\_\_\_\_ FAX \_\_\_\_\_  
EMAIL \_\_\_\_\_

\_\_\_\_\_ Signature

\_\_\_\_\_ Date

If you have questions, please contact Nicholas Read, Chief Procurement Officer at (617) 796-1220.

## Request for Taxpayer Identification Number and Certification

**Give form to the  
 requester. Do not  
 send to the IRS.**

Print or type  
See Specific instructions on page 2.

|   |   |
|---|---|
| Name (as shown on your income tax return)   |   |
| Business name, if different from above  |   |
| Check appropriate box: <input type="checkbox"/> Individual/sole proprietor <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership<br><input type="checkbox"/> Limited liability company. Enter the tax classification (D=disregarded entity, C=corporation, P=partnership) ▶ ..... <input checked="" type="checkbox"/> Exempt payee<br><input type="checkbox"/> Other (see instructions) ▶ |   |
| Address (number, street, and apt. or suite no.)   | Requester's name and address (optional) |
| City, state, and ZIP code   |   |
| List account number(s) here (optional)  |   |

### Part I Taxpayer Identification Number (TIN)

Enter your TIN in the appropriate box. The TIN provided must match the name given on Line 1 to avoid backup withholding. For individuals, this is your social security number (SSN). However, for a resident alien, sole proprietor, or disregarded entity, see the Part I instructions on page 3. For other entities, it is your employer identification number (EIN). If you do not have a number, see *How to get a TIN* on page 3.

**Note.** If the account is in more than one name, see the chart on page 4 for guidelines on whose number to enter.

|                                |
|--------------------------------|
| Social security number         |
| or                             |
| Employer identification number |

### Part II Certification

Under penalties of perjury, I certify that:

1. The number shown on this form is my correct taxpayer identification number (or I am waiting for a number to be issued to me), and
2. I am not subject to backup withholding because: (a) I am exempt from backup withholding, or (b) I have not been notified by the Internal Revenue Service (IRS) that I am subject to backup withholding as a result of a failure to report all interest or dividends, or (c) the IRS has notified me that I am no longer subject to backup withholding, and
3. I am a U.S. citizen or other U.S. person (defined below).

**Certification instructions.** You must cross out item 2 above if you have been notified by the IRS that you are currently subject to backup withholding because you have failed to report all interest and dividends on your tax return. For real estate transactions, item 2 does not apply. For mortgage interest paid, acquisition or abandonment of secured property, cancellation of debt, contributions to an individual retirement arrangement (IRA), and generally, payments other than interest and dividends, you are not required to sign the Certification, but you must provide your correct TIN. See the instructions on page 4.

|                  |                            |        |      |
|------------------|----------------------------|--------|------|
| <b>Sign Here</b> | Signature of U.S. person ▶ | Date ▶ | Name |
|------------------|----------------------------|--------|------|

### General Instructions

Section references are to the Internal Revenue Code unless otherwise noted.

#### Purpose of Form

A person who is required to file an information return with the IRS must obtain your correct taxpayer identification number (TIN) to report, for example, income paid to you, real estate transactions, mortgage interest you paid, acquisition or abandonment of secured property, cancellation of debt, or contributions you made to an IRA.

Use Form W-9 only if you are a U.S. person (including a resident alien), to provide your correct TIN to the person requesting it (the requester) and, when applicable, to:

1. Certify that the TIN you are giving is correct (or you are waiting for a number to be issued),
2. Certify that you are not subject to backup withholding, or
3. Claim exemption from backup withholding if you are a U.S. exempt payee. If applicable, you are also certifying that as a U.S. person, your allocable share of any partnership income from a U.S. trade or business is not subject to the withholding tax on foreign partners' share of effectively connected income.

**Note.** If a requester gives you a form other than Form W-9 to request your TIN, you must use the requester's form if it is substantially similar to this Form W-9.

**Definition of a U.S. person.** For federal tax purposes, you are considered a U.S. person if you are:

- An individual who is a U.S. citizen or U.S. resident alien,
- A partnership, corporation, company, or association created or organized in the United States or under the laws of the United States,
- An estate (other than a foreign estate), or
- A domestic trust (as defined in Regulations section 301.7701-7).

**Special rules for partnerships.** Partnerships that conduct a trade or business in the United States are generally required to pay a withholding tax on any foreign partners' share of income from such business. Further, in certain cases where a Form W-9 has not been received, a partnership is required to presume that a partner is a foreign person, and pay the withholding tax. Therefore, if you are a U.S. person that is a partner in a partnership conducting a trade or business in the United States, provide Form W-9 to the partnership to establish your U.S. status and avoid withholding on your share of partnership income.

The person who gives Form W-9 to the partnership for purposes of establishing its U.S. status and avoiding withholding on its allocable share of net income from the partnership conducting a trade or business in the United States is in the following cases:

- The U.S. owner of a disregarded entity and not the entity,

## Business Category Information Form\*

IFB No. 24-65

### Newton Commonwealth Golf Course Maintenance Facility Improvements & Renovations (Sub-Bidders)

| Business Type Categories*                                       | Select All That Apply |
|---|-----------------------|
| MBE: Minority-Owned Business Enterprise                         |                       |
| WBE: Women-Owned Business Enterprise                            |                       |
| VBE: Veteran Business Enterprise                                |                       |
| SDVOBE: Service-Disabled Veteran-Owned Business Enterprises     |                       |
| DOBE: Disability-Owned Business Enterprise                      |                       |
| LGBTBE: Lesbian, Gay, Bisexual, Transgender Business Enterprise |                       |

\*Information is being collected as part of a City initiative to open contract opportunities to underrepresented vendors.

I do not wish to complete this form.

There is no penalty for persons who do not complete this Form, and whether or not the Form is completed will not be taken into consideration in awarding a bid.

I certify that the foregoing information is true and correct.

Company Name: \_\_\_\_\_

By: \_\_\_\_\_

Date: \_\_\_\_\_

## **CONTRACT FORMS**

The awarded bidder will be required to complete and submit documents substantially similar in form to the following.

These forms may need to be modified on account of changed circumstances, and are provided for informational purposes only.

# CITY-CONTRACTOR AGREEMENT

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## INDEX

1. THE CONTRACT DOCUMENTS
  2. GENERAL DESCRIPTION OF THE WORK
  3. THE ARCHITECT
  4. CONTRACT TIME
  5. CONTRACT PRICE
  6. CONTRACTOR'S REPRESENTATIONS
  7. MISCELLANEOUS
  8. AVAILABILITY OF APPROPRIATION
- 

THE CITY OF NEWTON (the **City**), a municipal corporation of the Commonwealth of Massachusetts, acting through its Commissioner of Public Buildings and its Chief Procurement Officer, but without personal liability to either, and \_\_\_\_\_ of \_\_\_\_\_

(The **Contractor**) hereby mutually agree as follows:

---

### ARTICLE 1 - THE CONTRACT DOCUMENTS

---

1.1 The Contract Documents form the contract between the **City** and the **Contractor** and are incorporated into this Contract by this reference. The Contract Documents represent the final and entire integrated agreement between the parties with respect to the Work under the Contract Documents. The Contract Documents supersede all prior oral or written agreements, if any, between the parties, and any statement, representation, promise or inducement not set forth in the Contract Documents is null and void, and not binding on either the **City** or the **Contractor**. The Contract Documents shall not in any way create a relationship of any kind between the **Architect** and the **Contractor**, or between the **City** and any Subcontractor, or Supplier, or any other person. The **Architect** shall, however, be entitled to performance and enforcement of obligations under the Contract which are consistent with the **Architect's** authority and responsibilities under the Contract Documents.

1.2. The Contract Documents, on the date when the **City** executes this Contract and which are attached to this Contract consist of the following:

This Contract, fully executed by the **City** and the **Contractor**, including:  
Addenda \_\_\_\_\_ through \_\_\_\_\_.

The Project Manual for **NEWTON COMMONWEALTH GOLF COURSE FACILITY MAINTENANCE IMPROVEMENTS & RENOVATIONS**, Wage Rate Requirements and Wage Rate Schedule including any updated prevailing wage rate schedules as applicable, General Conditions, and Technical Specifications, and Drawings, bearing the title **NEWTON COMMONWEALTH GOLF COURSE FACILITY MAINTENANCE IMPROVEMENTS & RENOVATIONS AT 212 KENRICK STREET**.

Advertisement for Bids and Instructions to Bidders.

Performance and Payment Bonds, fully executed by the **Contractor**, and the corresponding sureties.

The **Contractor's** Bid Form.

The Contract Documents itemized in this paragraph 1.2 are included with this Contract.

1.3 Other Contract Documents which will be issued after the date when the **City** executes this Contract consist of:

Change Orders signed by the **City**, regardless of whether or not they are signed by the **Contractor**.

Change Authorizations signed by the **Official**, regardless of whether or not they are signed by the **Contractor**.

Contract Amendments executed by both parties.

1.4 There are no Contract Documents other than those listed in this Article 1. The Contract Documents may be modified or supplemented as provided in the General Conditions.

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## ARTICLE 2 - GENERAL DESCRIPTION OF THE WORK

2.1 The **Contractor** shall furnish all of the materials and perform all of the Work required by the Contract Documents listed in Article 1.

---

## ARTICLE 3 - THE ARCHITECT

3.1 The **City** has retained Raymond Design Associates, Inc, 60 Ledgewood Place, Rockland Massachusetts 02370. to act as the **City's** representative, assume all duties and responsibilities of and have the rights and authority assigned to the **Architect** in the Contract Documents with respect to completion of the Work in accordance with the Contract Documents.

---

## ARTICLE 4 - CONTRACT TIME

4.1 Contract Time shall commence upon **Contractor's** receipt of Notice to Proceed. Such notice shall be provided upon the execution of this Contract by the Mayor of the **City** and the **Contractor** shall bring the Work to Substantial Completion on **April 11, 2025**, and to Final Completion on or before **June 12, 2025**, as indicated in the Invitation for Bid. The **Contractor** represents to the **City** that the Contract Time is sufficient to perform the original scope of work in accordance with the Contract Documents.

4.2 The **City** and the **Contractor** recognize that the Contract Time(s) so specified are of the essence of this Contract, and the **City** will suffer financial losses if the Work is not completed within the Contract Time(s) specified plus any extensions authorized by Change Order. Accordingly, if the **Contractor** fails to complete the Work, or designated part of the Work, within the corresponding Contract Times, he shall pay the **City** liquidated damages in accordance with paragraph 4.2.1.

4.2.1 The **Contractor** agrees to allow the **City** to deduct from progress payments and retention and to pay to the **City** as liquidated damages, and not as a penalty, the amount of One Thousand, Five Hundred Dollars and No/Cents (\$1,500.00) for each calendar day that expires after the Contract Time specified in paragraph 4.1 for Substantial Completion until the Work is Substantially Complete. The **Contractor** further agrees to allow the **City** to deduct from progress payments or retention and to pay to the **City** as liquidated damages, and not as a penalty, the amounts designated subject to the terms and conditions specified, for each day that expires after each of the Contract Time(s) specified for Substantial Completion or Partial Completion of each of those separable parts of the Work until each of the parts is so substantially or partially complete.

---

## ARTICLE 5 - CONTRACT PRICE

5.1 The **City** shall pay and the **Contractor** shall accept, as full compensation for everything furnished, done by or resulting to the Contract in carrying out this Contract, subject to additions and deductions in the Contract Documents, the not to exceed Contract Price of \_\_\_\_\_ DOLLARS (\$ \_\_\_\_\_).

The **Contractor** agrees that the Contract Price complies with prevailing wage requirements and is sufficient to properly staff the Work within the Contract Time.

5.2 This Contract is subject to the availability of an appropriation therefor.

5.3 If the Contract is funded under a grant with the Federal Government, it is being executed without further appropriation pursu-



ant to M.G.L. Chapter 44, Section 53A.

5.4 If the amount of the City Comptroller's certification of available funds is less than the not to exceed Contract Price stated above, the City shall not be liable for any claims or requests for payment by the **Contractor** which would cause total claims or payments under this Contract to exceed the amount so certified by the City Comptroller.

5.5 Unless otherwise expressly provided in a writing incorporated herein by reference the amount certified by the City Comptroller as available funds under this Contract may be increased or decreased by the **Official** upon written notice to the **Contractor** bearing the written approval of such change by the Mayor of the City.. Such notice shall be sent or delivered to the **Contractor** at the **Contractor's** business address and shall take effect not less than seven (7) days after the date of such delivery or mailing. In the event of such decrease, the **Contractor** shall be compensated for services rendered to the effective date of such reduction, in accordance with the rates of compensation specified in this Contract.

5.6 Payments by the **Owner** to the **Contractor** will be made in current funds on the basis of the prices indicated on the **Contractor's** Bid Form, subject to the conditions governing payments to the **Contractor** given in the Contract Documents.

---

## ARTICLE 6 - CONTRACTOR'S REPRESENTATIONS

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6.1 The **Contractor** has not given, offered or agreed to give any person, corporation or other entity any gift, contribution or offer of employment as an inducement for, or in connection with, the award of this Contract.

6.2 No Subcontractor to or Subcontractor of the **Contractor** has given, offered or agreed to give any gift, contribution or offer of employment to the **Contractor**, or to any other person, organization, or entity as an inducement for, or in connection with, the award to the Subcontractor of a contract by the **Contractor**.

6.3 No person, corporation or other entity, other than a bona fide full-time employee of the **Contractor** has been retained or hired by the **Contractor** to solicit for or in any way assist the **Contractor** in obtaining this Contract upon an agreement or understanding that such person, corporation or other entity by paid a fee or other consideration contingent upon the award of this Contract to the **Contractor**.

---

## ARTICLE 7 - MISCELLANEOUS

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7.1 No assignment by a party to this Contract of any rights under or interests in the Contract Documents will be binding on the other party without the written consent of the party sought to be bound; and specifically, but without limitation, monies that may become due and monies that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law); and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

7.2 The **Contractor** shall perform all Work under this Contract as an independent contractor. The **Contractor** shall not be considered an agent of the **City**, nor shall his Subcontractors be considered agents of the **City**.

7.3 The **City** and the **Contractor** each binds itself, its partners, successors, assigns and legal representatives to the other party to this Contract, its partners, successors, assigns and legal representatives in respect of all covenants, agreements and obligations contained in the Contract Documents.

7.4 This Contract and the Contract Documents shall be governed by the Laws and Regulations of the Commonwealth of Massachusetts.

7.5 The **City** reserves the right to correct any error in any progress payment that may have been paid. The **City** reserves the right, should proof of defective Work be discovered after final payment, to claim and recover from the **Contractor** and his surety, or either of them, sufficient sums to correct or remove and replace the defective Work.

7.6 Any waiver by the **City** of any provision of the Contract Documents shall be specific and in writing, and shall apply only to the particular matter and not to other similar or dissimilar matters. Any waiver of any breach of this Contract shall not be held to be a waiver of any other or subsequent breach.

7.7 Nothing contained in this Contract shall in any manner authorize, empower or constitute the **Contractor**, his Subcontractors or Suppliers as agent(s) of the **City**; to assume or create any obligation or responsibility whatsoever, express or implied, on behalf of or in the name of the **City**; or to bind the **City** in any manner or make any representation, warranty, covenant, agreement or com-

mitment on behalf of the **City**. The **Contractor** shall perform all Work under this Contract as an independent contractor. This contract does not create and shall not be construed as creating, any rights enforceable by any person not a party to the Contract.

7.8 This Contract supersedes all prior oral or written agreements, if any, between the parties and constitutes the entire, integrated agreement between the parties with respect to the Work to be performed under the Contract Documents.

7.9 If any provision(s) of the Contract Documents is/are invalid, illegal or unenforceable, all other provisions of the Contract Documents shall nevertheless remain in full force and effect. If any provision of the Contract Documents is inapplicable to any person or circumstance, that provision shall nevertheless remain applicable to all other persons and circumstances.

7.10 It is the intent of the **City** and the **Contractor** that all provisions of Law required to be inserted or referenced in the Contract Documents are in fact inserted or referenced in the Contract Documents. If any provision of Law is not so inserted or referenced, or is inserted or referenced improperly, then each such provision shall be considered inserted or referenced in proper form at no increase in Contract Price or Contract Time.

7.11 The duties, obligations, criteria or procedures imposed by the Contract Documents and the rights and remedies made available are in addition to, and not in any way a limitation of, any rights and remedies which are otherwise allowed or imposed by Law, except that in the event a specific part or detailed requirement of a provision, criterion or procedure in the Contract Documents and a specific part or detailed requirement of a provision, criterion or procedure imposed by Law conflict, the specific part or detailed requirement of such provision, criterion or procedure imposed by Law shall govern. All other specific parts or detailed requirements in the provisions, criteria or procedures of the applicable Law and the Contract Documents shall remain in full force and effect and be read with the controlling specific part or detailed requirement. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

7.12 The **Contractor** shall not sell, assign, transfer or otherwise convey any of his rights and shall not delegate any of his duties under this Agreement without the prior and express written consent of the **City** and the Surety. In its sole discretion the **City** may refuse to consent to any proposed assignment or delegation. Any attempted sale, assignment, transfer, conveyance or delegation in violation of this paragraph shall be void and shall relieve the **City** of any further liability under the Contract Documents but shall not relieve the **Contractor's** sureties of any liability. If the **City** consents in writing to an assignment, unless specifically stated to the contrary in the consent, the assignment shall not release or discharge the **Contractor** from any duty or responsibility set forth in the Contract Documents, and shall not release or discharge the Surety under the Bonds required by the Contract Documents.

7.13 This Contract shall be binding on the **City**, the **Contractor** and all of their respective successors and legal representatives and, if the **City** has consented to an assignment or delegation as provided in paragraph 7.12, assigns and delegates.

7.14 Unless otherwise specified in the Contract Documents, any notice or communication shall be in writing, and shall be deemed to have been given as of the time of actual receipt.

7.15 Unless otherwise specified in writing, any notice or other communication to the **City** or **Contractor** shall be duly served if delivered to the intended individual in person or to a member of the firm or entity, or to an officer of the corporation for which it was intended, at the corresponding address designated in this Agreement.

7.16 Any notice or other communication to the sureties furnishing the Performance and Payment Bonds shall be sufficiently given if delivered to the intended individual in person or to a member of the firm or entity, or to an officer of the corporation for which it was intended, at the address designated in the corresponding Bond.

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## ARTICLE 8 – AVAILABILITY OF APPROPRIATION

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8.1 This Contract is subject to an appropriation being available therefor.

IN WITNESS WHEREOF, the parties have caused this instrument to be executed in quintuplicate under seal the day and year first above written.

**CONTRACTOR**

**CITY OF NEWTON**

By \_\_\_\_\_

Print Name \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

*Affix Corporate Seal Here*

City funds in the amount of \$ \_\_\_\_\_  
are available in account #:

\_\_\_\_\_

I further certify that the Mayor, or her designee is  
authorized to execute contracts and approve change  
orders.

By \_\_\_\_\_

*Comptroller of Accounts*

Date \_\_\_\_\_

By \_\_\_\_\_

*Chief Procurement Officer*

Date \_\_\_\_\_

By \_\_\_\_\_

*Commissioner of Public Buildings*

Date \_\_\_\_\_

Approved as to Legal Form and Character

By \_\_\_\_\_

*Associate City Solicitor*

Date \_\_\_\_\_

CONTRACT AND BONDS APPROVED

By \_\_\_\_\_

*Mayor, or her designee*

Date \_\_\_\_\_

**CERTIFICATE OF AUTHORITY - CORPORATE**

1. I hereby certify that I am the Clerk/Secretary of \_\_\_\_\_  
(insert full name of Corporation)

2. corporation, and that \_\_\_\_\_  
(insert the name of officer who signed the **contract and bonds.**)

3. is the duly elected \_\_\_\_\_  
(insert the title of the officer in line 2)

4. of said corporation, and that on \_\_\_\_\_  
(insert a date that is **ON OR BEFORE** the date the officer signed the **contract and bonds.**)

at a duly authorized meeting of the Board of Directors of said corporation, at which all the directors were present or waived notice, it was voted that

5. \_\_\_\_\_ the \_\_\_\_\_  
(insert **name** from line 2) (insert **title** from line 3)

of this corporation be and hereby is authorized to execute contracts and bonds in the name and on behalf of said corporation, and affix its Corporate Seal thereto, and such execution of any contract of obligation in this corporation's name and on its behalf, with or without the Corporate Seal, shall be valid and binding upon this corporation; and that the above vote has not been amended or rescinded and remains in full force and effect as of the date set forth below.

6. ATTEST: \_\_\_\_\_ *AFFIX CORPORATE SEAL HERE*  
(Signature of **Clerk or Secretary**)\*

7. Name: \_\_\_\_\_  
(Please print or type name in line 6)\*

8. Date: \_\_\_\_\_  
(insert a date that is **ON OR AFTER** the date the officer signed the **contract and bonds.**)

\* The name and signature inserted in lines 6 & 7 must be that of the Clerk or Secretary of the corporation.

**CITY OF NEWTON, MASSACHUSETTS**

**PERFORMANCE BOND**

Know All Men By These Presents:

That we, \_\_\_\_\_, as PRINCIPAL, and \_\_\_\_\_, as SURETY, are held and firmly bound unto the City of Newton as Oblige, in the sum of \_\_\_\_\_ dollars (\$ \_\_\_\_\_) to be paid to the Oblige, for which payments well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the said PRINCIPAL has made a contract with the Oblige, bearing the date of \_\_\_\_\_, 2024 for the construction of \_\_\_\_\_ in Newton, Massachusetts.  
(Project Title)

Now, the condition of this obligation is such that if the PRINCIPAL and all Sub-contractors under said contract shall well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of said contract on its part to be kept and performed during the original term of said contract and any extensions thereof that may be granted by the Oblige, with or without notice to the SURETY, and during the life and any guarantee required under the contract, and shall also well and truly keep and perform all the undertakings, covenants, agreements, terms and conditions of any and all duly authorized modifications, alterations, changes or additions to said contract that may hereafter be made, notice to the SURETY of such modifications, alterations, changes or additions being hereby waived, then this obligation shall become null and void; otherwise, it shall remain in full force, virtue and effect.

In the event, that the contract is abandoned by the PRINCIPAL, or in the event that the Oblige terminates the employment of the PRINCIPAL or the authority of the PRINCIPAL to continue the work said SURETY hereby further agrees that said SURETY shall, if requested in writing by the Oblige, take such action as is necessary to complete said contract.

In Witness Whereof, the PRINCIPAL and SURETY have hereto set their hands and seals this \_\_\_\_day of \_\_\_\_\_ 2024.

PRINCIPAL

SURETY

\_\_\_\_\_

\_\_\_\_\_

BY \_\_\_\_\_  
(SEAL)

BY \_\_\_\_\_  
(ATTORNEY-IN-FACT) (SEAL)

\_\_\_\_\_  
(Title)

ATTEST: \_\_\_\_\_

ATTEST: \_\_\_\_\_

**CITY OF NEWTON, MASSACHUSETTS**

**PAYMENT BOND**

Know All Men By These Presents:

That we, \_\_\_\_\_, as PRINCIPAL, and \_\_\_\_\_, as SURETY, are held and firmly bound unto the City of Newton as Obligee, in the sum of \_\_\_\_\_ dollars (\$ \_\_\_\_\_) to be paid to the Obligee, for which payments well and truly to be made, we bind ourselves, our respective heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Whereas, the said PRINCIPAL has made a contract with the Obligee, bearing the date \_\_\_\_\_ of \_\_\_\_\_, 2024, for the construction of \_\_\_\_\_ (Project Title) in Newton, Massachusetts.

Now, the conditions of this obligation are such that if the PRINCIPAL and all Sub-contractors under said contract shall pay for all labor performed or furnished and for all materials used or employed in said contract and in any and all duly authorized modifications, alterations, extensions of time, changes or additions to said contract that may hereafter be made, notice to the SURETY of such modifications, alterations, extensions of time, changes or additions being hereby waived, the foregoing to include any other purposes or items set out in, and to be subject to, provisions of M.G.L. c.30, §39A, and M.G.L. c.149, §29, as amended, then this obligation shall become null and void; otherwise it shall remain in full force, virtue and effect.

In Witness Whereof, the PRINCIPAL and SURETY have hereto set their hands and seals this \_\_\_\_\_ day of \_\_\_\_\_, 2024.

PRINCIPAL

SURETY

\_\_\_\_\_

\_\_\_\_\_

BY \_\_\_\_\_  
(SEAL)

BY \_\_\_\_\_  
(ATTORNEY-IN-FACT) (SEAL)

\_\_\_\_\_  
(Title)

ATTEST: \_\_\_\_\_

ATTEST: \_\_\_\_\_

**TABLE OF CONTENTS**

1. CONTRACT DOCUMENTS
2. THE CITY - GENERAL PROVISIONS
3. THE ARCHITECT - GENERAL PROVISIONS
4. THE CONTRACTOR - GENERAL PROVISIONS
5. SUBCONTRACTORS AND SUPPLIERS
6. PROJECT COORDINATION
7. PROSECUTION AND COMPLETION
8. PROGRESS PAYMENTS, FINAL PAYMENT & ACCEPTANCE
9. PROTECTION OF PERSONS AND PROPERTY
10. LEGAL REQUIREMENTS AND INSURANCE
11. CHANGES IN THE WORK
12. CHANGES IN CONTRACT PRICE OR CONTRACT TIME
13. GUARANTEES
14. TERMINATION
15. DISPUTES
16. LIQUIDATED DAMAGES

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**CITY OF NEWTON**  
**PUBLIC BUILDINGS DEPARTMENT**  
**(General Conditions For City Projects Bid Under M.G.L. c. 149)**

**ARTICLE 1 - CONTRACT DOCUMENTS**

**1.1 Use of Terms:**

1.1.1 The following terms used in this Section or elsewhere in the Contract Documents, shall have these meanings:

*Addendum* – A written modification, clarification, correction or other change to the Contract Documents issued by the Official prior to the date stated for the receipt of bids.

*Application for Payment* - The form furnished by the **Official** to be used by the **Contractor** in requesting payment, and which shall enclose the affidavit required in the Contract Documents.

*Architect* - The individual, partnership, corporation, joint venture, or any combination thereof, named as **Architect** in the agreement who will have the rights and authority assigned to the **Architect** in the Contract Documents. The term **Architect** means the **Architect** or its authorized representative.

*Business Day* - Any day except Saturdays, Sundays and legal holidays observed by the **City**. The term "day" means a calendar day.

*Change Authorization* - A written order executed by the **City** directing the **Contractor** to make changes in the Work or giving the basis for a potential change in Contract Price or Contract Time for incorporation into the Contract Documents by Change Order.

*Change Order* - A written instrument which when fully executed by the **City** amends the Contract Documents to provide for changes in the Work, or in Contract Price or Contract Time.

*City* - The City of Newton, a municipal corporation in the Commonwealth of Massachusetts, acting by its Public Buildings Commission, represented by the Director of the Public Buildings Department or his authorized representative.

*Claim* - A written demand of assertion by the **City** or **Contractor**, which is properly certified according to the requirements of Paragraph 15.2.1, seeking an adjustment in Contract Price and payment of monies due, an extension or shortening in Contract Time, the adjustment or interpretation of Contract terms, or any other relief arising under or relating to the Contract, after a determination by the **Architect** or **City** under the appropriate provision of the Contract Documents.

*Contract/Contract Documents* – This Agreement, fully executed; the Certificate of Authority; all Addenda; the Letter of Award; the Project Manual including MWBE/AA Requirements, Wage Rate Requirements and Wage Rate Schedule including any updated prevailing wage rate schedules as applicable, Supplementary Conditions; the General Conditions; the Drawings; the Specifications; the Invitation for Bids; the Contractor's bid; all bonds submitted; All Change Authorizations and Change Orders when fully executed.

*Contract Time* – The time commencing upon the date of execution of the Contract by the Mayor of the City and continuing through the date of Final Completion.

*Contract Price* – The not to exceed lump sum price representing full compensation for everything furnished, done by or resulting to the **Contractor** in carrying out the Contract.

*Contractor* - Person or firm named "The Contractor" in the Agreement with whom the **City** has awarded and entered into the Agreement.

*Correction Period* - The period of time within which the **Contractor** shall, in accordance with the Contract Documents, either correct, or if rejected, remove and replace, defective Work.

*Date for Commencement of the Contract Time* - The date when the Contract Time starts to run.



*Day* – A calendar day.

*Defective Work* - Work that is unsatisfactory, deficient or damaged, does not conform to the Contract Documents, or does not meet the requirements of any inspection, test or approval.

*Drawings* – The graphic and pictorial part of the Contract Documents depicting the Work including plans, elevations, sections, details, schedules and diagrams Drawings shall not serve nor be used as Shop Drawings.

*Final Acceptance* - The **Official's** written notice to the **Contractor** accepting the Work, following the **Official's** concurrence with the **Architect's** determination that the Work has been completed and is acceptable.

*Laws* - Laws, including statutes, by-laws, rules, regulations, codes, resolutions and ordinances, or orders.

*M.G.L.* - Massachusetts General Laws.

*Notice of Claim* – A clearly marked written notice that states the general nature of the Claim delivered by the party making the Claim to the other party no later than thirty (30) days after the determination giving rise to the Claim.

*Official* - The Commissioner of the Public Buildings Department, acting on behalf of the **City** in the execution of the Agreement, or his/her authorized representative.

*Owner* - The City of Newton: see definition for "City".

*Partial Utilization* - Use by the **City** of a portion of the Work before reaching Substantial Completion for all the Work.

*Progress Schedule* – The Schedule which shows the **Contractor's** approach to planning, scheduling, and execution of the Work.

*Project* - The total construction of which the Work may be the whole, or a part, as indicated in the Contract Documents.

*Site* – The land on which the Project is located, indicated on the Site Drawings and showing its physical position in relation to the adjacent lands.

*Specifications* - Parts of the Contract Documents consisting of written requirements for technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and performance of related services.

*Sub-agreement* – A subcontract or purchase order awarding part of the Work to a Subcontractor or Supplier.

*Subcontractor* - A person having a Sub-agreement for performing labor at the site, or for performing labor and furnishing materials/equipment. *Filed sub-bid Subcontractor is one who performs a sub trade for which the City requested filed sub-bids.*

*Submittals* - Includes Shop Drawings, brochures, samples, and all those other documents required for submission by the Contract Documents. The term *Shop Drawings* includes drawings, diagrams, illustrations, standard schedules, performance charts, instructions, and other data prepared by or for the **Contractor** to illustrate some part of the Work, or by a Supplier and submitted by the **Contractor** to illustrate items of materials or equipment.

*Substantial Completion* - Either the Work has been completed except for Work items representing less than one percent (1%) of the adjusted Contract Price, or completed and opened to public use except for minor incomplete or unsatisfactory items that do not materially impair the usefulness of the Work required by the Contract.

*Supplier* - A manufacturer, fabricator, distributor, materialman or vendor having a Sub-agreement for furnishing materials and equipment and/or not for performing labor at the site.

*Total Float* - Number of Business Days by which Work may be delayed from its Early Dates without necessarily extending the Contract Times. *Contract Float* is the number of Business Days between the **Contractor's** anticipated date for early completion of all or part of the Work and the corresponding Contract Time.

*Underground Utilities* - All pipelines, conduits, ducts, cables, wells, tanks, tunnels, and appurtenances, or other similar facilities, installed underground to furnish: water, electricity, gases, steam, petroleum products, telephone, communications, cable TV, sewerage and drainage removal, traffic, or control systems.

*Work* - The entire completed construction, or its various parts, as specified in the Contract Documents. Work is the result of performing and furnishing all services, obligations, responsibilities, labor, materials, equipment, temporary facilities, and in-

cidental necessary to complete the scope under the Contract Documents. Whenever the term "execution" is used with reference to the Work, it includes the performance and/or furnishing of the Work.

1.1.2 Any period of time in days will be computed to exclude the first and include the last day. If the last day falls on a non-Business Day, it shall be omitted from the computation. The term "registered mail" includes certified mail with return receipt requested. The term "person" means individuals, firms, partnerships, corporations, receivers, trustees, joint ventures, and any combinations of them. The term "State" or "Commonwealth" means the Commonwealth of Massachusetts.

1.1.3. Other terms used in this Section shall have the meanings assigned to them elsewhere in the Contract Documents, and if not assigned and where the context will permit, as used or defined in Massachusetts General Laws (M.G.L.).

## **1.2 Interpretations:**

1.2.1. Whenever the term "the **Contractor**" is used concerning an action, obligation or event, it shall cover, even if not expressly stated, actions or obligations of, events involving, any Subcontractor, Supplier, or anyone for whom any of them may be liable, unless the context requires otherwise.

1.2.2. Whenever a provision obligates the **Contractor** to reimburse the **City** for certain costs incurred, the **City** is entitled to withhold a corresponding set-off against any payment, and to amend the Contract Price accordingly.

1.2.3. Whenever a provision covering delay, extension, or acceleration which in the Contract Documents covers delay, re-scheduling, extended performance, disruption, interference, inefficiency, productivity, and production losses, acceleration, or hindrance and associated cost(s) for which the **City** is not responsible, or which is not unreasonable under the circumstances, or which was within the contemplation of the parties, specifies that "the **City** shall authorize the necessary change in Contract Time **only**", the authorized change in Contract Time shall be the **Contractor's** sole and exclusive remedy with respect to the **City** for any such delay, extension, or acceleration, however caused, resulting from the event contemplated by that provision.

1.2.4 A provision requiring the **Contractor** to "defend, indemnify and hold harmless the **City** and the **Architect**." or covering claims against or liability of the **City** and/or the **Architect**, shall include the **City** and **Architect**, their respective consultants, agents, directors, officers, shareholders and employees and any combination of any of them, and the **City's** agencies or department issuing permits covering the Work. A provision requiring the **Contractor** to so defend, indemnify and hold harmless the **City** and **Architect** shall also require the **Contractor** to defend, indemnify and hold harmless the **City** and **Architect**, as interpreted, from and against all of the specified claims, including those caused in part by the negligence or other liability-creating conduct or omissions of the **City** or **Architect**. The **Contractor** shall not be required to indemnify the **City** or **Architect** against liability for loss or damage resulting from the sole negligence of the **City** or **Architect**.

1.2.5 Any reference to an Article or paragraph in these General Conditions, without identification of the particular Section, shall mean a reference to these General Conditions. Terms capitalized in these General Conditions include terms defined in paragraph 1.1.1 or paragraph 1.1.3.

1.2.6 Each Article in this Section contains sub-articles, numbered as this sub-article 1.2 is numbered; parts, numbered as this part 1.2.6 is numbered; and sub-parts - all of which are considered "paragraphs". A reference to a paragraph means a reference to the entire sub-article, a part, or a sub-part, or any combination of them, depending on the intent of the reference.

## **1.3 Applicable Law:**

1.3.1 This Contract is made subject to all laws of the Commonwealth of Massachusetts.

1.3.2 If the Contract Documents contain any unlawful provisions, such unlawful provisions shall be of no effect. Upon the application of either party, the unlawful provision shall be considered stricken from the Contract Documents without affecting the remainder of the Contract Documents.

1.3.3 All provisions of law required to be inserted in the Contract Documents shall be and are inserted herein. If through mistake, neglect, oversight or otherwise, any such provision is not herein inserted or inserted in improper form, upon the application of either party, the Contract Documents shall be changed by the **City**, at no increase in Contract Price or extension in Contract Time, so as to strictly comply with the law and without prejudice to the rights of either party hereunder.

## **1.4 Intent of the Contract Documents:**

1.4.1 It is the intent of the Contract Documents to describe and provide for a functionally complete Project, or Work, to be constructed in accordance with the Contract Documents. In addition to the work expressly called for in the Drawings and Specifications, any other Work, materials or equipment that may reasonably be inferred from the Contract Documents as being required to produce the intended result shall be provided, at no increase in Contract Price or extension in Contract Time,

and without requiring any changes in the Work, whether or not specifically called for.

1.4.2 Except as otherwise provided in the Contract Documents, words which have an accepted technical or trade meaning used to describe any Work, materials or equipment, shall be interpreted in accordance with that meaning. Reference to standard specifications, manuals or codes of any technical society, organization or association, whether specifically or by implication, shall mean the latest standard specification, manual, code in effect at the date established for receipt of Sub-Bids, unless otherwise expressly stated.

1.4.3 Except as provided by the requirements of M.G.L. Chapter 149, Section 44F, the Divisions and Sections of the Specifications and the identification of any Drawings shall (a) not control the **Contractor** in delineating Work to be performed by specific suppliers, and (b) be complementary, and anything mentioned or shown in a Division or in a specific Drawing shall be of like effect as if shown in all divisions of the specifications and all Drawings.

1.4.4 Whenever the terms "as ordered", "as directed", "as required", "as allowed", "as approved" or terms of like effect are used, or the adjectives "reasonable", "suitable", "acceptable", "proper" or "satisfactory" or adjectives of similar effect are used to describe a requirement, direction, review or judgment of the **Architect** (or the **City**) as to the Work, it is intended that the requirement, direction, review or judgment will be solely to evaluate the Work for compliance with the Contract Documents. No use of any such term or adjective mentioned above, or provision of any standard specification, manual or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of the **Official**, the **Contractor**, or the **Architect**, or any of their consultants, agents or employees from those assigned in the Contract Documents, nor shall it be effective to assign to the **Official** or the **Architect**, or any of their consultants, agents or employees, any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of the Contract Documents.

### **1.5 Priority of the Contract Documents:**

1.5.1 The Contract Documents are complementary, and anything mentioned or shown in a part of the Contract Documents shall be of like effect as if shown in all parts of the Contract Documents. In resolving conflicts, the Contract Documents shall be given the priority determined by the **Architect**, with regard to matters affecting the design of the Work, and the **Official**, with regard to all other matters, to be consistent with their intent and necessary to produce the intended result. Subject to such interpretation by the **Architect** or **Official**, the Contract Documents shall be interpreted on the basis of the following priorities, the first listed having the highest priority:

- .1 Change Orders, Change Authorizations, and written amendments to the Contract, those dated later taking precedent over those dated earlier;
- .2 Owner-Contractor Agreement;
- .3 General Conditions;
- .4 Technical Specifications; and
- .5 Drawings.

1.5.2 If the issue of priority involves the Technical Specifications and the Drawings, figured dimensions shall govern over scaled dimensions. Work not particularly shown, identified, sized, or located shall be the same as similar Work that is shown or specified. Detail Drawings shall govern over general Drawings, larger scale Drawings take precedence over smaller scale Drawings and Contract Drawings govern over Shop Drawings. Whenever notes, specifications, dimensions, details, or schedules in the Specifications or in the Drawings, or between the Specifications and the Drawings, or between Change Order or Change Authorization Drawings and Contract Drawings, conflict, the higher performance requirement shall be furnished by the **Contractor** at no increase in the Contract Price or the Contract Time.

1.5.3 Compliance with these priority conditions shall not justify any changes in the Work, or any increase in Contract Price or Contract Time, unless any such compliance results in Work that may not reasonably be inferred from the Contract Documents as being required to produce the intended result.

### **1.6 Information and Instructions for Contract Documents:**

1.6.1 The **Contractor** shall carefully study all contract Documents and other instructions from the **Architect** and the **Official** as they are delivered, and procure from the **Architect** such special information, detailed drawings, etc., as may be necessary for the proper performance of the Work.

1.6.2 Where drawings show outline or descriptive representations of repetitive features, the **Contractor** shall construe them in

exact accordance with the corresponding features which are common to similar items or materials and which are completely drawn and specified.

1.6.3 Where the statement "Consult Drawing No. \_\_\_" or "Refer to Drawing No. \_\_\_" occurs in the Specifications, such references to a Drawing have been made solely for the convenience of the **Contractor** to help identify the item under consideration and to locate the typical detail of such item in the set of Contract Drawings. It is not the intention of such references, however, to list each and every Drawing on which a certain item may occur.

### **1.7 Ownership and Use of the Contract Documents:**

1.7.1 Unless otherwise provided in the Supplementary Conditions, the **Official** shall furnish to the **Contractor** one (1) copy of the Contract Documents at no cost.

1.7.2 Neither the **Contractor**, nor any Subcontractor or Supplier shall have or acquire any title to or ownership rights in any of the Drawings, Specifications or other Contract Documents, and they shall not reuse any of them on extensions of the Project or any other project without prior written consent of the **City** and the **Architect**. The **Contractor**, Subcontractors and Suppliers are granted a limited license to use and reproduce portions of the Contract Documents as appropriate for use in the execution of the Work. Copies made under this license shall bear the copyright notice shown on the Contract Documents.

1.7.3 All work papers, questionnaires and other written material prepared or collected by the **Contractor** in the course of completing the Work to be performed under this Contract shall at all times be the exclusive property of the **City**. The **Contractor** shall not use such materials for any purposes other than the purpose of this Contract without the prior written consent of the **Official**.

### **1.8 Relationship with the City:**

1.8.1 The **Contractor** is retained solely for the purpose of and to the extent set forth in the Contract Documents. The **Contractor's** relationship to the **City** during the term of this Contract shall be that of an independent Contractor. The **Contractor** shall have no capacity to involve the **City** in any contract nor to incur any liability on the part of the **City**. The **Contractor**, its agents or employees shall not be considered as having the status or pension rights of an employee; provided that the **Contractor** shall be considered an employee for the purpose of M.G.L. Chapter 268A (the Conflict of Interest Law). The **City** shall not be liable for any personal injury to or death of the **Contractor**, its agents or employees.

1.8.2 The **Contractor** shall be solely responsible for construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work unless the Contract Documents give other specific instructions concerning these matters. Where the terms and conditions for the delivery or provision of goods or services by the **Contractor** to the **City** are expressly set forth in the Contract Documents or are incorporated herein by reference, those terms and conditions shall be complied with by the **Contractor**.

1.8.3. Before they can be binding on the Parties, all amendments to the Contract must be in writing and signed by the **Official** and the **Contractor**, approved as to the availability of a sufficient appropriation and filed with the City Comptroller, and signed by the Mayor of the City.

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## **ARTICLE 2 - THE CITY - GENERAL PROVISIONS**

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### **2.1 The City May Stop the Work:**

2.1.1 If the Contractor fails to correct work which is not in accordance with the requirements of the Contract Documents or, If the Work is *defective*, or the **Contractor** fails to provide sufficient skilled workers or suitable materials or equipment, or fails to execute Work so that in the judgment of the **City** the completed Work will conform to the Contract Documents, the **City** may order the **Contractor** to stop all or part of the Work in question, until the problem has been corrected. This right of the **City** to stop the Work shall not create or impose any duty on the **City** to exercise this right for the benefit of the **Contractor** or any other party. The **Contractor** shall remain responsible for maintaining progress, and shall not be entitled to any increase in

Contract Time or Contract Price, and the **Contractor** shall reimburse the **City** for all direct, indirect or consequential costs incurred by the **City** and attributable to such an order to stop the Work.

### **2.2 Availability of Lands (Including Properties):**

2.2.1 The Contract Documents indicate the lands upon which the Work is to be performed, including rights-of-way and easements for access that are furnished by the **City**.

2.2.2 Any additional lands, rights-of-way and easements not furnished that the **Contractor** deems necessary shall be obtained by the **Contractor** at no increase in Contract Price or Contract Time. The **Contractor** shall obtain and submit to the **City** all required permits from the State, the proper Federal Government agency, Public Governmental Body or public utility or form the property owner(s) for the use of lands and access so obtained.

### 2.3 Reference Points:

2.3.1 The **City** through the **Architect** shall provide reference points and the **Contractor** will stake such points and will verify them in the field if requested to do so. The **Contractor** shall be responsible for laying out the Work, protecting and preserving those reference points, and he shall make no changes at all without the prior written approval of the **Architect**. The **Contractor** shall: report to the **Architect** whenever any reference point is lost or destroyed or requires relocation due to necessary changes in grades or locations; be responsible for the accurate replacement or relocation of any lost or destroyed reference points by professionally qualified personnel; and assume any resultant cost or delay.

### 2.4 Clerk of the Works:

2.4.1 A Clerk of the Works may be engaged by the **City** for this Project. In the event that a **Clerk of the Works** is so engaged, he/she shall not, have any authority to order any changes in the Work, nor to make any decision relating to arrangement, design or construction, or to the disposition of materials or workmanship, or to the conduct of the Work without the written authorization of the **Official**.

2.4.2 The **Clerk of the Works** shall have access to the premises and all areas of the Project at all times. The **Contractor** shall provide full cooperation to the Clerk in the performance of his/her duties.

### 2.5 Limitations on the City's Responsibilities

2.5.1 The **City** is not responsible for the **Contractor's** means, methods, techniques, sequences or procedures applicable to the Work; nor for safety precautions and programs related to safety. The **City** is not responsible for the **Contractor's** failure to execute the Work in accordance with the Contract Documents; nor for the acts or omissions of the **Contractor** or of any Subcontractor, any Supplier or anyone for whose acts the **Contractor** or any of the Subcontractors or Suppliers may be liable.

2.5.2 Neither the **City** nor the **City's** consultants are responsible for the acts or omissions of the **Contractor** or of any Subcontractor, any Supplier, or anyone for whose acts the **Contractor** or any of the Subcontractors or Suppliers may be liable.

2.5.3 The **City's** authority to review any of the **Contractor's** Progress Schedules, or the **City's** decision to raise or not to raise any objections about such Progress Schedule Submittals, shall not impose on the **City** any responsibility for the timing, planning, scheduling or execution of the Work, nor in any way give rise to any duty or responsibility on the part of the **City** to exercise this authority for the benefit of the **Contractor**, any Subcontractor or Supplier, or any other party.

2.5.4 Neither the **City's** authority to review the **Contractor's** certificates and policies of insurance as set forth in the Instructions to Bidders, nor the **City's** decision to raise or not to raise any objections about those certificates and policies, shall in any way give rise to any duty or responsibility on the part of the **City** to exercise this authority for the benefit of the **Contractor**, any Subcontractor or Supplier, or any other party.

### 2.6 No Waiver of Legal Rights:

2.6.1 The **City** reserves the right to correct any error in any progress payment that may have been paid. The **City** reserves the right, should proof of *defective* Work be discovered after final payment, to claim, and recover from the **Contractor** and his surety, or either of them, sufficient sums to correct, or remove and replace, the *defective* Work.

2.6.2 Any waiver by the **City** or the **Official** of any provision of the Contract Documents shall be in writing, and shall apply only to the particular matter concerned and not to other similar or dissimilar matters. Any waiver of any breach of this Contract shall not be held to be a waiver of any other or subsequent breach.

### 2.7 Miscellaneous Provisions:

2.7.1 Written communications from the **Official** to the **Contractor** will in general be issued directly to the **Contractor** with copy to the **Architect**. Written communications from the **Contractor** to the **Official** shall be issued to the **Official** with copy to the **Architect**.

2.7.2 Any written direction or interpretation issued by the **Architect** to the **Contractor** must contain the formal endorsement thereon by the **Official**, or the **Official's** representative, for it to be considered valid or effective.

2.7.3 If the **City** retains another person for the Project or the Work who is not the **Architect's** agent or employee, the duties, responsibilities and limitations of authority of that person will be provided in the Supplementary Conditions.

2.7.4 The **City** shall make payments to the **Contractor** as provided in the Contract Documents, and as required by Law.

2.7.5 The **City** may issue unilaterally, or negotiate, at the **City's** discretion, Change Orders and Change Authorizations as provided in Article 11 of the General Conditions. Except as recognized under paragraph 11.1.3, only the **City** is empowered under the Contract Documents to order or cause changes in the Work.

2.7.6 The **City** may unilaterally delay all or any part of the Work and correspondingly adjust or negotiate adjustments in Contract Price or Contract Time, as provided in Article 11 of the General Conditions. Except as recognized in paragraph 7.5, only the **City** is empowered under the Contract Documents to order or cause **City**-caused delays to all or any part of the Work.

2.7.7 Decisions for which the **City** is responsible under the Contract Documents shall be made promptly and, in any event, within thirty (30) days after receipt of written submission but if a decision requires extended investigation and study, it will be made as permitted by M.G.L. Chapter 30, Section 39P.

## 2.8 Rights to Data

2.8.1 All data consisting of, but not limited to plans, drawings designs, specifications, computer programs, technical reports and operating manuals delivered, developed or produced or paid under the requirements of the Contract Documents shall be the property of the **City**. The **City** maintains all rights to such data including the right to use, duplicate, and disclose, it in whole or in part, in any manner and for any purpose. If that data is copyrightable, the **Contractor** may copyright it subject to the right of the **City**. The **City** reserves a royalty-free, nonexclusive and irrevocable license to use, duplicate, publish and disclose such data, in whole or in part, and to authorize others to do so. The **City** shall include provisions to implement, maintain and effectuate the provisions of these rights in all Sub-agreements which produce copyrightable data.

## 2.9 Contractor Evaluation

2.9.1 As required by M.G.L. Chapter 149, §§44D(7) and (16) and 810CMR 8.00 *et seq.*, the **City** will submit a completed Standard Contractor Evaluation Form to the Division of Capital Asset Management (DCAM) for the **Contractor** and each Subcontractor, with a copy to the Contractor/Subcontractor. The evaluation will be submitted within 70 days for the **Contractor** and within 90 days for the Subcontractors from the completion of the Project or from the date of termination of the Contractor or Subcontractor. At approximately 50% completion of the Project the **City** will advise the **Contractor** of the **City's** preliminary evaluation for informational purposes. The Standard Contractor Evaluation Form will rate the performance of the **Contractor** and Subcontractors, and will be completed by the **City's** Project Manager. The **City** will not negotiate the contents of the Contractor Evaluation Form or the Project rating for any reason.

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## ARTICLE 3 - THE ARCHITECT-GENERAL PROVISIONS

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### 3.1 General:

3.1.1. In the event of the termination of the employment of the **Architect**, the **City** may appoint an **Architect** whose status under the Contract Documents shall be that of the former **Architect**. Nothing in these Contract Documents shall create a contractual relation between the **Architect** and the **Contractor**.

3.1.2. The **Architect** will make on-site observations at appropriate intervals to observe the quality of in-progress and completed Work, and to determine whether the Work is being executed so that the Work, when completed, will be in accordance with the Contract Documents. Based on those on-site observations, the **Architect** will endeavor to guard the **City** against *defective* Work and will keep the **Official** informed of the progress of the Work.

3.1.3. The **Architect** will have authority to disapprove or reject Work that the **Architect** believes to be *defective* Work. When the **Contractor** has been notified by the **Architect** of rejection of *defective* work, the **Contractor** shall take prompt action to correct the *defective* work.

3.1.4 On-site observations by the **Architect** or any project representatives of the **City** shall not relieve the Contractor from the obligation to perform the Work in accordance with the Contract Documents, or represent acceptance of defective work, nor give rise to any duty on their part to make the observations for the benefit of the **Contractor** or any other person.

### 3.2 Interpretations: Time for Decisions, Approval:

3.2.1. The **Architect** will be the initial interpreter of the requirements for the Contract Documents, and in such capacity will render determinations as to the acceptability of Work performed, subject to the provisions of paragraph 3.2.4. Unless other-

wise provided in the Contract Documents, notices, proposals, or other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents shall be referred initially to the **Architect** in writing with a request for a written decision, which the **Architect** will render within a reasonable time. Once given, the **Architect's** determination shall be final and binding on the **Contractor** unless the **Contractor** delivers to the **Official** written notice of a claim within thirty (30) days after receipt of such determination, in which case the provisions of Article 15 will apply.

3.2.2. When functioning as interpreter and making determinations the **Architect** will not be liable for any interpretation or determination rendered in good faith. The rendering of an interpretation or other determination by the **Architect** about any notice, request or other matter will be a requisite to the exercise by the **Contractor** of any rights or remedies the **Contractor** may otherwise have under the Contract Documents or by Law concerning any claim, dispute or other similar matter.

3.2.3 A decision on interpretation of the Specifications, approval of equipment, material or any other approval, or progress of the work, shall require that the decision be made promptly and, in any event, no later than thirty (30) days after the written submission for decision; but if such decision requires extended investigation and study, the **Official** or **Architect** shall, within thirty (30) days after the receipt of the submission, give written notice of the reasons why the decision cannot be made within the thirty (30) day period and the date by which the decision will be made.

3.2.4 In giving instructions, the **Architect** shall not have the authority to direct any change in the Work, whether or not involving extra cost, without the prior written authorization of the **Official** in each instance.

### **3.3 Limitations on the Architect's Responsibilities**

3.3.1 Neither the **Architect's** authority to act under this Article 3 or elsewhere in the Contract Documents nor any decision made by the **Architect** in good faith to exercise or not to exercise such authority shall give rise to any duty or responsibility of the **Architect** to the **Contractor**, any Subcontractor, or any Supplier, any surety for any of them, or any other person.

3.3.2 The **Architect** is not responsible for the **Contractor's** means, methods, techniques, sequences or procedures applicable to the Work, or safety precautions and programs concerning safety. The **Architect** is not responsible for the **Contractor's** failure to perform or furnish the Work in accordance with the Contract Documents. Nor is the **Architect** responsible for the acts or omissions of the **Contractor** or of any Subcontractor, any Supplier, or of anyone for whose acts any of them may be liable.

### **3.4 Clarifications and Interpretations; Unit Price Work:**

3.4.1 The **Architect** will issue, within a reasonable period of time, written clarifications or interpretations of the requirements of the Contract Documents, as the **Architect** may determine necessary, which shall be consistent with or reasonably inferable from the intent of the Contract Documents.

3.4.2. The **Architect**, subject to a prior review with the **Official**, will make determinations about the actual quantities and classes of Unit Price Work done by the **Contractor**.

3.4.3. Any clarification, interpretation or determination by the **Architect** under this paragraph 3.4 shall be final and binding on the **Contractor** unless the **Contractor** delivers to the **City** written notice of a change as provided in paragraph 11.1.3 within thirty (30) days after receipt of that decision.

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## **ARTICLE 4 -THE CONTRACTOR -GENERAL PROVISIONS**

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### **4.1 General Responsibility**

4.1.1. The **Contractor**, all Subcontractors, and all parties employed on the Work, shall perform their Work in a good and workman like manner and in accordance with the Contract Documents.

4.1.2. The **Contractor** shall not assign the whole or any part of the work under this Contract or any monies due or to become due hereunder without prior written consent of the **Official**. In the event that the **Contractor** assigns all or any part of any monies due or to become due under this Contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the **Contractor** shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the Work called for in this Contract.

4.1.3. The **Contractor** shall conform to all determinations and directions of the **Official** in accordance with provisions of the Contract Documents concerning all questions which may arise relating to the Work.

4.1.4 The **Contractor** shall comply with and give all notices required by laws, ordinances, codes, rules and regulations and

lawful orders of public authorities applicable to performance of the Work.

#### 4.2 Review of the Contract Documents:

4.2.1. Before undertaking each part of the Work, the **Contractor** shall study and compare the Contract Documents with each other, verify pertinent figures and applicable field measurements, and coordinate related requirements for dependent Work such as location, dimensions, fit, completeness, consistency, etc.

4.2.2. The **Contractor** shall notify the **Architect** in writing of any conflict, error or omission in the Contract Documents the **Contractor** recognizes, and shall obtain a written interpretation or clarification from the **Architect** before proceeding with any affected Work. Unless authorized by the **Official** in writing, any work done by the **Contractor** prior to obtaining that interpretation or clarification which is directly or indirectly affected by same, will be at the **Contractor's** risk and the **Contractor** shall bear all resulting costs and delays. The **Contractor** shall be responsible for any costs or delays resulting from any unnecessary requests for clarification submitted to the **Architect** by the **Contractor** that can be determined from the Contract Documents.

4.2.3. If the **Contractor** performs Work which involves a conflict, error or omission, he shall assume responsibility for that performance and shall bear all resulting costs and delays, as long as he actually recognized the conflict, error, or omission or if he should reasonably have recognized it by reason of, but not limited to, the **Contractor's** Bid estimate or usage of the trade.

#### 4.3 Supervision and Project Management:

4.3.1. The **Contractor** shall supervise and direct the Work competently, applying the skills, expertise and attention necessary to perform the Work in accordance with the Contract Documents. The **Contractor** shall be solely responsible for any means, methods, techniques, sequences and procedures applicable to the Work, unless a specific means, method, techniques, sequence or procedure is indicated in or required by the Contract Documents. The **Contractor** shall be responsible to the **City** for acts and omissions of the **Contractors'** employees, subcontractors and their agents and employees, and other persons or entities performing portions of the Work for or on behalf of the **Contractor** or any of its subcontractors. The **Contractor** shall be responsible to see that the finished Work complies accurately with all of the Contract Documents and all approved Submittals.

4.3.2. The **Contractor** shall at all times keep on the site a competent resident superintendent, properly licensed, for the entire Work and a competent foreman for each specialty trade. The superintendent shall not be assigned or replaced without written notice to the **Official**. If the **Official** objects to the **Contractor's** superintendent, whether initially or otherwise, the **Contractor** shall submit a replacement superintendent at no increase in Contract Price or Contract Time. The superintendent shall be the **Contractor's** representative at the site and have authority act on his behalf.

4.3.3. The **Contractor's** project superintendent and similar authorized representatives of any Subcontractor, Supplier or other person or organization shall attend all meetings, as requested by the **Official** or the **Architect** at no increase Contract Price. Such meetings shall include attendance at weekly construction progress meetings.

4.3.4. The **Contractor** shall, upon written request of the **Official**, remove from **City** premises and replace all individuals in the **Contractor's** employ whom the **Official** determines to be disorderly, careless or incompetent or to be employed in violation of the terms of the Contract Documents.

#### 4.4 Personnel, Materials and Equipment:

4.4.1 The **Contractor** shall provide competent, properly licensed, suitably qualified and reliable personnel to survey and lay out the Work and furnish and perform the Work as required by the Contract Documents. The **Contractor** shall at all times enforce strict discipline and maintain good order at the site.

4.4.2. Unless otherwise provided in the Contract Documents, the **Contractor** shall furnish, pay for and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water (including water for testing, flushing, and construction), sanitary facilities, temporary facilities and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up and completion of the Work.

4.4.3. All materials and equipment shall be of good quality and new, unless otherwise allowed, and the **Contractor** shall furnish satisfactory evidence (including reports of required tests) as to their kind and quality. Materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned following the manufacturer's and Supplier's instructions, unless otherwise provided in the Contract Documents. All materials and equipment shall be properly protected against damage throughout the furnishing and performance of the Work so that they remain of good quality and in the as-new condition. For each item, the **Contractor** shall furnish complete information as to preventive maintenance and operating requirements, parts lists in sufficient detail to facilitate ordering replacements, and any applicable special condition. Should the manner or



method of installation, specified performance or test results be contrary to the manufacturer's recommendations, the **Contractor** shall promptly notify the **Architect** in writing of that conflict before proceeding with that Work; otherwise, he shall be deemed to have certified that Specifications will be met by the materials or equipment.

#### **4.5 Wage Rates:**

4.5.1. The rate per hour of the wages to be paid to mechanics and apprentices, teamster, chauffeurs, and laborers in the Work to be performed under this Contract shall be not less than the rate of wages in the schedule entitled "Schedule of Prevailing Wage Rates," as determined by the Department of Labor and Workforce Development of the Commonwealth of Massachusetts. This schedule shall continue to be the minimum rate of wages for said employees during the life of this Contract. The **Contractor** shall keep posted on the site of the Work a legible copy of said schedule of Minimum Wage Rate and Health and Welfare Fund and Pension Fund Contributions. Apprentices employed pursuant to this determination of wage rates must be registered and approved by the State Apprenticeship Council. Wherever rates for journeymen or apprentices are not listed, and if any other labor is not included in this list, the **Contractor** shall insert the rates of all those employed on the Work.

4.5.2. The **Contractor** shall pay to any reserve police officers employed by him, if any, the prevailing wage rate paid regular City of Newton police officers. Such police officers shall be covered by Worker's Compensation Insurance and Employer's Liability Insurance by the **Contractor**.

4.5.3. The **Contractor** shall keep on file at the site the wage rates and classifications of all labor employed in the work in order that they may be available for inspection by the **Official** or the **Architect**.

#### **4.6 Working Hours:**

4.6.1. No laborer, workman, mechanic, foreman, or inspector working within the Commonwealth in the employ of the **Contractor**, Subcontractor, or others shall be required or permitted to work more than 8 hours in any one day, or more than 48 hours in any one week, or more than 6 days in any one week, except in cases of emergency.

4.6.2. Unless otherwise required under the Contract Documents, or directed in writing by the **Official**, all Work shall be performed during the regular working hours. However, if the **Contractor** desires to carry on the work outside of regular working hours or on Saturdays, Sundays, federal legal holidays, or City recognized holidays, he may submit application to the **Official** no less than 48 hours in advance to date and time of such work. The Contractor shall allow ample time to enable satisfactory arrangements to be made for inspecting work in progress and shall bear all costs with respect thereto, including the cost of the **City's Clerk of the Works**. Any approval by the **Official** of the **Contractor's** request for carrying out Work outside of regular working hours, overtime or shift Work, or any schedule acceleration measures will not be grounds for any increase in Contract Price or an extension in Contract Time. The Contractor shall also be aware of the time restrictions imposed on construction activities by the City's Noise Ordinance, Sec. 20-13 of the City of Newton Revised Ordinances, and shall apply for permits for exemptions when work will exceed the time restrictions.

#### **4.7 Equal Employment Opportunity:**

4.7.1. The **Contractor** shall assume, and shall require each Subcontractor to assume, the obligation to take whatever affirmative actions are necessary to ensure that employees and applicants for employment under this Contract, are treated equally irrespective of race, color, religious creed, national origin, sex, gender identity, sexual orientation, age or ancestry. The term "treated"

shall mean and include without limitation the following: recruited, whether by advertising or other means; compensated, whether in the form of rates of pay or otherwise; selected for training including apprenticeship; promoted; upgraded; demoted; downgraded; transferred; laid-off; and terminated.

4.7.2. Neither the **Contractor** nor any Subcontractor shall discriminate against any employee or applicant for employment because of race, color, religious creed, national origin, sex, gender identity, sexual orientation, age, or ancestry.

4.7.3. The **Contractor** and all Subcontractors shall carry out the requirements pertaining to equal employment with the diligence that they apply to any other part of the Contract.

#### **4.8 Lodging, Boarding, and Trading of Employees:**

4.8.1. Every employee in the Work shall be allowed to lodge, board and trade where and with whom he/she elects and the **Contractor** shall not directly or indirectly require as a condition of employment in the Work that an employee shall lodge, board, or trade at a particular place or with a particular person.

#### **4.9 Preference in Employment:**

4.9.1. The **Contractor** and each Subcontractor shall give preference in the employment of mechanics and apprentices, teamsters, chauffeurs and laborers, first to the citizens of the Commonwealth who have been residents of the Commonwealth for at least six months at the commencement of their employment, and who are veterans as defined in M.G.L. Chapter 4, Section 7, clause 43, and who are qualified to perform the Work to which the employment relates; and secondly, to citizens on the Commonwealth generally, and if they cannot be obtained in sufficient numbers, then to citizens of the United States; and shall give preference to veterans and citizens who are residents of the City of Newton.

#### **4.10 Substitutes or "Or-Equal" Items:**

4.10.1. Whenever materials or equipment are described in the Contract Documents by using a brand name, make, manufacturer, supplier or specification, the naming or specification of the item is intended to denote the essential characteristics of the item desired pursuant to M.G.L. Chapter 30, Section 39M(b). Unless words indicating that no substitution is permitted are used, items from prospective suppliers may be accepted by the **Official** if sufficient information is submitted by the **Contractor** in his written application for the substitution to allow the **Official** to determine whether the material or equipment proposed (1) will perform at least equally well the functions and achieve the results called for by the general design concept, (2) is at least of equal materials of construction, quality and necessary essential design features, (3) is suited to the same use as that named or specified, (4) conforms substantially to the desired detailed requirements for that item, including but not limited to, durability, strength, appearance, aesthetics (where aesthetics are essential), safety, service, useful life, reliability, economy of operation and ease of maintenance, (5) evidences a proven record of performance, (6) will yield net savings to the **City**, and (7) will not impact the Construction Progress Schedule and will not extend any Contract Time(s).

4.10.2. Each application for a substitution shall certify that the proposed substitute will meet each of the first six (6) criteria itemized in paragraph 4.10.1, and that the evaluation and acceptance by the **Official** of the proposed substitute will not prejudice completion of the Work within the limits of the Construction Progress Schedule and the Contract Time. Each application shall certify whether or not acceptance of the substitute will require a change in any of the Work or any of the means, methods, techniques, sequences or procedures applicable to the Work indicated in or required by the Contract Documents, or in work performed by the **City** or others, and whether or not incorporation or use of the substitute is subject to payment of any license fee or royalty. All variations of the substitute from the item named or specified shall be identified (operation, materials, or construction finish, thickness or gauge of material, dimensions, loads, tolerances, deleted/added features, etc.), and information regarding available maintenance, repair and replacement service will be indicated.

4.10.3. The application shall contain an itemized estimate of all costs that will result directly or indirectly from evaluation and acceptance of the proposed substitute, including, but not limited to costs and delays of redesign, or claims of other contractors affected by the substitute, and changes in operating, maintenance, repair, replacement or spare part costs. The **Contractor** is solely responsible for verifying that substitutes are in accordance with the Contract Documents, and that dimensions, arrangement, design and construction details, and all other features of substitutes are suited to the specified purpose. The **Contractor** assumes full responsibility for the time and cost required to make substitute items conform to the requirements of the Contract Documents, or to implement any changes in the Work or in other work which may be required because of or to accommodate the substitute, or both.

4.10.4. If a substitute item differs from that named or specified, and that difference was not expressly identified in the **Contractor's** written application, or it results in changes to the Work or in the function or general design concept, the **City** has authority to require removal and replacement of the substitute.

4.10.5. The **Official's** decision regarding a substitution will be made within the time allowed in M.G.L. Chapter 30, Section 39P. A proposed substitute will be accepted as equivalent or "or-equal" to that named or specified if it meets the substitution criteria and if the deduction proposed by the Contractor reflects the net difference in cost, provided, however, that one hundred percent (100%) of the net savings benefits the **City**. No substitute will be utilized, ordered, or installed without the **Official's** prior written acceptance. Whether or not the **Official** accepts a proposed substitute, the **Contractor** shall reimburse the **City** for any associated extra costs of the **City** resulting from the substitute, including but not limited to, related charges of the **Architect** made necessary by the evaluation and acceptance (or rejection) of each proposed substitute.

4.10.6. An item will be considered equal to the item so named or described if (1) it is at least equal in quality, durability, appearance, strength and design; (2) it will perform at least equally well the function imposed by the general design for the Work; and (3) it conforms substantially, even with deviations, to the detailed requirements for the item in the Specifications, pursuant to M.G.L. Chapter 30, Section 39M (b).

#### **4.11 Schedule Submittals:**

4.11.1. Within fifteen (15) days after execution of the Contract, the **Contractor** shall submit to the **Architect** "revision 0" of the Schedule of Values. No line item on the Schedule of Values shall exceed \$25,000.00 unless acceptable to the **official**. In

addition, in fulfillment of the **Contractor's** obligations to commence, prosecute and complete the Work within the Contract Time, the **Contractor** shall submit with the first Application for Payment "Revision 0" of the **Contractor's** Progress Schedule and the **Contractor's** schedule of Shop Drawing submissions.

4.11.2. The **Contractor** shall correct, adjust or modify those schedules returned as "Revise and Resubmit", and shall resubmit Revision "0" schedules within the times specified. The **Contractor's** Revision "0" Progress Schedule shall be utilized to the fullest extent when making proposals or claims for changes in Contract Time or Contract Price.

4.11.3. The **Contractor** shall keep the **Official** informed of progress of the Work by submitting monthly Progress Schedules, which shall stay current with the **Contractor's** approach to Work remaining, be employed when reporting on progress or schedule recovery actions and facilitate the evaluation of payments. The **Contractor** shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with the **City**. No Work shall be delayed or postponed pending resolution of any disputes or disagreements. The **Contractor** shall exercise reasonable precautions, efforts and measures to avoid or mitigate situations that would cause delays.

4.11.4. After checking and verifying that an issue of revision of the Progress Schedule complies with the applicable requirements and procedures in the Contract, the **Contractor** shall, within the times specified, submit to the **Architect** four (4) copies, or in the alternative, five (5) copies for use by the **Official** and the **Architect** plus additional copies as required by the **Contractor** of that Submittal bearing the **Contractor's** stamp of approval as representation to the **City** that the **Contractor** has determined or verified all data on that Progress Schedule, and that the **Contractor** and the Subcontractors and Suppliers have reviewed and coordinated the sequences in that Progress Schedule with the requirements of the Work.

4.11.5. Early Dates in the Progress Schedules shall be based on proceeding with all or part of the Work exactly on the date when the Contract Time for the Work, or designated part of the Work, commences to run. Late Dates shall be based on completing all or part of the Work exactly on the corresponding Contract Time unless the **Contractor** anticipates early completion of all or part of the Work (subject to those provisions governing use of Contract Float by the **City**). Where sequences of Work are indicated in or are required by the Contract Documents, the Progress Schedule shall disclose in detail the **Contractor's** approach to conforming with those sequences of Work.

4.11.6. Progress Schedule Submittals are intended to show the overall priority and sequencing of Activities with which the **Contractor** intends to accomplish the Work or Work remaining to comply with the Contract Times and those sequences of Work indicated in or required by the Contract Documents; show how the **Contractor** anticipates foreseeable events or site conditions that may in any manner affect the cost, progress, schedule, performance, and furnishing of the Work; reflect the means, methods, techniques, sequences, and procedures applicable to the Work chosen by the **Contractor**; and accurately record how completed Work was performed as to sequencing and timing.

4.11.7. The **Official's** and **Architect's** review of a Progress Schedule may result in comments relating to: conformance with the Contract Time(s) and those sequences of Work indicated in or required by the Contract Documents, selection of Milestones and recording of Milestone Times, and conformance with the Technical Specifications and any other information given in the Contract Documents which may have a significant bearing on the use of the Progress Schedule to resolve issues affecting Contract Price or Contract Time. However, whether or not any objections are noted, no such review or objections shall be effective to change the duties or responsibilities of the **City** or **Architect** or to impose on either of them a responsibility for the accuracy of any such Progress Schedule details, the correctness of all of which shall remain the sole responsibility of the

**Contractor.**

#### **4.12 Project Photographs:**

4.12.1. Before the **Contractor** commences any work at the site, and on the first work day of each month thereafter until Substantial Completion of the Work, the **Contractor** shall, at his expense, have exterior and interior digital photographs with disc storage taken by a competent commercial photographer from different viewpoints, as directed by the **Official** or **Architect**. The **Official** and **Architect** shall have the right to increase or decrease the number of photographs required at each period, maintaining an overall average number of exposures per period.

4.12.2. All prints of digital photographs shall be "8 x 10" size. The prints shall bear the date and time of day of the exposure, name of project, the specific location, description of view, and name and address of the photographer. The digital photo disc and one glossy print shall be submitted to the **Official** and one glossy print of each shall be delivered to the **Architect**, all within fifteen (15) days after the exposures are made.

4.12.3. If the **Contractor** fails to provide the photographs as required by the Contract Documents, the **City** shall be entitled to a corresponding cost set-off against the **Contractor's** next Application for Payment, or may choose to have the photograph taken by another photographer, and correspondingly charge those associated costs to the **Contractor**.

#### **4.13 Shop Drawing, Samples and Printed Data:**

4.13.1. The **Contractor** shall submit to the **Architect** within fifteen (15) days after the Date for Commencement of Contract Time, his Shop Drawing Log and completed Shop Drawing Submission Schedule, in the form specified by the **Official**, and shall update, and resubmit this Schedule each month to the **Architect** in accordance with the requirements of the Contract Documents.

4.13.2. Submissions of Shop Drawings, samples and printed data shall state the Project name, Specifications Sections, and paragraph numbers which apply to the items submitted. The **Contractor** shall submit Shop Drawings, samples, and printed data in sufficient time to permit checking, resubmission, rechecking, approval and subsequent fabrication and delivery. Failure on the **Contractor's** part to do so will not justify an increase in Contract Time.

4.13.3. Submittals made by the **Contractor** which are not required by the Contract Documents may be returned without action, in the **Architect's** sole discretion.

4.13.4. The **Architect's** review and approval of a technical Submittal will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The **Architect's** review and approval of a technical Submittal shall not extend to means, methods, techniques, sequences or procedures applicable to the Work except where a specific means, method, technique, sequence or procedure is indicated in or required by the Contract Documents or to safety precautions or programs related to safety, nor shall the **Architect's** review impose on the **Architect** any responsibility for the accuracy of engineering design(s) furnished by the **Contractor**, including but not limited to dimensions, quantities, performance of equipment and systems, or any other similar matters, the correctness of all of which shall remain the sole responsibility of the **Contractor**. Approval of a separate item, or partial Submittal, shall not mean approval of the item's assembly or Submittals not yet reviewed.

4.13.5. Shop Drawings or other technical Submittals consisting of drawings and specifications involving architecture, professional engineering, land surveying or landscape architecture, shall only be prepared by a registrant within the specific discipline involved.

4.13.6. The **Architect** shall be entitled to rely upon the accuracy or completeness of any designs, calculations or certifications made by licensed or certified professionals accompanying a specific Submittal, whether or not that stamp or written certification is required by the Contract Documents.

#### **4.14 Shop Drawing Submittals:**

4.14.1 After complying with the requirements in paragraph 4.14.4 and 4.14.5 and all applicable procedures in the Specifications, the **Contractor** shall, in accordance with the Progress Schedule, submit to the **Architect** four (4) copies, or in the alternative, five (5) copies for use by the **Official** and the **Architect** plus additional copies as required by the **Contractor** of all Shop Drawings, which shall bear a stamp or specific written indication (called "written approval") that the **Contractor** has satisfied his responsibilities under the Contract Documents with respect to the review of the submission. Shop Drawings without the **Contractor's** written approval will be returned for resubmission. All submissions shall be identified as the **Architect** may require.

4.14.2. The **Contractor** shall also submit to the **Architect** with such diligence so as to not delay the Work, all other technical Submittals such as samples, test results, test procedures, etc. that are required by the Contract Documents. All samples shall have been checked and be accompanied by a specific written indication that the **Contractor** has satisfied his responsibilities with respect to the review of the submission, and by a certificate guaranteeing that the item complies with the Contract Documents. Additional provisions governing the submission of other technical Submittals are given in the technical Specifications.

4.14.3. At the time of each submission, the **Contractor** shall give the **Architect** specific written notice of each variation of the Submittal from the requirements of the Contract Documents and in addition, shall cause a specific notation of each variation to be made on each Shop Drawing, sample or other technical Submittal submitted for review and approval.

4.14.4. The **Contractor** shall check, stamp with his approval, and submit to the **Architect**, until approved by the **Architect**, with such promptness as to cause no delay in the Work, all Shop Drawings and all other Submittals required by the Contract Documents. At the time of submission, the **Contractor** shall inform the **Architect** in writing of any deviation in the Shop Drawings from the requirements of the Contract Documents, or on resubmitted Shop Drawings, to revisions, other than the corrections requested by the **Architect** on previous submissions.

4.14.5. Before each submission, the **Contractor** shall determine and verify all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers and other similar data as to correctness and completeness, and he shall have reviewed and coordinated each technical Submittal with other technical Submittals and with the requirements of the Contract Documents. Technical Submittals of a Subcontractor or Supplier such as the

location, dimensions, fit, completeness, consistency, integration, etc. shall be coordinated with those of other Subcontractors or Suppliers, and be so represented in the **Contractor's** written approval before submission to the **Architect**.

4.14.6. Shop Drawings that are received from the **Contractor** will be the only Shop Drawings considered for review by the **Architect**. By approving and submitting Shop Drawings, the **Contractor** thereby represents that he has determined and verified all field measurements, field construction criteria, materials, catalogue numbers and other similar data, and that he has checked and coordinated each Shop Drawing with the requirements of the work and of the Contract Documents. Shop Drawings not so checked and approved will be returned to the **Contractor** without being examined by the **Architect**.

4.14.7. A technical Submittal will be returned within fifteen (15) days, or later if Total Float is available in the Progress Schedule, as either "Approved", "Approved as Noted", "Revise and Resubmit" or an appropriate combination. If a Submittal cannot be returned within that period, the **Architect** shall within fifteen (15) days after receipt, give written notice of the date by which that Submittal will be returned. The **Contractor** shall revise and correct Submittals returned as "Correct and Resubmit", and resubmit them to the **Architect** for his review and return - directing specific attention in writing to any revisions other than the corrections called for by the **Architect** on previous Submittals.

4.14.8. The Shop Drawings shall be clear, complete, and accurate, and shall give all information necessary or requested in individual Sections of the Specifications, and also show adjoining work and details of connections thereto.

4.14.9. Shop Drawings shall be submitted in a proper sequence reflecting the logical sequence and relative priority of the various phases of Work to ensure the preparation of a properly coordinated set of Shop Drawings.

4.14.10. The **Contractor** shall, at his expense, prepare and submit composite Shop Drawings showing the work under all affected trades, upon request of the **Architect**, with no change in Contract Price or Contract Time.

4.14.11. The **Architect** will review and return Shop Drawings with reasonable promptness after his receipt of same, but only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents. The **Architect's** review and approval of Shop Drawings will not extend to the accuracy of other matters that may be contained in the Submittals, including but not limited to such matters as dimensions, quantities, performance of equipment and systems designed by the **Contractor**, engineering design(s) furnished by the **Contractor**, the **Contractor's** means, methods, techniques, sequences or procedures applicable to the Work except where a specific mean, method, technique, sequence, or procedure is indicated in or required by the Contract Documents or to safety precautions or programs related to safety, the correctness of which shall remain the sole responsibility of the **Contractor**. Approval of a separate item, or partial Submittal, shall not mean approval of the item's assembly or Submittals not yet received.

4.14.12. The **Architect** will make comments, if any are required, directly on the reproducible transparency and return the transparency to the **Contractor**. The **Contractor** shall incorporate the **Architect's** corrections onto the original drawings and resubmit a new reproducible transparency and two prints thereof to the **Architect** for his approval. This procedure shall be repeated until all corrections are made to the satisfaction of the **Architect**.

4.14.13. No review, return or approval of Submittals shall relieve the **Contractor** of responsibility for any variation from the requirements of the Contract Documents unless the **Contractor** has in writing called attention to each variation at the time of submission and the **Official** has given written approval of each such variation by a specific written notation incorporated in or accompanying the approval or returned Submittal. No review, return or approval of Submittals shall relieve the **Contractor** from responsibility for errors or omissions in the Submittals or for having complied with the provisions of this Article 4.

4.14.14 Where a Shop Drawing, sample or other technical Submittal is required by the technical Specifications, any related Work performed by the **Contractor** prior to the **Official's** approval of the pertinent Submittal will be at the sole expense and responsibility of the **Contractor**.

4.14.15 Submittals are not Contract Documents. Technical Submittals are intended to demonstrate how the **Contractor** intends to conform to the design concept of the Project and the information given in the Contract Documents.

#### **4.15 Samples:**

4.15.1. The **Contractor** shall submit for the written approval of the **Architect** all samples required in the individual Sections of the Specifications. Samples shall be submitted in a proper sequence reflecting the logical sequence and relative priority of the various phases of the Work. Unless otherwise specified in the individual Specification sections, three (3) specimens of each sample shall be submitted.

4.15.2. Samples shall be of sufficient size to permit proper evaluation of material. Where variations in color or other characteristics are to be expected, samples showing the minimum range of variation shall be submitted. Materials exceeding the range of variation of the approved samples will not be approved on the Work.

4.15.3. Samples which can be conveniently mailed shall be sent directly to the **Architect**, accompanied by a transmittal notice stating the name of the Project, Specifications Section and Article number to which the sample refers and description of the item being submitted. The **Contractor** shall mail a copy of the transmittal notice to the **Official**.

4.15.4. All other samples shall be delivered at the field office of the **Clerk of the Works**, with sample identification tags attached and properly filled in. A transmittal notice listing the delivered samples shall be submitted to the **Architect** and to the **Official** by the **Contractor**.

4.15.5. Costs associated with the delivery of samples shall be paid by the **Contractor**.

4.15.6. The **Architect** will with reasonable promptness review and give written approval of samples but only for conformance with the design concept of the Project and with the information given in the Contract Documents.

#### **4.16 Printed Data:**

4.16.1 The **Contractor** shall submit to the **Architect** six (6) copies of printed data as required in the Specifications, or if an electronic copy is available, one (1) hard copy and one (1) electronic copy. All such printed data shall be specific and identification of material or equipment submitted shall be clearly made in ink.

4.16.2 The **Contractor** shall resubmit six (6) copies of such data, or if an electronic copy is available, one (1) hard copy and one (10) electronic copy, until approved and, after approval, shall provide and distribute such number of copies as required for the **Contractor's** use.

#### **4.17 Responsibilities for Repeat Submittals:**

4.17.1 All costs incurred by the **City** and the **Architect** made necessary by the review of a particular Submittal after the second time review shall be borne by the **Contractor** without any increase in Contract Price or Contract Time, and shall either be reimbursed by the **Contractor** to the **City**, shall be deducted by the **City** from amounts which may become due to the **Contractor**, or will result in a credit Change Order to the City.

4.17.2 All time consumed by the resubmission and re-reviews of a particular Submittal shall not meet the requirements for increases in Contract Time or Contract Price.

#### **4.18 Operating and Maintenance Instructions and Stock Items:**

4.18.1 The **Contractor** shall collect all operating, service and maintenance instructions of all mechanical, electrical and manually operated equipment required by them under the Contract Documents, bind them into four (4) complete sets properly formatted and indexed, and submit them to the **Architect** when the Work has reached 90% completion. Failure by the **Contractor** to provide these instructions will prevent subsequent Applications for payment from being approved.

4.18.2 Four (4) copies of all operating and maintenance instructions shall be submitted. These instructions shall be arranged in loose-leaf notebooks of not more than 2" thickness and organized by trade. Each notebook shall be indexed and sorted by building feature or piece of equipment to make all information easily accessible. Each equipment section shall be prefaced by a summary sheet including an equipment description, manufacturer, manufacturer's representative, model number and all nameplate information, and location within the building.

4.18.3 Upon the date of Substantial Completion, the **Contractor** shall provide verbal instructions and demonstrations to the **Official** and other **City** representatives at the site concerning maintenance of all building features and equipment.

4.18.4 Upon the date of Substantial Completion, all maintenance stock items required to be supplied under this Contract shall be delivered to the job site by the **Contractor**. All maintenance stock shall be delivered to the job site in unopened containers and stored properly in accordance with manufacturer's instructions. The **Contractor** shall provide the **Official** with storage instructions for all spare maintenance stock supplied.

#### **4.19 Record Documents:**

4.19.1 From the sets of Contract Documents furnished by the **Official**, the **Contractor** shall reserve one set for record purposes. From this set, the **Contractor** shall detach and furnish the drawings of their Work for their record purposes at no charge to the mechanical, plumbing, fire protection, electrical and any other Subcontractors as may be required by the **Official**.

4.19.2 The **Contractor** shall maintain at the site one (1) record copy of all Drawings, Specifications, Addenda, Change Orders, Change Authorizations, field orders, test records, construction photos, and written interpretations/clarifications, in good

order and annotated in a neat and legible manner using a contrasting, reproducible color to show all revisions made and dimensions noted during execution of the Work. These record documents together with a properly annotated record copy of all approved Submittals shall be available to the **Architect**, the **Official** and the **Clerk of the Works** for reference. Upon completion of the Work, these record documents and annotated Submittals shall be delivered to the **City**.

4.19.3 Upon Substantial Completion, the **Contractor** shall return the complete set of record documents including as-built drawings to the **Architect**. The **Architect** will review these documents and return them to the **Contractor** with any necessary comments. The **Contractor** shall revise the same with no change in Contract Price until satisfactory to the **Architect**, as evidenced by his approval endorsed thereon.

4.19.4 Upon receipt of the **Architect's** approval, the **Contractor** shall, at no increase in Contract Price, make deliver to the City one (1) hard copy of all record drawings including as-built drawings and one (1) CD with both pdfs and AUTO CAD version acceptable to the **Official** of all record drawings. The **Contractor** shall ensure that all as-built information shown on the record drawings is transferred onto said pdfs and AUTO CAD versions. The drafting shall be done by experienced drafters and shall match the original drawings.

4.19.5 The **Contractor**, shall also, at his expense, prepare one (1) hard copy of all record drawings and one (1) CD with both pdfs and AUTO CAD version acceptable to the **Official**, and submit the same to the **Architect** before the **Contractor** shall be entitled to Final Payment.

4.19.6 Each week, the **Contractor** shall submit to the **Architect** and **Clerk of the Works** daily reports recording: the labor work force and equipment utilized by the **Contractor** and Subcontractors; materials and equipment received; visits by Suppliers and others; specialty trade Work performed for each significant aspect of in-progress or completed Work within each major area of Work; the status of the Work at the Site; and other similar pertinent information.

#### **4.20 Instruction Relating to Existing Conditions:**

4.20.1 The **Contractor** represents that he has read the Contract Documents and is fully informed in regard to all provisions thereof, including without limitation, the drawings, Contract Time and the provisions for liquidated damages, and that he has visited the premises described in the Contract Documents and made his own examination of the place where the Work is to be performed and of all conditions pertaining to the Work and has made his own estimates. The **Contractor** agrees that he shall not hold the **City**, its agents or employees responsible for or bound by any schedule, time period, estimate, sounding, boring, or any plan of any thereof and shall assume all liability for the prosecution of the Work and shall bear all losses resulting to him in such prosecution of the Work. No claim for an increase in Contract Price or other damages or any other claim other than for an extension in Contract Time shall be made or asserted against the **City** by reason of any delays unless specifically allowed by the Contract Documents or required by law. The **Contractor** shall not be entitled to an increase in the Contract Price or to compensation of any kind from the **City**, including extended site and home office overhead, for direct, indirect, consequential impact or other costs, expenses or damages, including but not limited to costs of acceleration or inefficiency arising because of delay, disruption or interference from any cause whatsoever. This provision shall not preclude recovery of damages by the **Contractor** for hindrances or delay due solely to fraud or bad faith on the part of the **City** or its agents. Otherwise, the **Contractor** shall be entitled only to a non-compensable extension to the Contract Time as the sole and exclusive remedy for such resulting delay, in accordance with and to the extent provided above.

4.20.2 Pursuant to M.G.L. Chapter 30, Section 39N, if, during the progress of the Work, the **Contractor** or the **City** discovers that the actual subsurface or latent physical conditions encountered at the site differ substantially or materially from those shown on the plans or indicated in the Contract Documents, either the **Contractor** or the **City** may request an equitable adjustment in the Contract Price applying to Work affected by the differing site condition. A request for such an adjustment shall be in writing and shall be delivered by the party making such claim to the other party as soon as possible after such conditions are discovered. Upon receipt of such a claim from a **Contractor**, or upon its own initiative, the **City** shall make an investigation of such physical conditions and, if they differ substantially or materially from those shown on the plans, or indicated in the Contract Documents, or from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the plans and Contract Documents and are of such a nature as to cause an increase or decrease in the cost or performance of the Work or a change in the construction methods required for the performance of the Work which results in an increase or decrease in the cost of the Work the **City** shall make an equitable adjustment in the Contract Price and the Contract shall be modified in writing accordingly.

#### **4.21 Removal of Existing Work:**

4.21.1 The following requirements shall apply to existing conditions which are located within the Limit of Contract Lines indicated on the Drawings:

4.21.2 On and above existing grades, unless designated in the Contract Documents to be reused, remain, or be altered, all existing items shall become the property of the **Contractor** and shall be completely removed from the site by the **Contractor**, at

no change in Contract Price.

4.21.3 Below existing grades, unless designated in the Contract Documents to remain, be reused, be altered, or to be paid for on a unit price basis, as stipulated in the Section entitled "Unit Prices", all subsurface materials shall be excavated to the lines specified in the Contract Documents and completely removed from the site by the **Contractor**, at no change in the Contract Price.

#### **4.22 Marks and Lines:**

4.22.1 The **Contractor** shall furnish, at his expense, the services of a Land Surveyor registered to practice in the Commonwealth of Massachusetts, who shall, for the **Contractor**, establish and maintain on-site permanent bench marks, and determine from them the various levels of work, and place the levels, and the lines of the buildings, on substantial batter boards and stakes, as required for the proper execution of the Work.

4.22.2 The **Contractor** shall employ on a full time basis a person, acceptable to the **Official**, with sufficient engineering background and experience in the type of work required hereunder who shall, for the **Contractor**, do other engineering work which shall include, without limitation, leveling, checking, and verifying wall and main partition lines.

4.22.3 The **Contractor** shall be fully responsible for the accuracy of all lines and levels established by or for him. The **Contractor** shall furnish to the **Official** a certificate signed by said Land Surveyor, registered in the Commonwealth of Massachusetts, certifying that the location of the building and the principal lines, levels and dimensions of the building are accurately established in accordance with the Contract Drawings.

#### **4.23 Materials, Inspection, Disposition and Suitable Storage:**

4.23.1 Unless otherwise stated in the Specifications, or noted on the Drawings, all materials and equipment shall be new and in manufacturer's original containers, clearly marked as to contents. Upon delivery of materials, copies of the delivery receipts shall be given to the **Clerk of the Works**.

4.23.2 The **Contractor** shall allow the **Clerk of the Works** and/or any other designated representative of the **Official** or the **Architect** to examine materials, and he shall furnish labor and equipment to assist in such examination with no change in Contract Price.

4.23.3 The **Contractor** shall store all delivered materials in proper locations which will not interfere with the Work. If any stored materials are rejected, a notice of rejection will be given to the **Contractor** by the **Official** or the **Architect** in writing. Upon receipt of a rejection notice, the **Contractor** shall, within twenty-four (24) hours thereafter, proceed to remove all such rejected materials from the site, and completely remove such materials within five (5) working days.

4.23.4 Should the **Contractor** or any Subcontractor install, or permit the installation of, any materials which have not been inspected prior to installation, the **Contractor** shall be held fully responsible therefor, and if such installed materials are rejected after inspection by the **Architect** or **Official**, the **Contractor** shall, take down all portions of the Work containing rejected materials, remove all such materials from the site, and replace the rejected materials accordingly at no increase in Contract Price.

4.23.5 The **Contractor** shall provide for the protection and orderly keeping of materials, and shall provide sufficient heat and cooling to prevent damage to said materials.

4.23.6 No determination by the **Official** or the **Architect** regarding materials and/or equipment which are not incorporated in the Work, but are suitably stored on the site, or at some other location approved in writing by the **Official**, for the purposes defined under Article 8, whether or not payment by the **City** to the **Contractor** on behalf of all or any part of said materials and/or equipment has been made, shall relieve the Contractor of his obligation to bring the work to Final Completion, at no change in the Contract Price.

4.23.7 In no event shall materials and/or equipment be considered delivered and suitably stored at the site, or some other location approved in writing by the **Official**, for the purposes defined under Article 8 unless in the judgment of the **Official**, the materials and/or equipment are actually scheduled for prompt use, meet the requirements of the Contract Documents, and that the **Contractor** can and will, at his expense, adequately protect and insure the materials and/or equipment until they are incorporated in the Work. No payment will be made by the **City** for related storage charges, insurance and/or costs and expenses.

#### **4.24 Cutting and Patching:**

4.24.1 See Division 1, Section 017329 of Technical Specifications.



#### **4.25 Existing Utilities:**

4.25.1 If existing utility lines, which are indicated in the Contract Documents are damaged by the **Contractor** or any Subcontractor, including without limitation, cables, ducts, conduits and piping, they shall be immediately repaired, protected, and maintained in use until relocation of same has been completed, or shall be cut or capped or prepared for service connections, as the Contract Documents require, unless they are to be abandoned in accordance with the Contract Documents.

4.25.2 The **Contractor** shall be responsible for locating all Underground Utilities in advance of excavating whether shown in the Contract Documents or indicated by exposed components; scheduling excavation and uncovering in advance, unless it prejudices Work already uncovered; shoring, blocking, and protecting all Underground Utilities; whether shown or indicated or newly-discovered; repairing any damage done to Underground Utilities to the satisfaction of the **Official** or their owner(s); promptly notifying the **Official** and the **Architect** of any newly discovered Underground Utility; and the safety and protection of, and repairing of any damage done to, any affected Work. The **Contractor** shall not, except in an emergency, make an excavation unless written notice of the proposed excavation is given to the owner of any affected Underground Utilities at least two (2) business days before such excavation is to be made.

4.25.3 All costs involved and time required to perform the responsibilities in paragraph 4.25.2 shall be deemed as within the Contract Price and the **Contractor's** schedule for performing the Work within the Contract Time.

4.25.4 The **Contractor** shall notify the **Official** in writing, not less than three (3) business days in advance of the proposed time for shutting down or interrupting of any utilities, services, or facilities which may affect the operation of other buildings, services or facilities of the **City** or the **City's** other contractors. In no case shall any shutdown or interruption of any utilities, services, or facilities be made without the prior written approval by the **Official**. Unless otherwise authorized in writing by the **Official**, the Contractor shall so schedule and coordinate his work that such interruption will occur on weekends, holidays, or before or after the normal working day of the **City's** Facilities. All costs and expenses, including outage costs and back charge costs, shall be borne by the **Contractor**.

#### **4.26 Maintenance of Site:**

4.26.1 At all times prior to Final Completion, the **Contractor** shall keep the site free from accumulation of waste materials or rubbish.

4.26.2 The **Contractor** shall be responsible for the protection of all completed Work, and for repairing, replacing or cleaning any such Work which has been damaged by other trades or by any other cause, so that all Work is in perfect condition in accordance with the Contract Documents at the time of Substantial Completion.

4.26.3 At the end of each work week, the **Contractor** shall thoroughly clean the site of all rubbish and debris of any nature, and remove such from the site. The **Contractor** shall thoroughly clean the entire Project and site. Specific cleaning requirements, prior to final inspection, shall be as set forth in Division 1 of the Technical Specifications.

4.26.4 Immediately prior to final inspection by the **Architect** and the **Official**, the **Contractor** shall thoroughly clean the entire Project and site. Specific cleaning requirements, prior to final inspection, shall be as set forth in Division 1 of the Technical Specifications.

4.26.5 The **Contractor** shall confine construction equipment, the storage of materials and equipment, and the operations of workers to those lands, rights-of-way and easements identified in and permitted by the Contract Documents, and shall not unreasonably encumber the premises with construction equipment, materials or equipment. The **Contractor** shall assume full responsibility for any damage to those lands including properties and fixtures, rights-of-way and easements or to the owners or occupants of any adjacent lands or access, resulting from execution of the Work. The **Contractor** shall defend, indemnify and hold harmless the **Owner** and **Architect** from and against all claims arising out of or resulting from any damage to any such land, or to any adjacent lands, including loss of use.

4.26.6 The **Contractor** shall keep the premises free accumulations of waste materials, rubbish and other debris. Upon the completion of the Work, the **Contractor** shall remove waste and surplus materials, rubbish, debris, tools and construction equipment, and shall leave the site clean and ready for occupancy by the **City**. The **Contractor** shall restore to original condition all property not designated for alteration by the Contract Documents including, but not limited to walks, roadways, paved or landscaped areas used during prosecution of the Work. If the **Contractor** fails to comply with this requirement, the **City** may do so, in which case the **Contractor** shall reimburse the **City** for all costs incurred by the **City**.

4.26.7 The **Contractor** shall not load or permit any part or any structure to be loaded in any manner that will endanger the structure. The **Contractor** shall not subject any part of the Work or adjacent property to stresses or pressures that will damage and endanger the Work or adjacent property, or both.

#### **4.27 Inspection and Testing of the Work:**

4.27.1 All materials, equipment and workmanship shall be subject to inspection and testing by the **Official**, the **Architect** and their authorized representatives, for conformance with the requirements of the Contract Documents.

4.27.2 If the Contract Documents, laws, codes, ordinances, rules, regulations, or orders of any public authority having jurisdiction require any Work to be inspected, tested or approved, the **Contractor** shall give the **Architect, Clerk of the Works**, and the **Official** written notice not less than 72 hours in advance of the time that the Work will be ready for inspection, testing, or approval so the **Architect, Clerk of the Works**, and the **Official** may observe such inspection, testing or approval. The **Contractor** shall bear all costs of such inspections, tests and approvals unless otherwise provided in the Contract Documents.

4.27.3 Inspection and testing by the **City**, the **Architect**, or their representative, or by any other person, shall in no event reduce or remove the **Contractor's** responsibility for compliance with the full intent and requirements of the Contract Documents.

4.27.4 The **Contractor** must anticipate any and all time required for the testing, inspection and approval of material before incorporation into the Work. No increases in Contract Price or Time will be permitted for losses or delays attributable thereto.

4.27.5 After testing or inspection should any materials or portion of the Work be found *defective* and not conforming to the Contract Documents, such materials or portion of the Work shall be promptly removed, replaced and made to conform to the requirements of the Contract Documents by the **Contractor** at no increase in Contract Price or Contract Time. The Contractor shall pay all costs for retesting, and or re-inspection of the corrected Work.

4.27.6 Reasonable cost for travel, room and board, incurred by the **Official** or his authorized representative, for the inspection of materials required in the performance of the Work, which are fabricated outside the limits of the City of Newton will be deducted from amounts otherwise due or to become due to the **Contractor**.

4.27.7 If after Commencement of the Work, the **Official** or the **Architect** determines, in their sole discretion, that any of the Work requires special inspection, testing or approval, not otherwise provided for in the Contract Documents, the **Architect** may with the approval of and upon the written order of the **Official**, instruct the **Contractor** in writing to order such special inspection, testing or approval. The **Contractor** shall give the **Official** and the **Architect** seventy-two (72) hours advance written notice of the time and place of such inspection, testing or approval. In the event that such special inspection or testing shows that the Work or part of the Work does not conform to the requirements of the regulations or orders of any public authority having jurisdiction, the **Contractor** shall pay all costs of such inspection, testing or approval, otherwise the **City** shall bear such costs.

4.27.8 Examinations of questioned Work may be ordered at any time and from time to time by the **Official** and/or the **Architect**, and if so ordered, the **Contractor** shall uncover the Work. If such Work is found to be in accordance with the Contract Documents, the **City** will pay the reasonable costs of examination and replacement. If such Work is found to be not in accordance with the Contract Documents, the **Contractor** shall pay all costs of examination, replacement, and all related testing.

#### **4.28 Claims by the Contractor for Loss or Injury:**

4.28.1 If the **Contractor** claims any loss or injury resulting to him from any act, omission, or neglect of the **City**, its agents or employees, the **Contractor** shall in strict compliance with all of the requirements of Article 15, and in any event no later than thirty (30) days after the loss or injury that gives rise to the claim, deliver to the **Official** a written statement of the loss or injury in the form of a clearly marked Notice of Claim. Under no circumstances will any reimbursement be made to the **Contractor** unless the **Contractor** shall have delivered the timely written Notice of Claim in accordance with the requirements of this paragraph and Article 15.

4.28.2 The **Contractor** shall have no right to recover damages for any claims or any loss or injury resulting from Work not being performed in conformance with the Contract Documents.

4.28.3 The **Contractor** shall bear all losses resulting from any cause both before Final Completion, and after Final Completion if the Work or any part of the Work fails to conform to the Contract Documents.

#### **4.29 Responsibility for Labor, Material and Equipment Costs:**

4.29.1 The **Contractor** shall pay and be exclusively responsible for all debts for labor and material contracted for by the **Contractor**, for the rental of any appliance or equipment hired by the **Contractor** and/or for any expense incurred on account of the Work.

#### **4.30 Conflict of Interest:**

4.30.1 The **Contractor's** attention is called to M.G.L. Chapter 268A the Conflict of Interest Law. The **Contractor** shall not

act in collusion with any **City** officer, agent, employee or any other party, nor shall the **Contractor** make gifts regarding this Contract or any other matter in which the **City** has a direct and substantial interest.

#### **4.31 Emergencies:**

4.31.1 In emergencies affecting the safety or protection of persons or the Work or property at or adjacent to the site, the **Contractor**, without special instructions or authorization from the **Architect** or the **Official**, is obligated to act to prevent threatened damage, death, injury, or loss. The **Contractor** shall give the **Official** written notice within forty-eight (48) hours of any changes in the Work resulting from the action taken. If the **Official** concurs, the **Official** shall authorize the required changes in accordance with Articles 11 and 12, and, unless the emergency was due in whole or in part to the fault or negligence of the **Contractor**, correspondingly adjust the Contract Price or the Contract Time.

#### **4.32 Miscellaneous Provisions:**

4.32.1 The **Contractor** shall inspect Work already in-place to verify that it is in proper condition to receive dependent Work. The **Contractor** shall be responsible for all cutting and patching which may be necessary to complete the Work and to make its several parts fit together properly, whether or not that Work is expressly specified in the Contract Documents.

4.32.2 The **Contractor** shall initiate, maintain and supervise all weather precaution programs applicable to the Work. In the event of severe weather, the **Contractor** shall immediately inspect the Work and the site, and take all necessary actions to insure that public access and safety are maintained.

4.32.3 The **Contractor** shall perform Work and operate vehicles and equipment so as to cause the least practicable interference with traffic and without becoming a hazard to the public or interfering with any overhead utilities. When transporting materials, vehicles shall not be loaded beyond the capacity recommended by the manufacturer of the vehicle or set by Law. When crossing curbs or sidewalks, the **Contractor** shall protect them from damage. Safe and adequate pedestrian and vehicular access shall be provided and maintained to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, hospitals, fire and police stations, and like establishments.

4.32.4 The **Contractor** shall give seventy-two (72) hours advance notice of Work on or across private driveways to the owners of the private driveways and the **Architect, the Clerk of the Works, and Official**. The interference from such Work shall be minimized by restoring service as soon as possible. Except as otherwise provided in the technical Specifications, open excavations shall be bridged with steel plates.

4.32.5 Whenever the prosecution of the Work requires that certain operations be carried out beyond the limits of the site designated in the Contract Documents or the indications of temporary fences or barricades, the **Contractor** shall schedule trenching, utility Work, site development, and landscaping so as to occasion a minimum of disturbance to or interfere with the normal operation of the **City** or others.

4.32.6 Pumping, draining and control of surface and groundwater shall be done so as to not endanger the Work or any adjacent facility or property, nor interrupt, restrict or interfere with the use of any such adjacent facility or property.

4.32.7 If a specific means and method is indicated in or required by the Contract Documents, the **Contractor** may furnish or utilize a substitute means and method, if the **Contractor** submits to the **Architect** sufficient information, in accordance with the applicable requirements for substitutions, to allow the **Architect** to determine whether the substitute is equivalent to that indicated or required by the Contract Documents.

4.32.8 Any damaged Work corrected by the **Contractor** shall be corrected so as to be equal in all respects including quality, appearance, function, finish, etc. to non-damaged like Work.

4.32.9 The **Contractor** shall, prior to final inspection, mark in a permanent and readily identifiable manner, all reference points provided by the **City** through the **Architect**.

4.32.10 The **Contractor** shall take whatever steps, procedures or means are required to prevent any dust nuisance due to his operations, and he shall maintain dust control measures at all times in accordance with the requirements of the **City** and any public governmental body with jurisdiction. Dumping of spoil or waste material on land or property obtained by the **Contractor** shall be in strict conformance with all applicable Laws.

4.32.11 The **Contractor** shall not obstruct access to municipal structures, hydrants, valves, manholes, fire alarms, etc., nor shall he make any connections to, operate valves or otherwise interfere with the operation of the water system without first securing the necessary approvals and permits.

4.32.12 The **Contractor** shall prosecute Work in the manner which will cause the least practicable interference with and

avoid prolonged interruption of or damage to existing facilities, including underground utilities and overhead utilities. The **Contractor** shall obtain written approval from the **Official** prior to performing any Work involving connection to or interruption of existing facilities, and shall perform that Work during those periods of time which cause the least interference or annoyance.

#### **4.33 Quality Control:**

4.33.1 The **Contractor** shall establish a quality control system and submit the procedure to the **Official** to insure sufficient supervision, inspection and testing of all items of Work, including those of Subcontractors and Suppliers, and to control conformance to the applicable Specifications and Drawings with respect to product, workmanship, construction, maintenance while idle, finish, functional performance and identification. The **Contractor's** quality control system shall include checking, approval and coordination of Submittals and the surveillance of all specified tests. Nothing contained in these quality control requirements shall be construed as limiting the obligations of the **Contractor** under the Contract Documents.

4.33.2 The **Contractor's** quality control system shall specifically incorporate the responsibility for checking all aspects of the Work including, but not limited to the **Contractor**-established elevations, the location of all underground pipelines and electrical conduits before covering begins, all reinforcing steel before pouring concrete, and any other items of Work which cannot be located and inspected without uncovering once the particular part of the Work is complete. Data so obtained shall be recorded on the record documents.

#### **4.34 Incidents with Historic Property Deposits:**

4.34.1 The **Contractor** shall at once cease operations in the affected areas and notify in writing the **Official** of any historic property deposits, as determined by the City of Newton Historical Commission or the Massachusetts Historical Commission, which are encountered or unearthed during the execution of the Work. The **Contractor** shall provide for the protection of the deposits in a proper and satisfactory manner, and no further disturbance of the deposits shall be permitted until the **Contractor** has been notified by the **Official** that Work can be resumed in the affected areas.

4.34.2 If any such incident with historic properties causes or will cause delay, extension or acceleration that postpones, extends or any other manner alters the schedule or completion of all or part of the Work, the **Official** shall, pursuant to the provisions in Articles 11 and 12, make or negotiate with the **Contractor**, an adjustment in Contract Price or Contract Time for any increases in the **Contractor's** cost or the time required to perform the Work. The **Contractor** assumes responsibility for any delay, extension or acceleration, from an incident with historical properties, which is reasonable under the Contract Documents.

#### **4.35 Related Work at Site:**

4.35.1 The **City** may perform other work at the Site with the City's own forces or have other work performed by other persons. If the Contract Documents did not note that other work is to be performed, written notice will be given to the **Contractor** prior to starting that other work.

4.35.2 The **Contractor** shall afford each other person or the **City** when performing other work proper and safe access to the Site and a reasonable opportunity for the handling, unloading and storage of materials and equipment and the execution of their work, and shall properly connect and coordinate the Work with theirs. The **Contractor** shall not cut, excavate or otherwise alter any other work without the written consent of the other person and the **Architect**. The **Contractor** shall afford each other person prompt written notice whenever Work interfacing with the person's work has been performed.

4.35.3 If any part of the Work depends for proper execution or results on the work of the **City** or another person, the **Contractor** shall inspect and promptly report to the **Architect** in writing conditions in that work which render it unavailable or unsuitable for proper execution and results. The **Contractor's** failure to do so will constitute an acceptance of other work as fit and proper for integration with the Work except for latent or non-apparent defects and deficiencies in the other work.

4.35.4 Wherever Work to be performed by the **Contractor** is dependent upon the work of others; the **Contractor** shall coordinate his Work with the dependent work to the same extent that he is required to coordinate dependent work. Subcontractor work under paragraph 6.2. Installation of Work by the **Contractor** or by any Subcontractor in any given area shall constitute acceptance by the **Contractor** or that Subcontractor of all previously placed dependent work.

4.35.5 If the **City** contracts with others for other work, the person or organization that will have the authority and responsibility for coordinating the activities of the **Contractor** and those others will be identified in the Supplementary Conditions. Unless otherwise specifically stated, neither the **City** nor the **Architect** shall have any authority or responsibility for coordination of the activities of the **Contractor** and those others.

4.35.6 Unless otherwise so provided in the Supplementary Conditions, the **Contractor** shall coordinate the preparation and

checking of Submittals with those other persons whose work in any way relates or depends upon the Work, or vice versa, and the **Contractor** shall so represent it in the **Contractor's** Submittal to the **Architect**. Upon receipt of approval of those Submittals from the **Architect**, or receipt of a Submittal as "Re-submittal Not Required" from the **Official**, the **Contractor** shall promptly furnish prints of those Submittals to those other parties.

#### **4.36 Mutual Duties and Responsibilities:**

4.36.1 If the **Contractor** causes damage to the work or property of others, or if a claim arising out of the **Contractor's** execution of Work is made by a person against the **Contractor**, the **City**, or the **Architect**, the **Contractor** shall promptly attempt to settle with that person by agreement or otherwise resolve the claim. The **Contractor** shall defend, indemnify and hold harmless the **City** and the **Architect** from and against all claims, causes of action, lawsuits, damages, losses and expenses, whether direct, indirect or consequential, including but not limited to charges of engineers, attorneys and other professionals and costs of both defense and appeal, if any, arising out of or resulting from damage by the **Contractor** to the work or property of others or from the **Contractor's** execution of the Work.

4.36.2 If another person causes damage to the Work or property of the **Contractor**, or if the performance of other work results in any other claim by the **Contractor**, the **Contractor** shall promptly attempt to settle with that person by agreement or otherwise resolve the claim. The **Contractor** shall not institute any action against the **City** or **Architect**, their consultants, agents or any of their directors, officers, shareholders, agents or employees, or permit any action against them to be maintained in the **Contractor's** name or for his benefit in any court or before any tribunal, which action seeks to impose liability or recover damages from the **City** or **Architect** for such claim.

4.36.3 If another person performing other work causes delay, extension or acceleration that postpones, extends or in any other manner alters the schedule or completion of all or part of the Work, the **Official** shall, pursuant to Articles 11 and 12, make or negotiate with the **Contractor**, an adjustment in Contract Price or Contract Time for any increases in the **Contractor's** cost or the time required to perform the Work. The **Contractor** assumes responsibility for any delay, extension or acceleration caused by other work which is reasonable under the Contract Documents.

4.36.4 If another person performing other work is granted an extension in Contract Time on account of causes warranting said

extension but without compensation, and said Contract Time is coterminous with a Contract Time under this Contract, and if the **City** concludes that said extension requires a change in the coterminous Contract Time, the **Official** shall authorize the necessary change in Contract Time only.

#### **4.37 The Contractor's Responsibility for City Costs:**

4.37.1 If the **Contractor** becomes involved in settling or otherwise resolving claims with other persons performing other work arising out of events covered under paragraphs 4.36.1 or 4.36.2, or because of any other related controversy, including damage to the Work or other work or a dispute about responsibility for clean-up or any other issue, neither the **City**, the **Architect**, nor any of their consultants, agents nor any of their directors, officers, stockholders nor employees will be involved in any way in such actions unless ordered to do so by a court of competent jurisdiction. If the **City** incurs costs contrary to the provisions of this Article, the **Contractor** shall reimburse those cost to the **City**.

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### **ARTICLE 5 - SUBCONTRACTORS AND SUPPLIERS**

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#### **5.1 Use of Subcontractors:**

5.1.1 The **Contractor**, in performance of the Work, shall use the Subcontractors named in the **Contractor's** Bid and shall not use any other Subcontractor in the performance of the Work against whom the **Official** has reasonable objections; nor shall the **Contractor** be required to employ any Subcontractor against whom he has a reasonable objection.

5.1.2 The **Contractor** shall not assign, delegate, subcontract or in any way transfer any interest in this Contract without prior written consent of the **Official**

5.1.3 If the **City's** consent to a Subcontractor named by the **Contractor** prior to the giving of the notice of award is withdrawn on the basis of subsequent reasonable objections, or the **City** has reasonable objection, or the **City** for the **City's** sole convenience objects, to a Subcontractor nominated after the giving of the notice of award, the **Contractor** shall promptly proceed to nominate a substitute Subcontractor for evaluation by the **City**.

5.1.4 If any such withdrawal of the **City's** consent or any such objection for the convenience of the **City** causes an increase or decrease in the **Contractor's** cost for the part of the Work in question, the **Official** shall, except as provided below, make an adjustment in the Contract Price equal to the difference in cost between the nominated and substitute sub-agreements for that

part of the Work. If any such withdrawal or objection causes or will cause delays which extend, postpone or in any other manner alters the schedule or completion of all or part of the Work, the **Contractor** shall assume all of the **Contractor's** related delay, extension or acceleration costs, however, caused; except that the **Official** shall authorize the necessary change in Contract Time **only**. The **Contractor** assumes responsibility for any and all cost and delay resulting from the **City's** reasonable objection to a Subcontractor nominated after the notice of award.

5.1.5 The **City's** consent to a nominated Subcontractor shall not constitute a waiver of any right of the **City** to reject *defective* Work nor shall the authority given to the **City** under this paragraph give rise to any duty on the part of the **City** to exercise such authority for the benefit of the **Contractor** or any other person.

## **5.2 Relation Between Subcontractors and Contractor:**

5.2.1 In the event that a suspension, delay, interruption or failure to act of the **City** increases the cost of performance to any Subcontractor, that Subcontractor shall have the same rights against the **Contractor** for payment of an increase in the cost of his performance as provided for the **Contractor** under M.G.L. Chapter 30, Section 39O, paragraphs (a) and (b). Nothing in these paragraphs (a) and (b) shall in a way change, modify, or alter any other rights the **Contractor** or the Subcontractor may have against each other.

## **5.3 The Contractor's Continuing Responsibilities:**

5.3.1 The **Contractor** shall be fully responsible to the **City** and the **Architect** for all acts and omissions of all the Subcontractors and Suppliers, at any tier, to the same extent as the **Contractor** is responsible for the **Contractor's** own acts and omissions. Nothing in the Contract Documents shall create any contractual relationship between the **City** or the **Architect** and any Subcontractor or Supplier, nor create any express or implied duty or obligation on the part of the **City** or the **Architect** to any Subcontractor or Supplier or the **Contractor's** sureties, to pay or to see to the payment of any monies owed to any of them.

## **5.4 Sub agreements:**

5.4.1 Work performed by a Subcontractor or Supplier shall be through an appropriate sub-agreement which expressly binds the Subcontractor or Supplier to the requirements of the Contract Documents for the express benefit of the **City** and the **Architect**, requires each of them to assume toward the **Contractor** all the obligations which the **Contractor** assumes toward the **City** and the **Architect**, and contains waiver provisions as required by paragraph 10.9. The **Contractor** shall pay each Subcontractor and Supplier as their interests may appear, a proportionate share of any funds received on account of losses under policies issued under Article 10.

5.4.2 Within seven (7) days after receipt of a written request from the **Official**, the **Contractor** shall submit an exact copy of each sub-agreement identified in the request. Such request shall not constitute approval of any Subcontractor by the **Official**. Time periods in Articles 11, 12 and 15 allowed to the **City** for making determinations on proposals, payments or claims shall be automatically extended if those sub-agreement(s) are not submitted within seven (7) days after receipt of a written request from the **Official**.

5.4.3 Subject to prior rights, if any, of the **Contractor's** surety, the **Contractor** assigns to the **City** each sub-agreement, which the **City** assumes by notifying the Subcontractor or Supplier in writing, upon a termination action under Article 14.

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## **ARTICLE 6 - PROJECT COORDINATION**

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### **6.1 General Coordination:**

6.1.1 The **Contractor** shall be responsible for the entire Project operations and shall properly coordinate the work of all trades and give all customary and proper assistance to all Subcontractors.

### **6.2 Subcontractor Coordination and Communications:**

6.2.1 All communications and information to and from Subcontractors shall be through the **Contractor**. The **Official** reserves the right to communicate directly with all subcontractors, suppliers, and vendors.

6.2.2 If Work to be performed by the **Contractor** directly or through a Subcontractor, is dependent upon previously placed Work, the **Contractor** shall supply and/or install items to be built into the dependent Work, examine dependent Drawings or Specifications, and examine, check and verify dependent dimensions of previously placed Work. The **Contractor** shall notify the **Architect** of previously placed dependent Work which is unsatisfactory or will prevent a satisfactory installation of other Work. Installation of Work by the **Contractor** directly or through a Subcontractor, in any given area, shall constitute ac-

ceptance by the **Contractor** of all previously placed dependent Work.

### 6.3 Coordination of Electric Service:

6.3.1 The **Contractor** shall coordinate the installation of the permanent primary and/or temporary electrical service with the appropriate power company, to assure availability of sufficient power for all Project requirements so as not to cause any delay in the Work.

### 6.4 Coordination with other Contractors:

6.4.1 The **Contractor** shall coordinate his operations with those of the **City's** other contractors if they are on, about, or adjacent to, the Project site. Cooperation will be required with respect to access to the Project site in the arrangement for the storage of materials, and in the detailed execution of the Work.

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## ARTICLE 7 - PROSECUTION AND COMPLETION

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### 7.1 Progress and Completion:

7.1.1 The Date for Commencement of the Contract Time shall be the date of execution of the Contract by the **Official**, unless otherwise directed in writing by the **Official**.

7.1.2 The **Contractor** shall commence the Work no earlier than the date of execution of the Contract by the **Official**, and shall prosecute and complete the Work regularly, diligently, and uninterruptedly at such rate or progress as will ensure Substantial Completion and Final Completion within the Contract Time(s).

7.1.3 Neither the **Contractor** nor the **City** shall be liable for any damages sustained by either party due to a failure to perform the Work under the terms of this Contract if such failure is in fact caused by the occurrence of a contingency the nonoccurrence

of which was a basic assumption under which this Contract was made, including but not necessarily limited to a natural disaster (flood, hurricane, or earthquake); a state of war, an imminent security threat, acts of enemies, embargoes, labor strikes, provided that the **Contractor** has notified the **Official** in writing of such cause within fourteen (14) days after its occurrence.

7.1.4 Before any Work is started, the **Contractor** shall deliver to the **Official** all of the licenses, permits, certificates of insurance, and bonds required by the Contract Documents. All certificates of insurance shall clearly state **ON THE FACE OF THE CERTIFICATE** that: the **City** and any other entity required by the Contract are Additional Insureds on all required policies except Workers' Compensation for the covered project; that Waiver of Subrogation is included with respect to all policies and coverages listed above; that the above insurance is primary and non-contributory over any other insurance available to the **City**; that such insurance extends to contractual liability; and that should any of the above policies be cancelled before the expiration thereof the issuing insurer will mail written notice to the **City** as certificate holder thirty (30) days in advance. The following statement affirming that coverage completely complies with the contract requirements shall be included in the Special Items section of the certificate of insurance or in an attached Special Items Addendum Page: **"The aforementioned insurance coverages completely comply with General Conditions Article 10 insurance requirements, Paragraphs 10.5 through 10.13.** Refer to Article 10, Paragraphs 10.5 through 10.11 for additional insurance requirements.

7.1.5 The **Contractor** shall start performance and furnishing of the Work on the Date of Commencement of the Contract Time. No Work shall be done at the site prior to the date on which the corresponding Contract Time starts to run.

7.1.6 Within ten (10) days after the **City** executes the Agreement, a pre-construction meeting will be held to record twenty-four hour emergency telephone numbers for key personnel; to review the qualifications of key **Contractor** personnel, the **Contractor's** plans for lay-down, staging, construction traffic, access to the site, parking and other similar matters; to review procedures for Change Orders, Change Authorizations and Submittals; and to establish and understanding among the parties as to the Work.

### 7.2 Compliance with Contract Time Requirements:

7.2.1 The **Contractor** shall prosecute the Work with the diligence necessary to ensure its completion within the Contract Time. The **Contractor** shall provide sufficient labor, materials and equipment, and shall promptly undertake appropriate action to recover schedule, as may be necessary to comply with the Contract Time requirements. Except as otherwise may be permitted by the Contract Documents, all Work at the site shall be performed during normal working hours, unless the **Contractor** has obtained the **City's** prior written consent.

7.2.2 Normal working hours shall be as per the **City's** Noise Ordinance, secs. 20-13--20-19 of the Revised Ordinances of the City of Newton, or based on a schedule beginning no earlier than 7:00 A.M. and ending no later than 7:00 P.M. on weekdays (excluding legal holidays), but not exceeding forty-eight (48) hours per week. If Work during other than normal working hours is scheduled by the **Contractor**, he shall reimburse the **City** for all of the **City's** associated extra costs; such costs to include, but not necessarily limited to, the **Architect's** related charges to the **City** and other costs assessed against or incurred by the **City** as designated in the Contract Documents, and if not designated, which the **Contractor** could reasonably have been expected to be aware of.

7.2.3 Given the Contract Time requirements of the Contract Documents, Early Dates in the Progress Schedule shall be based on proceeding with all or part of the Work exactly on the date when the Contract Time for the Work, or designated part of the Work, commences to run. Late Dates shall be based on completing the Work, or specified part of the Work, exactly on the corresponding Contract Time.

7.2.4 No Work shall be performed in other than daylight conditions unless adequate lighting has been provided by the **Contractor** after securing all required written approvals.

7.2.5 The **Contractor** shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with the **City**. No Work shall be delayed or postponed pending resolution of any disputes or disagreements. The **Contractor** shall exercise reasonable precautions, efforts and measures to avoid or mitigate situations that would cause delays.

### **7.3 Substantial Completion; Partial Completion:**

7.3.1 When the **Contractor** considers that (a) the entire Work, or (b) a portion of the Work, for which a Contract Time for Substantial Completion has been specified in the Contract Documents, has progressed to the point where it is sufficiently complete, in accordance with the Contract Documents, the **Contractor** shall notify the **City** and **Architect** in writing that the **Contractor** considers the Work substantially complete, or that portion of the Work substantially complete as the case may be. Within a reasonable time after receipt of any such notice from the **Contractor** and **Architect** shall inspect the Work or designated portion of the Work to determine the status of completion. If the **Architect** does not consider (a) the Work substantially complete, or (b) the portion of the Work inspected substantially complete, the **Official** will, within thirty (30) days after the inspection, present in writing to the **Contractor** an itemized list of incomplete and unsatisfactory Work sufficient to demonstrate the basis for that determination.

7.3.2 If the **City**, with the advice of the **Architect**, considers the Work substantially complete, the **City** will, within twenty-one (21) days of receipt of the **Contractor's** certification, present to the **Contractor** a written declaration that the Work has been substantially completed. Such declaration shall fix a date of Substantial Completion and may attach a preliminary list of minor incomplete or unsatisfactory items not impairing the usefulness of the Work as the **City**, with the advice of the **Architect**, believes justifiable which shall be completed or corrected by the **Contractor** before the **City** considers the Work acceptable and ready for final payment.

7.3.3 In the event that the **City** fails to respond, by presentation of a written declaration or itemized list, to the **Contractor's** certification within the twenty-one (21) day period, the **Contractor's** certification shall take effect as the **City's** declaration that the Work has been substantially completed. The term "substantially complete" as applied to any Work refers to Substantial Completion.

7.3.4 At the time of delivery of the **City's** written declaration of Substantial Completion of the Work or part of the Work under Partial Utilization, the **City** will attach the **Architect's** written recommendation as to division of responsibilities between the **City** and the **Contractor** for security, operation, safety, maintenance, heat, utilities, insurance, and warranties and guarantees, pending final payment or Substantial Completion of the entire Work. If approved by the **City**, such written recommendation shall become binding upon the **City** and the **Contractor**, unless they have otherwise agreed in writing and so informed the **Architect**, prior to the **Official** issuing the Certificate of Substantial Completion.

7.3.5 If the **Architect** and **City** consider, or if after consideration of the **City's** objections, the **Architect** considers the entire Work substantially complete, or the portion of the Work inspected substantially complete, the **Architect** will deliver to the **City** and **Contractor** a Certificate of Substantial Completion with a Punch List fixing a date of Substantial Completion, a date for completion of the Punch List to the satisfaction of the **Architect** and, in the case of Substantial Completion of the Work or Partial Utilization under paragraph 7.4, a recommendation as to the division of responsibilities between the **City** and **Contractor**. If after considering the **City's** objections, the **Architect** determines that the entire Work is not substantially complete, or the portion of the Work inspected is not substantially complete, the **Architect** will notify the **Contractor** in writing stating the reasons.

### **7.4 Partial Utilization:**



7.4.1 Utilization by the **City** of any part of the Work, prior to Substantial Completion of the Work shall not affect the times of Substantial or Final Completion.

7.4.2 The **Contractor** agrees to permit the Partial Utilization of any part of the Work, by the **City** prior to Substantial Completion, in accordance with the following terms:

7.4.3 The **City** will, prior to any such Partial Utilization, give written notice to the **Contractor** indicating the areas intended to be used and occupied and commencement date(s) of such use.

7.4.4 Upon receipt of such notice of intent from the **City**, the **Contractor** shall promptly secure and submit to the **Official** endorsement from the **Contractor's** insurance carrier(s) and written consent from the **Contractor's** surety, permitting occupancy and use of the part of the Work, by the **City**. In addition, all **Contractor** or **subcontractor** workers who may be present in any part of the Work when students are present must be CORI checked and evidence of such provided to the **City**.

7.4.5 The **Contractor** shall maintain all insurance required under the Contract Documents for all portions of the Work used or occupied by the **City**. Such occupancy shall not affect the various guarantee periods called for by the Contract Documents.

7.4.6 The utilization of any part of the Work, by the **City** shall not be construed as final acceptance of Work, nor relieve the **Contractor** of the **Contractor's** obligation to perform any Work required by the Contract Documents, but not completed prior to Substantial Completion in, and with respect to, the areas to be occupied prior to the stipulated date Substantial Completion of the Work.

7.4.7 The **Contractor** shall not be required to maintain or clean the portion(s) of the Work so occupied, nor shall the **Contractor** be responsible for wear and tear or damage resulting solely from such occupancy.

7.4.8 It is understood and agreed that when any portion of the Work is in a reasonable condition, in the opinion of the **Official**, to receive any fittings or furniture or other property of the **City** not included in the Contract Documents, the **Contractor** shall provide all necessary facilities and protection.

## 7.5 City-Caused Delay:

7.5.1 In the event a suspension, delay, interruption or failure to act of the **City** increases the cost of performance to any subcontractor, that subcontractor shall have the same rights against the **Contractor** for payment for an increase in the cost of his performance as the provisions 7.5.2 and 7.5.3 give the **Contractor** against the **City**, but nothing in provisions 7.5.2 and 7.5.3 shall in any way change, modify or alter any other rights which the Contractor or the subcontractor may have against each other.

7.5.2 The **City** may order the **Contractor** in writing to suspend, delay, or interrupt all or any part of the Work for such period of time as it may determine to be appropriate for the convenience of the **City**; provided however, that if there is a suspension, delay or interruption for fifteen (15) days or more or due to a failure of the **City** to act within the time specified in this Contract, the **City** shall make an adjustment in the Contract Price for any increase in the cost of performance of this Contract but shall not include any profit to the **Contractor** on such increase; and provided further, that the **City** shall not make any adjustment in the Contract Price under this provision for any suspension, delay, interruption or failure to act to the extent that such is due to any cause for which the Contract provides for an equitable adjustment of the Contract Price under any other Contract provisions.

7.5.3 The **Contractor** must submit the amount of a claim under provision 7.5.2 to the **City** in writing as soon as practicable after the end of the suspension, delay, interruption or failure to act and, in any event, not later than the date of final payment under this Contract and, except for costs due to a suspension order, the **City** shall not approve any costs in the claim incurred more than twenty (20) days before the **Contractor** notified the **City** in writing of the act or failure to act involved in the claim. The **City** and the **Contractor** agree that it is both reasonable and practicable for any Notice of Claim under the provisions of paragraph 7.5.2 to be filed in writing with the **Official** no later than thirty (30) days after the end of the suspension, delay, interruption or failure to act that gives rise to the claim

7.5.4 No **City**-caused delay is unreasonable unless it exceeds the time specified or contemplated for the act (or failure to act) in the Progress Schedule for Work involved or affected by the **City**-caused delay.

7.5.5 Except as provided in this paragraph, no order or act, or failure to act, of the **City** or **Architect** shall constitute an unreasonable **City**-caused delay, or a **City**-caused delay which justifies an increase in Contract Price or Contract Time. No claim for an increase in Contract Price or other damages or any other claim other than for an extension in Contract Time shall be made or asserted against the **City** by reason of any delays unless specifically allowed by the Contract Documents or required by law. The **Contractor** shall not be entitled to an increase in the Contract Price or to compensation of any kind from the **City**, including extended site and home office overhead, for direct, indirect, consequential impact or other costs, expenses or

damages, including but not limited to costs of acceleration or inefficiency arising because of delay, disruption or interference from any cause whatsoever. This provision shall not preclude recovery of damages by the **Contractor** for hindrances or delay due solely to fraud or bad faith on the part of the **City** or its agents. Otherwise, the **Contractor** shall be entitled only to a non-compensable extension to the Contract Time as the sole and exclusive remedy for such resulting delay, in accordance with and to the extent provided above.

## **7.6 Division of Responsibilities:**

7.6.1 At the time of delivery of the certificate of Substantial Completion of the Work, or a certificate of Substantial Completion of a portion of the Work under Partial Utilization, the **Architect** will attach a written recommendation as to division of responsibilities between the **City** and **Contractor** for security, operation, safety, maintenance, utilities, insurance, and warranties and guarantees, pending final payment (or Substantial Completion of the Work), which shall be binding upon the **City** and **Contractor**, unless the **City** and **Contractor** have otherwise agreed in writing and so informed the **Architect**.

7.6.2 Any **Architect's** recommendation as to division of responsibilities under Partial Utilization shall bind the **City** and **Contractor** at the time when the **City** starts that Partial Utilization following receipts of evidence of compliance with the requirements of paragraph 10.8 regarding property insurance.

## **7.7 Unreasonable Delay, Extension or Acceleration:**

7.7.1 For the purposes of justifying increases in Contract Price, no delay or extension (or acceleration in lieu of any such delay or extension) for which the **City** is responsible under the Contract Documents shall be unreasonable under the circumstances, however caused, unless it extends completion of all or a specified part of the Work beyond the time specified or contemplated for all or a part of the Work in the Progress Schedule.

## **7.8 Use of Float:**

7.8.1 Total Float and Contract Float, whether expressly disclosed in the Progress Schedule or implied by the use of float suppression techniques, are not for the exclusive benefit of the **Contractor** or **City**, and shall be available to the **City**, **Architect** and **Contractor** to offset delays which postpone, extend or in any other manner alter the schedule or completion of all or part of the Work.

7.8.2 Adjustment or removal by the **Contractor** of any float suppression techniques used, e.g. preferential sequencing, crew movements, equipment use, form reuse, etc., extended duration, imposed dates, scheduling Work not required for a Contract Time as required Work anyhow, and others will be a prerequisite to an increase in Contract Price or Contract Time.

# **ARTICLE 8 - PROGRESS PAYMENTS, FINAL PAYMENT & ACCEPTANCE**

## **8.1 Schedule of Values; Application for Payment**

8.1.1 The Schedule of Values shall subdivide the Work into component parts in sufficient detail to facilitate and serve as the basis for progress payments, as specified in these General Conditions, and if not specified, by further detailing of the **Contractor's** bid breakdown. For each item, the Schedule of Values shall include quantities; direct craft labor man hours, labor cost and material/equipment cost. Labor costs shall include an appropriate amount of construction equipment costs, supplemental costs, administrative expenses, contingencies and profit.

8.1.2 Pursuant to M.G.L. Chapter 30 §39 K, within fifteen (15) days after receipt from the **Contractor**, of an Application for Payment, the **City** will make a periodic payment to the **Contractor** for the work performed during the preceding month, and upon certification by the **Contractor** that he is the lawful owner and that the materials are free from all encumbrances as noted on the Transfer of Title Form, for the materials not incorporated in the Work but delivered and suitably stored at the site, or at some other location approved in writing by the **Official** to which the **Contractor** has title or to which a Subcontractor has title and has authorized the **Contractor** to transfer title to the **City**, less (1) a retention based on its estimate of the fair value of its claims against the **Contractor**, and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of M.G.L. Chapter 30, Section 39F, and less (3) a retention not exceeding five percent (5%) of the approved amount of the periodic payment. Payment for materials and equipment stored on or off the Site shall be conditioned on compliance by the **Contractor** with procedures satisfactory to the **City** to establish the **City's** title to such materials or equipment or otherwise protect the **City's** interest, at a minimum to include a fully executed Transfer of Title Form.

8.1.3 The **Contractor's** Application for Payment shall be delivered on the day of each month established by the **Official**, by hand or by registered or certified mail, with return receipt requested, to the office of the **Architect**. The **Architect** shall mark the Application with the date of receipt. The date of receipt of an Application for Payment received on a Saturday shall be the first working day thereafter.

8.1.4 Such Application for Payment shall be in accordance with the Schedule of Values and made on a two-part form approved by the **Official** and shall be arithmetically correct and shall show (a) the value of labor and materials used in the work, and (b) the value, quantity of each item of materials not incorporated in the work but delivered and suitably stored at the site or elsewhere in accordance with this Article, and shall be accompanied by receipted bills for or other acceptable evidence of the ownership of, and satisfactory authority to transfer title to the **City** of, the materials not incorporated in the Work, and in addition, on a form satisfactory to the **Official**, an instrument transferring to the **City** title to the aforesaid materials. In addition, all Applications for Payment shall contain a separate item for each filed Subcontractor as of the date the Application is filed.

8.1.5 The **Architect** will submit the **Contractor's** Application for Payment, as checked and approved by the **Architect**, together with the **Architect's** certificate, to the **Official** not later than five (5) business days from the date the **Architect** receives an Application in the proper form from the **Contractor**.

8.1.6 The **Contractor** shall also submit, when requested by the **Official** or the **Architect**, vouchers and such other information showing payments already made by him for labor and materials used in the Work.

8.1.7 The **Architect** shall issue certificates for payments monthly, based on the **Contractor's** monthly Application for Payment. All orders and certificates shall be approved by the **Official** and shall not be binding on the **City** until so approved.

8.1.8 An Application for Payment covering Work of Subcontractors or Suppliers shall exclude amounts the **Contractor** or a Subcontractor does not intend to pay to Subcontractors or Suppliers for any reason. The **Contractor** will not be paid for any Work performed by a Subcontractor until all required evidence of insurance for that Subcontractor has been received and reviewed by the official if such information has been requested by the **Official**. The **Contractor** and the Subcontractors shall promptly pay the amounts due to each Subcontractor and Supplier, upon receipt of payment from the **City**.

## **8.2 Intent of Review of Application for Payment:**

8.2.1 The **Architect's** recommendation of any payment requested constitutes a representation to the **City**, based on on-site observations and on the **Architect's** review of the Application for Payment and the accompanying data and schedules, that the Work has progressed to the point indicated, that, to the best of the **Architect's** knowledge, information and belief, the quality of the Work is in accordance with the Contract Documents subject to an evaluation of the Work for conformance with the Contract Documents as a functioning whole prior to and upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work, and to any other qualifications stated in the recommendation, and that the **Contractor** is entitled to payment of the amount recommended.

8.2.2 In the case of final payment, the **Architect's** recommendation that the Work is acceptable shall be an additional representation by the **Architect** to the **Owner** that the conditions governing final payment to the **Contractor** have been met.

## **8.3 Review of Applications for Payment:**

8.3.1 The **Official's** review of an Application for Payment will be based on on-site observations by the **Architect**, and on the **Architect's** review of the Application for Payment and of the accompanying data and schedules, and shall indicate that, to the best of the **Architect's** knowledge, information and belief, the Work has progressed to the point indicated, and that the quality of the Work is in accordance with the Contract Documents, subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests specified in the Contract Documents, a final determination of quantities and classifications for Unit Price Work, and any other qualifications so stated.

8.3.2 The **Official** may make changes in any Application for Payment submitted by the **Contractor**, and the payment due on said Application shall be computed in accordance with the changes so made, but such changes or any requirement for the periodic payment or the date for the commencement of interest charges on the amount of the periodic payment shall be computed in accordance with the changes made as provided herein; provided that the **Official** may, within seven (7) days after receipt, return to the **Contractor** for correction any Application which is not in the required form or which contains computations not arithmetically correct and, in that event, the date of receipt of such Application shall be the date of receipt of the corrected Application in the proper form and with arithmetically correct computations.

8.3.3 No certificate given or payment made shall be evidence of the performance of this Contract, either wholly or in part and no payment, whether made upon the final certificate or otherwise, shall be construed as an acceptance of *defective* work or materials.

8.3.4 No payment will be made for General Conditions by the **City** to the **Contractor** until the 1) Schedule of Values; 2) Progress Schedule; 3) Schedule of Shop Drawings Submittals and Shop Drawing Log; 4) all other technical submittals, in-

cluding but not limited to a Schedule for Samples, Test Procedures, Test Results and other Printed Data have all been submitted, reviewed and determined to be in accordance with the requirements of the Contract Documents. In addition, no payment will be made for General Conditions by the **City** to the **Contractor** unless Record Drawings in the required format are provided, maintained and regularly updated by the **Contractor** in accordance with the requirements of the Contract Documents. The **City** may withhold such amounts from progress payments or from the final payment due or to become due to the **Contractor** as are necessary to satisfy any obligations of the **Contractor** under the Contract, or to satisfy other obligations of the **Contractor** not related to the Contract which the **City** is ordered to satisfy by a court of competent jurisdiction or is required to satisfy by law. Obligations of the **Contractor** under the Contract that may result in withholding all or part of a payment if, in the discretion of the **City**, are not satisfactorily provided include but are not limited to: obtain all required permits and licenses; provide the required temporary facilities; security of the Site; maintenance and weekly cleaning of the Site; fire protection; wind protection; noise/pollution control; establishment of a quality control system; coordination of sub-trades and suppliers; provide a full-time licensed superintendent and competent foreman; payment of police detail and fire watch accounts; payment of **City** costs for evaluation of substitution requests; payment for site utilities; payment for all labor and materials; correction of defective work; provide project photographs; establish and maintain on-site permanent benchmarks; provide operating, service and maintenance instructions; delivery of warranties and guarantees and follow all required close-out and commissioning procedures.

#### **8.4 Refusal to Recommend or to Make Payment:**

8.4.1 The **City** may withhold from any payment an amount based on the **Official's** estimate of the fair value of its claims against the **Contractor**, including but not limited to, any liquidated damages that would become or have been determined to be due; claims made against the **City** on account of the **Contractor's** performance or furnishing of the Work; direct payments due to Subcontractors in accordance with the provisions of M.G.L. Chapter 30, §39F; subsequently discovered evidence or other items entitling the **City** to a withholding or set-off against the amount recommended; or because of the **Architect's** refusal to recommend payment. The **Official** will give the **Contractor** immediate written notice stating the reasons for such action.

8.4.2 The **Architect** may refuse to recommend the whole or any part of any payment, or because of subsequently discovered evidence or inspection or test results, nullify any such payment previously recommended, as may be necessary in the **Architect's** opinion, to protect the **City** from loss because: the Work is *defective*, or completed Work has been damaged requiring correction or replacement; the Contract Price has been reduced by Change Order; the **City** has been required to correct *defective* Work or to complete Work; reasonable evidence exists that the Work, or specified part, cannot be completed for the Contract Price or will not be completed within the Contract Time; third party claims filed or reasonable evidence indicating the probable filing of such claims; failure of the Contractor to make payments properly to Subcontractors for labor, materials or equipment; persistent failure to carry out the Work in accordance with the Contract Documents.

#### **8.5 Payment Upon Substantial Completion:**

8.5.1 Within sixty-five (65) days after the date of Substantial Completion, the **Official** shall send to the **Contractor** for acceptance a Substantial Completion estimate for the quantity and price of the Work done and all but one percent (1%) retainage on that Work, including the quantity, price and all but one percent (1%) retainage for the undisputed part of each work item and extra work item in dispute but excluding the disputed part thereof, less the estimated cost of completing all incomplete and unsatisfactory items and less the total progress payments made to date for the Work. The **Official** also shall deduct from the Substantial Completion estimate an amount equal to the sum of all demands for direct payment filed by Subcontractors and not yet paid to Subcontractors or deposited in joint accounts pursuant to M.G.L. Chapter 30, Section 39F, but the **Official** shall not deduct any amount by virtue of claims asserted against the **Contractor** by Subcontractors or Suppliers.

8.5.2 Within fifteen (15) days after the effective date of declaration of Substantial Completion, the **Official** shall send to the **Contractor** by certified mail, return receipt requested, a complete list of all incomplete or unsatisfactory Work items, and, unless delayed by causes beyond his control, the **Contractor** shall complete all such items within forty-five (45) days after the receipt of such list or before the date for final payment and acceptance, whichever is later. If the **Contractor** fails to complete the Work items within such time, the **Official** may, subsequent to seven (7) days written notice to the **Contractor** by certified mail, return receipt requested, terminate the Contract and complete the incomplete or unsatisfactory items and charge the cost of same to the **Contractor**.

8.5.3 If the **Official** fails to prepare and send to the **Contractor** any Substantial Completion estimate required by this paragraph on or before the date specified, the **City** shall pay to the **Contractor** interest on the amount which would have been due pursuant to such Substantial Completion estimate at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Boston from such date to the date on which the **Official** sends that Substantial Completion estimate to the **Contractor** for acceptance or to the date of payment, whichever occurs first. The **Official** shall include the amount of such interest in the Substantial Completion estimate.

8.5.4 Not later than the sixty-fifth (65th) day after each Subcontractor substantially completes his Work in accordance with

the Contract Documents, the entire balance due under the Subcontract, less amounts retained by the **Official** as the estimated cost of completing the incomplete and unsatisfactory items of Work, shall be due the Subcontractor; and the **City** shall pay that amount to the **Contractor**. The **Contractor** shall pay to the Subcontractor the full amount received from the **City** less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the **Contractor**.

8.5.5 If, within seventy (70) days after the Subcontractor has substantially completed his Work, the Subcontractor has not received from the **Contractor** the balance due under the Subcontract including any amount due for extra labor and materials furnished to the **Contractor**, less any amount retained by the **City** as the estimated cost of completing the incomplete and unsatisfactory items of Work, the Subcontractor may demand direct payment of that balance from the **City**. The demand shall be by a sworn statement delivered to or sent by registered mail to the **Official**, and a copy shall be delivered to or sent by registered mail to the **Contractor** at the same time. The demand shall contain a detailed breakdown of the balance due under the Subcontract and a statement of the status of completion of the Subcontract Work. Any demand made after Substantial Completion of the Subcontract Work shall be valid even if delivered or mailed prior to the seventieth (70th) day after the Subcontractor has substantially completed the Work. Within ten (10) days after the Subcontractor has delivered or so mailed the demand to the **Official** and delivered or so mailed a copy to the **Contractor**, the **Contractor** may reply to the demand. The reply shall be by a sworn statement delivered to or sent by registered mail to the **Official** and a copy shall be delivered to or sent by registered mail to the Subcontractor at the same time. The reply shall contain a detailed breakdown of the balance due under the Subcontract including any amount due for extra labor and materials furnished to the **Contractor** and the amount due for each claim made by the **Contractor** against the Subcontractor.

8.5.6 Within fifteen (15) days after receipt of the demand by the **Official**, but in no event prior to the seventieth day after Substantial Completion of the Subcontract Work, the **Official** shall make direct payment to the Subcontractor of the balance due under the Subcontract including any amount due for extra labor and materials furnished to the **Contractor** less any amount (i) retained by the **City** as the estimated cost of completing the incomplete or unsatisfactory items of work, (ii) specified in any court proceedings barring such payment, or (iii) disputed by the **Contractor** in the sworn reply; provided, that the **Official** shall not deduct from a direct payment any amount as provided in part (iii) if the reply is not sworn to, or for which the sworn reply does not contain the detailed breakdown required by paragraph 8.5.5 above. The **City** shall make further direct payments to the Subcontractor forthwith after the removal of the basis for deductions from direct payments made as provided in parts (i) and (ii) of this paragraph.

8.5.7 The **City** shall deposit the amount deducted from a direct payment as provided in part (iii) of paragraph 8.5.6 in an interest-bearing joint account in the names of the **Contractor** and Subcontractor in a bank in Massachusetts selected by the **Official** or agreed upon by the **Contractor** and the Subcontractor and shall notify the **Contractor** and the Subcontractor of the date of the deposit and the bank receiving the deposit. The bank shall pay the amount in the account, including accrued interest, as provided in an agreement between the **Contractor** and the Subcontractor or as determined by decree of a court of competent jurisdiction and appropriate venue.

8.5.8 All direct payments and deductions from demands for direct payments deposited in an interest-bearing account or accounts in a bank pursuant to a paragraph 8.5.7, shall be made out of amounts payable to the **Contractor** at the time of receipt of a demand for direct payment from a Subcontractor and out of amounts which later become payable to the **Contractor** and in the order of receipt of such demands from Subcontractors. All direct payments shall discharge the obligation of the **City** to the **Contractor** to the extent of such payment.

8.5.9 The **Official** shall deduct from payments to the **Contractor** amounts which, together with the deposits in interest-bearing accounts pursuant to paragraph 8.5.7, are sufficient to satisfy all unpaid balances of demands for direct payment received from Subcontractors. All such amounts shall be designated for such direct payments, and the Subcontractors all have a right in such deductions prior to any claims against such amounts by creditors of the **Contractor**.

## **8.6 Payment to Subcontractors (Chapter 30 §39F):**

8.6.1 After the **Contractor** receives payment on account of an Application for Payment, the **Contractor** shall pay to each Subcontractor the amount paid for the labor performed and the materials furnished by that Subcontractor, less any amount specified in any court proceedings barring such payment and also less any amount claimed due from the Subcontractor by the **Contractor**.

8.6.2 Each payment made by the **City** to the **Contractor** for the labor performed and the materials furnished by a Subcontractor shall be made to the **Contractor** for the account of that Subcontractor; and the **Official** shall take reasonable steps to compel the **Contractor** to so pay such Subcontractor, however the **City** shall have no obligation to pay or to see to the payment of money to any Subcontractor or Supplier, except as may otherwise be required by law or by a court of competent jurisdiction. If the **Official** has received a demand for direct payment from a Subcontractor for any amount which has already been included in a payment to the **Contractor** or which is to be included in a payment to the **Contractor** for payment to the Subcontractor, the **Official** shall act upon the demand as provided in this Article.

8.6.3 Any assignment by a Subcontractor of the rights under this paragraph 8.6 to a surety company furnishing a bond under the provisions of M.G.L. Chapter 149, §29 shall be invalid. The assignment and subrogation rights of the surety to amounts included in a demand for direct payment which are in the possession of the **City** or which are on deposit pursuant to paragraph 8.5.7 shall be subordinate to the rights of all Subcontractors who are entitled to be paid under this Section and who have not been paid in full.

8.6.4 A **Contractor** or Subcontractor shall enforce a claim to any portions of the amount of a demand for direct payment deposited as provided in this Article, by a petition in equity in the Superior Court against the other and the bank shall not be a necessary party. A Subcontractor shall enforce a claim for direct payment or a right to require a deposit as provided in this Article by a petition in equity in the Superior Court against the **City** and the **Contractor** shall not be a necessary party.

8.6.5 "Subcontractor" as used in this paragraph 8.6 shall mean a person who files a Sub-Bid and receives a subcontract as a result of that filed Sub-bid or who is approved by the **Official** in writing as a person performing labor or both performing labor and furnishing materials pursuant to a contract with the **Contractor**.

### **8.7 Final Application for Payment:**

8.7.1 Upon written notice from the **Contractor** that the entire Work or a specified part is complete and ready for final payment, the **Architect** will make final inspection with the **Official** and the **Architect** will notify the **Contractor** in writing of all instances of incomplete or *defective* Work revealed by the final inspection. The **Contractor** shall immediately undertake any necessary measures to correct the deficiencies.

8.7.2 After the **Contractor** has completed all such corrections to the satisfaction of the **Architect** and delivered all required close out documents including but not limited to, maintenance and operating instructions, guarantees, bonds, certificates of inspection, marked-up record documents and as-built drawings (revised to reflect any changes or corrections made after Substantial Completion) and all other required documents, and after the **Architect** has consented to review the Work to determine whether it is acceptable, the **Contractor** may make application for final payment. The application for final payment shall enclose: affidavits certifying that the bonds and insurance are in effect and that insurance coverage will not be canceled, adversely changed or renewal refused except as provided under paragraph 10.5.5; AIA document G707 certifying that the surety agrees that final payment shall not relieve the surety of any of its obligations under the Bond; affidavits of compliance; complete and legally effective waivers acceptable to the **Official** from all persons holding payment claims against the Work, or if any Subcontractor or Supplier refuses or fails to furnish such waiver, a bond or other security acceptable to the **Official** to indemnify the **City** against any such payment claim; and a list of all property damage and injury insurance claims arising due to Work performed handled by the **Contractor** and the **Contractor's** insurer identifying the claimant, the nature and the action taken.

### **8.8 Final Payment and Acceptance:**

8.8.1 If, on the basis of the **Architect's** observation of the Work and final inspection, and his review of the final Application for Payment, the **Architect** is satisfied that the Work, or specified part of the Work, has been completed and the **Contractor's** other obligations under the Contract Documents have been fulfilled, the **Architect** will, within thirty (30) days after receipt of the final Application for Payment, furnish to the **Official** and the **Contractor** the **Architect's** recommendation of acceptance. If not satisfied, the **Architect** will return the Application to the **Contractor** indicating in writing the reasons for not recommending final payment and acceptance, in which case the **Contractor** shall make the necessary corrections and resubmit the Application.

8.8.2 After the receipt of an Application for final payment, and within sixty-five (65) days after (a) the **Contractor** fully completes the Work or substantially completes the Work so that the value of the Work remaining to be done is, in the estimate of the **Official**, less than one percent (1%) of the original Contract Price, or (b) the **Contractor** substantially completes the Work and the **City** takes possession for occupancy, whichever occurs first, the **City** shall pay the **Contractor** the entire balance due on the Contract less (1) a retention based on its estimate of the fair value of its claims against the **Contractor** and of the cost of completing the incomplete and unsatisfactory items of work and less (2) a retention for direct payments to Subcontractors based on demands for same in accordance with the provisions of M.G.L. Chapter 30, §39F, or based on the record of payments by the **Contractor** to the Subcontractors under this Contract if such record of payment indicates that the **Contractor** has not paid Subcontractors as provided in §39F.

8.8.3 If the **City** fails to make payment as provided for in Paragraph 8.8.2, there shall be added to each such payment daily interest at the rate of three percentage points above the rediscount rate then charged by the Federal Reserve Bank of Newton commencing on the first day after said payment is due and continuing until the payment is delivered or mailed to the **Contractor**; provided, that no interest shall be due, in any event, on the amount due on an Application for final payment until fifteen (15) days after receipt of such an Application from the **Contractor**. The **Contractor** agrees to pay to each Subcontractor a portion of any such interest paid in accordance with the amount due each Subcontractor.

8.8.4 If the **City** fails to prepare and send to the **Contractor** the final estimate within thirty (30) days after receipt of notice of completion, the **City** shall include in the final estimate interest on the amount which would have been due to the **Contractor** at the rate specified in paragraph 8.5.3 from the thirtieth (30th) day after such completion until the date on which the **Official** sends the final estimate to the **Contractor** for acceptance or the date of payment, whichever occurs first, provided that the **Official's** inspection shows that no Work items required by the Contract Documents remain incomplete or unsatisfactory. Interest shall not be paid under this provision on amounts for which interest is to be paid under paragraph 8.4.

8.8.5 In consideration of execution of this Contract by the **City**, the **Contractor** agrees that simultaneously with the acceptance of what the **City** tenders as the final payment by it under this Contract, he will execute and deliver to the **City** an instrument under seal releasing and forever discharging the **City** of and from any and all claims, demands, and liabilities whatsoever of every name and nature both at law and in equity arising from growing out of, or in any way connected with this Contract, save only such claims, demands, and liabilities as are expressly excepted in said instrument. It is agreed that the person who in fact executes and delivers said instrument shall be deemed to be authorized and empowered to execute and deliver the same on behalf of the **Contractor**.

8.8.6 If the **City** does not concur with the **Architect's** determination, the **City** will return the application to the **Contractor** indicating in writing the reasons for refusing final acceptance, in which case the **Contractor** shall make the necessary corrections and resubmit the application. The **City's** written determination will be binding upon the **Contractor**, unless he delivers to the **City** a written Notice of Claim within thirty (30) days after receipt of the determination in compliance with Article 15.

8.8.7 If through no fault of the **Contractor** final completion of the Work is significantly delayed and if recommended by the **Architect**, the **City** may, upon receipt of the **Contractor's** Final Application for Payment, and without terminating the Contract,

make payment of the balance due for that portion of the Work fully completed and accepted. If the balance to be held by the **City** for Work not fully completed or corrected is less than the retainage on that Work, the affidavits specified in paragraph 8.7.2 and the releases or waiver, or bonds, shall be furnished as required and submitted by the **Contractor**. Payment of the balance due shall be made under the provisions for final payment, but it shall not constitute a waiver of claims.

#### **8.9 Payment for Labor and Materials by Contractors and Subcontractors:**

8.9.1 The **Contractor** agrees that he and all Subcontractors performing the Work shall pay for all Labor performed or furnished and materials used or employed in the performance of the Work including lumber so employed which is not incorporated in the Work and is not wholly or necessarily consumed or made so worthless as to lose its identity, but only to the extent of its purchase price less its full salvage value, and including also any material specially fabricated at the order of the **Contractor** or Subcontractor for use as a component part of the Work so as to be unsuitable for use elsewhere, even though such material has not been delivered and incorporated into the Work, but only to the extent that such specially fabricated materials is in conformity with the Contract Documents, or any charges for materials used or employed therein which are consigned to the **Contractor** or to a Subcontractor who has a direct contractual relationship with the **Contractor**, and shall pay all sums due for the rental or hire of vehicles, steam shovels, roller propelled by steam or other power, concrete mixers, tools, and other appliances and equipment employed in the Work; and shall pay the transportation charges directly related to such rental or hire; and shall pay all sums due trustees or other persons authorized to collect such payments from the **Contractor** or Subcontractors based upon the labor performed or furnished as aforesaid for a maximum of one-hundred twenty (120) consecutive calendar days, for health and welfare plans and other fringe benefits which are payable in cash, and provided for in collective bargaining agreements between organized labor and the **Contractor** or Subcontractors.

8.9.2 In the event that the Contract Documents provide for reimbursement by the **City** to the **Contractor** for travel or other expenses, the **Contractor** shall submit such proposed expenses to the **Official** for approval prior to the incurrence of such expenses.

#### **8.10 Penalties for False Claims:**

8.10.1 The attention of the **Contractor** and all Subcontractors is directed to each of the following sections of the M.G.L. regarding penalties for presentation to the **City** of what the **Contractor** or Subcontractor knows to be a false claim or claims.

8.10.1.1 M.G.L. Chapter 266, §67B provides for criminal penalties of a fine of not more than Ten Thousand Dollars (\$10,000.00) or for imprisonment for not more than five years in State Prison or for not more than two and one half years in the House of Correction, or both; M.G.L. Chapter 12, §5B provides for civil penalties of not less than Five Thousand Dollars (\$5,000.00) and not more than Ten Thousand Dollars (\$10,000.00) per violation, plus three times the amount of damages sustained by the City as well as the cost to recover said damages; and M.G.L. Chapter 29, §29F provides for debarment from bidding on all public work for a specified period of time that may be imposed for willfully supplying materially false information incident to performing any public contract or subcontract.

## 8.11 Contractor's Continuing Obligation:

8.11.1 The **Contractor's** obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following constitutes acceptance of Work not in accordance with the Contract Documents or a release of the **Contractor's** obligation to perform the Work in accordance with the Contract Documents: (a) a recommendation of any progress or final payment by the **Architect**, (b) the issuance of a certificate of Substantial Completion, (c) any payment by the **City** to the **Contractor**, (d) any Partial Utilization by the **City**, (e) any act of acceptance by the **City** nor any failure to do so, (f) any review and approval of a Shop Drawing, sample, test procedure, or other Submittal, (g) any review of a Progress Schedule, (h) any inspections, tests or approvals, (i) the issuance of a notice of acceptability by the **Architect**, (j) any correction of *defective* Work by the **Official**.

## 8.12 Waiver of Claims:

8.12.1 The making and acceptance of final payment will not constitute a waiver by the **City** of any rights in respect of the **Contractor's** continuing obligations under the Contract Documents, nor will it constitute a waiver of (a) any claims by the **City** against the **Contractor** still unsettled, (b) any claims arising from unsettled payment claims, *defective* Work appearing after final inspection or failure by the **Contractor** to comply with the Contract Documents or the terms of any special warranties or guarantees provided by the Contract Documents or by Law.

8.12.2 The making and acceptance of final payment will constitute a waiver of all claims by the **Contractor** against the **City** other than those previously made on a timely basis in writing and still unsettled.

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## ARTICLE 9 - PROTECTION OF PERSONS AND PROPERTY

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### 9.1 General:

9.1.1 The **Contractor** shall be responsible for all Site security and he shall protect everything on, in, or at the site from injury by water, frost, wind, fire, accident, theft, vandalism or other cause, and any interference; take charge of, protect, and be liable for any loss of or damage to the materials for use under this Contract delivered at or in the vicinity of the Site, and whether or not suitably stored at the Site, or at some other location agreed upon in writing by the **Official**, pursuant to this Section by whomever furnished; take all proper precautions to protect the **City's** property or adjoining property from damage or unnecessary interference; provide proper means of access to the property and replace or put in a good condition every public or private way, conduit, catch basin, fence, trees, or other things damaged by the **Contractor** in performing the Work, unless permanently done away with on approval of the **Official**, for the proper performance of the Work; take all proper precautions to protect persons from injury, unnecessary interference or inconvenience, and be responsible for the results of any failure in doing so; leave an obstructed way along public and private places for pedestrians and vehicular traffic and leave direct access to hydrants; provide proper walks over and around any obstruction made in public places in the performance of the Work; maintain from the beginning of twilight through the whole of every night, on or near the obstruction, sufficient lights and guards to protect travelers from injury thereby; when the Work is suspended keep all roadways and sidewalks in proper condition, and put and leave the same in safe condition at the completion of the Work, all to the satisfaction of the **Official**.

9.1.2 Any additional requirements for protection of persons and property shall be as set forth in these General Conditions and in the Supplementary Conditions.

### 9.2 Safety and Protection:

9.2.1 The **Contractor** shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs. The **Contractor** shall take all necessary precautions for the safety of, and shall erect and maintain all necessary safeguards and provide the necessary protection to prevent damage, injury or loss to: (a) all employees on the Work, (b) other persons who may be affected, (c) all the Work and materials and equipment to be incorporated into the Work whether in storage on or off the Site and (d) other property at or adjacent to the Site including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Utilities not designated for removal, relocation or replacement. Unless otherwise stated in writing by the **Contractor** to the **Official**, the **Contractor's** safety representative at the site shall be the superintendent.

9.2.2 The **Contractor** shall, and shall require all Subcontractors to comply with all Laws including **City** ordinances and regulations governing the safety and protection of persons or property, including but not limited to (a) the Occupational Safety and Health Act and the Hazard Communication Act, as promulgated by the Federal Government and as adopted by the Commonwealth of Massachusetts, and (b) all applicable State health and safety requirements. The **Contractor** shall be responsible for all fines and penalties imposed for any related violation(s) of Federal, State and **City** health and safety requirements.



9.2.3 The **Contractor** shall notify owners of adjacent property, including Underground Utility owners, in writing seventy-two hours in advance when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. The **Contractor** shall simultaneously notify the **Clerk of the Works and Official** of any notice given to owners of adjacent property. All damage, injury or loss to that property caused, directly or indirectly, in whole or in part, by the **Contractor**, any Subcontractor or Supplier shall be remedied by the **Contractor**, except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of the **City** or the **Architect**, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the **Contractor**. The **Contractor** shall shore up, brace, underpin, and protect as may be necessary, all foundations and other parts of all existing structures adjacent to the Site. These **Contractor's** duties and responsibilities shall continue until the **Architect** has issued written notice to the **City** and the **Contractor** that the Work is acceptable.

9.2.4 Blasting operations, if any are specifically approved by the **Official**, shall be conducted by competent and suitably trained and qualified persons and in strict accordance with the rules and regulations of the Massachusetts Department of Public Safety governing the keeping, storage, use, manufacturer, sale, handling, transportation or other disposition of explosives, and such other rules and regulations as may be promulgated from time to time by authorities having jurisdiction. The **Contractor** shall obtain all required permits prior to the use of explosives, and shall furnish a copy of those permits to the **Official** prior to their use. When using other hazardous materials or equipment, the **Contractor** shall exercise the utmost care and shall carry on such activities under the supervision of competent and properly qualified persons.

9.2.5 The **Contractor** is fully responsible for initiating, maintaining and supervising all safety precautions and programs related to safety on the site. The **Contractor** shall submit to the **Official** no later than fifteen (15) days after the Date for the Commencement of Work, his written plan for site Safety and Accident prevention. This plan must be submitted to the **Official** prior to the **Contractor's** submittal of the first Application for Payment.

9.2.6 Except as otherwise may be provided in the technical specifications, if the **Contractor** encounters material at the site reasonably believed to be asbestos or polychlorinated biphenyl (PCB) which has not been rendered harmless, the **Contractor** shall immediately stop all affected Work, report the condition to the **Official** in writing and take appropriate health and safety precautions. Upon receipt of any such notice, the **Official** will investigate the conditions. If in fact the material is asbestos or PCBs which have not been rendered harmless, the **Official** shall suspend all affected Work and proceed to have the asbestos or PCB material removed or rendered harmless by either negotiating a Change Order or Change Authorization with the **Contractor**, by means of separate contract or as the **Official** may otherwise deem expedient, or in the alternative, terminate the affected Work or the entire Agreement for convenience, as provided in Article 14.

9.2.7 Once the material has been removed or rendered harmless, the affected Work shall be resumed as directed by the **Official**. If any such incident causes or will cause delay, extension or acceleration that postpones, extends or in any other manner alters the schedule or completion of all or part of the Work, the **Owner** shall, pursuant to the provisions in Articles 8 and 11, make or negotiate with the **Contractor**, an adjustment in Contract Price or Contract Time for any increases in the **Contractor's** actual documented cost or the time required to perform the Work. The **Contractor** assumes responsibility for any related delay, extension or acceleration that is reasonable under the Contract Documents.

### **9.3 Accident Prevention:**

9.3.1 The **Contractor** shall comply with all recommendations and requirements for accident prevention of the Associated General Contractors of America and the provisions for accident prevention included in the Commonwealth of Massachusetts, 454, CMR 10.0 "Construction Industry Rules and Regulations." The **Contractor** should note that these aforementioned recommendations and requirements are the minimum standards that are to be adhered to.

9.3.2 Neither the **City** nor the **Architect** nor any officer, agent or employee of either of them shall be responsible for providing safe working places, safety measures, means or techniques for the **Contractor**, Subcontractors or their employees or any individual.

### **9.4 Fire Protection and Prevention:**

9.4.1 The **Contractor** will ensure that the requirements in the Contract Documents and any and all permits issued regarding Fire Protection and Prevention, including fire watch, are strictly adhered to during the entire Contract Time, until Final Completion of the Work.

### **9.5 Wind Protection:**

9.5.1 The **Contractor** shall take every precaution to minimize danger to persons, damage to the Work, and damage to adjacent properties resulting from winds. These precautions shall include, but not limited to, removing all loose materials, tools

and/or equipment from exposed locations, and removing or securing scaffolding or other temporary work.

## **9.6 Insurance Inspection:**

9.6.1 The **Contractor** shall provide for periodic inspections by his insurance underwriters and shall submit written evidence of the same to the **Official**. The **Contractor** shall, at his expense, promptly carry out their recommendations.

## **9.7 Security:**

9.7.1 The **Contractor** shall provide, at no increase in Contract Price, sufficient security at the Site at all times when the **Contractor's** personnel are not present for the protection of all Work, materials, equipment, and property at the Site, from the Commencement of the Work until Substantial Completion of the Project.

9.7.2 If the **Contractor** fails to provide sufficient security as called for in paragraph 9.7.1, the **Official** may elect to provide such sufficient security as required, and charge the associated costs to the **Contractor**.

## **9.8 Welding and Cutting:**

9.8.1 All welding and cutting shall be in accordance with Newton Fire Department regulations. Torch cutting and/or welding operations by Subcontractors shall have the approval of the **Contractor** prior to start of such operations. In addition to the requirements of this Article, wherever electric or gas welding or cutting work is done in the vicinity of combustible material, or over areas where persons may be found, interposed shields of fireproof material shall be used to protect against fire damage or injury. Personnel with suitable fire extinguishing equipment shall be stationed near welding and cutting operations to prevent the sparks from lodging in floor cracks or passing through floor or wall openings and from lodging in combustible materials. Chemical extinguishers shall be available and ready for use in all locations where torch cutting and/or welding operations are in progress.

## **9.9 Overloading:**

9.9.1 The **Contractor** shall neither cause nor allow the design live load of any or all parts of the structure to be exceeded at any time during the performance of the Work.

## **9.10 Noise and Pollution Control:**

9.10.1 All Work performed under the Contract Documents shall conform to the requirements of: M.G.L. Chapter 111, §§ 31C and 142D; Rules and Regulations adopted by the Commonwealth of Massachusetts Department of Public Health, Division of Environmental Health; the City of Newton Noise Ordinance, secs. 20-13 – 20-19 of the Revised Ordinances of the City of Newton; the Inspectional Services Department; the Newton Health and Human Services Department; and all other regulatory agencies having jurisdiction.

## **9.11 Weather Protection:**

9.11.1 In accordance with the requirements of M.G.L. Chapter 149, §44G(d) the **Contractor** shall be responsible for initiating, maintaining and supervising all weather protection precautions and programs in connection with the Work. As part of this responsibility, the **Contractor** shall provide temporary enclosures and heat to permit construction work to be carried on during the months of November through March, and shall furnish, if required by the **Official**, one (1) accurate Fahrenheit thermometer with daily high and low readings for every 2,000 square feet of floor space where the work areas exceed 2,000 square feet.

9.11.2 "Weather Protection" shall mean the temporary protection of that Work adversely affected by moisture, wind and cold, by covering, enclosing and/or heating. This protection shall provide adequate working areas during the months of November through March as determined by the **Official** and consistent with the approved Progress Schedule to permit the continuous progress of all Work necessary to maintain an orderly and efficient sequence of construction operations. The **Contractor** shall furnish and install all "weather protection" material and be responsible for all costs, including heating required to maintain a minimum temperature of 40 degrees Fahrenheit at the working surface. This provision does not supersede any specific requirements for methods of construction, curing of materials or the applicable general conditions set forth in the Contract Documents with added regard to performance obligations of the Contract, the **Contractor** shall submit to the **Official** the required number of copies of his proposed methods for "Weather Protection."

9.11.3 Weather protection and heating devices shall comply with safety regulations, including provisions for adequate ventilation and fire protection devices. Heating devices that may cause damage to finish surfaces shall not be used.

### 10.1 Laws; Permits and Licenses:

10.1.1 The **Contractor** shall become familiar with and comply with all applicable Laws, and shall give all notices required by laws, ordinances, rules, regulations and lawful orders of public authorities applicable to the performance of the Work. Unless otherwise expressly stated, references in the Contract Documents to Laws shall mean the current version or edition of the Law. Unless expressly required by Law, neither the **City** nor **Architect** shall be responsible for monitoring the **Contractor's** compliance with any Laws. If the **Contractor** believes the Contract Documents deviate from the requirements of any permits, codes or Laws, the **Contractor** shall give the **Architect** and the **City** prompt written notice. If the **Contractor** performs any Work knowing or having reason to know it is contrary to any permits, codes or Laws, the **Contractor** shall bear responsibility for all resulting cost and delay. Except as provided in paragraph 10.1.3, the **Contractor** shall bear responsibility for all costs and delays arising from these obligations.

10.1.2 The **Contractor** shall obtain and pay for all legally required permits and licenses, and the **Contractor** shall pay all governmental charges, impact fees, inspection fees and other fees necessary for the prosecution of the Work including Work involved in a Change Order, Change Authorization or claim, and submit copies to the **Architect**. The **Contractor** shall meet all requirements of those permits, licenses and fees. If the **Official** has obtained any permits or licenses, the **Contractor** shall meet all requirements of those permits and licenses. The **Contractor** shall pay all charges of utility Officials for connections to the Work. Except as provided below, the **Contractor** shall bear all costs and delays arising from these responsibilities.

10.1.3 If the requirements of any issued permit or license, or of any Laws applicable to the Work, differ from those specified in the Contract Documents, or if not specified, enacted before the date of Bid opening, the **Contractor** shall, promptly after becoming aware, notify the **Architect** in writing. If the **Official**, with the advice of the **Architect**, concludes that the Contract Documents require changing because of that variance, the **Official** shall authorize the required changes together with any adjustment in Contract Price necessitated solely by the variance. If the variance causes or will cause delay, extensions or acceleration that postpones, extends or in any other manner alters the schedule or completion of all or part of the Work, the **Official** shall, pursuant to the provisions in Articles 11 and 12, make or negotiate with the **Contractor**, an adjustment in Contract Price or Contract Time for any increases in the **Contractor's** cost or the time required to perform the Work. The **Contractor** assumes responsibility for any related delay, extension or acceleration under the Contract Documents.

10.1.4 If the **Contractor** observes that the Contract Documents are at variance with the requirements of any permits, licenses, or Laws, the **Contractor** shall give the **Architect** prompt written notice. If the **Contractor** performs any Work knowing or having reason to know that it is contrary to permits or licenses, or Laws, the **Contractor** shall assume all resultant costs and delays.

10.1.5 If the **Contractor** delays the progress of any related work at the Site let by the **City** under a separate contract apart from this Contract so as to cause loss for which the **City** becomes liable, then he shall reimburse the **City** for such loss based on actual costs incurred by the **City**.

### 10.2 Patent Fees and Royalties:

10.2.1 The **Contractor** shall pay all license fees and royalties and bear all costs incident to the use, in the performance of the Work or the incorporation into the Work, of any invention, design, process, product or device covered by patent rights or copyrights. If a particular item is specified in the Contract Documents or is selected by the **Contractor** for use in the performance of the Work, and its use is subject to patent rights or copyrights calling for the payment of any license fees or royalties, it shall remain the responsibility of the **Contractor** to assume all costs incident to its use. Whenever the **Contractor** is required or elects to use any such item, the right for its use shall be provided for by suitable agreement(s) with the patentee or owner, and copies of the agreement(s) shall be filed with the **Architect**. However, whether or not agreement(s) is/are made or filed as noted, the **Contractor** and his surety shall in all cases defend, indemnify and hold harmless the **Owner** and **Architect** from and against all claims, causes of action, lawsuits, damages, losses and expenses, whether direct, indirect or consequential, including but not limited to charges of engineers, attorneys and other professionals and costs of both defense and appeal, if any, in the remainder of this Article 10 referred to collectively as "claims", arising from patent rights or copyrights infringements.

### 10.3 Taxes:

10.3.1 Except as otherwise provided in the Instructions to Bidders, the **Contractor** shall pay all sales, consumer, use and other taxes assessed against the **City** or the **Contractor** in accordance with Laws covering the Work. The **Official** shall make an adjustment in Contract Price for any increased taxes covering the Work paid by the **Contractor**, provided that those increases in taxes were enacted after the date of Bid opening. The **City of Newton** is exempt from Massachusetts Sales Tax. The Certificate of Exemption Number is E-046-001-404.

10.3.2 M.G.L. Chapter 64, §6(f) exempts, from Massachusetts sales tax, materials and supplies consumed, employed or expended in the Work, materials and supplies physically incorporated in the Work, and rental charges for construction vehicles and equipment rented specifically for use on the Work or while being used exclusively for the transportation of materials for the Work.

#### **10.4 Performance, Payment and Other Bonds:**

10.4.1 The **Contractor** shall furnish Performance and Payment Bonds with good and sufficient surety, each in an amount equal to the Contract Price, as the security required by M.G.L. Chapter 149. All bonds shall be in the forms specified in the Contract Documents, and shall only be issued by a surety currently licensed to do business by the Commonwealth of Massachusetts Division of Insurance and appearing on the current U.S. Treasury Circular 570 List of Approved Sureties and remain in effect until the end of the Correction Period. Attorneys-in-Fact who sign Bonds shall attach a certified copy of their Power of Attorney to conduct business in the Commonwealth of Massachusetts.

#### **10.5 The Contractor's Insurance-General:**

10.5.1 The insurance the **Contractor** shall purchase and maintain at his expense shall include the coverage required by the laws of the Commonwealth of Massachusetts as well as that specified in this Article, and be written for not less than the limits of coverage required in this Article or as required by the laws of the Commonwealth of Massachusetts. Deductible amounts shall be reduced or eliminated upon the **Official's** written request. The insurer's costs of providing the insured(s) a defense and appeal, including attorney's fees, may not be included in, and shall be in addition to, the limits of the policy coverages. Certificates of Insurance must be delivered to the **Official** before any work is started, and shall be in the form required by Paragraph 7.1.4 and in the coverages and minimum policy limits required in this Article.

10.5.2 The **Contractor** shall not start or continue to perform any Work unless he has in full force and effect all required insurance; nor shall he allow any Subcontractor or Supplier to perform any Work until that Subcontractor or Supplier has in full force and effect all required insurance or the **Contractor's** insurance has been endorsed to add that Subcontractor or Supplier as an additional insured.

10.5.3 Insurance shall only be provided by insurers licensed to transact business in the Commonwealth of Massachusetts.

10.5.4 Deductible amounts shall be reduced or eliminated upon the **Official's** written request. The insurer's costs of providing the insureds a defense and appeal, including attorney's fees, may not be included, and shall be in addition to, the limits of the coverage provided.

10.5.5 All the policies of insurance shall be endorsed to provide that the coverage afforded will not be canceled, adversely changed or renewal refused until the expiration of at least thirty (30) days prior written notice to the **Official** by registered mail. Should any coverage approach expiration during the period in which it is to remain in full force and effect, it shall be renewed prior to its expiration, and a renewal certificate filed with the **Official** at least fifteen (15) days prior to expiration.

10.5.6 If any of the **Contractor's** sureties or insurers is declared bankrupt or placed into receivership, ceases to meet the requirements of the Contract Documents, or its license to do business in the Commonwealth of Massachusetts is terminated, the **Contractor** shall immediately substitute other bonds/sureties or insurers/policies, which shall conform to the requirements of the Contract Documents, and shall file the appropriate bonds or certificates of insurance with the **Official**.

10.5.7 The required insurance coverages shall be placed with insurance companies licensed by the Commonwealth of Massachusetts Division of Insurance to do business in the Commonwealth of Massachusetts and having a Best's rating of "A"; shall be taken out before the Contract Time commences and be kept in full force and effect throughout the term of the Contract; shall be primary and non-contributory to any coverages maintained by the **City**; and shall require that the **City** be given thirty (30) days advance notice in the event of any cancellation or any materially adverse change in coverage. All such insurance, with the possible exception of Pollution Liability Insurance, shall be written on an occurrence basis form as opposed to a claims-made basis form. The **City** shall be named as an additional insured under the Commercial General Liability, Umbrella, Automobile Liability, Pollution Liability and Builders Risk policies. Additional insured form ISO CG 20-10 11/85 or equivalent, and Waiver of Subrogation in Favor of Owner form ISO CG2404 is required under the General Liability and Umbrella policies. The Workers' Compensation and Employers' Liability policies shall include a waiver of subrogation in favor of the **City**. All such insurance as is required of the **Contractor** shall be provided by or on behalf of all Subcontractors to cover their operations. The **Contractor** shall be held responsible for any modifications, deviations or omissions in compliance with these requirements by the Subcontractors. At the inception of the Contract and throughout the term of the Contract the **City** shall be provided with certificates of insurance evidencing that such insurance policies are in place and provide the coverages required.

#### **10.6 The Contractor's Liability Insurance:**

10.6.1 The **Contractor** shall purchase and maintain commercial general liability and other insurance appropriate for the Work and which will provide protection from claims itemized below which may arise out of or result from the **Contractor's** performance and furnishing of the Work and the **Contractor's** other obligations under the Contract Documents, whether the Work and other obligations will be performed or furnished by the **Contractor**, any Subcontractor or Supplier. The amounts of the commercial general liability insurance policy shall be as follows:

- |                                    |  |
|------------------------------------|--|
| 1. Bodily Injury                   | \$1,000,000 each occurrence                |
| 2. Property Damage                 | \$2,000,000 general aggregate, per project |
| 3. Products & Completed Operations | \$1,000,000 annual aggregate               |
| 4. Personal & Advertising Injury   | \$1,000,000 each occurrence                |
| 5. Medical Expenses                | \$10,000                                   |

The commercial general liability policy shall include coverage relating to explosion, collapse, and underground property damage.

The **Contractor** shall also provide insurance coverage for bodily injury and property damage resulting from liability arising out of pollution related exposures such as asbestos abatement, lead paint abatement, tank removal, removal of contaminated soil, etc. The **City** shall be named as an additional insured and the amount of coverage shall be \$1,000,000 per occurrence and \$2,000,000 aggregate.

10.6.1.1 Claims under worker's compensation, disability benefits, and other applicable similar employee benefits acts; claims for damages because of bodily injury, occupational sickness or disease, or death of the **Contractor's** employees.

10.6.1.2 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the **Contractor's** employees; claims for damages insured by personal injury liability coverage sustained (a) by any person as a result of an offense directly or indirectly related to the employment of such person by the **Contractor**, or (b) by any other person for any other reason; claims for damages because of injury to or destruction of tangible property wherever located, including loss of use resulting from any such injury or destruction.

10.6.1.3 Claims arising out of operation of laws for damages because of bodily injury or death of any person or for damage to property.

10.6.1.4 Claims for damages because of bodily injury or death of any person, or property damage arising out of ownership, maintenance, operation, use or loading and unloading of any owned, hired or non-owned motor vehicle used in the Work, including employee non-ownership use. The combined single limit shall be \$1,000,000 and shall include a CA9948 Pollution Endorsement and shall name the **City** as an additional insured.

10.6.2 The **Contractor's** liability insurance shall include contractual liability coverage sufficient to cover the **Contractor's** indemnification obligations under the Contract Documents. The **Contractor** agrees to pay on behalf of the **Official**, and to provide and pay a defense for all claims covered by the **Contractor's** obligations under the indemnification provisions.

10.6.3 The **Contractor's** liability insurance shall be endorsed to include the **City** as an additional insured, and the **Architect**, the **City's** and **Architect's** consultants, any of their subsidiaries or affiliates, and each of their respective directors, officers, shareholders, agents or employees as additional insureds. The insurance afforded to the **City** and those other parties shall be primary insurance, and neither the coverage nor the amount of insurance provided under the **Contractor's** policies shall be reduced or prorated by the existence of any other insurance applicable to any loss the **City** or those other parties may have sustained.

10.6.4 The **Contractor's** liability insurance shall remain in effect until the end of the Correction Period and at all times after that when the **Contractor** may be correcting, or removing and replacing *defective* Work. The Products and Completed operations insurance shall be maintained for two (2) years after final payment. Evidence of insurance shall be furnished to the **Official** upon request and no less frequently than yearly.

10.6.5 These requirements shall not be construed to limit the liability of the **Contractor** or his insurers. The **City** does not represent that the specified coverages or limits of insurance are sufficient to protect the **Contractor's** interests or liabilities.

10.6.6 If the **City** or the **Contractor** suffers injury or damage to person or property because of error, omission or act of the other, any of the other's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observation of that injury or damage. This provision is not and shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or statute of repose.

## **10.7 The Owner's Liability Insurance:**

10.7.1 The **Contractor** shall purchase and maintain owners' contractor's protective liability insurance specifically for and appropriate for the Work and which will provide protection for the **City** against those claims which may arise out of or result from operations under the Contract; or the **Contractor** shall be required to endorse the **Contractor's** commercial liability insurance to show that the limits of liability apply per project and per location. If the **Contractor** furnishes owner's and contractor's protective liability insurance, the parties designated in paragraph 10.6.3 shall be included as additional insureds by endorsement.

## **10.8 Property Insurance:**

10.8.1 The **Contractor** shall purchase and maintain Property Insurance written on a Builders Risk "all risk" completed value completed Work and Work in progress insurance, or equivalent policy form, and shall include, without limitation, insurance against the perils of flood and earthquake, fire, physical loss or damage including theft, vandalism, malicious mischief, collapse, windstorm and demolition occasioned by enforcement of any applicable legal requirements covering the Work at the Site in the amount of its full replacement cost. The insurance shall include the interests of the **City**, **Contractor**, Subcontractors and Suppliers, **Architect** and the **City's** and **Architect's** consultants, all of whom shall be listed as additional insureds, and shall be endorsed to include damages, losses and expenses arising out of or resulting from any insured loss or incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers, architects, attorneys and other professionals). If not covered under the all risk insurance, the **Contractor** shall purchase and maintain property insurance on any Work stored on and off the site in transit when that Work is included in an Application for Payment. The property insurance may have a deductible not exceeding \$25,000.00 which shall be borne by the **Contractor**, and shall comply with the requirements in paragraph 10.9.

10.8.2 If required in the Supplementary Conditions, the **Contractor** shall purchase and maintain boiler and machinery insurance and additional property insurance which will include the interests of the **City**, the **Contractor**, Subcontractors, the **Architect** and the **City's** and the **Architect's** consultants, all of whom shall be listed as additional insureds.

## **10.9 Waiver of Rights:**

10.9.1 The **City** and the **Contractor** waive all rights against each other for all losses and damages caused by any of the perils covered by the insurance provided in response to paragraphs 10.6, 10.7 and 10.8 and any other insurance applicable to the Work and also waive all such rights against the **City**, and all other persons named as insureds or additional insureds in such policies for losses and damages so caused. Each Sub-agreement shall contain similar waiver provisions by the Subcontractor or Supplier in favor of the **City**, the **Architect**, and all other parties named as insureds or additional insureds. None of these waivers shall extend to the rights that any of the insured may have to the proceeds of insurance held by the **City** as trustee or otherwise payable under a policy so issued.

10.9.2 The **City** and the **Contractor** intend that any policies of insurance shall protect all of the parties insured and provide primary coverage for all losses and damages caused by the perils covered. Accordingly, all such policies shall be endorsed to provide that in the event of payment of any loss or damage the insurer will have no rights of subrogation or other recovery against any of the parties named as insured or additional insured, and if the insurers require separate waiver forms to be signed by the **Architect** or the **City's** and the **Architect's** consultants, the **City** will obtain separate waiver forms, and if such forms are required of any Subcontractor or Supplier, the **Contractor** will obtain them.

## **10.10 Receipt and Application of Proceeds:**

10.10.1 Any insured loss under the policies of property insurance required by paragraph 10.8 will be adjusted with the **City** and made payable to the **City** as trustee for the insureds, as their interests may appear, subject to the requirements of any applicable mortgage clause and of paragraph 10.10.2. The **City** shall deposit in a separate account any money so received, and shall distribute it in accordance with any agreement that the parties in interest may reach. If no other distribution agreement is reached the damaged Work shall be repaired or replaced, the monies so received applied for that purpose, and the Work and the associated costs covered by Change Order.

10.10.2 The **City** as trustee shall have power to adjust and settle any loss with the insurers, unless one of the parties in interest objects in writing within fifteen (15) days after the occurrence of loss to the **City's** exercise of this power. If an objection is made, the **City** as trustee shall settle with the insurers pursuant to any agreement the parties in interest may reach.

## **10.11 Indemnification:**

10.11.1 To the fullest extent permitted by law the **Contractor** shall assume the defense of and hold the **City**, **Architect**, their officers, agents and employees harmless from all suits and claims against them, or any arising from the use of any invention, patent or patent right, and by or from any act or omission or neglect for the **Contractor**, any Subcontractor, anyone directly or

indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

10.11.2 For any and all claims against the **City** or the **Architect** or any of their officers, agents, or employees by an employee of the **Contractor**, and Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, the indemnification obligation of the **Contractor** shall not be limited in any way by any limitation of the amount or type of damages, compensation or benefits payable by or for the **Contractor** or any **Contractor** under Worker's Compensation Acts, disability benefit acts or other employee benefit acts.

10.11.3 To the fullest extent permitted by law the **Contractor** shall defend, indemnify and hold harmless the **City** and **Architect** from and against all claims for bodily injury, sickness, disease, or death, or injury to or destruction of property, including loss of use, which claims arise out of, relate to, or are in any way connected with: the Work; the failure of the **Contractor** or any Subcontractor to provide a safe work place; or noncompliance with Law by the **Contractor**, any Subcontractor or Supplier. With respect to all claims against the **City** or **Architect** by any employee of the **Contractor**, the indemnification obligation under this paragraph shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the **Contractor**, any Subcontractor or Supplier under worker's compensation, disability benefit or other employee benefit acts.

10.11.4 The obligations of the **Contractor** under paragraph 10.11.3 shall not extend to the liability of the **Architect** arising out of or resulting from (a) the preparation or approval of maps, drawings, opinions, reports, surveys, designs or specifications, or (b) the giving or failure to give directions or instructions by the **Architect**, but only if such giving or failure to give is the sole cause of the injury or damage.

10.11.5 The **Contractor** shall defend, indemnify and hold harmless the **City** and **Architect** from and against all claims as referred to in this paragraph, claims for damages to the Work itself, and claims for any other costs which any of them may incur arising from (a) failure, neglect or refusal of the **Contractor** to faithfully perform the Work and other obligations under the Contract Documents, or (b) the failure of the **Contractor**, any Subcontractor or Supplier to obtain or renew the insurance coverages required by the Contract Documents.

#### **10.12 Partial Utilization-Property Insurance:**

10.12.1 Any Partial Utilization by the **City** shall be subject to the insurers providing the property insurance having acknowledged receipt of notice and in writing effected the necessary changes in coverage. Those insurers shall consent by endorsement, but the property insurance shall not be canceled or lapse on account of any Partial Utilization.

#### **10.13 Non-Conforming Bonds or Insurance:**

10.13.1 If any of the **Contractor's** surety(ies) or insurer(s) is declared bankrupt, placed into receivership or otherwise becomes insolvent, or ceases to meet the requirements of the Contract Documents, or its license to do business in the Commonwealth is terminated, the **Contractor** shall at once substitute another bond and surety, or insurer and policy, which shall conform to the requirements of the Contract Documents.

#### **10.14 Medical and Sanitary Requirements:**

10.14.1 The **Contractor** shall promptly and fully comply with all sanitary and medical requirements as may from time to time be promulgated so that the health of all workers, local communities and persons residing on or near the Work may be preserved and safeguarded. The **Contractor** shall dismiss, and shall not rehire, any person who violates sanitary and medical requirements.

10.14.2 The **Contractor** shall rigorously prohibit the committing of nuisances upon the lands of the **City** or upon adjacent property. Structures for the sanitary necessities of all persons employed on the Work shall be provided and maintained by the **Contractor**.

10.14.3 As to health and sanitation, the **Contractor** shall promptly and fully comply with the Laws and Regulations of the State Department of Public Health, and those of all other local Authorities. The **Contractor** shall provide all articles necessary for first aid, and he shall make proper and satisfactory provisions for the transportation of sick and injured employees to, and their care at, established hospitals in the vicinity of the Work.

#### **10.15 Required Provisions, Chapter 30, §39R:**

10.15.1 The **Contractor** shall make, and keep for at least six (6) years after final payment, books, records, and accounts which in reasonable detail accurately and fairly reflect the transactions and dispositions of the **Contractor**, and until the expiration of six (6) years after final payment, the Office of the Commonwealth's Inspector General and the Deputy Commission-

er of Capital Asset Management and Maintenance shall have the right to examine any books, documents, papers or records of the **Contractor** or of any Subcontractor that directly pertain to, and involve transactions relating to, the **Contractor** or that Subcontractor. The **Contractor** shall describe any change in the method of maintaining records or recording transactions that materially affect any statements filed with the **Official**, and the date of the change and reasons for the change, and shall accompany the description with a letter from the **Contractor's** Independent Certified Public Accountant approving or otherwise commenting on the changes. The Contractor certifies that prior to executing the Contract, the **Contractor** has filed a statement of management of Internal Accounting Controls and an audited financial statement for the most recent completed fiscal year, and he will continue to file such statements annually.

10.15.2 The **Contractor** shall file with the **Official** a statement of management as to whether his and his subsidiaries system of Internal Accounting Controls reasonably assures that: (1) transactions are executed in accordance with management's general and specific authorization; (2) transactions are recorded as necessary (i) to permit preparation of financial statements in conformity with generally accepted accounting principles, and (ii) to maintain accountability for assets; (3) access to assets is permitted only in accordance with management's general or specific authorization; and (4) the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action is taken with respect to any difference.

10.15.3 The **Contractor** shall also file with the **Official** a statement prepared and signed by an Independent Certified Public Accountant, stating that s/he has examined the statement of management of internal accounting controls and expressing an opinion as to whether: (1) the representations of management in response to this paragraph 10.15 are consistent with the result of management's evaluation of the system of internal accounting controls; and (2) such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.

10.15.4 The **Contractor** shall annually, during the term of the Contract, file with the Deputy Commissioner of Capital Asset Management and Maintenance a financial statement prepared by an Independent Certified Public Accountant based on an Audit by that Accountant. The final statement filed shall include the date of final payment. All statements shall attach an Accountant's report, and shall be made available to the **Official** upon request.

10.15.5 Failure by the **Contractor** to satisfy any of the requirement of M.G.L. Chapter 30, §39R, or to comply with any such rules, regulations and guidelines as may be promulgated from time to time, may be grounds for debarment pursuant to M.G.L. Chapter 149, §44C.

10.15.6 Records and statements required to be made, kept or filed under these provisions shall not be public records as defined in M.G.L. Chapter 4, §7, and shall not be open to public inspection; provided, however, that such records and statements shall be made available as stated in paragraph 10.14.1.

#### **10.16 No Conflict with Laws or Regulations:**

10.16.1 The duties, obligations, criteria or procedures imposed by these General Conditions and the rights and remedies made available are in addition to, and not in any way a limitation of, any rights and remedies which are otherwise made available or imposed by Laws or Regulations, except that in the event a specific part or detailed requirement of a provision, criterion or procedure in these General Conditions and a specific part or detailed requirement of a provision, criterion or procedure imposed or available by Laws or Regulations conflict, the specific part or detailed requirement of such provision, criterion or procedure imposed or available by Laws or Regulations in conflict shall govern. All other specific parts or detailed requirements in the provisions, criteria or procedures of the applicable Laws or Regulations and these General Conditions not in conflict shall remain in full force and effect and be read with the controlling specific part or detailed requirement. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

#### **10.17 Notice and Service:**

10.17.1 Unless otherwise specified in the Contract Documents, any notice or communication shall be in writing, and shall be deemed to have been given as of the time of actual receipt.

10.17.2. Any notice or other communication to the **Contractor** shall be sufficiently given if delivered to the intended individual, officer or partner of the **Contractor** in person or at the office of the **Contractor** designated in the Contract.

10.17.3 All notices or other communication to the **Official** shall, unless otherwise specified in writing to the **Contractor**, be sufficiently given if delivered to the intended individual in person or at the office designated in the Contract.

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## **ARTICLE 11 - CHANGES IN THE WORK**

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### **11.1 Changes in the Work:**



11.1.1 Without invalidating the Agreement and without notice to any surety, the **City** may, at any time, by Change Order or Change Authorization signed by the **City**, order changes in the Work (a) consisting of additions, deletions or other revisions within the scope of the Work in the requirements of the Specifications and Drawings, the means, methods, techniques or sequences applicable to the Work, the **City**-furnished lands, equipment, materials, or services, or (b) directing acceleration of the Work, and unilaterally make or provide the basis for making an adjustment in Contract Price or Contract Time. Upon receipt of any such unilateral order, the **Contractor** shall promptly proceed or continue with the Work involved as directed. Any such unilateral adjustment in Contract Price or Contract Time made by Change Order, or authorized by Change Authorization, shall

be final and binding on the **Contractor** unless the **Contractor** delivers to the **Official** written Notice of Claim, in strict compliance with all of the requirements of Article 15, within thirty (30) days after receipt of the unilateral order.

11.1.2 The **Official** reserves the right to negotiate with the **Contractor** changes under in the Work by delivering to the **Contractor** an unsigned Change Authorization describing the change under consideration and requesting that the **Contractor** submit a proposal for an adjustment in Contract Price or Contract Time.

11.1.3 Any other written or oral order from the **Official** or the **Architect**, including statement or conduct, instruction, interpretation, determination, or approval that causes a change shall be treated as a change in the Work; but only if the **Contractor** or the **Official** gives prompt written notice to the other by means of an unsigned Change Authorization detailing the circumstances, and the scope and character of the Work involved.

11.1.4 If after evaluation of an unsigned Change Authorization received under paragraph 11.1.3, the **Official**, with the advice of the **Architect**, concludes that changes in the Work have been ordered, the **Official** shall by Change Order or Change Authorization signed by the **City** correspondingly amend the Contract Documents. If the **Official**, on the other hand, concludes that a change has not been ordered, the **Official's** determination shall be final and binding on the **Contractor** unless the **Contractor** delivers to the **Official** written Notice of Claim that complies with Article 15 within thirty (30) days from receipt of that decision.

11.1.5 Except as provided in this paragraph, no written or oral order from the **Official** or the **Architect**, shall be treated as a change in the Work or entitle the **Contractor** to an increase in Contract Price or Contract Time under this paragraph.

11.1.6 Adjustments in Contract Price or Contract Time made necessary by changes in the Work ordered or negotiated under this paragraph shall be based on changes, as specified in Articles 7 and 12, in the **Contractor's** cost or the time required to perform any part of the Work, except that no increase in Contract Price or Contract Time shall be due under this paragraph if excluded by another provision of the Contract Documents.

11.1.7 No proposal nor claim by the **Contractor** on account of changes under paragraph 11.1.3 shall be allowed for any costs or delay incurred more than twenty (20) days before the **Contractor** gives written notice as required.

## **11.2 Changes Due to Differing Site Conditions:**

11.2.1 If the **Contractor** or the **Official** discovers that the actual subsurface or latent physical conditions encountered at the Site differ materially from those shown or indicated on the Contract Documents, or from those ordinarily encountered and recognized as inherent in the Work of the character and scope provided, or that any reference points need correction to enable the **Contractor** to proceed with the Work, either the **Contractor** or the **Official** shall notify the other party in writing. A notice from the **Contractor** shall be delivered promptly and before the conditions are disturbed. A notice from the **Official** shall be delivered as soon as possible after the conditions are discovered.

11.2.2 Upon receipt or delivery of any such notice, the **Official** shall investigate the conditions. If the **Official** concludes that conditions on which the **Contractor** is entitled to rely do materially differ, the **Official** shall order the necessary changes and correspondingly adjust Contract Time or Contract Price, as provided in Article 12, unless excluded by another provision of the Contract Documents.

11.2.3 If the **Official** decides that the Contract Documents do not need amending or decides to make or not to make a change in Contract Price or Contract Time, or that a change in reference points is not required, any such decision shall be final and binding on the **Contractor** unless he delivers written Notice of Claim that complies with Article 15 within thirty (30) days of receipt of that decision.

11.2.4 Except in the case of newly-discovered underground utilities all costs involved and time required to perform the specified **Contractor's** responsibilities for underground utilities shall be considered as having been included in the Contract Price and in the **Contractor's** schedule for performing the Work within the Contract Time.

11.2.5 If Underground Utilities cause or will cause delays which postpone, extend or in any other manner alter the schedule or the completion of all or part of the Work, the **Contractor** shall assume all of the **Contractor's** related delay, extension or acceleration costs, however caused; except that, if the **Official** believes that the delays require a change in Contract Time, the **Official** shall authorize the necessary change in Contract Time only.

11.2.6 At least twenty (20) days, plus the time required by the **Contractor** to deliver a proposal shall be allowed to the **Official** to resolve any report of differing site conditions.

11.2.7 No proposal nor claim by the **Contractor** due to differing site conditions shall be allowed unless the **Contractor** has given written notice as required by this Article or Article 15.

### **11.3 Changes Due to Overruns or Underruns in Quantities:**

11.3.1 For all Unit Price Work the Contract Price includes an amount equal to the sum of the unit prices Bid for each item of Unit Price Work times its estimated quantity. Each unit price will be deemed to include an amount sufficient to cover all costs, including supplemental and administrative costs, and profit. Prior to final payment, a Change Order will be issued as recommended by the **Architect** to reflect actual quantities for Unit Price Work, and to correspondingly adjust the Contract Price.

11.3.2 The **Contractor** shall promptly, before proceeding with any affected Work, notify the **Official** in writing whenever the actual quantity for a significant item of Unit Price Work, differs materially from its estimated quantity, and request a re-evaluation of that item's unit price or the Contract Time, or inform the **Official** that a re-evaluation is not warranted. Promptly after receipt of the notice, the **Architect** will review conditions about that item of Work and evaluate their effect on the unit prices and the Contract Time(s). If the **Official** consents to quantities varying from those estimated, or does not make written objection, the **Contractor** shall proceed with the affected Unit Price Work as directed by the **Architect**.

11.3.3 If the **Official** determines that the additional or reduced quantities for such an item of Unit Price Work justify an adjustment in the unit price, or in Contract Time, or both, the **Official** shall authorize a revised unit price applicable to actual quantities for that item above one hundred twenty percent (120%) or below eighty percent (80%) of the estimated quantity, or a change in Contract Time, or both; except that, no adjustment shall be provided unless the variation between actual and estimated quantities for all Unit Price Work results in an increase or decrease in the Contract Price by more than ten percent (10%). If the **Official** decides that the unit prices are valid even for the additional or reduced quantities, or that no adjustment in the Contract Time is warranted, solely due to the variation in quantities, or both, that decision shall be final and binding on the **Contractor** unless he delivers to the **Official** a written Notice of Claim within thirty (30) days from receipt of that decision pursuant to the requirements of Article 15..

11.3.4 In evaluating unit prices, or changes in Contract Time due to quantity variations, the **Contractor** and the **Official** shall take into account increases or decreases in the **Contractor's** costs to perform the Work involved solely as result of the variation in quantities, as opposed to the **Contractor's** fault or negligence, errors in the **Contractor's** Bid, or other similar factors.

### **11.4 Change Orders; Change Authorizations:**

11.4.1 A Change Order or Change Authorization executed by the **City** and also by the **Contractor** without a **Contractor's** notice of reservation of rights to claim additional adjustments constitutes an all-inclusive settlement for all changes and for all direct, supplemental, indirect, consequential and cumulative costs and delays, including the Contractor's overhead and profit, and the **Contractor's** signature represents a waiver of any and all rights to file a claim on account of that instrument, the Work or the Work involved in that instrument and all prior Change Orders.

11.4.2 A Change Order or Change Authorization, signed by the **City**, and also by the **Contractor**, with a notice of reservation of rights to claim additional compensation, shall become final and binding on the **Contractor**, without consideration of his reservation of rights, unless the **Contractor** delivers to the **Official** a clearly marked written Notice of Claim within thirty (30) days after the date when a Notice of Claim on account of the Change Order or Change Authorization executed by the **City** becomes due in strict compliance with the requirements of Article 15, and in any event no later than thirty (30) days after the date the **Contractor** signs the Change Order containing a notice of reservation of rights to claim additional compensation.

11.4.3 The **City** and the **Contractor** shall sign Change Orders with reasonable promptness covering changes in the Work including any necessary adjustments in Contract Price or Contract Time ordered or agreed to by the parties, changes in Contract Price or Contract Time which are agreed to in total or in part or previously executed Change Authorizations. Amounts for Work involved in a Change Order may be included in Application for Payment only after it has been completely executed by the **City**.

11.4.4 When signed by the **City**, the **City** may use Change Authorizations to order changes in the Work, provide the basis for

a subsequent adjustment in Contract Price or Contract Time, order changes not warranting an adjustment in Contract Price or Contract Time, or authorize minor deviations. Amounts for Work involved in a Change Authorization are not allowable for payment until that Change Authorization has been incorporated into a Change Order that has been signed by the **Official**, approved as to form by the Corporation Counsel and approved to have a sufficient appropriation by the City Auditor.

11.4.5 The **City** reserves the right to decrease the adjustments made in any Change Order if, upon an audit of the **Contractor's** records including but not limited to records pertaining to all cost and pricing data used by the **Contractor** in estimating the **Contractor's Bid** for the work and in monitoring costs incurred, that audit reveals that the **Contractor** provided false or inaccurate cost and pricing data in negotiating that Change Order.

#### **11.5 Deviations:**

11.5.1 In accordance with M.G.L. Chapter 30, §39I, every **Contractor** having a contract for the construction, alteration, maintenance, repair or demolition of, or addition to, any public building or public works for the Commonwealth, or of any political subdivision thereof, shall perform all the work required by such contract in conformity with the Plans and Specifications contained therein. No willful and substantial deviation from said Plans and Specifications shall be made unless authorized in writing by the **Official** or by the **Architect** in charge of the work who is duly authorized by the **City** to approve such deviations. In order to avoid delays in the execution of the work, such deviation from the Plans and Specifications may be authorized by a written order of the **Official** or **Architect** so authorized to approve such deviation. Within 30 days thereafter, such written order shall be confirmed by a certificate of the **Official** stating: (1) if such deviation involves any substitution or elimination of materials, fixtures or equipment, the reasons why such materials, fixtures or equipment were included in the first instance and the reasons for substitution or elimination and, if the deviation is of any other nature, the reason for such deviation giving justification therefor; (2) that the specified deviation does not materially damage the Project as a whole; (3) that either the work substituted for the work specified is of the same cost and quality, or that an equitable adjustment has been agreed upon between the **Official** and the **Contractor**, and the amount in dollars of said adjustment; and (4) that the deviation is in the best interest of the **City**. Such certificate shall be signed under the penalties of perjury and shall be a permanent part of the file record of the Work. Whoever violates any provision of this paragraph willfully and with intent to defraud shall be punished by a fine of not more than \$5,000 or by imprisonment for not more than 6 months, or both.

#### **11.6 Delay and Waiver Provisions:**

11.6.1 At least twenty (20) days plus the time required by the **Contractor** to deliver a proposal shall be allowed to the **Owner** to negotiate and resolve any changes in the Work, any changes in unit prices or any report of differing site conditions.

11.6.2 If a change in the Work, a case of differing site conditions or a case of variation in quantities causes or will cause delay, extension or acceleration that postpones, extends or in any other manner alters the schedule or completion of all or part of the Work, the **Official** shall, pursuant to Articles 8 and 11, make or negotiate with the **Contractor**, an adjustment in Contract Price or Contract Time for any increase in the **Contractor's** cost or the time required to perform the Work. The **Contractor** assumes responsibility for any related delay, extension or acceleration caused by or resulting to the **Contractor**.

11.6.3 No proposal nor claim by the **Contractor** on account of changes in the Work, differing site conditions or variation in quantities shall be allowed if made after final payment.

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## **ARTICLE 12 - CHANGES IN CONTRACT PRICE OR CONTRACT TIME**

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### **12.1 Changes in Contract Price or Contract Time:**

12.1.1 The Contract Price or Contract Time shall be changed only by Change Order. The basis for a subsequent change in Contract Price or Contract Time may also be authorized by a Change Authorization signed by the **Official**.

12.1.2 Contract Time whether stated in the Agreement or changed by Change Order shall not be changed due to a delay in a **Contractor's** early completion date until all Contract Float is used and performance of the specified Work extends necessarily beyond that Contract Time.

12.1.3 Contract Price whether stated in the Agreement or changed by Change Order shall not be changed due to a delay in a **Contractor's** early completion date until half of the Contract Float available in the Progress Schedule at the time of the start of the delay is used and performance of the specified Work is necessarily extended.

### **12.2 Proposals or Claims Substantiating Adjustments:**

12.2.1 All **Contractor** proposals must at a minimum contain the reasons for the proposed change; the effect of the proposed change on the Progress Schedule; the effect on the Contract Time and the proposed price for the change, all in sufficient detail to be evaluated by the **Architect**. All **Contractor** proposals shall be due within twenty (20) days after receipt of the **Archi-**

tect's written notice requesting a proposal or delivery to the **Architect** of the **Contractor's** written notice of the occurrence of an event which the **Contractor** believes justifies a change in Contract Price or Contract Time. Any delay in the submittal of a **Contractor's** proposal will not justify or constitute basis for an increase in Contract Price or Contract Time. Proposals shall not be subject to change for at least sixty (60) days from their receipt by the **Architect**. If no Contractor proposal has been received by the **Architect** within the twenty (20) day period allowed by this Article, or if the **Contractor's** proposal does not contain the information required, then the **Architect**, in his sole discretion, will use any of the methods described in Article 12.3 to determine the adjustment, if any, in the Contract Price.

12.2.2 Contractor proposals shall cover all aspects of the Work involved, and shall be fully documented and itemized as to all costs, as specified in this Article, quantities, and Fee which shall segregate percentages for profit and administrative costs. Proposals shall certify in writing that the amounts would be or were necessarily incurred despite reasonable mitigation efforts. Amounts for Subcontractors or Suppliers shall be equally supported, and must be reviewed by the Contractor before being submitted to the **Architect**.

12.2.3 Where the change in Contract Price arises from changes in the time required to perform any Work, or where a change in Contract Time is sought, the **Contractor's** itemized estimates shall in addition detail all productivity and production data, and include a detailed analysis of the Progress Schedule.

### **12.3 Methods for Determining Adjustments in Contract Price:**

12.3.1 The methods to be used to determine an adjustment in Contract Price necessitated by changes ordered or under negotiation, delay ordered, caused or under negotiation or Work covered by any proposal or claim, all pursuant to these General Conditions are referred to collectively as "the Work involved", and are limited to the following:

12.3.2 Where the Work involved is covered by lump sum prices or unit prices in the Contract Documents, on the basis of those lump sum prices or unit prices, respectively;

12.3.3 Where the Work involved is not covered by lump sum prices or unit prices, by mutual acceptance of a lump sum price negotiated on the basis of the **Contractor's** itemized good faith estimate of the anticipated cost of the Work involved as specified in this Article plus a fee for the Work involved calculated per paragraph 12.11;

12.3.4 Where the Work involved is not covered by either of the first two methods, and **Official** and the **Contractor** cannot agree, on the basis of the **Official's** estimate of the cost of the Work involved plus a fee for the Work involved of eighty-five percent (85%) of the maximum fee allowed in paragraph 12.11;

12.3.5 Where the **Official** and the **Contractor** cannot agree, and the **Official** directs the **Contractor** to proceed with the Work involved with payments to be made per actual costs, on the basis of an itemized breakdown of the actual cost of the Work involved as specified in this Article plus a fee for the Work involved of seventy percent (70%) of the maximum fee allowed in paragraph 12.11. Where the **Official** and the **Contractor** agree and the **Official** directs the **Contractor** to proceed with the Work involved with payment to be made per actual costs on a time and materials basis, on the basis of an itemized breakdown of the actual cost of the Work involved as specified in this Article, plus a fee for the Work involved of one hundred percent (100%) of the maximum fee allowed in paragraph 12.11;

12.3.6 Where the Work involved is not covered by any of the preceding methods, and if payment is to be determined by a court of competent jurisdiction and appropriate venue, it is agreed that the actual cost and fee methods in paragraph 12.3.5 shall be the only appropriate method for determining the cost and the fee of the Work involved.

12.3.7 In computing the cost of the Work involved, costs shall be in amounts no higher than those prevailing in the locality of the Project, and include only the appropriate items for labor, material or equipment, construction equipment, and supplemental costs specified in this Article.

### **12.4 Labor, Subcontract and Material/Equipment Costs:**

12.4.1 The cost of the Work involved includes payroll costs for craft labor including foremen in the direct employ of the **Contractor** assigned to the site and engaged in furnishing and incorporating materials or equipment in the Work involved. Payroll costs shall include wages at the minimum wage rates for Contractor's personnel established for this Contract pursuant to M.G.L. Chapter 149, §§ 26-27H plus labor burdens, e.g. social security, unemployment, workers' compensation, health and retirement benefits, vacation and holiday pay, etc. When determining actual payroll costs per paragraph 12.3.5, daily time sheets certified by the **Contractor** and verified by the **Architect** will be the record upon which payroll costs shall be based. When determining actual payroll costs per paragraph 12.3.6, daily time sheets shall be valid only if they expressly correlate to the Work involved, and if developed when the Work involved was performed for the purposes of establishing payroll.

12.4.2 The cost of the Work involved includes payments by the **Contractor** to Suppliers for material and equipment used in

the Work involved, including transportation, storage, and necessary Supplier's field services. All trade discounts, rebates and refunds and all returns from sale of surplus items shall accrue to the **Official**, and the **Contractor** shall make provisions so that they may be obtained. If required by the **Official**, the **Contractor** shall obtain bids for designated items of materials or equipment and nominate at least two (2) suppliers for selection by the **Official**. When determining actual material and equipment costs, invoices segregating items associated with the Work involved shall be the record upon which to base actual costs.

12.4.3 The cost of the Work involved includes payments made by the **Contractor** to Subcontractors for the Work involved performed by the Subcontractors. When determining Subcontractors' cost of the Work involved, the methods to be used shall be those used to determine the **Contractor's** costs, except that the term "Subcontractor" shall replace the term "the **Contractor**" if the context will permit. If required by the **Official**, the **Contractor** shall obtain detailed competitive sub-bids and nominate at least two (2) Subcontractors for the performance of any Work involved, subject to selection by the **Official**.

### **12.5 Construction Equipment Costs:**

12.5.1. The cost of the Work involved includes costs for individual construction equipment with replacement value in excess of \$500.00. Transportation, loading and unloading, installation, dismantling and removal costs shall be allowed only if prior consent is obtained from the **Architect**, and if the equipment is or was transported to the site solely for the Work involved. Shipping costs will be allowed if the equipment requires the use of a carrier, and provided the travel distance does not exceed that for similar equipment available from sources in the Boston metropolitan area. When multiple attachments are used, only the highest cost attachment shall be recoverable. Equipment costs shall cease when the equipment is no longer needed for the Work involved. Payroll costs for labor operating the equipment shall be as in paragraph 12.4.1. Equipment costs shall be computed using the same accounting and estimating rules, and prices, whether related to added or deleted items of Work.

12.5.2. When determining actual equipment costs under paragraph 12.3.5, daily records listing the equipment, operators, and actual usage, and verified by the **Architect** shall be the records upon which costs will be based. When determining actual equipment costs under paragraph 12.3.6, similar daily records shall be valid only if developed when the Work involved was performed.

12.5.3. Rented or owned equipment at the site, idled solely by actions of the **Official** or the **Architect**, shall be paid at the rates for rented equipment, or on the basis of fifty (50%) percent of the rates for owned equipment, respectively, provided that the idle period exceeds that normally experienced for such equipment and occurs during normal working hours.

### **12.6 Rented or Leased Equipment:**

12.6.1. Except as provided below, for equipment rented or leased, the **Contractor** or Subcontractors shall be entitled to amounts based on negotiated rental or lease rates, but in no event shall the amounts exceed the rates listed in the Rental Rate "Blue Book" published by Equipment Watch, Inc. for the region covering the Boston metropolitan area applicable to that equipment model number and year. The equipment rate for second or third shifts shall not exceed fifty percent (50%) of the base rate. Operating costs shall not exceed the hourly operation rate in the Blue Book. Hourly rates for equipment previously in use at the site for at least a month (or a week) shall be based on the monthly rate divided by 176 hours (or the weekly rate divided by 40 hours). Equipment not previously in use at the site shall not be billed to the **Official** at rates higher than:

| Equipment Usage               | Payment Category |
|-------------------------------|------------------|
| Less than 8 hours             | Hourly Rate      |
| 1 day but less than 7 days    | Daily Rate       |
| 1 week but less than 30 days  | Weekly Rate      |
| 30 days or more (when in use) | Monthly Rate     |

12.6.2 For equipment rented or leased from firms associated with or owned by the **Contractor**, costs shall be treated as though the equipment was owned equipment.

### **12.7 Owned Equipment:**

12.7.1 For equipment owned by the **Contractor**, or by his affiliates, the **Contractor** shall be entitled to costs based on billings established by his normal accounting practices, but in no event shall those costs exceed the rates listed in the Custom Cost Evaluator published by Equipment Watch, Inc. for the region covering the Boston metropolitan area. The owned equipment hourly rate plus the estimated operation cost per hour from the Custom Cost Evaluator will be the basis for determining owned equipment costs. For shift Work, the equipment rate shall not exceed the shift Work hourly costs in the Custom Cost

## 12.8 Supplemental Costs:

12.8.1 The cost of the Work involved includes a proportion of necessary supplemental costs, to the extent those supplemental costs increase or decrease on account of (a) labor, material/equipment, Subcontract or equipment costs of the Work involved, or (b) an extension in Contract Time, including:

12.8.1.1 Payroll costs, and subsistence expenses, for the **Contractor's** full-time resident superintendent, and payroll costs for other personnel in the employ of the **Contractor** engaged in Site activities and listed in the schedule of indirect personnel classifications agreed to by the **Official**, if those costs arise solely from an extension in Contract Time.

12.8.1.2 Costs not exceeding two percent (2%) of the labor costs under paragraph 12.4.1 excluding burdens of field supplies consumed in the performance of the Work involved, and purchase costs not exceeding two percent (2%) of the labor costs under paragraph 12.4.1, less burdens; tools individually valued at less than \$500.00 and not owned by the workers which are used and consumed in the performance of the Work involved, and purchase cost less market value if used but not consumed.

12.8.1.3 Costs of office and temporary facilities at the site, inclusive of materials, supplies, equipment and appliances, if those costs arise solely from an extension in Contract Time;

12.8.1.4 The costs of utilities, fuel and sanitary facilities, long distance telephone calls, telephone service at the site, if those costs arise solely from an extension in Contract Time;

12.8.1.5 Costs of consultants or Subcontractors not covered under paragraph 12.4.3; provided those costs were authorized by the **Official** prior to proceeding with the Work involved, and if not covered by paragraph 12.4 or are not excluded by paragraph 12.11.

12.8.1.6 Taxes related to the Work involved, and for which the **Contractor** is liable, and fees for permits and licenses, if they related solely to the Work involved.

12.8.1.7 Physical losses, damages and expenses to the Work involved not compensated by property insurance or otherwise, sustained by the **Contractor** in the performance and furnishing of the Work, except losses and damages within the deductible amounts of property insurance, but only if the losses, damages and expenses result from causes beyond the control and not due to the fault or negligence of the **Contractor**.

12.8.1.8 The actual documented cost of premiums for increases in bonds and insurance required solely because of the Work involved will be paid based on invoices from the surety.

## 12.9 Limitation on Equipment and Supplemental Costs:

12.9.1 The **Contractor** shall not be allowed to recover construction equipment or supplemental costs not attributable to the performance of the Work involved. Payroll costs for the full-time resident superintendent are an example of costs that are not recoverable.

## 12.10 Costs Covered by the Fee for the Work Involved:

12.10.1 The Cost of the Work involved shall not include any of the following costs that are considered administrative costs or contingencies covered by the Fee for the Work involved:

12.10.1.1 Payroll costs and other compensation of (a) the **Contractor's** executives, general and administrative managers, project managers, estimators, claim consultants, attorneys, accountants, labor relation coordinators, contract and subcontract administrators, purchasers, expeditors, and other administrative staff, whether employed at the site or in his principal or branch offices, and (b) construction managers, engineers, schedulers, detailers, architects, safety personnel, clerks and other administrative staff employed in his principal or branch offices;

12.10.1.2 The market value of small tools used but not consumed.

12.10.1.3 Any part of the **Contractor's** capital expenses, including interest on capital for the Work involved, lost interest, on unpaid retainage, and charges for delinquent payments.

12.10.1.4 Costs associated with the preparation of Change Orders or Change Authorizations whether or not ultimately authorized by the **Official**, or the preparation or filing of claims.

12.10.1.5 Costs of consultants or attorneys, in the direct employ of the **Contractor** or otherwise, utilized for services related to the Work.

12.10.1.6 Other administrative expense(s), lost profits, lost interest on unpaid retainage, and the costs of any item not specifically and expressly included in this Article 12.

12.10.1.7 Expenses of the **Contractor's** principal and branch offices, including, but not limited to storage and yard facilities.

### **12.11 Fee for the Work Involved:**

12.11.1 Any adjustment in Contract Price for Work involved shall also include a Fee for costs under paragraph 12.10 and negotiated profit, shall not exceed the following amounts:

12.11.1.1 For Work involved performed by the **Contractor**, the **Contractor's** Fee shall not exceed fifteen percent (15%) of the Cost of the Work involved, less supplemental costs. For Work involved performed by a Subcontractor, the Subcontractor shall receive a Fee of ten percent (10%) of the Cost of the Work involved, less supplemental costs.

12.11.1.2 In addition to the Fee(s) specified in paragraph 12.11.1.1, for Work involved that is performed by Subcontractors, the **Contractor** shall receive a mark-up Fee of five percent (5%) of the performing Subcontractors' costs. No Fee shall be payable to the **Contractor** on the basis of the performing Subcontractors' Fee or supplemental costs.

12.11.1.3 The credit to be allowed to the **City** for any adjustment in Contract Price yielding a net decrease in cost, *i.e.* the cost of the Work involved is negative, shall be the amount of the net decrease together with a Fee credit equal to one-third of the Fee which would be allowed under paragraphs 12.11.1.1 and 12.11.1.2.

12.11.1.4 When more than one individual adjustment in Contract Price, each resulting in a net increase or decrease in the Cost of the Work involved, is covered in one specific Change Order or Change Authorization or proposal or claim, the combined Fee shall be computed as the sum of the individual Fees.

### **12.12 Payment for Extension in Contract Time:**

12.12.1 Subject to the applicable requirements of the Contract Documents, an extension in Contract Time may be combined with an increase in Contract Price to cover costs solely associated with the time extension in the case of changes in the Work, differing site conditions, or significant variation in quantities. No such adjustment in Contract Price shall be made to the extent that performance would have been extended by any other cause, including fault or negligence of the **Contractor**, Subcontractors, or Suppliers, or for which an adjustment is excluded by any other provision of the Contract Documents.

12.12.2 The cost of the Work involved arising from an extension in Contract Time, shall exclude amounts not solely related to the extension in Contract Time, such as: operating costs of construction equipment assigned to the Work on a continuing basis but primarily used in the furnishing and incorporating of materials and equipment into the Work; owned, or rental, costs plus operating costs of construction equipment used solely in the furnishing and incorporating of materials or equipment into the Work such as crane costs for specific lifts and concrete pump truck costs; supplemental costs unaffected by the increase in Contract Time, or otherwise allocable to Work other than the Work involved e.g. small tools, site facilities fully paid for in previous payments, etc.

12.12.3 If delays entitling the **Contractor** to increase in Contract Price under the Contract Documents extend performance or completion of the entire Work beyond the Contract Time stated in Article 4 of the Owner-Contractor Agreement and if, upon a request from the **Contractor**, the **City** concludes that because of such extension a portion of the **Contractor's** costs itemized in paragraph 12.10 will be or were unabsorbed prior to the expiration of the Contract Time, the **Contractor** shall be allowed Fee to cover any such unabsorbed costs given by the portion of the Contract Price unbilled prior to the expiration of the Contract Time times the ratio of the **Contractor's** administrative costs to billings, not to exceed five percent (5%).

12.12.4 The **Contractor** shall not recover from the **City**: acceleration costs to keep progress despite **City**-caused delays or other delays which warrant extensions in Contract Time but exclude increases in Contract Price; escalation costs for any part of the Work not delayed beyond the Late Dates in the Progress Schedule; or delay costs not expressly allowed for in this Article.

### **12.13 Criteria for Determining Adjustments in Contract Time:**

12.13.1 The criteria to be used to determine an adjustment in Contract Time necessitated by changes ordered or under negotiation as provided in these General Conditions, or Work covered by a proposal or a claim, are limited to the following:

12.13.2 An adjustment in a specified Contract Time will not be granted unless (a) the time required to perform or complete the furnishing or performance of Work controlling achievement of that particular Contract Time is extended pursuant to para-

graph 12.13.3, and (b) all of the Total Float, and therefore Contract Float, in the Progress Schedule is used and consumed.

12.13.3 An extension in Contract Time will not be granted unless the **Contractor** can demonstrate through an analysis of the Progress Schedule that unforeseeable causes beyond the control and without the fault or negligence of both the **Contractor** and the Subcontractors or Suppliers led to performance or completion of all or part of the Work beyond the corresponding Contract Time despite the **Contractor's** reasonable and diligent actions. Examples of such causes include: (1) acts of God or of the public enemy; (2) acts of the **City** in its sovereign or contractual capacity; (3) acts of the U.S. Government or another Public Authority or Agency; (4) acts of another party in the performance of a contract with the **City**; (5) fires, floods, epidemics, quarantine restrictions; (6) incidents with archaeological features; (7) strikes, freight embargo; (8) unusual weather and related adverse subsurface conditions, unusual meaning expectation, frequency, severity, or unseasonable; (9) a case of differing site conditions or differing reference points; (10) a case of an emergency; (11) a case of a reasonable objection to a nominated Subcontractor; (12) unusually severe shortages of construction materials from such causes as area-wide shortages, an industry-wide strike, or a natural disaster affecting all feasible sources of supply; (13) variation in quantities of Unit Price Work as provided in Article 11; (14) delays, as itemized in this paragraph, to Subcontractors or Suppliers arising from unforeseeable causes beyond the control and without fault or negligence of both the **Contractor** and those Subcontractors or Suppliers; (15) work stoppages caused by or initiated by other **City** or public agencies.

12.13.4 An extension in Contract Time, if any granted, shall be the **Contractor's** sole and exclusive remedy for any delay, disruption, interference, or hindrance and associated costs, however caused, resulting from causes contemplated in paragraph 12.13.3.

#### **12.14 Negotiating Changes in Contract Price or Contract Time:**

12.14.1 In addition to the notice requirements in Articles 7 and 11, the **Contractor** shall give written notice to the **Official** of any written or oral order of the **Official** or the **Architect** which justifies a change in Contract Price or Contract Time by delivering a proposed Change Authorization itemizing in sufficient detail the related circumstances and the justification for the adjustments proposed. If the **Official**, with the advice of the **Architect**, concludes that a change in Contract Price or Contract Time is warranted, the **City** shall make or negotiate with the **Contractor** the appropriate adjustments. If the **Official** finds otherwise, the **Official's** decision shall be final and binding on the **Contractor** unless the **Contractor** delivers to the **Official** a clearly marked written Notice of Claim within thirty (30) days from receipt of that decision in strict compliance with the requirements of Article 15.

12.14.2 The **Official** may notify the **Contractor** of proposed changes in Contract Price or Contract Time by delivering to the **Contractor** an unsigned Change Authorization requesting that the **Contractor** signoff on the proposed changes in Contract Price or Contract Time or submit an alternate proposal.

12.14.3 If the **Official** makes the decision to order any changes in Contract Price or Contract Time, whether unilaterally or in negotiations with the **Contractor**, those changes in Contract Price or Contract Time shall be binding on the **Contractor**, unless the **Contractor** delivers to the **Official** clearly marked written Notice of Claim within thirty (30) days from receipt of that decision in strict compliance with the provisions of Article 15.

12.14.4 If the **Contractor** is directed or ordered to stop the Work, or any part of the Work by any **City** or public agency, other than the **Official** the **Contractor** is required to so inform the **Official** within four (4) hours of such action.

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### **ARTICLE 13 - GUARANTEES**

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#### **13.1 General Guarantees:**

13.1.1 In consideration of the execution of this Contract by the **City** and the Contract Price herein stipulated to be paid and received for the performance of the work, the **Contractor** binds and obligates himself and agrees to bring all portions of the Work under this Contract to completion in accordance with the Contract Documents and within the Contract Time, free of all defects of material and workmanship, and guarantees that the Work shall remain free of all defects of material and workmanship for a period of one year from the date of Substantial Completion. The **Contractor** guarantees, on written notice from the **Official**, to immediately repair and make good, or cause to be repaired and made good, at the **Contractor's** expense, all defects of material or workmanship in the Work and to pay for or cause to be paid for any damage to other work resulting therefrom, or from the repair thereof which may develop during the period of one year from the date of Substantial Completion.

13.1.2 Warranties for all specified or substitute items of materials and equipment shall include a certification endorsed by the **Contractor** warranting their merchantability, and that they are functionally suitable and fit for their intended purpose.

13.1.3 The warranties, guarantees and obligations for correction of Work specified in this Article are in addition to and not in limitation of any other specific remedies provided in the Contract Documents or by Laws or Regulations.



### **13.2 Tests and Inspections:**

13.2.1 The **Official**, the **Architect**, their representatives, testing agencies and Public Authorities or Agencies with jurisdiction shall be permitted access to the Work for their observation, inspection and testing. The **Contractor** shall provide proper and safe conditions for such access. The **Contractor** shall give the **Architect** and **Clerk of the Works** timely notice of readiness of, and access to, the Work for all required inspections, tests, or approvals. Test, inspections or approvals shall not in any way relieve the **Contractor** from his obligations to perform the Work in accordance with the Contract Documents, or to warrant and guarantee the Work as provided in the Contract Documents.

13.2.2 Deleted in its Entirety.

13.2.3 If a Public Authority or Agency enforces testing, inspection or approval differing from those specified, or if not specified, from those enacted on or before the date of Bid opening, necessitating an amendment to the Contract Documents, the **Official** shall authorize the required changes in the Work, together with any adjustment in Contract Price necessitated by the changes. If the Changed testing, inspection or approval causes or will cause delays which postpone, extend or in any manner alter the schedule or the completion of all or part of the Work, the **Contractor** shall absorb all of the **Contractor's** related delay, extension or acceleration costs, however caused; except that if the **Official** and the **Contractor** believe that the delays require a change in Contract Time, the **Official** shall authorize the necessary change in Contract Time **only**.

13.2.4 If any testing, inspection or approval reveals failure of any part of the Work, the **Contractor** shall not be allowed to recover any associated costs, and he shall reimburse the **Official** for all of direct, indirect and consequential costs made necessary by that failure including those of repeated procedures and compensation for the **Architect's** services.

13.2.5 Tests, inspections or approvals shall not in any way relieve the **Contractor** from the **Contractor's** obligations to perform the Work in accordance with the Contract Documents and to warrant and guarantee the Work as provided in the Contract Documents

### **13.3 Special Guarantees:**

13.3.1 It is expressly agreed and understood that the general guarantee set forth under this Article is in addition to and not in substitution of such guarantees as may be required under any other Section of the Contract Documents.

13.3.2 All guarantees required in the Contract Documents, including those which originate with any Subcontractor, Supplier or other person, shall be in the form set forth by the **Official** and must be delivered to the **Official** before final payment to the **Contractor** will be made.

13.3.3 The **Contractor** and Subcontractors shall be jointly and severally liable to the **City** under the terms of all guarantees originating with any Subcontractor.

13.3.4 The failure to deliver a required guarantee shall be held to constitute a failure of the **Contractor** or Subcontractor to fully complete his work in accordance with the Contract Documents.

13.3.5 The period of all special guarantees, unless otherwise specified, shall be one year from the date of Substantial Completion.

### **13.4 Correction or Removal, or Acceptance of Defective Work:**

13.4.1 If required by the **Official** or **Architect**, the **Contractor** shall promptly, as directed, either correct all *defective* Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the **Architect** or if any testing, inspection or approval of all or part the Work reveals failure of that part of the Work to comply with the requirements of the Contract Documents, remove it from the site and replace it at the **Contractor's** expense. If, instead of requiring correction or removal and replacement of *defective* Work, the **Official** prefers to accept it, the **Official** may do so, in which case the **Contractor** shall not be entitled to any increase in Contract Time or Contract Price, and he shall reimburse the **City** for all direct, indirect and consequential costs of the **City** incurred because of the correction or removal of or due to the **City's** evaluation and determination to accept *defective* Work.

13.4.2 If the **Official's** acceptance of *defective* Work occurs prior to the **Architect's** recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents; and the **City** shall be entitled to an appropriate decrease in the Contract Price. If the acceptance occurs after that recommendation, an appropriate amount shall be deducted from the final payment, or if the final payment has been made, an appropriate amount shall be paid by the **Contractor** to the **City**.

### **13.5 The City May Correct Defective Work:**

13.5.1 If the **Contractor** fails within a reasonable time after written notice of the **Architect** to proceed to correct *defective* Work or to remove and replace rejected Work as required by the **Architect**, or if the **Contractor** fails to perform the Work in accordance with the Contract Documents, or if the **Contractor** fails to comply with any other provision of the Contract Documents, the **Official** may, after seven (7) days' written notice to the **Contractor**, correct and remedy any such deficiency. To the extent necessary to complete corrective action, the **Official** shall have full power and authority to exclude the **Contractor** from all or part of the site, and to exercise all of the rights and remedies in paragraph 14.1. The **Contractor** shall allow the **Official**, the **Official's** representatives, agents and employees whatever access to the site that may be necessary to enable the **Official** to exercise the rights and remedies under this paragraph. The **Contractor** shall not be allowed an extension in Contract Time or increase in Contract Price because of any delay in performance of the Work attributable to the exercise by the **City** of these rights and remedies, and he shall reimburse the **City** for all direct, indirect and consequential costs of the **City** in exercising such rights and remedies, such costs to include, but not be limited to, all costs of repair and replacement of work of others destroyed or damaged by correction, removal or replacement of defective Work, and a Change Order will be issued incorporating the necessary changes.

### **13.6 Uncovering Work:**

13.6.1 If Work that is to be observed by the **Architect** or inspected, tested or approved is covered without written concurrence or contrary to the written request of the **Official** or the **Architect**, it shall when requested by the **Official**, be uncovered, exposed or otherwise made available for observation, testing, inspection or approval, as the **Official** may require and if necessary, replaced at the **Contractor's** expense.

13.6.2 The **Contractor**, at the **Architect's** request, shall uncover, expose or otherwise make available for observation, inspection or testing as the **Architect** may require, any covered Work if the **Architect** considers it advisable that such covered Work be observed by the **Architect** or inspected or tested by others.

13.6.3 The **Contractor** shall not be entitled to an increase in Contract Price or Contract Time, and he shall reimburse the **City** for all direct, indirect and consequential costs incurred by the **City** due to any uncovering or exposure, including but not limited to, the costs of that uncovering or exposure, observation, inspection, testing and satisfactory reconstruction, whenever Work covered without the written concurrence or contrary to the written request of the **Architect** or **Official** under paragraph 13.6.1 is uncovered, or whenever covered Work uncovered at the **Architect's** request under paragraph 13.6.2 is found to be *defective*. If Work is uncovered or exposed under paragraph 13.6.2 and not found to be *defective*, the **Contractor** shall be entitled to an increase in Contract Price or Contract Time, either or both, directly attributable to such uncovering.

### **13.7 Correction Period:**

13.7.1 The Correction Period shall commence on the date of Substantial Completion of the Work, or a later date if so specified in the Contract, and last for one (1) year or such a longer period of time as may be specified in the Contract Documents.

13.7.2 If within the designated Correction Period, the Work, or any part of the Work is discovered to be *defective*, the **Contractor** shall promptly, without an adjustment in Contract Price and in accordance with the **Official's** written instructions, either correct that *defective* Work, or if it has been rejected by the **Official**, remove it from the site and replace it with *non-defective* Work. If circumstances warrant it, including, but not limited to, in an emergency, the **Official** may have the *defective* Work corrected or the rejected Work removed and replaced. In that event, the **Contractor** shall not be allowed to recover any associated costs, and he shall reimburse the **City** for all of the **City's** reasonable direct, indirect and consequential costs so incurred. If that event takes place after final payment and the **Contractor** fails to pay such costs to the **City** within thirty (30) days after presentation for payment, the **City** will give written notice to the **Contractor** of a claim, in which case the provisions of Article 15 shall apply.

13.7.3 The specified warranties and guarantees and the **Contractor's** obligations for correction of Work specified in this Article are in addition to and not in limitation of any other specific remedies provided in the Contract Documents or by Law. Nothing contained in this paragraph or this Article shall be construed as establishing a period of limitation for or limiting the obligations of the **Contractor** under the Contract Documents.

### **13.8 Extended Warranties and Guarantees:**

13.8.1 Following written notice to the Contractor, the **City** may in its sole discretion advance or defer the date for commencement of the Correction Period, in which case the **Contractor** shall maintain the warranties and guarantees until the revised date for commencement of the Correction Period. If such advancement or deferral in the date for commencement of the Correction Period causes an increase or decrease in the cost of the warranties and guarantees provided by the **Contractor**, the **Official** shall make an adjustment in Contract Price or Contract Time, as provided in Articles 8 and 11.

13.8.2 Whenever the **City** undertakes Partial Utilization of a portion of the Work which was specifically identified in the Contract Documents, or the **Contractor** fails to complete the Work or a separable portion of the Work within the corresponding Contract Time and the **City** undertakes Partial Utilization under paragraph 7.4, the **Contractor** shall maintain the warranties

and guarantees in full force and effect during the period between the applicable commencement of Partial Utilization date, and the date of commencement of the Correction Period, and for such maintenance of the warranties and guarantees the **Contractor** shall receive no adjustment in Contract Price.

13.8.3 Any *defective* Work that is either corrected or rejected and replaced will be warranted and guaranteed in accordance with the provisions of this Article 13 for a period of one (1) year from the date of such correction or removal and replacement. If within such extended Correction Period, that Work is once again found to be *defective*, the **City** may exercise any of the **City's** rights and remedies under this Article.

### **13.9 Special Maintenance Requirements:**

13.9.1 In special circumstances where the Work, or a designated part, progresses to Substantial Completion or Partial Completion but is not placed in continuous service until the commencement of the Correction Period, the **Contractor** shall maintain the Work, or designated part, in good order and in proper working condition and take all other actions as are necessary for its protection during the period between the applicable Substantial or Partial Completion date and the date of commencement of the Correction Period, and for such maintenance the **Contractor** shall receive no adjustment in Contract Price.

13.9.2. If the Work suffers loss or damage, however caused, the **Contractor** shall rebuild, repair, restore and make good without an increase in Contract Price all losses or damages to any portion of any Work. The occurrence of **City**-caused delay or the granting of an extension in Contract Time for any cause shall not relieve the **Contractor** of his responsibility for the Work, or designated part, as specified in this paragraph.

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## **ARTICLE 14 - TERMINATION**

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### **14.1 Notice of Intention to Terminate for Cause:**

14.1.1. If at any time reasonable doubt of the **Contractor's** due performance arises, the **Official** may demand adequate, written assurance of due performance. In addition, the **Official**, acting on knowledge or belief, may include with the demand for assurance a written notice to the **Contractor** and surety of the **City's** intent to terminate the **Contractor's** right to complete the Work within seven (7) days, or sooner if safety to persons or property is in question, because of occurrence of any of the following events, which constitute lack of due performance and are reasonable grounds for terminating the **Contractor**.

14.1.1.1 The **Contractor** fails to complete the Work, or separable part, within the corresponding Contract Time; fails or refuses to prosecute the Work, or separable part of the Work, with the diligence required for completion within the corresponding Contract Time; or fails or refuses to supply sufficient skilled workers, materials or equipment in adherence to the Progress Schedule, as revised from time to time;

14.1.1.2 The **Contractor** admits in writing, or the **City** otherwise establishes, the **Contractor's** inability to pay his debts generally as they become due; or in response to the **City's** demand, fails to promptly provide adequate, written assurance, the adequacy of which the **City** shall be the sole judge, of due performance in accordance with the Contract Documents;

14.1.1.3 A trustee, receiver, custodian or agent of the **Contractor** is appointed under applicable Law or under contract, whose appointment or authority to take charge of property of the **Contractor** is for the purpose of enforcing a lien against such property or for the purpose of general administration of such property for the benefit of the **Contractor's** creditors; or

14.1.1.4 The **Contractor** disregards the authority of the **Architect**, otherwise violates in any substantial way any provision of the Contract Documents, fails to perform the Work in accordance with the Contract Documents, with the Contract Documents, or disregards the Laws, ordinances, codes, rules or regulations of any public governmental entity with jurisdiction.

14.1.1.5 The **Contractor** fails to make payment to filed Item 2 Subcontractors for materials or labor in accordance with the written agreements between the **Contractor** and Subcontractors.

14.1.1.6 The **Contractor** is guilty of a substantial breach of a provision of the Contract Documents.

14.1.2. Promptly after the **Contractor** receives either a demand for assurance or a notice of termination, the **Contractor** and surety shall meet with the **City** and present the plan they intend to follow to give adequate assurance of due performance to the **City** and to avoid or cure any default. If at or after the meeting, the **City** decides to allow the **Contractor** to continue prosecution of the Work to completion, that decision shall not waive the **City's** right to declare the **Contractor** in default subsequently nor affect any rights or remedies of the **City** against the **Contractor** or surety, or both, then existing or which may accrue in the future.

### **14.2 Termination for Cause:**

14.2.1. If the **Contractor** at any time refuses or neglects to supply a sufficient number of properly skilled workers or of materials of the proper quality, or fails in any respect to perform the Work, or separable part of the Work, with promptness and diligence, or fails in the performance of any of the agreements herein contained, and such refusal, neglect or failure has been certified to by the **Official**, the **City** shall have full power and authority to give written notice to the **Contractor** and the surety of the **City's** intention to terminate the services of the **Contractor** seven (7) days after giving notice, or sooner if safety to persons or property is in question.

14.2.2 If the **Contractor** seeks relief in bankruptcy, or if he makes a general assignment for the benefit of his creditors, or if a receiver of his property is appointed, or if the Work to be done under this Contract is abandoned, or if this Contract or any part thereof is sublet or assigned without the previous written consent of the **Official**, or if the **Contractor** becomes insolvent, or if at any time the **Official** shall certify in writing that the **Contractor** has refused or neglected to supply a sufficient number of properly skilled workers or of materials of the proper quality, or has failed in any respect to perform the Work with promptness and diligence, or has failed in the performance of any agreements herein contained, the **City** acting by the **Official** and at his discretion, may without prejudice to any right or remedy, and after giving the **Contractor** and his surety seven (7) days prior written notice, notify the **Contractor** to terminate the Work and the **City**, acting by the **Official** and at his discretion, and without prejudice to any other remedies that the **City** may have, may thereupon by contract or otherwise, complete the Work and charge the entire expense of so completing the Work to the **Contractor**; and the **Contractor** shall not be entitled to receive any further payment under this Contract until Final Completion of the Work, at which time, if the unpaid balance of the amount to be paid under this Contract shall exceed the expense incurred by the **City**, such excess shall be paid by the **City** to the **Contractor**. If the expense of completing the Work exceeds such unpaid balance, an appropriate credit Change Order shall be issued deducting from the Contract an amount then or thereafter due to the Contractor equal to the actual cost of correcting such deficiencies, including the City's expenses and compensation for the additional services of the Architect made necessary by such failure, refusal or default. For the purpose of completing the Work, the **City**, acting by the **Official**, may take possession of and use, or cause to be used, any materials, implements, machinery and tools of every description as may be found upon the site of the work.

#### **14.3 Termination for Convenience:**

14.3.1 Upon not less than seven (7) days written notice to the **Contractor** and the surety, or sooner if reasonable under the circumstances; the **Official** may, without cause and without prejudice to any other right or remedy, elect to terminate any part of the Work, or the Contract in whole or in part as the **City** may deem appropriate for its convenience. Upon receipt of any such termination notice, the **Contractor** shall immediately proceed in accordance with any specific provisions or instructions, protect and maintain the Work, and make reasonable and diligent efforts to mitigate costs associated with the termination.

14.3.2 In any such termination for the convenience of the **City**, the **Contractor** shall be paid for Work completed in accordance with the Contract Documents prior to receipt of the notice of termination, and for reasonable termination settlement costs relating to commitments which had become firm prior to the termination, based solely on supporting documentation that is provided to the **City** by the **Contractor**, the adequacy of which will be determined by the **City** in its sole discretion; provided, however, that the payment to the **Contractor** will exclude any and all anticipated supplemental costs, administrative expenses and profit on uncompleted work; and provided, further, that if no agreement can be reached as to reasonable termination costs, the parties will follow the provisions in the Federal Acquisition Regulations, clause 52.249-2 found in 48 CFR PART 52.

14.3.3 If, after notice of termination of the services of the **Contractor** for any of the causes listed in paragraph 14.1, it is determined that the **Contractor** was not in default, the termination shall be deemed to have been for the convenience for the **City**. In such event the **Contractor** may recover from the **City** payment in accordance with this paragraph 14.3.

14.3.4 Upon any such termination for convenience, the **City** shall have full power and authority to take possession of the Work, assume any Sub-agreements with Subcontractors and Suppliers which the **City** so selects, and prosecute the Work to completion by contract or as the **City** may deem expedient.

#### **14.4 Surety Default:**

14.4.1 If upon receipt of a notice of termination for cause, the surety fails to perform its obligations under the Performance Bond with reasonable promptness, the **City** shall declare the surety in default under the Performance Bond in accordance with the provisions of this paragraph.

14.4.1.1 No default of the surety under the Performance Bond shall be declared however, until the expiration of seven (7) days after receipt by the surety of a written notice from the **Official** demanding that the surety perform its obligations under the Performance Bond.

14.4.1.2 If the **City** declares the surety in default, the **City** shall have full power and authority to exclude the surety and **Contractor** from the site, assume any Sub-agreements which the **City** so selects and take possession of the Work and of all the surety's and **Contractor's** tools, appliances, plant and office, and construction equipment at the site and (a) use the same to the

full extent they could be used by the surety and **Contractor** (without liability to the surety or **Contractor** for trespass, rent or conversion), (b) incorporate into the Work all materials and equipment stored at the site or for which the **City** has paid the **Contractor** but which are stored elsewhere, and (c) prosecute the Work to completion by contract or as the **City** otherwise may deem expedient.

14.4.2 If the **City** has terminated the **Contractor** or defaulted the surety, any such termination or default will not affect any rights or remedies of the **City** against the **Contractor** or surety, or both, then existing or which may accrue after termination. Any retention or payment of monies due the **Contractor** or surety by the **City** will not release the **Contractor** or surety from any liability. All provisions of the Contract Documents that by their nature survive final acceptance of the Work shall remain in full force and effect after a termination for cause of the **Contractor** or default of the surety, or both, as applicable.

14.4.3 The **City** may, in its sole discretion, permit the **Contractor** or surety to continue to perform Work when the **Contractor** or surety has been terminated or declared in default for any reason. Such decision by the **City** shall in no way operate as a waiver of any of the **City's** rights under the Contract Documents or the Performance Bond, nor in the event of a subsequent default, entitle the **Contractor** or surety to continue to perform or prosecute the Work to completion.

#### **14.5 The Contractor May Stop Work or Terminate:**

14.5.1 To the extent permitted by Law, if through no act or fault of the **Contractor**, the **Architect** fails to act on any Application for Payment within thirty (30) days after it is submitted, or the **City** fails for ninety (90) days to pay the **Contractor** any Application for Payment sum finally determined by the **Architect** and **City** to be due, then the **Contractor** may, upon thirty (30) additional days written notice to the **City** of a suspension of work, suspend the Work.

14.5.2 If the **City** fails to correct the conditions, if any, which under this paragraph justify the **Contractor's** suspension of the Work within ninety (90) days from the commencement of the suspension, the **Contractor** may upon thirty (30) days additional written notice to the **City** and the **Architect** terminate the Contract and recover from the **City** payment in accordance with paragraph 14.4.2 Except as specifically provided in this paragraph, these provisions shall not relieve the **Contractor** of the obligations under Article 8 to carry on the Work in accordance with the Progress Schedule and without delay during disputes and disagreements with the **City**.

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### **ARTICLE 15 - DISPUTES**

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#### **15.1 Claims Under This Article:**

15.1.1 All Notices of Claims, Claims and any other matters in dispute between the **City** and the **Contractor** arising from or related to the Contract Documents or a claimed breach thereof, specifically including those matters arising from Paragraphs 4.28.1; 7.5.3 and 11.4.2, shall be subject to, processed and resolved as provided in this Article 15.

15.1.2 A "Claim" under this Article 15 shall mean a written demand or assertion by the **City** or **Contractor**, which is properly certified according to the requirements of Paragraph 15.2.1, seeking an adjustment in Contract Price and payment of monies due, an extension or shortening in Contract Time, the adjustment or interpretation of Contract terms, or any other relief arising under or relating to the Contract, after a determination by the **Architect** or **City** under the appropriate provision of the Contract Documents.

15.1.3 A Claim arising under the Contract is a Claim that can be resolved under a provision within the Contract Documents that provides for or excludes the relief sought by the claimant. Such Claims shall be resolved in accordance with the applicable provisions.

15.1.4 No Claim shall be valid unless it is based upon the prior submission of a clearly marked written "Notice of Claim" that states the general nature of the Claim delivered by the party making the Claim to other party promptly, but in no event later than thirty (30) days after the **Architect's** or **Official's** determination giving rise to the Claim. The receipt by the **City** of a timely Notice of Claim shall be a condition precedent to the **City** receiving a valid a Claim submitted from the **Contractor** for evaluation. The clearly marked written "Claim" itself together with all supporting data shall be delivered within sixty (60) days after the determination. The responsibility to substantiate Claims shall rest with the party making the Claim. Notwithstanding anything to the contrary in this Article, the **Official** shall not be required to deliver notice of any Claim for liquidated damages or involving retention until sixty (60) days after the final acceptance.

15.1.5 A Claim by the **Contractor** shall be submitted to the **Official** with a copy to the **Architect** for a written decision from the **City**. The **City** will provide the **Contractor** with a written acknowledgement of receipt of the Claim within seventy-two (72) hours, and will notify the **Contractor** as to the status of the Claim within thirty (30) days of receipt. A Claim by the **City** shall be submitted to the **Contractor** and the **Architect** for a written determination from the **Architect**.

15.1.6 Once given, the **City's** final decision on a Claim submitted by the **Contractor** shall be final and binding on the **Contractor** unless the **Contractor** files suit within thirty (30) days after receipt of the **City's** decision.

### **15.2 Requirements for Contractor Claims:**

15.2.1 For all **Contractor** Claims seeking an increase in Contract Price or Contract Time, the **Contractor** shall submit a statement signed under the penalties of perjury and executed by an officer or partner in charge, or by a responsible senior officer or general managing partner of the **Contractor** certifying that the Claim is made in good faith; the amount claimed accurately reflects the adjustments in Contract Price or Contract Time for which the **Contractor** believes the **City** is liable, and covers all costs and delays to which the **Contractor** is entitled from the occurrence of the claimed event; and supporting costs and pricing data are current, accurate, complete and represent the best of the **Contractor's** knowledge and belief.

### **15.3 Determination on a Claim:**

15.3.1 Pending final resolution of any Claim, including litigation, the **Contractor** shall proceed diligently with the Work, and comply with any decision of the **Official** or the **Architect**.

15.3.2 After settlement or final adjudication of any Claim under this Article if, upon demand, payment by the **Contractor** is not made to the **City**, the **City** may offset the appropriate amounts against (a) payments due to the **Contractor** under any other contract between the **City** and the **Contractor**, or (b) any amounts for which the **City** may be obligated to the **Contractor** in any capacity.

### **15.4 Venue:**

15.4.1 The **Contractor**, the **Contractor's** sureties, and the Subcontractors and Suppliers agree, consent and submit to the service of process at the address and in the manner specified in Article 10.17.

15.4.2 The **Contractor**, the **Contractor's** sureties, and the Subcontractors and Suppliers waive jurisdiction and venue and shall submit to the jurisdiction of the County of Middlesex only, regardless of residence or domicile, with respect to any actions or suits at law or in equity arising under or related to the bidding, award, performance, or completion of the Work, payment for work performed, or any Claim.

15.4.3 The **Contractor** shall insert a provision containing the venue and service of process requirements of paragraph 15.4.1 and 15.4.2 in all sub-agreements and agreements between the **Contractor** and his sureties and insurers, altering the provisions only as necessary to properly identify the contracting parties.

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## **ARTICLE 16 – LIQUIDATED DAMAGES**

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16.1.1 If the Contractor fails to complete the Work within the time specified in the contract, or any extension thereof, the Contractor shall pay to the City as liquidated damages, the sum of \$3,000.00 for each day of delay. Completion dates are specified in the Contract for separate phases of the work, and the amount of liquidated damages shall be assessed on each and every phase which is delayed. In the context of this paragraph, “delay” means failure to complete the Project. To the extent that the Contractor's delay or nonperformance is excused under another section in this Contract, liquidated damages shall not be due the City. The Contractor remains liable for damages caused other than by delay.

16.1.2 If the City terminates the Contractor's right to proceed pursuant to section 2.12.1, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the Work together with any increased costs to the City in completing the Work.

16.1.3 If the City does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the Work is completed or accepted.

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## **END OF GENERAL CONDITIONS**

SECTION 00 27 00  
UNIT PRICES1  
**(Submit with Bid Forms)**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Note: This list of Unit Prices shall be completed and included with the Bid Form.**
- C. General / Prime contractor bid unit prices shall be inclusive of trade bid contractor's unit pricing values.**

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices.
- B. Related Sections include the following:
  - 1. Section 32 32 23 Segmented Retaining Walls
  - 2. Section 04 01 20 Unit Masonry
  - 3. Section 07 84 00 Firestopping

1.3 DEFINITIONS

- 1. Unit price is a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 2. Specification Sections referenced in the schedule contain requirements for Work described under each unit price. The unit prices provided will be used for ADD's and cover the description outlined below for each scope of work. Work not utilized under this section will be taken as DEDUCT's and will be taken at 15% less than the ADD price to account for overhead and profit.**

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1 Bidders must provide unit prices for three (3) options set forth at p. 100. These are prices which the Bidder will charge for additional requested work but, while the option prices shall be included in the successful Bidder's contract, option prices shall not be considered in determining the lowest bid.

PART 2 - LIST OF UNIT PRICES

DESCRIPTION

UNIT PRICE

Linear foot cost to add Segmented Retaining Wall, 4 feet high with associated earthwork, excavation and backfill

**(Section 32 32 23 Segmented Retaining Walls)-**

**Base bid shall include 25 linear feet above and beyond what is indicated in the specifications / drawings.**

Square foot cost to replace damaged CMU (concrete masonry units)

**(Section 04 01 20 Unit Masonry) Base bid shall include 50 S.F above and beyond what is indicated in the specifications / drawings.**

To provide firestopping / firesafing infill to one 4" diameter opening penetrations in the walls / floors or ceiling.

Refer to **(Section 07 84 00)**

**Base bid shall include 40 penetrations above and beyond what is indicated In the specifications.**

END OF SECTION 00 27 00



## CITY OF NEWTON

### WAGE RATE REQUIREMENTS

#### 1. GENERAL

- A. This section summarizes the requirements for the payment of wages to laborers and mechanics employed under the Contract.
- B. Other duties and requirements of law which may not be specified in this section apply and are inherently a part of the Contract.

#### 2. WAGE RATES

- A. The rate per hour to be paid to mechanics, apprentices, teamsters, chauffeurs, and laborers employed on the Work shall not be less than the rate of wages in the attached "Minimum Wage Rates" as determined by the Commissioner of Labor and Industries. This schedule shall continue to be the minimum rate of wages for said employees during the life of this Contract.
- B. Keep posted on the site a legible copy of said schedule. Keep on file the wage rates and classifications of labor employed on this Work in order that they may be available for inspection by the Owner, Administrator, or the Architect.
- C. Apprentices employed pursuant to this determination of wage rates must be registered and approved by the State Apprenticeship Council wherever rates for journeymen or apprentices are not listed.
- D. Pay reserve police officers employed on the Work the prevailing rate of wages paid to regular police officers as required by M.G.L. c149, Sec. 34B, as amended. Such police officers shall be covered by Workmen's Compensation Insurance and Employers Liability Insurance by the Contractor.
- E. The Contractor and all subcontractors shall, on a weekly basis throughout the term of the contract, provide to the City of Newton certified payroll affidavits verifying compliance with M.G.L. c.149, Sec. 27, 27A and 27B. The Contractor is obligated to provide such records to the City directly on a weekly basis. The City may assess a penalty of \$100 for each day beyond the required submission date that such records are received, which amount shall be deducted from any amounts to the Contractor from the City. In the event of chronic late submissions, the City shall report the same to the Office of the Attorney General.
- F. The Contractor and all subcontractors shall provide a Statement of Compliance within 15 days of the completion of its portion of the work. This statement shall be submitted to the Owner on the form found elsewhere in this section.
- G. The Contractor shall maintain accurate and complete records, including payroll records, during the Contract term and for three years thereafter.

**END OF SECTION**



MAURA HEALEY  
Governor

KIM DRISCOLL  
Lt. Governor

THE COMMONWEALTH OF MASSACHUSETTS  
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT  
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the  
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

LAUREN JONES  
Secretary

MICHAEL FLANAGAN  
Director

**Awarding Authority:** City of Newton  
**Contract Number:** IFB #24-65 **City/Town:** NEWTON  
**Description of Work:** Newton Commonwealth Golf Course Maintenance Facility Improvements and Repairs

**Job Location:** 212 Kendrick St

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, the awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. The annual update requirement is not applicable to 27F "rental of equipment" contracts. The updated wage schedule must be provided to all contractors, including general and sub-contractors, working on the construction project.
- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wages schedules shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or a sub-contractor.
- Apprentices working on the project are required to be registered with the Massachusetts Division of Apprentice Standards (DAS). Apprentices must keep their apprentice identification card on their persons during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wages schedule. Any apprentice not registered with DAS regardless of whether they are registered with another federal, state, local, or private agency must be paid the journeyworker's rate.
- Every contractor or subcontractor working on the construction project must submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. For a sample payroll reporting form go to <http://www.mass.gov/dls/pw>.
- Contractors with questions about the wage rates or classifications included on the wages schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Contractors must obtain the wages schedules from awarding authorities. Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may file a complaint with the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

**Issue Date:** 04/01/2024

**Wage Request Number:** 20240329-047

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| <b>Construction</b>  |                |           |         |         |                           |            |
| (2 AXLE) DRIVER - EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>            | 12/01/2023     | \$40.05   | \$14.41 | \$18.67 | \$0.00                    | \$73.13    |
|  | 06/01/2024     | \$41.05   | \$14.41 | \$18.67 | \$0.00                    | \$74.13    |
|  | 08/01/2024     | \$41.05   | \$14.91 | \$18.67 | \$0.00                    | \$74.63    |
|  | 12/01/2024     | \$41.05   | \$14.91 | \$20.17 | \$0.00                    | \$76.13    |
|  | 06/01/2025     | \$42.05   | \$14.91 | \$20.17 | \$0.00                    | \$77.13    |
|  | 08/01/2025     | \$42.05   | \$15.41 | \$20.17 | \$0.00                    | \$77.63    |
|  | 12/01/2025     | \$42.05   | \$15.41 | \$21.78 | \$0.00                    | \$79.24    |
|  | 06/01/2026     | \$43.05   | \$15.41 | \$21.78 | \$0.00                    | \$80.24    |
|  | 08/01/2026     | \$43.05   | \$15.91 | \$21.78 | \$0.00                    | \$80.74    |
|  | 12/01/2026     | \$43.05   | \$15.91 | \$23.52 | \$0.00                    | \$82.48    |
| (3 AXLE) DRIVER - EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>            | 12/01/2023     | \$40.12   | \$14.41 | \$18.67 | \$0.00                    | \$73.20    |
|  | 06/01/2024     | \$40.88   | \$14.41 | \$18.67 | \$0.00                    | \$73.96    |
|  | 08/01/2024     | \$40.88   | \$14.91 | \$18.67 | \$0.00                    | \$74.46    |
|  | 12/01/2024     | \$40.88   | \$14.91 | \$20.17 | \$0.00                    | \$75.96    |
|  | 06/01/2025     | \$41.12   | \$14.91 | \$20.17 | \$0.00                    | \$76.20    |
|  | 08/01/2025     | \$41.12   | \$15.41 | \$20.17 | \$0.00                    | \$76.70    |
|  | 12/01/2025     | \$41.12   | \$15.41 | \$21.78 | \$0.00                    | \$78.31    |
|  | 06/01/2026     | \$43.12   | \$15.41 | \$21.78 | \$0.00                    | \$80.31    |
|  | 08/01/2026     | \$43.12   | \$15.91 | \$21.78 | \$0.00                    | \$80.81    |
|  | 12/01/2026     | \$43.12   | \$15.91 | \$23.52 | \$0.00                    | \$82.55    |
| (4 & 5 AXLE) DRIVER - EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>        | 12/01/2023     | \$40.24   | \$14.41 | \$18.67 | \$0.00                    | \$73.32    |
|  | 06/01/2024     | \$41.24   | \$14.41 | \$18.67 | \$0.00                    | \$74.32    |
|  | 08/01/2024     | \$41.24   | \$14.91 | \$18.67 | \$0.00                    | \$74.82    |
|  | 12/01/2024     | \$41.24   | \$14.91 | \$20.17 | \$0.00                    | \$76.32    |
|  | 06/01/2025     | \$42.24   | \$14.91 | \$20.17 | \$0.00                    | \$77.32    |
|  | 08/01/2025     | \$42.24   | \$15.41 | \$20.17 | \$0.00                    | \$77.82    |
|  | 12/01/2025     | \$42.24   | \$15.41 | \$21.78 | \$0.00                    | \$79.43    |
|  | 06/01/2026     | \$43.24   | \$15.41 | \$21.78 | \$0.00                    | \$80.43    |
|  | 08/01/2026     | \$43.24   | \$15.91 | \$21.78 | \$0.00                    | \$80.93    |
|  | 12/01/2026     | \$43.24   | \$15.91 | \$23.52 | \$0.00                    | \$82.67    |
| ADS/SUBMERSIBLE PILOT<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i>                          | 08/01/2020     | \$103.05  | \$9.40  | \$23.12 | \$0.00                    | \$135.57   |
| For apprentice rates see "Apprentice- PILE DRIVER"                                     |                |           |         |         |                           |            |
| AIR TRACK OPERATOR<br><i>LABORERS - ZONE 1</i>   | 12/01/2023     | \$45.08   | \$9.65  | \$18.07 | \$0.00                    | \$72.80    |
| For apprentice rates see "Apprentice- LABORER"   |                |           |         |         |                           |            |
| AIR TRACK OPERATOR (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023     | \$45.08   | \$9.65  | \$18.07 | \$0.00                    | \$72.80    |
|  | 06/01/2024     | \$46.56   | \$9.65  | \$18.07 | \$0.00                    | \$74.28    |
|  | 12/01/2024     | \$48.03   | \$9.65  | \$18.07 | \$0.00                    | \$75.75    |
|  | 06/01/2025     | \$49.53   | \$9.65  | \$18.07 | \$0.00                    | \$77.25    |
|  | 12/01/2025     | \$51.03   | \$9.65  | \$18.07 | \$0.00                    | \$78.75    |
|  | 06/01/2026     | \$52.58   | \$9.65  | \$18.07 | \$0.00                    | \$80.30    |
|  | 12/01/2026     | \$54.08   | \$9.65  | \$18.07 | \$0.00                    | \$81.80    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)                      |                |           |         |         |                           |            |

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|---------------------------|------------|
| ASBESTOS REMOVER - PIPE / MECH. EQUIPT.<br><i>HEAT &amp; FROST INSULATORS LOCAL 6 (BOSTON)</i>        | 12/01/2023     | \$40.80   | \$14.50 | \$11.05 | \$0.00                    | \$66.35    |
|   | 06/01/2024     | \$41.80   | \$14.50 | \$11.05 | \$0.00                    | \$67.35    |
|   | 12/01/2024     | \$42.80   | \$14.50 | \$11.05 | \$0.00                    | \$68.35    |
|   | 06/01/2025     | \$43.80   | \$14.50 | \$11.05 | \$0.00                    | \$69.35    |
|   | 12/01/2025     | \$44.80   | \$14.50 | \$11.05 | \$0.00                    | \$70.35    |
| ASPHALT RAKER<br><i>LABORERS - ZONE 1</i>   | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |         |         |                           |            |
| ASPHALT RAKER (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i>                     | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
|   | 06/01/2024     | \$46.06   | \$9.65  | \$18.07 | \$0.00                    | \$73.78    |
|   | 12/01/2024     | \$47.53   | \$9.65  | \$18.07 | \$0.00                    | \$75.25    |
|   | 06/01/2025     | \$49.03   | \$9.65  | \$18.07 | \$0.00                    | \$76.75    |
|   | 12/01/2025     | \$50.53   | \$9.65  | \$18.07 | \$0.00                    | \$78.25    |
|   | 06/01/2026     | \$52.08   | \$9.65  | \$18.07 | \$0.00                    | \$79.80    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)                                     |                |           |         |         |                           |            |
| ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE<br><i>OPERATING ENGINEERS LOCAL 4</i>                          | 12/01/2023     | \$55.03   | \$15.00 | \$16.40 | \$0.00                    | \$86.43    |
|   | 06/01/2024     | \$56.33   | \$15.00 | \$16.40 | \$0.00                    | \$87.73    |
|   | 12/01/2024     | \$57.78   | \$15.00 | \$16.40 | \$0.00                    | \$89.18    |
|   | 06/01/2025     | \$59.08   | \$15.00 | \$16.40 | \$0.00                    | \$90.48    |
|   | 12/01/2025     | \$60.53   | \$15.00 | \$16.40 | \$0.00                    | \$91.93    |
|   | 06/01/2026     | \$61.83   | \$15.00 | \$16.40 | \$0.00                    | \$93.23    |
|   | 12/01/2026     | \$63.28   | \$15.00 | \$16.40 | \$0.00                    | \$94.68    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"  |                |           |         |         |                           |            |
| BACKHOE/FRONT-END LOADER<br><i>OPERATING ENGINEERS LOCAL 4</i>  | 12/01/2023     | \$55.03   | \$15.00 | \$16.40 | \$0.00                    | \$86.43    |
|   | 06/01/2024     | \$56.33   | \$15.00 | \$16.40 | \$0.00                    | \$87.73    |
|   | 12/01/2024     | \$57.78   | \$15.00 | \$16.40 | \$0.00                    | \$89.18    |
|   | 06/01/2025     | \$59.08   | \$15.00 | \$16.40 | \$0.00                    | \$90.48    |
|   | 12/01/2025     | \$60.53   | \$15.00 | \$16.40 | \$0.00                    | \$91.93    |
|   | 06/01/2026     | \$61.83   | \$15.00 | \$16.40 | \$0.00                    | \$93.23    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"  |                |           |         |         |                           |            |
| BARCO-TYPE JUMPING TAMPER<br><i>LABORERS - ZONE 1</i>   | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |         |         |                           |            |
| BLOCK PAVER, RAMMER / CURB SETTER<br><i>LABORERS - ZONE 1</i>   | 12/01/2023     | \$45.08   | \$9.65  | \$18.07 | \$0.00                    | \$72.80    |
| For apprentice rates see "Apprentice- LABORER"  |                |           |         |         |                           |            |
| BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023     | \$45.08   | \$9.65  | \$18.07 | \$0.00                    | \$72.80    |
|   | 06/01/2024     | \$46.56   | \$9.65  | \$18.07 | \$0.00                    | \$74.28    |
|   | 12/01/2024     | \$48.03   | \$9.65  | \$18.07 | \$0.00                    | \$75.75    |
|   | 06/01/2025     | \$49.53   | \$9.65  | \$18.07 | \$0.00                    | \$77.25    |
|   | 12/01/2025     | \$51.03   | \$9.65  | \$18.07 | \$0.00                    | \$78.75    |
|   | 06/01/2026     | \$52.58   | \$9.65  | \$18.07 | \$0.00                    | \$80.30    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)                                     |                |           |         |         |                           |            |
| BOILER MAKER<br><i>BOILERMAKERS LOCAL 29</i>  | 01/01/2024     | \$48.12   | \$7.07  | \$20.60 | \$0.00                    | \$75.79    |

Issue Date: 04/01/2024

Wage Request Number: 20240329-047

Page 3 of 41

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 65      | \$31.28              | \$7.07 | \$13.22 | \$0.00                    | \$51.57    |
| 2    | 65      | \$31.28              | \$7.07 | \$13.22 | \$0.00                    | \$51.57    |
| 3    | 70      | \$33.68              | \$7.07 | \$14.23 | \$0.00                    | \$54.98    |
| 4    | 75      | \$36.09              | \$7.07 | \$15.24 | \$0.00                    | \$58.40    |
| 5    | 80      | \$38.50              | \$7.07 | \$16.25 | \$0.00                    | \$61.82    |
| 6    | 85      | \$40.90              | \$7.07 | \$17.28 | \$0.00                    | \$65.25    |
| 7    | 90      | \$43.31              | \$7.07 | \$18.28 | \$0.00                    | \$68.66    |
| 8    | 95      | \$45.71              | \$7.07 | \$19.32 | \$0.00                    | \$72.10    |

Notes:

Apprentice to Journeyworker Ratio:1:4

|  |            |         |         |         |        |          |
|--|------------|---------|---------|---------|--------|----------|
| BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) | 02/01/2024 | \$62.40 | \$11.49 | \$23.59 | \$0.00 | \$97.48  |
| BRICKLAYERS LOCAL 3 (NEWTON)                                 | 08/01/2024 | \$64.50 | \$11.49 | \$23.59 | \$0.00 | \$99.58  |
|  | 02/01/2025 | \$65.80 | \$11.49 | \$23.59 | \$0.00 | \$100.88 |
|  | 08/01/2025 | \$67.95 | \$11.49 | \$23.59 | \$0.00 | \$103.03 |
|  | 02/01/2026 | \$69.30 | \$11.49 | \$23.59 | \$0.00 | \$104.38 |
|  | 08/01/2026 | \$71.50 | \$11.49 | \$23.59 | \$0.00 | \$106.58 |
|  | 02/01/2027 | \$72.90 | \$11.49 | \$23.59 | \$0.00 | \$107.98 |

**Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Newton**

Effective Date - 02/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$31.20              | \$11.49 | \$23.59 | \$0.00                    | \$66.28    |
| 2    | 60      | \$37.44              | \$11.49 | \$23.59 | \$0.00                    | \$72.52    |
| 3    | 70      | \$43.68              | \$11.49 | \$23.59 | \$0.00                    | \$78.76    |
| 4    | 80      | \$49.92              | \$11.49 | \$23.59 | \$0.00                    | \$85.00    |
| 5    | 90      | \$56.16              | \$11.49 | \$23.59 | \$0.00                    | \$91.24    |

Effective Date - 08/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$32.25              | \$11.49 | \$23.59 | \$0.00                    | \$67.33    |
| 2    | 60      | \$38.70              | \$11.49 | \$23.59 | \$0.00                    | \$73.78    |
| 3    | 70      | \$45.15              | \$11.49 | \$23.59 | \$0.00                    | \$80.23    |
| 4    | 80      | \$51.60              | \$11.49 | \$23.59 | \$0.00                    | \$86.68    |
| 5    | 90      | \$58.05              | \$11.49 | \$23.59 | \$0.00                    | \$93.13    |

Notes:

Apprentice to Journeyworker Ratio:1:5

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| BULLDOZER/GRADER/SCRAPER<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023 | \$54.43 | \$15.00 | \$16.40 | \$0.00 | \$85.83 |
|  | 06/01/2024 | \$55.71 | \$15.00 | \$16.40 | \$0.00 | \$87.11 |
|  | 12/01/2024 | \$57.15 | \$15.00 | \$16.40 | \$0.00 | \$88.55 |
|  | 06/01/2025 | \$58.43 | \$15.00 | \$16.40 | \$0.00 | \$89.83 |
|  | 12/01/2025 | \$59.87 | \$15.00 | \$16.40 | \$0.00 | \$91.27 |
|  | 06/01/2026 | \$61.15 | \$15.00 | \$16.40 | \$0.00 | \$92.55 |
|  | 12/01/2026 | \$62.59 | \$15.00 | \$16.40 | \$0.00 | \$93.99 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| CAISSON & UNDERPINNING BOTTOM MAN<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2023 | \$45.48 | \$9.65 | \$18.22 | \$0.00 | \$73.35 |
|  | 06/01/2024 | \$46.96 | \$9.65 | \$18.22 | \$0.00 | \$74.83 |
|  | 12/01/2024 | \$48.43 | \$9.65 | \$18.22 | \$0.00 | \$76.30 |
|  | 06/01/2025 | \$49.93 | \$9.65 | \$18.22 | \$0.00 | \$77.80 |
|  | 12/01/2025 | \$51.43 | \$9.65 | \$18.22 | \$0.00 | \$79.30 |
|  | 06/01/2026 | \$52.98 | \$9.65 | \$18.22 | \$0.00 | \$80.85 |
|  | 12/01/2026 | \$54.48 | \$9.65 | \$18.22 | \$0.00 | \$82.35 |

For apprentice rates see "Apprentice- LABORER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| CAISSON & UNDERPINNING LABORER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2023 | \$44.33 | \$9.65 | \$18.22 | \$0.00 | \$72.20 |
|   | 06/01/2024 | \$45.81 | \$9.65 | \$18.22 | \$0.00 | \$73.68 |
|   | 12/01/2024 | \$47.28 | \$9.65 | \$18.22 | \$0.00 | \$75.15 |
|   | 06/01/2025 | \$48.78 | \$9.65 | \$18.22 | \$0.00 | \$76.65 |
|   | 12/01/2025 | \$50.28 | \$9.65 | \$18.22 | \$0.00 | \$78.15 |
|   | 06/01/2026 | \$51.83 | \$9.65 | \$18.22 | \$0.00 | \$79.70 |
|   | 12/01/2026 | \$53.33 | \$9.65 | \$18.22 | \$0.00 | \$81.20 |

For apprentice rates see "Apprentice- LABORER"

| Classification  | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|--------|---------|---------------------------|------------|
| CAISSON & UNDERPINNING TOP MAN<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2023     | \$44.33   | \$9.65 | \$18.22 | \$0.00                    | \$72.20    |
|   | 06/01/2024     | \$45.81   | \$9.65 | \$18.22 | \$0.00                    | \$73.68    |
|   | 12/01/2024     | \$47.28   | \$9.65 | \$18.22 | \$0.00                    | \$75.15    |
|   | 06/01/2025     | \$48.78   | \$9.65 | \$18.22 | \$0.00                    | \$76.65    |
|   | 12/01/2025     | \$50.28   | \$9.65 | \$18.22 | \$0.00                    | \$78.15    |
|   | 06/01/2026     | \$51.83   | \$9.65 | \$18.22 | \$0.00                    | \$79.70    |
|   | 12/01/2026     | \$53.33   | \$9.65 | \$18.22 | \$0.00                    | \$81.20    |
| For apprentice rates see "Apprentice- LABORER"                            |                |           |        |         |                           |            |
| CARBIDE CORE DRILL OPERATOR<br><i>LABORERS - ZONE 1</i>                   | 12/01/2023     | \$44.58   | \$9.65 | \$18.07 | \$0.00                    | \$72.30    |
| For apprentice rates see "Apprentice- LABORER"                            |                |           |        |         |                           |            |
| CARPENTER<br><i>CARPENTERS - ZONE 2 (Eastern Massachusetts)</i>           | 03/01/2024     | \$47.12   | \$9.83 | \$19.97 | \$0.00                    | \$76.92    |
|   | 09/01/2024     | \$48.37   | \$9.83 | \$19.97 | \$0.00                    | \$78.17    |
|   | 03/01/2025     | \$49.62   | \$9.83 | \$19.97 | \$0.00                    | \$79.42    |
|   | 09/01/2025     | \$50.87   | \$9.83 | \$19.97 | \$0.00                    | \$80.67    |
|   | 03/01/2026     | \$52.12   | \$9.83 | \$19.97 | \$0.00                    | \$81.92    |
|   | 09/01/2026     | \$53.37   | \$9.83 | \$19.97 | \$0.00                    | \$83.17    |
|   | 03/01/2027     | \$54.62   | \$9.83 | \$19.97 | \$0.00                    | \$84.42    |

**Apprentice - CARPENTER - Zone 2 Eastern MA**

Effective Date - 03/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 45      | \$21.20              | \$9.83 | \$1.73  | \$0.00                    | \$32.76    |
| 2    | 45      | \$21.20              | \$9.83 | \$1.73  | \$0.00                    | \$32.76    |
| 3    | 55      | \$25.92              | \$9.83 | \$3.40  | \$0.00                    | \$39.15    |
| 4    | 55      | \$25.92              | \$9.83 | \$3.40  | \$0.00                    | \$39.15    |
| 5    | 70      | \$32.98              | \$9.83 | \$16.51 | \$0.00                    | \$59.32    |
| 6    | 70      | \$32.98              | \$9.83 | \$16.51 | \$0.00                    | \$59.32    |
| 7    | 80      | \$37.70              | \$9.83 | \$18.24 | \$0.00                    | \$65.77    |
| 8    | 80      | \$37.70              | \$9.83 | \$18.24 | \$0.00                    | \$65.77    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 45      | \$21.77              | \$9.83 | \$1.73  | \$0.00                    | \$33.33    |
| 2    | 45      | \$21.77              | \$9.83 | \$1.73  | \$0.00                    | \$33.33    |
| 3    | 55      | \$26.60              | \$9.83 | \$3.40  | \$0.00                    | \$39.83    |
| 4    | 55      | \$26.60              | \$9.83 | \$3.40  | \$0.00                    | \$39.83    |
| 5    | 70      | \$33.86              | \$9.83 | \$16.51 | \$0.00                    | \$60.20    |
| 6    | 70      | \$33.86              | \$9.83 | \$16.51 | \$0.00                    | \$60.20    |
| 7    | 80      | \$38.70              | \$9.83 | \$18.24 | \$0.00                    | \$66.77    |
| 8    | 80      | \$38.70              | \$9.83 | \$18.24 | \$0.00                    | \$66.77    |

Notes:

Apprentice to Journeyworker Ratio:1:5

| Classification   | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|---------------------------|------------|
| CARPENTER WOOD FRAME<br><i>CARPENTERS -ZONE 2 (Wood Frame)</i> | 10/01/2023     | \$30.61   | \$7.02 | \$6.47  | \$0.00                    | \$44.10    |
|  | 10/01/2024     | \$31.91   | \$7.02 | \$6.47  | \$0.00                    | \$45.40    |
|  | 10/01/2025     | \$33.21   | \$7.02 | \$6.47  | \$0.00                    | \$46.70    |
|  | 10/01/2026     | \$34.51   | \$7.02 | \$6.47  | \$0.00                    | \$48.00    |

All Aspects of New Wood Frame Work

**Apprentice - CARPENTER (Wood Frame) - Zone 2**

Effective Date - 10/01/2023

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$15.31              | \$7.02 | \$0.00  | \$0.00                    | \$22.33    |
| 2    | 50      | \$15.31              | \$7.02 | \$0.00  | \$0.00                    | \$22.33    |
| 3    | 55      | \$16.84              | \$7.02 | \$2.00  | \$0.00                    | \$25.86    |
| 4    | 55      | \$16.84              | \$7.02 | \$2.00  | \$0.00                    | \$25.86    |
| 5    | 70      | \$21.43              | \$7.02 | \$6.47  | \$0.00                    | \$34.92    |
| 6    | 70      | \$21.43              | \$7.02 | \$6.47  | \$0.00                    | \$34.92    |
| 7    | 80      | \$24.49              | \$7.02 | \$6.47  | \$0.00                    | \$37.98    |
| 8    | 80      | \$24.49              | \$7.02 | \$6.47  | \$0.00                    | \$37.98    |

Effective Date - 10/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$15.96              | \$7.02 | \$0.00  | \$0.00                    | \$22.98    |
| 2    | 50      | \$15.96              | \$7.02 | \$0.00  | \$0.00                    | \$22.98    |
| 3    | 55      | \$17.55              | \$7.02 | \$2.00  | \$0.00                    | \$26.57    |
| 4    | 55      | \$17.55              | \$7.02 | \$2.00  | \$0.00                    | \$26.57    |
| 5    | 70      | \$22.34              | \$7.02 | \$6.47  | \$0.00                    | \$35.83    |
| 6    | 70      | \$22.34              | \$7.02 | \$6.47  | \$0.00                    | \$35.83    |
| 7    | 80      | \$25.53              | \$7.02 | \$6.47  | \$0.00                    | \$39.02    |
| 8    | 80      | \$25.53              | \$7.02 | \$6.47  | \$0.00                    | \$39.02    |

Notes:

Apprentice to Journeyworker Ratio:1:5

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| CEMENT MASONRY/PLASTERING<br><i>BRICKLAYERS LOCAL 3 (NEWTON)</i> | 01/01/2024 | \$49.33 | \$13.00 | \$23.57 | \$1.30 | \$87.20 |
|--|------------|---------|---------|---------|--------|---------|

Issue Date: 04/01/2024

Wage Request Number: 20240329-047

Page 7 of 41



**Apprentice - CEMENT MASONRY/PLASTERING - Eastern Mass (Newton)**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$24.67              | \$13.00 | \$15.93 | \$0.00                    | \$53.60    |
| 2    | 60      | \$29.60              | \$13.00 | \$18.57 | \$1.30                    | \$62.47    |
| 3    | 65      | \$32.06              | \$13.00 | \$19.57 | \$1.30                    | \$65.93    |
| 4    | 70      | \$34.53              | \$13.00 | \$20.57 | \$1.30                    | \$69.40    |
| 5    | 75      | \$37.00              | \$13.00 | \$21.57 | \$1.30                    | \$72.87    |
| 6    | 80      | \$39.46              | \$13.00 | \$22.57 | \$1.30                    | \$76.33    |
| 7    | 90      | \$44.40              | \$13.00 | \$23.57 | \$1.30                    | \$82.27    |

**Notes:**  
Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

**Apprentice to Journeyworker Ratio:1:3**

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| CHAIN SAW OPERATOR<br><i>LABORERS - ZONE 1</i> | 12/01/2023 | \$44.58 | \$9.65 | \$18.07 | \$0.00 | \$72.30 |
|--|------------|---------|--------|---------|--------|---------|

For apprentice rates see "Apprentice- LABORER"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023 | \$56.13 | \$15.00 | \$16.40 | \$0.00 | \$87.53 |
|   | 06/01/2024 | \$57.45 | \$15.00 | \$16.40 | \$0.00 | \$88.85 |
|   | 12/01/2024 | \$58.93 | \$15.00 | \$16.40 | \$0.00 | \$90.33 |
|   | 06/01/2025 | \$60.26 | \$15.00 | \$16.40 | \$0.00 | \$91.66 |
|   | 12/01/2025 | \$61.73 | \$15.00 | \$16.40 | \$0.00 | \$93.13 |
|   | 06/01/2026 | \$63.06 | \$15.00 | \$16.40 | \$0.00 | \$94.46 |
|   | 12/01/2026 | \$64.54 | \$15.00 | \$16.40 | \$0.00 | \$95.94 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| COMPRESSOR OPERATOR<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023 | \$35.62 | \$15.00 | \$16.40 | \$0.00 | \$67.02 |
|   | 06/01/2024 | \$36.47 | \$15.00 | \$16.40 | \$0.00 | \$67.87 |
|   | 12/01/2024 | \$37.42 | \$15.00 | \$16.40 | \$0.00 | \$68.82 |
|   | 06/01/2025 | \$38.27 | \$15.00 | \$16.40 | \$0.00 | \$69.67 |
|   | 12/01/2025 | \$39.22 | \$15.00 | \$16.40 | \$0.00 | \$70.62 |
|   | 06/01/2026 | \$40.08 | \$15.00 | \$16.40 | \$0.00 | \$71.48 |
|   | 12/01/2026 | \$41.03 | \$15.00 | \$16.40 | \$0.00 | \$72.43 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| DELEADER (BRIDGE)<br><i>PAINTERS LOCAL 35 - ZONE 2</i> | 01/01/2024 | \$56.06 | \$9.95 | \$23.95 | \$0.00 | \$89.96 |
|  | 07/01/2024 | \$57.26 | \$9.95 | \$23.95 | \$0.00 | \$91.16 |
|  | 01/01/2025 | \$58.46 | \$9.95 | \$23.95 | \$0.00 | \$92.36 |

Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$28.03              | \$9.95 | \$0.00  | \$0.00                    | \$37.98    |
| 2    | 55      | \$30.83              | \$9.95 | \$6.66  | \$0.00                    | \$47.44    |
| 3    | 60      | \$33.64              | \$9.95 | \$7.26  | \$0.00                    | \$50.85    |
| 4    | 65      | \$36.44              | \$9.95 | \$7.87  | \$0.00                    | \$54.26    |
| 5    | 70      | \$39.24              | \$9.95 | \$20.32 | \$0.00                    | \$69.51    |
| 6    | 75      | \$42.05              | \$9.95 | \$20.93 | \$0.00                    | \$72.93    |
| 7    | 80      | \$44.85              | \$9.95 | \$21.53 | \$0.00                    | \$76.33    |
| 8    | 90      | \$50.45              | \$9.95 | \$22.74 | \$0.00                    | \$83.14    |

Effective Date - 07/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$28.63              | \$9.95 | \$0.00  | \$0.00                    | \$38.58    |
| 2    | 55      | \$31.49              | \$9.95 | \$6.66  | \$0.00                    | \$48.10    |
| 3    | 60      | \$34.36              | \$9.95 | \$7.26  | \$0.00                    | \$51.57    |
| 4    | 65      | \$37.22              | \$9.95 | \$7.87  | \$0.00                    | \$55.04    |
| 5    | 70      | \$40.08              | \$9.95 | \$20.32 | \$0.00                    | \$70.35    |
| 6    | 75      | \$42.95              | \$9.95 | \$20.93 | \$0.00                    | \$73.83    |
| 7    | 80      | \$45.81              | \$9.95 | \$21.53 | \$0.00                    | \$77.29    |
| 8    | 90      | \$51.53              | \$9.95 | \$22.74 | \$0.00                    | \$84.22    |

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| DEMO: ADZEMAN<br>LABORERS - ZONE 1                        | 12/01/2023 | \$44.48 | \$9.65 | \$18.07 | \$0.00 | \$72.20 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: BACKHOE/LOADER/HAMMER OPERATOR<br>LABORERS - ZONE 1 | 12/01/2023 | \$45.48 | \$9.65 | \$18.07 | \$0.00 | \$73.20 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: BURNERS<br>LABORERS - ZONE 1                        | 12/01/2023 | \$45.23 | \$9.65 | \$18.07 | \$0.00 | \$72.95 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: CONCRETE CUTTER/SAWYER<br>LABORERS - ZONE 1         | 12/01/2023 | \$45.48 | \$9.65 | \$18.07 | \$0.00 | \$73.20 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: JACKHAMMER OPERATOR<br>LABORERS - ZONE 1            | 12/01/2023 | \$45.23 | \$9.65 | \$18.07 | \$0.00 | \$72.95 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |
| DEMO: WRECKING LABORER<br>LABORERS - ZONE 1               | 12/01/2023 | \$44.48 | \$9.65 | \$18.07 | \$0.00 | \$72.20 |
| For apprentice rates see "Apprentice- LABORER"            |            |         |        |         |        |         |

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| DIRECTIONAL DRILL MACHINE OPERATOR<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023     | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|  | 06/01/2024     | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|  | 12/01/2024     | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|  | 06/01/2025     | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|  | 12/01/2025     | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|  | 06/01/2026     | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|  | 12/01/2026     | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"               |                |           |         |         |                           |            |
| DIVER<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i>                            | 08/01/2020     | \$68.70   | \$9.40  | \$23.12 | \$0.00                    | \$101.22   |
| For apprentice rates see "Apprentice- PILE DRIVER"                       |                |           |         |         |                           |            |
| DIVER TENDER<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i>                     | 08/01/2020     | \$49.07   | \$9.40  | \$23.12 | \$0.00                    | \$81.59    |
| For apprentice rates see "Apprentice- PILE DRIVER"                       |                |           |         |         |                           |            |
| DIVER TENDER (EFFLUENT)<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i>          | 08/01/2020     | \$73.60   | \$9.40  | \$23.12 | \$0.00                    | \$106.12   |
| For apprentice rates see "Apprentice- PILE DRIVER"                       |                |           |         |         |                           |            |
| DIVER/SLURRY (EFFLUENT)<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i>          | 08/01/2020     | \$103.05  | \$9.40  | \$23.12 | \$0.00                    | \$135.57   |
| For apprentice rates see "Apprentice- PILE DRIVER"                       |                |           |         |         |                           |            |
| DRAWBRIDGE OPERATOR (Construction)<br><i>DRAWBRIDGE - SEIU LOCAL 888</i> | 07/01/2020     | \$26.77   | \$6.67  | \$3.93  | \$0.16                    | \$37.53    |
| ELECTRICIAN<br><i>ELECTRICIANS LOCAL 103</i>                             | 03/01/2024     | \$61.86   | \$13.00 | \$22.21 | \$0.00                    | \$97.07    |
|  | 09/01/2024     | \$63.78   | \$13.00 | \$22.26 | \$0.00                    | \$99.04    |
|  | 03/01/2025     | \$64.98   | \$13.00 | \$22.30 | \$0.00                    | \$100.28   |
|  | 09/01/2025     | \$66.89   | \$13.00 | \$22.36 | \$0.00                    | \$102.25   |
|  | 03/01/2026     | \$68.09   | \$13.00 | \$22.39 | \$0.00                    | \$103.48   |
|  | 09/01/2026     | \$70.00   | \$13.00 | \$22.45 | \$0.00                    | \$105.45   |
|  | 03/01/2027     | \$71.19   | \$13.00 | \$22.49 | \$0.00                    | \$106.68   |
|  | 09/01/2027     | \$73.11   | \$13.00 | \$22.54 | \$0.00                    | \$108.65   |
|  | 03/01/2028     | \$74.31   | \$13.00 | \$22.58 | \$0.00                    | \$109.89   |

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 03/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 40      | \$24.74              | \$13.00 | \$0.74  | \$0.00                    | \$38.48    |
| 2    | 40      | \$24.74              | \$13.00 | \$0.74  | \$0.00                    | \$38.48    |
| 3    | 45      | \$27.84              | \$13.00 | \$16.67 | \$0.00                    | \$57.51    |
| 4    | 45      | \$27.84              | \$13.00 | \$16.67 | \$0.00                    | \$57.51    |
| 5    | 50      | \$30.93              | \$13.00 | \$17.17 | \$0.00                    | \$61.10    |
| 6    | 55      | \$34.02              | \$13.00 | \$17.67 | \$0.00                    | \$64.69    |
| 7    | 60      | \$37.12              | \$13.00 | \$18.17 | \$0.00                    | \$68.29    |
| 8    | 65      | \$40.21              | \$13.00 | \$18.68 | \$0.00                    | \$71.89    |
| 9    | 70      | \$43.30              | \$13.00 | \$19.18 | \$0.00                    | \$75.48    |
| 10   | 75      | \$46.40              | \$13.00 | \$19.69 | \$0.00                    | \$79.09    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 40      | \$25.51              | \$13.00 | \$0.77  | \$0.00                    | \$39.28    |
| 2    | 40      | \$25.51              | \$13.00 | \$0.77  | \$0.00                    | \$39.28    |
| 3    | 45      | \$28.70              | \$13.00 | \$16.69 | \$0.00                    | \$58.39    |
| 4    | 45      | \$28.70              | \$13.00 | \$16.69 | \$0.00                    | \$58.39    |
| 5    | 50      | \$31.89              | \$13.00 | \$17.20 | \$0.00                    | \$62.09    |
| 6    | 55      | \$35.08              | \$13.00 | \$17.70 | \$0.00                    | \$65.78    |
| 7    | 60      | \$38.27              | \$13.00 | \$18.21 | \$0.00                    | \$69.48    |
| 8    | 65      | \$41.46              | \$13.00 | \$18.71 | \$0.00                    | \$73.17    |
| 9    | 70      | \$44.65              | \$13.00 | \$19.22 | \$0.00                    | \$76.87    |
| 10   | 75      | \$47.84              | \$13.00 | \$19.74 | \$0.00                    | \$80.58    |

Notes: :  
App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3\*\*\*

|   |            |         |         |         |        |          |
|---|------------|---------|---------|---------|--------|----------|
| ELEVATOR CONSTRUCTOR<br>ELEVATOR CONSTRUCTORS LOCAL 4 | 01/01/2022 | \$65.62 | \$16.03 | \$20.21 | \$0.00 | \$101.86 |
|---|------------|---------|---------|---------|--------|----------|

**Apprentice - ELEVATOR CONSTRUCTOR - Local 4**

Effective Date - 01/01/2022

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$32.81              | \$16.03 | \$0.00  | \$0.00                    | \$48.84    |
| 2    | 55      | \$36.09              | \$16.03 | \$20.21 | \$0.00                    | \$72.33    |
| 3    | 65      | \$42.65              | \$16.03 | \$20.21 | \$0.00                    | \$78.89    |
| 4    | 70      | \$45.93              | \$16.03 | \$20.21 | \$0.00                    | \$82.17    |
| 5    | 80      | \$52.50              | \$16.03 | \$20.21 | \$0.00                    | \$88.74    |

**Notes:**  
Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

**Apprentice to Journeyworker Ratio:1:1**

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| ELEVATOR CONSTRUCTOR HELPER<br><i>ELEVATOR CONSTRUCTORS LOCAL 4</i> | 01/01/2022 | \$45.93 | \$16.03 | \$20.21 | \$0.00 | \$82.17 |
|---|------------|---------|---------|---------|--------|---------|

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023 | \$44.58 | \$9.65 | \$18.07 | \$0.00 | \$72.30 |
|  | 06/01/2024 | \$46.06 | \$9.65 | \$18.07 | \$0.00 | \$73.78 |
|  | 12/01/2024 | \$47.53 | \$9.65 | \$18.07 | \$0.00 | \$75.25 |
|  | 06/01/2025 | \$49.03 | \$9.65 | \$18.07 | \$0.00 | \$76.75 |
|  | 12/01/2025 | \$50.53 | \$9.65 | \$18.07 | \$0.00 | \$78.25 |
|  | 06/01/2026 | \$52.08 | \$9.65 | \$18.07 | \$0.00 | \$79.80 |
|  | 12/01/2026 | \$53.58 | \$9.65 | \$18.07 | \$0.00 | \$81.30 |

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY<br><i>OPERATING ENGINEERS LOCAL 4</i> | 11/01/2023 | \$50.30 | \$14.50 | \$16.15 | \$0.00 | \$80.95 |
|   | 05/01/2024 | \$51.54 | \$14.50 | \$16.15 | \$0.00 | \$82.19 |
|   | 11/01/2024 | \$52.83 | \$14.50 | \$16.15 | \$0.00 | \$83.48 |
|   | 05/01/2025 | \$54.27 | \$14.50 | \$16.15 | \$0.00 | \$84.92 |
|   | 11/01/2025 | \$55.56 | \$14.50 | \$16.15 | \$0.00 | \$86.21 |
|   | 05/01/2026 | \$57.00 | \$14.50 | \$16.15 | \$0.00 | \$87.65 |
|   | 11/01/2026 | \$58.29 | \$14.50 | \$16.15 | \$0.00 | \$88.94 |
|   | 05/01/2027 | \$59.72 | \$14.50 | \$16.15 | \$0.00 | \$90.37 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY<br><i>OPERATING ENGINEERS LOCAL 4</i> | 11/01/2023 | \$51.87 | \$14.50 | \$16.15 | \$0.00 | \$82.52 |
|   | 05/01/2024 | \$53.12 | \$14.50 | \$16.15 | \$0.00 | \$83.77 |
|   | 11/01/2024 | \$54.42 | \$14.50 | \$16.15 | \$0.00 | \$85.07 |
|   | 05/01/2025 | \$55.87 | \$14.50 | \$16.15 | \$0.00 | \$86.52 |
|   | 11/01/2025 | \$57.17 | \$14.50 | \$16.15 | \$0.00 | \$87.82 |
|   | 05/01/2026 | \$58.62 | \$14.50 | \$16.15 | \$0.00 | \$89.27 |
|   | 11/01/2026 | \$59.92 | \$14.50 | \$16.15 | \$0.00 | \$90.57 |
|   | 05/01/2027 | \$61.37 | \$14.50 | \$16.15 | \$0.00 | \$92.02 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| FIELD ENG. ROD PERSON-BLDG,SITE,HVY/HWY<br><i>OPERATING ENGINEERS LOCAL 4</i>              | 11/01/2023     | \$24.93   | \$14.50 | \$16.15 | \$0.00                    | \$55.58    |
|  | 05/01/2024     | \$25.66   | \$14.50 | \$16.15 | \$0.00                    | \$56.31    |
|  | 11/01/2024     | \$26.42   | \$14.50 | \$16.15 | \$0.00                    | \$57.07    |
|  | 05/01/2025     | \$27.27   | \$14.50 | \$16.15 | \$0.00                    | \$57.92    |
|  | 11/01/2025     | \$28.03   | \$14.50 | \$16.15 | \$0.00                    | \$58.68    |
|  | 05/01/2026     | \$28.88   | \$14.50 | \$16.15 | \$0.00                    | \$59.53    |
|  | 11/01/2026     | \$29.64   | \$14.50 | \$16.15 | \$0.00                    | \$60.29    |
|  | 05/01/2027     | \$30.49   | \$14.50 | \$16.15 | \$0.00                    | \$61.14    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                                 |                |           |         |         |                           |            |
| FIRE ALARM INSTALLER<br><i>ELECTRICIANS LOCAL 103</i>                                      | 03/01/2024     | \$61.86   | \$13.00 | \$22.21 | \$0.00                    | \$97.07    |
|  | 09/01/2024     | \$63.78   | \$13.00 | \$22.26 | \$0.00                    | \$99.04    |
|  | 03/01/2025     | \$64.98   | \$13.00 | \$22.30 | \$0.00                    | \$100.28   |
|  | 09/01/2025     | \$66.89   | \$13.00 | \$22.36 | \$0.00                    | \$102.25   |
|  | 03/01/2026     | \$68.09   | \$13.00 | \$22.39 | \$0.00                    | \$103.48   |
|  | 09/01/2026     | \$70.00   | \$13.00 | \$22.45 | \$0.00                    | \$105.45   |
|  | 03/01/2027     | \$71.19   | \$13.00 | \$22.49 | \$0.00                    | \$106.68   |
|  | 09/01/2027     | \$73.11   | \$13.00 | \$22.54 | \$0.00                    | \$108.65   |
|  | 03/01/2028     | \$74.31   | \$13.00 | \$22.58 | \$0.00                    | \$109.89   |
| For apprentice rates see "Apprentice- ELECTRICIAN"   |                |           |         |         |                           |            |
| FIRE ALARM REPAIR / MAINTENANCE<br>/ COMMISSIONING <i>ELECTRICIANS</i><br><i>LOCAL 103</i> | 03/01/2024     | \$49.49   | \$13.00 | \$20.19 | \$0.00                    | \$82.68    |
|  | 09/01/2024     | \$51.02   | \$13.00 | \$20.24 | \$0.00                    | \$84.26    |
|  | 03/01/2025     | \$51.98   | \$13.00 | \$20.27 | \$0.00                    | \$85.25    |
|  | 09/01/2025     | \$53.51   | \$13.00 | \$20.32 | \$0.00                    | \$86.83    |
|  | 03/01/2026     | \$54.47   | \$13.00 | \$20.34 | \$0.00                    | \$87.81    |
|  | 09/01/2026     | \$56.00   | \$13.00 | \$20.39 | \$0.00                    | \$89.39    |
|  | 03/01/2027     | \$56.95   | \$13.00 | \$20.42 | \$0.00                    | \$90.37    |
|  | 09/01/2027     | \$58.49   | \$13.00 | \$20.46 | \$0.00                    | \$91.95    |
|  | 03/01/2028     | \$59.45   | \$13.00 | \$20.49 | \$0.00                    | \$92.94    |
| For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"                       |                |           |         |         |                           |            |
| FIREMAN (ASST. ENGINEER)<br><i>OPERATING ENGINEERS LOCAL 4</i>                             | 12/01/2023     | \$44.47   | \$15.00 | \$16.40 | \$0.00                    | \$75.87    |
|  | 06/01/2024     | \$45.53   | \$15.00 | \$16.40 | \$0.00                    | \$76.93    |
|  | 12/01/2024     | \$46.71   | \$15.00 | \$16.40 | \$0.00                    | \$78.11    |
|  | 06/01/2025     | \$47.77   | \$15.00 | \$16.40 | \$0.00                    | \$79.17    |
|  | 12/01/2025     | \$48.94   | \$15.00 | \$16.40 | \$0.00                    | \$80.34    |
|  | 06/01/2026     | \$50.00   | \$15.00 | \$16.40 | \$0.00                    | \$81.40    |
|  | 12/01/2026     | \$51.18   | \$15.00 | \$16.40 | \$0.00                    | \$82.58    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                                 |                |           |         |         |                           |            |
| FLAGGER & SIGNALER (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i>     | 12/01/2023     | \$25.48   | \$9.65  | \$18.07 | \$0.00                    | \$53.20    |
|  | 06/01/2024     | \$26.51   | \$9.65  | \$18.07 | \$0.00                    | \$54.23    |
|  | 12/01/2024     | \$26.51   | \$9.65  | \$18.07 | \$0.00                    | \$54.23    |
|  | 06/01/2025     | \$27.59   | \$9.65  | \$18.07 | \$0.00                    | \$55.31    |
|  | 12/01/2025     | \$27.59   | \$9.65  | \$18.07 | \$0.00                    | \$55.31    |
|  | 06/01/2026     | \$28.71   | \$9.65  | \$18.07 | \$0.00                    | \$56.43    |
|  | 12/01/2026     | \$28.71   | \$9.65  | \$18.07 | \$0.00                    | \$56.43    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"                         |                |           |         |         |                           |            |

| Classification                         | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|---------------------------|------------|
| FLOORCOVERER                           | 03/01/2024     | \$54.73   | \$8.83 | \$20.27 | \$0.00                    | \$83.83    |
| <i>FLOORCOVERERS LOCAL 2168 ZONE I</i> | 09/01/2024     | \$56.23   | \$8.83 | \$20.27 | \$0.00                    | \$85.33    |
|  | 03/01/2025     | \$57.73   | \$8.83 | \$20.27 | \$0.00                    | \$86.83    |
|  | 09/01/2025     | \$59.23   | \$8.83 | \$20.27 | \$0.00                    | \$88.33    |
|  | 03/01/2026     | \$60.73   | \$8.83 | \$20.27 | \$0.00                    | \$89.83    |
|  | 09/01/2026     | \$62.23   | \$8.83 | \$20.27 | \$0.00                    | \$91.33    |
|  | 03/01/2027     | \$63.73   | \$8.83 | \$20.27 | \$0.00                    | \$92.83    |

**Apprentice - FLOORCOVERER - Local 2168 Zone I**

Effective Date - 03/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 45      | \$24.63              | \$8.83 | \$1.76  | \$0.00                    | \$35.22    |
| 2    | 45      | \$24.63              | \$8.83 | \$1.76  | \$0.00                    | \$35.22    |
| 3    | 55      | \$30.10              | \$8.83 | \$3.52  | \$0.00                    | \$42.45    |
| 4    | 55      | \$30.10              | \$8.83 | \$3.52  | \$0.00                    | \$42.45    |
| 5    | 70      | \$38.31              | \$8.83 | \$16.75 | \$0.00                    | \$63.89    |
| 6    | 70      | \$38.31              | \$8.83 | \$16.75 | \$0.00                    | \$63.89    |
| 7    | 80      | \$43.78              | \$8.83 | \$18.51 | \$0.00                    | \$71.12    |
| 8    | 80      | \$43.78              | \$8.83 | \$18.51 | \$0.00                    | \$71.12    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 45      | \$25.30              | \$8.83 | \$1.76  | \$0.00                    | \$35.89    |
| 2    | 45      | \$25.30              | \$8.83 | \$1.76  | \$0.00                    | \$35.89    |
| 3    | 55      | \$30.93              | \$8.83 | \$3.52  | \$0.00                    | \$43.28    |
| 4    | 55      | \$30.93              | \$8.83 | \$3.52  | \$0.00                    | \$43.28    |
| 5    | 70      | \$39.36              | \$8.83 | \$16.75 | \$0.00                    | \$64.94    |
| 6    | 70      | \$39.36              | \$8.83 | \$16.75 | \$0.00                    | \$64.94    |
| 7    | 80      | \$44.98              | \$8.83 | \$18.51 | \$0.00                    | \$72.32    |
| 8    | 80      | \$44.98              | \$8.83 | \$18.51 | \$0.00                    | \$72.32    |

Notes: Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

|                                    |            |         |         |         |        |         |
|------------------------------------|------------|---------|---------|---------|--------|---------|
| FORK LIFT/CHERRY PICKER            | 12/01/2023 | \$55.03 | \$15.00 | \$16.40 | \$0.00 | \$86.43 |
| <i>OPERATING ENGINEERS LOCAL 4</i> | 06/01/2024 | \$56.33 | \$15.00 | \$16.40 | \$0.00 | \$87.73 |
|                                    | 12/01/2024 | \$57.78 | \$15.00 | \$16.40 | \$0.00 | \$89.18 |
|                                    | 06/01/2025 | \$59.08 | \$15.00 | \$16.40 | \$0.00 | \$90.48 |
|                                    | 12/01/2025 | \$60.53 | \$15.00 | \$16.40 | \$0.00 | \$91.93 |
|                                    | 06/01/2026 | \$61.83 | \$15.00 | \$16.40 | \$0.00 | \$93.23 |
|                                    | 12/01/2026 | \$63.28 | \$15.00 | \$16.40 | \$0.00 | \$94.68 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|---------------------------|------------|
| GENERATOR/LIGHTING PLANT/HEATERS<br><i>OPERATING ENGINEERS LOCAL 4</i>                  | 12/01/2023     | \$35.62   | \$15.00 | \$16.40 | \$0.00                    | \$67.02    |
|   | 06/01/2024     | \$36.47   | \$15.00 | \$16.40 | \$0.00                    | \$67.87    |
|   | 12/01/2024     | \$37.42   | \$15.00 | \$16.40 | \$0.00                    | \$68.82    |
|   | 06/01/2025     | \$38.27   | \$15.00 | \$16.40 | \$0.00                    | \$69.67    |
|   | 12/01/2025     | \$39.22   | \$15.00 | \$16.40 | \$0.00                    | \$70.62    |
|   | 06/01/2026     | \$40.08   | \$15.00 | \$16.40 | \$0.00                    | \$71.48    |
|   | 12/01/2026     | \$41.03   | \$15.00 | \$16.40 | \$0.00                    | \$72.43    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                              |                |           |         |         |                           |            |
| GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS)<br><i>GLAZIERS LOCAL 35 (ZONE 2)</i> | 01/01/2024     | \$45.56   | \$9.95  | \$23.95 | \$0.00                    | \$79.46    |
|   | 07/01/2024     | \$46.76   | \$9.95  | \$23.95 | \$0.00                    | \$80.66    |
|   | 01/01/2025     | \$47.96   | \$9.95  | \$23.95 | \$0.00                    | \$81.86    |

**Apprentice - GLAZIER - Local 35 Zone 2**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$22.78              | \$9.95 | \$0.00  | \$0.00                    | \$32.73    |
| 2    | 55      | \$25.06              | \$9.95 | \$6.66  | \$0.00                    | \$41.67    |
| 3    | 60      | \$27.34              | \$9.95 | \$7.26  | \$0.00                    | \$44.55    |
| 4    | 65      | \$29.61              | \$9.95 | \$7.87  | \$0.00                    | \$47.43    |
| 5    | 70      | \$31.89              | \$9.95 | \$20.32 | \$0.00                    | \$62.16    |
| 6    | 75      | \$34.17              | \$9.95 | \$20.93 | \$0.00                    | \$65.05    |
| 7    | 80      | \$36.45              | \$9.95 | \$21.53 | \$0.00                    | \$67.93    |
| 8    | 90      | \$41.00              | \$9.95 | \$22.74 | \$0.00                    | \$73.69    |

Effective Date - 07/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$23.38              | \$9.95 | \$0.00  | \$0.00                    | \$33.33    |
| 2    | 55      | \$25.72              | \$9.95 | \$6.66  | \$0.00                    | \$42.33    |
| 3    | 60      | \$28.06              | \$9.95 | \$7.26  | \$0.00                    | \$45.27    |
| 4    | 65      | \$30.39              | \$9.95 | \$7.87  | \$0.00                    | \$48.21    |
| 5    | 70      | \$32.73              | \$9.95 | \$20.32 | \$0.00                    | \$63.00    |
| 6    | 75      | \$35.07              | \$9.95 | \$20.93 | \$0.00                    | \$65.95    |
| 7    | 80      | \$37.41              | \$9.95 | \$21.53 | \$0.00                    | \$68.89    |
| 8    | 90      | \$42.08              | \$9.95 | \$22.74 | \$0.00                    | \$74.77    |

**Notes:**

Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| HOISTING ENGINEER/CRANES/GRADALLS<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023 | \$55.03 | \$15.00 | \$16.40 | \$0.00 | \$86.43 |
|   | 06/01/2024 | \$56.33 | \$15.00 | \$16.40 | \$0.00 | \$87.73 |
|   | 12/01/2024 | \$57.78 | \$15.00 | \$16.40 | \$0.00 | \$89.18 |
|   | 06/01/2025 | \$59.08 | \$15.00 | \$16.40 | \$0.00 | \$90.48 |
|   | 12/01/2025 | \$60.53 | \$15.00 | \$16.40 | \$0.00 | \$91.93 |
|   | 06/01/2026 | \$61.83 | \$15.00 | \$16.40 | \$0.00 | \$93.23 |
|   | 12/01/2026 | \$63.28 | \$15.00 | \$16.40 | \$0.00 | \$94.68 |

Issue Date: 04/01/2024

Wage Request Number: 20240329-047

Page 15 of 41



**Apprentice - OPERATING ENGINEERS - Local 4**

Effective Date - 12/01/2023

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 55      | \$30.27              | \$15.00 | \$0.00  | \$0.00                    | \$45.27    |
| 2    | 60      | \$33.02              | \$15.00 | \$16.40 | \$0.00                    | \$64.42    |
| 3    | 65      | \$35.77              | \$15.00 | \$16.40 | \$0.00                    | \$67.17    |
| 4    | 70      | \$38.52              | \$15.00 | \$16.40 | \$0.00                    | \$69.92    |
| 5    | 75      | \$41.27              | \$15.00 | \$16.40 | \$0.00                    | \$72.67    |
| 6    | 80      | \$44.02              | \$15.00 | \$16.40 | \$0.00                    | \$75.42    |
| 7    | 85      | \$46.78              | \$15.00 | \$16.40 | \$0.00                    | \$78.18    |
| 8    | 90      | \$49.53              | \$15.00 | \$16.40 | \$0.00                    | \$80.93    |

Effective Date - 06/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 55      | \$30.98              | \$15.00 | \$0.00  | \$0.00                    | \$45.98    |
| 2    | 60      | \$33.80              | \$15.00 | \$16.40 | \$0.00                    | \$65.20    |
| 3    | 65      | \$36.61              | \$15.00 | \$16.40 | \$0.00                    | \$68.01    |
| 4    | 70      | \$39.43              | \$15.00 | \$16.40 | \$0.00                    | \$70.83    |
| 5    | 75      | \$42.25              | \$15.00 | \$16.40 | \$0.00                    | \$73.65    |
| 6    | 80      | \$45.06              | \$15.00 | \$16.40 | \$0.00                    | \$76.46    |
| 7    | 85      | \$47.88              | \$15.00 | \$16.40 | \$0.00                    | \$79.28    |
| 8    | 90      | \$50.70              | \$15.00 | \$16.40 | \$0.00                    | \$82.10    |

Notes:

Apprentice to Journeyworker Ratio:1:6

|                                 |            |         |         |         |        |          |
|---------------------------------|------------|---------|---------|---------|--------|----------|
| HVAC (DUCTWORK)                 | 02/01/2024 | \$57.22 | \$14.59 | \$27.50 | \$2.98 | \$102.29 |
| SHEETMETAL WORKERS LOCAL 17 - A | 08/01/2024 | \$58.97 | \$14.59 | \$27.50 | \$2.98 | \$104.04 |
|                                 | 02/01/2025 | \$60.72 | \$14.59 | \$27.50 | \$2.98 | \$105.79 |
|                                 | 08/01/2025 | \$62.57 | \$14.59 | \$27.50 | \$2.98 | \$107.64 |
|                                 | 02/01/2026 | \$64.52 | \$14.59 | \$27.50 | \$2.98 | \$109.59 |

For apprentice rates see "Apprentice- SHEET METAL WORKER"

|                            |            |         |         |         |        |          |
|----------------------------|------------|---------|---------|---------|--------|----------|
| HVAC (ELECTRICAL CONTROLS) | 03/01/2024 | \$61.86 | \$13.00 | \$22.21 | \$0.00 | \$97.07  |
| ELECTRICIANS LOCAL 103     | 09/01/2024 | \$63.78 | \$13.00 | \$22.26 | \$0.00 | \$99.04  |
|                            | 03/01/2025 | \$64.98 | \$13.00 | \$22.30 | \$0.00 | \$100.28 |
|                            | 09/01/2025 | \$66.89 | \$13.00 | \$22.36 | \$0.00 | \$102.25 |
|                            | 03/01/2026 | \$68.09 | \$13.00 | \$22.39 | \$0.00 | \$103.48 |
|                            | 09/01/2026 | \$70.00 | \$13.00 | \$22.45 | \$0.00 | \$105.45 |
|                            | 03/01/2027 | \$71.19 | \$13.00 | \$22.49 | \$0.00 | \$106.68 |
|                            | 09/01/2027 | \$73.11 | \$13.00 | \$22.54 | \$0.00 | \$108.65 |
|                            | 03/01/2028 | \$74.31 | \$13.00 | \$22.58 | \$0.00 | \$109.89 |

For apprentice rates see "Apprentice- ELECTRICIAN"

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| HVAC (TESTING AND BALANCING - AIR)<br><i>SHEETMETAL WORKERS LOCAL 17 - A</i>         | 02/01/2024     | \$57.22   | \$14.59 | \$27.50 | \$2.98                    | \$102.29   |
|  | 08/01/2024     | \$58.97   | \$14.59 | \$27.50 | \$2.98                    | \$104.04   |
|  | 02/01/2025     | \$60.72   | \$14.59 | \$27.50 | \$2.98                    | \$105.79   |
|  | 08/01/2025     | \$62.57   | \$14.59 | \$27.50 | \$2.98                    | \$107.64   |
|  | 02/01/2026     | \$64.52   | \$14.59 | \$27.50 | \$2.98                    | \$109.59   |
| For apprentice rates see "Apprentice- SHEET METAL WORKER"                            |                |           |         |         |                           |            |
| HVAC (TESTING AND BALANCING -WATER)<br><i>PIPEFITTERS LOCAL 537</i>                  | 03/01/2024     | \$65.28   | \$12.70 | \$21.80 | \$0.00                    | \$99.78    |
|  | 09/01/2024     | \$67.08   | \$12.70 | \$21.80 | \$0.00                    | \$101.58   |
|  | 03/01/2025     | \$68.88   | \$12.70 | \$21.80 | \$0.00                    | \$103.38   |
| For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"            |                |           |         |         |                           |            |
| HVAC MECHANIC<br><i>PIPEFITTERS LOCAL 537</i>  | 03/01/2024     | \$65.28   | \$12.70 | \$21.80 | \$0.00                    | \$99.78    |
|  | 09/01/2024     | \$67.08   | \$12.70 | \$21.80 | \$0.00                    | \$101.58   |
|  | 03/01/2025     | \$68.88   | \$12.70 | \$21.80 | \$0.00                    | \$103.38   |
| For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"            |                |           |         |         |                           |            |
| HYDRAULIC DRILLS<br><i>LABORERS - ZONE 1</i>   | 12/01/2023     | \$45.08   | \$9.65  | \$18.07 | \$0.00                    | \$72.80    |
| For apprentice rates see "Apprentice- LABORER"                                       |                |           |         |         |                           |            |
| HYDRAULIC DRILLS (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023     | \$45.08   | \$9.65  | \$18.07 | \$0.00                    | \$72.80    |
|  | 06/01/2024     | \$46.56   | \$9.65  | \$18.07 | \$0.00                    | \$74.28    |
|  | 12/01/2024     | \$48.03   | \$9.65  | \$18.07 | \$0.00                    | \$75.75    |
|  | 06/01/2025     | \$49.53   | \$9.65  | \$18.07 | \$0.00                    | \$77.25    |
|  | 12/01/2025     | \$51.03   | \$9.65  | \$18.07 | \$0.00                    | \$78.75    |
|  | 06/01/2026     | \$52.58   | \$9.65  | \$18.07 | \$0.00                    | \$80.30    |
|  | 12/01/2026     | \$54.08   | \$9.65  | \$18.07 | \$0.00                    | \$81.80    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"                   |                |           |         |         |                           |            |
| INSULATOR (PIPES & TANKS)<br><i>HEAT &amp; FROST INSULATORS LOCAL 6 (BOSTON)</i>     | 09/01/2023     | \$53.50   | \$14.75 | \$19.61 | \$0.00                    | \$87.86    |
|  | 09/01/2024     | \$56.92   | \$14.75 | \$19.61 | \$0.00                    | \$91.28    |
|  | 09/01/2025     | \$60.34   | \$14.75 | \$19.61 | \$0.00                    | \$94.70    |
|  | 09/01/2026     | \$63.76   | \$14.75 | \$19.61 | \$0.00                    | \$98.12    |

**Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston**

Effective Date - 09/01/2023

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$26.75              | \$14.75 | \$14.32 | \$0.00                    | \$55.82    |
| 2    | 60      | \$32.10              | \$14.75 | \$15.37 | \$0.00                    | \$62.22    |
| 3    | 70      | \$37.45              | \$14.75 | \$16.43 | \$0.00                    | \$68.63    |
| 4    | 80      | \$42.80              | \$14.75 | \$17.49 | \$0.00                    | \$75.04    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$28.46              | \$14.75 | \$14.32 | \$0.00                    | \$57.53    |
| 2    | 60      | \$34.15              | \$14.75 | \$15.37 | \$0.00                    | \$64.27    |
| 3    | 70      | \$39.84              | \$14.75 | \$16.43 | \$0.00                    | \$71.02    |
| 4    | 80      | \$45.54              | \$14.75 | \$17.49 | \$0.00                    | \$77.78    |

Notes:  
Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| IRONWORKER/WELDER<br><i>IRONWORKERS LOCAL 7 (BOSTON AREA)</i> | 03/16/2024 | \$53.97 | \$8.35 | \$26.70 | \$0.00 | \$89.02 |
|---|------------|---------|--------|---------|--------|---------|

**Apprentice - IRONWORKER - Local 7 Boston**

Effective Date - 03/16/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 60      | \$32.38              | \$8.35 | \$26.70 | \$0.00                    | \$67.43    |
| 2    | 70      | \$37.78              | \$8.35 | \$26.70 | \$0.00                    | \$72.83    |
| 3    | 75      | \$40.48              | \$8.35 | \$26.70 | \$0.00                    | \$75.53    |
| 4    | 80      | \$43.18              | \$8.35 | \$26.70 | \$0.00                    | \$78.23    |
| 5    | 85      | \$45.87              | \$8.35 | \$26.70 | \$0.00                    | \$80.92    |
| 6    | 90      | \$48.57              | \$8.35 | \$26.70 | \$0.00                    | \$83.62    |

Notes:

Apprentice to Journeyworker Ratio:1:4

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| JACKHAMMER & PAVING BREAKER OPERATOR<br><i>LABORERS - ZONE 1</i> | 12/01/2023 | \$44.58 | \$9.65 | \$18.07 | \$0.00 | \$72.30 |
|--|------------|---------|--------|---------|--------|---------|

For apprentice rates see "Apprentice- LABORER"

|                                     |            |         |        |         |        |         |
|-------------------------------------|------------|---------|--------|---------|--------|---------|
| LABORER<br><i>LABORERS - ZONE 1</i> | 12/01/2023 | \$44.33 | \$9.65 | \$18.07 | \$0.00 | \$72.05 |
|-------------------------------------|------------|---------|--------|---------|--------|---------|

**Apprentice - LABORER - Zone 1**

Effective Date - 12/01/2023

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 60      | \$26.60              | \$9.65 | \$18.07 | \$0.00                    | \$54.32    |
| 2    | 70      | \$31.03              | \$9.65 | \$18.07 | \$0.00                    | \$58.75    |
| 3    | 80      | \$35.46              | \$9.65 | \$18.07 | \$0.00                    | \$63.18    |
| 4    | 90      | \$39.90              | \$9.65 | \$18.07 | \$0.00                    | \$67.62    |

Notes:

Apprentice to Journeyworker Ratio:1:5

|                                     |            |         |        |         |        |         |
|-------------------------------------|------------|---------|--------|---------|--------|---------|
| LABORER (HEAVY & HIGHWAY)           | 12/01/2023 | \$44.33 | \$9.65 | \$18.07 | \$0.00 | \$72.05 |
| LABORERS - ZONE 1 (HEAVY & HIGHWAY) | 06/01/2024 | \$45.81 | \$9.65 | \$18.07 | \$0.00 | \$73.53 |
|                                     | 12/01/2024 | \$47.28 | \$9.65 | \$18.07 | \$0.00 | \$75.00 |
|                                     | 06/01/2025 | \$48.78 | \$9.65 | \$18.07 | \$0.00 | \$76.50 |
|                                     | 12/01/2025 | \$50.28 | \$9.65 | \$18.07 | \$0.00 | \$78.00 |
|                                     | 06/01/2026 | \$51.83 | \$9.65 | \$18.07 | \$0.00 | \$79.55 |
|                                     | 12/01/2026 | \$53.33 | \$9.65 | \$18.07 | \$0.00 | \$81.05 |

**Apprentice - LABORER (Heavy & Highway) - Zone 1**

Effective Date - 12/01/2023

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 60      | \$26.60              | \$9.65 | \$18.07 | \$0.00                    | \$54.32    |
| 2    | 70      | \$31.03              | \$9.65 | \$18.07 | \$0.00                    | \$58.75    |
| 3    | 80      | \$35.46              | \$9.65 | \$18.07 | \$0.00                    | \$63.18    |
| 4    | 90      | \$39.90              | \$9.65 | \$18.07 | \$0.00                    | \$67.62    |

Effective Date - 06/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 60      | \$27.49              | \$9.65 | \$18.07 | \$0.00                    | \$55.21    |
| 2    | 70      | \$32.07              | \$9.65 | \$18.07 | \$0.00                    | \$59.79    |
| 3    | 80      | \$36.65              | \$9.65 | \$18.07 | \$0.00                    | \$64.37    |
| 4    | 90      | \$41.23              | \$9.65 | \$18.07 | \$0.00                    | \$68.95    |

Notes:

Apprentice to Journeyworker Ratio:1:5

|                           |            |         |        |         |        |         |
|---------------------------|------------|---------|--------|---------|--------|---------|
| LABORER: CARPENTER TENDER | 12/01/2023 | \$44.33 | \$9.65 | \$18.07 | \$0.00 | \$72.05 |
| LABORERS - ZONE 1         |            |         |        |         |        |         |

For apprentice rates see "Apprentice- LABORER"

|                                 |            |         |        |         |        |         |
|---------------------------------|------------|---------|--------|---------|--------|---------|
| LABORER: CEMENT FINISHER TENDER | 12/01/2023 | \$44.33 | \$9.65 | \$18.07 | \$0.00 | \$72.05 |
| LABORERS - ZONE 1               |            |         |        |         |        |         |

For apprentice rates see "Apprentice- LABORER"

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER<br><i>LABORERS - ZONE 1</i>  | 12/01/2023     | \$44.48   | \$9.65  | \$18.07 | \$0.00                    | \$72.20    |
| For apprentice rates see "Apprentice- LABORER"   |                |           |         |         |                           |            |
| LABORER: MASON TENDER<br><i>LABORERS - ZONE 1</i>  | 06/01/2023     | \$43.83   | \$9.40  | \$17.82 | \$0.00                    | \$71.05    |
|  | 06/01/2024     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
| For apprentice rates see "Apprentice- LABORER"   |                |           |         |         |                           |            |
| LABORER: MASON TENDER (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i>  | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
|  | 06/01/2024     | \$46.06   | \$9.65  | \$18.07 | \$0.00                    | \$73.78    |
|  | 12/01/2024     | \$47.53   | \$9.65  | \$18.07 | \$0.00                    | \$75.25    |
|  | 06/01/2025     | \$49.03   | \$9.65  | \$18.07 | \$0.00                    | \$76.75    |
|  | 12/01/2025     | \$50.53   | \$9.65  | \$18.07 | \$0.00                    | \$78.25    |
|  | 06/01/2026     | \$52.08   | \$9.65  | \$18.07 | \$0.00                    | \$79.80    |
|  | 12/01/2026     | \$53.58   | \$9.65  | \$18.07 | \$0.00                    | \$81.30    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"   |                |           |         |         |                           |            |
| LABORER: MULTI-TRADE TENDER<br><i>LABORERS - ZONE 1</i>  | 12/01/2023     | \$44.33   | \$9.65  | \$18.07 | \$0.00                    | \$72.05    |
| For apprentice rates see "Apprentice- LABORER"   |                |           |         |         |                           |            |
| LABORER: TREE REMOVER<br><i>LABORERS - ZONE 1</i>  | 12/01/2023     | \$44.33   | \$9.65  | \$18.07 | \$0.00                    | \$72.05    |
| This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER" |                |           |         |         |                           |            |
| LASER BEAM OPERATOR<br><i>LABORERS - ZONE 1</i>  | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
| For apprentice rates see "Apprentice- LABORER"   |                |           |         |         |                           |            |
| LASER BEAM OPERATOR (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i>  | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
|  | 06/01/2024     | \$46.06   | \$9.65  | \$18.07 | \$0.00                    | \$73.78    |
|  | 12/01/2024     | \$47.53   | \$9.65  | \$18.07 | \$0.00                    | \$75.25    |
|  | 06/01/2025     | \$49.03   | \$9.65  | \$18.07 | \$0.00                    | \$76.75    |
|  | 12/01/2025     | \$50.53   | \$9.65  | \$18.07 | \$0.00                    | \$78.25    |
|  | 06/01/2026     | \$52.08   | \$9.65  | \$18.07 | \$0.00                    | \$79.80    |
|  | 12/01/2026     | \$53.58   | \$9.65  | \$18.07 | \$0.00                    | \$81.30    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"   |                |           |         |         |                           |            |
| MARBLE & TILE FINISHERS<br><i>BRICKLAYERS LOCAL 3 - MARBLE &amp; TILE</i>  | 02/01/2024     | \$47.89   | \$11.49 | \$21.37 | \$0.00                    | \$80.75    |
|  | 08/01/2024     | \$49.57   | \$11.49 | \$21.37 | \$0.00                    | \$82.43    |
|  | 02/01/2025     | \$50.61   | \$11.49 | \$21.37 | \$0.00                    | \$83.47    |
|  | 08/01/2025     | \$52.33   | \$11.49 | \$21.37 | \$0.00                    | \$85.19    |
|  | 02/01/2026     | \$53.41   | \$11.49 | \$21.37 | \$0.00                    | \$86.27    |
|  | 08/01/2026     | \$55.17   | \$11.49 | \$21.37 | \$0.00                    | \$88.03    |
|  | 02/01/2027     | \$56.29   | \$11.49 | \$21.37 | \$0.00                    | \$89.15    |

**Apprentice - MARBLE & TILE FINISHER - Local 3 Marble & Tile**

Effective Date - 02/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$23.95              | \$11.49 | \$21.37 | \$0.00                    | \$56.81    |
| 2    | 60      | \$28.73              | \$11.49 | \$21.37 | \$0.00                    | \$61.59    |
| 3    | 70      | \$33.52              | \$11.49 | \$21.37 | \$0.00                    | \$66.38    |
| 4    | 80      | \$38.31              | \$11.49 | \$21.37 | \$0.00                    | \$71.17    |
| 5    | 90      | \$43.10              | \$11.49 | \$21.37 | \$0.00                    | \$75.96    |

Effective Date - 08/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$24.79              | \$11.49 | \$21.37 | \$0.00                    | \$57.65    |
| 2    | 60      | \$29.74              | \$11.49 | \$21.37 | \$0.00                    | \$62.60    |
| 3    | 70      | \$34.70              | \$11.49 | \$21.37 | \$0.00                    | \$67.56    |
| 4    | 80      | \$39.66              | \$11.49 | \$21.37 | \$0.00                    | \$72.52    |
| 5    | 90      | \$44.61              | \$11.49 | \$21.37 | \$0.00                    | \$77.47    |

Notes:

Apprentice to Journeyworker Ratio:1:3

| Classification                           | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| MARBLE MASONS,TILELAYERS & TERRAZZO MECH | 02/01/2024     | \$62.42   | \$11.49 | \$23.56 | \$0.00                    | \$97.47    |
| BRICKLAYERS LOCAL 3 - MARBLE & TILE      | 08/01/2024     | \$64.52   | \$11.49 | \$23.56 | \$0.00                    | \$99.57    |
|  | 02/01/2025     | \$65.82   | \$11.49 | \$23.56 | \$0.00                    | \$100.87   |
|  | 08/01/2025     | \$67.97   | \$11.49 | \$23.56 | \$0.00                    | \$103.02   |
|  | 02/01/2026     | \$69.32   | \$11.49 | \$23.56 | \$0.00                    | \$104.37   |
|  | 08/01/2026     | \$71.52   | \$11.49 | \$23.56 | \$0.00                    | \$106.57   |
|  | 02/01/2027     | \$72.92   | \$11.49 | \$23.56 | \$0.00                    | \$107.97   |

**Apprentice - MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile**

Effective Date - 02/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$31.21              | \$11.49 | \$23.56 | \$0.00                    | \$66.26    |
| 2    | 60      | \$37.45              | \$11.49 | \$23.56 | \$0.00                    | \$72.50    |
| 3    | 70      | \$43.69              | \$11.49 | \$23.56 | \$0.00                    | \$78.74    |
| 4    | 80      | \$49.94              | \$11.49 | \$23.56 | \$0.00                    | \$84.99    |
| 5    | 90      | \$56.18              | \$11.49 | \$23.56 | \$0.00                    | \$91.23    |

Effective Date - 08/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$32.26              | \$11.49 | \$23.56 | \$0.00                    | \$67.31    |
| 2    | 60      | \$38.71              | \$11.49 | \$23.56 | \$0.00                    | \$73.76    |
| 3    | 70      | \$45.16              | \$11.49 | \$23.56 | \$0.00                    | \$80.21    |
| 4    | 80      | \$51.62              | \$11.49 | \$23.56 | \$0.00                    | \$86.67    |
| 5    | 90      | \$58.07              | \$11.49 | \$23.56 | \$0.00                    | \$93.12    |

Notes:

Apprentice to Journeyworker Ratio:1:5

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| MECH. SWEEPER OPERATOR (ON CONST. SITES)<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023 | \$54.43 | \$15.00 | \$16.40 | \$0.00 | \$85.83 |
|  | 06/01/2024 | \$55.71 | \$15.00 | \$16.40 | \$0.00 | \$87.11 |
|  | 12/01/2024 | \$57.15 | \$15.00 | \$16.40 | \$0.00 | \$88.55 |
|  | 06/01/2025 | \$58.43 | \$15.00 | \$16.40 | \$0.00 | \$89.83 |
|  | 12/01/2025 | \$59.87 | \$15.00 | \$16.40 | \$0.00 | \$91.27 |
|  | 06/01/2026 | \$61.15 | \$15.00 | \$16.40 | \$0.00 | \$92.55 |
|  | 12/01/2026 | \$62.59 | \$15.00 | \$16.40 | \$0.00 | \$93.99 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                     |            |         |         |         |        |         |
| MECHANICS MAINTENANCE<br><i>OPERATING ENGINEERS LOCAL 4</i>                    | 12/01/2023 | \$54.43 | \$15.00 | \$16.40 | \$0.00 | \$85.83 |
|  | 06/01/2024 | \$55.71 | \$15.00 | \$16.40 | \$0.00 | \$87.11 |
|  | 12/01/2024 | \$57.15 | \$15.00 | \$16.40 | \$0.00 | \$88.55 |
|  | 06/01/2025 | \$58.43 | \$15.00 | \$16.40 | \$0.00 | \$89.83 |
|  | 12/01/2025 | \$59.87 | \$15.00 | \$16.40 | \$0.00 | \$91.27 |
|  | 06/01/2026 | \$61.15 | \$15.00 | \$16.40 | \$0.00 | \$92.55 |
|  | 12/01/2026 | \$62.59 | \$15.00 | \$16.40 | \$0.00 | \$93.99 |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                     |            |         |         |         |        |         |
| MILLWRIGHT (Zone 1)<br><i>MILLWRIGHTS LOCAL 1121 - Zone 1</i>                  | 01/01/2024 | \$48.03 | \$10.08 | \$21.72 | \$0.00 | \$79.83 |
|  | 01/06/2025 | \$50.53 | \$10.08 | \$21.72 | \$0.00 | \$82.33 |
|  | 01/05/2026 | \$53.03 | \$10.08 | \$21.72 | \$0.00 | \$84.83 |

**Apprentice - MILLWRIGHT - Local 1121 Zone 1**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 55      | \$26.42              | \$10.08 | \$5.64  | \$0.00                    | \$42.14    |
| 2    | 65      | \$31.22              | \$10.08 | \$6.66  | \$0.00                    | \$47.96    |
| 3    | 75      | \$36.02              | \$10.08 | \$19.16 | \$0.00                    | \$65.26    |
| 4    | 85      | \$40.83              | \$10.08 | \$20.18 | \$0.00                    | \$71.09    |

Effective Date - 01/06/2025

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 55      | \$27.79              | \$10.08 | \$5.64  | \$0.00                    | \$43.51    |
| 2    | 65      | \$32.84              | \$10.08 | \$6.66  | \$0.00                    | \$49.58    |
| 3    | 75      | \$37.90              | \$10.08 | \$19.16 | \$0.00                    | \$67.14    |
| 4    | 85      | \$42.95              | \$10.08 | \$20.18 | \$0.00                    | \$73.21    |

Notes: Step 1&2 Appr. indentured after 1/6/2020 receive no pension, but do receive annuity. (Step 1 \$5.72, Step 2 \$6.66)  
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:4

|                                   |            |         |        |         |        |         |
|-----------------------------------|------------|---------|--------|---------|--------|---------|
| MORTAR MIXER<br>LABORERS - ZONE 1 | 12/01/2023 | \$44.58 | \$9.65 | \$18.07 | \$0.00 | \$72.30 |
|-----------------------------------|------------|---------|--------|---------|--------|---------|

For apprentice rates see "Apprentice- LABORER"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| OILER (OTHER THAN TRUCK CRANES,GRADALLS)<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2023 | \$24.41 | \$15.00 | \$16.40 | \$0.00 | \$55.81 |
|   | 06/01/2024 | \$25.01 | \$15.00 | \$16.40 | \$0.00 | \$56.41 |
|   | 12/01/2024 | \$25.67 | \$15.00 | \$16.40 | \$0.00 | \$57.07 |
|   | 06/01/2025 | \$26.27 | \$15.00 | \$16.40 | \$0.00 | \$57.67 |
|   | 12/01/2025 | \$26.93 | \$15.00 | \$16.40 | \$0.00 | \$58.33 |
|   | 06/01/2026 | \$27.52 | \$15.00 | \$16.40 | \$0.00 | \$58.92 |
|   | 12/01/2026 | \$28.19 | \$15.00 | \$16.40 | \$0.00 | \$59.59 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| OILER (TRUCK CRANES, GRADALLS)<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2023 | \$29.86 | \$15.00 | \$16.40 | \$0.00 | \$61.26 |
|   | 06/01/2024 | \$30.58 | \$15.00 | \$16.40 | \$0.00 | \$61.98 |
|   | 12/01/2024 | \$31.38 | \$15.00 | \$16.40 | \$0.00 | \$62.78 |
|   | 06/01/2025 | \$32.10 | \$15.00 | \$16.40 | \$0.00 | \$63.50 |
|   | 12/01/2025 | \$32.90 | \$15.00 | \$16.40 | \$0.00 | \$64.30 |
|   | 06/01/2026 | \$33.62 | \$15.00 | \$16.40 | \$0.00 | \$65.02 |
|   | 12/01/2026 | \$34.42 | \$15.00 | \$16.40 | \$0.00 | \$65.82 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| OTHER POWER DRIVEN EQUIPMENT - CLASS II<br>OPERATING ENGINEERS LOCAL 4 | 12/01/2023 | \$54.43 | \$15.00 | \$16.40 | \$0.00 | \$85.83 |
|  | 06/01/2024 | \$55.71 | \$15.00 | \$16.40 | \$0.00 | \$87.11 |
|  | 12/01/2024 | \$57.15 | \$15.00 | \$16.40 | \$0.00 | \$88.55 |
|  | 06/01/2025 | \$58.43 | \$15.00 | \$16.40 | \$0.00 | \$89.83 |
|  | 12/01/2025 | \$59.87 | \$15.00 | \$16.40 | \$0.00 | \$91.27 |
|  | 06/01/2026 | \$61.15 | \$15.00 | \$16.40 | \$0.00 | \$92.55 |
|  | 12/01/2026 | \$62.59 | \$15.00 | \$16.40 | \$0.00 | \$93.99 |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"



| Classification   | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|--------|---------|---------------------------|------------|
| PAINTER (BRIDGES/TANKS)<br><i>PAINTERS LOCAL 35 - ZONE 2</i> | 01/01/2024     | \$56.06   | \$9.95 | \$23.95 | \$0.00                    | \$89.96    |
|  | 07/01/2024     | \$57.26   | \$9.95 | \$23.95 | \$0.00                    | \$91.16    |
|  | 01/01/2025     | \$58.46   | \$9.95 | \$23.95 | \$0.00                    | \$92.36    |

**Apprentice - PAINTER Local 35 - BRIDGES/TANKS**

**Effective Date - 01/01/2024**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$28.03              | \$9.95 | \$0.00  | \$0.00                    | \$37.98    |
| 2    | 55      | \$30.83              | \$9.95 | \$6.66  | \$0.00                    | \$47.44    |
| 3    | 60      | \$33.64              | \$9.95 | \$7.26  | \$0.00                    | \$50.85    |
| 4    | 65      | \$36.44              | \$9.95 | \$7.87  | \$0.00                    | \$54.26    |
| 5    | 70      | \$39.24              | \$9.95 | \$20.32 | \$0.00                    | \$69.51    |
| 6    | 75      | \$42.05              | \$9.95 | \$20.93 | \$0.00                    | \$72.93    |
| 7    | 80      | \$44.85              | \$9.95 | \$21.53 | \$0.00                    | \$76.33    |
| 8    | 90      | \$50.45              | \$9.95 | \$22.74 | \$0.00                    | \$83.14    |

**Effective Date - 07/01/2024**

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$28.63              | \$9.95 | \$0.00  | \$0.00                    | \$38.58    |
| 2    | 55      | \$31.49              | \$9.95 | \$6.66  | \$0.00                    | \$48.10    |
| 3    | 60      | \$34.36              | \$9.95 | \$7.26  | \$0.00                    | \$51.57    |
| 4    | 65      | \$37.22              | \$9.95 | \$7.87  | \$0.00                    | \$55.04    |
| 5    | 70      | \$40.08              | \$9.95 | \$20.32 | \$0.00                    | \$70.35    |
| 6    | 75      | \$42.95              | \$9.95 | \$20.93 | \$0.00                    | \$73.83    |
| 7    | 80      | \$45.81              | \$9.95 | \$21.53 | \$0.00                    | \$77.29    |
| 8    | 90      | \$51.53              | \$9.95 | \$22.74 | \$0.00                    | \$84.22    |

**Notes:**  
Steps are 750 hrs.

**Apprentice to Journeyworker Ratio:1:1**

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| PAINTER (SPRAY OR SANDBLAST, NEW) *   | 01/01/2024 | \$46.96 | \$9.95 | \$23.95 | \$0.00 | \$80.86 |
| * If 30% or more of surfaces to be painted are new construction,<br>NEW paint rate shall be used. <i>PAINTERS LOCAL 35 - ZONE 2</i> | 07/01/2024 | \$48.16 | \$9.95 | \$23.95 | \$0.00 | \$82.06 |
|   | 01/01/2025 | \$49.36 | \$9.95 | \$23.95 | \$0.00 | \$83.26 |

**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - New**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$23.48              | \$9.95 | \$0.00  | \$0.00                    | \$33.43    |
| 2    | 55      | \$25.83              | \$9.95 | \$6.66  | \$0.00                    | \$42.44    |
| 3    | 60      | \$28.18              | \$9.95 | \$7.26  | \$0.00                    | \$45.39    |
| 4    | 65      | \$30.52              | \$9.95 | \$7.87  | \$0.00                    | \$48.34    |
| 5    | 70      | \$32.87              | \$9.95 | \$20.32 | \$0.00                    | \$63.14    |
| 6    | 75      | \$35.22              | \$9.95 | \$20.93 | \$0.00                    | \$66.10    |
| 7    | 80      | \$37.57              | \$9.95 | \$21.53 | \$0.00                    | \$69.05    |
| 8    | 90      | \$42.26              | \$9.95 | \$22.74 | \$0.00                    | \$74.95    |

Effective Date - 07/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$24.08              | \$9.95 | \$0.00  | \$0.00                    | \$34.03    |
| 2    | 55      | \$26.49              | \$9.95 | \$6.66  | \$0.00                    | \$43.10    |
| 3    | 60      | \$28.90              | \$9.95 | \$7.26  | \$0.00                    | \$46.11    |
| 4    | 65      | \$31.30              | \$9.95 | \$7.87  | \$0.00                    | \$49.12    |
| 5    | 70      | \$33.71              | \$9.95 | \$20.32 | \$0.00                    | \$63.98    |
| 6    | 75      | \$36.12              | \$9.95 | \$20.93 | \$0.00                    | \$67.00    |
| 7    | 80      | \$38.53              | \$9.95 | \$21.53 | \$0.00                    | \$70.01    |
| 8    | 90      | \$43.34              | \$9.95 | \$22.74 | \$0.00                    | \$76.03    |

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

|                                       |            |         |        |         |        |         |
|---------------------------------------|------------|---------|--------|---------|--------|---------|
| PAINTER (SPRAY OR SANDBLAST, REPAINT) | 01/01/2024 | \$45.02 | \$9.95 | \$23.95 | \$0.00 | \$78.92 |
| PAINTERS LOCAL 35 - ZONE 2            | 07/01/2024 | \$46.22 | \$9.95 | \$23.95 | \$0.00 | \$80.12 |
|                                       | 01/01/2025 | \$47.42 | \$9.95 | \$23.95 | \$0.00 | \$81.32 |

**Apprentice - PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$22.51              | \$9.95 | \$0.00  | \$0.00                    | \$32.46    |
| 2    | 55      | \$24.76              | \$9.95 | \$6.66  | \$0.00                    | \$41.37    |
| 3    | 60      | \$27.01              | \$9.95 | \$7.26  | \$0.00                    | \$44.22    |
| 4    | 65      | \$29.26              | \$9.95 | \$7.87  | \$0.00                    | \$47.08    |
| 5    | 70      | \$31.51              | \$9.95 | \$20.32 | \$0.00                    | \$61.78    |
| 6    | 75      | \$33.77              | \$9.95 | \$20.93 | \$0.00                    | \$64.65    |
| 7    | 80      | \$36.02              | \$9.95 | \$21.53 | \$0.00                    | \$67.50    |
| 8    | 90      | \$40.52              | \$9.95 | \$22.74 | \$0.00                    | \$73.21    |

Effective Date - 07/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$23.11              | \$9.95 | \$0.00  | \$0.00                    | \$33.06    |
| 2    | 55      | \$25.42              | \$9.95 | \$6.66  | \$0.00                    | \$42.03    |
| 3    | 60      | \$27.73              | \$9.95 | \$7.26  | \$0.00                    | \$44.94    |
| 4    | 65      | \$30.04              | \$9.95 | \$7.87  | \$0.00                    | \$47.86    |
| 5    | 70      | \$32.35              | \$9.95 | \$20.32 | \$0.00                    | \$62.62    |
| 6    | 75      | \$34.67              | \$9.95 | \$20.93 | \$0.00                    | \$65.55    |
| 7    | 80      | \$36.98              | \$9.95 | \$21.53 | \$0.00                    | \$68.46    |
| 8    | 90      | \$41.60              | \$9.95 | \$22.74 | \$0.00                    | \$74.29    |

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| PAINTER / TAPER (BRUSH, NEW) *  | 01/01/2024 | \$45.56 | \$9.95 | \$23.95 | \$0.00 | \$79.46 |
| * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used. PAINTERS LOCAL 35 - ZONE 2 | 07/01/2024 | \$46.76 | \$9.95 | \$23.95 | \$0.00 | \$80.66 |
|   | 01/01/2025 | \$47.96 | \$9.95 | \$23.95 | \$0.00 | \$81.86 |

**Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$22.78              | \$9.95 | \$0.00  | \$0.00                    | \$32.73    |
| 2    | 55      | \$25.06              | \$9.95 | \$6.66  | \$0.00                    | \$41.67    |
| 3    | 60      | \$27.34              | \$9.95 | \$7.26  | \$0.00                    | \$44.55    |
| 4    | 65      | \$29.61              | \$9.95 | \$7.87  | \$0.00                    | \$47.43    |
| 5    | 70      | \$31.89              | \$9.95 | \$20.32 | \$0.00                    | \$62.16    |
| 6    | 75      | \$34.17              | \$9.95 | \$20.93 | \$0.00                    | \$65.05    |
| 7    | 80      | \$36.45              | \$9.95 | \$21.53 | \$0.00                    | \$67.93    |
| 8    | 90      | \$41.00              | \$9.95 | \$22.74 | \$0.00                    | \$73.69    |

Effective Date - 07/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$23.38              | \$9.95 | \$0.00  | \$0.00                    | \$33.33    |
| 2    | 55      | \$25.72              | \$9.95 | \$6.66  | \$0.00                    | \$42.33    |
| 3    | 60      | \$28.06              | \$9.95 | \$7.26  | \$0.00                    | \$45.27    |
| 4    | 65      | \$30.39              | \$9.95 | \$7.87  | \$0.00                    | \$48.21    |
| 5    | 70      | \$32.73              | \$9.95 | \$20.32 | \$0.00                    | \$63.00    |
| 6    | 75      | \$35.07              | \$9.95 | \$20.93 | \$0.00                    | \$65.95    |
| 7    | 80      | \$37.41              | \$9.95 | \$21.53 | \$0.00                    | \$68.89    |
| 8    | 90      | \$42.08              | \$9.95 | \$22.74 | \$0.00                    | \$74.77    |

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

|                                  |            |         |        |         |        |         |
|----------------------------------|------------|---------|--------|---------|--------|---------|
| PAINTER / TAPER (BRUSH, REPAINT) | 01/01/2024 | \$43.62 | \$9.95 | \$23.95 | \$0.00 | \$77.52 |
| PAINTERS LOCAL 35 - ZONE 2       | 07/01/2024 | \$44.82 | \$9.95 | \$23.95 | \$0.00 | \$78.72 |
|                                  | 01/01/2025 | \$46.02 | \$9.95 | \$23.95 | \$0.00 | \$79.92 |

**Apprentice - PAINTER Local 35 Zone 2 - BRUSH REPAINT**

Effective Date - 01/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$21.81              | \$9.95 | \$0.00  | \$0.00                    | \$31.76    |
| 2    | 55      | \$23.99              | \$9.95 | \$6.66  | \$0.00                    | \$40.60    |
| 3    | 60      | \$26.17              | \$9.95 | \$7.26  | \$0.00                    | \$43.38    |
| 4    | 65      | \$28.35              | \$9.95 | \$7.87  | \$0.00                    | \$46.17    |
| 5    | 70      | \$30.53              | \$9.95 | \$20.32 | \$0.00                    | \$60.80    |
| 6    | 75      | \$32.72              | \$9.95 | \$20.93 | \$0.00                    | \$63.60    |
| 7    | 80      | \$34.90              | \$9.95 | \$21.53 | \$0.00                    | \$66.38    |
| 8    | 90      | \$39.26              | \$9.95 | \$22.74 | \$0.00                    | \$71.95    |

Effective Date - 07/01/2024

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$22.41              | \$9.95 | \$0.00  | \$0.00                    | \$32.36    |
| 2    | 55      | \$24.65              | \$9.95 | \$6.66  | \$0.00                    | \$41.26    |
| 3    | 60      | \$26.89              | \$9.95 | \$7.26  | \$0.00                    | \$44.10    |
| 4    | 65      | \$29.13              | \$9.95 | \$7.87  | \$0.00                    | \$46.95    |
| 5    | 70      | \$31.37              | \$9.95 | \$20.32 | \$0.00                    | \$61.64    |
| 6    | 75      | \$33.62              | \$9.95 | \$20.93 | \$0.00                    | \$64.50    |
| 7    | 80      | \$35.86              | \$9.95 | \$21.53 | \$0.00                    | \$67.34    |
| 8    | 90      | \$40.34              | \$9.95 | \$22.74 | \$0.00                    | \$73.03    |

Notes:  
Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY)                          | 12/01/2023 | \$44.33 | \$9.65  | \$18.07 | \$0.00 | \$72.05 |
| LABORERS - ZONE 1 (HEAVY & HIGHWAY)                               | 06/01/2024 | \$45.81 | \$9.65  | \$18.07 | \$0.00 | \$73.53 |
|   | 12/01/2024 | \$47.28 | \$9.65  | \$18.07 | \$0.00 | \$75.00 |
|   | 06/01/2025 | \$48.78 | \$9.65  | \$18.07 | \$0.00 | \$76.50 |
|   | 12/01/2025 | \$50.28 | \$9.65  | \$18.07 | \$0.00 | \$78.00 |
|   | 06/01/2026 | \$51.83 | \$9.65  | \$18.07 | \$0.00 | \$79.55 |
|   | 12/01/2026 | \$53.33 | \$9.65  | \$18.07 | \$0.00 | \$81.05 |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway) |            |         |         |         |        |         |
| PANEL & PICKUP TRUCKS DRIVER                                      | 12/01/2023 | \$39.88 | \$14.41 | \$18.67 | \$0.00 | \$72.96 |
| TEAMSTERS JOINT COUNCIL NO. 10 ZONE A                             | 06/01/2024 | \$40.88 | \$14.41 | \$18.67 | \$0.00 | \$73.96 |
|   | 08/01/2024 | \$40.88 | \$14.91 | \$18.67 | \$0.00 | \$74.46 |
|   | 12/01/2024 | \$40.88 | \$14.91 | \$20.17 | \$0.00 | \$75.96 |
|   | 06/01/2025 | \$41.88 | \$14.91 | \$20.17 | \$0.00 | \$76.96 |
|   | 08/01/2025 | \$41.88 | \$15.41 | \$20.17 | \$0.00 | \$77.46 |
|   | 12/01/2025 | \$41.88 | \$15.41 | \$21.78 | \$0.00 | \$79.07 |
|   | 06/01/2026 | \$42.88 | \$15.41 | \$21.78 | \$0.00 | \$80.07 |
|   | 08/01/2026 | \$42.88 | \$15.91 | \$21.78 | \$0.00 | \$80.57 |
|   | 12/01/2026 | \$42.88 | \$15.91 | \$23.52 | \$0.00 | \$82.31 |

| Classification  | Effective Date | Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|--------|---------|---------------------------|------------|
| PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK)<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i><br>For apprentice rates see "Apprentice- PILE DRIVER" | 08/01/2020     | \$49.07   | \$9.40 | \$23.12 | \$0.00                    | \$81.59    |
| PILE DRIVER<br><i>PILE DRIVER LOCAL 56 (ZONE 1)</i>   | 08/01/2020     | \$49.07   | \$9.40 | \$23.12 | \$0.00                    | \$81.59    |

**Apprentice - PILE DRIVER - Local 56 Zone 1**

Effective Date - 08/01/2020

| Step | percent | Apprentice Base Wage | Health | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|--------|---------|---------------------------|------------|
| 1    | 50      | \$24.54              | \$9.40 | \$23.12 | \$0.00                    | \$57.06    |
| 2    | 60      | \$29.44              | \$9.40 | \$23.12 | \$0.00                    | \$61.96    |
| 3    | 70      | \$34.35              | \$9.40 | \$23.12 | \$0.00                    | \$66.87    |
| 4    | 75      | \$36.80              | \$9.40 | \$23.12 | \$0.00                    | \$69.32    |
| 5    | 80      | \$39.26              | \$9.40 | \$23.12 | \$0.00                    | \$71.78    |
| 6    | 80      | \$39.26              | \$9.40 | \$23.12 | \$0.00                    | \$71.78    |
| 7    | 90      | \$44.16              | \$9.40 | \$23.12 | \$0.00                    | \$76.68    |
| 8    | 90      | \$44.16              | \$9.40 | \$23.12 | \$0.00                    | \$76.68    |

**Notes:**

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80  
Step 1&2 \$34.01/ 3&4 \$41.46/ 5&6 \$62.80/ 7&8 \$69.25

Apprentice to Journeyworker Ratio:1:5

|  |            |         |         |         |        |          |
|--|------------|---------|---------|---------|--------|----------|
| PIPEFITTER & STEAMFITTER<br><i>PIPEFITTERS LOCAL 537</i> | 03/01/2024 | \$65.28 | \$12.70 | \$21.80 | \$0.00 | \$99.78  |
|  | 09/01/2024 | \$67.08 | \$12.70 | \$21.80 | \$0.00 | \$101.58 |
|  | 03/01/2025 | \$68.88 | \$12.70 | \$21.80 | \$0.00 | \$103.38 |

**Apprentice - PIPEFITTER - Local 537**

Effective Date - 03/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 40      | \$26.11              | \$12.70 | \$9.05  | \$0.00                    | \$47.86    |
| 2    | 45      | \$29.38              | \$12.70 | \$21.80 | \$0.00                    | \$63.88    |
| 3    | 60      | \$39.17              | \$12.70 | \$21.80 | \$0.00                    | \$73.67    |
| 4    | 70      | \$45.70              | \$12.70 | \$21.80 | \$0.00                    | \$80.20    |
| 5    | 80      | \$52.22              | \$12.70 | \$21.80 | \$0.00                    | \$86.72    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 40      | \$26.83              | \$12.70 | \$9.05  | \$0.00                    | \$48.58    |
| 2    | 45      | \$30.19              | \$12.70 | \$21.80 | \$0.00                    | \$64.69    |
| 3    | 60      | \$40.25              | \$12.70 | \$21.80 | \$0.00                    | \$74.75    |
| 4    | 70      | \$46.96              | \$12.70 | \$21.80 | \$0.00                    | \$81.46    |
| 5    | 80      | \$53.66              | \$12.70 | \$21.80 | \$0.00                    | \$88.16    |

**Notes:**  
 \*\* 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.  
 Refrig/AC Mechanic \*\*1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)  
**Apprentice to Journeyworker Ratio:\*\***

|   |            |         |         |         |        |          |
|---|------------|---------|---------|---------|--------|----------|
| PIPELAYER<br><i>LABORERS - ZONE 1</i>   | 12/01/2023 | \$44.58 | \$9.65  | \$18.07 | \$0.00 | \$72.30  |
| For apprentice rates see "Apprentice- LABORER"                                |            |         |         |         |        |          |
| PIPELAYER (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023 | \$44.58 | \$9.65  | \$18.07 | \$0.00 | \$72.30  |
|   | 06/01/2024 | \$46.06 | \$9.65  | \$18.07 | \$0.00 | \$73.78  |
|   | 12/01/2024 | \$47.53 | \$9.65  | \$18.07 | \$0.00 | \$75.25  |
|   | 06/01/2025 | \$49.03 | \$9.65  | \$18.07 | \$0.00 | \$76.75  |
|   | 12/01/2025 | \$50.53 | \$9.65  | \$18.07 | \$0.00 | \$78.25  |
|   | 06/01/2026 | \$52.08 | \$9.65  | \$18.07 | \$0.00 | \$79.80  |
|   | 12/01/2026 | \$53.58 | \$9.65  | \$18.07 | \$0.00 | \$81.30  |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)             |            |         |         |         |        |          |
| PLUMBERS & GASFITTERS<br><i>PLUMBERS &amp; GASFITTERS LOCAL 12</i>            | 03/03/2024 | \$67.74 | \$14.32 | \$19.11 | \$0.00 | \$101.17 |
|   | 09/01/2024 | \$69.54 | \$14.32 | \$19.11 | \$0.00 | \$102.97 |
|   | 03/02/2025 | \$71.34 | \$14.32 | \$19.11 | \$0.00 | \$104.77 |

Apprentice - PLUMBER/GASFITTER - Local 12

Effective Date - 03/03/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 35      | \$23.71              | \$14.32 | \$6.88  | \$0.00                    | \$44.91    |
| 2    | 40      | \$27.10              | \$14.32 | \$7.82  | \$0.00                    | \$49.24    |
| 3    | 55      | \$37.26              | \$14.32 | \$10.65 | \$0.00                    | \$62.23    |
| 4    | 65      | \$44.03              | \$14.32 | \$12.53 | \$0.00                    | \$70.88    |
| 5    | 75      | \$50.81              | \$14.32 | \$14.41 | \$0.00                    | \$79.54    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 35      | \$24.34              | \$14.32 | \$6.88  | \$0.00                    | \$45.54    |
| 2    | 40      | \$27.82              | \$14.32 | \$7.82  | \$0.00                    | \$49.96    |
| 3    | 55      | \$38.25              | \$14.32 | \$10.65 | \$0.00                    | \$63.22    |
| 4    | 65      | \$45.20              | \$14.32 | \$12.53 | \$0.00                    | \$72.05    |
| 5    | 75      | \$52.16              | \$14.32 | \$14.41 | \$0.00                    | \$80.89    |

Notes:  
 \*\* 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr  
 Step4 with lic\$69.00, Step5 with lic\$76.87

Apprentice to Journeyworker Ratio:\*\*

|  |            |         |         |         |        |          |
|--|------------|---------|---------|---------|--------|----------|
| PNEUMATIC CONTROLS (TEMP.)<br><i>PIPEFITTERS LOCAL 537</i> | 03/01/2024 | \$65.28 | \$12.70 | \$21.80 | \$0.00 | \$99.78  |
|  | 09/01/2024 | \$67.08 | \$12.70 | \$21.80 | \$0.00 | \$101.58 |
|  | 03/01/2025 | \$68.88 | \$12.70 | \$21.80 | \$0.00 | \$103.38 |

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| PNEUMATIC DRILL/TOOL OPERATOR<br><i>LABORERS - ZONE 1</i> | 12/01/2023 | \$44.58 | \$9.65 | \$18.07 | \$0.00 | \$72.30 |
|---|------------|---------|--------|---------|--------|---------|

For apprentice rates see "Apprentice- LABORER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023 | \$44.58 | \$9.65 | \$18.07 | \$0.00 | \$72.30 |
|   | 06/01/2024 | \$46.06 | \$9.65 | \$18.07 | \$0.00 | \$73.78 |
|   | 12/01/2024 | \$47.53 | \$9.65 | \$18.07 | \$0.00 | \$75.25 |
|   | 06/01/2025 | \$49.03 | \$9.65 | \$18.07 | \$0.00 | \$76.75 |
|   | 12/01/2025 | \$50.53 | \$9.65 | \$18.07 | \$0.00 | \$78.25 |
|   | 06/01/2026 | \$52.08 | \$9.65 | \$18.07 | \$0.00 | \$79.80 |
|   | 12/01/2026 | \$53.58 | \$9.65 | \$18.07 | \$0.00 | \$81.30 |

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| POWDERMAN & BLASTER<br><i>LABORERS - ZONE 1</i> | 12/01/2023 | \$45.33 | \$9.65 | \$18.07 | \$0.00 | \$73.05 |
|---|------------|---------|--------|---------|--------|---------|

For apprentice rates see "Apprentice- LABORER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| POWDERMAN & BLASTER (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023 | \$45.33 | \$9.65 | \$18.07 | \$0.00 | \$73.05 |
|   | 06/01/2024 | \$46.81 | \$9.65 | \$18.07 | \$0.00 | \$74.53 |
|   | 12/01/2024 | \$48.28 | \$9.65 | \$18.07 | \$0.00 | \$76.00 |
|   | 06/01/2025 | \$49.78 | \$9.65 | \$18.07 | \$0.00 | \$77.50 |
|   | 12/01/2025 | \$51.28 | \$9.65 | \$18.07 | \$0.00 | \$79.00 |
|   | 06/01/2026 | \$52.83 | \$9.65 | \$18.07 | \$0.00 | \$80.55 |
|   | 12/01/2026 | \$54.33 | \$9.65 | \$18.07 | \$0.00 | \$82.05 |



| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)            |                |           |         |         |                           |            |
| POWER SHOVEL/DERRICK/TRENCHING MACHINE<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023     | \$55.03   | \$15.00 | \$16.40 | \$0.00                    | \$86.43    |
|  | 06/01/2024     | \$56.33   | \$15.00 | \$16.40 | \$0.00                    | \$87.73    |
|  | 12/01/2024     | \$57.78   | \$15.00 | \$16.40 | \$0.00                    | \$89.18    |
|  | 06/01/2025     | \$59.08   | \$15.00 | \$16.40 | \$0.00                    | \$90.48    |
|  | 12/01/2025     | \$60.53   | \$15.00 | \$16.40 | \$0.00                    | \$91.93    |
|  | 06/01/2026     | \$61.83   | \$15.00 | \$16.40 | \$0.00                    | \$93.23    |
|  | 12/01/2026     | \$63.28   | \$15.00 | \$16.40 | \$0.00                    | \$94.68    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                           |            |
| PUMP OPERATOR (CONCRETE)<br><i>OPERATING ENGINEERS LOCAL 4</i>               | 12/01/2023     | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|  | 06/01/2024     | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|  | 12/01/2024     | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|  | 06/01/2025     | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|  | 12/01/2025     | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|  | 06/01/2026     | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|  | 12/01/2026     | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                           |            |
| PUMP OPERATOR (DEWATERING, OTHER)<br><i>OPERATING ENGINEERS LOCAL 4</i>      | 12/01/2023     | \$35.62   | \$15.00 | \$16.40 | \$0.00                    | \$67.02    |
|  | 06/01/2024     | \$36.47   | \$15.00 | \$16.40 | \$0.00                    | \$67.87    |
|  | 12/01/2024     | \$37.42   | \$15.00 | \$16.40 | \$0.00                    | \$68.82    |
|  | 06/01/2025     | \$38.27   | \$15.00 | \$16.40 | \$0.00                    | \$69.67    |
|  | 12/01/2025     | \$39.22   | \$15.00 | \$16.40 | \$0.00                    | \$70.62    |
|  | 06/01/2026     | \$40.08   | \$15.00 | \$16.40 | \$0.00                    | \$71.48    |
|  | 12/01/2026     | \$41.03   | \$15.00 | \$16.40 | \$0.00                    | \$72.43    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                           |            |
| READY-MIX CONCRETE DRIVER<br><i>TEAMSTERS 170 - Rosenfeld (Walpole)</i>      | 01/01/2024     | \$29.40   | \$12.96 | \$8.00  | \$0.00                    | \$50.36    |
|  | 05/01/2024     | \$30.15   | \$13.96 | \$8.00  | \$0.00                    | \$52.11    |
|  | 01/01/2025     | \$30.15   | \$13.46 | \$8.00  | \$0.00                    | \$51.61    |
|  | 05/01/2025     | \$30.90   | \$13.46 | \$8.25  | \$0.00                    | \$52.61    |
|  | 01/01/2026     | \$30.90   | \$13.96 | \$8.25  | \$0.00                    | \$53.11    |
|  | 05/01/2026     | \$31.90   | \$13.96 | \$8.25  | \$0.00                    | \$54.11    |
|  | 01/01/2027     | \$31.90   | \$14.46 | \$8.25  | \$0.00                    | \$54.61    |
|  | 05/01/2027     | \$32.90   | \$14.46 | \$8.25  | \$0.00                    | \$55.61    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                           |            |
| RECLAIMERS<br><i>OPERATING ENGINEERS LOCAL 4</i>                             | 12/01/2023     | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|  | 06/01/2024     | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|  | 12/01/2024     | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|  | 06/01/2025     | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|  | 12/01/2025     | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|  | 06/01/2026     | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|  | 12/01/2026     | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                   |                |           |         |         |                           |            |
| RIDE-ON MOTORIZED BUGGY OPERATOR<br><i>LABORERS - ZONE 1</i>                 | 12/01/2023     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
| For apprentice rates see "Apprentice- LABORER"                               |                |           |         |         |                           |            |

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| ROLLER/SPREADER/MULCHING MACHINE<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023     | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|  | 06/01/2024     | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|  | 12/01/2024     | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|  | 06/01/2025     | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|  | 12/01/2025     | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|  | 06/01/2026     | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|  | 12/01/2026     | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| ROOFER (Inc. Roofer Waterproofing & Roofer Damproofg)<br><i>ROOFERS LOCAL 33</i> | 02/01/2024 | \$50.03 | \$12.78 | \$21.45 | \$0.00 | \$84.26 |
|  | 08/01/2024 | \$51.53 | \$12.78 | \$21.45 | \$0.00 | \$85.76 |
|  | 02/01/2025 | \$52.78 | \$12.78 | \$21.45 | \$0.00 | \$87.01 |
|  | 08/01/2025 | \$54.28 | \$12.78 | \$21.45 | \$0.00 | \$88.51 |
|  | 02/01/2026 | \$55.53 | \$12.78 | \$21.45 | \$0.00 | \$89.76 |

**Apprentice - ROOFER - Local 33**

Effective Date - 02/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$25.02              | \$12.78 | \$6.21  | \$0.00                    | \$44.01    |
| 2    | 60      | \$30.02              | \$12.78 | \$21.45 | \$0.00                    | \$64.25    |
| 3    | 65      | \$32.52              | \$12.78 | \$21.45 | \$0.00                    | \$66.75    |
| 4    | 75      | \$37.52              | \$12.78 | \$21.45 | \$0.00                    | \$71.75    |
| 5    | 85      | \$42.53              | \$12.78 | \$21.45 | \$0.00                    | \$76.76    |

Effective Date - 08/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$25.77              | \$12.78 | \$6.21  | \$0.00                    | \$44.76    |
| 2    | 60      | \$30.92              | \$12.78 | \$21.45 | \$0.00                    | \$65.15    |
| 3    | 65      | \$33.49              | \$12.78 | \$21.45 | \$0.00                    | \$67.72    |
| 4    | 75      | \$38.65              | \$12.78 | \$21.45 | \$0.00                    | \$72.88    |
| 5    | 85      | \$43.80              | \$12.78 | \$21.45 | \$0.00                    | \$78.03    |

Notes: \*\* 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1  
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.  
(Hot Pitch Mechanics' receive \$1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio: \*\*

|   |            |         |         |         |        |         |
|---|------------|---------|---------|---------|--------|---------|
| ROOFER SLATE / TILE / PRECAST CONCRETE<br><i>ROOFERS LOCAL 33</i> | 02/01/2024 | \$50.28 | \$12.78 | \$21.45 | \$0.00 | \$84.51 |
|   | 08/01/2024 | \$51.78 | \$12.78 | \$21.45 | \$0.00 | \$86.01 |
|   | 02/01/2025 | \$53.03 | \$12.78 | \$21.45 | \$0.00 | \$87.26 |
|   | 08/01/2025 | \$54.53 | \$12.78 | \$21.45 | \$0.00 | \$88.76 |
|   | 02/01/2026 | \$55.78 | \$12.78 | \$21.45 | \$0.00 | \$90.01 |

For apprentice rates see "Apprentice- ROOFER"

|   |            |         |         |         |        |          |
|---|------------|---------|---------|---------|--------|----------|
| SHEETMETAL WORKER<br><i>SHEETMETAL WORKERS LOCAL 17 - A</i> | 02/01/2024 | \$57.22 | \$14.59 | \$27.50 | \$2.98 | \$102.29 |
|   | 08/01/2024 | \$58.97 | \$14.59 | \$27.50 | \$2.98 | \$104.04 |
|   | 02/01/2025 | \$60.72 | \$14.59 | \$27.50 | \$2.98 | \$105.79 |
|   | 08/01/2025 | \$62.57 | \$14.59 | \$27.50 | \$2.98 | \$107.64 |
|   | 02/01/2026 | \$64.52 | \$14.59 | \$27.50 | \$2.98 | \$109.59 |

Issue Date: 04/01/2024

Wage Request Number: 20240329-047

Page 33 of 41

**Apprentice - SHEET METAL WORKER - Local 17-A**

Effective Date - 02/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 42      | \$24.03              | \$14.59 | \$6.13  | \$0.00                    | \$44.75    |
| 2    | 42      | \$24.03              | \$14.59 | \$6.13  | \$0.00                    | \$44.75    |
| 3    | 47      | \$26.89              | \$14.59 | \$12.11 | \$1.61                    | \$55.20    |
| 4    | 47      | \$26.89              | \$14.59 | \$12.11 | \$1.61                    | \$55.20    |
| 5    | 52      | \$29.75              | \$14.59 | \$13.09 | \$1.72                    | \$59.15    |
| 6    | 52      | \$29.75              | \$14.59 | \$13.34 | \$1.73                    | \$59.41    |
| 7    | 60      | \$34.33              | \$14.59 | \$14.75 | \$1.91                    | \$65.58    |
| 8    | 65      | \$37.19              | \$14.59 | \$15.73 | \$2.03                    | \$69.54    |
| 9    | 75      | \$42.92              | \$14.59 | \$17.69 | \$2.26                    | \$77.46    |
| 10   | 85      | \$48.64              | \$14.59 | \$19.15 | \$2.47                    | \$84.85    |

Effective Date - 08/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 42      | \$24.77              | \$14.59 | \$6.13  | \$0.00                    | \$45.49    |
| 2    | 42      | \$24.77              | \$14.59 | \$6.13  | \$0.00                    | \$45.49    |
| 3    | 47      | \$27.72              | \$14.59 | \$12.11 | \$1.63                    | \$56.05    |
| 4    | 47      | \$27.72              | \$14.59 | \$12.11 | \$1.63                    | \$56.05    |
| 5    | 52      | \$30.66              | \$14.59 | \$13.09 | \$1.75                    | \$60.09    |
| 6    | 52      | \$30.66              | \$14.59 | \$13.34 | \$1.76                    | \$60.35    |
| 7    | 60      | \$35.38              | \$14.59 | \$14.75 | \$1.94                    | \$66.66    |
| 8    | 65      | \$38.33              | \$14.59 | \$15.73 | \$2.06                    | \$70.71    |
| 9    | 75      | \$44.23              | \$14.59 | \$17.69 | \$2.30                    | \$78.81    |
| 10   | 85      | \$50.12              | \$14.59 | \$19.15 | \$2.52                    | \$86.38    |

**Notes:**  
Steps are 6 mos.

**Apprentice to Journeyworker Ratio:1:4**

|  |            |         |         |         |        |         |
|--|------------|---------|---------|---------|--------|---------|
| SPECIALIZED EARTH MOVING EQUIP < 35 TONS | 12/01/2023 | \$40.34 | \$14.41 | \$18.67 | \$0.00 | \$73.42 |
| TEAMSTERS JOINT COUNCIL NO. 10 ZONE A    | 06/01/2024 | \$41.34 | \$14.41 | \$18.67 | \$0.00 | \$74.42 |
|  | 08/01/2024 | \$41.34 | \$14.91 | \$18.67 | \$0.00 | \$74.92 |
|  | 12/01/2024 | \$41.34 | \$14.91 | \$20.17 | \$0.00 | \$76.42 |
|  | 06/01/2025 | \$42.34 | \$14.91 | \$20.17 | \$0.00 | \$77.42 |
|  | 08/01/2025 | \$42.34 | \$15.41 | \$20.17 | \$0.00 | \$77.92 |
|  | 12/01/2025 | \$42.34 | \$15.41 | \$21.78 | \$0.00 | \$79.53 |
|  | 06/01/2026 | \$43.34 | \$15.41 | \$21.78 | \$0.00 | \$80.53 |
|  | 08/01/2026 | \$43.34 | \$15.91 | \$21.78 | \$0.00 | \$81.03 |
|  | 12/01/2026 | \$43.34 | \$15.91 | \$23.52 | \$0.00 | \$82.77 |

| Classification   | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|----------------|-----------|---------|---------|---------------------------|------------|
| SPECIALIZED EARTH MOVING EQUIP > 35 TONS<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i> | 12/01/2023     | \$40.63   | \$14.41 | \$18.67 | \$0.00                    | \$73.71    |
|  | 06/01/2024     | \$41.63   | \$14.41 | \$18.67 | \$0.00                    | \$74.71    |
|  | 08/01/2024     | \$41.63   | \$14.91 | \$18.67 | \$0.00                    | \$75.21    |
|  | 12/01/2024     | \$41.63   | \$14.91 | \$20.17 | \$0.00                    | \$76.71    |
|  | 06/01/2025     | \$42.63   | \$14.91 | \$20.17 | \$0.00                    | \$77.71    |
|  | 08/01/2025     | \$42.63   | \$15.41 | \$20.17 | \$0.00                    | \$78.21    |
|  | 12/01/2025     | \$42.63   | \$15.41 | \$21.78 | \$0.00                    | \$79.82    |
|  | 06/01/2026     | \$43.63   | \$15.41 | \$21.78 | \$0.00                    | \$80.82    |
|  | 08/01/2026     | \$43.63   | \$15.91 | \$21.78 | \$0.00                    | \$81.32    |
|  | 12/01/2026     | \$43.63   | \$15.91 | \$23.52 | \$0.00                    | \$83.06    |
| SPRINKLER FITTER<br><i>SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1</i>              | 03/01/2024     | \$69.75   | \$10.90 | \$23.20 | \$0.00                    | \$103.85   |
|  | 10/01/2024     | \$71.55   | \$10.90 | \$23.20 | \$0.00                    | \$105.65   |
|  | 03/01/2025     | \$73.35   | \$10.90 | \$23.20 | \$0.00                    | \$107.45   |

**Apprentice - SPRINKLER FITTER - Local 550 (Section A) Zone 1**

**Effective Date - 03/01/2024**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 35      | \$24.41              | \$10.90 | \$12.80 | \$0.00                    | \$48.11    |
| 2    | 40      | \$27.90              | \$10.90 | \$13.60 | \$0.00                    | \$52.40    |
| 3    | 45      | \$31.39              | \$10.90 | \$14.40 | \$0.00                    | \$56.69    |
| 4    | 50      | \$34.88              | \$10.90 | \$15.20 | \$0.00                    | \$60.98    |
| 5    | 55      | \$38.36              | \$10.90 | \$16.00 | \$0.00                    | \$65.26    |
| 6    | 60      | \$41.85              | \$10.90 | \$16.80 | \$0.00                    | \$69.55    |
| 7    | 65      | \$45.34              | \$10.90 | \$17.60 | \$0.00                    | \$73.84    |
| 8    | 70      | \$48.83              | \$10.90 | \$18.40 | \$0.00                    | \$78.13    |
| 9    | 75      | \$52.31              | \$10.90 | \$19.20 | \$0.00                    | \$82.41    |
| 10   | 80      | \$55.80              | \$10.90 | \$20.00 | \$0.00                    | \$86.70    |

**Effective Date - 10/01/2024**

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 35      | \$25.04              | \$10.90 | \$12.80 | \$0.00                    | \$48.74    |
| 2    | 40      | \$28.62              | \$10.90 | \$13.60 | \$0.00                    | \$53.12    |
| 3    | 45      | \$32.20              | \$10.90 | \$14.40 | \$0.00                    | \$57.50    |
| 4    | 50      | \$35.78              | \$10.90 | \$15.20 | \$0.00                    | \$61.88    |
| 5    | 55      | \$39.35              | \$10.90 | \$16.00 | \$0.00                    | \$66.25    |
| 6    | 60      | \$42.93              | \$10.90 | \$16.80 | \$0.00                    | \$70.63    |
| 7    | 65      | \$46.51              | \$10.90 | \$17.60 | \$0.00                    | \$75.01    |
| 8    | 70      | \$50.09              | \$10.90 | \$18.40 | \$0.00                    | \$79.39    |
| 9    | 75      | \$53.66              | \$10.90 | \$19.20 | \$0.00                    | \$83.76    |
| 10   | 80      | \$57.24              | \$10.90 | \$20.00 | \$0.00                    | \$88.14    |

Notes: Apprentice entered prior 9/30/10:  
40/45/50/55/60/65/70/75/80/85  
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

| Classification   | Effective Date   | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|--|-----------|---------|---------|---------------------------|------------|
| STEAM BOILER OPERATOR<br><i>OPERATING ENGINEERS LOCAL 4</i>                    | 12/01/2023   | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|  | 06/01/2024   | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|  | 12/01/2024   | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|  | 06/01/2025   | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|  | 12/01/2025   | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|  | 06/01/2026   | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|  | 12/01/2026   | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |
|  | For apprentice rates see "Apprentice- OPERATING ENGINEERS" |           |         |         |                           |            |
| TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN<br><i>OPERATING ENGINEERS LOCAL 4</i> | 12/01/2023   | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|  | 06/01/2024   | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|  | 12/01/2024   | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|  | 06/01/2025   | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|  | 12/01/2025   | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|  | 06/01/2026   | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|  | 12/01/2026   | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |
|  | For apprentice rates see "Apprentice- OPERATING ENGINEERS" |           |         |         |                           |            |
| TELECOMMUNICATION TECHNICIAN<br><i>ELECTRICIANS LOCAL 103</i>                  | 03/01/2024   | \$49.49   | \$13.00 | \$20.19 | \$0.00                    | \$82.68    |
|  | 09/01/2024   | \$51.02   | \$13.00 | \$20.24 | \$0.00                    | \$84.26    |
|  | 03/01/2025   | \$51.98   | \$13.00 | \$20.27 | \$0.00                    | \$85.25    |
|  | 09/01/2025   | \$53.51   | \$13.00 | \$20.32 | \$0.00                    | \$86.83    |
|  | 03/01/2026   | \$54.47   | \$13.00 | \$20.34 | \$0.00                    | \$87.81    |
|  | 09/01/2026   | \$56.00   | \$13.00 | \$20.39 | \$0.00                    | \$89.39    |
|  | 03/01/2027   | \$56.95   | \$13.00 | \$20.42 | \$0.00                    | \$90.37    |
|  | 09/01/2027   | \$58.49   | \$13.00 | \$20.46 | \$0.00                    | \$91.95    |
|  | 03/01/2028   | \$59.45   | \$13.00 | \$20.49 | \$0.00                    | \$92.94    |

Issue Date: 04/01/2024

Wage Request Number: 20240329-047

Page 36 of 41

**Apprentice - TELECOMMUNICATION TECHNICIAN - Local 103**

Effective Date - 03/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 45      | \$22.27              | \$13.00 | \$0.67  | \$0.00                    | \$35.94    |
| 2    | 45      | \$22.27              | \$13.00 | \$0.67  | \$0.00                    | \$35.94    |
| 3    | 50      | \$24.75              | \$13.00 | \$16.16 | \$0.00                    | \$53.91    |
| 4    | 50      | \$24.75              | \$13.00 | \$16.16 | \$0.00                    | \$53.91    |
| 5    | 55      | \$27.22              | \$13.00 | \$16.57 | \$0.00                    | \$56.79    |
| 6    | 60      | \$29.69              | \$13.00 | \$16.97 | \$0.00                    | \$59.66    |
| 7    | 65      | \$32.17              | \$13.00 | \$17.38 | \$0.00                    | \$62.55    |
| 8    | 70      | \$34.64              | \$13.00 | \$17.78 | \$0.00                    | \$65.42    |
| 9    | 75      | \$37.12              | \$13.00 | \$18.18 | \$0.00                    | \$68.30    |
| 10   | 80      | \$39.59              | \$13.00 | \$18.58 | \$0.00                    | \$71.17    |

Effective Date - 09/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 45      | \$22.96              | \$13.00 | \$0.69  | \$0.00                    | \$36.65    |
| 2    | 45      | \$22.96              | \$13.00 | \$0.69  | \$0.00                    | \$36.65    |
| 3    | 50      | \$25.51              | \$13.00 | \$16.16 | \$0.00                    | \$54.67    |
| 4    | 50      | \$25.51              | \$13.00 | \$16.16 | \$0.00                    | \$54.67    |
| 5    | 55      | \$28.06              | \$13.00 | \$16.57 | \$0.00                    | \$57.63    |
| 6    | 60      | \$30.61              | \$13.00 | \$16.97 | \$0.00                    | \$60.58    |
| 7    | 65      | \$33.16              | \$13.00 | \$17.38 | \$0.00                    | \$63.54    |
| 8    | 70      | \$35.71              | \$13.00 | \$17.78 | \$0.00                    | \$66.49    |
| 9    | 75      | \$38.27              | \$13.00 | \$18.18 | \$0.00                    | \$69.45    |
| 10   | 80      | \$40.82              | \$13.00 | \$18.58 | \$0.00                    | \$72.40    |

Notes:

Apprentice to Journeyworker Ratio:1:1

|                                     |            |         |         |         |        |          |
|-------------------------------------|------------|---------|---------|---------|--------|----------|
| TERRAZZO FINISHERS                  | 02/01/2024 | \$61.34 | \$11.49 | \$23.59 | \$0.00 | \$96.42  |
| BRICKLAYERS LOCAL 3 - MARBLE & TILE | 08/01/2024 | \$63.44 | \$11.49 | \$23.59 | \$0.00 | \$98.52  |
|                                     | 02/01/2025 | \$64.74 | \$11.49 | \$23.59 | \$0.00 | \$99.82  |
|                                     | 08/01/2025 | \$66.89 | \$11.49 | \$23.59 | \$0.00 | \$101.97 |
|                                     | 02/01/2026 | \$68.24 | \$11.49 | \$23.59 | \$0.00 | \$103.32 |
|                                     | 08/01/2026 | \$70.44 | \$11.49 | \$23.59 | \$0.00 | \$105.52 |
|                                     | 02/01/2027 | \$71.84 | \$11.49 | \$23.59 | \$0.00 | \$106.92 |

**Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile**

Effective Date - 02/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$30.67              | \$11.49 | \$23.59 | \$0.00                    | \$65.75    |
| 2    | 60      | \$36.80              | \$11.49 | \$23.59 | \$0.00                    | \$71.88    |
| 3    | 70      | \$42.94              | \$11.49 | \$23.59 | \$0.00                    | \$78.02    |
| 4    | 80      | \$49.07              | \$11.49 | \$23.59 | \$0.00                    | \$84.15    |
| 5    | 90      | \$55.21              | \$11.49 | \$23.59 | \$0.00                    | \$90.29    |

Effective Date - 08/01/2024

| Step | percent | Apprentice Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|------|---------|----------------------|---------|---------|---------------------------|------------|
| 1    | 50      | \$31.72              | \$11.49 | \$23.59 | \$0.00                    | \$66.80    |
| 2    | 60      | \$38.06              | \$11.49 | \$23.59 | \$0.00                    | \$73.14    |
| 3    | 70      | \$44.41              | \$11.49 | \$23.59 | \$0.00                    | \$79.49    |
| 4    | 80      | \$50.75              | \$11.49 | \$23.59 | \$0.00                    | \$85.83    |
| 5    | 90      | \$57.10              | \$11.49 | \$23.59 | \$0.00                    | \$92.18    |

Notes:

Apprentice to Journeyworker Ratio:1:3

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| TEST BORING DRILLER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2023 | \$48.33 | \$9.65 | \$18.22 | \$0.00 | \$76.20 |
|  | 06/01/2024 | \$49.81 | \$9.65 | \$18.22 | \$0.00 | \$77.68 |
|  | 12/01/2024 | \$51.28 | \$9.65 | \$18.22 | \$0.00 | \$79.15 |
|  | 06/01/2025 | \$52.78 | \$9.65 | \$18.22 | \$0.00 | \$80.65 |
|  | 12/01/2025 | \$54.28 | \$9.65 | \$18.22 | \$0.00 | \$82.15 |
|  | 06/01/2026 | \$55.83 | \$9.65 | \$18.22 | \$0.00 | \$83.70 |
|  | 12/01/2026 | \$57.33 | \$9.65 | \$18.22 | \$0.00 | \$85.20 |

For apprentice rates see "Apprentice- LABORER"

|   |            |         |        |         |        |         |
|---|------------|---------|--------|---------|--------|---------|
| TEST BORING DRILLER HELPER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2023 | \$44.45 | \$9.65 | \$18.22 | \$0.00 | \$72.32 |
|   | 06/01/2024 | \$45.93 | \$9.65 | \$18.22 | \$0.00 | \$73.80 |
|   | 12/01/2024 | \$47.40 | \$9.65 | \$18.22 | \$0.00 | \$75.27 |
|   | 06/01/2025 | \$48.90 | \$9.65 | \$18.22 | \$0.00 | \$76.77 |
|   | 12/01/2025 | \$50.40 | \$9.65 | \$18.22 | \$0.00 | \$78.27 |
|   | 06/01/2026 | \$51.95 | \$9.65 | \$18.22 | \$0.00 | \$79.82 |
|   | 12/01/2026 | \$53.45 | \$9.65 | \$18.22 | \$0.00 | \$81.32 |

For apprentice rates see "Apprentice- LABORER"

|  |            |         |        |         |        |         |
|--|------------|---------|--------|---------|--------|---------|
| TEST BORING LABORER<br><i>LABORERS - FOUNDATION AND MARINE</i> | 12/01/2023 | \$44.33 | \$9.65 | \$18.22 | \$0.00 | \$72.20 |
|  | 06/01/2024 | \$45.81 | \$9.65 | \$18.22 | \$0.00 | \$73.68 |
|  | 12/01/2024 | \$47.28 | \$9.65 | \$18.22 | \$0.00 | \$75.15 |
|  | 06/01/2025 | \$48.78 | \$9.65 | \$18.22 | \$0.00 | \$76.65 |
|  | 12/01/2025 | \$50.28 | \$9.65 | \$18.22 | \$0.00 | \$78.15 |
|  | 06/01/2026 | \$51.83 | \$9.65 | \$18.22 | \$0.00 | \$79.70 |
|  | 12/01/2026 | \$53.33 | \$9.65 | \$18.22 | \$0.00 | \$81.20 |

For apprentice rates see "Apprentice- LABORER"

| Classification  | Effective Date | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|---|----------------|-----------|---------|---------|---------------------------|------------|
| TRACTORS/PORTABLE STEAM GENERATORS<br><i>OPERATING ENGINEERS LOCAL 4</i>            | 12/01/2023     | \$54.43   | \$15.00 | \$16.40 | \$0.00                    | \$85.83    |
|   | 06/01/2024     | \$55.71   | \$15.00 | \$16.40 | \$0.00                    | \$87.11    |
|   | 12/01/2024     | \$57.15   | \$15.00 | \$16.40 | \$0.00                    | \$88.55    |
|   | 06/01/2025     | \$58.43   | \$15.00 | \$16.40 | \$0.00                    | \$89.83    |
|   | 12/01/2025     | \$59.87   | \$15.00 | \$16.40 | \$0.00                    | \$91.27    |
|   | 06/01/2026     | \$61.15   | \$15.00 | \$16.40 | \$0.00                    | \$92.55    |
|   | 12/01/2026     | \$62.59   | \$15.00 | \$16.40 | \$0.00                    | \$93.99    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                          |                |           |         |         |                           |            |
| TRAILERS FOR EARTH MOVING EQUIPMENT<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i> | 12/01/2023     | \$40.92   | \$14.41 | \$18.67 | \$0.00                    | \$74.00    |
|   | 06/01/2024     | \$41.92   | \$14.41 | \$18.67 | \$0.00                    | \$75.00    |
|   | 08/01/2024     | \$41.92   | \$14.91 | \$18.67 | \$0.00                    | \$75.50    |
|   | 12/01/2024     | \$41.92   | \$14.91 | \$20.17 | \$0.00                    | \$77.00    |
|   | 06/01/2025     | \$42.92   | \$14.91 | \$20.17 | \$0.00                    | \$78.00    |
|   | 08/01/2025     | \$42.92   | \$15.41 | \$20.17 | \$0.00                    | \$78.50    |
|   | 12/01/2025     | \$42.92   | \$15.41 | \$21.78 | \$0.00                    | \$80.11    |
|   | 06/01/2026     | \$43.92   | \$15.41 | \$21.78 | \$0.00                    | \$81.11    |
|   | 08/01/2026     | \$43.92   | \$15.91 | \$21.78 | \$0.00                    | \$81.61    |
|   | 12/01/2026     | \$43.92   | \$15.91 | \$23.52 | \$0.00                    | \$83.35    |
| TUNNEL WORK - COMPRESSED AIR<br><i>LABORERS (COMPRESSED AIR)</i>                    | 12/01/2023     | \$56.56   | \$9.65  | \$18.67 | \$0.00                    | \$84.88    |
|   | 06/01/2024     | \$58.04   | \$9.65  | \$18.67 | \$0.00                    | \$86.36    |
|   | 12/01/2024     | \$59.51   | \$9.65  | \$18.67 | \$0.00                    | \$87.83    |
|   | 06/01/2025     | \$61.01   | \$9.65  | \$18.67 | \$0.00                    | \$89.33    |
|   | 12/01/2025     | \$62.51   | \$9.65  | \$18.67 | \$0.00                    | \$90.83    |
|   | 06/01/2026     | \$64.06   | \$9.65  | \$18.67 | \$0.00                    | \$92.38    |
|   | 12/01/2026     | \$65.56   | \$9.65  | \$18.67 | \$0.00                    | \$93.88    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                           |            |
| TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)<br><i>LABORERS (COMPRESSED AIR)</i>       | 12/01/2023     | \$58.56   | \$9.65  | \$18.67 | \$0.00                    | \$86.88    |
|   | 06/01/2024     | \$60.04   | \$9.65  | \$18.67 | \$0.00                    | \$88.36    |
|   | 12/01/2024     | \$61.51   | \$9.65  | \$18.67 | \$0.00                    | \$89.83    |
|   | 06/01/2025     | \$63.01   | \$9.65  | \$18.67 | \$0.00                    | \$91.33    |
|   | 12/01/2025     | \$64.51   | \$9.65  | \$18.67 | \$0.00                    | \$92.83    |
|   | 06/01/2026     | \$66.06   | \$9.65  | \$18.67 | \$0.00                    | \$94.38    |
|   | 12/01/2026     | \$67.56   | \$9.65  | \$18.67 | \$0.00                    | \$95.88    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                           |            |
| TUNNEL WORK - FREE AIR<br><i>LABORERS (FREE AIR TUNNEL)</i>                         | 12/01/2023     | \$48.63   | \$9.65  | \$18.67 | \$0.00                    | \$76.95    |
|   | 06/01/2024     | \$50.11   | \$9.65  | \$18.67 | \$0.00                    | \$78.43    |
|   | 12/01/2024     | \$51.58   | \$9.65  | \$18.67 | \$0.00                    | \$79.90    |
|   | 06/01/2025     | \$53.08   | \$9.65  | \$18.67 | \$0.00                    | \$81.40    |
|   | 12/01/2025     | \$54.58   | \$9.65  | \$18.67 | \$0.00                    | \$82.90    |
|   | 06/01/2026     | \$56.13   | \$9.65  | \$18.67 | \$0.00                    | \$84.45    |
|   | 12/01/2026     | \$57.63   | \$9.65  | \$18.67 | \$0.00                    | \$85.95    |
| For apprentice rates see "Apprentice- LABORER"                                      |                |           |         |         |                           |            |



| Classification   | Effective Date                                 | Base Wage | Health  | Pension | Supplemental Unemployment | Total Rate |
|--|--|-----------|---------|---------|---------------------------|------------|
| TUNNEL WORK - FREE AIR (HAZ. WASTE)<br><i>LABORERS (FREE AIR TUNNEL)</i>                 | 12/01/2023                                     | \$50.63   | \$9.65  | \$18.67 | \$0.00                    | \$78.95    |
|  | 06/01/2024                                     | \$52.11   | \$9.65  | \$18.67 | \$0.00                    | \$80.43    |
|  | 12/01/2024                                     | \$53.58   | \$9.65  | \$18.67 | \$0.00                    | \$81.90    |
|  | 06/01/2025                                     | \$55.08   | \$9.65  | \$18.67 | \$0.00                    | \$83.40    |
|  | 12/01/2025                                     | \$56.58   | \$9.65  | \$18.67 | \$0.00                    | \$84.90    |
|  | 06/01/2026                                     | \$58.13   | \$9.65  | \$18.67 | \$0.00                    | \$86.45    |
|  | 12/01/2026                                     | \$59.63   | \$9.65  | \$18.67 | \$0.00                    | \$87.95    |
| For apprentice rates see "Apprentice- LABORER"   |  |           |         |         |                           |            |
| VAC-HAUL<br><i>TEAMSTERS JOINT COUNCIL NO. 10 ZONE A</i>                                 | 12/01/2023                                     | \$40.34   | \$14.41 | \$18.67 | \$0.00                    | \$73.42    |
|  | 06/01/2024                                     | \$41.34   | \$14.41 | \$18.67 | \$0.00                    | \$74.42    |
|  | 08/01/2024                                     | \$41.34   | \$14.91 | \$18.67 | \$0.00                    | \$74.92    |
|  | 12/01/2024                                     | \$41.34   | \$14.91 | \$20.17 | \$0.00                    | \$76.42    |
|  | 06/01/2025                                     | \$42.34   | \$14.91 | \$20.17 | \$0.00                    | \$77.42    |
|  | 08/01/2025                                     | \$42.34   | \$15.41 | \$20.17 | \$0.00                    | \$77.92    |
|  | 12/01/2025                                     | \$42.34   | \$15.41 | \$21.78 | \$0.00                    | \$79.53    |
|  | 06/01/2026                                     | \$43.34   | \$15.41 | \$21.78 | \$0.00                    | \$80.53    |
|  | 08/01/2026                                     | \$43.34   | \$15.91 | \$21.78 | \$0.00                    | \$81.03    |
|  | 12/01/2026                                     | \$43.34   | \$15.91 | \$23.52 | \$0.00                    | \$82.77    |
| WAGON DRILL OPERATOR<br><i>LABORERS - ZONE 1</i>   | 12/01/2023                                     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
|  | For apprentice rates see "Apprentice- LABORER" |           |         |         |                           |            |
| WAGON DRILL OPERATOR (HEAVY & HIGHWAY)<br><i>LABORERS - ZONE 1 (HEAVY &amp; HIGHWAY)</i> | 12/01/2023                                     | \$44.58   | \$9.65  | \$18.07 | \$0.00                    | \$72.30    |
|  | 06/01/2024                                     | \$46.06   | \$9.65  | \$18.07 | \$0.00                    | \$73.78    |
|  | 12/01/2024                                     | \$47.53   | \$9.65  | \$18.07 | \$0.00                    | \$75.25    |
|  | 06/01/2025                                     | \$49.03   | \$9.65  | \$18.07 | \$0.00                    | \$76.75    |
|  | 12/01/2025                                     | \$50.53   | \$9.65  | \$18.07 | \$0.00                    | \$78.25    |
|  | 06/01/2026                                     | \$52.08   | \$9.65  | \$18.07 | \$0.00                    | \$79.80    |
|  | 12/01/2026                                     | \$53.58   | \$9.65  | \$18.07 | \$0.00                    | \$81.30    |
| For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"                       |  |           |         |         |                           |            |
| WASTE WATER PUMP OPERATOR<br><i>OPERATING ENGINEERS LOCAL 4</i>                          | 12/01/2023                                     | \$55.03   | \$15.00 | \$16.40 | \$0.00                    | \$86.43    |
|  | 06/01/2024                                     | \$56.33   | \$15.00 | \$16.40 | \$0.00                    | \$87.73    |
|  | 12/01/2024                                     | \$57.78   | \$15.00 | \$16.40 | \$0.00                    | \$89.18    |
|  | 06/01/2025                                     | \$59.08   | \$15.00 | \$16.40 | \$0.00                    | \$90.48    |
|  | 12/01/2025                                     | \$60.53   | \$15.00 | \$16.40 | \$0.00                    | \$91.93    |
|  | 06/01/2026                                     | \$61.83   | \$15.00 | \$16.40 | \$0.00                    | \$93.23    |
|  | 12/01/2026                                     | \$63.28   | \$15.00 | \$16.40 | \$0.00                    | \$94.68    |
| For apprentice rates see "Apprentice- OPERATING ENGINEERS"                               |  |           |         |         |                           |            |
| WATER METER INSTALLER<br><i>PLUMBERS &amp; GASFITTERS LOCAL 12</i>                       | 03/03/2024                                     | \$67.74   | \$14.32 | \$19.11 | \$0.00                    | \$101.17   |
|  | 09/01/2024                                     | \$69.54   | \$14.32 | \$19.11 | \$0.00                    | \$102.97   |
|  | 03/02/2025                                     | \$71.34   | \$14.32 | \$19.11 | \$0.00                    | \$104.77   |
| For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"         |  |           |         |         |                           |            |

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

\*\* Multiple ratios are listed in the comment field.

\*\*\* APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.

\*\*\*\* APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

# The Massachusetts Prevailing Wage Law

## M.G.L. c.149, §§26 – 27

### NOTICE TO AWARDING AUTHORITIES

- 'The enclosed wage schedule applies only to the specific project listed at the top and will be updated for any public construction project lasting longer than one (1) year.
- 'You should request an updated wage schedule from the Division of Occupational Safety if you have not opened bids or selected a contractor within 90 days of the date of issuance of the enclosed wage schedule.
- 'The wage schedule shall be incorporated in any advertisement or call for bids for the project for which it has been issued.
- 'Once a contractor has been selected by the awarding authority, the wage schedule shall be made a part of the contract for that project.

### NOTICE TO CONTRACTORS

- The enclosed wage schedule, and any updated schedule, must be posted in a conspicuous place at the work site during the life of the project.
- The wages listed on the enclosed wage schedule must be paid to employees on public works projects regardless of whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- The enclosed wage schedule applies to all phases of the project including the final clean-up. Contractors whose only role is to perform final clean-up must pay their employees according to this wage schedule.
- All apprentices must be registered with the Massachusetts Division of Apprentice Training in order to be paid at the reduced apprentice rates. If a worker is not registered with the Division of Apprentice Training, they must be paid the “total rate” listed on the wage schedule regardless of experience or skill level. For further information, please call (617) 727-3486 or write to the Division of Apprentice Training, 399 Washington Street, 4th Floor, Boston, MA 02108

# WEEKLY PAYROLL RECORDS REPORT

## & STATEMENT OF COMPLIANCE

In accordance with Massachusetts General Law c.149, §27B, a true and accurate record must be kept of all persons employed on the public works project for which the enclosed rates have been provided. A Payroll Form has been printed on the reverse of this page and includes all the information required to be kept by law. Every contractor or subcontractor is required to keep these records and preserve them for a period of three years from the date of completion of the contract.

In addition, every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority. This is required to be done on a weekly basis. Once collected, the awarding authority is also required to preserve those records for three years.

In addition, each such contractor, subcontractor or public body shall furnish to the Department of Labor & Workforce Development/Division of Occupational Safety within fifteen days after completion of its portion of the work a statement, executed by the contractor, subcontractor or public body who supervises the payment of wages, in the following form:

### STATEMENT OF COMPLIANCE

\_\_\_\_\_, 2024

I, \_\_\_\_\_,  
(Name of signatory party) (Title)

do hereby state:

That I pay or supervise the payment of the persons employed by

\_\_\_\_\_ on the \_\_\_\_\_  
(Contractor, subcontractor or public body) (Building or project)

and that all mechanics and apprentices, teamsters, chauffeurs and laborers employed on said project have been paid in accordance with wages determined under the provisions M.G.L. c.149, §§26-27.

Signature \_\_\_\_\_

Title \_\_\_\_\_

DIVISION OF OCCUPATIONAL SAFETY, 399 WASHINGTON STREET, 5<sup>th</sup> FL., BOSTON, MA. 02108

**END OF SECTION**

**WEEKLY PAYROLL REPORT FORM**

Company Name: \_\_\_\_\_ Prime Contractor  
 Project Name: \_\_\_\_\_ Subcontractor  
 Awarding Auth.: \_\_\_\_\_ List Prime Contractor  
 Work Week Ending: \_\_\_\_\_ Employer Signature: \_\_\_\_\_  
 Print Name & Title: \_\_\_\_\_

| Employee Name & Address | Work Classification | Hours Worked |   |   |   |   |   |   | (A) Tot. Hrs. | (B) Hourly Base Wage | Employer Contributions |             |                 | (F) [B+C+D+E] Hourly Total Wage (prev. wage) | (G) [A*F] Weekly Total Amount |
|-------------------------|---------------------|--------------|---|---|---|---|---|---|---------------|----------------------|------------------------|-------------|-----------------|--|-------------------------------|
|                         |                     | S            | M | T | W | T | F | S |               |                      | (C) Health & Welfare   | (D) Pension | (E) Supp. Unemp |  |                               |
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|                         |                     |              |   |   |   |   |   |   |               |                      |                        |             |                 |  |                               |

NOTE: Every contractor and subcontractor is required to submit a copy of their weekly payroll records to the awarding authority.

Part 2 – Project Technical Sections Specifications

SECTION 00 01 00  
TABLE OF CONTENTS

|                                      |     |
|--------------------------------------|-----|
| Section 00 01 00 – Table of Contents | 1-4 |
| Section 00 86 00 – List of Drawings  | 1-2 |

**DIVISION 1**

|   |      |
|---|------|
| Section 01 10 00 - Summary of Work                                | 1-2  |
| Section 01 10 11 – Project Phasing Requirements                   | 1-5  |
| Section 01 14 00 – Work Restrictions                              | 1-6  |
| Section 01 25 13 – Product Substitution Procedures                | 1-2  |
| Section 01 30 00 – Administrative Requirements                    | 1-2  |
| Section 01 31 00 – Construction Scheduling and Phasing            | 1-6  |
| Section 01 31 10 – Project Management and Coordination            | 1-10 |
| Section 01 33 24 – Electronic Submittal Procedures                | 1-4  |
| Section 01 35 00 - Special Project Procedures                     | 1-6  |
| Section 01 35 43 – Environmental Procedures                       | 11-3 |
| Section 01 39 90 – Minor Alteration Work                          | 1-7  |
| Section 01 41 17 – Utility Notification                           | 1-2  |
| Section 01 42 00 – References and Definitions                     | 1-16 |
| Section 01 45 00 – Quality Control                                | 1-5  |
| Section 01 50 00 – Construction Facilities and Temporary Controls | 1-5  |
| Section 01 52 40 - Demolition and Construction Waste Management   | 1-6  |
| Section 01 60 00 – Materials and Equipment                        | 1-2  |
| Section 01 60 01 - Product Requirements                           | 1-4  |
| Section 01 70 00 - Contract Closeout                              | 1-3  |
| Section 01 73 00 – Execution                                      | 1-8  |
| Section 01 73 29 – Cutting and Patching                           | 1-7  |
| Section 01 77 00 - Closeout Procedures                            | 1-4  |

**DIVISION 2**

|  |     |
|--|-----|
| Section 02 41 19 – Selective Demolition                          | 1-4 |
| Section 02 83 33 – Demolition of Materials Containing Lead Paint | 1-4 |

**DIVISION 3**

|   |      |
|---|------|
| Section 03 30 00 – Cast-In-Place Concrete | 1-25 |
|---|------|

**DIVISION 4**

|  |      |
|--|------|
| Section 04 00 01 – Masonry Filed Sub-Bid Requirements*                                 | 1-3  |
| Section 04 01 20 – Unit Masonry* (Part of Section 04 00 01 Masonry Filed Sub-Bid Req.) | 1-19 |

**DIVISION 5**

|   |     |
|---|-----|
| Section 05 00 01 – Metal Fabrications Filed Sub-Bid Requirements* | 1-3 |
| Section 05 12 00 – Structural Steel                               | 1-9 |
| Section 05 30 00 – Steel Deck Infill                              | 1-4 |
| Section 05 40 00 – Light Gage Steel Framing Systems               | 1-8 |

Table of Contents

**Section 05 50 00 – Metal Fabrications\* (Part of Section 05 00 01 Metal Fabrications Filed Sub-Bid Req.)** **1-21**

**DIVISION 6**

|   |      |
|---|------|
| Section 06 10 00 – Rough Carpentry              | 1-4  |
| Section 06 40 00 – Architectural Woodwork       | 1-16 |
| Section 06 61 16 – Solid Surfacing Fabrications | 1-6  |

**DIVISION 7**

|   |             |
|---|-------------|
| Section 07 21 00 – Thermal Insulation   | 1-6         |
| Section 07 26 00 – Vapor Retarders  | 1-7         |
| <b>Section 07 27 13 – Modified Bituminous Sheet Air Barriers*<br/>(Part of Section 04 00 01 Masonry Filed Sub-Bid Req.)</b> | <b>1-11</b> |
| Section 07 53 23 – Roofing (Adhered EPDM Roof System)   | 1-15        |
| Section 07 62 00 – Sheet Metal Flashing, Roof Vent System and Trim  | 1-11        |
| Section 07 84 00 – Firestopping   | 1-12        |
| Section 07 92 00 – Joint Sealants   | 1-9         |

**DIVISION 8**

|  |      |
|--|------|
| Section 08 11 13 – Hollow Metal Doors and Frames | 1-12 |
| Section 08 31 00 – Access Doors and Panels       | 1-5  |
| Section 08 33 23 – Overhead Coiling Doors        | 1-7  |
| Section 08 51 13 – Aluminum Windows              | 1-16 |
| Section 08 71 00 – Door Hardware                 | 1-17 |
| Section 08 80 00 – Glazing                       | 1-7  |

**DIVISION 9**

|  |             |
|--|-------------|
| <b>Section 09 00 06 – Resilient Flooring Filed Sub-Bid Requirements*</b>   | <b>1-13</b> |
| <b>Section 09 00 09 – Painting Filed Sub-Bid Requirements*</b>   | <b>1-3</b>  |
| <b>Section 09 05 06 – Common Work Resulting for Flooring*<br/>(Part of Section 09 00 06 Resilient Flooring Filed Sub-Bid Req.)</b> | <b>1-8</b>  |
| Section 09 22 16 – Non-Structural Metal Framing  | 1-9         |
| Section 09 29 00 – Gypsum Board  | 1-13        |
| Section 09 30 19 – Tiling  | 1-15        |
| Section 09 51 00 – Acoustical Ceilings   | 1-11        |
| <b>Section 09 65 23 – Rubber Flooring*<br/>(Part of Section 09 00 06 Resilient Flooring Filed Sub-Bid Req.)</b>                    | <b>1-9</b>  |
| Section 09 67 23 – Resinous Flooring   | 1-10        |
| Section 09 68 00 – Tile Carpeting  | 1-9         |
| <b>Section 09 90 00 – Painting*<br/>(Part of Section 09 00 09 Painting Filed Sub-Bid Req.)</b>                                     | <b>1-14</b> |
| <b>Section 09 91 13 – Exterior Painting Schedule*<br/>(Part of Section 09 00 09 Painting Filed Sub-Bid Req.)</b>                   | <b>1-2</b>  |
| <b>Section 09 91 23 – Interior Painting Schedule*<br/>(Part of Section 09 00 09 Painting Filed Sub-Bid Req.)</b>                   | <b>1-8</b>  |

**DIVISION 10**

|  |     |
|--|-----|
| Section 10 14 00 – Signage             | 1-7 |
| Section 10 21 15 – Toilet Compartments | 1-5 |

|   |     |
|---|-----|
| Section 10 28 13 – Toilet Accessories     | 1-6 |
| Section 10 40 00 – Safety Specialties     | 1-5 |
| Section 10 51 13 – Metal Lockers          | 1-6 |
| Section 10 56 13 – Metal Storage Shelving | 1-4 |

**DIVISION 11**

|   |     |
|---|-----|
| Section 11 31 00 – Residential Appliances | 1-3 |
|---|-----|

**DIVISION 12**

|                                      |     |
|--------------------------------------|-----|
| Section 12 24 00 – Window Treatments | 1-5 |
| Section 12 48 43 – Floor Mats        | 1-6 |

**DIVISION 21**

|  |             |
|--|-------------|
| <b>Section 21 00 00 – Fire Protection* (File Sub-Bid Required)</b> | <b>1-26</b> |
|--|-------------|

**DIVISION 22**

|  |             |
|--|-------------|
| <b>Section 22 00 00 – Plumbing* (Filed Sub-Bid Required)</b> | <b>1-37</b> |
|--|-------------|

**DIVISION 23**

|  |             |
|--|-------------|
| <b>Section 23 00 00 – HVAC* (Filed Sub-Bid Required)</b> | <b>1-74</b> |
|--|-------------|

**DIVISION 26**

|  |              |
|--|--------------|
| <b>Section 26 00 00 – Electrical* (Filed Sub-Bid Required)</b> | <b>1-109</b> |
|--|--------------|

**DIVISION 31**

|  |      |
|--|------|
| Section 31 10 00 – Site Preparation                  | 1-2  |
| Section 31 20 00 – Earth Moving                      | 1-25 |
| Section 31 23 19 - Dewatering                        | 1-5  |
| Section 31 25 00 – Erosion and sedimentation Control | 1-8  |

**DIVISION 32**

|  |      |
|--|------|
| Section 32 12 16 – Asphalt Paving            | 1-4  |
| Section 32 13 13 – Concrete Paving           | 1-15 |
| Section 32 16 00 = Curbs                     | 1-3  |
| Section 32 17 23 – Pavement Markings         | 1-3  |
| Section 32 30 00 – Site Improvements         | 1-3  |
| Section 32 32 23 – Segmented Retaining Walls | 1-10 |

**DIVISION 33**

|                  |      |
|------------------|------|
| Section 33 00 00 | 1-10 |
|------------------|------|

**APPENDIX**

|   |      |
|---|------|
| Intertek PSI – Subsurface Conditions Report, dated July 7, 2022 | 1-11 |
|---|------|



Intertek PSI - Geological Engineering Report, dated August 27, 2020 1-47  
Intertek PSI – Geological Engineering Report, Rev. 1, dated November 19, 2020 1-59

**PLANS MAY BE OBTAINED AT THE PURCHASING DEPARTMENT. PLEASE CALL AHEAD  
FOR AVAILABILITY AT 617-796-1220.**

END OF SECTION

SECTION 00 86 00

LIST OF DRAWINGS

DRAWING NUMBER

TITLE

GENERAL

A0.0 COVER SHEET  
A0.1 SYMBOLS, ABBRIVIATIONS AND DRAWING LIST  
A0.2 CODE REVIEW AND PLANS

SITE

EXISTING CONDITIONS SITE PLAN

CIVIL

C0.1 SITE LEGEND, NOTES & DETAILS  
C0.2 SITE DETAILS  
C0.3 SITE DETAILS  
C1.0 SITE DEMOLITION & PREPARATION PLAN  
C1.1 SITE LAYOUT & MASTER PLAN  
C2.1 SITE UTILITY PLAN  
C3.1 SITE GRADING PLAN

ARCHITECTURAL

D1.0 DEMOLITION/ SELECTIVE REMOVAL FLOOR PLANS  
D2.0 DEMOLITION/ SELECTIVE REMOVAL EXTERIOR ELEVATIONS  
A1.0 PROPOSED WORK - OVERALL FLOOR PLANS  
A1.1 PROPOSED WORK – ENLARGED FLOOR PLANS  
A1.2 PROPOSED WORK – ENLARGED REFLECTED CEILING PLANS  
A1.3 PROPOSED WORK – ROOF PLAN & DETAILS  
A2.0 PROPOSED WORK – EXTERIOR ELEVATIONS  
A3.0 PROPOSED WORK – BUILDING SECTIONS  
A3.1 PROPOSED WORK – WALL SECTIONS  
A3.2 PROPOSED WORK – WALL SECTIONS  
A3.3 PROPOSED WORK – ENLARGED STAIR PLANS AND SECTIONS  
A3.4 PROPOSED WORK – ENLARGED STAIR PLANS AND SECTIONS  
A4.0 PROPOSED WORK – DOOR & WINDOW TYPES, SCHEDULES & DETAILS  
A4.1 PROPOSED WORK – EXTERIOR WINDOW & DOOR DETAILS  
A5.0 PROPOSED WORK – ENLARGED PLANS & INTERIOR ELEVATIONS/ ADA HEIGHTS &  
CLEARANCES  
A5.1 PROPOSED WORK – ENLARGED PLANS & INTERIOR ELEVATIONS/ MILLWORK DETAILS

STRUCTURAL

S1.0 GENERAL NOTES  
S0.2 TYPICAL DETAILS  
S0.3 TYPICAL DETAILS  
S1.0 FOUNDATION PLANS & MEZZANINE FRAMING PLAN

S1.1 ROOF FRAMING PLAN  
S2.0 SECTIONS

FIRE PROTECTION

FP1.0 LEGEND, NOTES, AND DETAILS – FIRE PROTECTION  
FP1.1 GROUND & UPPER FLOOR PLANS – FIRE PROTECTION

PLUMBING

P0.1 LEGEND, SCHEDULES, AND DETAILS - PLUMBING  
P1.1 FLOOR PLANS - PLUMBING

HVAC

M0.0 HVAC SCHEDULES AND GENERAL NOTES  
MD1.0 HVAC DEMOLITION FLOOR PLANS  
M1.0 HVAC RENOVATION FLOOR PLANS  
M2.0 HVAC DETAILS I  
M4.0 HVAC CONTROLS

ELECTRICAL

ED1.0 ELECTRICAL DEMOLITION PLANS  
E0.1 ELECTRICAL SYMBOL LIST  
E0.2 LIGHTING FIXTURE SCHEDULE  
E0.3 ELECTRICAL SITE PLAN  
E1.0 LIGHTING FLOOR PLANS  
E2.0 POWER FLOOR PLANS  
E2.1 ROOF POWER PLAN & DETAILS  
E3.0 ELECTRICAL RISER DIAGRAM AND SCHEDULES  
E3.1 ELECTRICAL DETAILS  
E3.2 MECHANICAL AND PLUMBING SCHEDULES  
E4.0 FIRE ALARM RISER AND DETAILS  
E4.1 FIRE ALARM FLOOR PLANS

SECTION 01 10 00

SUMMARY OF THE WORK

1.01 GENERAL CONDITIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. The Sections of these Specifications entitled "Special Conditions, "Minimum Wage Determination," and Division 1 "General Requirements" (including, but not limited to "Unit Pricing") shall apply and are hereby made a part of this section of the Specifications.

1.02 LOCATION OF WORK

The work of this contract shall be performed at the **Newton Commonwealth Golf Course, 212 Kenrick Street, Newton, MA 02485**

1.03 CONTRACT DESCRIPTION

- A. In general, and without limiting the scope of this contract, the work consists of renovations to an existing two story building. The work to include new structural steel mezzanine, new Electrical, new Fire Protection sprinkler system, new HVAC, new Plumbing, new metal stud GWB partitions, new concrete slabs, new floor finishes, new suspended ACTceilings, new fire water line service, new painting, new & repair of masonry, new overhead coiling doors and upgrades to parking and driveway areas.

1.04 GENERAL SCOPE OF WORK

- A. The work to be done consists of Addition and Renovation of an existing golf maintenance facility building at the **Newton Commonwealth Golf Course** as shown and specified on the contract drawings and project manual entitled:  
**Newton Commonwealth Golf Course –  
Maintenance Facilities Improvements & Renovations**
- B. The General Contractor shall furnish and do everything, except as otherwise provided by specified indications herein or on the drawings, necessary to complete the work in accordance with the plans and specifications. He/she shall furnish all plant, labor, materials, supplies, tools, water, machinery, implements, light, power, transportation, and other facilities required, and do all work necessary for the complete execution and completion of the contract, except that work or materials specifically stated to be done or furnished by others.
- C. All work and materials furnished and installed shall be of the best quality and workmanship, and to the satisfaction of the Architect. There shall be no defect in the work or the operation thereof due to inferior materials or the workman like placing of any part. The work under this contract shall be performed at such times as may be necessary to facilitate the orderly progress of the work, and so as not to interfere with the continued use of the building for school purposes. It is the intention of these specifications and plans to cover all work necessary and incidental to the completion of this project, including all trades, as shown on the drawings or specified.
- D. It is required that the general contractor provide, for the project duration, a competent full-time project superintendent who is a Licensed Construction Supervisor in the state of Massachusetts.
- E. Contractor shall do all necessary cutting and patching of structural and finish work as necessary to

provide the finished results shown on the contract drawings and as herein specified.

1.05 PROJECT CONSTRUCTION COST ACCOUNTING

- A. The contractor shall prepare a Schedule of Values within 10 days of Notice to Proceed / contract execution, to be used for establishing the breakdown of costs and for determining percentages of completion for monthly payments for this project.
- B. The Schedule of Values shall include a complete breakdown of the costs for labor and material, separately, by building area of the various trades with further breakdown of each trade as required by the Architect. These Schedules of Values shall be submitted to and approved by the Architect prior to the submission by the contractor for the first Application for Payment and shall be used for all subsequent applications.

END OF SECTION

SECTION 00 10 11

PROJECT PHASING REQUIREMENTS

PART 1 - GENERAL

1.01 Related Documents

- A. All of the Contract Documents, including General Conditions, Supplemental Conditions and other Division 1 --General Requirements, apply to the Work of this Section.
- B. This Section contains general information that applies to all Work performed under the Contract and is inherently made a part of each Specification section.
- C. Phasing Drawings are included in the contract documents. Reference the Phasing Drawings for coordination with the requirements of this Section.

1.02 Project Background

- A. Due to Owner Occupancy of both the site and the building during the construction period, the Contractor must prosecute the Work as follows: Adhere to pre-established schedules in order to meet school start dates, provide minimum disruption of the Owner's use consistent with the Work being performed, and prosecute and control of the Work in such a fashion that the irregularities common to all addition and renovation projects can be handled by all parties concerned in a reasonable and timely way.
- B. In order to minimize disruption of the educational process and to enhance the safety of the users, operations of the Contractor are to be separated from those of the school to the maximum extent possible. Toward that end, the Work is divided into designated phases, which are to be made available to the Contractor and occupied by the Owner at differing times.
- C. The designated Phases of the Work are not meant to dictate the Contractors means and methods and/or the scheduling of individual work items. However, the beginning and end dates of individual phases are crucial in order to allow for continuous, smooth, school operations in the building and on the site by the Owner. As such, the end dates for individual phases noted in the Project Timetable will be the basis for assessing any liquidated damages called for in the contract.
- D. The Contractor may, at his option, suggest revisions to the Phases of the Work, or the Project Timetable outlined in this Section, which might improve the constructability, or reduce the overall construction time of the project without negatively impacting the Owner's use of the building and site for school and community functions in any way. The Owner reserves the sole right to approve or reject any proposed changes to the Phases of the Work and/or the Project Timetable. Unless proposed changes are approved by the Owner, the Project Timetable and Phases of the Work portions of this Section as written will remain in full force and effect.

1.03 Phases of the Work

- A. See 1.04 Project Timetable for dates associated with the following Phases of Work.

- B. Any work within occupied portions of the existing building, or site, shall take place during either non-school hours or vacation times as outlined below.
- C. Any deliveries to the Contractor's staging areas shall be limited during school hours. Do not schedule deliveries between the hours of 7:30 AM to 9:00 AM and 1:30 PM to 3:00 PM when school drop-off and pick-up is occurring
- D. Project Timetable
  - 1.04 Award of Bid will be approximately: 2 weeks after GC bids received.
  - 1.05 Phase 1 – Submittal / Procurement Period: May 8, 2024, through September 30, 2024
  - 1.06 Phase 2 – On-site mobilization / start of construction: Oct 1, 2024
  - 1.07 Phase 3 – Substantial Completion of the Newton Commonwealth Golf Course Maintenance Facility Renovations - April 11, 2025.
  - 1.08 Phase 4 – Final Completion of the project including all closeout requirements - June 12, 2025.
  - 1.09 Hours of Operation
    - A. The Contractor acknowledges the stringent requirements of the Owner with respect to the dates of Substantial Completion for various phases of the Work and recognizes that the construction schedule may require that work proceed on an accelerated basis. The Contractor further acknowledges that requirements related to safety and the maintenance of ongoing school operations will limit Contractor access to Owner-occupied areas of the school building and site to school vacations and/or after school hours. The Contractor therefore agrees that the Work of his own forces and his Subcontractors, including all filed Subcontractors, shall be performed on an overtime and/or double-shift basis if, and to the extent necessary, it is required to meet the construction schedule.
    - B. Neither overtime nor double-shift work shall be grounds for any claim for compensation to the Contractor or to any Subcontractor. If the nature of overtime or double-shift work requires that the Owner provide personnel to operate the facility at times when they would not normally be present, such personnel costs shall be born or reimbursed by the Contractor.
    - C. None of the requirements herein shall be construed as relieving the Contractor of his responsibility to conduct his operations in conformance with local ordinances or requirements established by the Commonwealth.
  - 1.010 Damages
    - A. It is the express understanding of the Owner and the Contractor that the time for performance on various phases of the Work is directly related to the school year and school calendar. Specifically, the various Contract Times are related to the dates for the opening of school after various school vacations and to the Owner's move-in time needed prior to those opening dates.
    - B. If the Contractor fails to achieve Substantial Completion of a phase of the Work within its Contract Time, the Owner may be required to make alternative arrangements for equivalent classroom space for whatever portion of the school year is affected and/or perform his move-in on an accelerated basis and will thereby incur administrative, professional, rental, storage, moving, transportation and other costs which would not be incurred if the Project Timetable had been met. A delay of even one or two days could

create a condition requiring expenditure of substantial sums of money relative to these items and, therefore, the Owner's damages are not at the outset strictly related to the actual length of the loss of use of the facility of portions thereof.

- C. If the Contractor fails to achieve Substantial Completion of a phase of the Work within its Contract Time, the Contractor shall pay the Owner for all actual costs, expenses, loss and damages as described herein. Such payment to the Owner may, at the Owner's option, be effected by the issuing of a Change Order deducting the amount of the Owner's claim from payments then or thereafter due the Contractor; if the payments then or thereafter due the Contractor are not sufficient to cover such amount, the Contractor shall pay the difference to the Owner.

1.011 Use and Occupancy by Owner Prior to Substantial Completion

- A. Prior to the dates of Substantial Completion stipulated above, the Owner shall have the right to occupancy and use of completed areas of any Portion provided the Owner's partial occupancy and use of such spaces, in the opinion of the Architect and the Owner's Representative, does not unduly interfere with the Contractor's operations. The time for occupancy, the location and extent of the areas to be occupied shall be determined by the Architect and the Owner's Representative.
- B. If phases of the Work have not been completed by the dates of Substantial Completion stipulated above, the Owner, at his election, may occupy any uncompleted portions of the building or parts thereof which are completed to such a degree as will make the use of those areas, however incomplete, functionally, educationally or financially preferable to the use of other temporary arrangements.
- C. The Owner will, prior to any such partial occupancy, give written notice thereof to the Contractor and such occupancy shall be subject to the following provisions:
  - 1. The Owner shall secure endorsement from the Contractor's insurance carrier and written consent of the surety, if any, permitting the occupancy during the remaining period of construction, which endorsement from the insurance carrier and written consent of the surety shall not be unreasonably withheld.
  - 2. Use and occupancy prior to acceptance shall not relieve the Contractor of his responsibility to maintain Contractor's Liability Insurance as required in the General Conditions, until the Project is completed and accepted by the Owner.
  - 3. Notwithstanding any partial occupancy, the one-year guarantee period called for in the Contract Documents shall not commence until the Substantial Completion of all work of the individual phases impacted by this clause.
  - 4. No partial occupancy by the Owner shall constitute an acceptance of work not performed in accordance with the Contract Documents, or relieve the Contractor from the obligation of performing any work required by the Contract past the Contract Phase Time, or constitute a waiver of any of the Owner's rights.
  - 5. Certain phases of Project Closeout procedures, including cleaning, may be requested for such portions contemplated for partial occupancy and the Contractor shall, upon request, perform these or the Owner will have the Work performed and deduct his costs from the project by change order. The Contractor shall not be relieved of maintenance costs due to his own operations on the portions of the



building so partially occupied prior to Substantial Completion. He shall not, however, be held responsible for wear and tear, damage or cleaning which can be clearly demonstrated as to be resulting from such partial occupancy.

6. In the event of such occupancy, the Contractor shall conform his work to the reasonable convenience of the Owner and, by whatever measures are necessary, on a temporary or a permanent basis, ensure that the Owner is provided with adequate heat, ventilation, light, power and water services in such partially-occupied areas.

#### 1.012 Separation of Uses

- A. Before beginning any phase of the Work, provide temporary fencing and barriers in the building and on the site as described in Division 1 of the Project Manual and/or as shown on the construction documents.
- B. Provide temporary partitions and dust-tight barriers within the building and over existing windows wherever necessary to separate areas occupied by the Owner from areas of the Contractor's operations.

#### 1.013 Special Access Requirements

- A. The Phases of the Work have been designated in such a way as to reduce as much as possible the Contractor's need to pass through areas of the building or site which are occupied by the Owner. It is recognized, however, that instances will arise in which there are no alternative means of access to Contractor areas of operation other than through Owner-occupied areas. In such instances, the Contractor shall coordinate and cooperate in every way with the Owner, in advance, to ensure that the Owner's safety and convenience is not compromised. Instances of this kind include, but are not necessarily limited to, those described below.
- B. The phases of the Work have been designated in such a way as to minimize the need for students, teachers, school administrators or suppliers to pass through areas of the building or site, which are occupied by the Contractor. It is recognized, however, that instances will arise when such passage is necessitated for access or for emergency egress. In such instances, the Contractor shall confer, in advance, with the Architect, Owner's Representative and local Building Official and shall take all measures and provide all temporary construction necessary to insure safe passage.
- C. Special access conditions which have been identified include, but are not limited to the following:
  1. During the time of Owner move-out and move-in from one area to another, there is the potential need for sharing of occupancies by Owner and Contractor.
  2. During all phases, the Fire Department shall have unhindered access to all existing, temporary, and permanent fire alarm panels.
  3. During all phases, the Fire Department shall have unhindered access to the entire perimeter of both the existing building, and the additions. Coordinate access requirements with the Fire Department and provide appropriate gates and travel surfaces.
  4. During all phases, the Contractor will be allowed access to Owner-occupied areas within the constraints described herein, for incidental operations such as the verification of existing conditions

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

5. During Phase 1, the Contractor will be allowed access to the existing building for field verification of existing conditions in conjunction with the Submittal / procurement Period.
6. During Phase 2, the Contractor will have full access to the existing building and commencement of construction activities
7. During Phase 3, the Contractor shall be Substantially Complete on or before April 11 2025.
8. Phase 4, the Contractor shall be have Final Completion including all closeout requirements.

END OF SECTION

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

SECTION 01 14 00  
WORK RESTRICTIONS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Site access restrictions.
- B. Coordination of work with City Agencies and Newton Public Buildings Project Manager
- C. Worker conduct, appearance and Work Rules.

1.2 WORK FORCE REQUIREMENTS

- A. Work force requirements:
  - 1. The General Contractor acknowledges the stringent requirements of the Owner with respect to the dates of Substantial Completion for various Portions of the Work, and recognizes that the construction schedule may require that work proceed on an accelerated basis. The General Contractor therefore agrees that the Work of his own forces and of his Subcontractors shall be performed on an overtime and/or double-shift basis if and to the extent necessary in order that the construction schedule be met.
  - 2. Neither overtime nor double-shift work shall be grounds for any claims for compensation to the General Contractor or to any Filed subcontractors or subcontractor. If the nature of overtime or double-shift work requires that the Owner and their agents provide personnel to operate the facility at times when they would not normally be present, such personnel costs shall be borne or reimbursed by the General Contractor.
  - 3. **The General Contractor, subcontractors shall have access to the site through the fence gate(s) approved by the Owner. All other gate access to the site will require approval of the their site representative.**
    - a. No vehicles (except fire, police and rescue) may enter or exit the construction sites from other gates unless authorized by the Owner.
    - b. Work schedule on site shall be Monday through Friday, 7:00AM to 5:00PM conforming to the **City of Newton** Ordinances and Bylaws. Any off hour work from times described above, the General Contractor will be required to get permission from the Town governing agency.
    - c. Prior to 7:00 AM any vehicle which arrives at the site during the "Closed Gate" time must move to a location acceptable to the Owner. Idling/parking on town streets is not permitted at any time. No vehicles will be allowed to idle on any other nearby street. The General Contractor shall be responsible for enforcing this requirement.
  - 4. Commencement of Work: **Prior to any work commencing on site the site fencing, erosion control and stabilized construction entrance shall be installed, completed and be reviewed by the City Conversation Commission and the Civil Engineer of Record for acceptance.** It is the responsibility of the General Contractor to provide materials and labors to maintain the fencing, erosion control and the stabilized construction entrance for the duration of the work on site.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

5. **Facility** access: The existing school site and building is unoccupied and shuttered. The General Contractor is required to coordinate with the Owner's Project Manager prior to scheduling Work.
6. **Winter Conditions:** The Owner and General Contractor recognize that time is of the essence for completion of this Contract and agrees to continue work throughout the winter months without delay or additional claim for costs to do so.
7. **City Authority:** The General Contractor shall comply with all local ordinances, including those with respect to work start, finish, and weekend work, including but not limited to any **City of Newton, MA** noise regulations.
8. None of the requirements herein shall be construed as relieving the General Contractor of his responsibility to conduct his operations in conformance with local ordinances or requirements established by the Commonwealth.

1.3 USE OF SITE

- A. Use of, and access to, site will be subject to special requirements of the Owner, as directed.
  1. Prior to beginning the Work of this Contract, the General Contractor shall meet with the Owner and the Architect to determine procedures regarding access and use of the site, locations and access to staging and storage areas, tree protection, temporary barriers and fencing, and any special site conditions or restrictions regarding the use of the site areas surrounding the construction.
  2. Use of Owner's receiving/shipping areas and loading dock: General Contractor is responsible to deliver and receive all materials and equipment. General Contractor is not permitted to have supplies or equipment shipped directly to them in care of the Owner or Building Manager. All shipments will be refused.
  3. The Owner will supply storage facilities for equipment and furnishings scheduled for salvage and reuse.
  4. **Security:** Owner and their agent's access must be permitted at all times in all construction areas.
- B. Confine operations to areas within Contract limits indicated on the Drawings. Portions of the site and building beyond areas in which construction operations are indicated are not to be disturbed.
  1. Use of on-site areas outside of the contract limits will not be permitted. Schedule imports / exports off site of machinery and equipment on to the site and going off site to minimize impact of the surrounding neighborhood and local streets. The General Contractor shall provide a schedule of times of equipment entering and exit the site, not to impact the high volume traffic periods during the day.
  2. The General Contractor, Filed subcontractors and subcontractors and their personnel are not permitted to use the School's cafeteria for eating or any school or adjacent Town facilities.
- C. Keep all public roads and walks, and access drive to facility clear of debris caused by this Work during building operations.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1.4 SITE ACCESS RESTRICTIONS

- A. Access to the site is restricted to established routes for safety of students and surrounding neighborhoods.

1.5 COORDINATION OF WORK WITH ADJACENT FACILITY OCCUPANCY

- A. The Owner intends to occupy adjacent facility parking areas and access roads during construction. Notify the Owner of work which will affect the use of these areas; coordinate work schedule with Owner. The General Contractor shall consult with the Owner's Project Manager on the best ways to provide access, and on changes to access areas, as the work progresses, to perform the Work.
  - 1. Take all measures to insure the safety of the general public. The General Contractor must take every reasonable precaution and employ all necessary measures including extra cleaning, special supervisory personnel, and additional temporary barriers and signage to facilitate the clean, quiet, safe, and continual operation during the demolition and construction of the addition and adjacent City facilities.
  - 2. Suspension of Work: The Owner retains the right to temporarily suspend work at any time when the noise or disturbance created by construction proves disruptive to the academic activities of the adjacent facility or exceeding the limits of any **City of Newton, MA** noise regulations. The Owner may request of the General Contractor to utilize other means and methods, if practical, and acceptable to the Architect, which are less disruptive.
- B. Interruption of services: Any major work entailing disruption to water, life safety systems, utility connections or other similar major disruption to the adjacent school must be closely coordinated with the Owner and local public safety officials, and temporary services, safety precautions, or connections provided. Do not shut down any service without approval of the Owner.
  - 1. Provide 1 week notification for any possible disruption of service to Owner, Owner's Project Manager and Architect provide notification for connecting, disconnecting, turning on or turning off any service which may affect Owner's operations of the existing facility.
  - 2. Provide 72 hour (3 work days) notice to the **Newton Fire Department** of disruptions in electrical services, fire alarm services, gas service and Electrical power services.
  - 3. Any action either planned or unplanned, by the General Contractor, Filed subcontractors or subcontractors which impairs the operation of anyone or the activation of the fire alarm detection and or suppression system shall cause notification of the appropriate party. In case of unplanned, accidental, impairment, the General Contractor will immediately notify the Owner. The General Contractor should be prepared to provide assistance to correct the problem at its own expense.

1.6 WORKER CONDUCT, APPEARANCE AND WORK RULES

- A. The conduct and appearance of each worker at the job site is of paramount importance. The Owner reserves the right to require any worker to be banished from the Site.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- B. Privacy: Conduct all work of the Contract with the maximum effort to maintain the privacy of the Owner's operations, staff, and employees. Do not allow workers to peer into areas of the adjacent residential properties which are visible from the work area. Invasion of privacy is a major infraction of the work rules.
- C. General Conduct and Demeanor: All construction workers shall treat all other workers, Owner staff, student and the public with respect and courtesy.
- D. Physical Appearance: Require each worker to dress appropriately in a clean, neat, and professional manner.
  - 1. Sleeved shirts and long pants are required minimum clothing. Short sleeved shirts may not be rolled up. Shirts may not be rolled up at the waist. Pants may not be rolled up past the top of the boots or shoes worn. Anyone not in compliance is subject to immediate dismissal.
- E. Entertainment Devices (including, but not limited to radios, CD players, MP3 players and televisions): The use of all entertainment devices, including personal devices with headphones or earphones, is strictly prohibited at all times.
  - 1. Control the volume of communication radios and loudspeakers to avoid creating a nuisance.
- F. Smoking: Smoking is strictly prohibited on-site.
- G. Alcoholic Beverages: Alcoholic beverages are strictly prohibited on-site.
- H. Language: Foul and rude language is strictly prohibited.
- I. Physical Actions: Running, horseplay, fighting, and other unprofessional conduct is prohibited. Fighting is a major infraction of the work rules.
- J. Stealing: Stealing of any materials, objects, furnishings, equipment, fixtures, supplies, clothing, or other items will not be tolerated and is a major infraction of the work rules.
- K. Sexual Harassment: All forms of physical and verbal sexual harassment will not be tolerated and is a major infraction of the work rules. Sexual harassment includes, without limitation: touching, taunting, whistling, sexually explicit stories, jokes, drawings, photos and similar representations, exhibitionism and all other sexually oriented offensive behavior.
- L. Warnings and Dismissal:
  - 1. For minor infractions of the rules, the Owner may issue a warning. Only one warning will be allowed per worker. A second infraction will result in immediate dismissal of the worker from the Site.
  - 2. For major infractions of the rules, the worker shall be dismissed immediately without warning and is subject to possible criminal prosecution.
- M. Notification of Workers: Clearly notify and educate each worker about these Work Rules and the requirements for worker conduct and appearance.
  - 1. Recommendation: The Owner recommends that the General Contractor notify each worker of the work rules in writing and obtain a signed acknowledgment of the worker's understanding of the work rules as a condition of employment on this project.

WORK RESTRICTIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1.7 GENERAL GUIDELINES FOR CONSTRUCTION – FIRE PREVENTION DIVISION

1. Smoke detectors shall be changed to heat detectors during construction.
2. Sprinkler heads shall be turned upright to maintain coverage during construction while ceiling grid is impaired.
3. Detail required for all hot work (generally 1 FF per 35ft when in direct line of sight)
4. Detail required for all sprinkler impairment (generally 1 FF per 2 floors)
5. Temporary fire alarm system shall be installed on all new construction projects (heats, pulls, AV, extinguishers) and tied into municipal circuits or central station monitoring. Temp system shall be tested by NFD.
6. Temporary street boxes may be required along the exterior of construction site depending on the size of project.
7. All permits (Building, Fire, Electric, etc.) shall be displayed at front entry of site.
8. NFPA 241 hard copy shall be kept at the front entry of the site and accessible to FD.
9. Any temporary heating must be permitted by FD.
10. Standpipes shall be built out to one floor below the top level as new construction develops.
11. Signage shall be installed indicating FDC, panel location, sprinkler room/valves, exits during construction.
12. Construction entrance gates must have Knox padlocks (see Superintendent of Wires).
13. Access to emergency vehicles/responders shall be maintained during construction.
14. We will only test new, clean devices. When installing and programming new smoke detectors in construction areas, after configuration, they must be removed and kept in a clean environment. Once construction is complete, prior to acceptance testing, they can be reinstalled. Heat detectors coverage must be maintained until new system is commissioned.

1.8 GENERAL GUIDELINES FOR ACCEPTANCE TESTING – FIRE PREVENTION DIVISION

1. Final acceptance testing will only take place if space is broom swept, clean, and ready for occupancy. This means all work is completed.
2. Request for Acceptance Application Form must be filled out completely.
  - a. Includes all necessary signatures.
  - b. Check for testing fee - \$100.

WORK RESTRICTIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- c. NFPA 72 Record of Completion
  - d. NFPA 13 Record of Completion (whenever sprinklers are touched)
  - e. Commercial acceptance testing will be scheduled after-hours, when applicable, to ensure that the building is not occupied during testing (associated fee must be submitted ahead of testing). Every effort will be made to ensure that a building is unoccupied during testing.
  - f. All other final inspections (electrical, plumbing, Emergency Responder Radio Coverage, etc.) must be signed off prior to Fire Department acceptance testing.
3. Sprinkler installer must be on site during testing.
  4. Fire alarm installer must have 2 representatives on site during testing, one should be a programmer.
  5. Fire alarm company of record representative must be on site during testing.
  6. Keys must be provided to be placed in the Knox Box.
  7. Exterior beacon must indicate appropriate space in alarm.
  8. Signage must be in place for FDC, fire panel, sprinkler room/valves, etc.
  9. Extinguishers must be mounted and in correct locations along egress.
  10. Sprinkler tampers will be tested.
  11. Main water flow will be tested.
  12. Isolation valves must be accessible and labeled.
  13. All fire alarm devices including A/V will be tested.
  14. System integrity and battery backup will be tested.
  15. Municipal and central station connections will be tested

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

END OF SECTION



Section 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Product options.
  - 1. Product selections.
  - 2. Visual matching.
- B. Product substitution procedures.
- C. Owner's proprietary products.

1.2 RELATED REQUIREMENTS

- A. Section 01 60 00 - PRODUCT REQUIREMENTS: Basic product requirements

1.3 PRODUCT OPTIONS

- A. Product selections: Comply with the following for selection of products:
  - 1. Products specified by reference standards or by description only: Provide any acceptable product meeting those standards or description.
  - 2. Products specified by performance requirements only: Provide any acceptable product which has been tested to show compliance with specified requirements, including indicated performances.
  - 3. Products specified by naming one or more manufacturers with a provision for substitutions: Provide products of manufacturers named, or submit a request for substitution for any manufacturer or product not named.
- B. Visual matching: Where Specifications require matching a sample, the Architect's decision on whether a proposed product matches is final. Where no product matches and complies with other requirements, comply with provisions for "substitutions" for selection of a matching product in another category.

1.4 PRODUCT SUBSTITUTION

- A. Products specified by reference standards or by description only: Any product meeting those standards or description.
- B. Pursuant to Massachusetts General Laws, Chapter 30, Section 39M(b), where products or materials are prescribed by manufacturer name, trade name or catalog reference, the word "or approved equal" shall be implied. The Architect will evaluate the proposed "equal" item on the following criteria:
  - 1. The submitted "equal" item is at least equal in quality, durability, appearance, strength and design,
  - 2. The submitted "equal" item is at least equal in function for the purpose intended by the design of the Work
  - 3. The submitted "equal" item conforms substantially to the detailed requirements for the items as indicated by the specifications.

- C. The Architect's evaluation and decision on whether a proposed product is equal to that specified, based on the above evaluation requirements. The General Contractor retains the right to appeal the Architect's determination of equality through regulated statutory provisions.
  - 1. The Architect and Owner reserve the right to reject proposed substitutions where data for VOCs is not provided or where emissions of individual VOCs are higher than for specified materials.
  
- D. Owner's proprietary products: Under provisions of Massachusetts General Laws, Chapter 30, Section 39M(b) the Owner has determined that specific products shall be proprietary for 'sound reasons in the public interest'. This determination has been made under vote of the **Town or City** represented by the **Awarding Authority** and has been recorded in writing for public record.
  - 1. Owner's proprietary products are listed under Section 01 60 00 and in respective individual Specification Sections.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

SECTION 01 30 00

ADMINISTRATIVE REQUIREMENTS

PART 1 - GENERAL

RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Administrative Submittals:
1. Schedule of Values: Submit prior to first Application for Payment within 10 days of Notice to Proceed / Contract execution. Schedule of Values shall include but not limited to the following.
    - a. Line item breakdown of labor and material with expenditures not to exceed \$10,000 or as otherwise adequately defined by the work.
    - b. Unit Price Bid scope items
    - c. Shop drawings
    - d. Closeout
  2. Daily Construction Reports and Field Condition Reports: Compile and submit weekly.
  3. Project Work Plan, including but not limited to, describing project sequence of work, building access, loading of materials on site and in building, coordination with Owner's occupants of building and site during construction, weekly two week look ahead schedule of work, delivery schedules, identifying and maintaining egress and entry access to the building and site with the owner's occupants at all times for life safety and operation of owner's activities. This work plan must be submitted and approved prior to mobilization on site.
  4. CORI Forms
    - a. Each employee of the General Contractor and Subcontractors that will be present on the project site must fill out a CORI form and present in person the form with a valid and legal picture identification card to the authorized CORI representative at the school for a criminal background check to be performed.
    - b. The CORI representative will provide the General Contractor and Subcontractors with forms of identification for each employee of the Trade Contractors and Subcontractors that are cleared and authorized to be on site.
    - c. A copy of each employee's identification card (hard hat sticker in lime green) must be visible at all times throughout construction activities. Anyone not displaying the identification card will be removed from site immediately and not allowed on site until proper identification is obtained.
- C. Changes to the Work:
1. Changes Initiated by Architect: Respond to requests from the Architect for changes by preparing a proposed change order (PCO).
  2. Changes Initiated by Contractor: Contractor may request a change to the Work upon encountering unforeseen conditions. Prepare a PCO substantiating increased costs necessary to address the condition.
  3. Proposed Change Order (PCO): Provide detailed accounting of labor, materials, equipment rentals, and subcontracting costs necessary to complete the proposed work. Indicate: base labor rate and detail of markups for direct personnel expense; subcontractors' costs; quantities and unit costs of materials and

equipment; and mark-up for overhead and profit per contract requirements. Percentage for labor burden should in accordance with Supplemental Conditions. Include proposed changes to project schedule. Require subcontractors to include same level of detail. Include summary sheet reflecting total costs.

4. Approved PCOs will be incorporated into a Change Order prepared by the Architect.

D. Requests for Information:

1. Upon discovery of information required from the Architect, submit a written RFI to the Architect. Provide space on form for Architect's response.
2. Thoroughly describe information requested, including specific drawing and specification references. Include Contractor's proposed resolution.
3. Maintain detailed log of RFIs and distribute copy at project meetings.

E. Project Management:

1. Project meetings: Attend weekly progress meetings conducted by the Architect, with the Owner.
2. Construction Progress Schedule: Prepare schedule indicating start and stop dates, and project milestones. Update as work progresses, but no less than monthly from NTP. Submit prior to starting work, once per month, and when schedule changes.

F. Action Submittals: Prepare and submit Shop Drawings, Product Data, and Samples indicated. Improperly prepared submittals will be returned by the Architect without action for resubmittal.

1. Assign each submittal a unique submittal number. Indicate Project name, Contractor's name, name of subcontractor or supplier who prepared the submittal, Specification Section number, and Drawing number or detail references if applicable. Provide space for Architect's action stamp.
2. Contractor's Review: Affix Contractor's stamp indicating that the Submittal has been reviewed and approved by Contractor and coordinated with other Work.
3. Deviations: Highlight, circle, or otherwise specifically identify deviations from the Contract Documents. Failure to indicate deviations shall not relieve Contractor of obligation to provide work as indicated on Contract Documents.
4. Copies: Three for printed matter.
5. Distribution: Distribute copies of approved submittals to Owners (two copies), subcontractors, and suppliers, and maintain one copy at project site.

END OF SECTION

SECTION 01 31 00

CONSTRUCTION SCHEDULING AND PHASING

1.01 GENERAL CONDITIONS

- A. The General Conditions together with all Amendments and Supplements as hereinbefore listed, shall apply and are hereby made a part of this section of the Specifications.
- B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 SCOPE OF WORK

- A. This section specifies the construction phasing and scheduling of the work.
  - 1. The building project must be substantially completed by **April 11, 2025**
  - 2. **The execution of work shall be tied into the specific areas on the CPM schedule. The sequence of work shall be in coordination with the Owner's preparation of the opening of the golf season. Final cleaning of the interior spaces shall be identified and coordinated with the Owner in preparation of phased occupancy.**
  - 3. Critical Path Method (CPM) scheduling of the Work.
    - A. Definitions:
      - 1. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
        - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
        - 2. Predecessor activity is an activity that must be completed before a given activity can be started.
      - 2. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
      - 3. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
      - 4. Event: The starting or ending point of an activity.
      - 5. Float: The measure of leeway in starting and completing an activity.
        - 1. Float time is not for the exclusive use or benefit of either Owner or Construction Manager, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Date of Substantial Completion.
        - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
        - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
      - 6. Fragment: An amplified portion of the CPM schedule, to study a special sequence or establish a difficult time estimate, showing its predecessors,

successors and impacts.

7. Major Area: A story of construction, a separate building, or a similar significant construction element.
8. Milestone: A key or critical point in time for reference or measurement.
9. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

B. General CPM Requirement: The General Contractor shall develop and maintain a Network Diagram to demonstrate fulfillment of the contract requirements and shall utilize the plan for scheduling, coordinating and monitoring the Work (including all activities of subcontractors, equipment vendors and suppliers). A conventional Critical Path Method (CPM) Precedence Diagramming Method (PDM) technique shall be utilized to satisfy both time and procurement applications.

C. Preliminary CPM Schedule: Submit for Architect's and Owner's review Critical Path Method (CPM) construction schedule in triplicate within 10 calendar days after date of commencement stated on Notice to Proceed and or execution of contract, whichever is sooner. Revise and resubmit as required.

1. Before the first progress payment can be approved, the General Contractor must have an approved CPM Schedule as described herein. It is the General Contractor's responsibility to submit the CPM schedule with sufficient time for review by the Owner and Architect and any re-submittals and corresponding reviews that may be necessary prior to approval of the first requisition.
2. Supporting data: Submit the following supporting data in addition to the CPM Plots:
  1. The proposed number of working days per week.
  2. The holidays to be observed during the life of the contract (by day, month, and year).
  3. The planned number of shifts per day.
  4. The number of hours per shift.
  5. List the major construction equipment to be used on the site, describing how each piece relates to and shall be used in support of the submitted network diagram work activities/events.

D. CPM Progress Schedule shall be as described below:

1. Network Diagram Plots, General: The network diagram shall be an activity or arrow diagram. The diagram shall show relationships between the various activities. Exercise sufficient care to produce a clear, legible and accurate network diagram. Group activities related to specific physical areas of the project, on the network diagram for ease of understanding and simplification. Provide a key plan on each network diagram sheet showing the project area associated with the work activities/events shown on that sheet.
2. Work Activities as a minimum include:
  1. All major and critical minor portions of the work.
    - i. Break up the work into activities/events of a duration no longer than 10 work days each, except as to non-construction activities/events (for example: procurement of materials, delivery of equipment, curing times) and any other activities/events for which the Architect may approve the showing of a longer duration.

2. Fabrication and delivery time for each item requiring off site fabrication.
3. Each mock-up and in-place sample.
4. Temporary facilities and controls.
3. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one area, roof area, or building, to another area, roof, or building, for at least the major trades who are performing major work under this contract.
4. Identify all events on which the work is dependent on actions of Architect and Owner, including:
  1. Submittal of shop drawings, equipment schedules, samples, color submission, coordination drawings, templates, fabrication and material delivery times.
  2. Architect/Engineer's review of shop drawings, equipment schedules, samples and templates as defined under Section 01 33 00. General Contractor shall additionally schedule and allow for in the CPM Progress Schedule time for Architect's response to General Contractor's request for clarifications and interpretations of the Contract Documents. Time required for such activity, up to 5 or more days, is part of the normal construction process and is not a valid reason for extension of Contract Time, nor increase in the Contract Amount.
  3. Delivery times of equipment furnished under separate Contracts with Owner, where the Construction Manager has responsibility for installation or coordination.
  4. Test, balance and adjust various systems and pieces of equipment, maintenance and operation manuals, instructions and preventive maintenance tasks.
5. Activity Descriptive Information: identify the following for each work activity/event:
  1. Activity/Event ID number. (Uniquely number each activity/event. The network diagram should be generally numbered in sequence; left to right; top to bottom, and omitting numbers ending in 3, 6, and 9).
  2. Concise description of activity (35 characters or less including spaces preferred).
  3. Work location code, coordinated with key plan.
  4. Performance responsibility or trade code using defined and approved abbreviations.
  5. Nodes that correspond to the activities on the network diagram.
  6. Duration (in work days).
  7. Early Start (calendar day).
  8. Late Start (calendar day).
  9. Early Finish (calendar day).
  10. Late Finish (calendar day).
  11. Total float time.
  12. Manpower required (average number of men per day).
  13. Work Activity/Event Cost Data (as described below).

- E. CPM Submittal Requirements: Submit three copies of Network Plots, and have approved an updated CPM prior to the approval of each progress payment.
1. Plot format (each submittal): Colored plots (minimum 11 x 17 inches) and a CD-ROM disc.
  2. Plots and reports required:
    1. Network diagram plots.
      - i. Bar chart plot.
      - ii. Time logic plot.
      - iii. Critical Path items of work only plot.
      - iv. Early start and finish plot.
      - v. Late start and finish plot.
      - vi. Individual monthly activity plots for each month for the duration of the entire Contract.
    2. Activity List.
    3. Shop drawing and sample submittal schedule.
  3. Updates: Update and reissue the CPM Progress Schedule in coordination with each application for progress payment. Submission of complete and accurate monthly CPM Progress Schedules is a pre-requisite to the Architect's Certificate of Payment. The updated CPM; shall include the items specified herein above, in addition the updated CPM shall show the following:
    1. Changes to the Contract and their effect on the schedule and Activity/event costs.
    2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
    3. Revisions to schedule as required reflecting actual prosecution and progress of the Project. Show current status of activities completed or partially completed. Identify actual start dates and finish dates for each activity.
    4. Modifications to the Contractor's plan of action for future activities.
- F. Work Activity / Procurement of Materials:
1. Provide procurement of materials work activities/events related to work, guarantee period services, and system testing, balancing, adjustment, Closeout documents, interim and final cleaning.
- G. Special CPM Progress Schedule Meetings: The Owner may require additional special CPM review meetings at any time during the Contract to review the CPM Progress Schedule updates.
- H. Responsibility for Project Completion:
1. Whenever it becomes apparent from the current progress review meeting or the updated CPM progress schedule that phasing or contract completion dates shall not be met, the General Contractor shall execute some or all of the following remedial actions:
    1. Increase construction manpower in such quantities and trades as necessary to eliminate the backlog of work.
    2. Increase the number of working hours per shift, shifts per working day, working days per week (pending approval of Owner), the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.



2. Prior to proceeding with any of the above actions, the General Contractor shall notify and obtain approval from the Owner's Representative for the proposed schedule changes. If such actions are approved, the CPM revisions shall be incorporated by the General Contractor into the network diagram before the next update, at no additional cost to the Owner.
- I. Extension of Contract Time: Each time an extension of Contract Time is requested, submit the request with justification and evidence supporting the request and submit a completely revised and updated CPM Project Schedule showing the impact of the proposed extension of Contract Time on the Progress Schedule.
  - J. "Look Ahead" activity reports: Prepare each week throughout the term of construction a listing of upcoming construction activities. Each weekly report shall include a listing of planned construction activities for the following 10 days. Submit a Look Ahead Activity Report at each job meeting to all participants. If no meeting is planned on a given week, mail the reports directly to both Architect and Owner's Project Manager.
    1. Maintain a record of all Look Ahead Activity Reports in a 3-ring binder in the Construction Manager's field office and make available for review by Architect and Owner's Project Manager.

### 1.03 SUBMITTALS

- A. The contractor shall submit to the Architect for approval, a construction schedule in accordance with the requirements hereinafter specified. The CPM schedule shall be updated once a month, tied to the payment application requisition.

### PART 2 - PRODUCTS (Not Used)

### PART 3 - EXECUTION

### 3.01 COORDINATION

- A. The existing maintenance building will continue to be operated during the course of construction, by the **Newton Commonwealth Golf Course** during the time that the work under this contract is being performed.
- B. During the course of the work the contractor shall, through a series of weekly meetings, continually appraise the Architect, the building committee representative and a **City of Newton** representative on the progress of the work, coordination issues and the scheduling of work yet to be done.
- C. The contractor shall coordinate his work with the operating personnel in order that disruption to traffic flows and town office schedules are held to a minimum.
- D. The moving of movable furniture and materials necessary for execution of the work of this contract will be done by the general contractor.

### 3.02 LIMITATIONS

- A. Sewer, water, gas and electric services to the School shall not be disconnected or disrupted during the course of performing the work under this contract except during unoccupied hours when approved by the Owner.

- B. Utilities and paving shall be performed in accordance with an approved schedule established at the coordination and scheduling meetings.
- C. Contractor's employee parking will be limited to designated areas on the site.
- D. Contractors storage area shall be confined to the areas designed on the site. All storage areas shall be returned to their original condition.
- E. The Contractor shall consult with the Chief of the **City of Newton Fire Department** on details of access routes for fire/emergency vehicles and appropriate signs (warning and information).
- F. The contractor shall coordinate his work with the school schedule to prevent pedestrian or vehicle traffic problems on the property. Demolition should not present problems for fire or ambulance access to the building entrances.
- G. Drilling, jack hammering and like noisy operations shall not be performed directly under, over or adjacent to occupied spaces. The contractor shall consult with the Architect and owner and ascertain when spaces will be unoccupied at which time such operations may be performed.
- H. The Owner may exercise the option to permit minor alterations to be performed in occupied spaces during periods when they are not in use. The spaces shall be left broom clean at the end of each work period. Failure to maintain these occupied spaces in a clean condition will cause discontinuance of remodeling work in occupied spaces until such time as they can be vacated.
- I. Temporary entrances and fencing required to provide safe legal exits and entrance to the existing building shall be constructed as necessary and shall be complete and inspected and approved by the Building Inspector.
- J. Exits shall be properly lighted and maintained clear of construction at all times.
- K. No construction materials shall be stored in such a way as to interfere with entrances and exits to the buildings and access to walks and playfields.
- L. All areas disturbed by the Contractor's operations shall be returned to their original condition.
- M. Contractor shall survey the building prior to the start of construction to document all areas of existing damage. Contractor shall submit all documentation of pre-existing damage to Owner electronically.

END OF SECTION

Section 01 31 10

PROJECT MANAGEMENT AND  
COORDINATION

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Project coordination.
- B. Project site administration.
- C. Project meetings.

1.2 RELATED SECTIONS

- A. Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES.
- B. Section 01 73 29 - CUTTING AND PATCHING.
- C. Section 01 78 00 - CLOSEOUT SUBMITTALS: Requirements for Project Record Drawings (As-built drawings).

1.3 GENERAL PROJECT COORDINATION

- A. Coordination: The General Contractor is fully responsible for coordinating the Work of this Contract including scheduling, submittals, Work and other activities included in various Sections to assure efficient and orderly sequence of installation of interdependent construction elements. The General Contractor is responsible for coordinating actual installed location and interface of work, and to make provisions to accommodate items scheduled for later installation.
- B. Where installation of one component depends on installation of other components before or after its own installation, schedule activities in the sequence required to obtain efficient installation with the least amount of alterations, or cutting and patching, to completed Work.
  - 1. The General Contractor shall be responsible to uncover work completed in order to install ill-timed work, at no additional cost to the Owner.
- C. Where space is limited, coordinate installation of different components to assure maximum accessibility for maintenance, service and repair.
- D. Coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- E. Verify that utility requirement characteristics of operating equipment are

compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.

- F. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- G. Coordinate completion and clean up of Work of separate Sections in preparation for Substantial Completion and Owner's occupancy.
- H. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

#### 1.4 UTILITIES, MECHANICAL AND ELECTRICAL COORDINATION

- A. Coordinate all Work of this Project. Provide full and complete coordination for utilities, mechanical and electrical work in Divisions 11, 13, and 21 through 28, with Work of other Divisions.
  - 1. Each Filed Sub Contractor and subcontractor shall compare his drawings and specifications with those of other Trades and report any discrepancies between them to the General Contractor. The General Contractor shall obtain from the Architect written instructions for changes necessary in the mechanical or electrical work, to ensure that all work is installed in coordination and cooperation with other Trades installing interrelated work. Before installation, each Filed Sub / Sub Contractor shall make proper provisions to avoid interferences in a manner approved by the Architect. All changes required in the work of each Filed Sub / Sub Contractor caused by his negligence, shall be corrected by him at his own expense, to the Architect's satisfaction.
- B. Give all advance notice to public utility companies as required by law, and provide proper disposition, subject to Architect's approval of all existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that in any way interfere with the Work, whether or not they are specifically shown on the Drawings.
- C. Coordination regarding existing utilities:
  - 1. Notify Owner and appropriate authorities when coming across an unknown utility line(s), and await decision as to how to dispose of same.
  - 2. When an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged, notify the Owner and utility company involved, and assure the protection, support, or moving of utilities to adjust them to the new work.
  - 3. The General Contractor shall be responsible for all damage caused to existing, active utilities located within the limits of this Contract, whether or

not such utilities are shown on the Drawings, including resultant damages or injuries to persons or properties.

- D. General coordination of piping, ductwork, conduits and equipment:
1. The Contract Drawings are diagrammatic only intending to show general runs and general locations of piping, ductwork, equipment and sprinkler heads.  
Determine exact routing and location of individual systems prior to fabrication of components or installation.
    - a. Piping runs requiring pitch have "right-of-way" over those systems that do not pitch.
    - b. System components whose elevations cannot be changed have "right-of-way" over those components whose elevations can be changed.
  2. Adjust locations of piping, ductwork, conduits and equipment as required to accommodate new work with interferences anticipated and as encountered during installation.
    - a. Locate piping, conduits and ductwork to be clear of swinging doors, access doors, and clear for unimpeded equipment access.
  3. Provide all offsets, transitions and changes of direction for all systems, as may be required to maintain proper clearances for headroom, and as may be required for coordination with other "fixed-in-place" building components (such as structural systems).
    - a. Furnish all vents, drains and similar accessories as may be required for offsets, transitions and changes of direction.
  4. Provide openings in the work for penetration of mechanical and electrical work.
  5. Coordinate final locations of ceiling mounted devices (including air distribution devices, thermostats, heaters, control devices, sprinkler heads and similar work) with reflected ceiling plans. Review locations with Architect and obtain approval of all devices prior to installation.

## 1.5 COORDINATION DOCUMENTS

- A. General: Prepare coordination drawings for areas where close coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space necessitates maximum utilization of space for efficient installation of different components.
1. Coordination Drawings include, but are not necessarily limited to:
    - a. Structure.
    - b. Partition and room layout.
    - c. ¼ inch scale elevation drawings of all masonry walls with reinforcement and all mechanical, electrical, plumbing and fire protection penetrations

- d. Ceiling layout and heights.
  - e. Light fixtures.
  - f. Access panels.
  - g. Sheet metal, heating coils, boxes, grilles, diffusers, and similar items.
  - h. All heating piping and valves.
  - i. Smoke and fire dampers.
  - j. Soil, waste and vent piping.
  - k. Food service equipment and appurtenances.
  - l. Major water.
  - m. Rain water drainage piping.
  - n. Major electrical conduit runs, panelboards, feeder conduit and racks of branch conduit.
  - o. Above ceiling miscellaneous metal.
  - p. Sprinkler piping and heads.
  - q. All equipment, including items in the Contract as well as OFCI and OFI items.
  - r. Equipment located above finished ceiling requiring access for maintenance and service. In locations where acoustical lay-in ceilings occur, indicate areas in which the required access area may be greater than the suspended grid system.
  - s. Seismic Restraints.
- B. Timing: Prior to fabricating materials or beginning work, supervise and direct the creation of one complete set of coordination drawings showing complete coordination and integration of work, including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, elevators, and electrical disciplines.
- C. Intent: Coordination drawings are for the General Contractor's Filed Sub / Sub Contractor's and subcontractor's use during construction and are not to be construed as replacing shop drawings or record drawings. Architect's review of submitted coordination drawings shall not relieve the General Contractor from his overall responsibility for the coordination of the Work of the Contract.
- D. Base sheets: Architect will provide CAD files for use by the General Contractor for the development of building coordination drawing "base sheets" upon signed receipt of Architect's disclaimer form. General Contractor is responsible to prepare and provide one accurately scaled set of building coordination drawing "base sheets" on reproducible transparencies showing all architectural and structural work. Base sheets shall be at appropriate scale; congested areas and sections through vertical shafts shall be at larger scale.
- 1. Highlight all fire rated and smoke partitions.
  - 2. Indicate horizontal and vertical dimensions to avoid interference with structural framing, ceilings, partitions, and other services.

3. Indicate elevations relative to finish floor for bottom of ductwork and piping and conduit (6 inches and greater in diameter).
  4. Indicate the main paths for the installation, or removal of, equipment from mechanical and electrical rooms.
- E. General Contractor shall circulate coordination drawings to the following subcontractors and any other installers whose work might conflict with other work. Each of these subcontractors shall accurately and neatly show actual size and location of respective equipment and work. Each subcontractor shall note apparent conflicts, suggest alternate solutions, and return drawings to General Contractor.
1. Plumbing Trade Contractor.
  2. Fire protection Trade Contractor.
  3. Heating ventilating and air conditioning Trade Contractor(s).
  4. Electrical discipline Trade Contractors.
  5. Control system Trade Contractors.
- F. Review and modify and approve coordination drawings in cooperation with individual installers and Filed Sub / Sub Contractor to assure conflicts are resolved before work in field is begun and to ensure location of work exposed to view is as indicated or as approved by Architect.
1. The General Contractor shall stamp, sign and submit coordination drawing originals to Architect for review.
  2. Do not commence work in areas described in the coordination drawings until receipt of Architect's comments.
  3. Submit electronic files of final coordination drawings to the Architect in suitable format.

## 1.6 GENERAL PROJECT ADMINISTRATION

- A. Prepare memoranda for distribution to each party involved outlining required coordination procedures. Include required notices, reports, and attendance at meetings.
- B. Prepare similar memoranda for the Owner and separate Construction Managers where coordination of their Work is required.
- C. Conduct conferences among Filed Sub Contractors, subcontractors and others concerned with the Work, to establish and maintain coordination and schedules, and to resolve coordination matters in dispute.
- D. Administrative Procedures: Coordinate scheduling and timing of administrative procedures with other activities to avoid conflicts and ensure orderly progress. Such activities include:
  1. Preparation of schedules.

2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project Closeout activities.

#### 1.7 SITE MOBILIZATION CONFERENCE

- A. Prior to commencement of the Work, schedule a meeting at a meeting room provided by the General Contractor.
  1. Attendance is required by Architect, General Contractor, engineering consultants, Construction Managers' Project Manager and Superintendent, General Contractor's, Filed Sub / Sub Contractor, and other major subcontractors, applicators, installers and suppliers. Other persons are required to attend as the Architect may direct or the General Contractor may wish to have present.
  2. Items of Agenda:
    - a. Use of premises by Owner, General Contractor, and subcontractor(s).
    - b. Owner's requirements and partial occupancy considerations.
    - c. Demolition procedures, identity tagging of existing furnishings and equipment for salvage or disposal.
    - d. Temporary utilities.
    - e. Barricading and protection of the public, dust barriers.
    - f. Survey and building layout.
    - g. Wetlands protection.
    - h. Potentially difficult areas of work.
    - i. Project coordination.
    - j. Construction-waste management and recycling procedures.
    - k. Sustainability product requirements and procedures.
    - l. Security and housekeeping procedures.
    - m. Construction schedules.
    - n. Work beyond Contract Limit.
    - o. Procedures for testing and inspection.
    - p. Procedures for maintaining record documents.
    - q. Requirements for equipment start-up.
    - r. Inspection and acceptance of equipment put into service during construction period.

#### 1.8 PRE-INSTALLATION/PRE-FABRICATION CONFERENCES

- A. When required in individual specification sections, prior to commencing the work of that trade, convene a pre-installation conference at work site, if possible, on



same day as weekly progress meeting.

- B. Notify Architect and Owner's Project Manager a minimum of one week in advance of meeting date.
- C. Attendance is required by General Contractor's Project Manager and Superintendent, and parties directly affecting, or affected by, work of the Section.
  - 1. General Contractor shall include discussions on waste management goals and requirements in all pre-fabrication meetings conducted with subcontractors, fabricators, and vendors.
  - 2. General Contractor shall include discussions on Owner's sustainable certification goals, procedures and requirements in all pre-fabrication meetings conducted with subcontractors, fabricators, and vendors.

#### 1.9 COORDINATION MEETINGS

- A. In addition to other specified meetings and additional meetings as required. General Contractor shall hold project coordination meetings, at least monthly at regularly schedule times. Hold meetings more frequently when necessary to ensure full coordination of work. Request representation at each meeting by every entity involved in coordination or planning for work of the entire project. Conduct meetings in a similar manner to progress meetings, to resolve coordination problems.
- B. Keep minutes of coordination meetings and distribute copies to all attendees, related parties and to Owner, Owner's Project Manager, Architect and its engineering consultants within 3 business days following meeting. Coordination meetings shall continue on an appropriate schedule, even after completion of coordination drawings by General Contractor, to review progress and resolve minor conflicts not identified in the coordination drawings.
- C. The following trades shall participate in coordination meetings, preparation of coordination drawings and reviews. Additional trades shall participate as the General Contractor deems necessary for proper coordination of the Work.
  - 1. Concrete work.
  - 2. Masonry.
  - 3. Structural steel, light gage metal framing and metal fabrications.
  - 4. Rough carpentry.
  - 5. Air and vapor barrier work.
  - 6. Finish wall and ceiling construction.
  - 7. Fire protection systems.

8. Plumbing systems, including roof drainage, waste and vent systems and distribution.
  9. Ductwork including appurtenances and equipment.
  10. HVAC piping.
  11. HVAC equipment and controls.
  12. Electrical lighting, power, communications and signaling, fire detection and related systems.
  13. Excavation, site utilities and site improvements.
- D. All adjustments necessary to achieve full coordination shall be determined in a timely manner, so as not to delay the work. Include time necessary for consideration by the Architect and Owner's Project Manager for proposed modifications. No claim for additional compensation for extension of time arising from delays due to failure of General Contractor to identify potential conflicts requiring coordination in a timely manner or from additional work made necessary by such failure will be valid.

#### 1.10 PROGRESS MEETINGS

- A. The Owner's Project Manager will schedule and administer meetings throughout the progress of the Work at regular intervals; make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes and distribute copies within 24 hours to Architect, Owner and participants, and to those affected by decisions made. Architect will review and send comments within 2 working days from receipt of minutes.
1. Scheduled Frequency of Meetings: Weekly.
- B. Attendance: Required are General Contractor's Project Manager and Project Superintendent, and each Filed Sub Contractor, applicator, installer, and supplier whose work is on-going or scheduled. Owner, Architect, engineering consultants, and other persons are required to attend as the Architect may direct. Subcontractors, vendors, suppliers shall be present at meetings upon request of General Contractor.
1. Attendee Authority: Trade Contractors, subcontractors and supplier representatives present at meetings shall have authority to act for and make commitments for, the entity which they represent.
  2. Restricted Attendance: Owner's Project Manager reserves the right to expel or exclude from any Progress Meeting any person(s) or company representative(s) without statement of reason or excuse.
  3. Attendance of Architect's Consultants: Construction Manager shall make an attendance request to the Owner's Project Manager for specific Architect's consultants and engineers at least 72 hours in advance of the meeting. Clearly identify in the request all consultant related issues and topics to be discussed at the meeting. The Architect will decide if its consultant or engineer will attend.

C. Items of Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identifications of problems which impede planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Progress of Work to be adjusted under coordination requirements, and effect of proposed changes on progress schedule and coordination.
12. Review of construction waste management and recycling performance, material quantities disposed and diverted for recycling.
13. Sustainable Certification Progress Report.
14. Other business relating to Work.

1.11 SPECIAL MEETINGS AND BUILDING COMMITTEE MEETINGS

- A. Special Project Meetings held by the General Contractor: The General Contractor shall conduct special project meetings throughout the course of the Work. Special Project Meetings are those held in addition to the regularly scheduled progress meetings. The Architect and Owner are not required to attend these meetings.
1. Special meeting issues may include, but are not limited to:
    - a. Safety issues.
    - b. Labor issues.
    - c. Special schedule issues.
- B. Environmental Quality Review Meetings: The General Contractor shall conduct special Environment Quality review meetings throughout the course of the Work.
1. Meetings may be held in conjunction with dates of Project Progress Meetings. The General Contractor shall notify both the Owner and Architect at least 7 days in advance of the meeting dates. The General Contractor along with any requested or necessary File Sub Contractors, subcontractors, applicators, vendors or material suppliers shall attend.
  2. Meeting shall include the following topics:
    - a. Review of construction waste management and recycling.
    - b. Review and update on CHPS Certification progress.
    - c. Review of indoor air quality testing.

- d. Sustainable design site visit coordination
  
- C. Building Committee Meetings: General Contractor is advised of obligation to attend Building Committee Meetings (held in evenings) as requested by Owner or Architect, at no additional cost to the Contract.
  
- D. Additional Special Meetings requested by the Architect or Owner: The General Contractor along with any requested or necessary Filed Sub Contractors, subcontractors, applicators, vendors or material suppliers shall attend additional meetings when requested by the Architect or Owner as they deem necessary. Such meetings may be convened on short notice if conditions at the project site so require and attendance is mandatory. The Architect and Owner are not limited as to the number of additional meetings that may be requested or the agenda for such meetings.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

END OF SECTION

SECTION 01 33 24  
ELECTRONIC SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. DIVISION 00 and 01 are hereby made part of this SECTION.
- B. Examine all conditions as they exist at the project prior to submitting a bid for the work of this SECTION.

1.02 SUMMARY

- A. Shop drawing and product data submittals shall be transmitted to Architect in electronic (PDF) format using online project management service such as Submittal Exchange, Sage Timberline, or equal pre-approved website service designed specifically for transmitting submittals between all construction team members.

1.03 PROCEDURES

- A. Submittal Preparation - Contractor may use any or all of the following options:
  - 1. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via the online project management software.
  - 2. All electronic PDF Files shall in have a schedule and be bookmarked.
  - 3. Subcontractors and Suppliers provide electronic (PDF) submittals to Contractor via email.
  - 4. Subcontractors and Suppliers provide paper submittals to Scanning Service which electronically scans and converts to PDF format.
  - 5. Submittals shall include:
    - a. Date and revision dates
    - b. Project title and number
    - c. The names of:
      - 1) Architect
      - 2) General Contractor
      - 3) Sub-contractor
      - 4) Supplier
      - 5) Manufacturer
      - 6) Separate detailer when pertinent
    - d. Identification of product or material
    - e. Relation to adjacent structure or materials

- f. Field dimensions, clearly identified as such
  - g. Specification section number - format is to include spec section, submittal name and number and revision. No other system will be accepted. This would apply to all ID of the submittal on transmittals and the pdf naming. Electronic copies of submittals are to be up-loaded to the architect's ftp site in the established folder hierarchy.  
**ex. 23 00 00-010-01 FIXTURES equates to Section 23 00 00, submittal number 10, revision 1**
  - h. Applicable standards, such as ASTM number
  - i. A blank space, five-inch by four-inch, for designer's stamp
  - j. Identification of deviations from contract documents
  - k. General contractor's stamp, initialed or signed certifying review and approval of submittal.
- B. Re-submission Requirements:
- 1. Product Data and Samples: Submit new data and samples as required from previous submittals.
  - 2. **All comments marked on the returned submittals are to be cataloged and specifically addressed and acknowledged as acceptable or un-acceptable to the contractor within 10 days of return receipt via specific transmittal. This is to ensure that the comments are understood and are either to be incorporated or contested. Any and all work incorporated into the finish product that does not conform to the submittal comments will be rejected and required to be replaced at the contractor's monetary and schedule expense.**
  - 3. **All comments marked on any returned submittal are assumed to be incorporated into all subsequent submittals and the architect will take no responsibility for any omissions.**
- C. Printed Submittals: Provide two printed sets of submittals for shop drawings for structural framing in addition to electronic submittals.
- D. Contractor shall review and apply electronic stamp certifying that the submittal complies with the requirements of the Contract Documents including verification of manufacturer / product, dimensions and coordination of information with other parts of the work.
- E. Contractor shall transmit each submittal to Architect using the electronic submittal website.
- F. Architect / Engineer review comments will be made available on the online project management service website for downloading. Contractor will receive email notice of completed review.
- G. Submit paper copies of any reviewed submittals not submitted electronically

at project closeout for record purposes in accordance with SECTION 01 70  
00 – CONTRACT CLOSEOUT.

#### 1.04 COSTS

- A. General Contractor shall include the full cost of the electronic submittal project subscription in their bid.

#### 1.05 PRODUCTS

- A. Basis of specification is Submittal Exchange website system for electronic construction submittals, Sage Timberline, or equal.
- B. Substitution may be considered if proposed service meets or exceeds all features listed in this Section.
  - 1. Independently hosted, web-based system for automated tracking, storage, and distribution of contract submittals, Requests For Information, and other contract related documents. FTP sites, e-mail exchanges, and server-based systems hosted from inside a contractor's office will not be considered acceptable.
  - 2. Minimum five years documented experience of use on commercial construction projects.
  - 3. Unlimited individual user accounts and system access for all project subcontractors, general contractor, owner staff, architect, design consultants, and sub-consultants, with no additional fees for those parties to access the system.
  - 4. Full version histories and dates of exchanges automatically tracked and available for viewing, searching, and reporting in a linear log format compatible with AIA G712.
  - 5. Functionality to group submittals as required packages and apply forms and review comments to entire package simultaneously.
  - 6. Functionality for integrated online PDF viewing and review, including graphical markups and stamps, for owner, architect, design consultants, sub-consultants, and general contractor without need for additional software purchase.
  - 7. Automatic, configurable email notifications for each project team member for new and reviewed submittals and other items.
  - 8. Customized, automated PDF form generation for submittals, RFIs, and other documents matching standard templates used by owner, design consultants, sub-consultants, and general contractor. Documentation and demonstration of automatic form generation using each entity's templates must be submitted as part of any substitution request.
  - 9. Prior to project start, system vendor shall create submittal log with all required items from project manual or submittal register. Owner or primary design consultant shall have full control over required items list and access to edit, add, or remove items during project.

10. System vendor shall provide access for owner, design consultants, sub-consultants, general contractor, and subcontractors to live technical support by phone and email minimum of 7 AM to 6 PM CST on standard business days at no additional cost.
11. At completion of project closeout, system vendor shall provide minimum of four archival discs that include all documents and tracking logs, or the ability to download this information from the live website in a single complete archive package.
12. Design component must include automatic notifications to design team during the design phase. Additionally will include project milestones, public plan room, and the ability to do markups in multiple locations.

**END OF SECTION**



SECTION 01 35 00  
SPECIAL PROJECT PROCEDURES

**PART I – GENERAL**

**1.01 SAFETY REGULATIONS**

A. This Project is subject to compliance with Public Law 92-596 "Occupational Safety and Health Act of 1970" (OSHA), with respect to all rules and regulations pertaining to construction including Volume 36, numbers 75 and 105, of the Federal Register as amended, and as published by the U.S. Department of Labor.

B. The committing of nuisances on the site or adjacent property is prohibited.

**1.02 SAFETY PRECAUTIONS**

A. The **Contractor** shall take all precautions to safeguard the health and wellbeing of all workers and all others rightfully on the Project site who may be affected by work done under this Contract.

B. All safety laws and regulations of the Commonwealth of Massachusetts applicable to work performed under this Contract shall be adhered to by the **Contractor**.

**1.03 LEGAL RELATIONS/RESPONSIBILITY TO PUBLIC**

A. Laws to be Observed:

A.1 The **Contractor** shall keep himself fully informed of all existing and future State and National Laws and Municipal ordinances and regulations in any manner affecting those engaged or employed in the Work, or the materials used or employed in the Work, or in any way affecting the conduct of the Work, and all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same and of all provisions required by Law to be made a part of this Contract, all of which provisions are hereby incorporated by reference and made a part hereof. The **Contractor** shall cause all Subcontractors, Suppliers, agents and employees to observe and comply with, all such existing and future Laws, ordinances, regulations, orders and decrees.

A.2 If the **Contractor** uses or stores toxic or hazardous substances he is subject to certain additional laws and regulations including but not limited to M.G.L. Chapter 111F, Section 2, (the "Right to Know" law) and regulations promulgated by the State Department of Public Health, the Department of Public Safety and those of City of Boston agencies.

**1.04 FIRE PROTECTION AND PREVENTION**

A. The **Contractor** shall keep the building and Project site free of rubbish and debris at all times.

A.1 The **Contractor** shall provide metal barrels located on each floor and other appropriate areas into which all refuse and garbage shall be deposited. All barrels shall have tight fitting covers.

A.2 At the end of each work week, the **Contractor** shall thoroughly clean the buildings and Project site of all rubbish and debris of any nature and remove such from the premises.

A.3 In addition to the requirements in this Section, the **Contractor** shall, until Final Completion of the Work, provide and maintain fire extinguishers ready for use distributed around the Project and in and about

temporary structures.

A.4 Gasoline and other flammable liquids shall be stored in and dispensed from UL listed safety containers in conformance with the National Board of Fire Underwriters recommendations and the Commonwealth of Massachusetts Department of Public Safety requirements, and in no event within the confines of the permanent structures.

A.5 All tarpaulins used shall have UL approval and comply with Federal Specifications CCC-C746. Polyethylene shall not be used.

#### **1.05 RUBBISH REMOVAL**

A. The **Contractor** shall remove all rubbish, waste, tools, equipment, and appurtenances caused by and used in the execution of the Work; but this shall in no way be construed to relieve the **Contractor** of his primary responsibility for maintaining the building and Project site clean and free of debris, leaving all work in a clean condition satisfactory to the **Official**.

B. Immediately after unpacking, the **Contractor** shall collect and remove from the building and Project site all packing materials, case lumber, excelsior, wrapping, and other rubbish.

#### **1.06 SITE DRAINAGE AND PUMPING**

A. The **Contractor** shall be responsible at all times for proper and sufficient site drainage and shall maintain such drainage during the life of the Contract in a manner acceptable to the **Architect** and so as not to adversely affect the adjacent areas.

B. The **Contractor** shall provide and maintain all pumps, suction and discharge lines, and power in sufficient number and capacity to keep all excavations, pits, trenches, foundations, and the entire property area free from accumulation of water from any source whatsoever at all times and under all circumstances and contingencies that may arise.

C. For additional requirements of excavation and dewatering, refer to SPECIFICATION SECTION entitled "EARTH WORK AND SITE PREPARATION".

#### **1.07 SNOW AND ICE REMOVAL**

A. The **Contractor** shall promptly remove all snow and ice which may impede the work, damage the finishes or materials, be detrimental to all/any crafts or trade impede trucking delivery and Fire Truck access or moving of materials at the site, or prevent adequate drainage of the site or adjoining areas.

#### **1.08 WINTER CONSTRUCTION**

A. The **Contractor** shall provide protection against damage to materials and work installed in freezing weather, including special heat and coverings to prevent damage by the elements. The ground surface, under footings, under pipe lines, under masonry, under concrete, and other work subject or damage shall be protected against freezing or ice formations.

B. Refer to SECTION 01 50 00 - TEMPORARY FACILITIES, for additional requirements applicable to winter construction.

#### **1.09 BROKEN GLASS**

A. The **Contractor** shall be held responsible at all times prior to Substantial Completion of the Work, or

occupancy by the **City**, whichever occurs first, for all broken or scratched glass, or glass which had been damaged as a result of the Work, or otherwise and, when so directed by the **Official**, the **Contractor** shall replace at no increase in Contract Price or Contract Time, all such glass broken, missing, or damaged prior to Substantial Completion.

### **1.10 CLEANING AND POLISHING**

A. The **Contractor** shall at all times keep the site free from accumulation of waste materials or rubbish.

B. Immediately prior to final inspection, the entire building and surrounding Project areas shall be thoroughly cleaned by the **Contractor** including, without limitation:

B.1 All construction facilities, tools, equipment, surplus materials, debris, and rubbish shall be removed from the Project site and the entire Work shall be left broom clean.

B.2 All finished surfaces shall be left in perfect condition, free of stains, spots, marks, dirt, and other defects. The **Contractor** shall be responsible for the cleaning and polishing of the Work of all trades, whether or not cleaning by such trades is included in their respective Sections of the Specifications.

B.3 All glass shall be washed and polished on both sides.

B.4 All metals, hardware, fixtures, and equipment shall be left in undamaged, bright, polished condition.

B.5 All filters shall be replaced and plenums, duct spaces, and furred spaces shall be left clean of debris and decayable materials.

C. In cleaning, items having manufacturer's finish, or items previously finished by a Subcontractor, care shall be taken so as not to damage such finish. In cleaning glass and finish surfaces, care shall be taken not to use cleaning agents which may stain any finish materials. Any damage to finishes caused by operations shall be corrected and repaired by the **Contractor** at no increase in Contract Price.

### **1.11 OPERATIONS IN OCCUPIED STRUCTURES**

A. The Contractor shall segregate all work from the public and/or user group or work force. The Contractor shall submit to the Owner's Representative the method of segregation for approval before start of any work.

B. The Contractor shall ensure that its agents and employees, including agents and employees of all subcontractors, not have any direct and unmonitored contact with children at any time on the Site.

C. In the event that the Contractor believes a portion of the Work cannot be completed without possible direct and unmonitored contact with a child, Contractor shall notify the Owner's representative and obtain prior written consent before proceeding with that portion of the Work. Workers who may have direct and unmonitored contact with children will be subject to verification of the Criminal Offender Record Information (CORI).

### **1.12 CONSTRUCTION SCHEDULE AND PROJECT OCCUPANCY**

A. The Contractor will have to schedule operations per a phasing plan to be coordinated with the BPFD to accommodate the day to day operations of the School. Construction is expected to commence during the Summer of 2020 while the school building is unoccupied and be completed in the Fall while the school building is occupied.

B. The General Contractor will be required to meet the following schedule for the progress and completion of the Work. In addition to the project schedules required under other Sections, the General Contractor will provide a phasing plan and schedule updated weekly showing where work will be occurring and which work tasks will be completed. The Phasing Schedule should provide a minimum 3 week look ahead and will be approved by the City Official prior to implementation.

C. *Schedule:*

**1.13 WORK HOURS – To Be Confirmed**

A. *Monday thru Friday – 7:00 am – 5:00 pm. Work allowed on Saturdays with permit from City of Newton Inspectional Services*

*A. Extended work hours (hours exceeding 8 hours per day, 40 hours per week or 32 hours per week when the week includes a legal holiday) used by the General Contractor to meet milestones and completion dates will require the General Contractor to pay overtime costs for one (1) Clerk.*

**1.14 BIDDERS INSPECTION OF EXISTING BUILDING AND SITE**

- A. All bidders are strongly encouraged to inspect the existing conditions at the Schools and make their own assessment of the work required to achieve the finished conditions specified in the Contract Documents in light of existing conditions.
- B. Failure to adequately inspect the site and/or to incorrectly assess existing conditions shall not be cause for extra payment to achieve the work required under the contract.
- C. Every Contractor will be bound by the scope of work required by the Contract Documents and must make whatever inspections he deems necessary to assure that the bid price includes the complete scope

**1.15 CONTRACTOR'S CONDUCT ON SITE**

- A. The Contractor and his personnel shall not interact with any of the facility users. The Contractor shall set up, in accordance with the Temporary Facilities, toilet facilities for all personnel involved in the project. No tradesperson, supplier, truck driver shall use the toilet facilities of the school or community center at any time during the completion of this work. Any person violating this provision of the contract will be removed from the site.

**1.16 REQUIRED PROCEDURES**

A. Schedule of Values shall be provided by the Contractor for each individual school building. The Schedule of Values shall be formatted to meet the standard MSBA Schedule of Values format with categories of work assigned to standardized work category designations. The preliminary Schedule of Values shall be approved by the Architect and OPM prior to the submission of the first payment application.

B. The contractor shall submit individual Applications for Payments for each individual school building. The Payment Application shall be approved by the Architect and OPM prior to the submission of the payment requisition.

C. The Contractor hereby agrees and acknowledges that the Contractor's records relating to the Project shall be subject to audit by the City / Agent, and such records shall include, but not be limited to, to the extent applicable, accounting records, written policies and procedures, Subcontractor files (including proposals of successful and unsuccessful bidders, bid tabulations, etc.), original estimates, estimate worksheets, correspondence, change order files, backcharge logs and supporting information, general ledger entries detailing cash and trade discounts earned, insurance rebates and dividends and any other Contractor records that may have a bearing on matters of interest to the City / Agent in connection with the Contractor's work for the Owner.

#### **1.17 COMMISSIONING**

A. The City will provide the services of a commissioning agent to perform tests and inspections of installed building elements and systems to validate installation and performance of the Work as intended and required by the Contract Documents. These tests and inspections may be performed by the Owner's Representative or by independent contractors or consultants, and the Contractor shall cooperate as necessary to permit the performance of the tests and inspections and shall perform all corrections as noted by the Commissioning Agent. The Commissioning Agent of the Owner or the Authority will utilize information provided by the Contractor for installation conditions. The commissioning activity performed by the Owner or the Authority in no way relieves or replaces the obligations of the Contractor in fulfillment of contract obligations. Any commissioning activities are at the sole discretion of the Owner or Authority and are not a requirement of this agreement.

B. Failed tests or inspections requiring retesting and additional site visits by the Commissioning Agent will be paid for by the Contractor until tests and inspections provide results that are in accordance with the specified requirements.

#### **1.18 ROOF AND GROUND PROTECTION**

A. All ground and roof areas which may be affected by the Work procedures to be photo and video documented by the General Contractor prior to commencement of the Work.

B. Roof Protection - Where work requires Contractor's forces and equipment to access rooftop areas, the Contractor shall protect all roof and roof edge areas from damage. The contractor will provide minimum ¾" thick plywood over rooftop work areas and all roof areas requiring foot traffic, staging or other equipment that could damage the roofing. The plywood cover shall be placed continuously over rooftop work areas to a minimum 12 feet from exterior walls to receive windows and pathways to access work areas. Additional plywood covering may be required to provide foot traffic space around staging. All foot traffic pathways to be a minimum 8 feet in width. The Contractor will be responsible for immediate repairs to damaged roof areas and shall report all damages immediately upon occurrence.

C. Ground Protection – Where staging, lifts, cranes, vehicle access, etc. damage the lawns, shrubs, playground and/or equipment, trees, gravel or paved ground surfaces on the school building site, the General Contractor will be responsible for the restoration of the damaged elements to new condition. Contractor should review site plans provided with Bid Documents to familiarize themselves with site conditions around each school. Playgrounds with rubber surfaces should be protected from damage from construction activities.

#### **1.19 PARKING, STORAGE AND DELIVERY OF MATERIALS**

- A. *Onsite storage and parking is limited. Refer to Site Logistics plan. Contractor to work with **Lynn Public Schools** to coordinate use of dumpsters and deliveries to site.*

**1.20 CORI CHECKS**

- A. The Contractor shall submit certification that they are in conformance with the standards as set forth by the **City of Newton**, regarding CORI checks policy for all workers on the project. All workers to complete and submit CORI Request Form.

**1.21 RECORD EXISTING CONDITIONS**

- A. At the completion of construction, the Contractor shall take post construction photographs of all areas where pre-existing damaged has been recorded as part of the Pre-Construction Survey. These photographs shall be submitted to the Architect and organized and annotated describing the type of pre-existing damage and its location and any changes that have occurred during the construction period.

**1.22 PERMITS AND REGULATIONS**

- A. The Contractor shall be responsible for all permits and permit fees necessary to complete the construction work. All fees for permits shall be included in the Contractors bid.

**1.23 NOT USED**

**1.26 NOT USED**

**01 35 00 END OF SPECIAL PROJECT PROCEDURES**

SECTION 01 35 43

ENVIRONMENTAL PROCEDURES

PART 1 – GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 RELATED WORK UNDER OTHER SECTIONS

- A. Section 02 83 33 Demolition of Material Bearing Lead Paint
- B. Section 04 01 20 Unit Masonry
- C. Section 06 10 00 Rough Carpentry
- D. Section 22 00 01 Plumbing
- E. Section 23 00 00 Heating Ventilation and Air Conditioning
- F. Section 26 00 01 Electrical

1.3 HAZARDOUS MATERIALS PROCEDURE

- A. Asbestos:
  - 1. Asbestos Materials Exist On-Site: There are accessible and inaccessible asbestos containing materials (ACM) in the existing building. ACM affected by the renovation project are included under this contract. The General Contractor shall formally notify each Sub-Contractor that there are ACM existing in the building. Hidden ACM may only be found during demolition. Refer to items 2 and 3 below.
  - 2. Unknown and inaccessible ACM: During demolition, it is possible that previously unknown asbestos materials may be discovered in currently concealed locations.
  - 3. Notification: If the General Contractor or Sub-Contractors discover or encounter any ACM during the performance of the work, the General Contractor shall immediately:
    - a. Stop work, notify the Architect and OPM about the presence of suspect ACM and request instructions for proper action, and
    - b. Take whatever steps and measures are necessary to reduce, control or eliminate the risk of exposure of workers and the public to the ACM.
    - c. Every effort will be made to obtain the 10-day DEP waivers to remove hidden or unforeseen ACM by the asbestos contractor. The General Contractor or Sub-Contractor shall allow sufficient time for the removal of the ACM at no additional charges to the owner for delays and should waivers be denied.

4. Responsible Person On-Site: The General Contractor shall designate one of its senior on-site employees to be in charge of coordination between the HAZ MAT Consultant, Architect, and all Sub-Contractors with respect to hazardous materials issues.
5. Responsibility for Hazardous Material Discovery: It is the sole responsibility of the General Contractor and Sub-Contractors to undertake whatever measures, methods or procedures are necessary, required or otherwise appropriate to safeguard the health and safety of all workers and members of the public with respect to identification and discovery of previously unknown hazardous materials during the work of the Project.
6. Roofing material was assumed to contain asbestos. The Roofing Contractor shall properly remove and dispose as ACM per DEP 310 CMR 7.15 and DLS 454 CMR 28.
7. Indemnification: To the fullest extent permitted by law, the General Contractor and Sub-Contractors shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including, but not limited to, attorneys' fees arising out of or relating to the performance of the Work, including the discovery or identification of any hazardous materials, provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to damage to or destruction of tangible property (other than the Work itself) including the loss of use resulting therefrom; and is caused in whole or in part by any negligent act or omission of the General Contractor and Sub-Contractors, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, regardless of whether or not it is caused in part by a party indemnified hereunder.

B. Other Hazardous Materials:

1. The General Contractor shall be made aware that other hazardous materials are found inside the building. The General Contractor shall be responsible for quantifying, removal, and proper disposal of all hazardous materials, including but not limited to batteries and related electrolytic material, light fixtures, ballasts, tubes, PCB's, mercury, switches, exit signs, thermostats, and other items.

C. PCB's:

1. The General Contractor and Sub-Contractors shall be made aware that building materials (Material) other than previously sampled including but not limited to painted surfaces, caulking, glue, coatings, sealant, and other building materials are likely to contain >1 ppm of Polychlorinated Biphenyls PCB's.
2. No testing was performed, and no testing will be permitted to be performed by any party working on this project.
3. All of the work of this Contract shall conform to the standard set by all applicable Federal, State and Local laws, regulations, ordinance, and guidelines.
4. The General Contractor and Sub-Contractors shall at its own cost and expense comply with all laws, ordinance, rules, and regulations of Federal, State, Regional and Local authorities during prepping, sanding, cutting, burning, scraping, painting over, grinding and regarding handling, storing, and disposing of contaminated waste material.

D. Silica Dust:

1. The General Contractor and Sub-Contractors shall be made aware that building materials (Material) may contain Silica.
2. Due to the difficulty associated with exhaustive testing, the Owner has elected to direct the General Contractor and Sub-Contractors to assume that Silica was found.
3. The General Contractor and Sub-Contractors shall review and comply with most recent US Department of Labor Final Rule and shall take extra precautions to protect workers and other personnel on site.



PART 2 – PRODUCTS            Not Used

PART 3 – EXECUTION        Not Used

END OF SECTION

SECTION 01 39 90

MINOR ALTERATION WORK

PART 1 - GENERAL

- 1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- 1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- 1.03 Under this Section, the work shall provide all materials, labor, equipment and appliances required to do patching, repair and alterations caused by damages in the progression of work not otherwise specified as indicated or required or both to complete the Work under this Contract.
- 1.04 Under this section, shall provide all materials, labor and equipment required to provide both exterior and interior protection and cleaning, including but not **limited to all interior rooms in conjunction where work occurs with poly barrier membrane covering over all surfaces / furniture / electronic devices prior to commencement of work.** This contractor shall maintain protection during all construction activities and provide periodic cleanings and a final cleaning to all affected areas. This shall include all interior and exterior areas in and adjacent to the work being performed on the building structure and site. List below is a general description of the work to be performed, but is not limited to the following.
1. Patch, repair and replace ceramic tile, epoxy flooring where new renovations have occurred.
  2. Patch, repair, replace and paint GWB partitions and soffits, door frames/doors where new renovations have occurred.
  3. Patch, repair and replace VCT, flooring, carpet, rubber flooring in relocation of door frames and windows.
  4. Patch, repair and paint of existing GWB / Plaster ceilings and walls where new renovations have occurred.
  5. Patch and repair of existing suspended ceilings where new renovations and access has occurred.
  - 6. Repair of landscaped and lawn areas where damage has occurred for access to building, windows, doors, roof and site.**
- A. Application of Requirements: Requirements specified in this Section apply to alteration work throughout the Work whether specified in this or other Sections.
- 1.05 Related Sections
- A. All sections in Divisions 1 through 33
  - B. Refer to other Sections for specific requirements for removal, alteration and reuse of existing materials and items not specified in this Section.
- 1.06 Submittals
- A. This Contractor shall submit Shop Drawings and related data samples for the Architect's approval in accordance with Section 01 33 00.

1. When Work specified in this Section is required, submit descriptions of methods to be used. Include manufacturer's data fully describing each material and product and certificates certifying compliance with Contract Documents. Show Drawings showing details of conditions to be encountered and narrative descriptions, including industry standards detailing methods proposed for making repairs. Provide such data, Shop Drawings and descriptions whether or not materials and methods to be used are indicated in the Contract Documents.
  - a. Manufacturer's Data: Include a product description of each material and product proposed for use, including but not be necessarily limited to the following:
    - 1) Sod: Include seed formula and location of source
    - 2) Fertilizer and lime
    - 3) Materials for Concrete Repair: Include product data and instructions for proprietary products to be used as materials for concrete repairs, including bonding agents, hardeners, admixtures, curing materials, etc.
    - 4) Acoustical ceilings
    - 5) Other products specified in this Section
  - b. Certificates: Certification data and certificates substantiating that plants to be used as replacement for plants damaged during the Work exactly match those removed in every particular and have been certified by authorities having jurisdiction.
  - c. Shop Drawings: Include details of each condition to be encountered, including but not be necessarily limited to installation and anchoring details and relationship to other work of each material and item requiring installation or reinstallation at each condition.
  - d. Narrative descriptions shall include, but not be necessarily limited to, the following:
    - 1) Methods to be used to protect existing vegetation, paving, building walls, cabinetwork, casework, materials, equipment, accessories, and finishes to be left in place while the Work is in progress
    - 2) Methods to be used to prepare existing surfaces for repairs
    - 3) Methods proposed for sodding and planting new plants to replace those removed because of damage. Methods submitted shall be as recommended by the specialist firm charged with planting and sodding.
    - 4) Methods proposed for cleaning and repairing acoustical ceiling and support system damaged or soiled during the work under this Contract
  - e. Samples: When requested, submit for approval samples of materials and items proposed for use in making repairs and renovations. This requirement does not supersede submittal requirements specified in other Sections.
  - f. Alterations Schedule: Before doing any Work at the site, submit for approval a schedule showing alterations required under the Contract. Coordinate alterations schedule with phasing schedule specified in Section "Work Sequence" and demolition schedule specified in Section "Demolition Schedule specified in Section "Demolition." Incorporate approved alterations schedule into construction schedule specified in Section "Submittals."

1.07 Quality Assurance

- A. General: Test materials to be used in making repairs for compatibility with existing materials. Do not proceed with repairs until Architect approves tests. Do not use incompatible materials.

- B. Plants and Sod: Planting and maintenance of plants and sod shall be done by an accepted single firm which specializes in such work.
  - C. Concrete: In making concrete repairs, comply with applicable requirements of ACI 301. "Specifications for Structural Concrete Buildings" ACI 318. "Building and Code Requirements for Reinforced Concrete" and the CRSI "Manual of Standard Practice."
  - D. Acoustical Ceilings: Have reinstallation done by an experienced installer of such systems.
  - E. Fire Performance Characteristics: Where fire-resistance ratings are indicated or required in existing work, provide materials and construction identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E119 by a recognized testing and inspecting organization or by another means as acceptable to the authority having jurisdiction.
- 1.08 Delivery, Storage and Handling
- A. Latex Cement Underlayment: Deliver in unopened factory containers with manufacturer's labels intact. Store in dry areas at temperatures above 40 degrees F. Use caution when mixing and applying to prevent irritation to worker's skin or eyes.
  - B. Other Cementitious Products: Deliver in manufacturer's original packages showing brand names. Store materials in unopened containers in a dry place.
  - C. Metal Products: Store 18 inches above ground and cover to prevent rusting and contact with soil or other materials that would destroy or reduce bond or otherwise damage the products. Do not create humid chambers under coverings.
  - D. Use no damaged or defective materials.
  - E. Do not stack materials to exceed design live loads of structure.
- 1.09 Project Conditions
- A. Disconnecting Services: Notify Owner and authorities owning or controlling wires, conduits, pipes, and other services affected by renovation and repair before starting operations. Refer to General Conditions and other specification sections for additional requirements related to existing utilities and services.
  - B. Protecting Property to Remain: Protection requirements specified in Section "Demolition" also apply to repair and alterations work. Protect from staining and other harm, vegetation, paving, finished surfaces, casework, cabinetwork, equipment, accessories, and devices that remain in place while the Work is being done. When removing items and surfaces to remain in order to do the Work protect removed items and materials from damage and staining. Satisfactorily repair damage done during the Work. Satisfactorily remove stains without damage to the stained surface. Remove and discard items with stains that cannot be satisfactorily removed and provide new matching items at no additional cost. Also remove damaged items that cannot be satisfactorily repaired and provide new matching items, at no additional cost.
  - C. Movement, Settlement and Other Damage to Existing Building Due to Alterations Work: Be solely responsible for correct damage resulting from inadequate, improper or careless construction procedures or inadequate shoring, bracing, support or protection.
  - D. Differing Conditions: Should materials, systems or conditions be encountered that differ from those indicated, immediately notify Architect by Telephone, followed by letter, and do not proceed without instructions.

- E. Examine Existing conditions. Examine surfaces to receive alterations Work and conditions under which the Work will be done. Do not proceed with the Work specified in this section before correcting unsatisfactory conditions.

## PART 2 - PRODUCTS

### 2.01 Salvaged Materials and Items

- A. To the extent indicated, reuse materials and items so indicated.
- B. Materials and Items to be Reused: Reinstall materials and items shown to be removed and reinstalled or which Contractor removes to make a way to do the Work in the same location from which removed unless indicated otherwise. Materials to be salvaged and reused in the Work include, but are not necessarily limited to, brick, concrete masonry units, acoustical ceilings, ceiling light fixtures, certain mechanical, electrical, plumbing and drainage equipment and devices and other materials and items indicated to be removed and reinstalled. Materials and items to be salvaged and reused in the Work also include items and materials similar to those listed above that must be removed in order to accomplish the Work but that are not specifically shown or specified to be removed, if Architect approves reinstallation.
- C. Materials and Items Not to be Reused: Do not reuse in the Project materials and items removed from the existing building to make way for the Work except as otherwise noted or with written approval unless removed material or item is indicated to be reused or unless the Contract Documents permit reuse at Contractor's option.
- D. Preparing for Reuse: Clean salvaged materials and items that will be reinstalled. Clean mortar from masonry units by hand. Put operating items in proper working order. Reused materials shall be in good condition without objectionable chips, cracks, splits, checks, dents, scratches, or other defects. Operating items shall operate properly.

### 2.02 New Materials

- A. General
  - 1. Provide new materials to match existing for closing of openings, repairs and reconstructions where suitable salvaged materials do not exist where insufficient quantities of salvaged materials exist to complete the Work or where reuse is not permitted. New materials to match existing shall be same types, sizes, qualities and colors as existing adjacent materials.
  - 2. Required new materials where similar materials do not exist shall comply with requirements specified in other Specification Sections.
- B. Trees, Shrubs, Ground Covers and other Plants: Comply with recommendations of ANSI Z60.1, "American Standard for Nursery Stock." Exactly match removed plant in condition that existed before the damage.
- C. Sod: Exactly match existing grass in type and seed mix; certified by state from which purchased; approved.
- D. Fertilizer, Lime and Other Soil Amendments and Topsoil and Planting Soil Mix: In accordance with recommendations of specialist firm who will plant and sod and approved.
- E. Materials for Concrete Repairs:
  - 1. Concrete: ASTM C94; 3,000 psi.
  - 2. Bonding agent: Two component epoxy-resin grout; ASTM C881; Type I or II
  - 3. Curing materials: Impervious sheet of white opaque 4-mil-thick polyethylene, waterproof craft paper, or polyethylene-coated burlap
  - 4. Other concrete materials: As approved.

- F. Acoustical Ceilings: Use existing suspension systems and acoustical materials. Should existing materials be damaged beyond satisfactory repair, use new products that exactly match those existing.
- G. Other New Materials to Match Existing: Same types, sizes, qualities, and colors as existing adjacent materials for closing of openings and repairs where suitable salvaged materials do not exist or where insufficient quantities of salvaged materials exist to complete the Work required, or where reuse of removed materials is not permitted.
- H. Required new materials where similar materials do not exist shall comply with requirements specified in other Specification Sections.

### PART 3 - EXECUTION

#### 3.01 Alterations, Patching and Repairs

- A. General: General repair of existing materials including but not limited to paving, landscaping, lawns, concrete, flooring, painted walls and acoustical ceilings is required where damage has occurred during the progression of work. Where cutting, alteration, removal or repair of such existing materials is indicated as part of the Work, or is necessary to permit performing the Work, and where existing materials are damaged during the Work, patch and repair using specified products. Finish to match existing adjacent work. Patches and repairs shall not be discernible from normal viewing distance.
- B. Removal and Storage Requirements: General requirements for removal are specified in Section 02 41 19 Selective Demolition. Removal of some materials and items is specified in other Specification Sections. Store materials and items to be reused in a safe location until reinstalled and assume responsibility for safe storage and handling.
- C. Repair of Materials and Items to be Reused: Satisfactorily repair materials and items to be reused that have become damaged during Contractor's operations or provide new equal products at no additional cost. Provide missing parts necessary to complete each installation.
- D. Patching Coordination: Coordinate patching involving various trades whether or not specifically mentioned in the Contract Documents.
- E. Restoring Existing Finishes:
  - 1. Restore floor, wall and ceiling finishes damaged or defaced because of cutting, patching, demolition, alteration, renovation or repair work to condition equal to that before Work under this Contract started.
  - 2. Where alteration, repair, or removals expose damaged or unfinished surfaces or materials, repair and finish or refinish such surfaces or remove the damaged or unfinished surfaces or materials and provide new, acceptable, matching surfaces or materials or acceptable salvaged materials to make continuous areas and surfaces uniform.
- F. Standards: Perform new Work and restore and refinish existing Work to comply with applicable requirements of the Specifications, except as follows:
  - 1. Materials for use in repair of existing surfaces but not otherwise specified shall conform to the highest standards of the trade involved and be in accordance with approved industry standards as required to match the existing surface.
  - 2. Workmanship for repair of existing materials not otherwise specified shall conform to similar workmanship existing in or adjacent to space where alterations are to be made.
  - 3. Reinstall salvaged items where no similar items exist in accordance with the highest standards of trade involved and in accordance with approved Shop Drawings.

- G. Patching Holes: Properly close and patch holes and openings in existing roof deck, floor, wall and ceiling surfaces resulting from alteration work and those shown to be filled to match adjacent undisturbed surfaces.
- H. Repairing Damaged Paving and Curbs:
  - 1. Similarly rectify damage to pavement, curb and gutter, or other structure incurred as a result of the Work.
- I. Existing Courtyard walks and Surfaces: Protect Repair damage to condition equal to that existing before the damage.
- J. Removed or Abandoned Utilities: Cap, valve, plug or bypass to make a complete and working installation.
- K. Landscaping and Lawns: Protect existing lawns and plantings to remain.
- L. Turf: Where existing turf is damaged during the Work, remove damaged turf and provide new sod. Place sod in accordance with approved narrative description of methods to be used, using approved sod, fertilizer, lime, and related materials and during normal planting season, as approved. Sod is subject to approval in place. Maintain sod until approved. Promptly remove rejected sod and provide new acceptable sod.
- M. Concrete Repairs:
  - 1. Where existing concrete is cut, drilled or otherwise damaged during the Work, patch and repair using 3,000 psi concrete. Follow approved narrative description of methods to be used. Bond new concrete to old concrete using specified epoxy-resin grout. Properly cure new concrete and finish to match existing adjacent concrete in color and texture.
  - 2. Where removing existing curbs, bases, walls, partitions, equipment, cabinetwork, finishes or topping leaves floor surface rough, depressed or unlevel, patch and level to within 1/8 inch in each 6 feet, leaving a finish resembling that left by steel trowel finishing; use a combination of concrete topping specified in Section "Cast-In-Place Concrete" and latex cement underlayment. Tolerance applies not only within the area of removal but also between the area of removal and adjacent surfaces.
    - a. Mixing latex cement underlayment: Follow manufacturer's instructions. Pour liquid into powder and mix thoroughly to proper consistency for Work to be done. Use material within one hour of mixing. If mix is too stiff, a small quantity of liquid latex may be added to aid workability.
    - b. Preparation: Clean surfaces of dust, dirt, oil, grease, paint, and other foreign matter. Concrete shall be thoroughly cured, and free from curing compounds. If concrete is very dry, dampen slightly with water before spreading underlayment. Do not permit water to puddle. Brush surfaces to receive underlayment with a prime coat of same latex used in underlayment mix and allow to dry clear before spreading underlayment.
    - c. Installation: Follow manufacturer's instructions. Build up thicknesses more than 1/4 inch using multiple coats, each not more than 1/4 inch thick. Do not install where more than one inch in finished thickness.
- N. Reinstalling Acoustical Ceilings:
  - 1. After completing Work above acoustical ceilings, examine hangers and hanger attachments that have been left in place. Verify their adequacy and suitability as support for reinstalled ceiling. Remove rejected hangers and attachments and provide new acceptable ones. Obtain approval before proceeding.

2. After approval of hangers and attachments, reinstall the existing lay-in grid and acoustical materials in the same locations from which they were removed. Do not reinstall removed acoustical ceilings in locations other than those from where removed.
  3. Repair minor damage to removed acoustical ceiling components using approved methods. Should existing acoustical ceiling components become damaged beyond satisfactory repair, or should Architect reject repairs, remove such damaged components and provide new, matching, acceptable components.
  4. Leave ceilings complete with no voids or openings, in the same plane as previously installed, with joints aligned, level to within 1/8 inch in 12 feet, and in every way the equal of the ceilings before removal.
  5. Clean soiled reinstalled acoustical ceilings using approved methods. Remove permanently soiled or stained units and provide new matching units.
- O. Existing Pipe and Duct covering and Existing Sprayed-on Firestopping: Restore to their original undamaged conditions.
- P. Mechanical and Electrical Equipment and Devices:
1. Reinstall and properly reconnect existing light fixtures; lighting panels; switches; outlets, thermostats, and other existing mechanical, electrical, and plumbing equipment and devices removed during the Work but not indicated to be removed. Reinstall only equipment and devices that are in good condition. Discard equipment and devices that are not in condition at least as good as existed before removal and provide new equivalent equipment and devices. New equipment and devices shall exactly match those removed in type, size, finish, configuration, and operating characteristics.

END OF SECTION



SECTION 01 41 17  
UTILITIES NOTIFICATION

**PART 1 – GENERAL**

1.1 GENERAL PROVISIONS

- A. Comply with all regulations and laws concerning excavation, demolition, or explosive work and be advised of utility notification requirements under Chapter 82, Section 40 of the Massachusetts General Laws.

1.2 ADMINISTRATIVE AUTHORITY

- A. Notification of utilities within the Commonwealth is performed through the Utilities Underground Plant Damage Prevention System, commonly referred to as “Dig Safe”.

1.3 REGULATORY REQUIREMENTS

- A. Contractors must notify “Dig Safe” by telephone before performing any earth moving operations including: digging, trenching, boring, site demolition, excavation, backfilling, grading, or explosive work in all public ways and private property.
- B. This notification must be made at least 72 hours (excluding weekends and holidays) prior to the Work described above, but not more than 30 calendar days before commencement of the contemplated Work. Notification shall occur between 6:00 AM to 6:00 PM local time from Monday to Friday, except in cases of emergency.
  - 1. The toll free phone number is: **811**.
  - 2. Provide the following information:
    - a. Municipality.
    - b. Location of work.
    - c. Intersecting street.
    - d. Type of work.
    - e. Starting date and time of work.
    - f. Name and title of caller.
    - g. Phone number of caller.
    - h. Best time for “Dig Safe” to return calls.
    - i. Company name of General Contractor.
    - j. Company name of Subcontractor or Filed Subcontractor performing sub-grade work.
- C. Member utilities of the Utilities Underground Plant Damage Prevention System are required to respond to the notice within 72 hours from the time said notice is received by designating at the locus the location of pipes, mains, wires, or conduits.
  - 1. Locations of underground utilities will be marked by spray paint or stakes. Marks will be color coded with additional descriptions of letters and arrows.

- D. Do not commence work until "Dig Safe" has been properly notified and has responded as described above.
- E. Subsequently notify "Dig Safe" of unanticipated additional blasting required after the initial notification to "Dig Safe" has been made. Do not perform the additional blasting work in less than 4 hours following the subsequent notification.

1.4 PROTECTION

- A. The Contractor is fully responsible for protection of the utility location markings, wherever these occur, on or off-site.
- B. Perform Work in such a manner, and with reasonable precautions taken to avoid damage to utilities under the surface in said areas of work. Immediately notify any known or suspected damage to underground utilities to the owner of such utilities.

**PART 2 - PRODUCTS** (not used)

**PART 3 - EXECUTION** (not used)

End of Section

SECTION 01 42 00  
REFERENCES AND DEFINITIONS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Abbreviations and Acronyms.
- B. Definitions
- C. Reference Standards.

1.2 ABBREVIATIONS AND ACRONYMS

- A. The following list of common abbreviations are referenced in individual specification sections. This list is provided for convenience to the Contractor and is not intended to define all abbreviations use in the Contract Documents.

1. Abbreviations for contract and specifications.

|        |  |
|--------|--|
| DCAMM  | Massachusetts Division of Capital Asset Management   |
| DOE    | Massachusetts Department of Education  |
| EPA    | United States Environmental Protection Agency  |
| IAQ    | Indoor Air Quality   |
| IEQ    | Indoor Environmental Quality   |
| HVAC&R | Heating, ventilating, air conditioning, and refrigeration systems.   |
| LEED™  | United States Green Building Council, <i>Leadership in Energy and Environmental Design Rating System</i> . |
| MEPA   | Massachusetts Environmental Protection Agency  |
| MGL    | Massachusetts General Laws   |
| MHD    | Massachusetts Highway Department (Mass Highway)  |
| MSDS   | Material Safety Data Sheet   |
| NIC    | Not In Contract  |
| OFCI   | Owner Furnished, Contractor Installed  |
| OFI    | Owner Furnished and Installed  |
| VOC    | Volatile Organic Compounds   |

2. Abbreviations for measurements and quantities.

|                      |              |
|----------------------|--------------|
| C                    | Celsius      |
| cm                   | Centimeter   |
| F                    | Fahrenheit   |
| Hrs                  | Hours        |
| Kg                   | Kilogram     |
| L                    | Liter        |
| M                    | meter        |
| m <sup>2</sup> or SM | square meter |
| m <sup>3</sup> or CM | cubic meter  |
| mm                   | Millimeter   |

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|      |                        |
|------|------------------------|
| Mths | Months                 |
| psi  | Pounds per square inch |
| t    | ton                    |

3. Abbreviations for Drawings.

|      |                         |
|------|-------------------------|
| A    | Acre                    |
| AC   | Air Conditioning        |
| ACST | Acoustical              |
| ACT  | Acoustical Ceiling Tile |
| AD   | Area Drain              |
| ADD  | Addendum                |
| ADDL | Additional              |
| ADJ  | Adjustable, Adjacent    |
| AFF  | Above Finish Floor      |
| AGGR | Aggregate               |
| AHU  | Air Handling Unit       |
| ALT  | Alternate               |
| ALUM | Aluminum                |
| ANOD | Anodized                |
| AP   | Access panel            |
| APRX | Approximate             |
| ARCH | Architectural           |
| AVG  | Average                 |
| &    | And                     |
| <    | Angle                   |
| @    | At                      |
| BC   | Brick Course            |
| BD   | Board                   |
| BG   | Below Grade             |
| BL   | Building Line           |
| BLDG | Building                |
| BLK  | Black                   |
| BLKG | Blocking                |
| BLR  | Boiler                  |
| BM   | Beam, Bench Mark        |
| BTM  | Bottom                  |
| BTU  | British Thermal Unit    |
| BOW  | Bottom of Wall          |
| CAB  | Cabinet                 |
| CB   | Chalkboard              |
| CBN  | Catch Basin             |
| CJ   | Control Joint           |
| CL   | Center Line             |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|       |                          |
|-------|--------------------------|
| CLG   | Ceiling                  |
| CLKG  | Caulking                 |
| CLOS  | Closet                   |
| CLR   | Clear                    |
| CLSRM | Classroom                |
| CMT   | Ceramic Mosaic Tile      |
| CMTB  | Ceramic Mosaic Tile Base |
| CMU   | Concrete Masonry Unit    |
| COL   | Column                   |
| COMP  | Compressible             |
| CONC  | Concrete                 |
| CONST | Construction             |
| CONT  | Continuous               |
| CONTR | Contractor               |
| CORA  | Corridor                 |
| CPT   | Carpet                   |
| CRS   | Course                   |
| CT    | Ceramic Tile             |
| CTB   | Ceramic Tile Base        |
| CTR   | Center                   |
| CUH   | Cabinet Unit Heater      |
| CW    | Coldwater                |
| [     | Channel                  |
| D     | Deep                     |
| DBL   | Double                   |
| DEG   | Degree                   |
| DEMO  | Demolition               |
| DEPT  | Department               |
| DET   | Detail                   |
| DF    | Drinking Fountain        |
| DIA   | Diameter                 |
| DIFF  | Diffuser                 |
| DIM   | Dimension                |
| DISP  | Dispenser                |
| DIV   | Division                 |
| DN    | Down                     |
| DPFG  | Damp Proofing            |
| DR    | Door                     |
| DRW   | Drawer                   |
| DS    | Downspout                |
| DWG   | Drawing                  |
| E     | East                     |
| EA    | Each                     |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|       |                                 |
|-------|---------------------------------|
| EJ    | Expansion Joint                 |
| EL    | Elevation                       |
| ELEC  | Electrical                      |
| ELEV  | Elevator                        |
| EMER  | Emergency                       |
| ENCL  | Enclosure                       |
| ENTR  | Entrance                        |
| EP    | Electrical Panel, Epoxy Paint   |
| EQ    | Equal                           |
| EQU   | Equipment                       |
| EWC   | Electric Water Cooler           |
| EX    | Existing                        |
| EXCV  | Excavation                      |
| EXP   | Exposed                         |
| EXT   | Exterior                        |
| EXTR  | Extruded                        |
| FA    | Fire Alarm                      |
| FAB   | Fabricate                       |
| FAF   | Fluid-Applied Athletic Flooring |
| FB    | Flat Bar                        |
| FD    | Floor Drain                     |
| FDVC  | Fire Department Valve Cabinet   |
| FE    | Fire Extinguisher               |
| FEC   | Fire Extinguisher Cabinet       |
| FEJ   | Floor Expansion Joint           |
| FF    | Finish Floor                    |
| FH    | Fire Hydrant                    |
| FIN   | Finish                          |
| FINGR | Finish Grade                    |
| FIX   | Fixed                           |
| FIXT  | Fixture                         |
| FLASH | Flashing                        |
| FLEX  | Flexible                        |
| FLOUR | Fluorescent                     |
| FLR   | Floor                           |
| FND   | Foundation                      |
| FPRF  | Fire Proofing                   |
| FRT   | Fire Retardant Treated          |
| FS    | Food Service                    |
| FT    | Foot, Feet                      |
| FTG   | Footing                         |
| FTR   | Finned Tube Radiation           |
| FURN  | Furniture                       |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|       |  |
|-------|--|
| FURR  | Furring                                |
| FUT   | Future                                 |
| GA    | Guage                                  |
| GALV  | Galvanized                             |
| GC    | General Contractor                     |
| GEN   | General, Generator                     |
| GFRG  | Glass Fiber Reinforced Gypsum          |
| GFRP  | Glass Fiber Reinforced Plaster         |
| GL    | Glass                                  |
| GND   | Ground                                 |
| GWB   | Gypsum Wall Board                      |
| GYP   | Gypsum                                 |
| H     | High                                   |
| HC    | Hollow Core                            |
| HDW   | Hardware                               |
| HM    | Hollow Metal                           |
| HORZ  | Horizontal                             |
| HP    | High Point                             |
| HR    | Hour                                   |
| HT    | Height                                 |
| HVAC  | Heating Ventilation & Air Conditioning |
| HW    | Hot Water                              |
| HWD   | Hardwood                               |
| ID    | Inside Diameter                        |
| IN    | Inch, Inches                           |
| INCL  | Include, Inclusive                     |
| INSUL | Insulation, Insulated                  |
| INT   | Interior                               |
| INV   | Invert, Inverse                        |
| JAN   | Janitor                                |
| JT    | Joint                                  |
| KD    | Knocked Down                           |
| KEC   | Kitchen Equipment Contractor           |
| KIT   | Kitchen                                |
| KW    | Kilowatt                               |
| KWH   | Kilowatt Per Hour                      |
| L     | Left, Long                             |
| LAM   | Laminate, Laminated                    |
| LAV   | Lavatory                               |
| LB    | Pound                                  |
| LF    | Linear Foot, Linear Feet               |
| LH    | Left hand                              |
| LP    | Low Point                              |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|      |                                       |
|------|---------------------------------------|
| LT   | Light                                 |
| LTG  | Lighting                              |
| MAT  | Entrance Mats, Entrance Grate         |
| MATL | Material                              |
| MAX  | Maximum                               |
| MB   | Marker Board                          |
| MECH | Mechanical                            |
| MEMB | Membrane                              |
| MFR  | Manufacturer                          |
| MIN  | Minimum                               |
| MISC | Miscellaneous                         |
| MO   | Masonry Opening                       |
| MR   | Moisture Resistant                    |
| MTD  | Mounted                               |
| MTG  | Mounting, Meeting                     |
| MTL  | Metal                                 |
| MUL  | Mullion                               |
| N    | North                                 |
| NAT  | Natural                               |
| NIC  | Not In Contract                       |
| NO   | Number                                |
| NOM  | Nominal                               |
| NRC  | Noise Reduction Coefficient           |
| NTS  | Not To Scale                          |
| OA   | Overall                               |
| OC   | On Center                             |
| OD   | Outside Diameter                      |
| OFI  | Owner Furnished Item                  |
| OFCI | Owner Furnished /Contractor Installed |
| OH   | Overhead                              |
| OPER | Operable                              |
| OPNG | Opening                               |
| OPP  | Opposite                              |
| OZ   | Ounce                                 |
| P    | Paint                                 |
| PAR  | Parallel                              |
| PERF | Perforated                            |
| PERP | Perpendicular                         |
| PG   | Paint Grade                           |
| PL   | Plate                                 |
| PLAM | Plastic Laminate                      |
| PLBG | Plumbing                              |
| PLAS | Plaster                               |

REFERENCES AND DEFINITIONS



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|       |                                   |
|-------|-----------------------------------|
| PNL   | Panel, Paneling                   |
| POL   | Polished                          |
| PPT   | Porcelain Paver Tile              |
| PPTB  | Porcelain Paver Tile Base         |
| PR    | Pair                              |
| PRFB  | Prefabricated                     |
| PRTBD | Particle Board                    |
| PSI   | Pounds Per Square Inch            |
| PT    | Pressure Treated                  |
| PTD   | Painted                           |
| PTN   | Partition                         |
| PWD   | Plywood                           |
| QR    | Quarter Round                     |
| QT    | Quarry Tile                       |
| QUAL  | Quality                           |
| QUAN  | Quantity                          |
| R     | Radius, Riser, Rubber             |
| RB    | Rubber Base                       |
| RCPT  | Receptacle                        |
| RD    | Roof Drain                        |
| REC   | Recessed                          |
| RECT  | Rectangular                       |
| REF   | Reference                         |
| REFL  | Reflected                         |
| REFR  | Refrigerator                      |
| REINF | Reinforced                        |
| REQD  | Required                          |
| RESIL | Resilient                         |
| REV   | Revise, Reverse                   |
| RH    | Right Hand                        |
| RHR   | Right Hand Reverse                |
| RL    | Rain Leader                       |
| RLG   | Railing                           |
| RO    | Rough Opening                     |
| RR    | Rubber Riser                      |
| RIT   | Right                             |
| RTR   | Rubber Tile, Rubber Tread         |
| S     | South                             |
| SC    | Solid Core                        |
| SCHD  | Schedule                          |
| SCRFB | Static Control Resilient Flooring |
| SECT  | Section                           |
| SEG   | Segment                           |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|      |                                   |
|------|-----------------------------------|
| SF   | Square Foot                       |
| SH   | Shelf                             |
| SHT  | Sheet                             |
| SHR  | Shower                            |
| SHVT | Seamless Sheet Vinyl              |
| SIM  | Similar                           |
| SLH  | Slotted Horizontal                |
| SLV  | Slotted Vertical                  |
| SMFL | Seamless Flooring                 |
| SPEC | Specification                     |
| SQ   | Square                            |
| SQIN | Square Inch                       |
| SS   | Stainless Steel                   |
| SSM  | Solid Surface Material            |
| ST   | Street                            |
| STA  | Station                           |
| STC  | Sound Transmission Classification |
| STD  | Standard                          |
| STL  | Steel                             |
| STOR | Storage                           |
| STR  | Structure                         |
| STRL | Structural                        |
| SUB  | Subcontractor                     |
| SUSP | Suspended                         |
| SWD  | Softwood                          |
| SYM  | Symmetrical                       |
| SYN  | Synthetic                         |
| SYST | System                            |
| T    | Tread                             |
| T&G  | Tongue and Groove                 |
| TB   | Tack Board                        |
| TC   | Top of Curb                       |
| TEL  | Telephone                         |
| TEMP | Temporary, Temperature            |
| TFE  | Thin-Film Epoxy Flooring          |
| THK  | Thick                             |
| THR  | Threshold                         |
| TLT  | Toilet                            |
| TO   | Top of                            |
| TOB  | Top of Blocking                   |
| TOC  | Top of Concrete                   |
| TOF  | Top of Foundation / Footing       |
| TOS  | Top of Steel                      |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|      |                                    |
|------|------------------------------------|
| TRK  | Track                              |
| TS   | Tube Steel                         |
| TV   | Television                         |
| TW   | Top of Wall                        |
| TYP  | Typical                            |
| TZ   | Terrazo                            |
| UC   | Undercut                           |
| UL   | Underwriters Laboratory            |
| UNO  | Unless Noted Otherwise             |
| UR   | Urinal                             |
| UV   | Unit Ventilator, Ultraviolet       |
| VB   | Vinyl Base                         |
| VCT  | Vinyl composite tile               |
| VERT | Vertical                           |
| VEST | Vestibule                          |
| VIF  | Verify in field                    |
| VP   | Veneer plaster                     |
| VTR  | Vent through roof                  |
| VWC  | Vinyl Wallcovering                 |
| W    | West, Wide, Width                  |
| W/   | With                               |
| W/O  | Without                            |
| WAB  | Wood Athletic Flooring Vented Base |
| WAF  | Wood Athletic Flooring             |
| WC   | Water Closet                       |
| WD   | Wood                               |
| WEJ  | Wall Expansion Joint               |
| WF   | Wide Flange                        |
| WH   | Water Heater                       |
| WP   | Work Point                         |
| WPGF | Water Proofing                     |
| WSF  | Wood Strip Flooring                |
| WT   | Weight, Wt (Steel Shape)           |
| XBAR | Crossbar                           |
| XH   | Extra Heavy                        |
| XL   | Extra Large                        |
| YD   | Yard                               |
| YR   | Year                               |
| YS   | Yield Strength                     |
| Z    | Modulus of Section                 |
| ZN   | Zinc                               |

REFERENCES AND DEFINITIONS

### 1.3 DEFINITIONS

- A. Definitions of contracting parties (Owner, Owner's Project Manager, General Contractor, and Architect): Refer to Section 01 10 00 –SUMMARY.
- B. Definitions for terms utilized in the Contract Documents:
1. "As necessary," "as directed," "when directed," "satisfactory," "good and sufficient," "approved," or other general qualifying terms are used on the Drawings: These terms are deemed to be followed by the words, "in the opinion of the Architect," or "by the Architect," as the case may be."
  2. "Addenda": written or graphic instruments issued prior to the execution of the Contract which modify or interpret the Bidding Documents, including the Drawings and Specifications, by additions, deletions, clarifications or corrections.
  3. "Approval," "approved," "approved equal," "or equal," or "other approved" means as approved by the Architect."
  4. The terms "Contractor" and "General Contractor" as used in the Project Manual have the same meaning and are interchangeable in Contract Documents. These terms refer to the same entity.
  5. The term "Day": is defined as the following:
    - a. The term "calendar day" is a full 24 hour period, starting from 12 AM (midnight), and includes all weekends and legal holidays.
    - b. The term "working day" shall mean any calendar day except Saturdays, Sundays, and legal holidays at the place of the building.
    - c. Where the term "day" is used without the adjective of "calendar" or "working", it shall mean "calendar day".
  6. "Furnish and Install" or "Provide": items identified shall be furnished and installed under this Contract. The term "Furnish", when used separately, shall mean that the items referred to shall be furnished, only. Similarly the term "install", when used separately, shall mean that the items referred to shall be installed, only.
  7. "Knowledge," "recognize" and "discover," their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows (or should know), recognizes (or should recognize) and discovers (or should discover) in exercising the care, skill and diligence required by the Contract Documents. Analogously, the expression "reasonably inferable" and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a Contractor familiar with the Project and exercising the care, skill and diligence required of the contractor by the Contract Documents.
  8. "Not in Contract" or "N.I.C.": equipment, furnishings, or other materials not included as a part of this Contract.
  9. "Product": materials, systems and equipment.
- C. Definitions pertaining to sustainable development: As defined in ASTM E 2114 - *Standard Terminology for Sustainability Relative to the Performance of Buildings*, and as specified herein.
1. "Biobased Materials": As defined in the Farm Security and Rural Investment Act, for purposes of Federal procurement of biobased products, "biobased"

means a “commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials.” Biobased materials also include fuels, chemicals, building materials, or electric power or heat produced from biomass as defined by The Biomass Research and Development Act of 2000.

- a. “Biobased Content”: The amount of biobased carbon in the material or product as a percentage of weight (mass) of the total organic carbon in the material or product.
2. “Chain-of-Custody: Process whereby a product or material is maintained under the physical possession or control during its entire life cycle.
3. “Composite panel products”: Manufactured wood products including, but are not limited to particle board (PB), Medium Density Fiberboard (MDF), wheatboard and strawboard and similar manufactured products
4. “Deconstruction: Disassembly of buildings for the purpose of recovering materials.
5. “DfE (Design for the Environment)”: A technique that includes elements of resource conservation and pollution prevention as applied in various product sectors. A technique that incorporates approaches which are part of product (or assembly) concept, need and design. Considerations involve material selection, material and energy efficiency, reuse, maintainability and design for disassembly and recyclability. Refer to ISO Guide 64, and EPA’s website at <http://www.epa.gov/dfef/> for additional clarification on Design for the Environment for additional clarification
6. “Environmentally preferable products”: Products and services that have a lesser or reduced effect on the environment in comparison to conventional products and services. Refer to EPA’s Final Guidance on Environmentally Preferable Purchasing for more information <<http://www.epa.gov/epp/guidance/finalguidancetoc.htm>>.
7. “Non-Renewable Resource”: A resource that exists in a fixed amount that cannot be replenished on a human time scale. Non-renewable resources have the potential for renewal only by geological, physical, and chemical processes taking place over of millions of years. Examples include: iron ore, coal, and oil.
8. “Perpetual Resource”: A resource that is virtually inexhaustible on a human time scale. Examples include solar energy, tidal energy, and wind energy.
9. “Recycled Content Materials”: Products that contain preconsumer or post-consumer materials as all or part of their feedstock. Recycled content claim shall be consistent with Federal Trade Commission (FTC) Guide for the Use of Environmental Marketing Claims.
10. “Renewable Resource”: A resource that is grown, naturally replenished, or cleansed, at a rate which exceeds depletion of the usable supply of that resource. A renewable resource can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grasslands, and fertile soil.

#### 1.4 REFERENCE STANDARDS

- A. For products or workmanship specified by association, trade, or Federal Standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by DATE OF ISSUE for Contract Documents, current on date of Owner-Contractor Agreement.
- C. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.
- D. The contractual relationship to the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
- E. Schedule of References
  - 1. Listed below are abbreviations for the names and titles of trade association names, federal government agencies and similar organizations which are referenced in the individual specification sections. The addresses and phone numbers provided are for the Contractor's convenience and are believed to be current and accurate, however addresses and phone numbers frequently change, and no assurance is made on their accuracy:

|        |  |
|--------|--|
| AA     | Aluminum Association<br>900 19th Street N.W., Suite 300 Washington, DC 20006<br><a href="http://www.aluminum.com">www.aluminum.com</a>   |
| ABAA   | Air Barrier Association of America<br>1600 Boston-Providence Highway Walpole, MA 02081<br><a href="http://www.airbarrier.org">www.airbarrier.org</a>   |
| AAMA   | American Architectural Manufacturer's Association<br>1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268<br><a href="http://www.aamanet.org">www.aamanet.org</a>   |
| AASHTO | American Assoc. of State Highway & Transportation Officials<br>444 N. Capitol Street NW, Suite 249 Washington, DC 20001<br><a href="http://www.aashto.org">www.aashto.org</a>  |
| ACI    | American Concrete Institute, International<br>38800 Country Club Drive, Farmington Hills, Michigan 48331<br><a href="http://www.aci-int.org">www.aci-int.org</a>   |
| ACPA   | American Concrete Pipe Association<br>222 West Las Colinas Boulevard, Suite 641, Irving TX<br><a href="http://www.concrete-pipe.org">www.concrete-pipe.org</a>   |
| ADC    | Air Diffusion Council<br>104 S. Michigan Ave, Suite 1500, Chicago, IL 60603<br><a href="http://www.flexibleduct.org">www.flexibleduct.org</a>  |
| AFPA   | American Forest & Paper Association<br>(Formerly NFPA National Forest Products Association)<br>1111 19 <sup>th</sup> St. N.W., Suite 800, Washington, DC 20036<br><a href="http://www.afandpa.org">www.afandpa.org</a> |
| AGA    | American Gas Association Inc.<br>1515 Wilson Blvd. Arlington, VA 22209-2469<br><a href="http://www.agagas.com">www.agagas.com</a>  |
| AGAI   | American Galvanizers Association Inc.<br>12200 E.Liff Ave, Suite 204, Aurora, CO 80014-1252  |

#### REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|        |   |
|--------|---|
|        | <a href="http://www.galvanizeit.org">www.galvanizeit.org</a>  |
| AIA    | American Institute of Architects<br>1735 New York Avenue, N.W., Washington, DC 20006-5292<br><a href="http://www.aia.org">www.aia.org</a>   |
| AISC   | American Institute of Steel Construction<br>1 E. Wacker Dr., Suite 3100, Chicago, IL 60601-2001<br><a href="http://www.aisc.org">www.aisc.org</a>                                       |
| AMCA   | Air Movement and Control Association<br>30 W. University Drive, Arlington Heights, IL 60004-1893<br><a href="http://www.amca.org">www.amca.org</a>                                      |
| ANSI   | American National Standards Institute<br>11 W. 42 <sup>nd</sup> Street, 13 Floor, New York, NY 10036<br><a href="http://www.ansi.org">www.ansi.org</a>                                  |
| APA    | APA - The Engineered Wood Association<br>(formerly APA - American Plywood Association)<br>P.O. Box 11700, Tacoma, WA 98411-0070<br><a href="http://www.apawood.org">www.apawood.org</a> |
| ARI    | Air-Conditioning and Refrigeration Institute<br>4301 N. Fairfax Dr., Suite 425, Arlington, VA 22203<br><a href="http://www.ari.org">www.ari.org</a>                                     |
| ASCA   | Architectural Spray Coaters Association<br>230 West Wells Street, Suite 311, Milwaukee WI 53203<br><a href="http://www.aecinfo.com">www.aecinfo.com</a>                                 |
| ASCE   | American Society of Civil Engineers<br>1015 15 <sup>th</sup> St. N.W., Washington, DC 20005<br><a href="http://www.asce.org">www.asce.org</a>   |
| ASHRAE | American Society of Heating, Refrigerating, and Air-Conditioning Engineers<br>1791 Tullie Circle NE, Atlanta GA.30329<br><a href="http://www.ashrae.org">www.ashrae.org</a>             |
| ASME   | American Society of Mechanical Engineers<br>345 East 47th Street, New York, NY 10017-2392<br><a href="http://www.asme.org">www.asme.org</a>   |
| ASTM   | American Society for Testing and Materials<br>100 Barr Harbor Drive, West Conshohocken, PA 19428<br><a href="http://www.astm.org">www.astm.org</a>                                      |
| AWI    | Architectural Woodwork Institute<br>1952 Isaac Newton Square W., Reston, VA 20190<br><a href="http://www.awinet.org">www.awinet.org</a>   |
| AWPA   | American Wood Preservers' Association<br>P.O. Box 286, Woodstock, MD 21163-0286<br><a href="http://www.awpa.com">www.awpa.com</a>   |
| AWPI   | American Wood Preservers' Institution<br>1945 Old Gallows Rd., Suite 150, Vienna, VA 22182<br><a href="http://www.oas.org">www.oas.org</a>  |
| AWS    | American Welding Society<br>550 LeJeune Road, N.W., Miami, FL 33126<br><a href="http://www.aws.org">www.aws.org</a>   |
| BHMA   | Builders Hardware Manufacturers Association, Inc.<br>355 Lexington Ave., 17 Floor New York, NY 10017<br><a href="http://www.buildershardware.com">www.buildershardware.com</a>          |
| CDA    | Copper Development Association  |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

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|       | 260 Madison Ave., 16 <sup>th</sup> Floor, New York, NY 10016<br><a href="http://www.copper.org">www.copper.org</a>  |
| CISCA | Ceilings & Interior Systems Construction Association<br>579 W. North Ave., Suite 301, Elmhurst, IL 60126<br><a href="http://www.cisca.org">www.cisca.org</a>                      |
| CRI   | Carpet and Rug Institute<br>310 Holiday Ave, Dalton, GA 30720<br><a href="http://www.carpet-rug.com">www.carpet-rug.com</a>   |
| CRSI  | Concrete Reinforcing Steel Institute<br>933 N. Plum Grove Road, Schaumburg, IL 60173-4758<br><a href="http://www.crsi.org">www.crsi.org</a>                                       |
| DHI   | Door and Hardware Institute<br>14170 Newbrook Dr., Chantilly, VA 22021-2223<br><a href="http://www.dhi.org">www.dhi.org</a>   |
| FM    | Factory Mutual Engineering & Research Corp.<br>1151 Boston-Providence Turnpike<br>Norwood, MA 02062<br><a href="http://www.fmglobal.com">www.fmglobal.com</a>                     |
| FSC   | Forest Stewardship Council (United States Chapter)<br>1155 30th Street NW, Suite 300, Washington, DC 20007<br><a href="http://www.c-f-c.com">www.c-f-c.com</a>                    |
| GA    | Gypsum Association<br>810 First Street, N.E., Suite 510 Washington, DC 20002<br><a href="http://www.gypsum.org">www.gypsum.org</a>  |
| GANA  | Glass Association of North America<br>2945 S.W. Wanamaker Dr., Suite A, Topeka, KS 66612-5321<br><a href="http://www.glass.org">www.glass.org</a>                                 |
| GICC  | Glazing Industry Code Committee<br>3310 Harrison St., Topeka, KS 66611-2279<br><a href="http://www.glazingcodes.net">www.glazingcodes.net</a>                                     |
| IGCC  | Insulating Glass Certification Council<br>3933 US Route 11, PO Box 2040, Cortland, NY 13045<br><a href="http://www.igcc.org">www.igcc.org</a>                                     |
| LSGA  | Laminators Safety Glass Association<br>3310 Harrison Street, Topeka KS 66611-2279<br><a href="http://www.glass.org">www.glass.org</a>   |
| MCAA  | Mason Contractors Association of America<br>1910 S. Highland Ave. Suite 101, Lombard, IL 60148<br><a href="http://www.masoncontractors.org">www.masoncontractors.org</a>          |
| MFMA  | Maple Flooring Manufacturers Association<br>60 Revere Drive, Suite 500, Northbrook, IL 60062<br><a href="http://www.maplefloor.org">www.maplefloor.org</a>                        |
| MIL   | Military Specifications and Standards<br>Naval Publications and Forms Center<br>5801 Tabor Avenue, Philadelphia, PA 19120<br><a href="http://www.milspec.com">www.milspec.com</a> |
| NAAMM | National Association of Architectural Metal Manufacturers<br>8 South Michigan Avenue, Suite 1000, Chicago, IL 60603<br><a href="http://www.naamm.org">www.naamm.org</a>           |
| NCMA  | National Concrete Masonry Association<br>2302 Horse Pen Road, Herndon, VA 20171-3499<br><a href="http://www.ncma.org">www.ncma.org</a>  |

REFERENCES AND DEFINITIONS



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

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| NEBB   | National Environmental Balancing Bureau<br>8575 Government Circle, Gaithersburg, MD 20877-4121<br><a href="http://www.nebb.org">www.nebb.org</a>   |
| NEMA   | National Electrical Manufacturers' Association<br>1300 N. 17 <sup>th</sup> St., Suite 1846, Rosslyn, VA 22209<br><a href="http://www.nema.org">www.nema.org</a>                          |
| NFPA   | National Fire Protection Association<br>1 Battery March Park, PO Box 9101, Quincy, MA 02269<br><a href="http://www.nfpa.org">www.nfpa.org</a>  |
| NFSHA  | National Federation of State High School Associations<br>PO Box 20626, Kansas City MO. 64195<br><a href="http://www.nfhs.org">www.nfhs.org</a>   |
| NRCA   | National Roofing Contractors Association<br>O'Hare International Center<br>10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607<br><a href="http://www.nrca.net">www.nrca.net</a>   |
| PCA    | Portland Cement Association<br>5420 Old Orchard Road, Skokie, IL 60077-1083<br><a href="http://www.cement.org">www.cement.org</a>  |
| PEI    | Porcelain Enamel Institute<br>4004 Hillsboro Pike, Suite 224B, Nashville, TN 37215<br><a href="http://www.porcelainenamel.com">www.porcelainenamel.com</a>                               |
| PS     | Product Standard<br>U. S. Department of Commerce<br><a href="http://www.omg.org">www.omg.org</a>   |
| SDI    | Steel Deck Institute<br>P.O. Box 25, Fox River Grove, IL 60021-0025<br><a href="http://www.sdi.org">www.sdi.org</a>  |
| SDI    | Steel Door Institute<br>30200 Detroit Road, Cleveland, OH 44145-1967<br><a href="http://www.steeldoor.org">www.steeldoor.org</a>   |
| SGCC   | Safety Glass Certification Council<br>RMS, P.O. Box 9 Henderson Harbor, NY 13651<br><a href="http://www.sgcc.org">www.sgcc.org</a>   |
| SIGMA  | Sealed Insulating Glass Manufacturers Association<br>401 N. Michigan Ave., Suite 2400, Chicago, IL 60611<br><a href="http://www.glasschange.com">www.glasschange.com</a>                 |
| SMACNA | Sheet Metal and Air Conditioning Contractors' National Association<br>4201 Lafayette Center Dr., Chantilly, VA 22022-1209<br><a href="http://www.smacnapa.org">www.smacnapa.org</a>      |
| SSMA   | Steel Stud Manufacturer's Association<br>8 South Michigan Avenue, Chicago IL 60603<br><a href="http://www.ssma.com">www.ssma.com</a>   |
| SSPC   | The Society for Protective Coatings<br>40 24 <sup>th</sup> Street, 6 <sup>th</sup> Floor, Pittsburgh PA 15222-4623<br><a href="http://www.sspc.org">www.sspc.org</a>                     |
| SWRI   | Sealant, Waterproofing & Restoration Institute<br>2841 Main Street, Suite 585, Kansas City, MO 64108<br><a href="http://www.swrionline.org">www.swrionline.org</a>                       |
| TCNA   | Tile Council of North America, Inc.<br>100 Clemson Research Blvd., Anderson, SC 29625<br><a href="http://www.tileusa.com">www.tileusa.com</a><br>(formerly TCA, Tile Council of America) |

REFERENCES AND DEFINITIONS

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

UL Underwriters' Laboratories, Inc.  
333 Pfingston Road, Northbrook, IL 60602  
[www.ul.com](http://www.ul.com)

USGBC United States Green Building Council  
1800 Massachusetts Avenue NW, Suite 300  
Washington DC 20036  
[www.usgbc.org](http://www.usgbc.org)

WDMA Window & Door Manufacturers Association  
(formerly National Wood Window & Door Association, NWWDA)  
205 E. Touhy Avenue, Suite G-54, Des Plaines, IL 60018  
[www.nwwda.org](http://www.nwwda.org)

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

SECTION 01 45 00

QUALITY CONTROL

**PART 1 - GENERAL**

1.1 SECTION INCLUDES

- A. General quality assurance and control of installation.
- B. Site safety, worker safety and training.
- C. Source quality control.
- D. Field samples and mock-ups.
- E. Manufacturer's field services and reports.
- F. Field quality control, Owner's right for confirmation.

1.2 RELATED SECTIONS

- A. Section 01 45 29 - TESTING LABORATORY SERVICES.

1.3 GENERAL QUALITY ASSURANCE AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including performance of each step in sequence. Notify Architect when manufacturers' instructions conflict with the provisions and requirements of the Contract Documents; obtain clarification before proceeding with the work affected by the conflict.
- C. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate high standards or more precise workmanship.
- D. Perform work by persons qualified to produce workmanship of specified quality.
- E. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.4 SITE SAFETY, WORKER SAFETY AND TRAINING

- A. General: The General Contractor, subcontractors and Filed Sub Contractors shall, at all times, exercise reasonable precautions for the

safety of all persons. All rules, regulations, and laws concerning safety that are in effect at the work site, and in particular, all applicable regulations of the Occupational Safety and Health Administration (OSHA) of the U.S. Government, in addition to specified requirements shall be complied with in all respects.

1. Construction Manager's responsibility for safety shall apply continuously twenty four (24) hours per Day during the term of this Contract and is not limited to normal working hours.
- B. General Contractor's safety program: Prior to commencement of the Work, the General Contractor shall develop and implement a Safety and Health Plan to comply with the Occupational Safety and Health Administration (OSHA) standards for the Construction Industry and all other applicable Federal, State, local laws and regulations. General Contractor's Safety and Health Plan, and included health and safety procedures and policies, shall be submitted to the Architect and Owner's Representative within fifteen (15) Days after the date of Notice to Proceed and in no event later than commencement of the Work, whichever occurs first.
1. Perform pre planning to ensure access is provided to Fire Department for all areas of the work site throughout the duration of the Contract. The General Contractor shall provide the Fire Department site access maps, updated regularly, to reflect changes in the layout of the work site and shall notify the Fire Department when each update is made
  2. Post and maintain, at prominent locations throughout the Project site, emergency telephone numbers and shall insure that all personnel on site are continuously aware of this information.
  3. Ensure safe access to the Work for the Owner, Architect, Architect's consultants, their designated representatives, and all others charged with inspection, testing and monitoring of the Work, and visitors to the site. The Construction Manager shall furnish site visitors with safety equipment, test equipment, safety apparel and instructions that are required to insure their safety on site, and in the performance of their duties related to the Work of this Contract
- C. All employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least 10 hours in duration. The OSHA training and certification course shall occur at the time each employee begins work. Furnish documentation to Owner and Architect, for each employee documenting successful completion of the OSHA safety training and certification course. Submit with the first certified payroll report. Comply fully with all laws and regulations applicable to awards made subject to Massachusetts General Laws (MGL) Chapter 149, Section 44A.

#### 1.5 GENERAL CONTRACTOR QUALITY CONTROL PROGRAM

- A. Procedures: General Contractor, Filed Sub Contractors and each subcontractor shall include all labor, materials, equipment, services and incidental items necessary to implement quality control procedures

to the extent necessary to demonstrate and maintain compliance with the Contract Documents.

- B. It is recognized that the General Contractor maintains standing written procedures as a corporation for the assurance of quality in finished projects. The Architect and Owner shall review and approve such corporate QA/QC program; review will be against the guidance provided by the following paragraphs and approval may be conditioned with requirements to expand specific sections to meet specific requirements of the Owner and/or the Owner's funders.
- C. Quality Control Plan: Within 20 days after Notice to Proceed, the General Contractor shall submit a Quality Control (QC) Plan to the Owner's Representative and Architect for approval. The plan shall address the following, as a minimum:
1. The General Contractor's commitment to quality and implementing and managing the QC program.
  2. Identification of the General Contractor's onsite QC Manager, with name, qualifications, duties and responsibilities. The QC Manager shall have the authority to direct the removal and replacement of non-conforming work. The QC Manager shall be present for all QC meetings, inspections and tests during the project.
  3. Procedures for addressing and commenting QC with General Contractor's staff, all subcontractors and suppliers, and Owner, Architect and Owner's representative.
  4. Procedures for review of submittals and submittal status, and documentation of same.
  5. Procedures for pre-installation meetings and documentation of same.
  6. Procedures for inspections of deliveries and documentation of same.
  7. Procedures for benchmark inspections, defined as initial installations, and documentation of same.
  8. Procedures for mockup inspections and documentation of same.
  9. Procedures for equipment in place, inspections and documentation of same.
  10. Procedures for inspections prior to closures of concealment and documentation of same.
  11. Procedures for start-up and commissioning and documentation of same.
  12. Procedures for turnover and documentation of same.
  13. Procedures for identifying, recording, tracking correcting and reporting items requiring rework, using a Rolling Completion list chronological item number, phase area, date listed, description, party responsible for correction, date notified, and date corrected.
  14. Procedures for testing and documentation of same.
  15. Procedures for corrective action on Architect's Field Reports and Testing Agency reports and documentation of same.

- D. Procedures for reporting on all of the above on a monthly basis as a condition precedent to review of the General Contractor's application for payment.

#### 1.6 SOURCE QUALITY CONTROL

- A. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- B. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Product Labeling: Attach label from agency approved by authority having jurisdiction for products, assemblies, and systems required to be labeled by applicable code(s).
  - 1. Label Information: Include manufacturer's or fabricator's identification, approved agency identification, and the following information, as applicable, on each label.
    - a. Model number.
    - b. Serial number.
    - c. Performance characteristics.

#### 1.7 FIELD SAMPLES

- A. Install field samples demonstrating quality level for the Work, at the site as required by individual specifications Sections for review and acceptance by Architect. Remove field samples prior to date of Final Inspection, or as directed.

#### 1.8 MANUFACTURER'S FIELD SERVICES AND REPORTS

- A. When called for by individual Specification Sections, provide at no additional cost to the Owner, manufacturers' or product suppliers' qualified staff personnel, to observe site conditions, start-up of equipment, adjusting and balancing of equipment, conditions of surfaces and installation, quality of workmanship, and as specified under the various Sections.
  - 1. Individuals shall report all observations, site decisions, and instructions given to applicators or installers. Immediately notify Architect of any circumstances which are supplemental, or contrary to, manufacturer's written instructions.
  - 2. Submit full report within 30 calendar days from observed site conditions to Architect for review.

#### 1.9 FIELD QUALITY CONTROL

- A. The Owner reserves the right to take samples and perform, at random,

tests of approved materials delivered to the job site to verify compliance  
of actual materials with specifications.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

END OF SECTION

SECTION 01 50 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

1.01 GENERAL CONDITIONS

- A. The "Standard Form of Agreement," as provided, Electronic Format, as published, together with all Amendments and Supplements as hereinbefore listed, shall apply and are hereby made a part of this section of the Specifications.
- B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 REQUIREMENTS

- A. Temporary Water
- B. Winter Conditions / Temporary Heat
- C. Weather Protection
- D. Temporary Power
- E. Hoisting Equipment and Machinery
- F. Staging
- G. Maintenance of Access
- H. Dust Control
- I. Noise Control
- J. Cleaning During Construction
- K. Sanitary Facilities
- L. Use of Site

1.03 TEMPORARY WATER

- A. The contractor shall arrange with the facility if he/she requires water for use during construction. Water will be furnished without cost to the contractor, but he shall pay for the cost to install, maintain and removal of any necessary temporary connections. All such temporary connections and removal of same, and use of water shall be done in a manner so as not to interfere with the facility's normal operations and any existing areas damaged shall be put back to their original condition.
- B. Use of water may be discontinued by the Town / City if, in the opinion of the Town / City, it is wastefully used.
- C. The General Contractor shall provide an adequate supply of drinking water from approved sources of acceptable quality, satisfactorily cooled, for his employees and those of his sub-contractors.

1.04 TEMPORARY WEATHER PROTECTION

- A. Proposed Plan: The General Contractor shall within 30 calendar days after Award of Contract, submit three copies of a typewritten proposed plan for "Weather Protection" and obtain the Architect's and Owner's written approval.
- B. Reporting Requirements:
  - 1. Within 10 calendar days after Contract award, the General Contractor shall submit in writing to the Owner for approval, three copies of its proposed plan for weather protection.
  - 2. The General Contractor shall furnish and install accurate Fahrenheit thermometers at three places designated by the Owner to determine whether the required temperature is being maintained. Thermometers shall indicate both high and low temperatures in a 24 hour period.
- C. Weather protection materials, equipment, and the installation thereof, shall comply with all the safety



rules and regulations including provisions for adequate ventilation and fire protection devices.

- D. Additional weather protection requirements: The General Contractor is responsible to ensure that the protection is provided for all materials and equipment from weather as required for the nature of the materials acceptable for installation or equipment used. (year round).
1. Where removal of existing roofing, roof sheathing, windows, doors, and other items is necessary to accomplish work, have materials and workmen ready to provide adequate and approve temporary covering of exposed areas.
  2. Temporary coverings shall be attended as necessary to insure effectiveness and to prevent displacement.
  3. Contractor shall repair or replace all elements of the building damaged by failure to properly protect them from the weather to the satisfaction of the Architect at no additional cost to the Owner.

#### 1.04 TEMPORARY POWER

- A. If contractor requires electrical power, they shall arrange for and pay for installation and removal of a temporary service with the local utility, or provide a generator and fuel. Costs for temporary power are to be included as part of the work.

#### 1.05 HOISTING EQUIPMENT AND MACHINERY

- A. All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in safe condition by the General Contractor for the use of all sub-contractor's material and/or equipment delivered to the designated hoisting area except that which is specifically required to be provided by the sub-contractors themselves and is so stated in each appropriately related section of the specifications. All costs for hoisting operating services shall be borne by the general contractor.

#### 1.06 STAGING

- A. All staging, exterior and interior, required to be over eight feet in height, shall be furnished and erected by the general contractor and maintained in safe condition by him/her without charge to and for the use of all trades as needed by them for proper execution of their work except where specified to the contrary in any filed sub-bid section of the project manual.

#### 1.07 MAINTAIN ACCESS

- A. The general contractor shall maintain all entrances and exits from the building for the duration of the contract as well as access to and around the building for vehicular traffic and authorized personnel.
- B. Workers' access to the building will be limited to those entrances designated by the Architect in consultation with School officials. The contractor shall protect all floors, walls, ceilings and other finished surfaces from damage. Any surfaces damaged shall be repaired to the Architect's satisfaction. Thoroughly clean all surfaces at the completion of the work.
- C. All materials resulting from demolition and removal operations shall be transported to the ground into dumpster bodies via suitable enclosed chutes.

#### 1.08 DUST CONTROL

- A. The general contractor shall provide adequate means for the purpose of preventing dust caused by construction operations throughout the period of the construction contract.
- B. The committing of nuisances and creating dust on the land of the Town and adjacent property shall be

rigorously prohibited and adequate steps taken to prevent it.

- C. This provision does not supersede any specific requirements for methods of construction or applicable general conditions set forth in the Contract Articles with added regard to performance obligations of the general contractor.

#### 1.09 NOISE CONTROL

- A. Develop and maintain a noise-abatement program and enforce strict discipline over all personnel to keep noise to a minimum. The work environment of the school must not be disrupted and noisy activities must be kept to an absolute minimum.
- B. Execute construction work by methods and by use of equipment which will reduce excess noise.
  - 1. Equip air compressors with silencers, and power equipment with mufflers.
  - 2. Manage vehicular traffic and scheduling to reduce noise.

#### 1.10 CLEANING AND PROTECTION DURING CONSTRUCTION

- A. Unless otherwise specified under the various trade sections of the specifications, the general contractor shall perform daily clean-up operations during construction as herein specified. Location of any dumpsters, storage trailers, or equipment left overnight shall be closely coordinated with and approved by the school.
- B. Control accumulation of waste materials and rubbish; periodically dispose of off-site. The general contractor shall bear all costs, including fees resulting from such disposal.
- C. Maintain project in accordance with all local, Commonwealth of Massachusetts and Federal Regulatory Requirements.
- D. Store volatile wastes in covered metal containers and remove from premises.
- E. Prevent accumulation of wastes which create hazardous conditions.
- F. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
  - 1. Do not burn or bury rubbish and waste materials on site.
  - 2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
- G. All areas of the grounds, walks, bushes, etc., shall be restored to their original condition prior to construction and any damage caused by workmen, staging, chemicals, etc., shall be repaired by contractor at no cost to the City.

#### 1.11 TOILET FACILITIES

- A. The contractor shall, at his/her own expense, provide the necessary toilet facilities for the workers in a location approved by the Owner. Separate facilities shall be provided for male and female employees. These facilities shall be open to the use of the Clerk of the Works, other contractors and their employees. The toilet shall be removed upon completion of the work, and the premises left clean and odorless. All temporary toilet facilities shall comply with the requirements of the Commonwealth of Massachusetts, county and town. The toilet facilities in the existing facilities shall **not** be used by the contractor or his/her sub-contractors.

#### 1.12 TEMPORARY SITE OFFICE

- A. Temporary Site Office  
The Contractor shall erect temporary offices at the site of the work for its own use and the Owner's

use, in a location approved by the Owner, adequately furnished and maintained in a clean, orderly condition by the Contractor, provided that the cost of relocating the trailers or temporary offices during construction shall be borne by the Contractor if the need so arises. The temporary offices shall meet the following requirements:

1. For the Contractor's field office at which it or its authorized representative.  
For the Owner, either a separate building or separate quarters with a thermostatically controlled heater, with full height partitions in close proximity to the Contractor's office. For Owner, not less than 280 square feet in area, separate office, conference meeting area, weather tight, well heated, well lighted by windows and electric lights, with screened door and windows with secure locking devices, separate toilet, and equipped with the following furniture and equipment in good condition: desk, 1 desk chair, 12 folding chairs and folding 12 ft meeting table
2. Telephone, Heat, Internet, Utilities  
The Contractor shall provide, maintain, and pay for separate individual telephone service to the Contractor's field office and to the Owner's field office, including a separately dedicated data / cable / internet lines (2). Unless specifically noted otherwise, the Contractor shall be responsible for providing and paying for all temporary heat and utility costs associated with the Project until use and occupancy is realized, at which time the Contractor and the Owner shall determine a fair and appropriate allocation for heat and utility costs incurred after Owner has undertaken use and occupancy.

#### 1.13 USE OF SITE

- A. New construction and alterations work shall be scheduled and performed in a manner that will provide a minimum of interference with the operation of the school which will be occupied during the construction and renovation work. Heat, light, ventilation, power, vehicle access and legal egress shall be maintained in the building at all times. The contractor shall provide the Owner with a schedule outlining all roof areas where work will be performed at the commencement of contract for coordination of Owner activities. The Owner must agree to the schedule prior to commencement of work. No work shall be performed in Owner activity areas without prior approval from Owner.
- B. The contractor shall consult with the Architect and Owner and ascertain when drilling, jack hammering, and like noisy operations may be performed.
- C. In scheduling the work there are certain spaces where no work will be permitted to be performed while space is occupied. Where it is necessary to install plumbing, heating, ventilating, air condition and electrical work in these spaces in order to complete the work, the contractor will be advised by the architect when these spaces are unoccupied and such work can be performed. If necessary to maintain the schedules and specified completion dates, the contractor shall perform portions of the work during a 3:00 p.m. to 11:00 p.m. shift without additional cost to the Town. The contractor shall remove all materials, tools and debris and broom clean these spaces at the end of each work day.
- D. The owner may exercise the option to permit minor alterations to be performed in occupied spaces during periods when they are in use. The spaces shall be left broom clean at the end of each work period. Failure to maintain these occupied spaces in a clean condition will cause discontinuance of remodeling work in occupied spaces until such time as they can be vacated.
- E. Use only those areas so designated by the School Department for construction and personnel parking, storage needs, etc.
- F. Arrange and maintain materials in orderly manner with use of walks, drives, roads, and entrances unencumbered.
- G. Before starting work, a 6 foot chain link fence with fabric shall be erected completely around the

construction area. The fencing shall be moved or relocated from time to time as the work progresses in order to safeguard the public from the hazards of the construction area.

END OF SECTION

SECTION 01 52 40

DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous demolition and construction waste.
  - 2. Recycling nonhazardous demolition and construction waste.
  - 3. Disposing of nonhazardous demolition and construction waste.
  - 4. Legal Removal and Disposal of Fluorescent Lamp and light Ballasts
- B. Related Sections include the following:
  - 1. Division 1 Section "Selective Demolition" for disposition of waste resulting from partial demolition of acoustical ceiling, GWB / masonry, walls, ceilings and construction materials.

1.3 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.4 PERFORMANCE REQUIREMENTS

- A. **General: Develop waste management plan that results in End-of-Project rates for salvage/recycling of 75 percent by weight of total waste generated by the Work.**
- B. Salvage/Recycle Requirements: Owner's goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:
1. Demolition Waste:
    - a. Brick (if required to be removed)
    - b. Concrete masonry units (if required to be removed)
    - c. Wood nailers, grounds and blocking
    - d. Plywood and oriented strand board
    - e. Wood trim.
    - f. Structural and miscellaneous steel.
    - g. Insulation.
  2. Construction Waste:
    - a. Lumber
    - b. Wood trim
    - c. Metals
    - d. Insulation
    - e. Electrical conduit and wire
    - f. Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:
      - 1) Paper
      - 2) Cardboard
      - 3) Boxes
      - 4) Plastic sheet and film
      - 5) Polystyrene packaging
      - 6) Wood crates
      - 7) Plastic pails

#### 1.5 SUBMITTALS

- A. Waste Management Plan: Submit 3 copies of plan within 7 days of date established for Notice to Proceed.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include separate reports for demolition and construction waste. Include the following information:
1. Material category
  2. Generation point of waste
  3. Total quantity of waste in tons
  4. Quantity of waste salvaged, both estimated and actual in tons
  5. Quantity of waste recycled, both estimated and actual in tons
  6. Total quantity of waste recovered (salvaged plus recycled) in tons
  7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste

- C. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

#### 1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction, including but not limited to, Massachusetts solid waste regulations contained in 310 CMR 16.00 and 310 CMR 19.000.

#### 1.7 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by Owner Project Manager. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
  1. Comply with Division 1 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.
- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  1. Distribute waste management plan to everyone concerned within three days of submittal return.
  2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
  2. Comply with Division 1 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
  1. Clean salvaged items.
  2. Pack or crate items after cleaning. Identify contents of containers.
  3. Store items in a secure area until installation.
  4. Protect items from damage during transport and storage.
  5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.



- B. Salvaged Items for Owner's Use:
  - 1. Clean salvaged items.
  - 2. Pack or crate items after cleaning. Identify contents of containers.
  - 3. Store items in a secure area until delivery to Owner.
  - 4. Transport items to Owner's storage area as designated by Owner.
  - 5. Protect items from damage during transport and storage.
  
- C. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

### 3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
  
- B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include, but are not limited to, the following:
  - 1. A listing of other available recycling receivers and processors are provided in the Massachusetts Recycling Directory, Available from the Massachusetts State Bookstore located in the State Capitol Building, for recycling operations within the Commonwealth of Massachusetts or, <http://www.mass.gov/dep/recycle/solid/swfacil.htm>
  
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
  - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
    - a. Inspect containers and bins for contamination and remove contaminated materials if found.
  - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  - 4. Store components off the ground and protect from the weather.
  - 5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

### 3.4 RECYCLING DEMOLITION WASTE

- A. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
  
- B. Metals: Separate metals by type.
  - 1. Structural Steel: Stack members according to size, type of member, and length.
  - 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

- C. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.
- D. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.
- E. Roof Fixtures and Drains: Separate by type and size.
- F. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

### 3.5 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  - 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  - 2. Polystyrene Packaging: Separate and bag materials.
  - 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  - 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  - 2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

### 3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials.
- C. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 60 00

MATERIALS AND EQUIPMENT

1.01 GENERAL CONDITIONS

- A. The Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 PRODUCTS

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.03 MANUFACTURING INSTRUCTIONS

- A. When work is specified to comply with the manufacturer's instructions, submit copies as specified in Section 01 33 00 Submittals, and distribute copies to persons involved, and maintain one set in field office.
- B. Perform work in accordance with details of instructions and specified requirements.

1.04 TRANSPORTATION AND HANDLING

- A. Refer to Contract and General Conditions and Specifications sections for requirements pertaining to transportation and handling of materials and equipment.
- B. Transport products by method to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry.
- C. Provide equipment and personnel to handle products by methods to prevent soiling or damage.
- D. Promptly inspect shipments to assure that products comply with requirements, that quantities are correct, and products are undamaged.

1.05 STORAGE AND PROTECTION

- A. Refer to Contract and General Conditions and Specification section for requirement pertaining to transportation and storage and protection of materials and equipment.
- B. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather tight enclosures; maintain within temperature and humidity ranges required by manufacturers instructions.
- C. **For exterior storage of fabricated products, windows, store front assemblies, doors assemblies adhesives and glues, interior finishes and materials shall be stored in watertight enclosed metal**

**container free of weather conditions. No outside tarped storage will be allowed.**

- D. Arrange storage to provide access for inspection. Periodically inspect to assure that products are undamaged, and are maintained under required conditions.
- E. No extended storage of materials will be permitted on site. Delivery of materials shall be scheduled in a manner that will limit "on site time" to 45 days or less before installation.

END OF SECTION

SECTION 01 60 01  
PRODUCT REQUIREMENTS

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Definition of Terms
- B. Basic product requirements.
- C. Product delivery and handling requirements.
- D. Product storage and protection requirements.

1.02 RELATED REQUIREMENTS

- A. Section 01 25 13 - PRODUCT SUBSTITUTION PROCEDURES:
  - 1. Product options.
  - 2. Product substitution procedures.

1.03 DEFINITION OF TERMS

- A. "Products" is defined as new material, machinery, components, equipment, fixtures, and systems used in the Work. Products do not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work.
- B. "Materials" are products that are shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
- C. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.
- D. "Fasteners" include all products required for mechanical connections and include, but are not limited to: nails, screws, bolts, expansion bolts, chemical bolts, epoxy anchors, pins, powder-actuated devices, and similar fasteners, anchors, and connections.
- E. Definitions in this article are not intended to negate the meaning of other terms used in Contract Documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

1.04 BASIC PRODUCT REQUIREMENTS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
- B. To the fullest extent possible, provide products of the same kind, from a single source.

- C. Provide interchangeable components of the same manufacturer, for similar components.
- D. When the Contractor has the option of selecting two or more products, ensure that products selected shall be compatible with products previously installed or approved.
- E. Provide all products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
- F. Galvanic Corrosion: Install materials in manner which will effectively isolate dissimilar metals which may potential for galvanic corrosion. Use non-absorptive dielectric material, isolation coatings, or other protective isolator approved by Architect.
- G. Fasteners, Anchors, and Connections: Provide all fasteners, anchors, and connections needed to safely, securely, and appropriately secure all Work permanently in place.
  - 1. General: The Contractor is solely responsible for the capacity, suitability, adequacy, and safety of all welded, fastened and anchored connections.
    - a. Comply with applicable code requirements regarding fastener selection and installation.
    - b. Provide at least two fasteners for each individual item being fastened.
    - c. Utilize fastener manufacturer's published load tables for working loads to assist in determining fastener size and space. Do not use ultimate load capacity in determining fastener selections.
    - d. Provide a minimum safety factor of 4.
    - e. Select and utilize fasteners having minimum galvanic corrosion factor.
    - f. Hydrogen embrittlement prevention:
      - 1) Do not use high-strength and low-alloy fasteners which have been subjected to an acid pre-treatment (because they can become brittle and fail), utilize instead equivalent capacity and size bi-metal, stainless steel or high strength aluminum fasteners, as appropriate to the conditions and materials where being used.
      - 2) Utilize low-hydrogen electrodes for welding high-strength steels to prevent hydrogen embrittlement.
  - 2. To permit the Contractor control over means and methods, some fastener conditions may not be fully defined in the Contract Documents. In particular, individual specification sections that require delegated independent engineering. In such instances the Contractor is fully responsible to determine method of fastening appropriate for each condition. The Contractor shall take into consideration substrate material(s) and product(s) being fastened, live and dead loading, and both atmospheric and visual exposure considerations. Contractor is responsible to determine fastener type, material, finish, size, diameter, length and spacing.
  - 3. Torque structural fasteners as recommended by fastener manufacturer, or as otherwise specified in the Contract Documents.
- H. Permanent Labels and Nameplates:

1. Restrictions:
  - a. Do not provide exposed-to-view labels, nameplates, or trademarks which are not required by code, or regulations.
  - b. Do not expose manufacturers, suppliers, or installer's name, logo, or trade names on normally visible surfaces.
  - c. Do not provide labels, nameplates or trademarks when individual specification sections specifically exclude them.
  - d. All exposed-to-view advertising and name-brand labels shall be fully removed without damage to substrate finish.
2. Location for required labels: Required labels, approval plates and stamps shall be located on a concealed surface, or where required for observation after installation on accessible non-conspicuous surface.
3. Data Plates: Provide permanent data plate on each item of service-connected or power-operated equipment.
  - a. Data Plate Information: Include manufacturer, model, serial number, date of manufacture, capacity, ratings, power requirements, and all other similar essential data.
  - b. Locate data plates on easily accessible surface that is inconspicuous in occupied spaces.

#### 1.05 PRODUCT DELIVERY AND HANDLING REQUIREMENTS

- A. Transport and handle products in accordance with manufacturer's instructions and as specified in individual specification sections.
- B. Schedule deliveries to avoid delays in installation of products, to minimize long-term storage, to prevent overcrowding of construction . Coordinate with installation to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- D. Provide equipment and personnel to handle and store products by methods to prevent soiling, disfigurement, or damage.

#### 1.06 PRODUCT STORAGE AND PROTECTION REQUIREMENTS

- A. Store and protect products in accordance with manufacturer's instructions and as specified in individual specification sections.
  1. Provide all necessary equipment and personnel to store products by methods to prevent soiling, disfigurement and damage.
  2. Store and protect products with seals and labels intact and legible.
- B. For exterior storage of fabricated products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
  2. Store sensitive products in weather-tight, climate controlled enclosures.
- D. Store loose granular materials on solid flat surfaces in a well-drained area; prevent mixing with foreign matter.
- E. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- F. Store heavy materials in locations and in a manner that will not damage or disfigure new construction.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section



SECTION 01 70 00

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. The Sections of these Specifications entitled "Special Conditions," "Minimum Wage Determination," and Division 1 "General Requirements" shall apply and are hereby made a part of this section of the Specifications.

1.02 FINAL CLEANING

- A. Unless otherwise specified under the various sections of the specifications, the general contractor shall perform final cleaning operations as herein specified prior to final inspection.
- B. Maintain project site free from accumulations of waste, debris, and rubbish, caused by operations. At completion of work, remove water, materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave project clean and ready for occupancy.
- C. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
- D. Use only those cleaning materials and methods that are recommended by the manufacturer or surface material to be cleaned.
- E. Broom clean exterior paved surfaces and rake clean other surfaces of the grounds.

1.03 RECORD DRAWINGS

- A. Record drawings shall consist of **all** the contract drawings.
- B. The general contractor and all subcontractors shall be required to maintain one set of record drawings, as the work relates to their sections of the specifications at the site.
- C. The record drawings shall be stored and maintained in the general contractor's field office apart from other documents used for construction. The record drawings shall be maintained in a clean, dry and legible condition and shall not be used for construction purposes.
- D. Record drawings, as submitted by the general contractor, shall be verified in the field by the Architect or his consultants. Verification by the Architect shall occur during the construction process and prior to the related work being completed and covered up.
- E. The record drawing shall be available at all time for inspection by the Architects. All deficiencies noted shall be promptly corrected.
- F. The following information shall be indicated on the record drawings:
  - 1. Record all changes, including change orders, in the location, size, number and type both horizontally and vertically of all elements of the project which deviate from those indicated on all the contract drawings.
  - 2. The tolerance for the actual location of utilities and appurtenances within the building to be marked

on the record drawings shall be plus or minus two (2) inches.

3. The location of all underground utilities and appurtenances referenced to permanent surface improvements, both horizontally and vertically at ten (10) feet intervals and at all changes of direction.
  4. The location of all internal utilities and appurtenances, concealed by finish materials, including but, not limited to valves, coils, dampers, vents cleanouts, strainers, pipes, junction boxes, turning vanes, variable and constant volume boxes, ducts, traps and maintenance devices. The location of these internal utilities, appurtenances and devices shall be shown by offsets to the column grid lines on the drawings.
  5. Each of the utilities and appurtenances shall be referenced by showing a tag number, area served and function on the record drawings.
- G. At the end of each month and before payment for materials installed, the general contractor, his subcontractors, and the Architect shall review record drawings for purpose of payment. IF THE CHANGES IN LOCATION OF ALL INSTALLED ELEMENTS ARE NOT SHOWN ON THE RECORD DRAWINGS AND VERIFIED IN THE FIELD, THEN THE MATERIAL SHALL NOT BE CONSIDERED AS INSTALLED AND PAYMENT WILL BE WITHHELD.
- H. At the completion of the contract, each subcontractor shall submit to the general contractor a complete set of his respective record drawings (including an electronic copy in PDF. File format) indicating all changes. After checking the above drawings, the general contractor shall certify in writing on the title sheet of the drawings that they are complete and correct and shall submit the record drawings to the Architect.
- I. The Architect shall review the drawings and shall verify by letter to the City of Newton that the work is accurate. The contractor shall arrange to have all changes incorporated on the original drawings. The contractor shall submit to the Architect, reproducible drawings on AUTOCAD disks and Adobe Acrobat files with two sets of prints to be used for the final inspection of the project. Inaccuracies in record drawings, as determined by the Architect, may be grounds for postponement of the final inspection until such inaccuracies are corrected.

#### 1.04 OPERATING AND MAINTENANCE REQUIREMENTS

- A. At least one month prior to the time of turning over this contract to the City for Use and Occupancy or Final Acceptance, the general contractor shall secure and deliver to the City via the Architect THREE complete, indexed files containing approved operating and maintenance manuals, shop drawings, and other data as follows:
1. Operating manuals and operating instructions for the various systems.
  2. Catalog data sheets for each item of mechanical or electrical or equipment actually installed including performance curves, rating data and parts list.
  3. Catalog sheets, maintenance manuals, and approved shop drawings of all mechanical or electrical equipment controls and fixtures with all details clearly indicated, including size of lamps.
  4. Names, address and telephone numbers of repair and service companies or each of the major systems installed under this contract.
- B. Non-availability of operating and maintenance manuals of inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the School Department until such time as the discrepancy has been corrected.

## 1.05 CLOSEOUT REQUIREMENTS AND SUBMITTALS

### A. Final Inspection:

1. The general contractor shall submit written certification that:
  - a) Project has been inspected for compliance with contract documents and has satisfied the Building Department and local Fire Department.
  - b) Project has been inspected by the roof system manufacturer for compliance with contract documents and warranty. The manufacturer shall provide a roof inspection report verifying that all work has been completed to their satisfaction.
  - c) Project is completed, and ready for final inspection.
2. Building Department Use and Occupancy Permit:
  - a) Arrange for a final inspection and secure the signed Certificate of Inspection for Use and Occupancy from the Building Department.
3. Items to be provided but not limited to in the Close-Out Document Submission
  - a) Full complete schedule of material and documents(TABLE OF CONTENTS)
  - b) Record drawings (Two hard copy and one electronic copy).
  - c) Workmanship, material and labor warranties for all trades.
  - d) Manufacturer's warranties for all materials
  - e) O and M manuals for all materials and equipment.
  - f) Record copy of all approved submittals (3 record hard copies and one electronic copy).
  - g) Certified letter stating continuance of insurance for period of workmanship warranty.
  - h) Letter from Contractor that all punch lists have been completed per the contract documents.
  - i) Consent of Surety
  - j) Lien releases from all trades, distributors and contractors.
  - k) Manufacturer's field reports and punch lists warranty acceptance.
  - l) Commissioning agents closeout requirements and documents.
  - m) Final accounting of schedule of values and changes to the contract.
  - n) Statement of Wage Rate Compliance

## 1.06 GUARANTEES AND WARRANTIES

- A. Submit to the Architect all extended guarantees and warranties that have been specified in various, individual sections of the specifications. All workmanship, material and labor warranties shall be a **minimum of two years** from the accepted approved date of substantial completion for all work. Manufacturer warranties shall be described as specified with in each section of the specifications.

END OF SECTION

SECTION 01 73 00

EXECUTION

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Examination of existing conditions and acceptance of conditions.
- B. Project preparation.
- C. Surveying and field engineering.
- D. Execution of the Work.
- E. Cleaning.
- F. Building flush out.
- G. Protecting installed work.

1.2 RELATED SECTIONS

- A. Section 01 52 40 Demolition and Construction Waste Management: Special administrative and procedural requirements for the Project waste management and recycling activities

1.3 EXAMINATION OF AND ACCEPTANCE OF EXISTING CONDITIONS

- A. The General Contractor, its subcontractors and Sub Contractors shall inform themselves of existing conditions before submitting his bid, and shall be fully responsible for carrying out all work required to completely and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the General Conditions.
- B. Prior to commencement of selective demolition work, inspect areas in which work will be performed. Photograph existing damage to structure surfaces, equipment, or to surrounding properties which could be misconstrued as damage resulting from selective demolition work; file with Architect prior to starting work.

1.4 SURVEYING AND FIELD ENGINEERING

- A. Employ a Land Surveyor or Professional Engineer registered in the Commonwealth of Massachusetts and acceptable to the Architect.
  - 1. Submit evidence of Surveyor's Errors and Omissions (E&O) Insurance coverage in the form of an Insurance Certificate.
- B. Submittals.

1. Submit name, address, and telephone number of at least three proposed Land Surveyors and obtain Architect's acceptance before starting survey work.
  2. On request, submit documentation verifying accuracy of survey work.
  3. Submit a copy of registered site drawing and certificate signed by the Land Surveyor, that the elevations and locations of the Work are in conformance with the Contract Documents.
- C. Examination.
1. Verify locations of survey control points prior to starting work.
  2. Promptly notify Architect/Engineer of any discrepancies discovered.
- D. Survey Reference Points.
1. Construction Manager shall locate and protect survey control and reference points.
  2. Control datum for survey is that indicated on Drawings.
  3. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
  4. Promptly report to Architect/Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
  5. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to the Architect.
- E. Survey Requirements.
1. Provide field engineering services. Utilize recognized engineering survey practices.
  2. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer and water service piping.
    - a. The existence and location of underground utilities and construction indicated on Drawings as existing are not guaranteed. Before beginning sitework, verify the existence and location of underground utilities and other construction.
  3. Establish a minimum of 2 permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on Project Record Documents.
  4. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
    - a. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
    - b. Grid or axis for structures.
    - c. Building foundation, column locations, and ground floor elevations.
  5. Periodically verify layouts by same means.

- F. Project Record Documents.
  - 1. As-built survey, progress submissions: Surveyor shall develop an as-built survey for the work-in-place. Copies of survey shall be submitted along with request for payments for foundation work, site utilities and paving work.
  - 2. Surveyor's log: Maintain a complete and accurate surveyor's log of control and other surveys, for review by Owner and authorities having jurisdiction. Make this log available for reference.
  - 3. Submit Final Property Survey and log under the provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.

#### 1.5 PROTECTION OF ADJACENT ELEMENTS

- A. Protect installed Work and provide special protection where called for in individual specification Sections.
- B. Protect existing facilities and adjacent properties from damage from construction and demolition operations. Provide temporary and removable protection for installed products and occupied areas.
- C. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials. Coordinate with requirements under individual specification sections.
- D. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- E. Protect all existing landscape areas not indicated to be cleared. Do not deface, injure, or destroy trees or other plant life. Do not remove or cut trees or other plant life, without authorization from the Owner. Do not attach any anchorages, ropes, cables or guys to any trees scheduled to remain.
  - 1. Prohibit traffic from landscaped areas.
- F. Protect non-owned vehicles, stored materials, site and structures from damage.
- G. Refer to respective Sections for other particular protection requirements.

#### 1.6 PROTECTION OF INTERIOR CONCRETE SLABS

- A. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential for areas scheduled to receive concrete stains and sealers, specified under Division 3.
  - 1. All hydraulic powered equipment must be diapered to avoid staining of in- place concrete.
  - 2. No trade shall park vehicles on the inside slab. If necessary, to complete their scope of work, drop cloths shall be placed under vehicles at all times.

3. No pipe cutting machine shall be used on the inside floor slabs.
4. Steel shall not be placed on interior slabs to avoid rust staining.

1.7 EXECUTION REQUIREMENTS FOR INSTALLATION, APPLICATION AND ERECTION

- A. Inspection of conditions: The Installer of each component shall inspect the substrate and conditions under which Work is performed. Do not proceed until unsatisfactory conditions have been corrected.
- B. Resource Efficiency of Materials:
  1. Use construction practices such as material reduction and dimensional planning that maximize efficient use of resources and materials.
    - a. Recheck measurements and dimensions, before starting installation.
  2. Provide materials that utilize recycled content to maximum degree possible without being detrimental to product performance or indoor air quality.
  3. Where possible and feasible, provide for non-destructive removal and re-use of materials after their service life in this building.
- C. Manufacturer's instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that they are more stringent than requirements in Contract Documents.
- D. Inspect material immediately upon delivery and again prior to installation. Reject damaged and defective items.
- E. Install each component during weather conditions and project status that will ensure the best results. Isolate each part from incompatible material as necessary to prevent deterioration.
- F. Coordinate temporary enclosures with inspections and tests, to minimize uncovering completed construction for that purpose.
- G. Limiting exposures: Supervise operations to ensure that no part of construction, completed or in progress, is subject to harmful or deleterious exposure. Such exposures include:
  1. Excessive static or dynamic loading.
  2. Excessive internal or external pressures.
  3. Excessive weathering.
  4. Excessively high or low temperatures or humidity.
  5. Air contamination or pollution.
  6. Water or ice.
  7. Chemicals or solvents.
  8. Heavy traffic, soiling, staining and corrosion.
  9. Rodent and insect infestation.

10. Unusual wear or other misuse.
  11. Contact between incompatible materials.
  12. Theft or vandalism.
- H. Provide attachment and connection devices and methods necessary for securing each construction element. Secure each construction element true to line and level. Allow for expansion and building movement.
- I. Visual effects: Provide uniform joint widths in exposed Work. Arrange joints to obtain the best effect. Refer questionable choices to the Architect for decision.
- J. Mounting heights: Where mounting heights are not indicated, review heights with Architect, prior to commencement of Work.
- K. Cleaning and protection: During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- L. Clean and maintain completed construction as often as necessary through the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

#### 1.8 PROGRESS CLEANING AND DISPOSAL OF WASTE MATERIALS

- A. General: Maintain site in a clean and orderly condition. Maintain work and surrounding areas free of waste materials, debris, and rubbish; remove from site on a on-going basis through-out the term of construction.
1. Adjacent Areas: Keep adjacent areas, neighboring properties, public ways, and all nearby areas clean and free of construction debris and dirt including windblown debris.
  2. Trade Contractors are responsible for cleanup and removal of their own rubbish, debris, shipping materials and waste materials through-out the term of their work.
- B. Control accumulation of waste materials and rubbish; periodically dispose of off- site. The Construction Manager shall bear all costs, including fees resulting from such disposal.
- C. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.
- D. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.
- E. Store volatile wastes in covered metal containers, and remove from premises daily.
- F. Prevent accumulation of wastes which create hazardous conditions.
- G. Provide adequate ventilation during use of volatile or noxious substances.

#### EXECUTION



1. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
  2. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- H. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
- I. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.
- J. Execute cleaning to ensure that the buildings, the sites, and adjacent properties are maintained free from accumulations of waste materials and rubbish and windblown debris, resulting from construction operations.
- K. Construction Manager shall provide on-site containers (dumpsters) for collection and containment of, waste materials, debris and rubbish.
1. Trash Barrels and Containers: Use containers with tightly fitting lids. Use only steel containers and lids when there is any evidence of rodent or pest activity.
  2. Returnables: Provide special, labeled containers for deposit returnables such as soda cans.
- L. Remove waste materials, debris, and rubbish from site at least once weekly, and dispose off-site. Comply with NFPA 241 for removal of combustible waste.
- M. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.
- N. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

#### 1.9 SITE MAINTENANCE AND CLEANING

- A. Maintain traffic and parking areas in a sound condition, free of excavated material, construction equipment, products, mud, snow, and ice.
1. Provide means of removing mud from vehicle wheels before entering public streets and Owner's parking areas and access.
- B. Maintain existing and permanent paved areas used for construction.
1. If any street or private way shall be rendered unsafe by the Construction Managers operations, the Construction Manager shall make such repairs or provide such temporary ways or guards as shall be acceptable to the governing authority.
  2. Promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

#### 1.10 FINAL CLEANING

- A. Scheduling: Perform final cleaning immediately prior to the Architect's review of the project for issue of the Certificate of Substantial Completion.
  - 1. Re-clean all surfaces, materials and products of the Work immediately prior to Owner's occupancy of the Project.
    - a. Should the Owner occupy any portion of the Work prior to completion of the Contract, the responsibilities for interim and final cleaning shall be in accordance with the General Conditions.
- B. Qualifications: Commercial cleaning firm, with a minimum of 3 years experience specializing in the post-construction cleaning of facilities.
- C. Protection: During the operation of final cleaning, protect surrounding materials and finishes against undue damage by the exercise of reasonable care and precautions. Clean, or repair all products and surfaces which are soiled or otherwise damaged by Work of this Section, to match original profiles and finishes. Materials and finishes which cannot be cleaned or repaired shall be removed and replaced with new work in conformance with the Contract Documents.
- D. General cleaning requirements:
  - 1. Control accumulation of waste materials and trash. Recycle or dispose of off- site at intervals approved by the Owner and in compliance with waste management procedures specified in Section 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL.
  - 2. Remove from the job site all tools, surplus materials, equipment, scrap, debris, and waste.
  - 3. Remove all advertising matter and temporary instructional material from exposed surfaces throughout.
  - 4. Use only methods and cleaning materials which are compatible with and as recommended by the manufacturer of the material being cleaned.
  - 5. Finished surfaces: Remove paint smears, spots, marks, dirt, mud and dust and similar disfigurement created by the Work, from all exposed to view existing or new interior and exterior finished surfaces.
  - 6. Polished surfaces: Apply the polish recommended by the manufacturer of the material being polished.
  - 7. Cleaning Materials: Only non-hazardous cleaning materials shall be used in the final cleanup.
- E. Exterior building surfaces:
  - 1. Visually inspect exterior surfaces and remove all traces of soil, waste materials, smudges, and other foreign matter.
  - 2. Remove all traces of splashed materials from adjacent surfaces.
  - 3. If necessary to achieve a uniform degree of cleanliness, hose down the exterior of the structure.
  - 4. In the event of stubborn stains not removable with water, the Architect may require light sandblasting or other cleaning at no additional cost to

the Owner.

5. Concrete: Clean exposed concrete free of all foreign matter. If, in the opinion of the Architect, further cleaning of specific areas is required, they shall be scrubbed with water or other cleaning agents. Acid cleaners shall not be used, except as may otherwise specifically permitted in the trade sections.
- F. Bright metal: Clean metal surfaces, hardware, fixtures, appliances, equipment, and similar items free of all foreign matter. As required, lightly scrub specific stains with clean water, mild soap, and soft rags, thoroughly rinsed and wiped with clean, soft white rags. Do not use abrasive cleaners.
- G. Glass: Replace broken, chipped and defective glass. Remove from glass: stains, spots, marks, paint smears; dirt and foreign materials. Clean and polish both surfaces of all interior and exterior glass. Clean and polish mirrors.
- H. Hardware: Clean and polish finished hardware, remove marks, stains, scratches and blemishes.
- I. Tile: Clean and polish floor and wall tile, remove grout film and excess grout.
- J. Woodwork: Dust and clean architectural woodwork and finish woodwork items, remove all stains, spots, and foreign matter using methods and cleaning agents which will not harm the various finishes.
- K. Site: Sweep exterior paved surfaces broom clean; rake clean unpaved surfaces.
- L. Equipment: Thoroughly clean all items of mechanical and electrical equipment; remove excess oils and grease from exposed surfaces.
  1. Clean permanent filters and replace disposable filters if ventilating units were operated during construction.
  2. Clean ducts, blowers and coils, if units were operated without filters during construction.

#### 1.11 PROTECTING INSTALLED WORK

- A. Floor and Finished Surfaces Protection: After installation, provide coverings to protect products from damage due to traffic and construction operations. Replace protective coverings which may become wet, torn, or ineffective. Remove coverings when no longer needed.
  1. Save plastic covering. At completion of Project, reuse if practical; if not, then recycle if local market exists.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

END OF SECTION

EXECUTION  
01 73 00 - 8

SECTION 01 73 29  
CUTTING AND PATCHING

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Examination of as built conditions and acceptance of conditions.
- B. Administrative and procedural requirements for cutting and patching, including attendant excavation and backfill as required to complete the Work. General Contractor is responsible for coordinating all cutting and patching work, including but not limited to:
  - 1. Cutting, altering, patching, and fitting of the Work as necessary for the proper completion of the Work. Fully integrated with all construction, all cutting, alterations and patching, to present the visual appearance of an entire, completed, and unified project.
    - a. Make all products and their components of the work fit together properly.
  - 2. Coordinate all openings in elements of the Work, and the patching of same, for penetrations required by all trades, including but not limited to mechanical, plumbing, fire protection and electrical work.
    - a. Individual filed subcontractor trades are responsible for designated types of coring and drilling penetrations for piping, conduit, ducts and other penetrations as defined in this Section.
    - b. Dimensional responsibilities:
      - 1) Mechanical, electrical, plumbing and fire protection cutting, coring, patching and sleeving of all openings up to and including 16 inches in diameter in both directions, horizontal and vertical, in walls, constructed of both masonry and gypsum drywall. In floors, the individual filed subcontractor trades are responsible for coring and sleeving up to and including 16 inches in diameter. The filed subcontractor's failure to properly coordinate coring of openings larger than those indicated herein during the construction of any wall or partition will result in the filed subcontractor trades assuming responsibility for the cost of cutting, sleeving and patching of openings provided by the General Contractor.
      - 2) The General Contractor is responsible for all coring that exceeds the dimensions indicated above except for uncoordinated or ill-timed work as indicated above.
  - 3. Uncover work to provide for installing, inspecting, or both, of ill-timed work;
  - 4. Remove and replace work not conforming to requirements of the Contract Documents or as otherwise determined to be defective.
  - 5. Patch and match all surfaces and products disturbed or damaged by the Work.
  - 6. Remove samples of installed work as specified for testing.
  - 7. Infill floor openings where MEP & FP has been abandoned from openings.

CUTTING AND PATCHING

## 1.2 RELATED REQUIREMENTS

- A. Individual product specification Sections:
1. Cutting and patching of not-exposed-to-view materials incidental to work of the Section.
  2. Core drilling of interior building components, incidental to work of individual Sections and as defined herein.
  3. Cutting and patching work of particular exposed-to-view finish work, performed by trades as specified herein.

## 1.3 SUBMITTALS

- A. Submit written proposals to perform cutting and patching under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES. Describe cutting and patching procedures in advance of the time cutting and patching.
1. Submit a written request when cutting work affects the following:
    - a. Structural integrity of any element in the project.
    - b. Integrity of weather-exposed or moisture-resistant elements.
    - c. Integrity of any fire suppression, fire alarm, or life safety system.
    - d. Interruption or disturbance of utilities service. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
    - e. Efficiency, maintenance, or safety of operational elements and systems.
    - f. Aesthetic and visual qualities of exposed-to-view elements.
    - g. Efficiency, operational life, maintenance, or safety of operational elements.
    - h. Work of Owner or work performed under separate Contract.
  2. Include in the request:
    - a. Identification of project.
    - b. Location and description of affected work.
    - c. Necessity for cutting or alteration.
    - d. Alternatives to cutting and patching.
    - e. Scope of proposed cutting, patching, alteration or excavation.
    - f. List of tradespeople who will execute the work.
    - g. Description of products to be used.
    - h. Extent of refinishing and cleaning to be performed.
    - i. Effect on work by Owner or work performed under separate Contract, and written permission of affected party.
    - j. Date and time cutting and patching is scheduled to be executed.
    - k. Cost proposal, when applicable.
    - l. Written permission of separate Construction Manager(s) whose work will be affected.

3. Review by the Architect does not waive the Architect's right to later require complete removal and replacement of Work found to be unsatisfactory.
4. Should conditions of Work or the schedule indicate a change of products from original installation, General Contractor shall submit a request for substitution in accordance with Section 01 33 00 Submittals

#### 1.4 QUALITY ASSURANCE

- A. Only tradespersons skilled and experienced in cutting and patching shall perform such Work.
- B. In performing Work which requires cutting, fixing, or patching, Construction Manager shall oversee and ensure filed subcontractor trade (s) and subcontractors utilize best efforts to protect and preserve the visual appearance and aesthetics of the Project to the reasonable satisfaction of both Owner and Architect.

#### 1.5 PERFORMANCE REQUIREMENTS

- A. General performance requirements: Execute work by methods to avoid damage to other Work, and which shall provide appropriate surfaces to receive patching and finishing.
- B. Structural elements: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load deflection ratio. Always obtain written approval of the cutting and patching proposal before cutting and patching structural elements.
  1. Do not drill through structural beams, slabs or columns. Core drilling through concrete block walls and stair platforms must be approved by the Architect.
  2. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
- C. Exposed elements:
  1. Employ original installer of new construction to perform cutting and patching for weather exposed and moisture resistant elements, and sight exposed surfaces.
- D. Penetrating elements: Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated materials in accordance to applicable codes and regulations, and compatible to surrounding construction.
- E. Visual requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

1. General: Restore work with new products in accordance with the requirements of the Contract Documents.
  2. Engage a firm recognized and experienced in firestopping for patching of existing firestopping, smoke seals and firesafing in compliance with applicable codes and as additionally required by authorities having jurisdiction. Comply with requirements of Section 07 84 00 - FIRESTOPPING.
- F. Operational and safety limitations: Do not cut and patch operating elements or safety components in a manner that would reduce their capacity to perform as intended, or would increase maintenance, or decrease operational life or safety.
1. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
    - a. Primary operational systems and equipment.
    - b. Fire resistance rated barriers and smoke
    - c. barriers. Water, moisture, or vapor barriers.
    - d. Membranes and flashings.
    - e. Fire protection systems.
    - f. Noise and vibration control elements and
    - g. Control systems.
    - h. Communication systems.
    - i. Conveying systems.
    - j. Electrical wiring systems.
- 1.6 WARRANTY
- A. Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void existing applicable warranties.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Patching Materials: Use patching materials identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible. Use materials whose installed performance shall equal or surpass that of the existing materials. Comply with specifications and standards for each specific product involved.
  1. All materials used shall be approved by the Architect for consistency with the existing surfaces.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Examination: Inspect existing conditions prior to commencing Work, including

elements subject to damage or movement during cutting and patching. After uncovering existing work, inspect conditions affecting performance of work. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

B. Layout of cutting and patching in masonry construction. After Construction Manager identifies areas requiring cutting and patching work. Masonry Trade Contractor shall indicate on walls the extent of masonry cutting work which shall be performed by the General Contractor. Necessary patching of openings shall be performed by the Masonry Trade Contractor.

### 3.2 PREPARATION

#### A. Protection:

1. Provide temporary supports to ensure structural integrity of the Work.
2. Protect existing construction during cutting and patching to prevent damage.
3. Provide protection from adverse weather conditions.
4. Provide protection from elements for areas which may be exposed by uncovering work.

### 3.3 GENERAL CUTTING AND PATCHING

- A. Performance: Execute work by methods to avoid damage to other Work, and which shall provide appropriate surfaces to receive repairs, patching, and finishing.
- B. Execute cutting, fitting, and patching, including excavation and fill, to complete the work.
1. Cut rigid materials using masonry saw or core drill. Pneumatic tools are not permitted without prior approval, from Architect
  2. Fit products together, to integrate with other work.
  3. Uncover work to install ill-timed work.
  4. Remove and replace defective or non-conforming work.
  5. Remove samples of installed work for testing, when requested.
  6. Provide openings in the work for penetration of mechanical and electrical work.
- C. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.
1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
  3. Cut through concrete and masonry using a cutting machine, such



as a Carborundum saw or a diamond-core drill.

4. Comply with requirements of applicable Division 31 - EARTHWORK Sections where cutting and patching requires excavating and backfilling.

### 3.4 FINISHING OF PATCHED AREAS:

- A. General: Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break; for assemblies, refinish entire unit.
  1. Patching: Patch with durable seams that are as invisible as possible, showing no evidence of patching and refinishing. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction. Comply with specified tolerances.
    - a. At penetrations of fire rated walls, partitions, ceiling or floor construction, completely seal voids with fire rated materials in accordance to applicable codes and regulations, and compatible to surrounding construction.
    - b. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces. Provide vapor and air seal when penetrating existing vapor and air seals.
    - c. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
  2. Where removing walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    - a. Where patching occurs in a painted surface, extend final paint coat over entire unbroken surface containing the patch after the area has received primer and second coat. Extend re-painting to entire surface plane up to where plane changes direction.
  3. Patch, repair, or rehang existing ceilings as necessary to provide an even- plane surface of uniform appearance.

### 3.5 CORING AND DRILLING

- A. Coring and Drilling of holes incidental to work of individual sections shall be performed by the trade requiring the penetration, except as follows:
  1. Coring and Drilling of holes greater than 16 inches in diameter in concrete decks and slabs.
  2. The General Contractor is responsible for coordinating core drilling in wall and roof surfaces leading to, or from, the outside of the Building.
  3. The General Contractor is responsible for coordination of all coring and drilling and resultant patches necessary for the completion of this Contract and for the quality and appearance of all patch Work in exposed-to-view finished materials.

3.6 CLEANING

- A. Cleaning patched areas: Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove paint, mortar, oils, putty and similar items.

END OF SECTION

Section 01 77 00  
CLOSEOUT PROCEDURES

1.1 SUMMARY

- A. Closeout of incomplete work (punch list) requirements.
- B. Closeout procedures.
- C. Conferences occurring after Substantial Completion.

1.2 RELATED REQUIREMENTS

- A. Section 01 78 00 - CLOSEOUT SUBMITTALS: Requirements for project record documents.

1.3 PUNCH LIST REQUIREMENTS AND PROCEDURES

- A. Definitions:
  - 1. General Contractor's Punch List: Complete list of incomplete and incorrect Work prepared by the General Contractor prior to request of Architect's inspection for Certification of Substantial Completion. As a minimum the List shall include the following information for each work item:
    - a. Clear identification of each incomplete work item, including all subcontractor's work.
    - b. Estimated value of each incomplete work item.
    - c. A short statement of why work is not complete.
    - d. Identify subcontract responsibility, as appropriate to each item.
  - 2. Architect's Punch List: A list of incomplete and incorrect Work prepared by the Architect, which modifies the General Contractor's Punch List, following review and acceptance of the General Contractor's Punch List.
- B. Pre-Closeout requirements: Prior to requesting initial Architect's inspection for Certification of Substantial Completion, submit to the Architect a full and complete list of all incomplete work items (General Contractor's Punch List).
- C. Punch list procedures at Substantial Completion:
  - 1. Architect will review submitted General Contractor's Punch List and determine whether it is suitable to proceed with the Substantial Completion Process.
    - a. If the Architect determines that the amount of completed work is insufficient to be considered for Substantial Completion, the Architect will not proceed with the Punch lists process until sufficient completion of the Project is achieved.
    - b. The Architect will review the General Contractor's Punch List and if the Architect determines that it does not reflect proper identification of the incomplete and incorrect work, he/she will request revision and resubmission of the General Contractor's Punch List.
    - c. If the Architect determines that the amount of work indicated on the General Contractor's Punch List is excessive, the Architect will suspend its review until the scope of Work identified in the General Contractor's Punch is reduced to a level satisfactory to the Architect.

- d. When the Architect reviews and accepts the General Contractor's Punch List as being an accurate reflection of incomplete and incorrect work; the Architect will prepare and issue to the General Contractor the "Architect's Punch List".
    - 1) The Architect's Punch List will be based on the General Contractor's Punch List with modifications and additions as may be required.
    - 2) The Architect's Punch List includes Work which must be completed and corrected prior to Final Completion.
  - 2. Upon receipt of the Architect's Punch List, the General Contractor shall immediately distribute the list to all subcontractors.
- D. Completion of Punch List Work: Make reasonable efforts to ensure that all "Architect's Punch List" items are completed or corrected within 14 calendar days from the date of the Architect's Punch List" or within the Contract Time, whichever is earlier.
- E. Architect's Final Inspection and review of Punch List Work:
- 1. After General Contractor certification that all punch list Work has been properly completed the Architect will then perform the Final Inspection.
    - a. Incomplete Items: If the Architect discovers any incomplete or incorrect "Architect's Punch List" items or any other deficiency in the work, the Architect will prepare a "Revised Punch List" which may also include other incomplete Contract requirements such as record documents, owner's operation and maintenance manuals, warranties, and other Contract requirements. Architect's site reviews of the Work for this "Revised Punch List" and any subsequent revised Punch Lists shall be performed as additional service to Owner, back-charged to the General Contractor.
    - b. The Architect may assign a dollar value for each item of incomplete or incorrect work remaining.

#### 1.4 CLOSEOUT PROCEDURES - SUBSTANTIAL COMPLETION

- A. Prior to requesting inspection for certification of Substantial Completion, complete the following:
- 1. On Application for Payment, show 100 percent completion for portions of work claimed as substantially complete.
    - a. Submit list of incomplete items (Punch List), value of incomplete work, and reasons work is not complete.
  - 2. Obtain evidence of compliance with requirements of governmental agencies having jurisdiction including, but not necessarily limited to:
    - a. Certificate of Final Inspections, "signed off" by authorities having jurisdiction.
  - 3. Remove temporary facilities and services that are no longer required.
  - 4. Complete Final Cleaning, including repair and restoration, or replacement of damaged Work.
  - 5. Remove surplus materials, rubbish and similar elements.
  - 6. Application for reduction of retainage.
  - 7. Consent of Surety.
  - 8. Advise the Owner of the change-over in security provisions.
  - 9. Notification of shifting insurance coverage.
  - 10. Final progress photographs.

- B. Within 2 weeks after receipt of the notice of Substantial Completion from the General Contractor, the Architect will inspect to determine status of completion.
  - 1. Should the Architect determine that the Work is not substantially complete:
    - a. The Architect will notify the General Contractor in writing, stating the reasons therefore.
    - b. The General Contractor shall remedy the deficiencies and send a second written notice of Substantial Completion to the Architect, requesting re-inspection.
- C. When the Architect concurs that the Work is substantially complete:
  - 1. The Architect will prepare AIA Document G 704 - CERTIFICATE OF SUBSTANTIAL COMPLETION, in accordance with the requirements of the GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS, accompanied by the General Contractor's list of items to be completed or corrected, as verified by the Architect.
  - 2. The Architect will submit the Certificate to the Owner, and to the General Contractor, for their written acceptance of the responsibilities assigned to them in the Certificate.

#### 1.5 CLOSEOUT PROCEDURES - FINAL ACCEPTANCE

- A. Prior to requesting inspection for certification of Final Acceptance and final payment, perform the following:
  - 1. Completion of incomplete Work. Submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for acceptance.
  - 2. Prove that all taxes, fees and similar legal obligations have been paid.
  - 3. Submit final payment requests with release of all liens, and supporting documentation.
  - 4. Provide written assurances that all unsettled claims are in the process of and will be resolved.
  - 5. Submit updated final statement, including accounting for final additional changes to the Contract Sum. Show additional Contract Sum, additions and deductions, previous Change Orders, total adjusted Contract Sum, previous payments and Contract Sum due.
  - 6. Submit consent of surety to Final Payment.
  - 7. Submit evidence of continuing insurance coverage complying with insurance requirements.
  - 8. Remove remaining temporary facilities and services.
  - 9. Deliver to Owner and obtain receipts for:
    - a. Pest Control Inspection Report.
  - 10. Submit Certification stating Work has been inspected for compliance with the Contract Documents.
  - 11. Submit Certification stating that Work is 100 percent complete and ready for final inspection.
- B. Within 2 weeks after receipt of the request for Final Acceptance from the General Contractor, the Architect will inspect to determine status of completion.
  - 1. Should the Architect determine that the Work is incomplete or defective:

- a. The Architect will notify the General Contractor in writing, stating the reasons listing the incomplete or defective work.
  - b. The General Contractor shall take immediate steps to remedy the deficiencies and send a second written notice of request for Final Acceptance to the Architect.
  - c. Costs relative to the Architects re-inspection due to failure of Work to comply with claims made by the General Contractor, will be compensated by the Owner, who will deduct the amount of such compensation from the Final Payment due to the General Contractor.
- C. After the Architect finds the Work acceptable, the Architect will review the Final Close-out submittals.
- D. Application for Final Payment: Submit Application for Final Payment in accordance with procedures and requirements of the General Conditions and Supplementary Conditions.
1. The Architect will prepare a Final Change Order, reflecting approved adjustments to the Contract Sum not previously made by other Change Orders.
- 1.6 CONFERENCES AFTER SUBSTANTIAL COMPLETION
- A. The Owner reserves the right to call for conferences commencing with the date of Substantial Completion and continuing for one year thereafter, for purposes of inspecting the Work and to plan correction of any deficiencies or failures discovered during this period.
1. Attendance is required by General Contractor's Project Manager, Architect, Owner's Project Manager and each applicator, installer, and supplier as the Owner may direct or the General Contractor may wish to have present. All representatives attending such meetings shall be the same persons, or shall have the same powers and authority, as those attending progress meetings occurring prior to the Date of Substantial Completion.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

Section 01 78 00  
CLOSEOUT SUBMITTALS

1.1 SECTION INCLUDES

- A. Project record documents.
- B. Record Project Manual.
- C. Project Record Drawings (As built drawings).
- D. Final Site Survey.
- E. Operation and maintenance data, preventive maintenance instructions.
- F. Materials and finishes manual.
- G. Product warranties and bonds.
- H. Maintenance contracts.
- I. Spare parts and maintenance materials.

1.2 RELATED SECTIONS

- A. Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION:
  - 1. Coordination Drawing Requirements.
  - 2. CAD File Requirements for base sheets to prepare Project Record Drawings (As built drawings).

1.3 PROJECT RECORD DOCUMENTS

- A. General: Record documents shall reflect actual "as-built" condition and the products installed. Include all changes and deviations from original Contract Documents, and incorporate information from:
  - 1. Original Contract Documents.
  - 2. Addenda.
  - 3. Change orders.
  - 4. Construction change directives.
  - 5. Field directives, and instructions from the Owner, Architect or regulatory authorities having jurisdiction.
- B. Project Record Documents include, but are not limited to:
  - 1. Record Project Manual.
  - 2. Project record drawings (as-builts).
  - 3. Final Site Survey.
  - 4. Operation and maintenance data, preventive maintenance instructions.
  - 5. Materials and finishes manual.
  - 6. Product warranties and bonds.

7. Maintenance contracts.
8. Record of all test reports and inspections.
9. Wall charts and data such as valve diagrams, electrical panel board directories, and similar information.
10. List of all attic stock, spare parts, maintenance and extra materials turned over to the Owner. List shall be organized and sorted by specification section, and have fields for product description and quantity. A separate list shall be provided for each school building and include items from the General Contractor, Filed Subcontractors and their respective sub-subcontractors.

C. Labeling and identification of Record Documents

1. Clearly label all record documents with name of Project and the words "Record Document".
2. Date progressive entries of information as appropriate.
3. Date Record Documents with the final submission date.

1.4 SUBMITTAL QUANTITY REQUIREMENTS

A. Furnish Architect with the following quantities of each submittal:

1. Record Project Manual: 4 bound copies.
2. Project record drawings (as built drawings):
  - a. 2 sets of Drawings in Autodesk Revit (version 2015) and Autocad MEP (version 2015) format.
  - b. 2 "blackline print" sets of Drawings.
3. Final Site Survey: 4 copies.
4. Operation and maintenance data, preventive maintenance instructions: 4 bound copies.
5. Owner Training Video for operation of building systems and major equipment.: 2 copies.
6. Materials and finishes manual: 2 bound copies.
7. Product warranties and bonds: 2 copies
8. Maintenance contracts: 2 copies
9. Record of all test reports and inspections: 4 copies.

1.5 RECORD PROJECT MANUAL

A. The General Contractor is responsible to maintain a Project Manual reflecting revisions and changes to the Original Issue Project Manual.

1. Clearly label the Record Project Manual as "Record Document Specifications, in a three ring binder.
2. Do not use Record Project Manual for construction purposes; protect from loss in a secure location.
3. Record all variations and deviations to the Contract Documents, including changes made by Addenda, Bulletin, Change Order, Change Directive and other modifications to the Contract.
  - a. Cut and paste revisions into their applicable specification section.



- b. Identify all changes with cross-reference to appropriate Addendum Number, Modification Number, Change Order Number.
  4. In each individual Specification Section, under "*Part 2 – Products*", identify all manufacturers and products which are actually used as part of the Work.
  5. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
- B. Record Project Manual: Provide prior to request for Final Acceptance.
1. Manuals shall be in 8-1/2 by 11 inch pages and bound in 3-ring (D-shape) binders with durable plastic covers. Internally subdivide the binder contents by Division with permanent page dividers.
  2. Label front cover and spine of each binder with laser printed titles, dates, and project information.
  3. All information from "in-progress" manual shall be clearly and completely transferred.
  4. Pages shall be undamaged.

## 1.6 PROJECT RECORD DRAWINGS

- A. The General Contractor is responsible to maintain a clean, undamaged set of prints of Contract Drawings and shop drawings for preparing the record drawings.
1. Where shop drawings are used, record a cross-reference at the corresponding location on the Contract Documents.
- B. Do not use Record Documents for construction purposes; protect from loss in a secure location. Mark-up these drawings to show clearly and completely the actual installation reflecting all changes made in the Work during construction.
1. Mark whichever drawing is most capable of showing conditions accurately.
  2. Record all variations and deviations to the Contract Documents, including changes made to schedules, details, and all architectural changes to structure, exterior enclosure, interior partitions and ceilings.
  3. Record new information that is important to the Owner, but was not shown on the Contract Drawings or shop drawings.
  4. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
- C. The Architect may periodically inspect these record drawings, and their proper maintenance may be a condition precedent to approval of applications for periodic payments.
- D. Deliver all Project Record Documents, shop drawings, product data, and samples to the Architect for the Owner's use, upon completion of the Work and prior to request for Final Acceptance of the Work.
- E. In addition at the completion of the work, the General Contractor shall be responsible for the preparation of neat, clean, and complete electronic file of record drawings in AutoCAD format, at no additional costs to the Owner. The Architect shall assist this process by providing the General Contractor with electronic AutoCAD files of all required drawings as they appeared when released as bid documents, and including revisions to reflect addenda, architect's supplemental instructions, and change orders processed by the Architect. The General Contractor will be responsible for making ANY OTHER revisions to

these drawings which are required to reflect the as-built construction conditions and any adjustments made during the completion and coordination of construction. This shall include but not be limited to adjustments which occur as a result of the fire protection, plumbing, mechanical, or electrical coordination drawing process. The General Contractor shall deliver these electronic AutoCAD record drawings to the Architect for review and approval at project substantial completion.

#### 1.7 FINAL SITE SURVEY

- A. Under provisions of Section 01 73 00 - EXECUTION, Surveyor shall provide final corrected submission of Final Site Survey (As-built Property Survey) after work has been completed.
  - 1. Final site survey shall show significant features for the Project. Include a certification, signed by the Surveyor, to the effect that meets, bounds, lines and levels of the Project are accurately positioned as shown on the survey.
- B. Survey format shall be in accordance with requirements of the authorities having jurisdiction, and show the following as a minimum:
  - 1. Property boundaries.
  - 2. All required legal descriptions.
  - 3. Bench marks.
  - 4. Completed foundation work.
  - 5. Building extremities.
  - 6. Pad mounted equipment.
  - 7. All paving work.
  - 8. Revisions to wetland areas.
  - 9. Easements and modifications to easements.
  - 10. Underground utilities and all changes in existing utilities.
- C. Record deviations from required lines and levels. Advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Final Site Survey, record deviations that are accepted and not corrected.
- D. Submit signed, sealed and certified copies shall be provided to the architect's office for review prior to filing with authorities having jurisdiction. Ensure information is complete, accurate submitted in a timely fashion.
  - 1. Recording: At Substantial Completion, have the final survey recorded by or with local authorities as the official "Property Survey".

#### 1.8 OPERATION AND MAINTENANCE MANUALS

- A. General: Coordinate content and submission requirements of operation and maintenance manuals with Owner's Commissioning Agent.
- B. Prepare data in the form of an instructional manual. Furnish separate manuals for each of the following groups of equipment:
  - 1. Special equipment and systems.
  - 2. Fire protection system.
  - 3. Utilities and plumbing systems.

4. Electrical systems.
- C. Furnish bound and properly identified Manuals prior to request for Final Acceptance.
1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three "D ring" capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers.
    - a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
    - b. Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches; locate pocket inside rear cover or bound in with text.
  2. Each manual shall include the same following minimum information:
    - a. Table of Contents.
    - b. Directory of General Contractor, subcontractors, and major equipment supplies listing addresses, phone numbers and appropriate emergency phone numbers.
      - 1) Include local sources of supplies and replacement parts.
    - c. Directory of Architect and consultants listing addresses and phone numbers.
    - d. Operation and maintenance instructions. Provide schematic diagrams of control systems, circuit directories for each electric panel and charts showing the tagging of all valves.
    - e. Air and water test and balancing reports.
    - f. Maintenance and cleaning instructions for finishes.
    - g. Product and manufacturer's Certificates.
    - h. Photocopies of all extended warranties and bonds.
  3. Submit one copy of completed volume in final form 21 days prior to Final Inspection. This copy will be returned after final inspection with Architect's comments; Revise and submit all volumes to Owner.
- D. For each item of equipment, include description of equipment, component parts and accessories. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- E. Standards:
1. Measurements: Provide all measurements in U.S. standard units such as feet and inches, pounds, and cfm; provide additional measurements in the "International System of Units" (SI).
  2. Abbreviations: Provide complete nomenclature of all parts of all equipment; include part numbers of all replaceable parts.
- 1.9 MATERIALS AND FINISHES MANUAL
- A. Furnish bound and properly identified manuals for all materials and finishes prior to request for Substantial Completion review.
1. Manuals shall be in 8-1/2 by 11 inch pages and bound in three "D ring" capacity binders with durable plastic covers. Internally subdivide the binder contents with permanent page dividers and logically organized.

2. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.
  - a. Arrange content by section number and systems, process flow, under section numbers and sequence as listed in the Table of Contents of this Project Manual.
  - b. Drawings: Preferable 11 inches in height bound in with text with reinforced punched binder tab. Fold drawings larger than 8-1/2 by 11 inches to size of text pages. Provide a drawing pocket for Drawings larger than 11 by 17 inches larger drawings; locate pocket inside rear cover or bound in with text.
- B. Manuals shall include the following:
  1. Product data, with catalog number, size, composition, and color and texture designations for all building products, applied materials, and finishes. Provide information for re-ordering custom manufactured products.
  2. Instructions for care and maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
  3. Moisture protection and weather exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
  4. Additional requirements: As specified in individual specification Sections.

#### 1.10 PRODUCT WARRANTIES AND BONDS

- A. Categories of Specific Warranties: Warranties on the work are in several categories, including those of General Conditions, and including (but not necessarily limited to) the following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of these Specifications:
  1. Special Project Warranty (Guaranty): A warranty specifically written and signed by General Contractor for a defined portion of the work; and, where required, countersigned by subcontractor, installer, manufacturer or other entity engaged by General Contractor.
  2. Specified Product Warranty: A warranty which is required by Contract Documents, to be provided for a manufactured product incorporated into the work; regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the work, or has written and executed a special project warranty as a direct result of Contract Document requirements.
  3. Coincidental Product Warranty: A warranty not specifically required by Contract Documents (other than as specified in this Section), but which is available on a product incorporated into the work, by virtue of the fact that manufacturer or product has published warranty in connection with purchases and use of product without regard for specific applications except as otherwise limited by terms of warranty.
- B. Commencement of Warranties: All warranties shall commence no sooner than the Date of Substantial Completion of the Project, except as explicitly specified otherwise in individual Specification Sections.
  1. Equipment and systems start-up, operation and use, occurring prior to Project Substantial Completion, will not be considered commencement of warranty period under any terms of this Contract.

- C. Refer to individual sections of Divisions 2 through 16 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees).
- D. General Limitations: It is recognized that specific warranties are intended primarily to protect Owner against failure of the work to perform, and against deficient, defective, and faulty materials and workmanship, regardless of sources. Except as otherwise indicated, specific warranties do not cover failures in the work which result from: 1) Unusual and abnormal phenomena of the elements, 2) The Owner's misuse, maltreatment or improper maintenance of the work, 3) Vandalism after time of substantial completion, or 4) Insurrection or acts of aggression, including war.
  - 1. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the General Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the General Contractor.
- E. Related Damages and Losses: In connection with General Contractor's correction of warranted work which has failed, remove and replace other work of project which has been damaged as a result of such failure, or must be removed and replaced to provide access for correction of warranted work.
  - 1. Consequential Damages: Except as otherwise indicated or required by governing regulations, special project warranties and product warranties are not extended to cover damage to building contents (other than work of Contract) which occurs as a result of failure of warranted work.
- F. Reinstatement of Warranty Period: Except as otherwise indicated, when work covered by a special project warranty or product warranty has failed and has been corrected by replacement or restoration, reinstate warranty by written endorsement for the following time period, starting on date of acceptance of replaced or restored work.
  - 1. A period of time ending upon date original warranty would have expired if there had been no failure, but not less than half of original warranty period of time.
- G. Replacement Cost, Obligations: Except as otherwise indicated, costs of replacing or restoring failing warranted units or products is General Contractor's obligation, without regard for whether Owner has already benefited from use through a portion of anticipated useful service lives.
- H. Rejection of Warranties: Owner reserves the right, at time of substantial completion or thereafter, to reject coincidental product warranties submitted by General Contractor, which in opinion of Owner tend to detract from or confuse interpretation of requirements of Contract Documents.
- I. General Contractor's Procurement Obligations: Do not purchase, subcontract for, or allow others to purchase or sub-subcontract for material or units of work for project where a special project warranty, certification or similar commitment is required, until it has been determined that entities required to countersign such commitments are willing to do so.
- J. Specific Warranty Forms: Where a special project warranty (guaranty) or specified product warranty is required, prepare a written document to contain terms and appropriate identification, ready for execution by required parties. Submit draft to Owner (through Architect) for approval prior to final executions.

1.11 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
- B. Deliver materials to on-site location designated by the Owner; obtain receipt.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION** (Not Used)

End of Section

SECTION 02 41 19

SELECTIVE DEMOLITION

PART 1 - GENERAL

- 1.01 General Conditions, Supplementary conditions and applicable part of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- 1.02 The Drawings on which this contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- 1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the selective demolition, removal and related Work necessary for the proper completion of the operations as required by the Contract Documents.
- A. The work of this section includes, but is not limited to, the following:
1. Complete controlled, selective demolition and removal from the site of all existing construction, materials and systems as need to properly complete the work of this Contract.
  2. Careful removal and storage of items designated on the Drawings to be reused or re-installed.
  3. Provision of the following temporary structures:
    - a. To protect from damage, all adjacent structures, building finishes, and equipment not indicated to be demolished or removed.
    - b. To support utilities which are currently supported by structures which are indicated to be demolished or removed.
    - c. To protect from dust, noise, and weather infiltration, all portions of the building that will remain occupied.
    - d. Coordination of Subcontractors demolition with the disconnecting, cutting, capping and rerouting of utilities.
  4. Legal removal and disposal of fluorescent lamps and light ballasts.
- 1.04 Related Work by Others:
- A. HVAC demolition and disposal is to be performed by Section 23 00 00 HVAC.
- 1.05 Related Section

- A. Section 02 83 33 Demolition of Materials Bearing Lead Paint
  - B. Section 04 01 20 Masonry
  - C. Section 06 10 00 Rough Carpentry
  - D. Section 09 29 00 Gypsum Board
  - E. Section 09 30 19 Tile
  - F. Section 09 51 00 Acoustical Tile
- 1.06 Existing Conditions
- A. This Contractor shall accept the premises in their present condition.
  - B. Prior to the commencement of any work under this Contract, this Contractor shall visit the site, examine the conditions there and thoroughly acquaint themselves with its obstacles and advantages for performing the Work. Contractor shall also study the Drawings explanatory of the Contract and compare same with the information gathered by the examination of the site, as no additional charge will be allowed for Work caused by unfamiliarity with the site and the Drawings.
  - C. Occupancy: Areas to be demolished will be unoccupied prior to start of work, but portions of the building will remain occupied and in full operation.
  - D. Condition of Structures: The Owner and Architect assume no responsibility nor make any claim as to the actual condition or structural adequacy of any existing construction to be demolished and the Contractor shall take all precautions to ensure safety of persons and property.
  - E. Traffic: Do not close or obstruct traffic ways, corridors, streets, walks or other used facilities without the written permission of the Owner and authorities having jurisdiction.

## PART 2 - PRODUCTS

### 2.01 Materials and Products

- A. Other temporary structures for shoring shall conform to all state, local and federal codes, and regulations.



PART 3 - EXECUTION

3.01 Demolition

- A. All work shall be done in accordance with the governing laws and building code, and all necessary permits required for the selective demolition work shall be procured by the Contractor. Provide unobstructed legal exits at all times.
- B. The selective demolition of all portions of the building to be removed shall be done with utmost care, using appropriate and safe tools and methods to assure that the building structures are not damaged. All possible care shall be taken to avoid overloading or damaging shock or vibration to portions of existing building which are to remain. All possible care shall be taken to prevent damage to existing materials and finishes which are to remain.
- C. Do not begin demolition work until all dust and protective barriers, and temporary shoring have been installed.
- D. Repair all damage done to elements of building to remain. Repairs shall be done in such manner as to closely match construction, appearance, and quality of original work.
- E. Items to be Reused: All existing items specified or designated on Drawings to be reused on the work shall be carefully removed in a manner to assure that least possible damage results. After removal, the items shall be stored in protected storage areas within the work areas of the building for alter distribution to the various trades responsible for the refurbishing and/or re-installation of same.
- F. Debris shall not be allowed to accumulate and shall be sprinkled during handling and loading to reduce dust. All debris shall be removed from the site daily. Debris shall be carried out in containers and not passed through, or thrown from, windows or other wall openings, in no case being permitted to drop free from windows, etc.
- G. Disposal: All materials removed under the selective demolition work and not called for on Drawings to be reused on the project or salvaged for Owner's use shall be disposed of legally, off-the-site, by the Contractor, who will, upon removal from the site, have the rights of salvage of the materials.

3.02 Temporary Barriers

- A. Protection: The Contractor shall be fully responsible for security of the work areas of the site and for protecting their and the Owner's materials stored or otherwise located on the site.
- B. The Contractor shall provide temporary barricading, overhead protection, etc., of substantial nature to protect workers, other personnel, and the public against various hazards and attendant nuisances that come about as the work progresses such as, but not necessarily limited to, falling materials, stored or stockpiled materials, etc. Comply fully with the governing laws and codes. Include substantial, well constructed, protective barriers at all work-limit lines separating Contract work areas from areas occupied by Owner.

3.03 Temporary Bracing, Shoring and Coverings, Etc.

- A. The Contractor shall provide temporary bracing and coverings to protect against collapse or damage to all structures, finishes, utilities, and equipment that are to remain in place in the work areas.

3.04 Sawcutting

- A. All sawcutting of masonry and concrete shall be accomplished by workers skilled in this Work with a minimum of five years experience. The name of the proposed Contractor and Work experience of the workers scheduled for the Work shall be submitted to the Architect for approval.

3.05 Noise, Dust and Pollution Control

- A. All work performed under this section shall conform to the requirements of Chapter III, Section 31C and Section 142D of the General Laws, Commonwealth of Massachusetts and Rules and Regulations adopted thereto by The Commonwealth of Massachusetts Department of Public Health, and the requirements of local noise, dust, and pollution control laws, ordinances, and regulative agencies applicable to the work.
- B. Provide flameproof dust-curtaining and block or filter mechanical return air systems in a safe manner between areas of the building to prevent passage of dirt and dust. Locations and quantities of barriers and dust curtaining shall at all times be subject to Owner's approval, but such approval, or lack of inspection or approval, by the Owner, shall not be construed as relieving the Contractor of any of responsibilities.

3.06 Cleaning

- A. Upon completion of demolition work, including the removal of all rubbish and debris, all exposed surfaces within the work area shall then be thoroughly cleaned.
- B. Items subject to water damage shall also be cleaned. When the surfaces are non-absorptive they shall be cleaned by wiping with clean, dampened cloths followed by immediate toweling with dry cloths. Specific stains shall be removed by use of dampened cloth with detergent, then thoroughly rinsed and dried. Where surfaces are absorptive they shall be cleaned by wiping with dry cloths and/or thorough vacuuming only.
- C. The intent of cleaning work is to provide surfaces which are to remain exposed in the finished work and surfaces which are to receive the work or finishes of other trades, cleaned free of all traces of dirt, grime, grease and other stains and defacements.

END OF SECTION

SECTION 02 83 33

DEMOLITION OF MATERIALS BEARING LEAD PAINT

PART 1 - GENERAL

- 1.01 Conditions of the Contract and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- 1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- 1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the demolition of materials bearing lead paint and related Work necessary for the proper completion of the operations as required by the Contract Documents.
- A. The Contractor shall be responsible for removal/ demolition of materials containing lead-based paint including the isolation of the work area, the control of the spread and clean-up of dust generated by this work and the strict use of worker protection.
  - B. The work area shall be physically isolated so that individuals other than those authorized to conduct or monitor the work shall be denied access into and immediately around the work area including stockpiling of debris.
  - C. The Contractor shall be responsible for strict control of dust and debris generated by the work. Disposable coverings shall be securely fastened to isolate work areas for the control of the dispersion of dust and debris and the integrity of these coverings shall be maintained until clean-up is completed. the Contractor shall be responsible for the immediate clean-up and legal disposal of dust and debris that escapes from the isolated work site. The Contractor shall be responsible for the regular clean-up and legal disposal of dust and debris generated within the isolated work area. All clean-up and disposal of lead-based paint shall follow all laws and regulations including MA 454 CMR 22.00 and EPA RRP Rule (40 CFR 745).
  - D. Before the application of overlays and new building materials, remove loose and flaking lead-based paint to make surfaces intact, ready for covering or replacement.
  - E. Worker protection, including blood lead level monitoring, protective clothing, respirators and hygiene procedures, shall be employed.
- 1.04 Existing Conditions
- A. This Contractor shall accept the premises in their present condition.
  - B. Prior to the commencement of any Work under this Contract, this Contractor shall visit the site, examine the conditions there and thoroughly acquaint himself with its obstacles and advantages for performing the Work. Contractor shall also study the Drawings explanatory of the Contract and compare same with the information gathered by the examination of the site, as no additional charge will be allowed for Work caused by unfamiliarity with the site and the Drawings.
- 1.05 Related Sections
- A. Section 02 41 19 - Selective Demolition

Demolition of Materials Bearing Lead Paint

B. Section 09 91 00 - Painting

1.06 Contractor Responsibility

- A. The Contractor shall assume full responsibility for the compliance with all federal, State and local regulations:
1. Worker safety and hygiene
  2. Transportation and disposal of hazardous waste

PART 2 - PRODUCTS

2.01 Materials

- A. The Contractor shall supply the following as their use is required:
1. Washing Agent: 5% solution trisodium phosphate
  2. Polyethylene Sheeting: 6 mil thick in 20 ft. wide rolls and conforming to ASTM E-154, C-156, D-14B, D-2103 and D-4379.
  3. Polyethylene Bagging: 6 mil. polyethylene bags designed for and labeled as containers for hazardous waste.
  4. Spray Encapsulant: Spray material that encases lead paint dust particles in an adhesive matrix.
  5. Spray Adhesive: To assist adhesion of duct tape
  6. Duct Tape: Fabric-backed high adhesion tape
  7. Vacuum Equipment: Utilizing HEPA filtration systems 99.97% effective to 0.3 microns particulate size to be the sole vacuum equipment in the work area
  8. Barrier Tape: 2 in. wide, yellow, non-adhesive tape with the words "CAUTION - LEAD PAINT ABATEMENT"

2.02 Warning Signs

- A. Prior to the daily beginning of work, the Contractor shall post caution signs at all approaches and the four compass edges to the work area. These signs shall read:

**WARNING  
LEAD PAINT REMOVAL HAZARD  
NO SMOKING, EATING OR DRINKING  
ENTRY AUTHORIZATION REQUIRED**

-----  
**ADVERTENCIA  
SE REMUEVE PINTURA DE PLOMO  
FAVOR NO FUMAR, COMER O TOMAR  
SE REQUIERE AUTORIZACION DE ENTRADA**

- B. Lettering shall not be smaller than 2 inches tall and shall be posted at a sufficient distance to permit a person to read the sign and take precautionary measures to avoid exposure to lead.

2.03 Worker Protection

A. Respirators

1. Workers shall be provided with NIOSH/MSHA certified respirators equipped with HEPA filters. The respirators are to be sanitized and maintained according to the

manufacturer's specifications. NOTE: Upgrade to appropriate organic cartridges in the event of the use of caustic stripping agents.

2. Appropriate respirator selection is dependent upon the intensity of the airborne concentration of lead exposure and shall follow OSHA guidelines contained in 29 CFR 1910.1025(f) (2).
  3. Respiratory compliance per task may be as follows:
    - a. Half-face negative pressure respirator equipped with high efficacy (HEPA) filters may be used for:
      - Classing with coil stock
      - Exterior component removal
      - Window and frame removal
      - Clean-up
    - b. Powered air-purifying respirator equipped with high efficacy (HEPA) filters must be used for:
      - Scraping to make intact or to strip to bare wood
      - Anytime airborne concentrations of lead exceed the 8 hour TWA of 2.5 mg/m<sup>3</sup>.
- B. Clothing
1. Workers shall be provided with protective disposable full-body coveralls, head covering, protective eye wear or face shield, boot or shoe covers and gloves. A minimum of two changes of clothing for each worker shall be provided during an 8 hour day.
- C. Safety Equipment
1. Work boots, work gloves, hard hats and safety glasses will be worn at all times. All times will be decontaminated prior to leaving abatement area. Work boots will not be taken for job site.

#### 2.04 Decontamination/Changing

- A. The Contractor shall provide a decontamination unit or changing area to be used by all abatement personnel upon entering and leaving the work area.
  1. The unit shall be placed immediately adjacent to the work area and polyethylene sheeting shall be placed on the pathway leading from the work area to the decontamination unit.
  2. No abatement work shall begin until the unit is in place in operating condition.

### PART 3 - EXECUTION

#### 3.01 Work Area Preparation

##### A. Interior Preparation

1. Interior preparation shall be performed by clean workers who are not contaminated with lead paint dust.
2. Window wall and door removal from the outside:
  - a. Cover floor area immediately beneath areas being removed.
  - b. Secure one layer of polyethylene on the interior of the window wall or door in a manner that the layer can be removed from the exterior but not interfere with the removal of the existing window wall. Seal all around with duct tape.

- c. Secure another layer of polyethylene on the interior of the window wall or door to the existing floor and/or wall surrounding the window or door being removed. Seal all around with duct tape.

B. Exterior Preparation

1. Polyethylene sheeting will be secured to the exterior wall above the ground plan by means of mechanical fasteners and/or adhesives. The sheeting will extend out from the building for the remainder of the 20 feet roll of sheeting and from the window or door opening or railing 20 feet in each direction covering soil surfaces. Where the work area abuts a neighboring unit, the ground sheeting shall be brought up the face of the building and secured to the building face approximately coincident with the interior party wall. The outer edge of the sheeting away from the building face shall be held up by securing to staging or timber framework.
2. Plywood panels, minimum 1/2 inch thick, will be placed on top of the ground sheeting to prevent puncturing in the immediate vicinity of the specific areas being worked on. The perimeters of the sheeting will be secured to the ground surface by stakes or weights.
3. Barrier tape and warning signs shall be erected along the outer edge of the ground sheeting.

3.02 Clean-Up

- A. Prompt clean-up of the flakes and dust collecting from making the surfaces intact and removing components shall be undertaken. Do not allow debris to accumulate outside of the disposal containers.

3.03 Breakdown of Coverings

- A. Remove all barriers and protective sheeting and clean up at the end of each work day and promptly at the conclusion of abatement work.
  1. Inspect sheeting to be sure that all loose dust, flakes and debris has been cleaned off and disposed.
  2. Vacuum and remove protective plywood panels.
  3. Working from the perimeter of the sheeting, fold toward the center, remove fastened edges and continue to neatly fold until sheeting can be placed in double polyethylene bags and disposed.

3.04 Disposal

- A. Legally dispose of all debris according to DEP and EPA regulations.
  1. Concentrated paint flakes, particles and dust shall be disposed as hazardous waste.
- B. Provide to Owner receipts indicating legal disposal of debris.

END OF SECTION

**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

**Part 1 – GENERAL**

**1.01 WORK INCLUDED**

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.
- B. The work of this Section consists of all cast-in-place concrete work as shown on the Drawings and as specified herein, and includes, but is not limited to, the following:
  - 1. Furnishing, placing, finishing, curing and protection of all plain and reinforced concrete work for the building. Also include all concrete work necessary to complete the work of other trades (i.e. housekeeping pads, inertia blocks, and foundations for mechanical, plumbing and electrical equipment).
  - 2. Furnishing and placing of reinforcing steel and related accessories.
  - 3. Furnishing, erection and removal of formwork and shoring, as required.
  - 4. Furnishing and installation of control joints, joint fillers and joint sealants.
  - 5. Concrete mix design, including admixtures.
  - 6. Coordination with all other trades for location of all pipe sleeves, duct openings, keys, chases, electrical boxes and conduits, anchors, dowels, embed plates, inserts, fastenings, flashing reglets and other devices required by other trades.
  - 7. Finishing of exposed concrete surfaces as herein specified.
  - 8. Installation of items such as sleeves, embed plates, anchor bolts, keys, dowels, inserts, etc. furnished by other trades which are required to be cast into concrete.
  - 9. Hardening and sealing of exposed concrete floors as herein specified.
  - 10. Furnishing and installation of non-shrink grout at base plates, pockets, etc.
  - 11. Furnishing and installation of patching compound at unacceptable honeycombing areas.
  - 12. Preparation and submission of reinforcing steel shop drawings.
  - 13. Furnishing and installation of vapor barrier under all slabs-on-grade.
  - 14. Furnishing and installation of concrete fill in steel pan stairs.
  - 15. Installation of rigid insulation at perimeter foundation walls and below slabs-on-grade as shown on Architectural Drawings.
  - 16. Furnishing and installation of waterstops at all elevator and/or mechanical pits, and construction joints below ground level.

17. Unless otherwise noted or specifically excluded, furnish and install any other item related to cast-in-place concrete work indicated on the Drawings, or specified, or obviously required to complete the work of this Section.

## **1.02 RELATED WORK**

- A. The following items of related work are specified and included in other Sections of the Specifications:

1. Section 01 40 00 - Quality Requirements
2. Section 02 20 00 - Earthwork
3. Section 05 12 00 - Structural Steel Framing
5. Section 05 50 00 - Metals Fabrications

## **1.03 REFERENCE SPECIFICATIONS**

- A Standards: The Contractor shall have in his possession and shall keep available in his field office, the following Standards and Recommended Practices to which reference may be made herein and to which the Contractor shall conform, except where otherwise required by this Specification.

1. American Society for Testing and Materials (ASTM): Listed Standards.
2. American Concrete Institute (ACI): Listed Standards.
3. ACI 211.1, "Recommended Practice for Selecting Proportions for Normal and Heavyweights."
4. ACI 214, "Recommended Practice for Evaluation of Compression Test Results of Field Concrete."
5. ACI 301, "Specifications for Structural Concrete for Buildings."
6. ACI 302, "Recommended Practice for Concrete Floor and Slab Construction."
7. ACI 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
8. ACI 305, "Recommended Practice for Hot Weather Concreting."
9. ACI 306, "Recommended Practice for Cold Weather Concreting."
10. ACI 309, "Consolidation of Concrete."
11. ACI 311, "Recommended Practice for Concrete Inspection."
12. ACI 315, "Recommended Practice for Detailing Reinforced Concrete Structures."
13. ACI 247, "Recommended Practice for Concrete Formwork."
14. CRSI, "Reinforced Concrete - A Manual of Standard Practice."
15. CRSI, "Recommended Practice for Placing Reinforcing Bars."
16. CRSI, "Recommended Practice for Placing Bar Supports."
17. AWS D1.4, "Structural Welding Code - Reinforcing Steel."
18. ACI 318-08, "Building Code Requirements for Structural Concrete".



#### 1.04 SUBMITTALS

- A. Make submittals in accordance with Section 01 30 00 – Administrative Requirements and Section 018113 - Sustainable Design Requirements.
- B. Submit shop and erection drawings for reinforcing steel (electronically) and manufacturer's data for other products for Architect's review.
- C. The contractor shall submit drawings showing the complete layouts of all control joints, construction joints, and isolation joints for all slabs-on-grade as per the requirements shown on the drawings. Concrete placement shall not proceed until these drawings and been reviewed by the Architect.
- D. Submit concrete mix design, not less than four weeks prior to first concrete placement, for all strengths indicated on the Drawings, for Architect's approval. Submittals for mix designs shall include the following:
  - 1. Mix Identification Designations (unique for each mix submitted.)
  - 2. Statement of intended use for the mix.
  - 3. Mix proportions, including all admixtures to be used.
  - 4. Manufacturer's data and/or certifications verifying conformance of all mix materials, including admixtures, with specified requirements.
  - 5. Wet and Dry Unit Weights.
  - 6. Entrained Air Content.
  - 7. Design Slump.
  - 8. Required Average Strength qualification data per ACI 301 3.9.1 and 3.9.2. Submit separate qualification data for each production facility which will supply concrete to the project.
  - 9. Average strength qualification data (trial mix data or field test data per ACI 301.3.9.3). When field test data is used to qualify average strength, submit separate qualification data for each production facility which will supply concrete to the project.
  - 10. Field test data submitted for qualification of average strength under ACI 301 3.9.1, 3.9.2, and 3.9.3 shall include copies of the Concrete Testing Agency's reports from which the data was compiled.

- E. Fabrication of any material or performing of any work prior to the final review of the shop drawings will be entirely at the risk of the Contractor.
- F. The Contractor is responsible for furnishing and installing materials called for in Contract Documents, even though these materials may have been omitted from reviewed shop drawings.
- G. Before being submitted to the Architect, all shop drawings shall be properly checked and coordinated by the Fabricator and by the Contractor and shall be stamped and signed accordingly. Drawings not complying with these requirements will be returned unchecked and stamped, "Not Reviewed."
- H. At least one copy of each Reviewed Shop Drawing shall be kept available in the Contractor's field office. Drawings not bearing evidence of release for construction by the Architect/Engineer shall not be kept on the job.
- I. Substitutions: Any request for product substitutions must be submitted with all necessary documentation, for the Architect/Engineer's review.

#### **1.05      QUALITY ASSURANCE**

- A. The Contractor shall retain the services of a qualified independent testing agency, approved by the Architect, to test aggregate and to prepare a mix design for each strength of concrete specified; and shall submit such mix designs and test results to the Architect for approval. Mix designs may also be based on proven current designs accompanied by test results. The costs of all such preliminary services shall be borne by the Contractor. All other testing and inspection will be performed by the Owner's testing agency.
- B. A qualified testing agency approved by the Architect for other testing and inspection will be selected by and be paid by the Owner. Structural Tests and Inspections shall be in accordance with Chapter 17 of the 2015 International Building Code.
- C. Cooperate fully with the testing agency's work in taking and storing samples. Provide storage facilities for concrete cylinders at the site.
- D. Accept as final results of tests made by the qualified professional testing organization engaged by the Owner.
- E. Testing required because of changes requested by the Contractor in materials, sources of materials, or mix proportions; and extra testing of concrete or materials because of failure to meet the Specification requirements are to be paid for by the Contractor.

- F. Advise the Testing Agency of intent to place concrete by notification at least 48 hours prior to time of placement.
- G. All materials, measuring, mixing, transportation, placing and curing shall be subject to inspection by the Architect or by the Testing Agency. However, such inspection, wherever conducted, shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements, nor shall inspector's acceptance of material or workmanship prevent later rejection of same by the Owner or Architect if defects are discovered.
- H. A pre-construction meeting shall be held at which representatives of the Owner, Architect, Testing Agency and the Contractor shall be present, prior to the commencement of concrete work. Discussions at the meeting will include concrete mix design, admixtures, reinforcing steel placement, concrete placement, concrete consolidation, curing, and protection.
- I. The Architect or his designate will at all times have the right to delay or stop concrete operations when in his judgment quality of the construction will impair the strength, durability or appearance of the finished product. All costs arising from delays due to noncompliance shall be paid by the Contractor.

#### **1.06 TESTING AND INSPECTION**

- A. Concrete inspection and testing will be made in accordance with Building Code requirements, and Contract Documents, and will include the following:
  - 1. Testing concrete for strength, air content, temperature, and unit weight.
  - 2. Marking and testing concrete cylinders, including furnishing cylinder containers for specimens.
  - 3. Transporting and storing of all specimens involved in testing and inspection. Test cylinders are to be transported to the laboratory no later than 24 hours after casting, but not earlier than 16 hours after casting.
  - 4. Inspection of mixing and placing of concrete at the site. The inspector shall document the amount and location of each concrete placement, the methods of placing concrete, and any other pertinent information.
- B. Test Specimens: The Testing Laboratory will take specimens of each class of concrete from different locations on the job as follows: At least one set of four cylinders for each 150 cubic yards (or fraction thereof) of each class of concrete, but not less than one set for any one day's operations.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

1. For concrete placed by pumping, test specimens and concrete used for determination of slump, air content, and weight are to be taken at the point of placement of the concrete into the forms.
  2. All samples shall be obtained in accordance with ASTM C172.
  3. Marking, curing and subsequent handling of test cylinders, except as modified herein shall be in accordance with ASTM C31. Testing shall be in accordance with ASTM C39.
  4. Cylinders shall be placed in a laboratory storage area under moist curing conditions at approximately 70 degrees F within 24 hours of molding, and maintained therein until tested. Tests shall be as follows:
    - a. One cylinder shall be tested at 7 days for information.
    - b. Three cylinders shall be tested at 29 days for acceptance. The acceptance test shall be average of the three cylinders. However, one cylinder may be held and tested at 56 days if the two previous cylinder tests are not acceptable.
- C. Test Reports: Reports of the cylinder tests shall be submitted as specified herein within five days of laboratory testing. Test reports shall, as a minimum, include:
1. Project data including project name and address, concrete supplier, supplier's delivery ticket number and mix identification number, Testing Agency's test or cylinder identification number, and location of pour.
  2. Results of field testing at time of sampling including date and time, amount of water added at site prior to sampling, ambient air temperature, concrete temperature, concrete slump, concrete air content, and concrete wet unit weight.
  3. Results of the laboratory testing including date test specimens were transported to the laboratory, date and age of concrete at time of testing, compressive strength of each cylinder tested, average compressive strength of tested cylinders, and specified design strength of concrete represented by the test.
- D. Additional Testing: Contractor shall bear the cost of testing and inspection resulting as a consequence of any of the following:
1. Work is not in conformance with the Contract Documents.
  2. Testing requested by the Contractor or Subcontractor such as additional cylinders for early breaks, etc.
  3. Testing to verify the adequacy of work done without prior notice, without proper supervision, or contrary to standard construction practice.
- E. Reinforcing Steel Inspection: Concrete reinforcing shall be inspected prior to closing of concrete form work or placing of concrete. Inspect all reinforcing for conformance

with the contract documents. Submit written reports of all inspections in accordance with Test reports. Such reports shall include a description of each area inspected, deficiencies noted, and corrections made by the Contractor to resolve deficiencies. Deficiencies observed shall be immediately brought to the attention of the Contractor's Field Superintendent.

- F. For moisture testing shall comply with one or more of the following:
1. ASTM F1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
  2. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
  3. ASTM F2420 - Standard Test method for determining Relative Humidity on the Surface of Concrete Floor Slabs Using Relative Humidity Probe Measurement and Insulated Hood.
  4. ASTM F710 - Preparing Concrete Floors to Receive Resilient Flooring

#### **1.07 NOTIFICATION OF RELATED TRADES**

- A. Notify all other trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc., when ready for such installation, and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.
- B. Leave openings in walls for pipes, ducts, etc., for mechanical and electrical work as shown on Drawings or as required by layout of mechanical systems. Layout and reinforcing of openings not specifically shown on the Structural Drawings shall be submitted to the Architect for review prior to execution.

### **PART 2 MATERIALS**

#### **2.01 CONCRETE COMPONENTS**

- A. Portland Cement: ASTM C-150 Type I at all exposed concrete, Type I or II elsewhere. All cement of each type shall be from a single source. Visual variations in color will not be accepted at exposed concrete surfaces. Provide a mix design that includes at least 20% slag/fly-ash of the cement component (by weight). Fly-ash shall conform to ASTM C618, Type C or F.
- B. Natural Aggregates:
  1. Fine Aggregates for Concrete: Shall be natural sand consisting of clean, hard, durable, uncoated particles, conforming to ASTM C33. Organic content shall be determined according to ASTM C40, and supernatant liquid above test sample shall show color no darker than reference standard color solution prepared at

- same time. Allow no frozen or partially frozen aggregate in the mix.
2. Coarse Aggregate for Concrete: For regular weight concrete use crushed stone or gravel from approved source conforming to ASTM C33. Coarse aggregate shall not contain greater amounts of deleterious materials than specified in Table III, ASTM C33. For lightweight concrete (115 PCF) use materials conforming to ASTM C330.
  3. Aggregate of designated size 1-1/2" may be used in work below finished grade provided the size of the coarse aggregate does not exceed 3/4 of the clear distance between reinforcing bars, nor 3/4 of the distance between reinforcement and the face of the concrete member in which it is placed.
  4. Aggregate of 3/4" size shall be used in all structural members where larger aggregate is not permitted by the preceding paragraph.
- C. Water shall be from an approved source, potable, clean, and free of oils, salt, alkali, organic matter and other deleterious material.
- D. Admixtures: (coordinate with the requirements of Section 2.07)
1. **Mid-Range Water Reducing Agent:** Shall conform to the requirements of ASTM C494, Type A. A mid-range water reducing agent shall be utilized in all classes of concrete. Mid-range water reducing admixtures shall be by one of the following, or approved equivalent:
    - a. "MIRA 95", by GCP Applied Technologies.
    - b. "Eucon X-15" by Euclid Chemical Co.
    - c. "MasterPolyhead 1020" by BASF.
    - d. Approved equivalent.
  2. **High-Range Water Reducing (HRWR) Admixture (Super Plasticizer):** Shall comply with ASTM C494, Type F or Type G and shall not contain more than 0.05% chloride ions. A high-range water reducing agent shall be utilized in all concrete with a water cement ratio less than 0.45. High-range water reducing admixtures shall be by one of the following:
    - a. "ADVA 198", by GCP Applied Technologies.
    - b. "Eucon 37", by The Euclid Chemical Co.
    - c. "MasterGlenium 1466" by BASF
    - d. Approved equivalent.
  3. **Air-Entraining Admixture:** Shall be utilized in all classes of concrete and shall comply with ASTM C260. Air-entraining agent must be by same manufacturer as water-reducing agent and shall be one of the following:

- a. "Darex AEA" by GCP Applied Technologies
  - b. "Airmix", by The Euclid Chemical Co.
  - c. "MasterAir VR 10" by BASF
  - d. Approved equivalent.
4. **Water-Reducing Set Retarders:** Shall conform with ASTM C494 Type D and may be used when ambient temperatures exceed 80 degrees F. Set retarders shall be one of the following:
- a. "Daratard-17", by GCP Applied Technologies
  - b. "Eucon Retarder 75", by The Euclid Chemical Co.
  - c. "MasterSet R100" by BASF.
  - d. Approved equivalent.
5. **Set Accelerator Admixture:** Non-chloride and non-corrosive accelerators shall conform to ASTM C494 Type C and may be used when temperatures are below 50 degrees F. The accelerator admixture shall be one of the following:
- a. "Polarset", by GCP Applied Technologies
  - b. "Accelguard 80", by The Euclid Chemical Co.
  - c. "MasterSet FP20" by BASF
  - d. Approved equivalent.
6. **Corrosion-Inhibiting Admixture:** Shall be used concrete slabs and other members where specified on the structural drawings that require enhanced resistance to corrosion due to moisture or atmospheric conditions by repassivating defects on the steel surface and shall conform to ASTM C494 Type S. The corrosion inhibiting admixture shall be one of the following:
- a. "MasterLife CI 222", by Master Buildings Solutions
  - b. "Eucon CIA", by The Euclid Chemical Co.
  - c. "Sika CNI", by SIKA Corporation
  - d. Approved equivalent.
7. **Prohibited Admixtures:** The use of calcium chloride, thiocyanates and other admixtures containing greater than 0.05% chloride ions shall not be accepted.

## 2.02 CONCRETE REINFORCEMENT

- A. All reinforcing steel shall conform to ASTM Specification A-615 Grade 60, deformed bars, unless noted otherwise. The minimum amount of recycled material for the

use in fabricating reinforcing steel for concrete shall be 80%.

- B. Welded wire fabric shall conform to ASTM Specification A-185. Supply in flat sheets.
- C. Bar supports, metal accessories and other devices necessary for proper assembly of concrete reinforcing shall be of standardized factory-made wire bar supports. All bar supports in exposed concrete shall have plastic tips to prevent rust spots on exposed surfaces. Wire for tying shall be 18 gauge black annealed wire conforming to ASTM Specification A-82.
- D. All reinforcing steel which is required to be welded shall conform to ASTM A706.
- E. Precast concrete blocks or bar supports with base plates shall be utilized to support reinforcement for slabs-on-grade.
- F. Hot Dip Galvanizing: Items exposed to the exterior or indicated on the drawings shall be hot- dipped galvanized **after fabrication**. Galvanizing bath shall be a combination nickel-zinc mixture. Prior to galvanizing, the steel shall be immersed in a pre flux solution of zinc ammonium chloride. The use of the wet kettle process shall be prohibited. Galvanize all ferrous fasteners, clips, sleeves, anchors and accessories in contact with galvanized items.
  - 1. Galvanizing shall comply with ASTM A123, A153 or A386 as applicable.
  - 2. Items to be galvanized shall be galvanized **after fabrication**. Where size of assembly is too large for complete unit galvanizing, these assemblies shall be galvanized prior to fabrication, in as large sections as practical and then only with the written approval of the Architect.
  - 3. Where galvanizing prior to completing fabrication cannot be avoided, joints shall be welded after fabrication, ground smooth and finished with four (4) full coats of California Products Corp. WW Totrust, Sealube ZRC, Zirp by Duncan or equal.

## 2.04 FORMWORK

- A. Forms: Except for exposed surfaces, formwork material shall be exterior "plyform" Class 1, B-B or as approved by the Architect, not less than 5/8 in. thick. For all exposed surfaces plywood forms shall be plastic coated, molded fiberglass or smooth coated material subject to the approval of the Architect. Provide suitable form inserts for reglets, rustication joints and champhers as required on the Architectural Drawings. Unless noted otherwise, champher strips shall be half-inch, 45 degree poplar wood strips nailed six inches on center and installed at inside corners of all forms. All new formwork shall be constructed with recycled materials.
- B. Form Oil: Oil shall be of a non-staining type, specifically manufactured for concrete forms.



- C. Form Ties: Except for exposed surfaces, factory-fabricated, removable or snap back, of approved design. Wire shall be at least 1-1/2 in. back from surfaces. For all exposed concrete work forms shall be tied in such a way that no evidence of ties is visible on the finished surfaces.
- D. Design Criteria:
  - 1. Design, construct, erect, support, brace, maintain and remove forms to comply with ACI 318 parts 1, 2 and 3.
  - 2. Comply with ACI 347 for loads, lateral pressures and allowable stresses and include wind loads.
  - 3. Construct formwork so concrete surfaces comply with ACI 301 Chapter 4 and ACI 347.
  - 4. Maximum allowable deflection of forming surfaces from concrete pressure is length/360 between supports.

## 2.05 ASSOCIATED MATERIALS

- A. Non-Shrink Grout: Shall be "MasterFlow 885" by Master BuildersBASF, "SonogROUT 10k" by Sonneborn Building Products, "Five Star Grout" by U.S. Grout Corporation, or equal approved by the Architect. Compressive strength of grout shall not be less than 5000 psi at 7 days, and 7500 psi at 28 days.
- B. Patching Compound: Shall be "SIKATOP 122 PLUS" by Sika Corporation in horizontal applications or "SIKATOP 123 PLUS" by Sika Corporation in vertical or overhead applications, or equal approved by the Architect.
- C. Vapor barrier shall be Stego Wrap (15 mil) manufactured by Stego Industries. Use caution to avoid perforations in vapor barrier material. Refer to Section 07 2615 "Under Slab Vapor Retarders", for additional information.
- D. Chemical surface sealer/hardener for **exposed concrete floor slabs only** shall be Kure-N-Seal, by Sonneborn Building Products, or equal. All non-exposed floor slabs shall not be chemically cured.
- E. Concrete curing methods shall be one of the following for non-exposed concrete floor slabs:
  - 1. Continuous sprinkling.
  - 2. Application of absorptive mats or fabric kept continuously wet.
  - 3. Continuous application of steam (not exceeding 150 degrees F.) or mist spray.
  - 4. Application of waterproof sheet material conforming to ASTM C171.
  - 5. Application of white polyethylene sheeting (4 mils thick) conforming to ASTM C171.
- F. Concrete inserts shall be as required on the Drawings. Sleeves shall be schedule 40 PVC or standard weight pipe conforming to ASTM A53.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- G. Joint Filler: Where used with caulking or sealants shall be non-extruding, self-expanding filler strips conforming to ASTM D1752, Type III, and AASHO N153, Type II, as manufactured by Celotex Corporation, W.R. Meadows, Inc., W.R. Grace and Company, or equal approved by the Architect.
- Where no sealant or caulking is required, strips may be non-extruding bituminous type in accordance with ASTM D1751.
- H. Chamfer Strips shall be wood.
- I. Bonding Agent: Shall be "Sika" Armatec 110 EpoCem, or approved equal.
- J. Waterstops shall be:
1. 6" wide SIKA Greenstreak polyvinylchloride multi-rib type.
  2. Volclay Waterstop – Rx by Cetco.
  3. Equal Approved the Architect.
- K. Perimeter insulation for foundation walls shall be 2" thick polystyrene insulation, Styrofoam SM by Dow Chemical Company, or equal Reviewed by the Architect
- L. Liquid chemical hardener for concrete shall be Hornolith by A.C. Horn Company; Surfhard by Euclid Chemical Company with zinc and/or magnesium silicofluoride with penetrating agent. The material shall be applied in accordance with the manufacturer's written recommendations and shall be compatible with curing techniques.
- M. Dovetail Anchor Slots: (Installation Only) Fabricated of 26 gage, Type 304 stainless steel, 1" wide x 1" deep x 5/8" throat x 10' lengths, with foam filler to protect channel from filling with concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. "Dovetail Slot #D/A", Dur-O-Wal, Inc.
    - b. "Dovetail Slot #100", Heckmann Building Products, Inc.
    - c. "Dovetail Slot #305", Hohmann & Barnard, Inc.
- N. Evaporation Retardant when needed per Section 3.07 for finishing in Hot Weather shall be:
1. "Eucobar", by Euclid Chemical Co.
  2. "MasterKure ER 50", by Master Builders
  3. Approved equivalent.
- O. All other materials not specifically described herein, but required for a complete and proper installation, shall be as selected by the Contractor and approved by the Architect.

## 2.06 STORAGE OF MATERIALS

- A. All materials shall be stored to prevent damage from the elements and other causes.
- B. Cement and aggregates shall be stored in such a manner as to prevent deterioration or intrusion of foreign mater. Any materials which have deteriorated, or which have been damaged, shall not be used for concrete.
- C. Store reinforcement steel on wood skids to protect it from weather, oil, earth and damage from trucking or other construction operations. Reinforcement shall be free from loose mill scale, rust, form oil, concrete splatter and other extraneous coatings at the time it is embedded in the concrete.

## 2.07 CONCRETE MIXES FOR CAST-IN-PLACE CONCRETE

- A. Strength: Proportion mixes to attain compressive strengths as indicated on the drawings in 28 day. Strength requirements for high early strength concrete shall be based on 7-day compressive strengths.
- B. Selection of Proportions:
  - 1. Mix Design: Cost of concrete mix design by the Contractor.
  - 2. Selection of Proportions: Use method ACI 301.9. Proportioning based on method of ACI 3.10 is not allowed.
    - a. Field test records used for documentation of the average strength produced by a proposed mix in accordance with ACI 301 3.9.3.2 shall, in addition to the requirements there listed, comply with the following:
      - i. The test record shall represent production concrete from a single design mix, produced during the past year, and may be composed of 30 or more consecutive tests.
      - ii. The test record shall represent concrete made with identical materials and proportions (including admixtures) to the proposed mix.
      - iii. The test record shall represent concrete proportioned to produce the maximum slump allowed by these specifications, and for air-

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

entrained concrete, within 0.5%+/- of the maximum air content allowed.

- b. Mixes proportioned on the basis of trial mixtures shall meet the provisions of ACI 301 3.9.3.3.
  - c. For concrete exposed to weather, the maximum water/cement ratio shall be 0.45.
  - d. For concrete exposed to deicing chemicals, the maximum water/cement ratio shall be 0.40.
- B. Air-entraining and water-reducing agents shall be used in all concrete in strict accordance with the manufacturer's printed instructions. Total air entrained in freshly-mixed concrete shall be 6.0% (plus or minus 1.0% of volume of concrete) for all exposed concrete. Interior slabs and concrete work not exposed to weather shall contain 2% (plus or minus 1% of volume of concrete) with required strengths maintained.
- C. **Fly Ash / Portland Cement Replacement:** Fly ash, in proportions **not greater than 20% by weight** of the total amount of cementitious materials, may be used when accepted by the Structural Engineer. Fly ash shall be compliance with ACI 226.3R and ASTM C-618. Cement content and/or water-cement ratios for mixes containing fly ash shall be based on the total weight of cementitious materials (i.e. Portland cement plus fly ash).
- D. **Blast Furnace Slag / Portland Cement Replacement:** Blast furnace slag may be substituted for Portland cement in **proportions ranging from 25% to 50% by weight** of the total amount of cementitious materials when accepted by the Structural Engineer. Blast Furnace Slag shall be in compliance with ACI 226.1R and ASTM C-989. Cement content and/or water-cement ratios for mixes containing blast furnace slag shall be based on the total weight of the cementitious materials (i.e. Portland cement plus blast furnace slag).
- E. Slump of concrete:
- 1. Exterior walks, stairs, pads, and footings: 5" (max).
  - 2. All other concrete elements: 5", 8" (max) at HRWR (if utilized).
- F. Premix admixtures in solution form and dispense as recommended by the manufacturer. Include the water in the solution in the design water content of the mixtures.

- G. Concrete fill for steel stairs and landing pans shall be comprised of a 1:2:2 mix with 3/8" maximum size normal weight aggregate and shall be placed with a three-inch maximum slump.

### **PART 3 EXECUTION**

#### **3.01 FORMING FOR CAST-IN-PLACE CONCRETE**

- A. ACI 301, latest edition, "Specifications for Structural Concrete for Buildings", Chapter 4 - Formwork, is hereby made a part of this Specification.
- B. Forms shall be constructed to conform to shapes, lines, and dimensions shown, plumb and straight, and shall be maintained sufficiently rigid to prevent deformation under load. Forms shall be sufficiently tight to prevent the leakage of grout. Securely brace and shore forms to prevent the leakage of grout. Securely brace and shore forms to prevent their displacement and to safely support the construction loads.
- C. Treat forms with a form release agent applied according to the manufacturer's instructions, by roller, brush or spray to produce a uniform thin film without bubbles or streaks. Apply the release agent in two coats for the first use of the form and in one coat for each additional use.
- D. ACI-301, Section 13.3 - Forms, is also hereby made a part of this Specification.

#### **3.02 MIXING PROCESS FOR CAST-IN-PLACE CONCRETE**

- A. Ready-mixed concrete shall be mixed and transported in accordance with Specification for Ready-Mixed Concrete" ASTM C94, Alt No. 3 and ACI STANDARD 304, "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete".

#### **3.03 REINFORCING FOR CAST-IN-PLACE CONCRETE**

- A. ACI 301, latest edition, "Specification for Structural Concrete for Buildings", Chapter 5 –Reinforcement, is hereby made a part of this Section.
- B. Reinforcement shall be placed in accordance with the latest requirements of CRSI, "Placing Reinforcing Bars" and "Recommended Practice for Placing Bar Supports" and with the following requirements:
  - 1. Reinforcement shall be continuous through construction joints unless otherwise indicated on the Drawings.
  - 2. Reinforcement shall be spliced in accordance with the requirements as indicated on the Drawings.
  - 3. Prior to placing concrete, the Contractor shall check all reinforcement after it is placed to insure that reinforcement conforms to the Contract Documents

and approved Shop Drawings.

4. Do not bend, weld or cut reinforcement in the field in any manner other than as shown on the Drawings.

### **3.04 EMBEDDED ITEMS FOR CAST-IN-PLACE CONCRETE**

- A. Coordinate the installation of all inserts required by other trades. Such inserts normally are to be in place prior to the placing of reinforcing steel.
- B. Place all required anchor bolts, anchor plates and dowels. All anchor bolts shall be set to correct locations by template.
- C. ACI 301, "Specification for Structural Concrete for Buildings", Sections 6.4 and 6.5, are hereby made a part of this Specification.

### **3.05 JOINTS FOR CAST-IN-PLACE CONCRETE**

- A. ACI 301, "Specifications for Structural Concrete for Buildings", Sections 6.1, 6.2 and 6.3 are hereby made a part of this Specification.
- B. Construction joints shall be as shown on the Drawings and shall be formed with keyed bulkheads. Unless otherwise noted on the drawings, construction joints in all concrete foundation walls or grade beams shall not exceed 40 linear feet.
- C. Control joints shall be as shown on the drawings. Unless otherwise noted on the Drawings, control joints in all paving slabs shall not exceed 600 s.f. and the maximum distance between joints in any direction shall not exceed 31 feet.
- D. Saw-cutting of slabs-on-grade must occur within a maximum of 24 hours after the start of concrete placement. Fill all saw-cut joints in concrete slabs which are to remain exposed with a modified epoxy joint sealant. Joints shall not be permanently filled until just prior to the completion of the Project. Joints which are to be covered with tile or carpeting shall have joints filled with cement grout flush to the slab surface.
- E. As an alternative at slabs-on-grade which do not remain exposed, control joints may be formed using Zip-Cap control joint (Model 832) by Greenstreak Plastic Products Company or approved equal. Installation shall be in strict accordance with the manufacturer's recommendations. Note that reinforcing steel will have to be depressed at the joints to permit placement of the Zip-Cap.

### **3.06 PLACING OF CAST-IN-PLACE CONCRETE**

- A. Notify the Architect at least 48 hours prior to each placement.
- B. Do not place concrete until reinforcing steel, inserts, sleeves and other work to be built into the concrete have been inspected and approved by the Architect or the Owner's representative and by all other trades concerned.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- C. See Section 3.07 for specific requirements related concreting in Hot Weather.
- D. See Section 3.08 for specific requirements related concreting in Cold Weather.
- E. Depositing: Delivery and placement of concrete shall be programmed so that the time lapse between batching and placement shall not exceed 1-1/2 hours. Concrete shall not be allowed a free fall of over 4 feet. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing.
- F. Concrete shall be deposited continuously, in horizontal layers of such thickness (not deeper than 18 inches) that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the Section. Placing shall be carried out at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or which has been contaminated by foreign materials shall not be deposited.
- G. Concrete shall be compacted thoroughly by vibrating to produce a dense, homogeneous mass without voids or pockets. Vibrators should be placed in concrete so as to penetrate approximately 3 inches to 4 inches into the preceding lift so as to blend the two layers. Vibrating techniques must assure that, when the coarse aggregate reaches the form, it stops and the matrix fills the voids.
- H. The Contractor shall become familiar with ACI-303, Chapter 7 regarding Placing and Consolidation of Architectural Concrete. All applicable recommendations contained within ACI-303 shall be strictly followed.
- I. Patching: Areas to be patched shall not exceed 1.5 square feet for each 1000 squares of surface area. Surface preparation and application of the patching compound specified in item 2.4.B shall be in strict accordance with the manufacturer's written directions. Patches shall match in every respect the color and texture of the surrounding surfaces. Mix formulation shall be determined by trial to obtain a color match when both the patch and surrounding concrete are cured and dry. After initial set, surfaces of patches shall be textured manually to obtain a match with the surrounding surfaces. All patches are subject to Architect's final acceptance as to appearance and quality. At holes formed by withdrawal of ends of steel snap-ties, wet and pack solid with patching mortar. Smooth out projections and fins with wet carborundum stones or power grinders. All voids, honeycombs and air pockets shall be patched. The Contractor shall make every reasonable effort to avoid voids, honeycombs and air pockets.

### 3.07 HOT WEATHER CONCRETING (ACI 305R)

- A. Hot weather is defined as a condition of high temperature, low humidity and high wind velocity which causes a rate of evaporation in excess of 0.2 pounds per square foot per hour as determined by ACI 305R, Figure 2.1.5. When concrete is placed under conditions of hot weather concreting, the Contractor shall provide extra protection of concrete against excessive placement temperatures and excessive drying throughout placing and curing operations. Extra protection shall include but not limited to the following:
1. All concreting during Hot Weather shall be done in accordance with ACI 305, "Recommended Practice for Hot Weather Concreting."
  2. When the temperature rises to 70 degrees Fahrenheit, all surfaces of the concrete shall be protected against rapid drying, particularly when the surface is exposed to direct sunlight.
  3. Concrete delivered to forms shall not exceed 90 degrees F.
  4. Forms, reinforcement, and air shall be cooled by water spraying immediately before placing concrete and spot temperatures shall be taken and recorded. Temperature of these items shall not exceed 90 degrees Fahrenheit.
  5. A Concrete Set Retarder in conformance with ASTM C494 Type D may be used in the concrete mix. Contractor to submit product information indicating dosage to be included to the Architect for review prior to concrete placement.
  6. Protect concrete during finishing operations by:
    - a. Continuous fog spray between finishing operations.
    - b. Immediately following screening, apply evaporating-retarding agent to accordance with the Manufacturer's recommendations.
  7. Immediately following screening, apply specific evaporation retarding agent in accordance with the Manufacturer's recommendations. Plastic cracking conditions may require application of compound several times during concrete finishing sequence.
  8. During curing operation for concrete slabs, cover concrete with wet burlap or cotton mats. Keep mats constantly wet for 7 days minimum.
- B. When the air temperature is forecast to exceed 92 degrees Fahrenheit at any time during the duration of any concrete pour, the Contractor shall submit a Hot Weather Concrete Procedure Plan to the Architect detailing the procedures to be used during the protecting, depositing, finishing, and curing of the concrete for review at least seven (7) days prior to casting the concrete.



### **3.08 COLD WEATHER CONCRETING (ACI 306R)**

- A. Cold weather is defined to occur when the air temperature falls to, or is expected to fall below 40 degrees Fahrenheit at any point during the depositing, curing, or protection period of concreting operations. Extra protection shall include but not limited to the following:
1. All concreting during Cold Weather shall be done in accordance with ACI 306, "Recommended Practice for Cold Weather Concreting."
  2. When the average daily temperature falls below 40 degrees Fahrenheit for three (3) consecutive days, all concrete elements shall be protected for a minimum of seven (7) consecutive days after the initial concrete placement, except foundation elements (footings, basement walls, frost walls, grade beams, etc.) shall be protected a minimum of three (3) days after the initial concrete placement. During this period, the temperature of the concrete shall maintain a minimum temperature of 50 degrees Fahrenheit but shall not exceed 70 degrees Fahrenheit.
  3. When the average daily temperature is expected to be 40 degrees Fahrenheit at the time of the concrete placement, the concrete delivered to the forms shall have a minimum temperature of 55 degrees Fahrenheit but shall not exceed 75 degrees Fahrenheit.
  4. A Concrete Set Accelerator in accordance with ASTM C494 Type C may be used in the concrete mix. Contractor to submit product information indicating dosage to be included to the Architect for review prior to concrete placement.
  5. All forms and reinforcement and other surfaces that will be in direct contact with the concrete shall be heated to a minimum temperature of 40 degrees Fahrenheit but shall not exceed 65 degrees Fahrenheit to prevent the rapid cooling of the concrete by contact with the surfaces.
  6. Keep forms free of ice, frost, and snow. Do not cast concrete against frozen subgrades. Pre-warm as needed.
  7. During conveying, concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality of the concrete is retained.
  8. The contractor shall maintain a record of temperatures of the concrete at the most exposed surfaces and the air temperature of each placement at the beginning and end of each day during the curing period. Records of the air and concrete temperatures shall be taken at a sufficient number of locations to

show the range of concrete and air temperatures. At the end of the protection period, the temperatures shall be submitted to the Architect for record.

- B. When the air temperature is forecast to exceed 32 degrees Fahrenheit at any time during the duration of any concrete pour, the Contractor shall submit a Cold Weather Concrete Procedure Plan to the Architect detailing the procedures to be used during the protecting, depositing, finishing, and curing of the concrete for review at least seven (7) days prior to casting the concrete.

### **3.09 FINISH OF CONCRETE SLABS**

- A. Interior slabs surfaces shall be screeded, leveled, floated and steel troweled. Mechanical troweling machines may be used if the desired finish and level tolerances can be obtained by their use, but finishing shall be by hand troweling at edges and areas inaccessible to machine trowels.
  - 1. Scratch Finish: Apply scratch finish to monolithic slab surfaces to receive concrete floor topping or mortar setting beds for tile, Portland cement terrazzo, and other bonded applied cementitious finish flooring material, and where indicated.
    - a. After placing slabs, finish surface to tolerances of  $F_F$  15 (floor flatness) and  $F_L$  13 (floor levelness) measured in accordance with requirements of ASTM E 1155. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms, or rakes.
  - 2. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or epoxy terrazzo, and where indicated.
    - a. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of  $F_F$  18 (floor flatness) and  $F_L$  15 (floor levelness) measured in accordance with requirements of ASTM E 1155. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
  - 3. Trowel Finish: Apply a trowel finish to monolithic slab surfaces exposed to view and slab surfaces to be covered with resilient flooring, carpet, ceramic or thin-set quarry tile, paint, or another thin film-finish coating system.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- a. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and finish surfaces to tolerances of  $F_F$  30 (floor flatness) and  $F_L$  25 (floor levelness) measured in accordance with requirements of ASTM E 1155. Grind smooth any surface defects that would telegraph through applied floor covering system.
  - b. Finish and measure surface so gap at any point between concrete surface and an unlevelled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 3/16".
- B. Trowel and Fine Broom Finish: Where ceramic or quarry tile is to be installed with thin-set mortar, apply a trowel finish as specified, then immediately follow by slightly scarifying the surface with a fine broom.
- C. Non-slip Broom Finish: Apply a non-slip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.
- D. Non-slip Aggregate Finish: Apply non-slip aggregate finish to concrete stair treads, platforms, ramps, sloped walks.
1. After completing float finishing and before starting trowel finish, uniformly spread 25 lbs. of dampened non-slip aggregate per 100 sq. ft. of surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface. After broadcasting and tamping, apply trowel finishing as specified.
  2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose non-slip aggregate.
- E. The addition of cement, sand, water, or mortar to slab surfaces while finishing concrete is strictly prohibited.
- F. All surfaces shall be finished to the tolerances noted above. Particular care shall be taken to finish troweling around the edges of the slabs so finish surface at edges shall be at same elevations as the rest of the top surface of the slab.

- G. Slabs shall be laid to temporary screeds set level at the proper elevations. Screeds to be pipe or metal. Wet screeds will not be allowed. Screeds shall be set no further apart than 12'-0" on center.
- H. Mark-off lines shall be formed with curbed edging tool, neat and true to line, uniform throughout. Conform to markings shown on Drawings.
- I. Immediately following finishing operations, arrises at edges and both sides of expansion joints shall be rounded to a 1/4 in. radius. Control joints shall be scored into slab surface with scoring tool. Adjacent edges of control joint shall at same time be finished to a 1/4 in. radius.
- J. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

**3.10 FINISH OF NON-ARCHITECTURAL CONCRETE SURFACES (other than slabs, stairs and walks and exposed-to-view architectural concrete finishes for landscaped walls)**

- A. Immediately upon removal of forms, point all form tie holes and other defects flush with surface, or as otherwise directed by the Architect.
- B. Remove all fins, and fill all honeycomb, holes and depressions with 1:2 mortar on all exposed interior and exterior concrete surfaces. Before patching, thoroughly wet surrounding concrete and keep wet for several hours. Brush into the surface to be patched with a grout of cement and water mixed to the consistency of paint. Carefully damp cure these patches.
- C. For non-architectural exterior or interior surfaces to remain unfinished and exposed to view, the surfaces, while concrete is "green", shall be wet, and rubbed with carborundum brick or other approved abrasive. Remove all fins, burrs, joint marks, and other projections, until uniform color and texture are produced. Any excess paste shall be removed. No cement grout or slush shall be used other than the cement paste drawn from the "green" concrete by the rubbing process. Wet rubbing shall not be required in storage and similar utilitarian spaces.
- D. Exterior or interior surfaces to receive paint or special coatings shall be finished as above, except uniform color and texture shall not be required.
- E. Concrete surfaces to receive waterproofing shall be cleaned and patched as above, remove all fins and fill all voids. Wet rubbing shall not be required on surfaces to receive waterproofing.

- F. Exposed concrete walls and pilasters shall have a smooth finish.
- G. Use chamfers at the edges of all exposed concrete.

### **3.11 FINISH OF CONCRETE WALKS AND STAIRS**

- A. Concrete walks and stairs shall be properly struck-off floated and finished with a fine broom finish or as otherwise noted. All joints and edges shall be tooled.
- B. Provide textured surfaces on all exterior concrete ramps.
- C. A sample area (10 sq. feet minimum) shall be finished and approved by the Architect prior to proceeding with the Work.
- D. All surfaces shall be properly damp cured.

### **3.12 CURING AND PROTECTION**

- A. Protect newly placed concrete against low and high temperature effects and against rapid loss of moisture. Moist cure all concrete for at least seven days at a temperature of at least 50 degrees F. by curing methods approved by the architect.
- B. For vertical or near-vertical surfaces, moist cure by keeping the form in contact with the concrete, or by other effective means approved by the Architect. Intermittent wetting and drying does not provide acceptable curing.
- C. Cure floor slabs by methods indicated in 2.05.E.
- D. See Section 3.07 for specific requirements related concreting in Hot Weather.
- E. See Section 3.08 for specific requirements related to concreting in Cold Weather.

### **3.13 ACCEPTANCE**

- A. When the tests on control specimens of concrete fall below the required strength, the Architect shall have the right to require, at the Contractor's expense, mix redesign, load tests and/or strengthening as directed, and/or removal and replacement of those parts of the structure in which such concrete was used.

### **3.14 CUTTING OF HOLES**

- A. Cut holes required by other trades in any cast-in-place concrete which did not receive sleeves. Use a core drilling process or sawing process which produces clean sharp edges and the minimum hole size which accommodates the piping, conduit, or equipment requiring the opening. Locations of holes and payment for this work will be by other trades and must be approved by the structural engineer.
- B. Obtain approval of Architect before cutting any holes for any trades.

### **3.15 FLOOR SEALING AND HARDENING**

- A. Except as noted in item "B" below, exposed floor surfaces, after hardening sufficiently to prevent damage and normally within several hours after final troweling, shall be treated with floor sealer in accordance with manufacturer's recommendations. Refer to item 2 4.D.
- B. All floor surfaces in the loading bays, all mechanical/electrical rooms and elevator machine rooms shall be treated with a liquid chemical hardener in accordance with manufacturer's recommendations. Refer to Section 03 3000.2.4.L.

### **3.16 EPOXY BONDING**

- A. Where required, new concrete shall be bonded to hardened new concrete or existing concrete in accordance with the adhesive manufacturer's instructions

### **3.17 CLEANING**

- A. The exposed faces of the cast-in-place concrete shall be cleaned of all stains, water marks, and leaked fines.

### **3.18 REMOVAL OF FORMWORK, SHORING AND RESHORING**

- A. Contractor shall be responsible for proper removal of formwork shoring, and reshoring.
- B. Remove vertical forms as soon as concrete has attained sufficient strength to support its own weight and their removal can be done without damage to the concrete. Apply curing compound immediately after removing forms.
- C. Keep horizontal forms and supports in place for not less than minimum periods of time noted below or until concrete has reached 60 percent of its specified strength.
  - 1. Soffits of beams or girders shall remain in place until concrete has attained 600 day-degrees.
  - 2. Forms of floor slabs shall remain in place until concrete has reached 400 day-degrees.  
Definition of day-degrees: Total number of days or fractions of days times mean daily air temperature at surfaces of concrete; where concrete surface is protected by insulated blankets or formwork, temperature may be taken under the blankets or formwork. For example, five days at temperature of 60 degrees F. equals 300 day degrees. Days or fractions of days in which temperature is below 50 degrees F. shall not be included in calculation of day-degrees.
- D. When forms are removed, place reshores at same time as stripping operations so that no unshored area is larger than one-fourth of a slab panel. Allow no live load on slab when stripping and shoring are being done.
- E. Field cure test cylinders under same conditions as concrete they represent in order to verify minimum strengths for form removal. Such cylinders and testing shall be

at the Contractor's expense.

**3.19 CLEAN-UP**

- A. Remove all scrap and debris from work of this Section from the job site daily.

**3.20 WATERSTOPS**

- A. Waterstops shall be securely held in place to prevent displacement during concrete placements. All necessary precautions shall be taken to ensure homogeneous concrete surrounding the waterstop.
- B. All straight run, connecting and intersecting joints shall be securely spliced in accordance with the manufacturer's recommendations. Spliced joints shall provide bond at least equal to the strength of the waterstop section.

**3.21 PERIMETER INSULTATION FOR FOUNDATION WALLS**

- A. Refer to Architectural Drawings for the location of all perimeter insulation for foundation walls.
- B. Material shall be installed in accordance with the manufacturer's instructions.

**END OF SECTION**

SECTION 04 00 01  
MASONRY FILED SUB-BID REQUIREMENTS  
(FILED SUB-BID REQUIRED)

**PART 1 - GENERAL**

**1.1 PUBLICLY BID FILED SUB-CONTRACTOR**

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
- C. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings: A0.1, A0.2, D1.0, D2.0, A1.0, A1.1, A1.2, A2.0, A3.0, A3.1, A3.2, A3.3, A3.4, A4.0, A4.1, A5.0, A5.1, S0.1, S0.2, S0.3, S1.1, S2.0
- D. Specification requirements for the File sub Bid Contract "Masonry Filed Sib Requirements" include all of the following listed Specification Sections: in their entirety:
  - 1. Section 04 00 01 – Masonry Filed Sub Bid requirements
  - 2. Section 04 01 20 – Unit Masonry
  - 3. Section 07 27 13 - Modified Bituminous Sheet Air Barriers
- E. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the Architectural and Demolition Drawings, not just those pertaining particularly to this Sub-Trade, unless specifically called out otherwise, regardless of where among the Drawings it appears: .
- F. Submit Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract.
- G. Sub Sub-Bid Requirements: NONE REQUIRED UNDER THIS SECTION.
- H. Submit bid in a sealed envelope in the manner described in the Instructions to Bidders before the date and time indicated for submission of bids.
- I. The Filed Sub Bid Contractor shall perform the complete trade work, including the following listed sub-trade classes of work, with employees on its own payroll unless the Filed Sub Bid Contractor identifies on the bid form, the name of a sub-trade subcontractor that will perform each of the following classes of sub-trade work and the corresponding sub-trade subcontract sum.
  - 1. None Required.
- J. If the Filed Sub Bid Contractor intends to use sub-trade subcontractors to perform any



portion of the trade work other than the customary sub-trade classes of work listed in Paragraph 1.1(E), above, the Filed Sub Bid Contractor shall list on the bid form the names of each such sub-trade subcontractor and each respective sub-trade subcontract sum unless: (a) the value of the sub-trade subcontract is less than Ten Thousand Dollars (\$10,000), or (b) the sub-trade subcontract is not subject to the provisions of M.G.L. c. 149, §§ 44A-J.

- K. Coordination with Commissioning Agent, Commissioning General Requirements and Building Enclosure Commissioning.

## 1.2 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from Construction Manager's or Filed- Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

## 1.3 PRE-INSTALLATION CONFERENCE

- A. Installer of the work of this trade is required to attend pre-installation conferences specified under the following specifications:
  - 1. Section 04 00 01 - Masonry
  - 2. Section 04 01 20 – Unit Masonry
  - 3. Section 07 27 13 - Modified Bituminous Sheet Air Barriers

## 1.4 SEQUENCING

- A. Phasing: Refer to Section 01 10 00 - SUMMARY, and Drawings for phasing and milestone completion requirements which affect the Construction Manager's Work and the Work of this Trade Contract.
- B. Coordinate work of this Filed Sub Bid Contract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- C. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Sub Bid Contract, have been received and approved by the Architect.
- D. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed

further until corrective work has been completed or waived.

## **PART 2 - PRODUCTS**

### **2.1 SCAFFOLDS AND STAGING**

- A. General: Filed Subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in the General Contractor .
1. Scaffolding and staging shall be provided by this Filed Sub Bid Contractor pursuant to requirements and shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub Bid Contractor requiring such scaffolding.
  2. Each Filed Sub Bid Contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the Construction Manager.
  3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility this Filed Subcontractor.
  4. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each workday to prohibit access to the scaffolding by unauthorized individuals.

### **2.2 HOISTING MACHINERY AND EQUIPMENT**

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Files Subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Filed Subcontractor, as referenced under section 01 50 00 - Construction Facilities and Temporary Controls.

## **PART 3 – EXECUTION (Not Used)**

END OF SECTION

SECTION 04 01 20

UNIT MASONRY

(FILED SUB-BID REQUIRED AS PART OF SECTION 04 00 01 MASONRY)

PART 1 - GENERAL

1.01 General

A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.

1.02 The drawings on which this Contract is based are listed in Section 00 86 00. Consult all drawings, note all conditions that may affect the work, and care for same executing this contract.

1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the masonry restoration and related work including but not limited, to the following:

A. Refer to the drawings for specific work notes.

1. New masonry CMU wall assemblies.
2. Repair and replace areas of existing damaged masonry CMU as indicated.
3. Provide new openings in existing masonry CMU wall assemblies.
4. Infill masonry openings with masonry, material to match adjacent.
5. Demolition and infill of masonry wall where access by other trades is required, i.e. plumbing, door frames, entrance openings, and access.
6. Install steel lintels in masonry opening supplied by 05 50 00 Metal Fabrications
7. Install new through-wall flashings in existing masonry walls where indicated. This shall include the selective demolition and reinstallation of new CMU masonry affected by the installation of the new through-wall flashing, doors, windows, vents, etc...
8. Sealants associated with work of this Section, including but not limited to masonry control joints, penetrations and loose lintel ends,
9. Clean metal work where indicated.
10. Thru-wall flashing, weep holes, metal counter flashings and ties at new exterior walls
11. Cavity wall drainage mats / mortar net.

12. Fire stopping of masonry partitions to adjacent surfaces
13. Door frames set into masonry shall be grout solid by this section
14. Unit Prices for CMU repair / replacement
15. All equipment, staging, scaffolding, hoisting, and demolition for the work of this Section.

1.04 Related Sections

- A. Section 00 27 00 – Unit Prices
- B. Section 02 41 19 - Selective Demolition
- C. Section 05 50 00 - Metal Fabrications
- D. Section 05 12 00 – Structural Steel
- E. Section 06 10 00 - Rough Carpentry
- F. Section 07 92 00 - Firestopping
- G. Section 07 92 00 – Joint Sealants

1.05 Submittals

- A. Submit for approval in accordance with the requirements of Section 01 33 24, the following:
  1. Manufacturers brochures and product data for all manufactured and purchased products.
  2. Actual color samples of:
    - a. Caulking
    - b. Mortar Mix
    - c. CMU Samples proposed for Repair. Individual brick masonry units for each type of masonry used with manufacturer's certificate of compliance with project specifications. Units shall show the extreme variations in colors, textures, finishes and dimensions and shall match existing color and texture of adjacent masonry surfaces.
    - d. Metal Flashing
- B. Sample Panels (Each Mortar Type)
  1. Construct at the site, mock-up panels as requested by the Architect for face brick and glass unit masonry. Panel shall show brickwork, joint finishing and construction methods to be incorporated into the work. Incorporate ties, flashing and weeps. All masonry work

constructed subsequently shall conform to the approved panel. Construct new panels as necessary until approved by the Architect.

1.06 Quality Assurance

A. Applicator Qualifications:

1. Experienced in the application of the specified products.
2. Employs persons trained for the application of the specified products.

B. Through-wall flashing installation in existing masonry wall procedures: Provide application and method procedures including bracing and shore for installation of new through wall flashings in existing masonry walls.

C. Product Data: Provide manufacturer's product data sheets on all products to be used for the work.

D. Applicator Qualifications: Submit qualifications of applicator.

1. Certification that applicator is experienced in the application of the specified products.
2. List of recently completed exterior masonry restoration cleaning projects, including project name and location, names of owner and architect, and description of cleaning products used, substrates, environmental regulations and application procedures.

E. Environmental Regulations: Describe testing, handling, treatment, containment, collection, transport, disposal and discharge of hazardous wastes and cleaning effluents. Describe any hazardous materials to be cleaned from substrates. Describe types of coatings and paints to be stripped from substrates. Indicate any lead-based paints. Submit applicable local environmental regulations.

F. Protection: Describe methods for protecting surrounding areas, landscaping, building occupants, pedestrians, vehicles and non-masonry surfaces during the work from contact with chemical restoration cleaners and paint strippers, residues, rinse water, fumes, wastes, and cleaning effluents.

G. Surface Preparation: Describe surface preparation to be completed before application of restoration cleaners and paint strippers.

H. Application: Describe application procedures of restoration cleaners and paint strippers.

1.07 Protection

A. All materials shall be carefully handled in transit and on the site so as to keep units whole, edges sharp and faces clean and undamaged. Masonry units shall not be dumped out, but shall be delivered in pallets, handles individually or in suitable groups and properly stacked.

B. Masonry units of all types shall be protected from wetting by rain or snow and shall be kept covered when not in use.

- C. Manufactured materials such as cleaning agents, mortar mix, cement and lime shall be delivered and stored in their original containers, plainly marked with product identification and manufacturer's name.
- D. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be incorporated into the Work and shall be removed from the site.
- E. Store unopened cartons of glass block in a clean, cool, dry area.
- F. Project/Site Conditions: Do not install glass block / masonry brick units when temperature is 40°F (4°C) and falling. Maintain the temperature of glass unit masonry / masonry brick units above 40°F (4°C) for the first 48 hours after construction.

#### 1.8 Environmental Requirements

- A. Do not repoint, coat, caulk, clean, wash down or wet surfaces, or waterproof when temperature may drop below 40 degrees F within 24 hours. Follow cold weather procedures as set out in ASNI A41.1 when temperatures may drop below 40 degrees F.
- B. For work not listed above, follow manufacturers recommendations for environmental requirements.

#### 1.09 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. American Concrete Institute (ACI) and American Society of Civil Engineers (ASCE): ACI 530.1/ASCE 6 - "Specifications for Masonry Structures"
  - 2. ASTM A 82 - Steel Web, Plain, for Concrete Reinforcement.
  - 3. ASTM A 123 - Zinc (Hot-Dip Galvanized) Coating on Iron and Steel Products.
  - 4. ASTM A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - 5. ASTM A 497 - Welded Wire Fabric; Deformed, for Concrete Reinforcement.
  - 6. ASTM A 615 - Deformed and Plain Billet-Steel Bar for Concrete Reinforcement.
  - 7. ASTM A 641 - Zinc-Coated (Galvanized) Carbon Steel Wire.
  - 8. ASTM B 117 - Salt Spray (Fog) Testing.
  - 9. ASTM B 633 - Electrodeposited Coatings of Zinc on Iron and Steel.
  - 10. ASTM C 5 - Quicklime for Structural Purposes.
  - 11. ASTM C 55 - Concrete Building Brick.
  - 12. ASTM C 62 - Building Brick.
  - 13. ASTM C 67 - Sampling and Testing Brick and Structural Clay Tile.
  - 14. ASTM C 90 - Load-Bearing Concrete Masonry Units.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

15. ASTM C129 - Non-Load Bearing Concrete Masonry Units.
16. ASTM C 140 - Method of Sampling and Testing Concrete Masonry Units.
17. ASTM C 144 - Aggregate for Masonry Mortar.
18. ASTM C 150 - Portland Cement.
19. ASTM C 207 - Hydrated Lime for Masonry Purposes.
20. ASTM C 216 - Facing Brick.
21. ASTM C 270 - Mortar for Unit Masonry.
22. ASTM C 387 - Packaged, Dry, Combined Materials, for Mortar and Concrete.
  
23. ASTM C 404 - Aggregates for Masonry Grout.
24. ASTM C 476 - Grout for Masonry
25. ASTM C 514 - Water Penetration and Leakage Test to Assess Performance of Integral Water Repellent Admixtures.
26. ASTM C 595 - Blended Hydraulic Cement.
27. ASTM C 652 - Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
28. ASTM C 744 - Prefaced Concrete and Calcium Silicate Masonry Units.
29. ASTM C 778 – Specification for Standard Sand.
30. ASTM C 780 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
31. ASTM C 954 - Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs.
32. ASTM C 1019 - Method of Sampling and Testing Grout.
33. ASTM C 1072 - Method for Measurement of Masonry Flexural Bond Strength.
34. ASTM C 1093 - Standard Practice for Accreditation of Testing Agencies for Masonry.
35. ASTM C 1329 – Standard Specification for Mortar Cement.
36. ASTM C 1357 – Test Methods for Evaluating Masonry Bond Strength.
37. ASTM D 2000 - Classification System for Rubber Products.
38. ASTM D 2287 - Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
39. ASTM E 119 - Fire Tests of Building Construction and Materials.
40. ASTM E 447 - Compressive Strength of Masonry Prisms.
41. ASTM E 488 - Strength of Anchors in Concrete and Masonry Elements.
42. ASTM E 518 - Test Method for Flexural Bond Strength of Masonry.
43. American National Standards Institute Building Code requirements.
44. MCAA – Hot and Cold Weather Masonry Construction.

The following reference materials are hereby made a part of this Section by reference thereto:

45. UL Fire Resistance Directory.
46. BIA applicable Technical Notes, Research Reports and Standards, including, but not limited to the following
  - a. BIA Research Report Number 15 – Causes and Control of Efflorescence in Brickwork.
  - b. BIA Technical Notes, Number 20 - Cleaning Brick Masonry.
47. IMI: Masonry Construction Guide Manual.
48. PCA, “Concrete Masonry Handbook”.
49. NCMA applicable TEK Bulletins.
50. NCMA TEK Bulletin N°. 45 - Removal of Stains from Concrete Masonry Walls.
51. ASTM E283 - 04 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure and Temperature Differences Across the Specimen.
52. ASTM E330 -02 Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
53. ASTM E547 -00 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference.
54. ASTM B209M -07 Standard Specification for Aluminum and Aluminum–Alloy Sheet and Plate.
55. ASTM C920 -08 Standard Specification for Elastomeric Joint Sealants.
56. ASTM E1886-05 and ASTM E 1996 –09 Impact and Cycle Tests
57. Dade County Test Standards (Dade and Broward Counties):
  - a. Test Protocol TAS 201 – Large and Small Missile Impact Tests
  - b. Test Protocol TAS 202 – Air, Water, Structural Tests
  - c. Test Protocol TAS 203 – Cyclic Wind Pressure Loading Tests
58. Notice of Acceptance Label (NOA) Issued by Miami-Dade County Product Control Division.
59. Tested in accordance with AAMA/WDMA/CSA 101/1.S.2/A440-05

1.10 Scaffolding, Limited Access Zone, Bracing and Equipment

- A. Furnish, install and maintain as long as is necessary, removing when no longer needed safe and adequate staging, scaffolding, hoisting, centering and other equipment necessary for the proper execution of the Work specified and indicated.
- B. Safety requirements for masonry wall construction are to be coordinated with the General Contractor and include the following:
  1. A limited access zone shall be established whenever a masonry wall is being constructed. The limited access zone shall conform to the following:



- a. The limited access zone shall be established prior to the start of construction of the wall.
  - b. The limited access zone shall be equal to the height of the wall to be constructed plus four feet and shall run the entire length of the wall.
  - c. The limited access zone shall be established on the side of the wall which will be unscaffolded.
  - d. The limited access zone shall be restricted to entry by employees actively engaged in constructing the wall. No other employees shall be permitted to enter the zone.
  - e. The limited access zone shall remain in place until the wall is adequately supported to prevent overturning and to prevent collapse unless the height of the wall is over eight feet, in which case the limited access zone shall remain in place until the requirements of paragraph (b) of this Section have been met.
  - f. All masonry walls over 8 feet in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.
- C. Staging and scaffolding shall comply with all applicable legal codes and regulations, including the Williams-Steiger Occupational Safety and Health Act of 1970 (OSHA).

#### 1.11 Warranty

- A. This Contractor further states that he will, at his own expense, repair and replace all such defective materials or workmanship and all other Work damaged thereby which is so damaged during the two (2) year warranty period.

### PART 2 - MATERIALS

#### 2.01 Masonry Materials

- A. All materials not specified by trade name shall meet the approval of the Architect.
- B. Materials shall be stored and handles so as to prevent damage and deterioration. Manufactured materials such as cement and lime shall be delivered and stored in the original containers and those showing evidence of damage shall be wholly rejected.
- C. Portland cement shall conform to ASTM-C-150, current specifications, Type 1.
- D. Hydrated lime shall be high calcium type conforming to ASTM C-207, current specifications, Type S.

#### 2.02 CONCRETE MASONRY UNITS

Acceptable Concrete Masonry Fabricators: Subject to compliance with the requirements specified herein, Fabricators offering concrete masonry products which may be

incorporated in the work include the following, or approved equal:

- A. Westbrook Concrete Block Company, Westbrook, CT.
- B. Foster-Southeastern, Inc., Holbrook, MA.
- C. Adolf Jandris and Sons, Inc., Gardner, MA.
- D. Anchor Concrete Products, Inc., Brick, NJ.
- E. Trendstone, Trenwyth Industries, Inc.; Emigsville, PA.
- F. Medway Block Company, Inc., Medway, MA.
- G. Park Avenue Cement Block Co., Cranston, RI.

1. Load bearing hollow and solid, normal weight concrete masonry units: Conform to ASTM C90, Type 1, Class 1.
  - A. Plain-faced units of nominal thickness indicated on the Drawings, nominal 8 by 16 inch face dimension with light gray color and uniform medium-fine texture, sound, true to plane and line, and free from chips, cracks, and other defects.
    - a. 4 inch width, 3 core regular with a shell face of 1.00 inch, 76 percent solid having a fire resistance rating of 3/4 hour. Provide solid block for all cut blocks of this width.
    - b. 6 inch width, 2 core regular with a shell face of 1.06 inch, 56 percent solid having a fire resistance rating of 1 hour. Provide solid block for all cut blocks of this width.
    - c. 8 inch width, 2 core-62 with a shell face of 1.50 inch, 62 percent solid having a fire resistance rating of 2 hours minimum.
    - d. 12 inch width, 2 core regular with a shell face of 1.50 inch, 50 percent solid having a fire resistance rating of 3 hour minimum.
    - e. Recycled content: Use maximum available percentage of recycled materials. Concrete masonry units incorporated into the work shall contain not less than 3 percent of recycled content.
  - B. Aggregate: sand and gravel: conform to ASTM C 33.
  - C. Minimum allowable compressive strength for an individual unit of not less than 1700 psi (net area); and not less than 1,900 psi. (net area) for average of 3 units; when tested in accordance with ASTM C 140.
  - D. Oven dry density: 125 pounds per cubic foot.
  - E. Moisture content for average of 3 units, when delivered, not exceeding 35 percent of the total absorption, when tested in accordance with ASTM C 140.
  - F. All interior CMU exposed outside corners to be factory bullnosed.
2. Non-loadbearing concrete masonry units (at interior non-load-bearing partitions only): Conform to ASTM C129, Type 1, light weight.
  1. Plain-faced units of nominal thickness indicated on the Drawings, nominal 8 by 16 inch face dimension with light gray color and uniform medium-fine texture, sound, true to plane and line, and free from chips, cracks, and other defects.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- a. Recycled content: Use maximum available percentage of recycled materials. Concrete masonry units incorporated into the work shall contain not less than 3 percent of recycled content.
  2. Wythes:
    - a. 4 inch width, 3 core regular with a shell face of 1.00 inch, 76 percent solid having a fire resistance rating of 3/4 hour. Provide solid block for all cut blocks of this width.
    - b. 6 inch width, 2 core regular with a shell face of 1.06 inch, 56 percent solid having a fire resistance rating of 1 hour. Provide solid block for all cut blocks of this width.
    - c. 8 inch width, 2 core-62 with a shell face of 1.50 inch, 62 percent solid having a fire resistance rating of 2 hours minimum.
    - d. Recycled content: Use maximum available percentage of recycled materials. Concrete masonry units incorporated into the work shall contain not less than 3 percent of recycled content.
  3. Aggregate: sand and gravel,
    - a. Normal weight block: conform to ASTM C 33.
    - b. Light weight block: conform to ASTM C 331.
  4. Minimum allowable compressive strength for an individual unit of not less than 500 psi (net area); and not less than 600 psi. (net area) for average of 3 units; when tested in accordance with ASTM C 140.
  5. Oven dry density:
    - a. Normal weight units: 125 pounds per cubic foot
    - b. Light weight units: 105 pounds per cubic foot
  6. Moisture content for average of 3 units, when delivered, not exceeding 35 percent of the total absorption, when tested in accordance with ASTM C 140.
  7. Provide units clearly labeled as non-load-bearing.
  8. All interior CMU exposed outside corners to be factory bullnosed.
- A. Concrete Building Brick: ASTM C55 and characteristics indicated below for grade, type, size and weight classification.
1. Grade: N.
  2. Type: moisture controlled units, Type 1.
  3. Size: modular, 2-1/4" x 3-5/8" x 7-5/8".
  4. Weight classification: Same as for concrete block.
- B. Concrete masonry grout blocks: Open end high strength concrete masonry units and slot type strength concrete masonry units for use at reinforced concrete masonry construction where indicated on the Drawings. Conform to

all requirements specified above for standard concrete masonry units, and the following additional requirements:

1. Plain-faced units of nominal thickness indicated on the Drawings, nominal 8 inch by 16 inch face dimension with light gray color and uniform medium-fine texture, sound, true to plane and line, and free from chips, cracks, and other defects.
2. All interior CMU exposed outside corners to be factory bullnosed.

3 MORTAR

A. Prepackaged mortar (ready mix) complying with ASTM C 1142, or site-mixed portland cement mortar complying with ASTM C 270 may be used.

1. Admixtures are not permitted except where expressly specified herein or as otherwise approved by Architect for specific field conditions.
2. Color and texture: As selected by the Architect from manufacturer's full range of available options.

B. Mortar materials for site mixed mortar:

1. Portland cement for masonry conforming to ASTM C 150, Type I, non-staining, without air entrainment. Use Type III as necessary for laying masonry in cold weather.
  - a. For brick masonry, use color matching portland cement.
  - b. For concrete masonry, use gray color portland cement
2. Aggregates for brick mortar: Clean sand, washed uniformly well graded, conforming to ASTM C 144, except for joints 1/4 inch and down use aggregate with 100 percent passing a No. 16 sieve.
3. Aggregates for grout: Conforming to ASTM C 144 for fine aggregate and ASTM C 404, Size 8 or 89.
4. Aggregate for concrete masonry mortar: Clean, washed uniformly well graded sand conforming to ASTM C 144, with the following gradation, and having a fineness modulus between 2.15 and 2.35:

| 4  | Seive Size | Percentage Passing |
|----|------------|--------------------|
| 5  | #4.....    | 100%               |
| 6  | #8.....    | 95 to 100%         |
| 7  | #16.....   | 70 to 100%         |
| 8  | #30.....   | 40 to 75%          |
| 9  | #50.....   | 10 to 35%          |
| 10 | #100.....  | 2 to 15%           |
| 11 | #200.....  | 0 to 5%            |

1. Mortar pigments: Commercial alkali-resistant, non-fading mortar

pigments, oxides of iron where feasible, synthetic type, equal to products of

- a. Davis Colors, Beltsville MD.
  - b. Solomon Grind-Chem Service, Inc., Springfield IL.
  - c. Landers Segal Color, Inc., Passaic New Jersey.
2. Lime: Approved brand of plastic hydrated lime, conforming to ASTM C 207, Type "S".
  3. Water: Clean and fresh without contaminants.

C. Prepackaged mortar (ready mix)

1. General: complying with ASTM C 1142, factory blended consisting of:
  - a. Portland cement: Comply with ASTM C 150, Type I.
  - b. Hydrated lime: Type S, complying with ASTM C 207.
  - c. Aggregate: Provide clean, sharp, well graded aggregate free from injurious amounts of dust, lumps, shale, alkali, surface coatings, and organic matter, and complying with ASTM C144.
  - d. Admixtures: Prepackaged mortar mixes contain manufacturer's own proprietary admixtures, additional field admixtures are strictly prohibited.
  - e. Water: Provide water free from deleterious amounts of acids, alkalis, and organic materials. Water shall be potable.
  - f. Pigments: Chemically inert synthetic iron oxide pigments, lightfast, weather resistant, complying with ASTM C-979.
    - 1) Mortar Color: As selected by Architect from manufacturer's full range of standard colors.

D. Mortar types:

1. Mortar for masonry below grade or in contact with earth: ASTM C 270 type M using the property specification.
2. Mortar for load bearing masonry: ASTM C 270 type S using the property specification.
3. Mortar for non-load bearing masonry above grade: ASTM C 270 type N using the property specification.

4. GROUT MIXES

- A. Prepackaged grout (ready mix) complying with ASTM C 1107, or site-mixed Portland cement grout complying with ASTM C 476 may be used.
- B. Grout for setting equipment, anchor bolts, elevator guide rails, structural steel elements and miscellaneous metals: Non-metallic high-strength controlled expansion grout of flowable consistency, having a compressive strength of 6,500 pounds per square inch (44.8 MPa) at 28 days; slump 8 to 10 inches.

1. Five Star Products, Inc., Fairfield CT, product "Five Star Grout".
  2. L&M Construction Chemicals, Omaha NE, Product: "Crystex".
  3. Master Builders, Cleveland, OH., product "Masterflow 713".
  
  4. Sika Corporation, Lyndhurst, NJ., product "SikaGrout 212".
  5. Sonneborn Building Products, Minneapolis, MN., product "SonogROUT 10K".
  6. Symons Corporation, DesPlaines, IL., product "Symons Multi Purpose Grout".
- C. Grout for engineered masonry (core fill): Course grout having a compressive strength of 2,000 to 2,250 pounds per square inch (13.8 to 15.5 MPa) at 28 days; slump 8 to 10 inches.
- D. Grout for bond beams and lintels: Fine grout having a compressive strength of 2,500 to 3,000 pounds per square inch (17.2 to 20.6 MPa) at 28 days; slump 8 to 10 inches.

## 2.03 REINFORCEMENT AND ANCHORAGE MATERIALS

- A. Single wythe longitudinal reinforcement for concrete masonry unit walls and partitions: in overall width 1-5/8 inches less than the overall wall thickness, as manufactured by Dur-O-Wal, Hohmann, AA Wire, or equal.
1. Interior partitions: Truss design, 9 gage ASTM A 641 class 1 galvanized wire.
  2. Exterior partitions: Truss design, 9 gage ASTM A 641 class 3 hot dipped galvanized wire.
  3. Provide preformed reinforcing sections at intersections of masonry walls and partitions, and whenever walls and partitions change direction.
- B. Multi-wythe longitudinal reinforcement for concrete masonry unit walls and partitions: in overall width 1-5/8 inches less than the overall wall thickness, with moisture drip as manufactured by Dur-O-Wal, Hohmann, AA Wire, or equal.
1. Interior partitions: Truss design, 9 gage ASTM A 641 class 1 galvanized wire without a moisture drip
  2. Exterior partitions: Truss design, 9 gage ASTM A 641 class 3 hot dipped galvanized wire with moisture drip.
- C. Reinforcing steel, additional to rods which are embedded in concrete: Solid steel reinforcing bars, conforming to ASTM A 615, Grade 60, hot dipped galvanized in accordance with ASTM 123, B2 finish, of sizes indicated on the Drawings.

## 2.04 Masonry Filler Materials

- A. Filler for top joint of interior non-bearing masonry partitions, at control joints and where otherwise indicated or required shall be non-combustible compressible filler, 3/8 inch thick and in widths required to fill joints to a point 3/8 inch from each face of walls.

2.05 Reinforcing Bars

- A. Type: Where indicated on the Drawings and where required, reinforcing bars used at masonry reinforcing wall conditions shall conform to ASTM A-615, Grade 60, including all applicable requirements set forth under Section 03300, Concrete.
- B. Placement: Refer to Drawings for spacing and sizes of reinforcing bars required at bearing and non-bearing masonry wall conditions including horizontal bar where required to top of masonry unit bond beam. Maintain 1 inch minimum clearance on all sides of reinforcing bars. Support and secure bars against displacement during grouting. Bars shall be a minimum of 4'-0" long except as otherwise indicated on the Drawings. Lapping at splices at horizontal applications and single lengths and where shown at vertical application shall be in accordance with published recommendations.

2.06 Masonry Ties:

- 12 Brick Veneer Anchors and Ties: Pos-I-Tie by Heckmann Building Products, Chicago, IL or equal with the following characteristics:
- 13 Veneer Anchors: Ties shall be thermally broken, zinc alloy barrel, with flanged head and eye with corrosion resistant self-drilling threaded screws to cover fastener hole. Length of barrel shaft sized to suit depth of material penetrated, allowing shoulder to seat directly on back-up, with  $\frac{3}{4}$  inch diameter washer under flanged head sealing surface penetration at anchor.
- 14 Corrugated stainless steel masonry ties screw anchored every course at 12" O.C.
  - 1. Screws for Brick Veneer to Concrete, CMU, Wood or Brick: Heckmann Tapcon.
  - 2. Screws for Brick Veneer to Structural Steel: Heckmann Dril-It.
    - a. At stack bond areas and where heights of brick of other than running or flemish bond exceed 8 inches shall be minimum 3/16 inch diameter wire, 5 inch length for use with high strength anchor with continuous 9 GA galvanized wire extending a minimum of 1'-0" beyond stack bond joint. Finish shall be hot-dipped galvanized.
    - b. In general, ties are to be screw anchored every course at 12" o.c. The minimum quantity is one.
    - c. Ties for new block walls to existing walls shall be continuous channels AHB 360 C with slots for #363 Gripstay Anchors.

2.07 Mortar and Grout

A. Mortar

- 1. Glass Unit Masonry: Mortar: Limit cementitious materials in mortar to Portland Cement and lime. Type S in accordance with ASTM C270. Mortar shall be 1 part Portland Cement,  $\frac{1}{2}$  part lime, and sand equal to  $2\frac{1}{4}$  to 3 times the amount of cementitious material (cement plus lime), all measured by volume. (For exterior glass block panels, an integral type water proofer should be added to the mortar mix.) **No antifreeze compounds or accelerators allowed.**

2. Portland Cement: Type I in accordance with ASTM C150. If a waterproof Portland Cement is used, the integral type waterproofer shall be omitted. (Masonry Cement is not acceptable.) Color: White.
3. Lime: Shall be a dolomitic pressure-hydrated lime, special hydrate, Type S, in accordance with ASTM C207.
4. Sand: A clean, white quartzite or silica type, essentially free of iron compounds, in accordance with ASTM C144, not less than 100% passing a No. 8 sieve.
5. Integral Type Water-repellent: Stearate type by The Euclid Chemical Company (Integral Waterpeller® Powder, **Not Liquid**, 1-800-321-7628), or approved equal. Note: Add Integral Waterpeller® powder to dry mortar mix. Do not add powder to wet mortar mix.
6. External Type Water Proofer: Water based silane sealer type by BASF Corporation (HYDROZO ENVIROSEAL™ 40, 1-800-243-6739). Note: Remove excess sealer from glass surfaces soon after application.
7. Veneer Masonry: Type N Mortar – min. 28 day compressive strength: 750 PSI.
8. Grout: Fine Type - Min. 28 day compressive strength: 2500 PSI.

#### 2.08 Mortar Materials

- A. Cement: Shall be an American Portland Cement, conforming to ASTM C-150, Type II for concrete masonry units as approved by the Architect
- B. Air Entraining Admixtures: For grout fill shall conform to C-260
- C. Lime: Shall be plastic hydrate, conforming to ASTM C-207, Type S (Only)
- D. Sand: Clean, washed uniformly well graded, conforming to ASTM C144-542, 100% passing a No. 8 sieve with not more than 35% passing a No. 50 sieve, and with a fineness modulus maintained at 2.25 plus-or-minus 0.10, light in color, and obtained from a single source.
- E. Shrinkage control additive for parging mortar mix for individual brick replacement: Acrylic polymer modifier, specifically formulated for adding to mortar mixes, Rohm & Haas Acrylic Modifier; Sisibond Products, Inc. C-21; Boiardi Products, Inc. Elastiment 150; or equal.
- F. Integral waterproofing for exterior mortar mixes: Master Builders Omicron Mortarproofing, Sonneborn Hydrocide, Pardee Dycrete, or equal.
- G. Water: Shall be potable and free from injurious contaminants

#### 2.09 CMU Mortar

- A. CMU mortar color and texture shall match existing as nearly as possible. Use varying sand colors to affect modification of the final mortar color, as approved by the Architect

#### 2.10 Sheet Copper

- A. All sheet copper shall be American made; manufacturer's trade name and weight of copper shall be marked on each sheet. Thickness shall match existing in areas of repair.



1. Copper: ASTM B 370; temper 0600 is required for forming; 16 oz. (0.0216 inch thick) except as otherwise indicated.
  2. Provide lead coating of 0.06 lbs per sq. ft. on exposed copper surfaces.
- 2.11 Counter Flashing - Counter Flashing shall be 2-piece 16 ounce copper reglet flashing as manufactured by Fry Reglet company or approved equal.
- A. Air Barrier Tape: CCW-705 Air Barrier Tape by Carlisle Coatings and Waterproofing or equal.
  - B. Adhesive for Bonding Insulation at Vertical Surfaces: Product recommended by insulation manufacturer with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation or substrates.
- 2.12 Cavity Wall Drainage Mat and Weep Vents
- A. Drainage mat shall be a polyethylene or nylon mesh in trapezoidal configuration, 10 inches high, thickness equal to cavity width, as manufactured by Mortar Net U.S.A. Ltd.
  - B. Weep vents shall be synthetic fiber bonded with flame-retardant adhesive with 90% open mesh, as manufactured by Mortar Net or approved equal.
- 2.13 Existing Masonry Surfaces
- A. Materials used to repair or patch existing masonry surfaces shall match as nearly as possible the existing masonry surfaces being patched in color, size and texture, subject to the approval of the Architect.
- 2.14 Membrane Flashing
- A. Masonry thru-wall flashing shall be coated 3 ounce copper equal to Phoenix Building Products Co., "Cop-R-Flash" Type A, AFCO Products Co., "Copper-Fabric", or York Mfg. Co "Cop-R-Tex".
- 2.15 Coating for Reinforcing Steel
- A. Corrosion protection for all steel reinforcing exposed during cast stone restoration shall be Sika Armatec 110 CPO CEM as manufactured by Sika Corp. This is a two component, factory proportioned mix.
- 2.16 Epoxy Repair Gel
- A. Epoxy: Sikadur Injection Gel

### PART 3 - EXECUTION

#### 3.01 Masonry

- A. All masonry shall be laid with and shall be reinforced and tied as detailed and in accord with the recommendations of the applicable trade publications. Bond and coursing shall match existing.

- B. Installation of through wall flashing in existing masonry walls shall be done in increments / sections as not affect the structural integrity of the existing masonry wall. The contractor shall submit for approval procedures for the installation of the through wall flashings including all bracing and shoring required to do the work prior to commencement of work.

3.02 Mixing Proportions

- A. Mixing: Mortars shall be machine-mixed in an approved type of mixer in which the quantity of water can be accurately and uniformly controlled. Where hydrated limes are used for mortars requiring a lime content, use the dry mix method. Where the dry mix method is employed, the materials for each batch shall be well raked and turned over together before the water is added until the even color of the mixed materials indicates that the cementitious materials have been thoroughly distributed throughout the mass, after which the water shall be gradually added until a thoroughly mixed mortar of the required plasticity is obtained. The same mortar mixture shall be used throughout.
- B. The method of measuring materials shall be such that the specified proportions of the materials can be controlled and accurately maintained. Shovel measurement will not be allowed.
- C. All cementitious materials and aggregate shall be mixed for a least three (3) minutes in a mechanical batch mixer with the maximum amount of water to produce a workable consistency. Hand mixing shall not be used unless approved.
- D. Mortar which has begun to set or is not used within 2-1/2 hours after initial mixing shall be discarded. Mortar which has stiffened due to evaporation within the 2-1/2 hour period shall be retempered to restore its workability. Retempering mortar which has partially hardened without additional cement aggregate or water will not be permitted.

3.03 Workmanship

- A. All masonry shall be laid by skilled workers under adequate supervision, shall be laid plumb, true to lines and levels with joints of uniform thickness (unless otherwise noted), all surfaces true and corner straight and plumb.
- B. The Masonry Subcontractor shall examine all Drawings as to requirements for accommodations and/or installation of work of other trades and shall provide all required recesses, chases, slots, cutouts, and built-ins for such work and shall also be responsible for the accommodations and/or installations of bearing plates, setting plates, setting of loose lintels, placement of anchors, bolts, reinforcing bars, and other items occurring in the masonry work. Every precaution should be taken to minimize future cutting and patching.
- C. No masonry shall be erected when the ambient temperature is below 40 degrees F. on a falling temperature or when there is a probability of freezing conditions existing within forty-eight (48) hours, unless directed or approved by the Architect.
- D. No frozen work shall be built upon and no brick or other unit having a film of water or frost on its surfaces shall be laid.
- E. Measurements: Proportions shall be by volume. One (1) bag of Portland cement (94 pounds) shall be considered as one (1) cubic foot; one (1) bag of lime (50 pounds) as 1 1/4 cubic foot; and sand shall be measured in dry condition (80 pounds being equal to one (1) cubic foot).
- F. Mortars shall be as follows:

1. Match color and texture of existing mortar.
  2. Conduct tests using the ingredients specified and make recommendations as to mix that will produce the most satisfactory results depending on the conditions prevailing at the time of mixing proportions.
- G. Mortar Strengths: Mortar for units except reinforced masonry units shall possess a strength of Type S mortar when tested in cubes or cylinders at the end of a 28-day aging period, all in accordance with ASTM C-270. Reinforced masonry unit mortar shall possess strength of 2500 psi in 28 days, in accordance with ASTM C-476, Type PM or PL.
- H. Anti-freeze admixtures will not be allowed to be in the mortar.
- I. Bond shall be kept plumb throughout. Units with greater than 12% absorption shall be wetted (except in freezing weather) before laying, as necessary to prevent too rapid an absorption of the water from the mortar and to ensure maximum bond. Work and items to be built in the masonry shall be built in as the work progresses and the space around built-in items shall be filled solidly with masonry and mortar. Chases and pockets shall be built-in as shown on the drawings and shall be kept free from mortar and other debris. All masonry partitions shall extend to underside of the deck or structure above, except as otherwise detailed.
- J. Unfinished work shall be stepped back for jointing with new work. Before new work is started, all loose mortar shall be removed and the exposed joint thoroughly wetted not less than twelve (12) hours before laying new work.
- K. Before stopping work each day, the Masonry Subcontractor shall cover the tops of all unfinished walls with waterproof reinforced paper which shall be properly secured in place and weighted down, and shall turn down not less than 4 inches on each side. Coverings shall be kept in place at all times except when men are working on the walls.
- L. Whenever any concrete or mortar is hoisted up the sides of walls or transported across floor slabs, the surface of same shall be protected and covered with a waterproof canvas tarpaulin or reinforced paper.
- M. Where adjustments must be made after the mortar has started to set, the masonry unit shall be removed and the mortar in the joint replaced with fresh mortar.
- N. All work shall be kept as clean as possible so that cleaning down may be accomplished easily; protect all masonry from stain at all times to guard from discoloration. Splashing at staging levels shall be avoided either by covering the courses at these levels or by cleaning the face brick and units so spattered while the mortar is still fresh.
- O. All exposed edges of brick and block shall produce a true, smooth, even plane. Irregular cutting of brick shall not be permitted and will be rejected.
- 3.04 CMU Laying
- A. CMU Coursing: CMU coursing shall be laid to match existing coursing.
  - B. Bond: Shall match existing.
  - C. Jointing: All joints on the exposed face of masonry walls and base shall be tooled to match existing joints. This shall be done with a stainless steel tool, before the mortar hardens but not until thumbprint hard, and with sufficient force to press the mortar tightly against the

masonry on both sides of the joint. Great care shall be taken not to spread the mortar over the edges of the face brick. All joints shall be uniform thickness throughout.

- D. CMU shall be laid with shoved joints and all joints shall be completely and thoroughly filled with mortar; bedding and buttering shall not be used; furrowed beds will not be permitted.
- E. All work shall be laid level and plumb. Masonry work shall be done from staging so that the mason may readily fill all joints. No overhead laying will be permitted.
- F. Set all anchors, ties, inserts, and bolts required in the Work shown or specified hereinbefore.
- G. Rake all joints to adequate depth where required to receive caulking and sealant.
- H. Extend flashing beyond jambs of openings and turn up to form a pan. Apply mastic to lintels and at joints in flashing. Extend flashing beyond outside face of brick and turn down to form a drip. Extend flashing up a minimum of 8 inches at new lintels.

### 3.05 Caulking Application

- A. Install appropriate joint backing and prime surfaces.
- B. Caulking shall be done neatly and all joints shall be tooled to compress the material into the joint and present a neat appearing finished joint. All material shall be in the joints. Depth of joints shall conform to manufacturers recommendations or will be rejected.
- C. Schedule: Caulking shall be provided in the following locations:
  - 1. At all cast stone joints including perimeter joints adjacent to brick work. Cut-out existing mortar prior to installing caulking.
  - 2. All other locations, where so noted on the drawings or where the use of caulking materials may be reasonable inferred as necessary to make the work of this section complete throughout the building.
- D. All mixing and application methods, times and weather shall be in strict accordance with the manufacturer's published recommendations.
- E. Adjacent surfaces shall be masked and all masonry shall be primed with a primer approved by the manufacturer of the caulking material. All joint shall be provided with a backer strip of the proper size to be compressed in the joint, leaving a space for caulking of the depth recommended by the manufacturer of the caulking material for the conditions.

### 3.06 Epoxy Injection

- A. Comply with the manufacturers published recommendations for surface preparation, mixing, and application.

### 3.07 Final Cleaning

- A. All Work shall be kept as clean as possible so that cleaning down may be accomplished easily. Protect all masonry from stain at all times to guard from discoloration. Splashing at staging levels shall be avoided either by covering the courses at these levels or by cleaning the masonry so spattered while the mortar is still fresh.

- B. All masonry shall be thoroughly washed and cleaned with clear water and fiber brushed to remove mortar stains, dirt and dust. Defective joints shall be cut out of a depth of not less than 3/4 inch and properly repainted to match adjoining mortar.
- C. If difficulty is encountered removing stains from masonry using only water, this Subcontractor, if approved by the Architect, may use stiff fiber brushes and not over 1 5% solution of muriatic acid after he has demonstrated to the Architect that acid is necessary.
- D. Immediately after cleaning, the masonry surfaces shall be rinsed down with clear water. Allow the first application to penetrate the surface (approximately 3 to 5 minutes) and reapply in the same saturating manner. Less material will be required to saturate the surface on the second application.

Note: When using brush or roller, care should be taken to assure that enough solution is applied. Apply sufficient material to thoroughly saturate the surface, making sure to brush out heavy runs or drips that do not penetrate.

END OF SECTION

Section 05 00 01  
METAL FABRICATIONS FILED SUB-BID REQUIREMENTS  
(FILED SUB-BID REQUIRED)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
- C. Specification requirements for the Filed Sub-Bid "MISCELLANEOUS AND ORNAMENTAL IRON" include all of the following listed Specification Sections: in their entirety:
  - 1. Section 05 00 01 – METAL FABRICATIONS FILED SUB-BID REQUIREMENTS.
  - 2. Section 05 50 00 - METAL FABRICATIONS.
  - 3. Review the structural drawings for these specific locations called out to be by METAL Fabrications.
- D. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings, not just those pertaining particularly to this Sub-Trade, unless specifically called out otherwise, regardless of where among the Drawings it appears: A0.1, A0.2, D1.0, D2.0, A1.0, A1.1, A1.2, A2.0, A3.0, A3.1, A3.2, A3.3, A3.4, A4.0, A4.1, S0.1, S0.2, S0.3
- E. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract.
- F. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in INVITATION TO BID and INSTRUCTIONS TO BIDDERS.
- G. Sub Sub-Bid Requirements: NONE REQUIRED UNDER THIS SECTION.

1.2 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

### 1.3 PRE-INSTALLATION CONFERENCE

- A. Installer of the Work of this trade is required to attend pre-installation conferences specified under the following specification sections:
  - 1. Section 04 01 20 - UNIT MASONRY.

### 1.4 SEQUENCING

- A. Phasing: Refer to Refer to Section 01 14 00 – WORK RESTRICTIONS, and Drawings for phasing and milestone completion requirements which affect the General Contractor's Work and the Work of this Filed Sub-Bid.
- B. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- C. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- D. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

## **PART 2 - PRODUCTS**

### 2.1 SCAFFOLDS AND STAGING

- A. General: Filed Subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and herein.
  - 1. Scaffolding and staging required for use by this Filed Subcontractor pursuant to requirements of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-Trade requiring such scaffolding.
  - 2. Each Filed Subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 TEMPORARY FACILITIES AND CONTROLS and as additionally required for dust control).
  - 3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Filed Subcontractor.
  - 4. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each work day to prohibit access to the scaffolding by unauthorized individuals.

2.2 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed Subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Filed Subcontractor, as referenced under Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

**PART 3 - EXECUTION** (Not Used)

End of Section



**SECTION 05 12 00  
STRUCTURAL STEEL**

**PART 1 - GENERAL**

**1.1 WORK INCLUDED**

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein. Steel sections indicated on the Architectural Drawings but not indicated on the Structural Drawings shall be made part of Section Metal Fabrications.
- B. The work of this Section consists of furnishing and erecting all structural steel work as shown on the Drawings and as specified herein or both. Structural steel work is that work defined in AISC "Code of Standard Practice" plus the steel work listed below and shown on the Structural Drawings, which includes, but is not limited to, the following:
1. Base plates and bearing plates if shop attached to structural steel columns or beams.
  2. Fasteners and connecting materials for framing structural steel to structural steel (i.e. shop and field bolted and/or welded connections of columns, base plates, tubes, beams, hangers, etc.)
  3. Selection of bolted/welded structural connections, as indicated on the Drawings, in accordance with AISC.
  4. Columns, beams, girders, purlins, girts, posts, channels, angles, plates, frames, anchors, rods, hangers, etc.
  5. Galvanizing of all exposed exterior elements, unless otherwise noted, and any other steel indicated on the drawings.
  6. Temporary connections, shoring and bracing, as required.
  7. Stiffener plates, where indicated.
  8. Chemical or adhesive capsule anchors and expansion anchors.
  9. Steel lintels - if attached to the structural steel frame.
  10. Hoisting of steel decking.
  11. Openings (unreinforced and reinforced) in structural steel required to accommodate mechanical, plumbing and electrical work.
  12. Shop installation only of headed shear connectors (excluding shear connectors required for composite beam action) where indicated.
  13. Shop Primer and field touch-up primer after erection of steel members.
  14. Provisions for the requirements of AESS "Architecturally exposed structural steel, at steel elements indicated on the drawings.

- C. Items to be Furnished Only: Furnish the following items for installation by the designated Sections.
1. Section 033000 – CAST-IN-PLACE CONCRETE: Anchor rods (with templates), leveling plates, embedded plates and embedded angle (each with headed anchors).

## **1.2 RELATED WORK**

- A. The following items of related work, including DIVISION 1 – GENERAL REQUIREMENTS, are specified and included in other Sections of the Specifications:
1. Section 03 30 00 - Cast-In-Place Concrete
  2. Section 05 30 00 – Steel Deck
  3. Section 05 40 00 – Light Gauge Steel Framing
  4. Section 05 50 00 - Metal Fabrications

## **1.3 REFERENCE SPECIFICATIONS**

- A. "Code of Standard Practice for Steel Buildings and Bridges," and "Specifications for Structural Steel Buildings, Allowable Stress Design and Plastic Design", Seismic Provisions for Structural Steel Buildings", by the American Institute of Steel Construction, latest edition.
- B. "Code for Welding in Building Construction" by the American Welding Society".
- C. ASTM listed standards by the American Society for Testing and Materials.
- D. In case of conflict between the Reference Specification and the Project Specification, the Project Specification shall govern. In case of conflict between Reference Specifications, the more stringent shall govern.
- E. When compliance with any Specification is specified herein for materials (or a product, manufactured or fabricated), the Contractor, if requested shall furnish an affidavit from the manufacturer (or fabricator) certifying that the materials (or product) delivered to the job meets the requirements specified. However, such certification shall not relieve the Contractor from the responsibility of complying with any added requirements specified herein.

## **1.3 SUBMITTALS**

- A. Submit complete Shop Drawings in accordance with the provisions of Section 013000 – SUBMITTAL.

1. No variance from design sizes and details will be permitted on submitted Shop Drawings, but requests for modification of connections of details to better suit their shop practice, or for any other reasons, will be considered by the Architect.
2. Fabrication of any material or performing of any work prior to the final review of the Shop Drawings will be entirely at the risk of the Contractor.
3. Shop Drawings shall include all information necessary for fabrication of the component parts of the structure. They shall indicate size and weight of members - type and location of shop and field connections, the type, size and extent of all welds, and the welding sequence when required. The welding symbols used on the Shop Drawings shall be as adopted by the American Welding Society.
4. Review of Shop Drawings shall be for size and arrangement of principle and auxiliary members and strength of representative connections based on sample checks. Any errors in dimensions shown on Shop Drawings shall be the responsibility of the Contractor.
5. Provide signed and sealed calculations prepared under the supervision of a Registered Design Professional Engineer, employed by the fabricator and registered in the State of Massachusetts for the following:
  - a. For all connections not specifically detailed on the drawings or noted to be designed by the Fabricator.
  - b. For all connections that are part of the lateral load resisting system as indicated on the drawings.

#### **1.4 TESTING AND INSPECTION**

- A. All materials and workmanship under this Section shall be subject to inspection in the mill, shop or field by qualified inspectors paid directly by the Owner. Structural Tests and Inspections shall be in accordance with Chapter 17 of the 2015 International Building Code.
- B. However, such inspection, wherever conducted, shall not relieve Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements, nor shall inspector's acceptance of materials or workmanship prevent later rejection of same by the Owner or Architect if defects are discovered.
- C. Inspection of welding work shall consist of non-destructive spot testing done by radiographic, magnetic, magnetic particle or ultrasonic method, whichever is most effective for joint to be tested.
- D. Inspection of bolting work shall be in accordance with "Specification for Structural Joints Using ASTM A325 or A490 Bolts" by the American Institute of Steel

Construction.

- E. The Contractor shall give proper notice to inspection agencies approved by the Architect and shall allow access and full facilities as required for this inspection.
- F. Regardless of any testing done, the Contractor is responsible for completing the structural steel work in complete compliance with these Specifications.
- G. The Contractor must set up a quality control program in the shop and in the field to ensure compliance with the Specifications.
- H. Report in writing to the Architect the results of the Contractor's inspection.
- I. When the Contractor is satisfied that the work is satisfactorily completed, notify the Architect, who will make arrangements with the independent testing engineer retained and paid by the Owner to verify that the work complies with these Specifications.

#### **1.5 STORAGE AND HANDLING**

- A. Care and protection shall be given to all structural steel during handling and storage. If items are to be stored prior to installation, they shall not be placed in contact with the ground and they shall be protected from the elements and kept dry.
- B. Do not store materials on the structure in a manner that may cause distortion or damage to supporting structural elements.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. Structural steel wide flanged shapes shall conform to ASTM A992. Steel channels, steel plates and angles shall be ASTM A572, Grade 50.
- B. Structural Steel tubular shapes (rectangular and square) shall conform to the requirements of ASTM A500, Grade C, (Fy = 50 ksi).
- C. Structural Steel tubular shapes (round) shall comply with the requirements of ASTM A500, Grade C, (Fy = 46 ksi).
- D. Bolts, nuts and washers shall comply with the requirements of ASTM, Standard A325 for Structural Joints Using ASTM A325 or A490 Bolts. Bolts shall be A325N

with washer. Connections shall be bearing type with shear planes through threads. Stainless steel bolts shall be Type 304 and shall be in accordance with ASTM A193. Stainless steel bolts shall be used at all expansion joint locations which require horizontal movement at horizontal slotted holes.

- E. Weld and joint details shall comply with the requirements of the "Code for Welding in Building Construction" by the American Welding Society.
- F. Anchor rods shall conform to ASTM 1554, Grade 36 or 55 (as indicated on the drawings).
- G. Chemical adhesive anchors shall be HIT-HY200 Safe Set System by Hilti or equal reviewed by the Architect.

The Contractor may submit alternative connector devices for review of the Architect. Alternative devices shall satisfy all applicable spacing and edge conditions and shall provide a connection of at least the strength of the connection required on the Contract Documents. Submission for alternative designs should be accompanied by complete engineering calculations certified by a Professional Engineer licensed in New Hampshire.

## **2.2 FABRICATION**

- A. All structural steel shall be fabricated in accordance with Reference Specifications, approved Shop Drawings, and as hereinafter specified.
- B. The selection of members and connections for any portions of the structure not indicated on the Drawings shall be completed by the fabricator. Connections shall be capable of supporting the maximum uniform load of the member for the span shown and the material specified.
- C. All shop connections shall be welded or bolted.
- D. All field connections shall be bolted unless otherwise indicated on the Drawings.
- E. Unless otherwise noted, diameter of holes in bolted parts shall be 1/16" greater than the nominal diameter of the bolt. No unfair holes will be accepted, and enlargement of holes shall not be accomplished by burning. Burrs resulting from drilling or punching shall be ground to the surface of the material. Shearing and punching shall be done cleanly so as not to deform or mar adjacent surfaces.
- F. Provide holes and connections as required for site assembly of steel work. Holes shall be drilled or punched and reamed in the shop. Show sizes and locations of all

such holes on the Shop Drawings.

- G. Hung lintels and other steel requiring accurate alignment and provisions for expansion/contraction shall be provided with slotted holes.
- H. Corrective work for structural steel members or assemblages having fabrication errors, or which exceed permissible tolerances shall be corrected only if permitted by the Architect. All corrective work shall be in accordance with AISC and AWS requirements. When requested by the Architect or testing agency, the Contractor shall submit to the Architect, for approval, drawings showing details of proposed corrective work and shall receive reviewed drawings prior to performing the corrective work. All corrective work shall be solely at Contractor's expense.
- I. All structural steel members shall have assigned positions and an identification mark or symbol, plainly indicated thereon near one end. Marks shall agree with those given on the shop drawings and erection drawings relating to or calling for the member.

### **2.3 PROTECTIVE COATINGS**

- A. All structural steel surfaces including connections shall receive a power tool cleaning in accordance with SSPC-SP3, "Power Tool Cleaning", except galvanized members and AESS members shall receive SSPC-SP6, "Commercial Blast Cleaning".
- B. Structural steel shall be shop primed with Tnemec 1099 (Rust Inhibiting Primer), unless noted otherwise, to be galvanized.
- C. Refer to Architectural Drawings for exposed steel elements requiring finish painting.
- D. Hot Dip Galvanizing: Items exposed to the exterior or indicated on the drawings shall be hot-dipped galvanized after fabrication. Galvanizing bath shall be a combination nickel-zinc mixture. Prior to galvanizing, the steel shall be immersed in a pre flux solution of zinc ammonium chloride. The use of the wet kettle process shall be prohibited. Galvanize all ferrous fasteners, clips, sleeves, anchors and accessories in contact with galvanized items.
  - 1. Galvanizing shall comply with ASTM A123, A153 or A386 as applicable.
  - 2. Items to be galvanized shall be galvanized after fabrication. Where size of assembly is too large for complete unit galvanizing, these assemblies shall be galvanized prior to fabrication, in as large sections as practical and then only with the written approval of the Architect.
  - 3. Where galvanizing prior to completing fabrication cannot be avoided, joints

shall be welded after fabrication, ground smooth and finished with four (4) full coats of California Products Corp. WW Totrust, Sealube ZRC, Zirp by Duncan or equal.

- E. Thoroughly protect all non-ferrous items in contact with dissimilar metals, concrete, masonry and mortar with approved bituminous coating on contact surfaces. Field paint factory primed galvanized steel per PAINTING Section of this specification.
- F. Top flanges of steel beams receiving shear connectors shall be left free of primer.
- G. Shop Coating of Hot Dip Galvanized Steel:
  - 1. Shop priming of galvanized steel: Where hot dip galvanized steel is to be primed prior to receiving a shop or field applied top coat, it shall be primed by the galvanizer within twelve hours of galvanizing. The primer shall be a ployamide epoxy applied to a minimum D.F.T. of 2.5 mils and force cured in a facility capable of maintaining 130 degrees F.
  - 2. Shop painting of galvanized steel: Where hot dip galvanized steel is to receive a factory applied top coat, it shall first be primed as stated above and shall then be coated by the galvanizer in a dedicated coating facility. The factory-applied topcoat shall be an aliphatic polyurethane applied to a D.F.T. of 2-4 mils and force cured in a facility capable of maintaining 130 degrees F. The galvanizer shall assume sole source responsibility for the coating system.

### **PART 3 - EXECUTION**

#### **3.1 ERECTION**

- A. All structural steel shall be anchored and erected in accordance with Reference Specifications, approved Shop Drawings, and as hereinafter specified.
- B. All work shall be accurately set to established lines and elevations and rigidly fastened in place with suitable attachments to the construction of the building. Errors in shop fabrication or deformation resulting from handling and transportation shall be reported immediately to the Architect, and approval of the method of erection shall be obtained. Approved corrections shall be made at no additional cost to the Owner.
- C. Temporary bracing, guying, and support shall be provided to keep the structure safe and aligned at all times during construction, and to prevent danger to persons and property. Check all temporary loads and stay within safe capacity of all building components. All work shall be in conformance with AISC, "Code of Standard

Practice".

- D. Except as otherwise indicated, all field connections shall be bolted in accordance with the AISC "Specifications for Structural Joints using ASTM A325 Bolts". Except as otherwise indicated, bolts shall be bearing type and need only be tightened to the snug tight condition as defined in Section 8.c of the bolt specification.
- E. Do not cut or alter any member in the field without Architect's written review for each specific condition.
- F. All welding shall be in accordance with Referenced Specifications and shall be done only by experienced welders who have, within one (1) year previously, been qualified by tests as prescribed in AWS "Standard Qualifications Procedure" for the type of work required.
- G. Galvanized elements shall be touched up (brush only) with 4 mils minimum of a zinc-rich paint at areas scarred by bolting or welding.
- H. Embedment of anchors into concrete shall be as specified on the Drawings but shall not be less than required by the manufacturer or the following (whichever is more stringent):
  - 3/8" anchor diameter 3 1/2" minimum embedment
  - 1/2" anchor diameter 4 1/4" minimum embedment
  - 5/8" anchor diameter 5" minimum embedment
  - 3/4" anchor diameter 6 3/4" minimum embedment
  - 7/8" anchor diameter 7" minimum embedment
  - 1" anchor diameter 8 1/4" minimum embedment
- I. Camber steel beams and girders as specified on the drawings.
- J. All anchor rods shall be set to correct locations by template.
- K. All column leveling plates shall be set level to correct elevations and the entire bearing area under the leveling plate shall be grouted solid with an approved non-shrink grout.
- L. Provide L2x2x1/4 angles as necessary for steel deck support at all columns where beams do not frame from four sides.

END OF SECTION

STRUCTURAL STEEL

05 12 00 - 8



SECTION 05 31 50  
STEEL DECK INFILL

PART 1 - GENERAL

- 1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- 1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- 1.03 SECTION INCLUDES:
- A. If, during the construction, it is determined that deteriorated steel decking exists, the Contractor shall inspect, replace, or plate over the steel deck that is rusted or deteriorated, as directed by the Owner's Representative. See Section 00 27 00 Unit Prices.
  - B. Make steel deck repairs or replacement as indicated in the base bid quantities. The contractor shall carry infill of roof metal deck
  - C. All deteriorated areas of steel deck shall be removed and replaced or plated over. The Contractor is to exercise extreme caution when removing existing roofing systems to ensure the integrity of the existing roof deck. Any additional roof deck damage as a result of the roof removal process shall be properly repaired by the Contractor, as specified herein, at no additional cost to the Owner,
  - D. The Contractor shall notify the Owner's Representative immediately upon uncovering existing steel deck showing signs of deterioration or excessive deflection. All deck replacement areas must be photographed and marked on a separate roof plan dedicated for deck repair tracking.
  - E. At locations where obsolete units are removed, 18 gauge galvanized plate can be used for openings up to 18." Larger openings shall be repaired using new steel deck spanning at least two supports. Existing deck shall be matched in profile and gauge.
  - F. Maintain steel deck and steel plate on the jobsite. Do not start work without replacement deck and plate on site.
  - G. All deck replacement includes removal and re-installation of any systems attached to the underside of the deck, including, but not limited to, electrical wires, conduit, HVAC lines, hangars, or other items.
  - H. The drawings indicate and show limits of construction for this project. The specifications specify materials and work requirements for this project. Both are complementary to each other and shall be followed to complete the work.

## 1.02 RELATED WORK

- A. Section 02 41 19 Selective demolition
- B. Section 06 10 00 Rough Carpentry
- C. Section 07 31 13 Asphalt Shingles
- D. Section 07 53 23 Roofing

## 1.03 SUBMITTALS

- A. Submit copies of product data and specified number of and samples as listed below.
  - 1. Manufacturer's literature of each type of fastener used for steel deck repair identified with brand type, size, finish, and other descriptive information.
  - 2. Manufacturer's literature and data sheets on steel deck, if requested.
  - 3. Manufacturer's literature and data sheets on primer for galvanized and painted steel deck or plates.

## 1.04 DECK INFILL

- A. The Contractor shall carry the assigned quantities of replacement or repair (listed below) in the Base Bid.
  - 1. Random removal and replacement of existing rusted or deteriorated 1-1/2 inch, galvanized, "B" steel deck, 18 gauge on all roof levels. This quantity is for installation over and above the work associated with removal of obsolete equipment and related service connections. Quantities shall be determined by calculation of actual square footage installed with no allowance for waste. Contractor to carry 50 SF in Base bid
  - 2. Random installation of 18 gauge galvanized plate over openings less than 18," including fastening. This quantity is for installation over and above the work associated with removal of obsolete equipment and related service connections. Quantities shall be determined by calculation of actual square footage installed with no allowance for waste. Contractor to carry 7 locations in Base bid

## PART 2 - PRODUCTS

### 2.01 STEEL MATERIALS

- A. Coordinate the structural Diaphragm loading splice that will be required, if the decking will not nest properly, to transfer the lateral loads with the details provided by the Structural Engineer of Record.

- B. Steel deck shall match existing deck as to gauge and profile, except gauge of replacement material may be greater (thicker) than existing. If profile cannot be matched, utilize Type "B" deck with the same height profile as existing. Assume 6 locations of 2'-6"x 5'-0"
- C. Galvanized steel decks shall be 20 gauge.
- D. Galvanized steel sheet for removal of obsolete equipment openings shall be 18 gauge, 18" or less. Assume 6 locations of 18"x18"

## 2.02 FASTENERS

- A. Sidelap or Sheet Steel Fasteners: For new or existing steel deck shall be #12 x 3/4" zinc-plated hex-washer head self-drilling sheet metal screws.
- B. Endlap Fasteners: For new or existing steel deck, with standard "nesting" ability, shall be #14 x 1-1/4" zinc-plated hex-washer head self-drilling sheet metal screw designed for fastening to structural steel.

## PART 3 - EXECUTION

### 3.01 STEEL DECK REPLACEMENT

- A. Sections of existing steel deck to be replaced shall be cut square and neat. Cut ends of deck at bearing supports. Cut ends will provide sufficient bearing distance as required by the SDI (Steel Deck Institute). Contractor shall note the location of all conduit, light supports, etc., prior to removal of existing deteriorated steel deck.
- B. New sections of steel deck shall span at least two (2) supports.
- C. Fasten deck, as specified.
- D. Where deck replacement is specified at a roof drain, coordinate with roof drainage requirements, as specified.
  1. Nest new decking to the existing by using the SDI details.
  2. After decking is secured, cut to receive the drain sump pan, being careful not to oversize the cut. Cutting shall be done with a portable, hand-held, reciprocating jig saw provided with a sharp blade. No burning will be permitted.
  3. Install the sump pan using than 12 fasteners located three (3) to each side.

### 3.02 FASTENING OF NEW OR EXISTING STEEL DECK

- A. Verify all recommendations with the Structural Engineer of Record and obtain written approval prior to the start of work.
- B. Sidelaps and endlaps of existing steel shall be fastened when existing welds or other fastenings are broken or insufficient according to the decision of the Owner's Representative.
- C. Endlap fasteners shall be installed at 6" o.c. (on center) on all bearing points. The deck shall be pulled down snugly onto the the bearing joist or beam.
- D. Sidelap fasteners shall be installed at the mid-points of all spans exceeding 3" and at the third points of all spans exceeding 6." Sidelap fastener spacing shall not exceed 3'-0" o.c. Mating surfaces shall be pulled snug.

### 3.03 INSTALLATION OF STEEL PLATE

- A. Verify all recommendations with the SDI requirements.
- B. Sheet steel shall lap the area requiring reinforcement by a minimum of 12" in all directions.
- C. Fasten steel sheet at 6" o.c. at the perimeter and 12" o.c. in the field of the sheet.

### 3.04 NESTING OF STEEL DECK CONNECTIONS

- A. When steel decks are replaced, the new steel deck shall nest into the adjacent existing decking at the end and side laps, as required by SDI written requirements.
- B. The Contractor shall make every effort to obtain new structural steel decking that matches the existing structural steel decking in profile and gauge. If the gauge cannot be matched, then decking with thicker gauge will be acceptable. If new structural steel decking of the same profile as the existing structural decking cannot be obtained, then the Contractor shall fabricate and install splice plates. The splice plates and fasteners must be approved, in writing, by a Structural Engineer hired by the roofing contractors if this condition is encountered. The Structural Engineer of Record will certify that the connections and splice plates will transfer all lateral diaphragm and gravity loads required by the Massachusetts State Building Code for this building.

END OF SECTION 05 31 50

**SECTION 054000**  
**LIGHT GAGE STEEL FRAMING SYSTEMS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. All of the Contract Documents, including General and Supplementary Conditions and Division 1 General Requirements, apply to the work of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

**1.2 DESCRIPTION OF WORK**

- A. The work of this Section includes, but is not limited to, the following:
  - 1. Design, Engineering and providing complete light gage steel framing and support systems including, but not limited to, floor framing, posts, joists, beams, lintels, trusses and bracing.
  - 2. Engineering and providing all connections, anchors, bracing, and accessories to interconnect the light gage steel framing assemblies and to connect and attach light gage steel framing and support systems to other building structural systems.

**1.3 RELATED WORK**

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:
  - 1. Section 033000 - Cast-In-Place Concrete
  - 2. Section 040120 - Reinforced Unit Masonry
  - 3. Section 051200 - Structural Steel
  - 4. Section 061000 – Rough Carpentry

**1.4 INTENT**

- A. A major intent of this section is to provide a structural floor framing system ready to receive T&G plywood decking systems indicated, and/or interior loadbearing framing systems.

1. Panelized Systems: The work of this Section may be shop panelized into structural light gage framing modules for field erection, assembly, and final connection.

## 1.5 QUALITY ASSURANCE

- A. Source: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturers of the primary materials.
- B. Structural Performance Requirements: Structurally design, engineer, and provide a complete steel framing and support system with deflection limited as follows under the full inward and outward lateral loads and, for soffits and ceilings, the full upward and downward loads prescribed by Building Codes for this building location or for loads indicated in Contract Documents, whichever is greater. Engineer all connections between lightgauge framing components and between lightgauge framing assemblies and building structure. Deflection and structural calculations shall not include any structural benefit from the sheathing, veneer, or building skin system; light gage steel framing alone shall carry the loads to miscellaneous steel supports and building structure. "L" is the length of the primary light gage members.
  1. Deflection Limit for Finish System: L/480 (Horizontal); L/600 (Vertical)
  2. Deflection Limit for Interior Loadbearing Framing: L/460.
- C. Welding: For situations where welding is permitted, employ only experienced welders who are certified in compliance with AWS "Standard Qualification Procedures", latest edition. Weld in compliance with AWS "Structural Welding code, Sheet Steel", latest edition.
- D. Engineering: Provide the services of a Professional Engineer, registered in Massachusetts to design, engineer, and assume professional responsibility for the complete light gage steel framing system, and to certify that the work of this Section meets or exceeds the performance requirements specified in this Section.
- E. Reference Standard: Compute structural properties of framing members in compliance with AISI "Specifications for the Design of Cold-Formed Structural Members", latest edition.
- F. Fire-Resistance: Where fire-resistance ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose fire-resistance rating has been tested in compliance with ASTM E119 by independent agencies acceptable to the Architect and authorities having

jurisdiction.

## 1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, installation instructions, use limitations and recommendations for each system component. Provide certifications stating that materials comply with requirements.
- B. Shop Drawings: Provide shop drawings for fabrication, installation and erection of all parts of the work and show spacing, size, gage and thickness of all system components. Provide elevations, sections, and details of deflection accommodation, supports, anchorages, connections, cross-bracing, bridging, kick-backs, additional framing at openings, and accessory items. Show size, type, and spacing of anchors, fasteners and connections between lightgauge framing assemblies and building structure. Show location, size, and type of each weld.
  - 1. Professional Seal Required: Provide shop drawings professionally prepared, stamped, signed, and sealed by a Professional Engineer, registered in Massachusetts.
  - 2. Calculations: Provide professionally prepared and sealed calculations and certification of the performance of this work. Show how design load requirements and other performance requirements have been satisfied.
- C. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties and limitations on standard framing members and other products furnished hereunder.
    - a. Recycled metal content: Provide manufacturer's written certification of recycled content of ferrous metal products. Indicate post-consumer and pre-consumer recycled content and provide documentation certifying products are from recycled sources.
  - 2. Provide calculations for loadings and stresses of exterior wall framing under the Professional Structural Engineer's seal. Show how design load requirements and other performance requirements have been satisfied.
  - 3. Manufacturer's installation instructions: Indicate special procedures, and conditions requiring special attention.
  - 4. Shop drawings:
    - a. Large scale design details showing component details, framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and accessories or items required of related work.
    - b. Detail all conditions which deviate from Contract Documents
    - c. Describe method for securing studs to tracks and for bolted and welded framing connections.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

5. Prior to prefabrication of framing, submit fabrication and erection drawings for approval. All calculations and details are to be submitted for all members and connections.
- B. Submit prior to request for Certificate of Occupancy, to both Architect and local Building Official having jurisdiction, under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS, the following
  1. All certifications, reports and programs required by Chapter 17 of the Massachusetts State Building code for work engineered by Contractor's Profession Engineer under the requirements of this Section.

### **1.7 TESTING AND INSPECTION**

- A. All materials and workmanship under this Section shall be subject to inspection in the mill, shop or field by the Architect, or by qualified inspectors selected by the Owner and paid directly by the Owner. Structural tests and inspections shall be in accordance with Chapter 17 of the 2015 International Building Code.
- B. However, such inspection, wherever conducted, shall not relieve the Contractor of his responsibility to furnish materials and workmanship in accordance with Contract requirements, or shall inspector's acceptance of materials or workmanship prevent later rejection of same by the Owner or Architect if defects are discovered.
- C. Inspection of welding work shall consist of non-destructive spot testing done by radiographic, magnetic, magnetic particle or ultrasonic method, whichever is most effective for joint to be tested.
- D. The Contractor shall give proper notice to the Owner's inspectors and/or testing agencies and shall allow access and full facilities as required for this inspection.
- E. Regardless of any testing done by the Owner, the Contractor is responsible for completing the metal decking work in complete compliance with these Specifications.
- F. Report in writing to the Architect the results of the Contractor's inspection.
- G. When the Contractor is satisfied that the work is satisfactorily completed, notify the Testing Engineer, who will be retained by the Owner, to verify that the work complies with these Specifications.

### **1.8 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials and products in factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from all



possible damage. Sequence deliveries to avoid delays, but minimize on-site storage.

## 1.9 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 3 years documented experience.
- B. Installer: Company with a minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.

## PART 2 - PRODUCTS

### 2.1 MATERIALS AND PRODUCTS

- A. Acceptable Manufacturers: Provide materials and products which meet or exceed the requirements of these specifications from one of the following manufacturers:
  - 1. Marino/Ware Division, Ware Industries, Inc., South Plainfield, NJ., 800-627-4661
  - 2. Clark Steel Framing Systems, S.O.S., Inc., Cincinnati, OH., 800-543-7140
  - 3. Dale/Incor Industries, Dearborn, MI., 800-882-STUD, 313-846-9400
  - 4. Unimast Incorporated, Franklin Park, IL., 800-524-0712, 800-969-4110
- B. Lightgage Steel Framing and Supports: Provide studs, runners, special heavier gage and taller deflection runners, bracing, and all other framing members indicated and needed.
  - 1. Steel Standard: ASTM A653, Structural Quality [formerly ASTM A446]. Fabricate members from minimum 50 ksi yield strength steel for framing members 16 gage and heavier and from minimum 33 ksi yield strength steel for 18 gage and lighter elements. Provide higher yield strength steel as required by engineering for this project.
  - 2. Corrosion Protection: Provide hot-dip galvanized ASTM A924, G-60 [formerly ASTM A525].
  - 3. Framing Member Depth: As indicated on the drawing.
  - 4. Framing Spacing: 16 inches on center maximum or as otherwise shown on the drawings. Provide closer spacing if necessary to meet deflection constraint requirements.
  - 5. Minimum Steel Gage: 16 U.S. Standard gage minimum or as otherwise shown on the drawings. Provide heavier gage if necessary to meet deflection constraint requirements.
    - a. This minimum gage is not only based on flexural performance of members, but also the minimum gage to accommodate masonry ties and other work.

6. Accessories: Provide lightgauge framing system manufacturer's standard components and accessories as needed for complete structural assemblies including, but not limited to, fasteners, clips, angles, anchors, shoes, ties, bracing, lintels, reinforcements, and other members and items. Provide ASTM A153 class B2 or ASTM A924 G-90 hot-dip galvanized finish on all lightgauge accessories.
  7. Angle Hangers: For suspending and bracing exterior ceilings and soffits, provide minimum 1-1/4" x 1-1/4" x 16 gage or heavier, hot-dip galvanized steel angles or other rigid hanger which can withstand compressive loads due to wind uplift.
- C. Welding Electrodes: Comply with AWS D1.3.
- D. Galvanized Touch-Up Paint: After fabrication, touch-up all galvanized surfaces with one of the following:
1. PPG Speedhide Galvanized Steel Paint
  2. ZRC Cold Galvanizing Compound
  3. Rust-Oleum Galvanized Metal Primer

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Pre-Installation Examination Required: The Installer shall examine previous work, related work, and conditions under which this work is to be performed and notify Contractor in writing of all deficiencies and conditions detrimental to the proper completion of this work. Beginning work means Installer accepts substrates, previous work, and conditions.
- B. Manufacturer's Instructions: Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this Section.
1. Welding: Do not weld any lightgauge framing member or component less than 16 gage. Use mechanical connections.
- C. Framing Spanning Between Floors: Accurately align top and bottom runners and attach runners to building structure in strict compliance with manufacturer's recommendations and approved shop drawings. Space fasteners and connections into building structure at not over 16" on center at with fasteners at corners and ends, unless otherwise indicated on approved shop drawings. Accurately position, space, plumb, and anchor vertical framing [studs] to bottom runners by mechanically fastening with at least one low profile pan head screw in each stud flange [one each

side of runner].

1. Openings: Frame wall openings with additional framing members at perimeter of openings as needed to meet structural performance requirements and to provide all framing members needed to support items such as windows, frames, and interior and exterior finishes. Always provide double studs and framing at entire perimeter of openings and penetrations.
  2. Components and Accessories: Provide all components, connections and accessories needed to provide a complete structural system which meets specified performance requirements.
  3. Coordination: Align factory provided holes in framing members or field punch framing members along the neutral axis to facilitate installation of electrical conduit, piping, and other work which must run through framing. Limit size and location of openings in framing members as recommended by framing system manufacturer and excellent engineering practice.
  4. Horizontal Bracing: Provide continuous 1-1/2" deep 16 gage cold-rolled channel horizontal bracing within 12" of tops of vertical framing and 4'-0" on centers (maximum) between. Connect bracing to each stud with mechanically fastened clip angles. Provide additional bridging and bracing as recommended by manufacturer, as necessary to meet performance requirements, and as indicated on approved shop drawings.
  5. Perpendicular Bracing: Provide diagonal kick-back bracing perpendicular to plane of framing system and securely anchored to building structure as needed to create a complete structural system meeting specified performance requirements. Locate diagonal perpendicular bracing only where shown on approved shop drawings and coordination drawings; avoid conflicts with other systems including mechanical and electrical systems and interior finishes. Ensure that diagonal perpendicular bracing will be fully concealed by interior finishes.
- D. Soffits and Ceilings: Suspend exterior ceilings and soffits with rigid steel studs or steel angle hangers spaced at not more than 4 feet on center in both directions, and engineered to withstand all downward and upward loads. Space horizontal framing members supporting soffit finishes at not more than 16" on center. Design, connect and cross-brace system as necessary to withstand required uplift loading and all dead, live and seismic loads prescribed by codes.
- F. Tolerances: The following allowable tolerances are allowable variations from locations and dimensions indicated by the Contract Documents and shall not be added to allowable tolerances indicated for other work.
1. Allowable Variation from True Plumb, Level & Line:  $\pm 1/8"$  in 20'-0"
  2. Allowable Variation from True Wall Thickness:  $\pm 1/8"$  in 20'-0"

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

3. Allowable Variation from True Plane of Adjacent Surfaces:  $\pm 1/8"$  in 10'-0"
- G. Touch-Up: Touch-up accessible damaged steel coatings, including every screw penetration from sheathing attachment and from steel to steel attachment.

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

(FILED SUB-BID REQUIRED AS PART OF SECTION 05 00 01 METAL FABRICATIONS FILED SUB  
BID REQUIREMENTS)

**PART 1 - GENERAL**

PART 1 - GENERAL

1.1 GENERAL

A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.

1.2 The drawings on which this Contract is based are listed in Section 00 86 00. Consult all drawings, note all conditions that may affect the work, and care for same executing this contract.

1.5 SUMMARY

A. The work of this Section consists of miscellaneous metals, and ornamental iron where shown on the Drawings, as specified herein, for complete and proper installation. Work includes, but is not limited to the following.

1. The terms "Metal Fabrications", "Misc. Metals" and "Miscellaneous Metals" as used in the Project Manual have the same meaning and are interchangeable in the Contract Documents. These terms refer to the same Trade Contract entity.

B. Furnish and install:

1. Metal stairs, handrails, and guard rails.
2. Cart battery trays
3. Steel peg boards with accessories

C. Furnish the following items for installation under related sections:

1. Anchors, bolts, inserts, and sleeves, required to attach miscellaneous metals for embedment into new concrete under Section 03 30 00 - CAST-IN-PLACE CONCRETE.
2. Hot dipped galvanized loose lintels at door, louver, window and similar openings in interior and exterior masonry partitions; installed under Section 04 01 20 – UNIT MASONRY.
3. Anchor bolts, with nuts and washers; inserts; and sleeves; required to attach miscellaneous metal items to new masonry, for installation under Section 04 01 20 – UNIT MASONRY.

D. Perform all drilling and cutting in miscellaneous metal items required for the attachment of other items.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- E. Core drill concrete stairs and ramps; grout into place railing posts.
- F. Mechanical fastening / welding of guard and hand rails to mezzanine steel
- G. Perform all shop painting for all surfaces of exposed to view galvanized and non- galvanized metals, and post-erection touch-up of shop prime and/or finish coat, using the same material as shop coating.
- H. Perform application of liquid zinc touch-up to all field welds of galvanized steel items furnished hereunder.
- I. All equipment, staging, scaffolding, hoisting, and demolition for the work of this Section.

1.6 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from Construction Manager's or Trade Contractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

1.7 RELATED REQUIREMENTS

- A. Section 03 30 00 – CAST-IN-PLACE CONCRETE: Installation of anchors and nosings into concrete, pouring concrete stair treads, landings and ramps.
- B. Section 04 01 20 – UNIT MASONRY: Building in of anchors into masonry walls.
- C. Section 05 12 00 – STRUCTURAL STEEL: Steel platform for mechanical air handling unit in Auditorium and steel tube at Gymnasium glass block infilled openings.
- D. Section 05 40 00 – Light Gauge Metal Framing: Structural stud and floor framing framing.
- E. Section 06 10 00 – CARPENTRY: Wood framing, blocking, subflooring and underlayment.
- F. Section 09 22 16 – NON-STRUCTURAL METAL FRAMING: Non-load-bearing metal framing systems for plaster construction.
- G. Section 09 91 00 – PAINTING: Applied finish coatings other than those

specified herein.

## 1.8 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 – REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. ASTM A 36 – Structural Steel.
  2. ASTM A 53 – Pipe, Steel, Black and Hot-Dipped, Zinc-coated, Welded and Seamless Steel Pipe.
  3. ASTM A 108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold Finished.
  4. ASTM A 123 – Zinc Coatings on Products Fabricated From Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.
  5. ASTM A 153 – Zinc-Coating on Iron and Steel Hardware.
  6. ASTM A 167 – Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  7. ASTM A 276 –Stainless and Heat- Resisting Steel Bars and Shapes.
  8. ASTM A 283 – Carbon Steel Plates, Shapes, and Bars.
  9. ASTM A 307 – Carbon Steel Externally Threaded Standard Fasteners.
  10. ASTM A 325 – Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
  11. ASTM A312/A312M – Seamless and Welded Austenitic Stainless Steel Pipes
  12. ASTM A 361 – Zinc Coated (Galvanized) Iron or Steel Roofing sheets.
  13. ASTM A 385 – Providing High Quality Zinc Coatings.
  14. ASTM A 386 – Zinc Coating on Assembled Steel Products.
  15. ASTM A 446 – Zinc Coated (Galvanized) Steel Sheets of Structural Quality, Coils and Cut Lengths.
  16. ASTM A 480 – General requirements Flat-Rolled Stainless and Heat- Resisting Steel Plate, Sheet and Strip.
  17. ASTM A 500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
  18. ASTM A 501 – Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  19. ASTM A 525 – Specification for Sheet Steel, Zinc Coated (Galvanized).
  20. ASTM A 666 – Stainless and Heat Resisting Chromium-Nickel Steel Sheet Strip, Plate and Flat Bar for Structural and Architectural Applications.
  21. ASTM A 780 – Repair of Hot-Dip Galvanizing.
  22. ASTM A1011/A1011M – Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with

Improved Formability, and Ultra-High Strength.

23. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus.
24. ASTM B 209 – Specification for Aluminum Alloy, Sheet and Plate.
25. ASTM B 221 – Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
26. ASTM A 575 Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades.
27. ASTM A576 Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
28. ASTM F 593 – Stainless Steel Bolts, Hex Cap Screws.
29. ASTM F 594 – Stainless Steel Nuts.
30. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
31. AGAI – Inspection Manual for Hot-Dipped Galvanized Products.
32. AISC – Code of Standard Practice for Steel Buildings and Bridges.
33. AISC – Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.
34. AISI. Referenced standards.
35. AWS – Standard Code for Arc and Gas Welding in Building Construction.
36. FS QQ-A-250d – Aluminum and Aluminum Alloy, Plate and Sheet.
  
37. IPA (Industrial Perforators Association) – Voluntary Standard Tolerances.
38. MIL-P-21035B – Paint High Zinc Dust Content, Galvanizing Repair (Metric) (superseding DOD-P-21035A)
39. NAAMM, applicable publications.
40. SSPC referenced standards.

## 1.9 ADMINISTRATIVE REQUIREMENTS

### A. Coordination:

1. Coordinate work of this Trade Contract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
2. Be responsible for establishing locations and levels for all work of this Section, except such parts as may be delivered to others and set by them. In such cases assist them in properly locating said parts.

### B. Sequencing:

1. Field Measurements
  - a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
  - b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.



C. Scheduling:

1. Coordinate the work of this Section with the respective trades responsible for installing inserts and anchorages furnished by this Section; make arrangements for delivery, receipt and installation of inserts and anchorages to prevent delay of the Work.

1.10 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:

1. Product Data: Manufacturer's complete product data and specifications for all prefabricated items, shop primer paints, liquid zinc coating, and hydraulic cements, to be furnished hereunder.
  - a. For epoxy anchoring systems: Furnish ICC-ES Code approvals and performance data that includes recommended loading for each application.
2. Shop Drawings, bearing registration stamp of a Professional Structural Engineer registered in Commonwealth of Massachusetts.
  - a. General requirements:
    - 1) Include large scale details of items of all metal fabrications to be furnished hereunder, showing proposed methods of anchorage to surrounding structure and conditions.
    - 2) Indicate on the shop drawings all erection marks for various places of miscellaneous metals, and ensure that the actual field pieces bear corresponding marks.
    - 3) Indicate shop built components, and field-built components.
    - 4) Indicate and detail all field installation connections.
    - 5) Indicate weld types and length.
    - 6) Indicate blocking locations.
  - b. Include large scale details of stairs, intermediate landings and railings.
  - c. Include large scale details of metal fabrications supporting work of other trades.
3. Selection Samples:
  - a. Sample card indicating Manufacturer's full range of colors of shop applied finishes available for selection by Architect.
4. Verification Samples:
  - a. Factory/shop finishes: 3 inch by 6 inch samples of factory-applied coatings and colors proposed for use for approval prior to coating application.
  - b. Handrail, quality assurance sample: Fabricate a sample showing a typical handrail section demonstrating component connections. Sample section shall be minimum 18 inches in horizontal length and 12 inches in height and include a corner post. Provide a shop primed finish.
    - 1) Accepted sample will be used to establish the quality standard

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

for railing fabrication and workmanship.

- c. Provide minimum 24 by 24 inch (or equivalent for shapes) of fabricated and finished ornamental metal components, demonstrating the quality of fabrication work, and finish.
- 5. Certificates:
  - a. Certificate of Compliance from Galvanizer: Submit notarized Certificate of Compliance with application for payment for galvanizing, signed by galvanizer, indicating compliance with requirements of specifications. Include scope of services provided, and quantity and itemized description of items processed.
  - b. Welders certificates as specified under Article entitled "QUALITY ASSURANCE".
- 1. Delegated Design Submittals: Provide calculations for loading and stresses for the work of this section, bearing the Professional Structural Engineer's seal. Show how design load requirements and other performance requirements as required by the 2009 International Building Code with Massachusetts Building Code, Eighth Edition amendments have been satisfied.
  - a. Work scope requiring loading and stress calculations includes, but is not limited to the following:
    - 1) Stairs, intermediate landings and railings.
    - 2) Metal fabrications supporting work of other trades.
- B. Closeout Submittals: Submit the following under provisions of Section 01 78 00 – CLOSEOUT SUBMITTALS.
  - 1. Special Inspections: Submit prior to request for Certificate of Occupancy, to both Architect and local Building Official having jurisdiction, the following:
    - a. All certifications, reports and programs required by the 2009 International Building Code with Massachusetts Building Code, Eighth Edition amendments for work engineered by Trade Contractor's Professional Engineer under the requirements of this Section.

#### 1.11 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
  - 1. Galvanizer's tagging: The galvanizer shall mark all lots of material with a clearly visible stamp or tag indicating the name of the galvanizer, the weight of the zinc coating, and the applicable ASTM Specification Numbers.
- B. Qualifications:
  - 1. Welders: Utilize only qualified welders employed on the Work. Submit verification that Welder's are AWS D1.1 and D1.4 qualified within the previous 12 months.
  - 2. Licensed Professionals: Provide the services of a Professional Structural Engineer, registered in the Commonwealth of Massachusetts to design and certify that the work of this section meets or exceeds the performance

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

requirements specified in this section and as required by the 2009 International Building Code with Massachusetts Building Code, Eighth Edition amendments.

- a. Prepare Shop Drawings for stairs, railings, and handrail brackets under direct supervision of a same Engineer experienced in design of this work.

#### 1.12 DELIVERY, STORAGE AND HANDLING

##### A. Delivery and Acceptance Requirements:

1. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.

##### B. Storage and Handling Requirements:

1. Handle and store materials under cover in a manner to prevent defacement, deformation, or other damage to the materials and to shop finishes, and to prevent the accumulation of foreign matter on the metal work. All such work shall be repaired and cleaned prior to erection.

#### 1.13 SEQUENCING

- ##### A. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed-Subcontract, have been received and approved by the Architect.

- ##### B. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

### **PART 2 – PRODUCTS**

#### 2.1 MATERIALS

- ##### A. General: All materials shall be new stock, free from defects impairing strength, durability or appearance, and of best commercial quality for each intended purpose. Unless specifically called for otherwise, work shall be fabricated from the following:
1. Aluminum: Provide alloy and temper recommended by aluminum producer or finisher for the type of use and finish indicated
    - a. Extruded bar and shapes: ASTM B 221, alloy 6063-T6 or alloy 6463-T52.
    - b. Extruded pipe and tube: ASTM B 429, alloy 6063-T6.
    - c. Drawn Seamless tube: ASTM B 483, alloy 6063-T832.
    - d. Plate and sheet: ASTM B209, alloy 6063-T6 or Alloy 3003-H14
  2. Steel shapes, plates and bars: ASTM Designation A 36.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

3. Steel pipe: ASTM A53, grade A, seamless pipe, black finish unless otherwise noted.
  4. Steel tubular shapes: ASTM A 501.
  5. Steel plates to be bent or cold-formed: ASTM A283, grade C.
  6. Steel bars and bar-size shapes: ASTM A36.
  7. Cold-finished steel bars: ASTM A108.
  8. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525.
  9. Stainless steel plate and sheet: ASTM A666, Type 304.
  10. Stainless steel castings: ASTM A743, Grade CF 8 or CF 20.
- B. Recycled content of Ferrous Metals: Use maximum available percentage of recycled steel. Steel incorporated into the work shall contain not less than 25 percent of recycled steel.
- C. Steel materials: to be hot dip-galvanized: Provide steel chemically suitable for metal coatings complying with the following requirements: Carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.
- D. Metal surfaces, general: For metal fabrications exposed to view upon completion of the Work, provide materials selected for their surface flatness, smoothness and freedom from surface blemishes. Do not use materials whose exposed surfaces exhibit pitting, seam marks, roller marks, rolled trade names, roughness, and, for steel sheet, variations in flatness exceeding those permitted by reference standards for stretcher-leveled sheet.
- E. Welding rods: AWS E70XX grade, or select in accordance with AWS specifications for the metal alloy to be welded and in accordance with the recommendation of the welding rod manufacturer.
1. Where stainless steel is welded to mild steel, select rods to minimize dilution effects on the stainless steel component.
- F. Steel Pegboards 2 - 48" x 96" Quantity: 4
1. Basis of Design: ULINE INC., Model H6450GR, Color: Gray. @0 Gauge steel with 9/32" hole, 1" apart with Accessories and mounting hardware included.
  2. 43 pc. Assortment Kit, Model H-2685, Quantity: 8

## 2.2 FASTENERS

- A. General: Provide all fasteners and attachments as required for work specified herein and as indicated on the Drawings.
1. In general,
    - a. Provide all fasteners and attachments of the same material and finish as the metal to which it is applied unless otherwise noted.
      - 1) Provide Type 304 stainless-steel fasteners for exterior use.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- 2) Provide Type 304 stainless-steel fasteners for fastening aluminum.
- B. Steel Bolts, Nuts and Washers: ASTM A307, galvanized to ASTM A153 for galvanized components.
  - C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel type 304 bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
  - D. Anchor Bolts: ASTM F 1554, Grade 36.
    - 1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
  - E. Eyebolts: ASTM A 489.
  - F. Machine Screws: ASME B18.6.3.
  - G. Lag Bolts: ASME B18.2.1.
  - H. Wood Screws: Flat head, ASME B18.6.1.
  - I. Plain Washers: Round, ASME B18.22.1.
  - J. Lock Washers: Helical, spring type, ASME B18.21.1
  - K. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel type 304 bolts, nuts and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.

## 2.3 ACCESSORIES

- A. Adhesive for attaching anchors and for direct pinning: high-modulus, high strength, moisture tolerant, epoxy adhesive. Two-component 100 percent solids, epoxy resin complying with ASTM C 881.
  - 1. Minimum performance properties (as cured at 70 degrees F. and 50 percent relative humidity):
    - a. Minimum Compressive Strength, tested per ASTM D-695: 1) at 3 days: 11300 psi (31.0 Mpa).  
2) at 7 days: 11800 psi (44.8 Mpa).  
3) at 28 days: 12200 psi (58.6 Mpa).
    - b. Shear Strength, tested per ASTM D-732 at 14 days: 6200 psi (43 Mpa)
    - c. Minimum Flexural Strength tested per ASTM D-790 at 14 days: 10700 psi (74 Mpa).
    - d. Minimum Bond Strength tested per ASTM C-882 at 14 days:
      - 1) Plastic Concrete to Hardened Concrete 2200 psi (13.8 Mpa).
      - 2) Plastic Concrete to Steel 2000 psi (13.8Mpa).
    - e. Maximum Water Absorption, tested per ASTM D-570: 24 hour 0.27%
    - f. Minimum Tensile properties tested per ASTM D-638: Tensile Strength 6900 psi (48 Mpa).

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

2. Products which may be considered as equal include the following, or approved equal:
  - a. Sika Corporation, Lyndhurst NJ., product: "Sikadur 32 Hi-Mod Gel.
  - b. Simpson Strong Tie, Pleasanton, CA., product "SET High Strength Epoxy".
  - c. Symons Corporation, Des Plaines, IL., product "Rescon Gel anchor 304".
  
- B. Grout: Ready mixed, non-metallic high-strength controlled expansion grout of flowable consistency, conforming to ASTM C 1107 with minimum compressive strength of 8,000 pounds per square inch (55.2 Mpa) at 28 days.
  1. Products which may be considered as equal include the following, or approved equal:
    - a. Five Star Products, Inc., Fairfield CT, product "Five Star Grout."
    - b. L&M Construction Chemicals, Omaha NE, Product: "Crystex."
    - c. BASF Construction Chemicals, Cleveland, OH., product "Masterflow 713".
    - d. Sika Corporation, Lyndhurst, NJ., product "SikaGrout 212".
    - e. ChemMasters, Madison, OH., product "Conset".
  
- C. Metal paste filler: 2 component epoxy, high strength, structural adhesive putty:
  1. Products which may be considered as equal include the following, or approved equal:
    - a. Abatron, Inc. Gilberts IL, product: "Ferrobond-P".
    - b. Dynatron/Bondo Corp., Atlanta, GA, product: "Bondo Plastic Filler".
  
    - c. U.S. Chemical & Plastics Company., Massillon OH, product "Metal filled epoxy".
  
- D. Liquid zinc coating, for touch-up of welds, scratches, and abrasions in galvanized steel: Low VOC organic zinc-rich coating containing 92% metallic zinc, by weight in the dried film (ASTM D520, Type III) and conforming to SSPC Paint 20, Type II, Level 1. Liquid zinc coating shall be recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to MIL-P-21035B and SSPC Paint 29, Type II, Level I, for repair of hot-dip galvanizing and meeting the requirements for Zinc-Rich Paints.
  1. VOC limit: not more than 250 g/L.
  2. Specified manufacturer and product: ZRC Worldwide, Marshfield MA, product "ZRC-221".
  
- E. Primer for non-galvanized steel surfaces, modified alkyd rust-inhibitive, high solids primer:
  1. Products which may be considered as equal include the following, or approved equal:
    - a. International (Courtaulds Coatings): Interlac 260HS.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- b. Rust-Oleum: 1069 Heavy Duty Rust Inhibitive Red Primer.
- c. Sherwin Williams: Kem Flash Primer HS, Red Oxide E61R702.
- d. Tnemec: 10-99 Red Primer.
- e. Wibur & Williams (California Products Corporation): 1703 Universal Metal Primer.

2.4 FABRICATION – GENERAL

- A. Metal surfaces shall be clean and free from mill scale, flake, rust and rust pitting; well-formed and finished to shape and size, true to details with straight, sharp lines, and angles and smooth surfaces. Curved work shall be to true radii. Exposed sheared edges shall be eased.
- B. Shop fabricate items wherever practicable, accurately fitting all parts and making all joints tight. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
- C. Do all cutting, punching, drilling, and tapping required for attachment of anchor bolts and other hardware and for attachment of work by other trades. All such work shall be done prior to hot-dip galvanizing of the various components.
- D. Grind all edges of bars and plates completely free from nicks and machine marks, prior to galvanizing and/or shop priming.
- E. Grind all exposed-to-view welds completely smooth and flush to the surface plane of the base metals. Perform welding work prior to galvanizing in all cases, except where field welding is necessary, in which case, completely coat all such welds with two coats of specified liquid zinc coating, after performing grinding operations.
  - 1. Finish welds on exposed to view components to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- F. Use screws and bolts only where welding cannot be performed, of sufficient size to ensure against loosening from normal usage of miscellaneous metal items furnished hereunder.
  - 1. Countersink all screw heads and bolt heads as far as practicable. Use not less than two screw, bolts, or other anchorage items, at each connection point.
  - 2. Draw up all threaded connections tightly, after buttering same with pipe joint compound, to exclude water.
- G. Provision for Thermal Movement: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
  - 1. Design, fabricate and install for temperature change range of 120 degrees F, ambient temperature and 180 degrees F, material surfaces.
- H. Carefully coordinate the installation of metal fabrications with the work of trades

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

responsible for the installation of interfacing work, and for the installation of work into the various assemblies furnished hereunder, and permit the installation of the related materials to be made at the appropriate times.

- I. Fit and assemble metal fabrications in largest practical sections for delivery to site, ready for installation.
  1. Galvanized assemblies: Where size of assembly is too large for galvanizing kettle, galvanize components prior to fabrication and assemble after galvanizing.

## 2.5 FABRICATION – RAILINGS

- A. Refer to the Drawings for location of railings (handrails) to be furnished and installed hereunder.
  1. Verify heights shown in Drawings comply with referenced codes and regulations.
- B. Railing performance requirements; conform to all requirements of those codes and regulations referenced under Section 01 41 00 – REGULATORY REQUIREMENTS.
  1. Railings: Design, fabricate and install all railings in a manner which will ensure the railings will be capable of withstanding loads as follows and as required under Section 1607 of the 2009 International Building Code with Massachusetts Building Code, Eighth Edition amendments.
    - a. Resist a load of 50 pounds per linear foot (0.73 kN/m) applied in any direction at the top and to transfer load through railing supports to structure.
    - b. Resist a single concentrated load of 200 pounds (0.89kN) applied in any direction at any point along the top, and to transfer load through railing supports to structure. Concentrated loading requirements are not concurrent with other loading requirements.
    - c. Intermediate rails, balusters and panel fillers shall resist a horizontally applied load of 50 pounds (0.89 kN) on an area equal to 1 square foot (.093m<sup>2</sup>), including openings and space between rails. Reactions due to this loading are not required to be superimposed with loadings specified for top rail.
  2. Verify heights shown in Drawings comply with local codes and regulations.
- C. Sizes of all railings and other structural members; shall be as indicated on the approved shop drawings, and in accordance with the standards of the National Association of Architectural Metal Manufacturers.
- D. General fabrication: Provide complete s ramp railing assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor railings on supporting structure. Indicate on shop drawings sizes of all members, gages and configurations of stairs and railings.
  1. Join components by welding unless otherwise indicated.



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

2. Use connections that maintain structural value of joined pieces.
  3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
  4. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
  5. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
  6. Form exposed work with accurate angles and surfaces and straight edges.
  7. Weld connections to comply with the following:
    - a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    - b. Obtain fusion without undercut or overlap.
    - c. Remove welding flux immediately.
    - d. Weld exposed corners and seams continuously unless otherwise indicated.
    - e. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint
  8. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
  9. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- E. Fabrication, Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads and deflection criteria.
1. Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
    - a. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
  2. Form changes in direction of railings as indicated on drawings, with radius bends of radius indicated. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
  3. Close exposed ends of railing members with prefabricated end fittings.
  4. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

5. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
  - a. Connect posts to stair framing by direct welding unless otherwise indicated.

## 2.6. FINISHES – HOT-DIP GALVANIZING

- A. Hot-Dip Galvanizing: For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process.
  1. Basis-of-Design: "Duncan Galvanizing, Everett, MA, product "Duragalv" or approved equal.
  2. Comply with ASTM A 123 for fabricated products and ASTM A 153 for bolts, nuts, washers, and other rough hardware. Provide thickness of galvanizing specified in referenced standards.
  3. Wherever possible, perform galvanizing after assembly of items.
  4. Galvanized items shall be straightened to remove all warpage and distortion caused by the galvanization process.
  5. Fill vent holes after galvanizing (if applicable), and grind smooth.
  6. Touch-up all breaks on hot-dip surfaces caused by cutting, welding, drilling or undue abrasion with liquid zinc coating as specified herein above. Apply liquid zinc by brush or spray on all damaged areas in two coats to a total dry film thickness of not less than 3 mils. Apply first coat within two hours after damage to hot-dip film to prevent undue oxidation of exposed surface. On all welds remove weld spatter by power wire brushing or equivalent before applying liquid zinc coating. Repair material should extend at least 3 inches beyond all edges of the damaged galvanized area as possible to assure continuity of galvanic protection.
  7. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, brite paint, or aluminum paints is not acceptable.

## 2.7 FINISHES – SHOP APPLIED COATINGS

- A. Schedule: Shop applied coatings as indicated on Drawings, and as additionally specified and scheduled in this Section.
  1. For non-galvanized steel surfaces:
    - a. Surface preparation prior to priming: Thoroughly clean all steel of all loose mill scale by power wire brushing or sandblasting. Remove all rust, dirt, weld flux, weld spatter, and other foreign matter by wire brushing or scraping (power wire-brushing, if necessary). Grind smooth any sharp projections.
    - b. Shop apply specified primers thoroughly and evenly on the surfaces and worked into the joints and other open areas on the surfaces. Surfaces inaccessible after assembly shall be given two coats. Dry

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

film thickness of primer shall be not less than 2.4 mils per coat.

2. For hot-dipped galvanized steel items scheduled for field applied painted finish:
  - a. Touch-up all breaks on hot-dip surfaces caused by cutting, welding, drilling or undue abrasion with liquid zinc coating as specified above under the Article entitle "Hot Dip Galvanizing".
  - b. Factory Applied Primer over Galvanized Steel: Provide factory-applied prime coat, certified OTC/VOC compliant less than 2.8 lbs/gal. and conforming to EPA and local requirements. Apply primer within 12 hours after galvanizing at the same galvanizer's plant in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Primer coat shall exhibit a rugosity (smoothness) not greater than 4 rug (16-20 microns of variation) when measured by a profilometer over a 1 inch straight line on the surface of architectural and structural elements that are less than 24 pounds per running foot. Profilometer shall be capable of operating in 1 micron increments. Blast cleaning of the surface is unacceptable for surface preparation. Primer shall have a minimum two year re-coat window for application of finish coat. Coatings must meet or exceed the following performance criteria as stipulated by the coatings manufacturer:
    - 1) Basis-of-Design: "Primergalv" by Duncan Galvanizing, Everett, MA or approved equal.
    - 2) Abrasion Resistance: ASTM D 4060 (CS17 Wheel, 1,000 grams load).1kg load, 200 mg loss.
    - 3) Adhesion: ASTM D4541, 1050 psi.
    - 4) Corrosion Weathering: ASTM D5894, 13 cycles, 4,368 hours; rating 10 per ASTM D714 for blistering and rating 7 per ASTM D610 for rusting.
    - 5) Direct Impact Resistance: ASTM D2794, 160 in. lbs.
    - 6) Flexibility: Method: ASTM D522, 180 degree bend, 1 inch mandrel, passes.
    - 7) Pencil Hardness: ASTM D3363, 3B.
    - 8) Moisture Condensation Resistance: ASTM D4585, 100 degrees F, 2000 hours; passes, no cracking or delamination.
    - 9) Dry Heat Resistance: Method: ASTM D2485, 250 degrees F.
  - c. Touch-up finish in conformance with manufacturer's recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.
3. For hot-dipped galvanized steel items scheduled for shop applied coating:
  - a. Touch-up all breaks on hot-dip surfaces caused by cutting, welding, drilling or undue abrasion with liquid zinc coating as specified above under the Article entitled "Hot Dip Galvanizing", herein above.
  - b. Finish: Provide factory-applied architectural coating over hot-dip galvanized steel matching approved samples.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- 1) Basis-of-Design: Duncan Galvanizing, Everett, MA, product "Colorgalv 10" or approved equal.
- 2) Primer coat shall be factory-applied. Apply primer within 12 hours after galvanizing and within 3 hours of surface preparation at the same facility where the galvanizing is done in a controlled environment meeting applicable environmental regulations and as recommended by the primer coating manufacturer. Primer must meet or exceed the criteria for the following categories as stipulated by the coatings manufacturer:
  - Abrasion Resistance: ASTM D4060 (CS17 Wheel, 1,000 grams load) 1kg load, 200 mg loss.
  - Adhesion: ASTM D4541, 1050 psi.
  - Corrosion Weathering: ASTM D5894, 13 cycles, 4,368 hours; rating 10 per ASTM D714 for blistering and rating 7 per ASTM D610 for rusting.
  - Direct Impact Resistance: ASTM D2794, 160 in. lbs.
  - Flexibility: Method: ASTM D522, 180 degree bend, 1 inch mandrel, passes.
  - Pencil Hardness: ASTM D3363, 3B.
  - Moisture Condensation Resistance: ASTM D4585, 100 degrees F, 2000 hours; passes, no cracking or delamination.
  - Dry Heat Resistance: Method: ASTM D2485, 250 degrees F.
- 3) Finish coat shall be factory-applied high performance architectural finish. Apply finish coating at the galvanizer's plant, in a controlled environment meeting applicable environmental regulations and as recommended by the finish coating manufacturer. Finish must meet or exceed the criteria for the following categories as stipulated by the coatings manufacturer:
  - Abrasion Resistance: ASTM D 4060, CS17 Wheel, 1,000 cycles 1kg load, 87.1 mg loss.
  - Adhesion: ASTM D4541, 1050 psi.
  - Direct Impact Resistance: ASTM D2794, greater than 28 in. pounds.
  - Indirect Impact Resistance: ASTM D2794, 12-14 in. pounds.
  - Dry Heat Resistance: ASTM D2485, 200 degrees F.
  - Salt Fog Resistance: ASTM B117 9,000 hours, rating 10 per ASTM D714 for blistering.
  - Flexibility: ASTM D522, 180 degree bend, 1/8 inch mandrel, passes.
  - Pencil Hardness: ASTM D3363, 2H.
  - Moisture Condensation Resistance: ASTM D4585, 100 degrees F, 1000 hours, no blistering or delamination.
  - Xenon Arc Test: ASTM D 4798, pass 300 hours.
- 4) Coatings shall be certified VOC compliant and conform to applicable regulations and EPA standards. Apply the galvanizing, primer and coating within the same facility and provide single-source responsibility for galvanizing, priming and

finish coating. Blast cleaning of the galvanized surface is not acceptable.

- d. Engage the services of a galvanizing facility which will assume single-source responsibility for galvanizing and finish coating.
  - 1) Touch-up finish in conformance with manufacturer's recommendations. Provide touch-up such that repair is not visible from a distance of 6 feet.
- 4. For aluminum fabrications: Shop-applied standard electrostatically applied baked enamel coating complying with AAMA 603. Coating shall be applied to 1.5 to 2 mills dry film thickness in color selected from manufacturer's fully available range.
- 5. Field touch-up: Shall be the responsibility of the installing contractor and shall include the filling, and touch-up of exposed job made bolt or screw holes, refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and marks, and final cleaning up of the finished surfaces.
  - a. Touch-up finishes shall be fully compatible with, and exactly match shop applied finish, color, texture and sheen.

## 2.8 SCAFFOLDS AND STAGING

- A. General: Trade Contractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in the Construction Manager's GENERAL PROJECT REQUIREMENTS – APPLICABLE TO ALL TRADE AND NON-TRADE SUBCONTRACTORS and herein.
  - 1. Scaffolding and staging required for use by this Trade Contractor pursuant to requirements of the Construction Manager's GENERAL PROJECT REQUIREMENTS – APPLICABLE TO ALL TRADE AND NON-TRADE SUBCONTRACTORS shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Trade Contractor requiring such scaffolding.
  - 2. Each Trade Contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the Construction Manager.
  - 3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility this Trade Contractor.
  - 4. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each workday to prohibit access to the scaffolding by unauthorized individuals.

## 2.9 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift

machinery required for the work by this Trade Contractor shall be furnished, installed, operated and maintained in safe conditions by this Trade Contractor.

### **PART 3 - EXECUTION**

#### **3.1 ERECTION - GENERAL**

- A. General: Accurately set all work to established lines and elevations, and rigidly fasten in place with suitable attachments to the construction of the building. At the completion of the work, check all work, re-adjust as required, and leave in perfect condition. Grind all exposed to view welds smooth to the touch.
  
- B. Setting bearing and leveling plates:
  - 1. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.
  - 2. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
    - a. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
    - b. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
  
- C. Miscellaneous framing and supports: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and additional requirements indicated on Shop Drawings.
  - 1. Anchor supports for operable partitions, and similar products, securely to and rigidly braced to building structure.

#### **3.2 FIELD WELDING**

- A. Field weld components indicated on approved shop drawings in accordance with AWS D1.1. Weld profile, quality, and finish shall be consistent with approved samples and mock-ups.
  - 1. Welds ground smooth: For groove welds, the weld shall be made flush to the surfaces of each side and be within + 1/16", -0" of plate thickness.
  - 2. Contouring and blending of welds: Where fillet welds are indicated to be ground contoured, or blended, oversize welds as required; grind to provide a smooth transition and to match profile on approved mock-up .
  - 3. Continuous Welds: Where noted on the drawings, provide continuous welds of a uniform size and profile.
  - 4. Minimize Weld Show Through: At locations where welding on the far side of an exposed connection occurs, grind distortion and marking of the steel

to a smooth profile with adjacent material.

- B. Immediately after welding, touch-up welds, burned areas and damaged surface coatings.
  - 1. Thoroughly remove all spatter by power wire-brushing (or if inaccessible, wire brushing) per SSPC, surface preparation specification SP2 or SP3. Allow surface to cool to ambient temperature. Clean surface with solvent wipe to remove oils, grease and dirt in accordance with SSPC surface preparation specification SP1.
  - 2. Apply one coat of liquid zinc to attain a minimum of 1.5 mils dry film thickness. Coating should extend at least two inches beyond either side of weldment to ensure complete coverage of welded area.

### 3.3 FIELD BOLTING

- A. Accurately drive all bolts into holes, protecting the bolt heads so as not to damage the thread during the driving. Ensure that bolt heads and nuts rest squarely against the metal. Where structural members have sloping flange faces, provide approved beveled washers at the bolted connections to afford square seating for bolt heads or nuts. Nick bolt threads for unfinished bolts to prevent the nuts from backing off.
  - 1. Bolt Head Orientation: All bolt heads shall be oriented as indicated on the contract documents. Where bolt-head alignment is specified, the orientation shall be noted for each connection on the erection drawings. Where not noted, the bolt heads in a given connection shall be oriented to one side.
- B. Use an approved calibrated manual or power torque wrench to obtain the proper torque and tension as recommended by the bolt manufacturer for all ASTM A 325 bolts.

### 3.4 INSTALLATION OF RAILINGS

- A. Adjust railings prior to anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated, or if not indicated, as required by design loading. Plumb posts in each direction. Secure posts and railing ends to building construction as follows:
  - 1. Anchor posts in concrete by means of pipe sleeves providing at least 1/2 inch clearance around entire perimeter of post, preset and anchored into concrete. After posts have been inserted into sleeves, fill annular space between post and sleeve solid with nonmetallic, nonshrink grout, mixed and placed to comply with grout manufacturer's directions.
    - a. For setting into colored concrete; hold grout back 1/2 inch from finish surface and fill void with Portland cement grout matching color and texture of adjacent surface.
    - b. Leave anchorage joint exposed, wipe off surplus grout, and leave 1/8" build-up, sloped away from post.
  - 2. Anchor posts to steel with steel flanges, angle type or floor type as required

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

by conditions, welded to posts and bolted to steel supporting members.

3. Anchor rail ends into concrete and masonry with round steel flanges welded to rail ends and anchored into wall construction with lead expansion shields and bolts.
  4. Anchor rail ends to steel with round flanges welded to rail ends and bolted to structural steel members, unless otherwise indicated.
  5. Install removable railing sections where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing.
- B. Secure handrails to wall with wall brackets and end fittings. Provide bracket with not less than 1-1/2" clearance from inside face of handrail and finished wall surface. Locate brackets as indicated, or if not indicated, at spacing required to support structural loads. Secure rails to walls with wall brackets, wall return fittings and anchor plates, in a manner required to meet code requirements, and as follows:
1. Each bracket shall be fastened with not less than 2 bolts.
  2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
  3. For hollow masonry anchorage, use toggle bolts having square heads.
  4. For steel framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors to steel reinforcing plate, using bolts of size and type required to support structural loads.
  5. For wood stud partitions, use lag bolts set into wood blocking or backing between studs. Coordinate with stud installations for accurate location of blocking or backing members.

### 3.5 TOUCH-UP

1. Touch-up all welds, burned areas, scratches, abrasions, on galvanized metals, using specified liquid zinc coating.
2. Touch-up all welds, scratches, abrasions, and other surface damaged on shop- primed or painted metals, using the same coatings as specified under shop applied finishes, herein above.

### 3.6 SUPPLEMENTAL SCHEDULES

1. General: Items listed herein below provide further description of those already indicated in the Drawings. This list does not represent a complete list of miscellaneous metal components or types required to complete the Work.
  - a. Carefully review all Drawings and furnish and install metal fabrications required by the various trades, whether or not specifically listed herein, such as miscellaneous clip angles, miscellaneous steel bracketing, and other miscellaneous metal items as indicated on the



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

Drawings, reasonably implied therefrom, or reasonably necessary for  
the thorough completion of the work.

2. Exterior railings: 1-1/4 inch (I.D.) ASTM A53, Grade A, Schedule 40, steel pipe, as detailed on the Drawings. Fabricated assemblies shall be hot-dipped galvanized, shop primed and shop finished.
  - a. Pipe railings: To prevent unnecessary damage to the galvanized coating by field welding, provide slip-fit method of connecting pipe railings. Fabricate pipe railing from mechanical steel tubing internally vented with holes 3/4 the size of the pipe's internal diameter.
  - b. Construction: Cope posts to fit tightly to rails. Miter and weld all corners of pipe railing. Grind smooth all welds and file all edges and corners.

At Exterior Railing Assemblies:

    - To prevent unnecessary damage to the galvanized coating by field welding, provide slip-fit method of connecting pipe railings.
    - Fabricate pipe railing from mechanical steel tubing internally vented with holes 3/4 the size of the pipe's internal diameter.
    - Where size of assembly is too large for galvanizing kettle, galvanize components prior to fabrication and assemble after galvanizing.
  - c. Where indicated set posts into sleeves bedded into concrete, wedge plumb and set with non shrink, non metallic grout. Furnish and install steel pipe sleeves, sized to accept steel posts, and fabricated with 3/16" steel plate continuously welded to bottom of sleeves. Set sleeves prior to placement of concrete.
  - d. Wall rails: Wall brackets:
    - Manufacturer: R & B Wagner, Inc., Butler, WI, or approved equal.
    - Type: Style F-3 , malleable, with anchor plate, (1) 7/16 inch dia. hole and (3) 1/4 inch dia. tapped holes with 1/4 inch round head bolts. Dimension from wall to pipe centerline, 2-1/2 inches, unless indicated otherwise.
    - Form elbow bends and wall returns to uniform radius, free from buckles and twists, with smooth finished surfaces. Close exposed ends of steel pipe by welding 3/16 inch thick steel plate in place. Return handrail ends to within 1/8" of wall.
3. Lintels: As scheduled on Structural Drawings.
  - a. Provide lintels 12 inches longer than masonry openings. Where lintel abuts column, provide structural clip connection.
  - b. Lintels occurring in exterior walls shall be galvanized in conformance with the requirements of ASTM A 143, and ASTM A 123.

END OF SECTION

SECTION 06 10 00  
ROUGH CARPENTRY

PART 1 - GENERAL

- 1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- 1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- 1.03 The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the rough carpentry and related Work necessary for the proper completion of the operations in accordance with the intent of the Contract Documents.
- The Work of this Section shall include, but not be limited to, the following:
- A. Temporary enclosure for window openings and other temporary items, including railings, ladders and similar items required under the applicable Sections of Division 1.
  - B. Pressure treated preservative treated wood furring & blocking.
  - C. All blocking & furring to be Fire Retardant treated wood furring & blocking
  - D. Pressure treated preservative treated wood blocking and nailers not specified under other Sections.
  - E. Pressure treated preservative treated wood blocking for all associated masonry and concrete.
  - F. Rough hardware, including bolts, screws, spikes, nails, and clips, as required to install rough carpentry work.
  - G. Plywood T&G decking and wainscot wall panels – A/C finish
  - H. Installation of any items specified elsewhere to be installed under this Section and those items under other Sections where installation is not specified.
  - I. Any other miscellaneous items of carpentry or fastening or installing of same.
  - J. Coordinate the rough carpentry work of this Section with the work of the various trades responsible for applying finish materials and other items to rough carpentry work. Furnish and install furring, blocking, and shims as required to make the rough carpentry surfaces acceptable to these trades.
- 1.04 Reference Standards, Specifications, and Codes
- A. The following are hereby made a part of this Section by reference thereto:
    - 1. American Wood Preservers Institute (AWPI) Standard C2.
    - 2. American Wood Preservers Bureau (AWPB) Quality Mark LP2.
    - 3. American Plywood Association (APA) Grades and Specifications.
    - 4. National Lumber Grades Authority. American Lumber Standards and Grading Rules and Standards of the various lumber associations whose species are being used, with grademarks for same.

5. U. S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber, and Product Standard PS-1, for quality of plywood.
6. National Forest Products Association National Design Specifications for Stress-Grade Lumber and Its Fastenings.

1.05 Related Sections:

- A. Section 01 39 90 – MINOR ALTERATION WORK
- B. Section 01 27 00 - UNIT PRICES
- C. Section 02 41 19 - SELECTIVE DEMOLITION
- D. Section 06 40 00 - ARCHITECTURAL WOODWORK
- E. Section 08 51 13 – ALUMINUM WINDOWS: Blocking of openings

1.06 Submittals

- A. Submit the following in accordance with Section 01 33 24.
  1. Specifications and product data for lumber and plywood, including fabrication process, treatments and accessories.

PART 2 - PRODUCTS

2.01 Grading Standards and Quality

- A. All stress-grade lumber shall conform to the requirements of NFPA National Design Specifications for Stress-Grade Lumber and its Fastenings.
- B. All lumber shall:
  1. Be new, dressed four sides (S4S) clear and free from warping and other defects.
  2. Have a moisture content not exceeding 19 percent when delivered to the project.
  3. Be in accordance with the grading rules of the lumber manufacturer's association under whose jurisdiction the specie of lumber is produced.
- C. Plywood: Conform to the requirements of Product Standard PS-1 and bear applicable APA grade trademarks.

2.02 Lumber, Plywood and Other Rough Carpentry Materials

- A. Stress-grade lumber: Conform to the following or better:

|           |                       |                            |     |           |
|-----------|-----------------------|----------------------------|-----|-----------|
| B. Member | Species/Grade No.     | Minimum Allowable (p.s.i.) |     |           |
|           |                       | Fb                         | Fc  | E         |
| Joists    | Hem-Fir No. 2         | 1,100                      |     | 1,400,000 |
| Posts     | Hem-Fir No. 1         |                            | 850 | 1,300,000 |
| Studs     | Spruce-Pine Fir No. 3 | 575                        | 450 | 1,200,000 |

- C. Non-stress grade lumber. Construction, of No. 2 and Better, Grade Hem/Fir or Spruce, Grade-stamped S-Dry.
- D. Plywood for panelboard mountings and similar uses: AC-Plugged Int-APA, touch-sanded.
- E. Plywood sheathing for sheathing and other concealed from view locations: CD-EXT-APA, in thicknesses indicated on the Drawings.
- F. Treatments for Wood and Plywood:

1. Pressure preservative treatment for application to all wood sleepers in conjunction with preformed roofing; blocking, nailers, cant strips, and curbs in conjunction with roofing and roofing sheet metal work; and for wood nailers and blocking embedded in concrete and masonry: Pressure treated with a toxic salt wood preservative meeting or exceeding Federal Specification TT-W-535, Type B, applied in a closed cylinder by vacuum process, full cell method in strict accordance with the recommended practices of the American Wood Preservers Association and Federal Specification TT-W-571g, with a retention of at least 0.35 pounds of dry salts per cubic foot of wood. Re-dry all treated wood before installation.
  2. Fire-retardant treatment for application to all wood framing members; plywood subflooring/underlayment; and for plywood sheathing used in conjunction with interior surfaces: Pressure fire-retardant treatment, providing a fire hazard classification of 25 Flame Spread, Smoke Developed, and Fuel Contributed, with no signs of progressive combustion when the 10-minute test is continued for an additional 20 minutes. Osmose Flame Proof LHC, Kippers Dricon, Hoover Universal Pro-TEX, or equal.
- G. Bolts and Fastenings:
1. All fasteners shall be screw or bolt type fasteners. **Nail fasteners are not allowed or accepted. All screw fasteners to countersunk and or flush with surface. No projections will be accepted.**
  2. For lumber having actual thickness of 1-1/2 inches or greater to masonry and concrete: Steel anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, 3/8 inch minimum diameter, spaced as shown, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.
  3. For lumber having actual thickness of greater than 7/8 inch but less than 1-1/2 inches to masonry and concrete: Steel anchor bolts or expansion bolts, as most applicable for the specific receiving surface material, at least 1/4 inch diameter of the most appropriate lengths for the specific application, spaced as shown, and staggered as far as practicable. Countersink all bolt heads, and provide head washers of matching material.
  4. For lumber having actual thickness of 7/8 inch and less: Steel anchor bolts or expansion bolts, at least 1/4 inch in diameter, or screws, of the most appropriate sizes; in lengths most suitable for the specific application, countersunk, spaced as shown, and staggered as far as practicable. Provide head washer of matching material.
  5. All bolts embedded into concrete or masonry shall be hot-dipped galvanized.

### PART 3 - EXECUTION

#### 3.01 Storage of Materials

- A. Store all materials in an elevated dry location, protected by waterproof coverings. Do not store within the building until masonry, concrete and other such wet work has been completed and allowed to dry.

#### 3.02 Temporary Bracing

- A. Provide and maintain, until such time as permanently built into the structure, all temporary bracing for pressed steel frames, sills, and other work requiring bracing and which is not specified as being provided under other Sections of the Specifications.

#### 3.03 Protection

- A. Do such work as is necessary to cover and protect all finishes and other work from damage during construction. Provide and maintain temporary substantial wood handrails around all

openings through floors, and provide temporary traffic-supporting coverings for roof openings until permanent items are installed thereover.

3.04 Temporary Enclosures

- A. Furnish, install and maintain in weatherproof condition until permanent enclosure items are installed, substantial temporary enclosures of weatherproof construction for all openings in the exterior walls of the building, as required to provide proper installation conditions for all trades engaged in the work. Remove temporary enclosures only when permanent enclosures will be immediately installed thereafter.

3.05 Runways and Ladders

- A. Furnish set, and maintain runways and ladders, leading from the lowest point of the building to the roofs, and serving conveniently onto each floor for the general use of all workmen.
- B. Ensure that temporary ladders are of sufficient length and in a position to permit the top end to project not less than three feet above the floor, wall or other surface against which it is placed.

3.06 General Installation of Rough Carpentry Work

- A. Closely coordinate the installation of the rough carpentry work with the work of other trades responsible for the installation of interfacing or overlaying materials, so as not to delay the work of the related trades.
- B. Erect all rough carpentry work plumb, level, and true with tight, close fitting joints, securely attached and braced to surrounding construction, all in a first class workmanlike manner. Counterbore for bolt heads, nuts, and washers where required to avoid interference with other materials. Bear complete responsibility for structural integrity, connections, and anchorage of all rough carpentry work.
- C. Use as long lengths as practicable for wood nailers, blockings, and curbs, to minimize number of joints, and attach the members with the types, and spacings, of fasteners specified herein.
- D. Fastening of nailers, blocking and other rough lumber. Pre-drill and counterbore all number at fastener locations. Install nailers and blocking with specified fastenings equipped with large washers, and space the fasteners not more than 18 inches on centers, and stagger lines of fasteners for all lumber having a width greater than 3-1/2 inches. Use not less than two fasteners per piece of lumber. **Ensure that no part of the fastener or nuts extend beyond the top surface of the lumber.** Install wood shims, as needed to ensure completely true surfaces. Miter all intersecting corners of lumber, and fit all adjacent running pieces with tight ends. After making cuts in treated lumber, and prior to the placement thereof, brush on a heavy coat of the specified preservative to the cut ends.
- E. Install wood grounds and furring as required for proper attachment of the work of other trades in accordance with the requirements provided by the respective related trades.

3.07 Clean-Up

- A. Upon completion of rough carpentry work in any given area, remove all rubbish and debris from the work area and leave in broom clean condition.

END OF SECTION

Section 06 40 00  
ARCHITECTURAL WOODWORK

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Furnish and install the following architectural woodwork items:
  - 1. New plastic laminated cabinets and casework
  - 2. Hardware for work of this Section.
  - 3. 2x3 Framing for 1/4 inch Peg Board
  
- B. Make all cutouts within casework items to accommodate sinks, piping, conduit, and other mechanical and electrical work, from templates provided by the respective mechanical and electrical trades.
  
- C. No attempt is made in this Section to list all elements of architectural woodwork required on this project or to describe how each element will be installed. It is the responsibility of the Contractor to determine for itself the scope and nature of the work required for a complete installation from the information provided herein and in the Drawings.

1.2 RELATED SECTIONS

- A. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
  
- B. Section 05 50 00 - METAL FABRICATIONS: Supports for countertops. – and Steel peg boards
  
- C. Section 06 10 00 - ROUGH CARPENTRY: Concealed wood blocking and nailers.
  
- D. Section 06 16 16 – SOLID SURFACE FABRICATIONS: Countertops and window sills / aprons
  
- E. Division 22 - PLUMBING: Plumbing fixtures and piping.
  
- F. Division 23 - HVAC
  
- G. Division 26 - ELECTRICAL: Electrical connections for lighting and power

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. ASTM C 209 - Test Methods for Cellulosic Fiber Insulating Board.
  2. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  3. ASTM D 523 - Standard Specification for Specular Gloss.
  4. ASTM D 1037 - Test Methods of Evaluating Properties of Wood-Base Fiber and Particle Panel Materials.
  5. ASTM E 84 - Test Method for Surface Burning Characteristics of Building Materials.
  6. AWI (Architectural Woodwork Institute) Quality Standards, Eighth Edition.
  7. AWI Quality Certification Program.
  8. APA Grades and Specifications.
  9. National Lumber Grades Authority, American Lumber Standards, and Grading Rules and Standards of the various lumber associations whose species are being used, with grade-marks for same.
  10. U.S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber; and Product Standard (PS):
    - a. PS-1 - Construction and Industrial Plywood Standard.
    - b. PS-20 - American Softwood Lumber Standard.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
1. Field Measurements: Where possible the woodwork manufacturer shall take field measurements before preparation of shop drawings and fabrication to ensure proper fitting of Work.
    - a. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
  2. Field dimensions which are not controlled by Project conditions: The woodwork manufacturer is responsible for details and dimensions not controlled by Project conditions and shall show on his shop drawings all required field measurements beyond his control.
    - a. The Contractor shall acknowledge the woodwork fabricator's need for accurate field dimensions prior to custom fabrication.
    - b. The Contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.
- B. Scheduling:
1. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

## 1.5 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
1. Product Data: Manufacturer's product data sheets, specifications, performance data, for each item furnished hereunder, including, but not limited to: Fastenings, adhesives, hardware, and accessories.
    - a. Provide additional information required for fillers and finish products: Include, chemical, functional, and environmental characteristics, limitations and special application requirements. Identify available colors, shades, and gloss.
  2. Shop drawings bearing dimensions of actual measurements taken at the project, include at least the following, which are in addition to shop drawing requirements described in AWI Quality Standards:
    - a. 1/4 inch scale elevations and plans of each casework item.
    - b. Large scale design details of minimum 1-1/2 inch to 1-foot scale, showing abutting materials, installation conditions, clearances. Show woodwork profiles, jointing and fastening methods; details of drawers and doors.
    - c. Full size or half-full size sections, showing individual components, profiles and jointing.
  3. Selection Samples:
    - a. Plastic laminate chips for initial color selection by Architect.
    - b. Provide additional samples as requested by Architect for initial selection of material colors and finishes.
  4. Verification Samples:
    - a. 12 by 12 inch samples of wood veneer illustrating maximum range of color variations and applied transparent shop finish.
    - b. 12 inch long samples of solid hardwoods illustrating maximum range of color variations and applied transparent shop finish.
    - c. 12 by 12 inch samples of plastic laminate (of each color required for project).

## 1.6 QUALITY ASSURANCE

- A. Fabricator/Installer: Work of this section shall be performed by a firm licensed by the AWI Quality Certification Program.
1. Woodwork fabricator/installer is required to be licensed by AWI as competent to perform the work specified. Certification shall be evidenced through the application of AWI Quality Certification labels and issuance of an AWI letter of licensing for the project. AWI certification labels shall be applied to each item of work.



- B. Quality Standards: All work performed under this Section shall be of quality grades, indicated below, as defined in the referenced AWI "Quality Standards, as modified herein by this Specification Section.
  - 1. All work having a transparent wood finish: Premium grade.
  - 2. All work having a opaque wood finish: Premium grade.
  - 3. All plastic laminated work: Premium grade.
  
- C. Qualifications:
  - 1. Fabricator/Installer: AWI member specializing in architectural woodwork of type specified herein having a minimum of 5 years documented experience.
  
- D. Delivery and Acceptance Requirements:
  - 1. General: The woodwork manufacturer, woodwork installer and the Contractor are jointly responsible to make certain that woodwork is not delivered until the building and storage areas are sufficiently dry so that the woodwork will not be damaged by excessive changes in ambient humidity and relative moisture content.
  - 2. Concrete, masonry, plaster, tile other wet work shall be completed and dry before delivery, storage and installation of woodwork items.
  - 3. Sequence deliveries to avoid delays and to minimize on-site storage.
  
- E. Storage and Handling Requirements:
  - 1. Ship and handle all materials and fabricated items in a manner which will prevent damage thereto and store all materials and fabricated items at a dry, elevated, ventilated, and protected interior location.

## 1.7 SITE CONDITIONS

- A. Temperature: Maintain ambient temperature above 55 degrees Fahrenheit for 5 calendar days before, and during installation of architectural woodwork; maintain temperature after installation until Owner's Final Acceptance.
  
- B. Relative Humidity: Maintain a relative humidity between 25 and 55 percent for a minimum period of 5 calendar days before, and during, installation of architectural woodwork: maintain relative humidity after installation until Owner's Final Acceptance.

## 1.8 FIELD MEASUREMENTS

- A. Field dimensions: The woodwork manufacturer is responsible for details and dimensions not controlled by Project conditions and shall show on his shop drawings all required field measurements beyond his control.
  - 1. The Contractor shall acknowledge the woodwork fabricator's need

for accurate field dimensions prior to custom fabrication.

2. The Contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

## 1.9 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

## PART 2 - PRODUCTS

### 2.1 LUMBER MATERIALS

- A. General requirements: New, dressed four sides (S4S), and free from warping and other defects.
  1. Moisture Content:
    - a. Solid hardwood(s) scheduled for transparent finish: Moisture content shall not exceed 8 percent when delivered to Project.
    - b. Typical (hardwood and softwoods): Moisture content of wood shall be between 5 and 10 percent when delivered to the project.
- B. Exposed wood scheduled for transparent finish (including but not limited to wood trim, casework frames, shelves, fillers, edge trim and drawer construction; and trim at wainscot): Maple), Plain Sawn, AWI Grade
  1. Wood shall color stain match existing wood work, and be clear without knots, and other natural defects.
- C. Exposed wood scheduled for opaque finish: White Birch, plain sliced, meeting AWI Grade I. Additionally, wood shall be clear without knots, and other natural defects.
  1. Wood trim to receive shop applied paint finish in colors selected by the Architect.
- D. Exposed plywood panels scheduled for opaque finish, in thicknesses indicated in Drawings.
- E. Concealed supports for edge and corner backing shall be kiln dried birch or poplar, meeting AWI Premium Grade Standards.
- F. Blocking and furring at base and walls shall comply with American Softwood Lumber Standard PS 20-70 and with specific grading requirements of SPIB: Kiln dried (KD15), Structural Light Framing, N<sup>o</sup>. 2 grade, free of warping and large knots.

- G. Internal concealed framing for casework: Kiln-dried, (KD15), eastern pine, poplar, eastern spruce, or southern pine, conforming to AWI Premium grade.
- H. Fir plywood for concealed from view applications in conjunction with the various casework items: EWA A-C PLUGGED EXT.

## 2.2 PLASTIC LAMINATE FACING AND BACKING

- A. Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - 1. Formica Corp., Cincinnati, OH.
  - 2. Laminart, Elk Grove Village, IL.
  - 3. Pioneer Plastics Corp. (Pionite), Auburn, ME.
  - 4. Nevamar Corp., Odenton, MD.
  - 5. Ralph Wilson Plastics Co. (Wilsonart), Temple, TX.
- B. Plastic laminate, general purpose, conforming to NEMA LD3.1 -1991 Grade GP50, nominal 0.050 inch thickness, in a low non-directional texture in color price group selected by the Architect.
  - 1. General purpose grade laminate shall be used for counter tops where indicated on the Drawings.
  - 2. General purpose grade laminate shall be used for all exposed to view surfaces including:
    - a. Exposed outward face of cabinet fronts and closure trim.
    - b. Cabinet doors (all sides).
    - c. Drawer fronts (all sides).
    - d. Interior surfaces of open cabinets (without doors).
    - e. Plastic laminated trim.
- C. Plastic laminate, cabinet interior grade, conforming to NEMA LD3-1985 Grade CL20, 0.020 inch nominal thickness, in a low non-directional texture in solid color price group as selected by the Architect from full range of available colors in all price groups.
  - 1. Cabinet interior grade laminate may be used for the interior surfaces of all 'closed cabinets,' where general purpose grade is not required.
  - 2. All shelving shall be cabinet interior grade.
- D. Plastic laminate, unfinished balancing (backer) sheet, conforming to NEMA LD3- 1985 undecorated laminate, Grade BK20, 0.020 inch nominal thickness.

## 2.3 BACKING FOR LAMINATES AND VENEERS

- A. Cabinetry case body, and countertops without sinks: Veneer core plywood consisting of five internal plies and two face veneer plies or laminate facing as specified herein.
  - 1. Thicknesses:
    - a. 3/4 inch thick at cases.
- B. Drawers and doors: Veneer core plywood consisting of five internal plies and two face veneer plies or laminate facing as specified herein.
  - 1. Thicknesses:
    - a. Typical: 3/4 inch thick panels, except as otherwise indicated or specified.
    - b. Doors over 36 inches tall: provide 1-1/4 inch thick panels.

## 2.4 GLASS AND GLAZING MATERIALS

- A. Tempered glass for casework doors, sides, and tops: 1/4 inch thick safety glass, ASTM C 1048 FT, fully tempered, complying with Class 1 clear, quality q3 glazing select, conforming to ANSI Z 97.1.
  - 1. Provide certification to Architect that glass complies with the specifications, do not label glass.
- B. Glazing tape: Preformed butyl compound with integral resilient tube spacing device 10-15 shore A durometer hardness; coiled on release paper; of sizes required for proper glazing.
- C. Setting blocks: Neoprene, 80-90 shore A durometer hardness; sized as follows:
  - 1. Length: 0.1 inch per square foot of glass, but not less than 4 inches.
  - 2. Width: equal to glazing rabbet space minus 1/16 inch.
  - 3. Height to suit glazing method and pane weight and area.

## 2.5 CABINET HARDWARE

- A. Manufacture: To establish a standard of quality, design and function desired, Drawings and specifications have been based on companies and products named under each particular hardware item. Manufacturers offering similar products which may be considered as equal, include the following:
  - 1. Catches and latches
    - a. H.B. Ives Company, Wallingford CT.
    - b. Knappe & Vogt, Grand Rapids, MI.
    - c. Stanley Hardware, New Britain CT.
  - 2. Drawer slides:
    - a. Accuride Corp., Santa Fe Springs, CA.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- b. Grass America Inc., Kernersville NC.
    - c. Häfele America Company, Archdale NC.
    - d. Knappe & Vogt, Grand Rapids, MI.
  - 3. Clothes hooks:
    - a. (Lamp) Sugatsune America, Inc. Carson, CA.
    - b. H.B. Ives Company, Wallingford CT.
    - c. Stanley Hardware, New Britain CT.
  - 4. Hinges:
    - a. Grass American Inc., Kernersville, NC
    - b. Julius Blum, Inc., Stanley NC.
    - c. (Lamp) Sugatsune America, Inc. Carson, CA.
  - 5. Locks:
    - a. Häfele America Company, Archdale NC.
    - b. National Cabinet Lock, Mauldin SC.
    - c. Timberline Supply Ltd., Lake Bluff IL.
  - 6. Pulls and knobs:
    - a. Engineered Products Company, Flint MI.
    - b. H.B. Ives Company, Wallingford CT.
    - c. Häfele America Company, Archdale NC.
  - 7. Shelf supports:
    - a. Häfele America Company, Archdale NC.
    - b. Knappe & Vogt, Grand Rapids, MI.
    - c. Stanley Hardware, New Britain CT.
  - 8. Wire grommets:
    - a. Dave Mockett & Company, Inc., Manhattan Beach, CA.
- B. Door and drawer pulls: Staple-shape wire pull, 4 inches long, solid brass with US26D, brushed chrome finish, with one-inch finger clearance.
- C. Locks: Provide at least three keys per keyed alike group.
- 1. Locks for all drawers and doors: deadbolt type, Equal to Timberline Supply: model CB281, lock plug finish LP-100 (nickel finish).
- D. Catches: Magnetic.
- E. Casework hinges:
- 1. General: Hinges shall be nickel plate over die-cast and formed metal. Assemblies made from plastic parts are not acceptable. Provide face frame adapter plates where face frames are indicated.
  - 2. Hinge for full overlay cabinet doors: Self closing concealed hinge having maximum 125 degree angle of opening. Hinges shall be equal to Blum

“Modul 125 Series”, with straight arm, model N°. 95M5550.

- F. Pad silencers for doors: 10 mm (3/8 inch) diameter, self-adhesive resilient plastic or nylon buttons, at least 2 per door, in clear color.
- G. Drawer Slides (provide one pair per drawer except as noted otherwise):
1. For file cabinets: Full extension type, 150 pounds per pair minimum rated capacity (for drawers over 30 inches, provide 175 pounds rated capacity), steel ball bearing rollers, drawer hold in feature. Finish: clear lacquered zinc. Acceptable slides are limited to:
    - a. For drawers up to 24 inches wide:
      - 1) Accuride N°. 4032.
      - 2) Knappe and Vogt N°. 8500.
      - 3) Häfele N°. 4034.
    - b. For drawers over 24 inches and up to 30 inches wide:
      - 1) Accuride N°. 4032.
      - 2) Knappe and Vogt N°. 8500.
      - 3) Häfele N°. No equal.
    - c. For drawers over 30 inches wide:
      - 1) Accuride N°. 4437.
      - 2) Knappe and Vogt N°. 8520.
      - 3) Häfele N°. No equal.
  2. For desk and casework drawers (excluding file drawers): Full extension type, 100 pounds per pair minimum rated capacity, steel ball bearing rollers, lever disconnect, drawer hold in detent feature. Finish: clear lacquered zinc.
    - a. Accuride N°. 3832A.
    - b. Knappe and Vogt N°. 8400.
    - c. Häfele N°. 3832.
- H. Shelf supports:
1. Double slot standards with brackets:
    - a. Standards 1-1/4 inch wide by 1/2 inch high steel standards with 1 inch centers for shelf supports, brushed chrome plate finish, of lengths required for conditions applied, equal to Knappe & Vogt model N°. 85 steel standards.
    - b. Brackets: Knappe & Vogt model N°. 185 ANO.
- I. Wire management grommets and covers: 3 inch diameter, as manufactured by Doug Mockett & Company, Manhattan Beach CA., (800) 523-1269, model number “EDP.” Provide where shown on Drawings, and if not shown, allow the following numbers of grommets; exact locations to be determined in field.
1. For counters 6 feet or less provide 2 wire grommets and covers.

2. For counters over 6 feet, provide 1 wire grommet and cover for every 42 inches of counter, or fraction thereof.
  
- J. Tracks and guides for glazed wood doors: Equal to Hefele product "Hawa Junior 80 Sliding Door Fitting Set", including upper track, running gear, track stop, guide, and bumper, No. 407.59.100-200 series.
  1. Provide Dust Cover No. 406.41.807.
  2. Provide Sealing And Buffer Strip No.
  
- K. Locks for sliding wood doors: Equal to Hafele Sliding Door Lock No. 234.55.209.

## 2.6 ACCESSORIES

- A. Adhesive for installation of plastic laminate: Rigid bond Polyvinyl acetate (PVA) type only. Contact cements are only permitted at countertops with sinks or similar "wet condition" areas.
  
- B. Glue for lamination and fabrication of wood and plywood items: Exterior Grade, phenolic resin glue.
  
- C. Bolts, nuts, washers, lags, pins, and screws: Of size and type to suit application chrome finish in exposed-to-view locations.
  1. Concealed joint fasteners: Threaded steel.
  
- D. Edging for countertops: Flexible self-healing, PVC bumper shaped tee molding, having a 1 1/4 inch face, equal to Outwater Plastics, Woodridge NJ., Model number 303-1250, in color as selected by Architect.
  
- E. Sealant, for joints between countertops and dissimilar materials: One component acetoxysilicone rubber, mildew resistant, FS TT-S-001543A, Type Non-Sag, Class A, and FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Class 25, Grade NS, use NT, G and A with a minimum movement capability of  $\pm 25$  percent, and a Shore A hardness of 20, in manufacturer's standard colors as selected by the Architect.
  1. Only use sealant and primers that comply with the following limits for VOC content:
    - a. Architectural sealants: 250 g/L.
    - b. Sealant primer: 250 g/L
  2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.
  3. Subject to requirements specified herein, the following products are acceptable, or approved equal:
    - a. Dow Corning Corporation, Midland MI.; product, "786".

- b. General Electric Company, Waterford NY.; product, "Sanitary 1700".
- c. Sonneborn Building Products Inc., Minneapolis MN.; product, "Sonolastic - OmniPlus".
- d. Tremco, Beachwood OH.; product, "Proglaze".

## 2.7 FABRICATION - GENERAL

- A. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
- B. Coordinate the fabrication of casework with that of the various trades responsible for installing materials and items which will be inserted into, or applied to, the casework surfaces. Obtain and verify templates, dimensions, and instructions from the respective trades before making cut-outs, holes, slots, and other cutting in the casework.
- C. Shop assemble custom casework for delivery to site. Deliver in assemblies as large as possible for entrance into the designated areas. Provide for concealed job connections of adjacent units.
- D. Fabricate, install and finish all work so that both sides of countertops, panels, doors, shelves and other casework are of balanced construction, to prevent warping.
- E. Cap exposed plywood with solid hardwood, matching color of wood veneer panels. Apply veneer over hardwood edging in manner to show no visible lines between wood veneer and hardwood edging.
- F. Fit corners and joints hairline, secure with concealed fasteners.
- G. Finish all solid wood and plywood surfaces smooth, and free from all machine and tool marks that will show through the wood veneer or facing materials.
- H. Make all joints tight, and form to conceal shrinkage. Glue all miters having a dimension of 4 inches or more from heel to point.
- I. Provide shop fabricated counters, shop mitered components, closure trims with ample allowance for field cutting and fitting. Provide additional trim as required for scribing and site cutting.
- J. Finished work shall be free from visible adhesive and pencil marks.

## 2.8 FABRICATION - CASEWORK

- A. Fabricate casework in accordance with requirements of specified AWI Grade  
Architectural Woodwork  
06 40 00 -11



and the following additional requirements:

1. Cabinets shall be in flush overlay construction, with drawer fronts and hinged doors overlapping openings a minimum of 1/4 inch all four sides.
2. Fabricate all casework scheduled for veneer finish with exposed to view grain of wood vertical or horizontal as indicated on Drawings.
3. Fabricate cabinets in integral units, each completely enclosed, without the use of common partitions.
4. Fabricate plastic laminated casework with top and bottom fillers and corner panels described as optional for Custom Grade Work in the Quality Standards.
5. Drawers:
  - a. Drawer sides and backs 1/2 inch thick solid hardwood of specified species.
  - b. Laminated drawer fronts: High density laminate over 3/4 inch specified core material. Drawer fronts shall be applied to separate drawer body component sub-front.
  - c. Wood veneer drawer fronts: body panel 1/2 inch thick solid hardwood of specified species, face panel same construction as specified for cabinet doors with matching veneer. Drawer fronts shall be applied to separate drawer body component sub-front.
  - d. Drawer bottoms (plywood veneer casework): 1/4 inch thick hardwood veneer panel housed and glued into front, sides and back.
  - e. Underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity.
  - f. Reinforce drawer bottoms with intermediate spreaders.
6. Doors: Square edge design, 3/4 inch thick, without any profiling and shall fully overlap the cabinet frame.
  - a. Laminate doors: Fabricate doors with plywood core and front and rear faces high-pressure laminate, of selected color.
  - b. Wood veneer doors: Fabricate doors with veneer core plywood core and front and rear faces grade AA wood veneer, and solid wood edging.
  - c. Maintain a maximum 1/8" reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
7. Base cabinets: Provide full horizontal top frame with glued and doweled joints, 3/4 inch plywood end panels and bottom. Bottom shall be glued and doweled and let into routed end panels. Provide 4 inch high toe rail, securely screwed to the end panels and to the bottom panel by concealed glue blocks.
8. Wall cabinets: Provide same finishes as base cabinets, with 3/4 inch thick top and bottom veneered plywood panels. Top and bottom panels shall be glued and doweled and let into routed end panels. Back of case shall be recessed and let into routed end panels and further secured with glue

blocks.

9. Door and drawer spreaders: Provide minimum 3/4 thick full width cabinet body spreaders immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, and close off reveal. Front edge to be match face of adjacent cabinet doors/drawers.

## 2.9 FABRICATION OF PLASTIC LAMINATE CLAD ITEMS

- A. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
- B. Except as otherwise specified hereunder, fabricate plastic laminate clad items in strict accordance with the details on the Drawings, the approved shop drawings, and workmanship standards set forth in the AWI Quality Standards Section 400, for specified Quality Grade.
- C. Shop fabricate all plastic laminate clad items. Adhere plastic laminate to plywood backing sheets by cold-press-method. Use of contact cements are not permitted. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Apply laminate backing sheet to reverse side of all laminated, panels, shelving and tops.
- D. Fit corners and joints hairline. Make all joints and miters tight, secure with concealed fasteners.

## 2.10 SHOP APPLIED FINISHING

- A. Transparent exposed-to-view finish for architectural woodwork: AWI Premium Grade Factory Finish System N° TR-4 "Conversion Varnish" system having a Medium rubbed effect with a sheen of 24° to 28° gloss units per ASTM D523. Finish system shall not substantially increase flame spread.
  1. One washcoat, reduced conversion varnish.
  2. Colorant: None - natural finish.
  3. One coat sealer, conversion varnish.
  4. Two coats topcoat: Conversion varnish equal to Sherwin Williams product "V84 series Kem Var".
- B. Opaque exposed-to-view finish for architectural woodwork: Premium Grade, AWI Factory Finish System "Opaque Catalyzed Polyurethane" system having a Full gloss sheen of 85° to 100° gloss units per ASTM D523 sheen with one coat of urethane Primer and one finish coat of catalyzed polyurethane enamel, equal to Sherwin Williams product "F63 series POLANE Enamel"..
  1. One vinyl washcoat.
  2. One coat sealer, urethane Primer.

3. Two coats topcoat: catalyzed polyurethane enamel, equal to Sherwin Williams product "F63 series POLANE-B Enamel
- C. Concealed surfaces: Thoroughly coat all concealed surfaces of finish woodwork before assembling with two coats of clear wood preservative.
- D. Field Touch-up: Shall be the responsibility of the installing contractor and shall include the filling, and touch-up of exposed job made nail or screw holes,  
refinishing of raw surfaces resulting from job fitting, repair of job inflicted scratches and marks, and final cleaning up of the finished surfaces.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Verify adequacy of blocking, backing and support framing for all finish carpentry work.
- B. Examine pre-fabricated woodwork before installation and verify that back priming has been completed and all packing has been removed.
- C. Beginning of installation means acceptance of existing conditions.

#### 3.2 PREPARATION

- A. Before installing work under this section, woodwork shall be conditioned to average prevailing humidity conditions in areas of installation.

#### 3.3 INSTALLATION - GENERAL

- A. Install work in accordance with the specified AWI quality standards.
- B. Woodwork shall be installed plumb, level, true and straight without distortions.
  1. Use concealed shims as required.
  2. Work shall be installed to a tolerance of 1/8 inch in 8 feet for plumb and levelness, including tops.
  3. There shall be no variations in flushness of adjoining surfaces.
- C. Tops and woodwork shall be scribed and trimmed to fit adjoining work.
  1. Where cuts occur, refinish surfaces and repair damaged finishes

- D. Secure woodwork to anchors or built-in blocking or blocking directly attached to substrates.
  - 1. Secure woodwork to grounds, furring, stripping and blocking as required with countersunk, concealed fasteners and blind nailing performing a complete installation.
  - 2. Use thin gauge finishing nails for exposed nailing, countersunk and filled flush with woodwork finished surface.
    - a. Match final finish materials where transparent finish is indicated.

### 3.4 INSTALLATION - CASEWORK AND COUNTERTOPS

- A. Install casework without distortion so that doors and drawers fit openings properly and are accurately and evenly aligned.
- B. Adjust casework hardware centering the doors and drawers in the openings, and provide unencumbered operation.
- C. Complete the installation of hardware and accessory items as indicated.
- D. Maintain veneer sequence matching of casework with transparent finish, where so manufactured.
- E. Tops: Anchor tops securely to base units and to other support systems as required.

### 3.5 TOLERANCES

- A. Maximum variation from true position 1/16 inch with a maximum of 1/32 inch offset from true alignment with adjoining surfaces intended to be flush.

### 3.6 ADJUSTING

- A. To whatever extent work was not completed at shop or prior to installation of woodwork, perform and complete the specified finishing of woodwork.
- B. Repair damaged and defective woodwork where possible eliminating defects functionally and visually.
  - 1. Where not possible to repair damaged or defective work, replace with matching new work.
  - 2. Adjust joinery for uniform appearance.
- C. Adjust doors and drawers for smooth and balanced movement, lubricate hardware for use.

3.7 CLEANING

- A. Comply with requirements of Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for handling and disposition of all construction and demolition waste.
- B. Daily clean work areas by sweeping and disposing of scraps and sawdust.
- C. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area leave area in broom-clean condition.
- D. Clean excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.
- E. Remove protective material from pre-finished surfaces, immediately prior to Final Acceptance.
- F. Carefully clean exposed and semi-exposed wood surfaces, in strict accordance with fabricator's instructions. Touch-up shop-applied finishes to restore damaged or soiled areas, matching adjoining finish.
- G. Wash down plastic laminate with a solution of mild detergent in warm water, applied with soft clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- H. Clean and polish hardware, and bright metal trim components.

3.8 PROTECTION

- A. Protect installed woodwork and maintain specified conditions, in a manner acceptable to both fabricator and installer. Ensure that work of this Section will not be damaged or soiled, and is completely free of defects at the time of final acceptance of Project by the Architect.

End of Section

SECTION 06 61 16  
SOLID SURFACING FABRICATIONS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Furnish and install solid surfacing (solid polymer) fabrications, including but not limited to the following:
  - 1. Solid surfacing window stools and aprons (interior sills).
  - 2. Solid surface countertops and back /side splashes
  - 3. Sealant, for joints between countertops, backsplashes and abutting surfaces.
- B. Make all cutouts within solid surfacing items required to accommodate sinks, and other plumbing fixtures, from templates provided by the respective trades.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking and nailers.
- B. Section 06 40 00 - ARCHITECTURAL WOODWORK: Trim, blocking, soffit and jambs

1.3 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets, specifications, performance data. Identify available colors, shades, and gloss
  - 2. Shop drawings: Large scale design details of minimum 1-1/2 inch-to-1 foot scale, showing abutting materials, installation conditions, clearances. Show profiles, jointing and fastening methods.
  - 3. Selection samples:
    - a. Solid surfacing samples for initial color selection by Architect.
    - b. Sealant material: Manufacturer's standard strips of sealant, in all available colors, for selections by the Architect.
    - c. Provide additional samples as requested by Architect for initial selection of material colors and finishes.
  - 4. Verification samples:
    - a. 12 by 12 inch samples of solid surfacing materials.

1.4 QUALITY ASSURANCE

- A. Fabricator and Installer; with a minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.
  - 1. Fabricator and Installer for solid surfacing products shall be trained and certified by solid surfacing manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Concrete, masonry, plaster, tile and marble setting and polishing and other wet work shall be completed and dry before delivery, storage and installation of fabricated solid surface items.
- B. Ship and handle all materials and fabricated items in a manner which will prevent damage thereto, and store all materials and fabricated items at a dry, elevated, ventilated, and protected interior location.
- C. Sequence deliveries to avoid delays and to minimize on-site storage.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperature above 55 degrees Fahrenheit for 5 calendar days before, during, and after installation of solid surfacing fabrications; maintain temperature until Owner's Final Acceptance.

1.7 FIELD MEASUREMENTS

- A. Field dimensions: The fabricator is responsible for details and dimensions not controlled by Project conditions and shall show on his shop drawings all required field measurements beyond his control.
  - 1. The Contractor shall acknowledge the fabricator's need for accurate field dimensions prior to custom fabrication.
  - 2. The Contractor and the fabricator shall cooperate to establish and maintain these field dimensions.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Acceptable Manufacturers and Products: Subject to compliance with the requirements specified herein, products which may be incorporated in the work include the following, or approved equal:
1. Aristec Acrylics LLC (Avonite Surfaces), Florence, KY., product "Avonite".
  2. E. I. du Pont de Nemours and Company, Inc., Wilmington, DE product, "Corian".
  3. Formica Corporation, Cincinnati, OH, product: "Solid Surfacing".
  4. Wilsonart International, Inc. Temple, TX, product "Gibraltar".
  5. Corian Solid Surfaces, Inc.

### **2.2 SOLID SURFACING MATERIALS**

- A. Polymer solid surfacing material: Non-porous surfacing material homogeneously composed of natural minerals and high-performance polymer, fabricated sizes and profiles as shown on the Drawings, in colors and finishes as selected by Architect.
1. Solid surfacing material shall be NSF (National Sanitation Foundation) listed under publication 51 - Plastic Materials and Components used in Food Equipment and bear the "component" mark.
  2. Colors and patterns shall be as selected by the Architect from the manufacturer's full range of available colors in all color groups.
  3. Colors: Architect to select from full range of colors including premium colors.
- B. Sheet thicknesses shall be as specified below or as otherwise indicated on Drawings.
1. Window sills and aprons: 1/2 inch thick in locations and heights as shown on the Drawings.
- C. Adhesive for build-up of solid surfacing sheets: color matched two-component seam adhesive as provided by solid surfacing manufacturer.
- D. Adhesive for installation of trim components, neoprene panel adhesive or structural silicone glazing sealant, as recommended by solid surfacing manufacturer.



## 2.3 ACCESSORIES

- A. Sealant, for joints between countertops and dissimilar materials: One component acetoxysilicone rubber, mildew resistant, FS TT-S-001543A, Type Non-Sag, Class A, and FS TT-S-00230C, Type II, Class A and ASTM C 920, Type S, Class 25, Grade NS, use NT, G and A with a minimum movement capability of  $\pm 25$  percent, and a Shore A hardness of 20, in manufacturer's standard colors as selected by the Architect, equal to one of the following:
  - 1. Dow Corning Corporation, Midland, MI.; product, "786".
  - 2. General Electric Company, Waterford, NY.; product, "Sanitary 1700".
  - 3. Sonneborn Building Products Inc., Minneapolis, MN.; product, "Sonolastic - OmniPlus".
  - 4. Tremco, Beachwood, OH.; product, "Proglaze".
- B. Bolts, nuts, washers, lags, pins, and screws: Of size and type to suit application chrome finish in exposed-to-view locations.
- C. Fir plywood for backing substrate: EWA C-C PLUGGED EXT.
- D. Concealed supports for edge and corner backing shall be kiln dried birch or poplar.

## 2.4 FABRICATION

- A. Coordinate the fabrication of solid surfacing products with that of the various trades responsible for installing materials and items which will be inserted into, or applied to, the countertop surfaces. Obtain and verify templates, dimensions, and instructions from the respective trades before making cut-outs, holes, slots, and other cutting in the countertops.
- B. Shop fabricate all solid surfacing items in strict accordance with the details on the Drawings, the approved shop drawings, and recommendations of the solid surfacing manufacturer.
- C. Fit corners and joints hairline. Make all field joints and miters tight, secure with concealed fasteners.
- D. Provide shop fabricated counters, shop mitered components, closure trims with ample allowance for field cutting and fitting. Provide additional trim as required for scribing and site cutting.
- E. Route all edges to be butted for a smooth, clean fit. Sand edges with 120 grit sandpaper to rough up surfaces for adhesive bonding. Clean with denatured alcohol.

- F. Prepare and apply adhesive in compliance with manufacturer's written instructions. Clamp all components using manufacturer's approved clamping methods at all joints and build-up laminations, maintain clamping until adhesive is set. Avoid over-tightening clamps and squeezing out adhesive.
- G. Remove excess adhesive when dry with router. Follow with belt sander using 120 grit, diagonal to joint. After adhesive is leveled and smooth with surface, proceed with final shaping and finishing.
- H. After shaping, smooth finish of cut surfaces equal to manufacturer's original finish. Sand surfaces smooth with wet 400 grit sandpaper. Remove superficial scratches and sander markings, buff with nylon buffing pads as recommended by solid surfacing manufacturer. Wipe surfaces clean and dry with cloths.
- I. Finished work shall be free from visible adhesive and pencil marks.
- J. Field touch-up: Shall be the responsibility of the installer and shall include the filling, and touch-up of exposed job made nail or screw holes, refinishing of surfaces resulting from job fitting, repair of job inflicted scratches and marks, and final cleaning up of the finished surfaces.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION - GENERAL**

- A. General: Install work in accordance with manufacturer's instructions.
- B. Solid surfacing shall be installed plumb, level, true and straight without distortions:
  - 1. Use concealed shims as required
  - 2. Work shall be installed to a tolerance of 1/8 inch in 8 feet for plumb and levelness, including tops.
  - 3. There shall be no variations in flushness of adjoining surfaces.
- C. Tops and trim shall be scribed and trimmed to fit adjoining work.
  - 1. Where cuts occur, refinish surfaces and repair damaged finishes
- D. Secure solid surfacing fabrications to blocking directly attached to substrates.
  - 1. Secure fabrications using concealed fasteners.
  - 2. Anchor tops securely to base units and to other support systems as required.

- E. After installation and leveling of solid surfacing fabrications has been completed; apply a continuous bead of specified sealant to all joints which abut walls or partitions. Tool the sealant to a uniformly dense surface, level with the edges of the casework. Immediately remove all excess sealant from solid surfacing surfaces.

### 3.2 TOLERANCES

- A. Maximum variation from true position 1/16 inch with a maximum of 1/32 inch offset from true alignment with adjoining surfaces intended to be flush.

### 3.3 CLEANING

- A. Daily clean work areas by sweeping and disposing of scraps.
- B. Clean excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and solid surfacing manufacturers.
- C. Wash down exposed surfaces with a solution of mild detergent in warm water, applied with soft clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

### 3.4 PROTECTION

- A. Protect installed fabrications in a manner acceptable to fabricator and installer, which shall ensure no damage or deterioration at the time of Final acceptance of Project by the Architect.

END OF SECTION

SECTION 07 21 00  
THERMAL / ACOUSTICAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install the following:
1. Rigid insulation beneath interior concrete slabs.
  2. Rigid insulation at perimeter window curbs
  3. Mineral wool insulation at exterior walls.
  4. Thermal batt insulation between wall framing.
  5. Low pressure, low expansion polyurethane foamed-in-place insulation / air barrier sealant: applied to seal gaps, cracks, cavities and joints in the building envelope, at door frames, perimeter of window frames, and other similar penetrations in exterior walls.
  6. Field Mock-Ups

1.2 RELATED REQUIREMENTS

- A. Section 05 40 00 – LIGHT GAUGE METAL FRAMING
- B. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking, nailers.
- C. Section 06 40 00 – ARCHITECTUAL WOODWORK
- D. Section 08 51 13 – ALUMINUM WINDOWS

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01420 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
1. ASTM C 203 - Breaking Load and Flexural Properties of Block Type Thermal Insulation.
  2. ASTM C 518 - Thermal Transmission Properties by Means of the Heat Flow Meter.
  3. ASTM C 578 - Preformed Cellular Polystyrene Thermal Insulation.
  4. ASTM D 1621 - Compressive Properties of Rigid Cellular Plastics.
  5. ASTM E 136 - Behavior of Materials in a Vertical Tube Furnace at 750°C.
  6. ASTM E 84 - Surface Burning Characteristics of Building Materials.
  7. ASTM E 96 - Water Vapor Transmission of Materials.

Thermal / Acoustical Insulation

8. All applicable federal, state and municipal codes, laws and regulations for thermal insulation.

#### 1.4 DEFINITIONS

- A. The "R-Value" referred to herein refers to the thermal resistance of the insulation alone and does not allow consideration of air spaces or other factors.

#### 1.5 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials under cover and in manner to keep them dry, protected from weather, direct sunlight and damage from construction traffic and other causes.
  1. Rigid board insulation materials are combustible and may constitute a fire hazard, do not expose insulation materials to open flames or other ignition sources, comply fully with manufacturer's recommendations and the requirements of local authorities having jurisdiction, for delivery, handling, storage and installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  1. Rigid insulation board (extruded polystyrene):
    - a. Dow Chemical Corp., Midland MI.
    - b. Owens Corning Commercial Insulation, Toledo OH.
    - c. Pactiv Building Products, Atlanta, GA
    - d. DiversiFoam Products, Rockford, MN
  2. Exterior Wall Cavity insulation:
    - a. Dow Chemical Company, Midland, MI.
    - b. Hunter Panels,
    - c. Atlas Roofing Corp.,  
Thermal / Acoustical Insulation

- d. Rmax,
- 3. Mineral fiber insulation:
  - a. Fibrex Insulations Inc., Sarnia, Ontario (Fibrex)
  - b. Roxul, Inc., Milton, Ontario. (Roxul).
  - c. Thermafiber Inc., Wabash IN. (Thermafiber)
- 4. Low pressure polyurethane foamed-in-place insulation / air barrier sealant:
  - a. Fomo Products, Inc., Norton OH.
  - b. Dow Chemical Company, Midland, MI.
  - c. Premier industrial Supply, Phoenix AZ.
  - d. Convenience Products, Division of Clayton Corp., Fenton MO.
  - e. Henry Company, El Segundo CA.
- 5. Acoustical mineral fiber insulation:
  - a. General Insulation Co., Medford, MA
  - b. Thermafiber Inc., Wabash IN.
  - c. Roxul, Inc., Milton, Ontario. (formerly Rock Wool Manufacturing Company).

## 2.2 MATERIALS

- A. Cavity wall insulation: ASTM C1289, faced rigid cellular polyisocyanurate board, Type 1, Class 2, Class A fire rated polyisocyanurate foam core with aluminum foil facers.
  - 1. Flame Spread Classification: Class A, ASTM-E-84, flame spread rating less than 25 and smoke developed less than 450.
  - 2. Thermal Resistance: ASTM 518, R-value of 6.5 per inch min..
  - 3. Thickness: 3 inches as indicated on the drawings.
  - 4. Compressive Strength: 25 psi.
  - 5. Contact Adhesive: Liquid or spray applied for adhering rigid foam to various substrates.
  - 6. Provide adhesive compatible with both surfaces to be joined. Provide letters of compatibility from each manufacturer.
  - 7. Insulation plate and fastener: 3-inch diameter metal insulation plate, 0.017 thick galvalume coated steel, .265 ID. Hole with corrosion resistant fasteners used for fastening rigid insulation to concrete or steel at locations referenced on the detail drawings only.
  - 8. Acceptable products include the following or approved equal:
    - a. Dow Chemical Company, product "Thermax Sheathing"
    - b. Hunter Panels, product "Xci Class A"
    - c. Atlas Roofing Corp., product "Energy Shield Pro 2"
    - d. Rmax, product "TSX-8500"

- B. Under-slab and foundation insulation, rigid extruded polystyrene insulation: Closed cell foam board, square edge, self-extinguishing, conforming to ASTM Thermal / Acoustical Insulation

C 578, Type IV, with a compressive strength of 25 pounds per square inch when tested in accordance with ASTM D 1621 equal to Dow Chemical Corp., Styrofoam Brand "Square Edge" insulation.

1. Thickness: 3 inches.
2. Panel size: 48 by 96 inches beneath slab, and 24 by 96 inches at verticals.
3. R-value: 15.
4. Acceptable products include but are not limited to:
  - a. Dow Chemical Corp., product, Styrofoam Brand "Square Edge"
  - b. Owens Corning, product "Foamular 250".
  - c. Pactiv, Corp. product "GreenGuard Type IV 25 PSI Insulation Board".
  - d. DiversiFoam Products, product "CertiFoam 25 SE".

C. Wall insulation for between framing: Semi-rigid mineral wool insulation for exterior wall cavities: dual density mineral wool fiber insulation board, conforming to ASTM C612, Type IVB having a nominal density of 4.4 pounds per cubic foot.

1. Non-Combustible as tested per ASTM E-136.
2. Flame Spread Classification: Class A (less than 25, per testing by NFPA 255, ASTM E-84 or UL 723), with flame spread rating of 0 and smoke developed rating of 0.
1. Thickness: 3 -1/2 inches having thermal resistance, R-value of .
2. Size: 16 inches x 48 inches (406 mm x 1219 mm).
3. Acceptable products include the following or approved equal:
  - a. Thermafiber Inc., Wabash IN. product "Thermafiber UltraBatt."
  - b. Roxul, Inc., Milton, Ontario, product, "Roxul ComfortBatt"

D. Foamed-in-place insulation for air barrier sealant: Low Pressure Polyurethane foam sealant. Acceptable products include the following or approved equal:

1. Fomo Products, Inc., product: "Handi Foam" or "Handi-Seal".
2. Dow Chemical Company, product: "Great Stuff Pro".
3. Premier industrial Supply, product: "XtraFoam".
4. Convenience Products, Division of Clayton Corp., product: "Touch 'n Foam No Warp".
5. Henry Company, product: "NailTite NT-100".

E. Acoustical batt insulation at rated partitions: Mineral wool fiber insulation batts, conforming to ASTM C665 Type 1, and ASTM C553 with a nominal density of 2.5 pounds per cubic foot, thickness as indicated on the Drawings.

1. Flame Spread Classification: Class A (less than 25, per testing by NFPA 255, ASTM E-84 or UL 723).
2. Recycled content of slag in mineral wool insulation: Use maximum available percentage of material (slag). Mineral wool insulation products incorporated

into the work shall contain not less than 75 percent of recycled material (slag) by weight.

3. Acceptable products include:
  - a. General Insulation Co., product: "Fibrex Sound Attenuation Fire Batt (SAFB)"
  - b. Roxul, Inc., product "Roxul AFB".
  - c. Thermafiber, Inc. product "Thermafiber SAFB".

- F. Acoustical batt insulation at non-rated partitions: Unfaced glass fiber insulation conforming to ASTM C-665 Type I, of width appropriate for spacing of framing or furring members with which used thickness as indicated on the Drawings.
  - 1 Flame Spread Classification: Class A (less than 25, per testing by NFPA 255, ASTM E-84 or UL 723).
  - 2 Recycled content of glass in glass-fiber insulation: Use maximum available percentage of recycled glass. Fiber glass insulation products incorporated into the work shall contain not less than 20 percent of recycled glass cullet.

## 2.3 ACCESSORIES

- A. Staples, tape, adhesives and fasteners required for the proper and complete installation for work of this Section shall be as recommended by each respective manufacturers of each insulation type.
- B. Adhesive for rigid insulation: Conforming with ASTM C-557-65T, equal to W.W. Henry Company, Huntington Park CA., product "118 - Foam Insulation Adhesive".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  1. Beginning of installation means acceptance of existing substrate and project conditions.

### 3.2 INSTALLATION

- A. Mineral wool insulation at exterior walls:
  1. Secure impale fasteners or securement clips to substrate at the frequency recommended by the manufacturer at 2 inches from edge of insulation.
  2. Adhere an 8 inch wide strip of polyethylene sheet over control joints with double beads of adhesive on each side of joint. Extend sheet full height of joint.
  3. Stagger vertical joints. Butt edges and ends tight to adjacent board and to protrusions. Place impale fastener locking discs or securement



clips. Tape seal board joints.

4. Install boards horizontally between wall reinforcement.

B. Batt and blanket insulation between framing members:

1. Install in accordance with manufacturer's instructions. Do not compress or "stuff" insulation into voids, compressed insulation has less thermal resistant value.
2. Trim insulation neatly to fit spaces. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation, do not cut around electrical boxes. Leave no gaps or voids.
3. Where insulation is located overhead and is not to be covered, install wire insulation supports to keep insulation in place.

C. Foamed-in-place insulation / air barrier sealant: Apply insulation in method to a uniform monolithic density without voids, in accordance with manufacturer's instructions.

1. Apply application of foam for air barrier seal includes, but is not limited to:
  - a. Door frames, window frames, and similar penetrations in exterior walls.
  - b. Gaps, cracks, cavities and joints in the building envelope, not sealed with other forms of air boots, including electrical boxes and conduit, ducts, fans, and piping.
  - c. Where additionally indicated on Drawings.

### 3.3 CLEANING

- A. Clean work under provisions of Section 01 73 00 – EXECUTION.
- B. Daily clean work areas by sweeping and disposing of debris, and scraps.
- C. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom- clean condition.

END OF SECTION

SECTION 07 26 00

VAPOR RETARDERS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. The work of this Section consists of vapor retarders (vapor barriers) where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.
- B. Furnish and install the following:
  - 1. Sheet membrane vapor barriers (vapor retarders) under concrete slabs-on-grade including seam tape, and pipe boots.
  - 2. Continuous permeable Air Vapor sheeting on interior wall assemblies
  - 3. Vapor permeable liquid applied membrane applied in interior face of masonry wall.
  - 4. Foamed-in-place insulation / air barrier sealant: applied to seal gaps, cracks, cavities and joints in the building envelope, at door frames, perimeter of window frames, and other similar penetrations in exterior walls.

1.2 RELATED REQUIREMENTS

- A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete slabs on grade.
- B. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking, nailers.
- C. Section 07 21 00 - THERMAL INSULATION: Thermal and acoustical insulation.
- D. Section 07 27 13 – MODIFIED BITUMINOUS SHEET AIR BARRIERS - Self-adhesive elastomeric sheet membrane air barrier system.

1.3 REFERENCES

- A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ASTM D 570 - Water Absorption of Plastics.

2. ASTM D 1004 - Initial Tear Resistance of Plastic Film and Sheeting.
3. ASTM D 1622 - Apparent Density of Rigid Cellular Plastics.
4. ASTM D 1938 - Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method.
5. ASTM D 2842 - Water Absorption of Rigid Cellular Plastics.
6. ASTM D 2582 - Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
7. ASTM D 2856 - Open Cell Content of rigid Cellular Plastics by Air Pycnometer.
8. ASTM E 136 - Behavior of Materials in a Vertical Tube Furnace at 750°C.
9. ASTM E 154 - Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover
10. ASTM E 1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
11. ASTM E 1745 - Plastic Vapor Retarders Used in Contact with Soil or Granular fill under Concrete Slabs
12. ASTM E 84 - Surface Burning Characteristics of Building Materials.
13. ASTM E 96 - Water Vapor Transmission of Materials.

- B. General References The following reference materials are hereby made a part of this Section by reference thereto:
1. ACI 302.1R Vapor Barrier Component (plastic membrane) is not less than 10 mils thick.
  2. NFPA 701 - Fire Tests for Flame Resistant Textiles and Films
  3. All applicable federal, state and municipal codes, laws and regulations for thermal insulation and vapor barriers.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Sequencing: Coordinate work of this section with related work.

#### 1.5 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.

2. Manufacturer's Instructions: Manufacturer's installation instructions for placement, seaming and pipe boot installation.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  2. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.
- B. Storage and Handling Requirements:
  1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
  2. Store materials under cover and in manner to keep them dry, protected from weather, direct sunlight and damage from construction traffic and other causes.

### **PART 2 - PRODUCTS**

#### 2.1 UNDER SLAB VAPOR BARRIERS

- A. Vapor Barrier: Specified Product: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Stego Industries LLC company, Product: "Stego Wrap (15 mil)."
  1. Vapor Barrier must have the following qualities
    - a. Minimum WVTR as ASTM E96 of 0.008
    - b. Water Vapor Barrier tested by ASTM E-1745: Meets or exceeds Class A
  2. Vapor Barriers: Subject to compliance with the requirements specified herein, products which may be incorporated in the work include, but are not limited to, the following:
    - a. Stego Wrap (15 mil) Vapor Barrier by Stego Industries LLC, San Juan Capistrano, CA.
    - b. W.R. Meadows Premoulded Membrane with Plasmatic Core.
    - c. Zero-Perm by Alumiseal.

#### 2.2 FOAMED-IN-PLACE AIR BARRIER

- A. Foamed-in-place insulation for air barrier sealant: UL Class I, two component polyurethane self frothing foam insulation equal to Dow Chemical Corporation, product "Froth-Pak" having the following characteristics:
  1. Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the

work include, but are not limited to, the following:

- a. BASF Corp., Polymers Div., Styropar Group, Parsippany NJ.
- b. Dow Chemical Corporation (Dow Building Solutions), Midland MI.
- c. Universal Protective Coatings, San Rafael CA.

2. Product characteristics.

- a. Propellant: HCFC or HFC, No CFC's are permitted.
- b. Apparent Density (ASTM D1622): 1.7 pounds per cubic foot. (with 1.75 pcf HCFC)
- c. Water Absorption (ASTM D2842): less than 2.5 percent water absorbed.
- d. Open cell content (ASTM D2856): less than 2 percent.
- e. Apparent aged (18 months) R value: 4.9 per inch.
- f. Flexural Strength, parallel (ASTM C203): 17 to 23 pounds per square inch.
- g. Flexural Strength, perpendicular (ASTM C203): 26 to 42 pounds per square inch.
- h. Flame Spread (ASTM E84): 25 or less (Class 1 rated).
- i. Smoke Developed (ASTM E84): 350 (Class 1 rated), tested for 2 inch depth.

2.3 PERMEABLE LIQUID APPLIED MEMBRANE

A. Vapor permeable liquid applied membrane equal to:

1. Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - a. Basis of Design: Henry Company, Inc., Huntington Park, CA. (Henry) – AirBloc 18MR
  - b. Tremco, Inc., Beachwood OH. ("Tremco") - ExoAir 220
  - c. Carlisle Coatings & Waterproofing Inc., Wylie, TX. ("CCW")

2.4 PERMEABLE SMART SHEET VAPOR MEMBRANE

A. Vapor permeable 2-mil thick film of polyamide (nylon), equal to: Certainteed – MemBrain Continuous Air Barrier & Smart Vapor Retarder. Class A Fire Rated 2-mil thick membrane.

1. Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - a. Certainteed MemBrain Continuous Air Barrier & Smart Vapor Barrier
  - b. PanelShield SA by VaporShield
  - c. Henry Company, Inc., Huntington Park, CA. (Henry)
  - d. Carlisle Coatings & Waterproofing Inc., Wylie, TX.
2. Product Characteristics.

| PHYSICAL AND CHEMICAL PROPERTIES                   |                           |   |
|--|---------------------------|---|
| PROPERTY   | TEST METHOD               | RESULT  |
| Water Vapor Permeance (57ng/Pa*s*m <sup>2</sup> )  | ASTM E96 Desiccant Method | ≤1.0 perm   |
| Water Vapor Permeance (572ng/Pa*s*m <sup>2</sup> ) | ASTM E96 Water Method     | >10 perms   |
| Corrosivity  | ASTM C665                 | No unusual aspect of corrosion such as pitting, cracking and adhesive cure inhibition |
| Fungi Resistance                                   | ASTM C1338                | No growth   |

### TECHNICAL DATA

#### Applicable Standards

- Model Building Codes:
  - ICC
  - National Building Code of Canada 2005 & 2010
  - Articles 9.25.4.2
  - Articles 9.25.3
- Water Vapor Permeance:
  - ASTM C665 Section 7.4, Water-Vapor Permeance
  - ASTM E96

#### Fire Properties

- ASTM E84
- Surface Burning Characteristics Flame Spread Index < 25 Smoke Developed Index < 450

#### Quality Assurance

CertainTeed's commitment to quality and environmental management has ensured the registration of the Athens, Chowchilla and Kansas City plants to ISO 9001:2008 and ISO 14001:2004 standards.

## 2.5 ACCESSORIES

- A. General: Staples, tape, adhesives and fasteners required for the proper and complete installation for work of this Section shall be as recommended by each respective manufacturers of each type of vapor barrier.
  1. Double-stick tape for attachment of vapor barrier: Double coated acrylic closed-cell foam tape, as manufactured by 3M Industrial Specialties Division, St. Paul MN, , product "Scotch VHB - 4952" or approved equal, having a thickness of 0.045 inches and a width of 1 inch.
- B. Air seal boot: PVC or EDPM premolded pipe and seal for penetrations at ceiling vapor barrier.
- C. Seam Tape: High Density Polyethylene Tape or HDPE Tape as recommended by vapor barrier manufacturer, with pressure sensitive adhesive. Minimum width 4 inches.
- D. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION**

- A. Ensure that subsoil is approved by Architect.
- B. Level and tamp or roll aggregate, sand or tamped earth base.

#### **3.2 INSTALLATION - VAPOR BARRIERS WITHIN BUILDING ASSEMBLIES**

- A. Place vapor and air barrier on warm side of all thermal insulation. Attach using commercial grade double stick tape. Lap and seal all sheet joints.
- B. Extend vapor and air barrier tight to full perimeter of adjacent window and door frames and other items interrupting the plane of membrane. Tape seal in place.

#### **3.3 INSTALLATION - BELOW-SLAB VAPOR BARRIERS/RETARDERS**

- A. General: Install Vapor Barrier in accordance with manufacturer's instructions and ASTM E 1643-98. Place vapor barrier beneath all floor slabs
- B. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.
- C. Lap Vapor Barrier over footings and seal to foundation walls.
- D. Overlap joints a minimum of six inches with top lap in direction of spreading concrete. Turn up double layer at slab edges abutting walls. Seal with manufacturer's tape.
- E. Seal all penetrations (including pipes, reinforcing steel, and permanent utilities) with manufacturer's pipe boot or vapor barriers recommended detail.
- F. Do not puncture vapor barrier. No punctures or unsealed penetrations are permitted.
- G. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

#### **3.4 INSTALLATION - FOAMED-IN-PLACE AIR BARRIER**

- A. Foamed-in-place air barrier: Apply foam in froth method to a uniform

monolithic density without voids, in accordance with manufacturer's instructions.

1. Apply application of foam for air barrier seal includes, but is not limited to:
  - a. Door frames, window frames, and similar penetrations in exterior walls.
  - b. Gaps, cracks, cavities and joints in the building envelope, not sealed with other forms of air boots, including electrical boxes and conduit, ducts, fans, and piping.
  - c. Where additionally indicated on Drawings.

END OF SECTION



SECTION 07 27 13  
MODIFIED BITUMINOUS SHEET AIR BARRIERS

(FILED SUB-BID REQUIRED AS PART OF SECTION 04 00 01 MASONRY)

**PART 1 – GENERAL**

1.1 SUMMARY

- A. The work of this Section consists of air and vapor membrane system where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.
- B. Furnish and install the following:
  - 1. Self-adhesive elastomeric sheet membrane air and vapor barrier system, including specified sheet membrane, required primers and adhesives.

1.2 RELATED REQUIREMENTS

- A. Section 04 01 20 – UNIT MASONRY
- B. Section 07 21 00 - THERMAL INSULATION.
- C. Section 07 92 00 - JOINT SEALANTS: Requirements for joint sealant and backing materials.

1.3 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.

- 1. ASTM E 96 - Test Methods for Water Vapor Transmission of Materials.
- 2. ASTM D 570 - Test Method for Water Absorption of Plastics.
- 3. ASTM E 154 - Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover.
- 4. ASTM D 1004 - Test Method for Initial Tear Resistance of Plastic Film and Sheeting.
- 5. ASTM D 1938 - Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

6. ASTM D 1876 - Test Method for Peel Resistance of Adhesives.
7. ASTM D 1970 - Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
8. ASTM D 412 - Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension.
9. ASTM E2178: Standard Test Method for Air Permeance of Building Materials
10. ASTM E2357: Standard Test method for Determining Air Leakage of Air Barrier Assemblies
11. ICC ES (ICC Evaluation Service) AC48 – Acceptance Criteria for Roof Underlayment for Use in Severe Climate Areas.

#### 1.4 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
2. Sequence activities to accommodate required inspection and testing services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
  - a. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.
  - b. Provide for continuity of the air barrier materials and products within each assembly in the air barrier system.
  - c. Provide for continuity of all the enclosure assemblies with joints and transition materials to provide a whole building air barrier system.
  - d. Cooperate with agencies performing required inspections, tests, and similar services. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Provide supplemental assistance to testing agencies
    - 1) Provide access to the Work.
    - 2) Furnish incidental labor and facilities necessary to facilitate inspections and tests.
    - 3) Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
    - 4) Deliver samples to testing laboratories.
    - 5) Provide security and protection of samples and test equipment at the Project Site.

#### 1.5 SUBMITTALS

- ##### A. Information and Review Submittals: Submit the following under

**MODIFIED BITUMINOUS SHEET AIR BARRIERS**

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:

1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties.
  - a. Include certification of data indicating Volatile Organic Compound (VOC) content of all components of waterproofing system.
2. Shop Drawings: Developed for specific project conditions including mock-up, submittal of manufacturer's standard details are prohibited.
  - a. Show the locations and extent of air and vapor barrier system including details of typical conditions including:
    - 1) Intersections with other envelope systems and materials.
    - 2) Membrane counter-flashings.
    - 3) Bridging of gaps.
    - 4) Penetrations through barrier including conduits, pipes and similar items.
3. Verification Samples:
  - a. Self-adhered air and vapor barrier membrane.
  - b. Through-wall flashing membrane.
  - c. Transition membrane.
4. Test and Evaluation Reports:
  - a. Provide an Evaluation Report as the manufacturer's documentation confirming material has been evaluated and conforms to the requirements of the ASTM E2176 Standard for Air Barrier Materials.
  - b. Provide dew point analysis of exterior wall assembly and field testing of mockup for static air, pressure air, static water, and bond/adhesion in compliance with applicable ASTM standards.
5. Manufacturer's Instructions:
  - a. Installation Instructions: indicate preparation, installation requirements and techniques, joint and crack treatment and application temperature range, product storage and handling criteria, and limitations of the material.
6. Special Procedure Submittals:
  - a. Written statement, signed by the air barrier applicator, stating that the Contract Drawings have been completely reviewed with an agent of the air barrier and vapor barrier system manufacturer; accompanied by a written statement from the manufacturer that the selected air barrier and vapor barrier system is proper, compatible, and adequate for the application shown.
    - 1) Manufacturer's review shall include recommendations for detailed conditions and specific application requirements for project. Copies shall be sent to Architect, Owner, General Contractor and application sub-contractor.
  - b. The applicator will notify the Architect and Owner in writing that the existing conditions when exposed are in conflict with the Contract Documents for the proper application of the selected air barrier and vapor barrier system or the warranty

requirements.

7. Qualification Submittals:
  - a. Submit proof of License of the Contractor by ABAA (Air Barrier Association of America, Inc.) at the time of bidding and prior to commencing the work
- B. Closeout Submittals: Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
  1. Bonds and Warranty Documentation:
    - a. Manufacturer's Warranties and Guarantees as specified elsewhere herein this Section.

#### 1.6 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
- B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of air barrier system.
- C. Qualifications:
  1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.
- D. Manufacturer's Installation Review: Make arrangements to have Manufacturer's representative (employed by manufacturer) on-site during work of this Section to periodically review installation procedures. A minimum of 3 site visits are required.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  2. Deliver and store air barrier materials in new, sealed, containers showing manufacturer's identification, year of production, net weight, date of packaging, and location of packaging.
- B. Storage and Handling Requirements:
  1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
    - a. Protect primers, mastic and adhesives from high heat, flames or sparks.
  2. Store all materials in an elevated, dry location, protected by waterproof coverings. Following manufacturer's recommended storage procedures for humidity and temperature conditions, protect materials from freezing.

1.8 SITE CONDITIONS

- A. Maintain ambient temperature above 30 degrees Fahrenheit for 24 hours before, during, and after installation until liquid or mastic accessories have cured.

1.9 WARRANTY

- A. General: Submit warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
- B. Manufacturer Warranty:
  - 1. Provide 5 year Manufacturer's product warranty which shall include replacement of defective materials.
    - a. Warranty shall include provisions for coverage of the following:  
Membrane will bridge ruptures caused by cracking of the immediate substrate up to 1/16 inch width.
- C. Special Warranty:
  - 1. Provide 2 year Applicator's warranty or bond which shall include removal and replacement of defective materials, and repairs or replacement of Owner's materials and products damaged due to failure of air and vapor barrier installation to resist water or moisture penetration.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Basis of Design: For assembly compliance with NFPA 285 and to establish a standard of quality, design and function desired, Drawings and specifications have been based on Carlisle Coatings & Waterproofing Inc., Wylie, TX.
  - 1. Product: "Fire Resist 705 FR-A".
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1 Carlisle Coatings & Waterproofing Inc., Wylie, TX. (Carlisle)
  - 2 Henry Company, Inc., Huntington Park, CA. (Henry)
  - 3 W.R. Grace & Co., Construction Products Division, Cambridge MA. (Grace)
  - 4 Tremco, Inc., Beachwood OH. (Tremco)

2.2 DESCRIPTION

- A. Regulatory Requirements: Comply with 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments: 780 CMR 13, Section 502.4.3 Air Barriers and NFPA 285.

2.3 PERFORMANCE/DESIGN CRITERIA

- A. General: The air barrier shall have the following characteristics:
  - 1. It must be continuous, with all joints made airtight.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

2. It shall have an air permeability not to exceed  $0.004 \text{ cfm/ft}^2$  under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to  $0.02 \text{ L/s/m}^2$  @ 75 Pa.) when tested in accordance with ASTM E2178.
  3. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
  4. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Transition connections shall be made between the following:
    - a. Foundation and walls.
    - b. Walls and windows or doors.
    - c. Different wall systems.
    - d. Wall and roof.
    - e. Wall and roof over unconditioned space.
    - f. Walls, floor and roof across construction, control and expansion joints.
    - g. Walls, floors and roof to utility, pipe and duct penetrations.
  5. All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight.
- B. Sheet membrane: Prefabricated composite sheet, minimum 1 mm (41 mil) thick, consisting of 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (5 mils) aluminum faced film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
1. Minimum Performance Requirements:
    - a. Water Vapor Transmission: ASTM E 96, Method B, 0.1 perms maximum.
    - b. Water Absorption: ASTM D 570 - Max. 0.1% by weight.
    - c. Puncture Resistance: ASTM E 154 - 311 N (70 lbs.).
    - d. Tear Resistance: 1) Initiation: ASTM D 1004 - min. 58 N (7.0 lbs.) M.D. 2) Propagation: ASTM D 1938 - min. 40 N (4.0 lbs.) M.D.
    - e. Low Temperature Flexibility: ASTM D 1970 - Unaffected to -43 degrees C (-45 degrees F).
    - f. Tensile Strength: ASTM D 412, Die C Modified, Min. 600 psi.
    - g. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D 412 - Die C - Min. 200%.
- C. Surface conditioner, liquid membrane tape, crack filler, mastics, and accessories as recommended by the sheet membrane manufacturer and comply with the following:
1. Description: Latex-based, water-dispersible liquid for substrate preparation.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- a. Flash Point: No flash to boiling point.
  - b. Solvent Type: Water.
  - c. VOC Content: Not to exceed 350 g/l.
  - d. Application Temperature: -4 degrees C (25 degrees F) and above.
  - e. Freeze/Thaw Stability: 5 cycles min.
  - f. Freezing point (as packaged): -20 degrees C (-5 degrees F).
- D. Termination Mastic: Rubberized asphalt-based mastic with 200 g/l max. VOC Content.
- E. Primer: Rubber-based primer in solvent with 680 g/l max. VOC content.
- F. Termination bars: Minimum 1/8 inch thick stainless steel, of channel profile with 1/4-inch legs and minimum 1 inch width. Termination bar shall be factory punched to accept fasteners 4 inches on-center. Install with stainless steel screw fasteners.

## 2.4 AIR BARRIER ACCESSORIES

- A. Transition Aluminum Membrane: 0.9 mm (35 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (5 mil) of aluminum film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed, and comply with the following:
- 1 Water Absorption, ASTM D570: max 0.1% by weight
  - 2 Puncture Resistance, ASTM E154: 355N (80 lbs) min.
  - 3 Lap Adhesion at -4°C (25°F), ASTM D1876 Modified: 880 N/m (5.0 lbs./in.) of width
  - 4 Low Temperature Flexibility, ASTM D1970 Modified: Unaffected to -26°C (15°F)
  - 5 Tensile Strength, ASTM D412, Die C Modified: min. 4.1 MPa (600 Psi)
  - 6 Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C Modified: min. 200%
- B. Preformed Silicone-Sealant Extrusion / Transition Strip System: Manufacturer's standard preformed extruded pre-engineered pre-cured, low-modulus silicone-rubber extrusion, sized to fit opening widths, with a single-component, neutral-curing, 40 durometer. Class 100/50 (low-modulus) translucent silicone sealant for bonding extrusions to substrates, with a lock-in dart designed to fit pressure bar conditions.
- 1. Basis of Design: Tremco Commercial Sealants & Waterproofing, Beachwood, OH. Product: "Proglaze ETA, System 3".
    - a. Width: As required by field conditions.
    - b. Acceptable Products: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
      - 1) Dow Corning Corporation, Midland MI, product: "123 Silicone Seal".
      - 2) Momentive Performance Materials, Inc., (GE Silicones), Waterford NY, product: "US11000 UltraSpan".
      - 3) Pecora Corporation, Harleysville PA, product: "Sil-Span".
      - 4) Tremco Commercial Sealants & Waterproofing, Beachwood, OH, Product: "Proglaze ETA, System 3".
- C. Lap Sealant: Manufacturer's Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes 10 g/l max. VOC Content.

- 1 Lap Sealant for terminations within 12 inches of fenestration assemblies to receive silicone sheet transition membrane:
- 2 Silicone sealant compatible with rubberized asphalt, and approved by both the sealant manufacturer and air barrier manufacturer for use as a lap sealant. Basis of design Dow 758 Silicone Weather Barrier Sealant.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  1. Verify items which penetrate surfaces to receive air barrier and vapor barrier are rigidly installed.
  2. Verify surfaces are free of cracks, depressions, waves, or projections which may be detrimental to successful installation.
  3. Do not apply air barrier and vapor barrier system to damp, frozen, dirty, dusty or surfaces unacceptable to membrane manufacturer.
  4. Examine joints and transitions to other building materials. Verify surfaces and size of transitions are suitable for products specified herein.
  5. Report in writing defects in substrates which may adversely affect the performance of the air and vapor barrier.
  6. Beginning of installation means acceptance of existing substrate and project conditions.

#### **3.2 PREPARATION**

- A. Perform all preparation work on receiving surfaces as required, including removal of fins, scaling, and projecting rough spots. Remove all dirt, oil, and other foreign matter from the concrete surfaces. Clean substrate surfaces (broom, vacuum or compressed air) to remove dust, loose stones and debris.
- B. All masonry joints shall be filled and struck flush with the face of masonry and limestone, using a 3:1 mix of sharp sand and Portland cement mixed with a one part bonding agent to five parts water, and allowed to cure.
- C. Apply primer as recommended by manufacturer at a rate of 250 to 350 square feet per gallon; Prime only the area which will be covered with membrane in a working day, areas not covered with membrane in 24 hours must be reconditioned.
- D. Prepare inside corners by installing a fillet of liquid membrane, latex modified cement mortar or epoxy mortar, extend 6 inches in all directions beyond the corner.
- E. Cracks and joints in substrate surface must be properly sealed with waterstop, joint filler and sealant as recommended by the sheet membrane waterproofing manufacturer.

#### **3.3 APPLICATION**



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- A. Perform the application of the sheet membrane air barrier and vapor barrier system in strict accordance with the manufacturer's installation specifications, details, and recommendations, and as specified herein.
  
- B. Condition and prime substrate surfaces:
  - 1. When required by dirty or dusty site conditions; by surfaces having irregular or rough texture, or if it becomes difficult to adhere the air and vapor barrier to the substrate, apply surface conditioner by spray, brush, or roller at the rate recommended by manufacturer, prior to membrane installation. Allow surface conditioner to dry completely before membrane application.
  - 2. Apply a bead or trowel coat of mastic along membrane edges, seams, cuts, and penetrations.
  - 3. Apply primer by brush or heavy nap, natural-material roller at rate recommended by manufacturer prior to membrane installation. Allow primer to dry completely before membrane application.
  
- C. Application of Membrane:
  - 1. Precut pieces of air & vapor barrier into easily-handled lengths.
  - 2. Remove silicone-coated release paper and position membrane carefully before placing length horizontally against the surface.
  - 3. Begin installation at the base of the wall placing top edge of membrane immediately below any masonry reinforcement or ties protruding from substrate.
  - 4. When properly positioned, place against surface by pressing firmly into place. Roll membrane with extension-handled countertop roller immediately after placement.
  - 5. Overlap horizontally-adjacent pieces 2 inches [50 mm] and roll seams.
  - 6. Subsequent sheets of membrane applied above shall be positioned immediately below masonry reinforcement or ties. Bottom edge shall be slit to fit around reinforcing wires or ties, and membrane shall overlap the membrane sheet below by 2 inches [50 mm]. Roll firmly into place.
  - 7. Seal around masonry reinforcing or ties and all penetrations with termination mastic.
  - 8. Continue the membrane into all openings in the wall, such as doors, windows, and terminate at points that will prevent visibility from interior.
  - 9. Coordinate the installation of air & vapor barrier with roof installer to ensure continuity of membrane with rooftop air & vapor membrane.
  - 10. At end of each working day seal top edge of air & vapor barrier to substrate with termination mastic.
  - 11. Do not allow the rubberized asphalt surface of the air & vapor barrier membrane to come in contact with polysulfide sealants, creosote, uncured coal tar products or EPDM.

### 3.4 FLASHING INSTALLATION

- A. Provide flashing where indicated on the Drawings, as specified herein and all conditions which may be considered similar to those indicated on the

#### MODIFIED BITUMINOUS SHEET AIR BARRIERS

Drawings.

1. Install stainless steel flashing with hemmed 45 degree edge extending beyond face of wall. Ensure through wall flashing is in proper position without forming pockets. Lap through wall flashing over top of flashing edge 1/2 to 3/4 inch behind face of wall; mastic between flashings.
2. Extend flashing to back up wall, turn up as indicated on drawings and terminate as follows, coordinated with air and vapor barrier system:
  - a. Concrete – with termination bar by this contractor.
  - b. Metal stud and gypsum sheathing - terminate at sheathing, securing top of air barrier with termination bar screwed into studs with type S-12 screws. Seal top of flashing, termination bar and screw heads with specified Type PE sealant.
3. Form end dams at horizontal terminations; turn flashing, fold and seal (not cut) at corners, bends and interruptions. Seal watertight using flashing manufacturer's recommended adhesive and sealer.
4. Carry head flashing 6 inches beyond both ends of lintels. At steel lintels, apply a heavy bed coat of compatible adhesive mastic and embed thru-wall flashing in the mastic.
5. Seal all punctures with elastic cement mastic recommended by flashing manufacturer.

### 3.5 INTERFACE WITH OTHER WORK

- A. Connect and seal exterior wall air-barrier membrane continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
- B. Coordinate the work of this Section with installation of curtainwall, storefront and door frames. Ensure air and vapor barrier transitions from curtain wall, storefront and door frames is completed with specified silicone sheet tie-ins.
- C. Provide compatible lap sealant over all membrane laps and terminations within 12 inches of window, curtainwall, storefront, door frames, louvers, and similar envelope openings, to silicone sheet tie-ins.
- D. Silicone sheet transition tie-ins: Install silicone transition sheet following manufacturer's instructions and recommendations, and as additionally specified herein:
  1. Preparation: Solvent wipe clean with isopropyl alcohol (IPA) using a clean, white, lint-free rag of all surfaces to receive silicone sheet transition strip from all dirt, debris, and contaminants that may affect the bond of performance of the sealant and silicone sheet. Dry wipe using a clean, white, lint-free rag.
  2. Use manufacturer's pre-made corners where applicable.
  3. Lap sheets to shed water, and seal all laps and transitions.
  4. Bed silicone transition sheet in a minimum 1 inch bed of approved sealant. Sealant shall extend to the outboard edge of the silicone

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

sheet, and the counterflash from the wall AVWB onto the face of the silicone sheet.

5. Bed silicone sheet into sealant in the glazing pocket of curtain wall framing. If the silicone sheet has a dart, fully engage dart into receiver in curtain wall system. Counterflash edge of silicone sheet with sealant such that the sealant extends from the curtain wall framing onto the face of the silicone sheet. Provide continuous pressure against silicone sheet with curtain wall framing components.
6. Transitions shall be subjected to all testing conducted for air, vapor and water barriers, as well as all fenestration testing for fenestrations to which the silicone sheet is applied.

3.6 FIELD QUALITY CONTROL

- A. Field inspection will be performed under the provisions of Section 01 45 00 - QUALITY CONTROL.
  1. Fully inspect air and vapor barrier installation, including transitions, prior to enclosing. Repair punctures, damaged areas and inadequately lapped seams with a patch of the membrane sized to extend 6 inches [150 mm] in all directions from the perimeter of the affected area.

3.7 CLEANING

- A. Daily clean work areas by sweeping and disposing of debris, and scraps.

3.8 PROTECTION

- A. Protect finished work under provisions of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
- B. Do not expose air and vapor barrier membrane to sunlight for more than thirty days prior to enclosure.

END OF SECTION

SECTION 07 53 23

ROOFING (Adhered EPDM Roof System)

PART 1 - GENERAL

- 1.01 General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- 1.02 The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- 1.03 The Work to be performed under this Section shall include furnishing all labor, materials and equipment required to install the single ply roofing and related Work as shown on the Drawings or herein specified.

Summary - Include the following:

- A. Patching of existing roof where penetrations have occurred by other trades, refer to plumbing, HVAC and electrical drawings
  - B. Tie into existing EPDM membrane roof system
  - C. Legal disposal of all debris. Provide necessary dumpsters.
  - D. New Vapor Barrier.
  - E. New mechanically and adhesive fastened insulation and cover board where indicated.
  - F. New tapered insulation, crickets, diverters where indicated.
  - G. Direct adhered EPDM membrane where indicated.
  - H. New metal edge strips, fascias and copings to tie into new gutters..
  - I. New Wood blocking and nailers associated with the roofing with patching of existing roof
  - J. New flashings and repair of existing metal flashings to remain.
  - K. Roof Walkway Traffic Pads at roof top equipment
  - L. Provide all new pressure treated lumber sleepers to all mechanical units.
  - M. Staging, hoisting and related support for the performance of the work.
- 1.04 Every detail and condition is not specifically illustrated by a detail Drawing. It is the intent of this Section, however, that every part of the reroofing and repair Work be completed in a manner to present a finished, watertight product equal in quality to details shown and specified and so approved by the Architect.
- 1.05 Shop Drawings
- A. Submit the following in accordance with Section 01 33 24:
    - 1. Shop Drawings shall include outline of roof and size, location and type of penetration, perimeter and penetration details and special details.
  - B. Shop Drawings shall also show full size details of flashings, gravel stops, fascias, expansion joints, fittings, curbs, parapet flashings and other metal Work.
- 1.06 Submittals

ROOFING (Adhered EPDM Roof System)

- A. Submit for approval samples, detailed shop drawings and manufacturer's specifications of the following materials in accordance with applicable requirements under Section 01 33 00:
1. Membrane and flashings (all types)
  2. Roof Walkway Traffic pads
  3. Bonding adhesive, splicing cement, lap sealant and related materials supplied by the membrane manufacturer
  4. Vapor Barrier
  5. Rigid insulation, taper insulation layout and cover board
  6. Aluminum edge fascia, trim and all metal work.
  7. Wood blocking, nailers and plywood
  8. Fasteners (All Types)
  9. Warranty Type and Period.
  10. Roof Manufacturer's assembly letter confirming design will meet specified wind speeds and warranty requirements.
  11. Piping, Couplings and fittings
  12. Anchors, Guides and Supports including Seismic Restraints.
- 1.07 Related Sections
- A. Section 02 41 19 - Selective Demolition
  - B. Section 06 10 00 – Rough Carpentry
  - C. Section 07 62 00 – Sheet Metal Flashing, Gutters and Trim
  - D. Section 07 92 00 – Joint Sealants
- 1.08 Acceptance of Installation Conditions
- A. This Contractor shall be fully responsible for the proper execution and performance of the Work described herein.
- 1.9 Quality Assurance -Roofing
- A. Inspection: Upon completion of the single ply roofing installation, an inspection shall be made by a representative of the roofing manufacturer to ascertain that the roofing system has been installed according to the manufacturer's specifications and details.
  - B. The Roofing System must achieve a UL **Class A**.
  - C. The specified roofing assembly must have been *successfully tested* by a qualified testing agency to resist the design uplift pressures calculated according to:
    - ANSI/SPRI WD-1 "Wind Design Standard Practice for Roofing Assemblies"
    - American Society of Civil Engineers (ASCE 7)
    - International Building Code (IBC) as amended and adopted by the current Massachusetts Building code.
- However, for *required fastening patterns*, the roofing system design and installation shall be installed to meet the fastening pattern attachment requirements of Factory Mutual **1-90, 100MPH**, including the prescriptive enhancements at all perimeter and corner conditions.

Design Uplift Ratings

|           |           |
|-----------|-----------|
| Field     | 52.8 psf  |
| Perimeter | 88.6 psf  |
| Corners   | 133.4 psf |

Rigid insulation (Mechanically Fastened) and cover-board (Adhesive Fastened) shall be fastened to the deck as indicated using approved fasteners and adhesives. Attachment shall be at a **minimum** and may be increased per the manufacturer requirements:

|                    |           |                     |
|--------------------|-----------|---------------------|
| Adhesive Fastened: | Field     | 4 inch ribbons O.C. |
|                    | Perimeter | 4 inch ribbons O.C. |
|                    | Corner    | 4 inch ribbons O.C. |

|                       |           |                              |
|-----------------------|-----------|------------------------------|
| Mechanical Fasteners: | Field     | 16 Fasteners per 4'x8' sheet |
|                       | Perimeter | 24 Fasteners per 4'x8' sheet |
|                       | Corner    | 32 Fasteners per 4'x8' sheet |

and as approved by the membrane manufacturer and the Architect to comply with the terms of the specified warranty and wind speed. Fasteners shall be as approved by the manufacturer.

1.10 Product, Delivery, Storage and Handling

- A. Deliver materials in original unopened containers.
- B. Containers shall be labeled with manufacturer's name, brand name, installation instructions and identification of various items.
- C. Store materials, except membrane, in dry area and protect. Damaged materials shall be replaced at Contractor's expense.
- D. Store materials, except membrane, between 60 degrees F and 80 degrees F. If exposed to lower temperatures, restore to proper temperatures before using.

1.11 Job Conditions

- A. Do not use oil base or plastic roof cement.
- B. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with single ply roofing system.
- C. Do not expose membrane and accessories to a constant temperature in excess of 180 degrees F.
- D. Do not breathe cement and bonding adhesive vapors or use near fire.
- E. Membrane splice wash used in the splicing procedure is extremely flammable; do not use near fire or flame or in a confined area. Dispense only from a UL listed or approved safety can.
- F. Splicing and bonding surfaces shall be dry and clean.
- G. Material Safety Data Sheets (MSDS) must be on location at all times during the transportation, storage and application of materials.

ROOFING (Adhered EPDM Roof System)

- H. When positioning membrane sheets, exercise care to locate all field splices away from low spots and out of drain sumps. All field splices should be shingled to prevent bucking of water.
  - I. When loading materials onto the roof, the Contractor must comply with the requirements of the building owner to prevent overloading and possible disturbance to the building structure.
  - J. If single ply roofing system is installed in cold temperatures, follow specified precautions for storage of materials and expose only enough cement and adhesive to be used within a four (4) hour period. No installation procedure that involves adhesives or bonding shall take place when the temperature is below 25 degrees F.
  - K. Roof surface shall be free of ponded water, ice or snow.
- 1.12 Guarantee-Warranty
- A. This Contractor further states that he will, at his own expense, repair and replace all such defective materials or workmanship and all other Work damaged thereby which is so damaged during the two (2) year warranty period. The roofing manufacturer will, at his own expense, repair and replace all defective materials and workmanship covered by their warranty and will repair any leak for the Thirty (30) year warranty period.
  - B. Pro-rated System Warranties shall not be accepted.
  - C. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the specifier's approval.

PART 2 - PRODUCTS

2.01 Single Ply EPDM Membrane - Directly Adhered

- A. **Furnish the rubber membrane roofing system as manufactured by the Carlisle Tire and Rubber Co., Carlisle, PA, Johns Manville Inc., Firestone Rubber Co. Inc., or approved equal as indicated on the Drawings and specified in the Contract Documents.**
- B. For the purpose of establishing a standard of quality only, this Specification has been written using the material requirements and installation procedure for fully adhered established by the Carlisle Tire and Rubber Co.
- C. All materials used in the roofing system shall be as furnished by the manufacturer selected.
  - 1. The membrane shall be Sure-Seal 0.090 inch thick, maximum ten feet wide, length determined by job conditions, EPDM (Ethylene Propylene Diene Monomer) compound elastomer conforming to the following minimum physical properties. The membrane shall conform to the minimum physical properties of ASTM D4637.

| <u>Property</u>                        | <u>Test Method</u> | <u>Specification</u> |
|--|--------------------|----------------------|
| Color: Black                           |                    |                      |
| Tolerance on Nominal Thickness, %      | ASTM D 412         | +/-10                |
| Tensile Strength Min. PSI              | ASTM D 412         | 1305                 |
| Elongation, Ultimate Min, %            | ASTM D 412         | 350                  |
| Tear Resistance Min, LBF/In<br>(Die C) | ASTM D 624         | 175                  |

ROOFING (Adhered EPDM Roof System)

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|  |                             |           |
|--|-----------------------------|-----------|
| Factory Seam Strength Min<br>ASTM D 816  | Modified<br>Rupture         | Membrane  |
| Resistance to Heat Aging   | ASTM D 573                  |           |
| Properties after 4 weeks @ 240° F  |                             |           |
| Tensile strength min. psi  | ASTM D 412                  | 1200      |
| Elongation, ultimate min,%   | ASTM D 412                  | 225       |
| Tear Resistance Min. lbf/in  | ASTM D 624                  | 150       |
| Linear dimensional change max,%  | ASTM D 1204                 | +/-2      |
| Ozone Resistance   |                             |           |
| Condition after exposure to 100pphm<br>Ozone in air for 168 h @ 104°F<br>Specimen is at 50% strain | ASTM D 1149                 | No Cracks |
| Brittleness Temperature Max.   |                             |           |
| degrees  | ASTM D 746                  | -75       |
| Resistance to Water Absorption   |                             |           |
| Change in mass max, after 7d<br>immersion @ 158°F, %   | ASTM D 471                  | 4         |
| Water Vapor Permeability<br>max, perm-mils   | ASTM E 96<br>(Proc B or BW) | 2.0       |
| Resistance to Outdoor (Ultraviolet)  |                             |           |
| Weathering Properties after<br>Langleys EMMAQUA: 50%<br>strain, calendar sheeting                  |                             |           |
| Tensile strength min, psi  | ASTM D 412                  | 1200      |
| Elongation min, %  | ASTM D 412                  | 225       |
| Sheet Composition  |                             |           |
| Weight percent of polymer that<br>is EPDM, min, %  |                             | 100       |
| Weight percent of sheet that is<br>EPDM polymer, min, %  |                             | 30        |

2. Flashing shall be minimum 0.060 inches thick, furnished by membrane manufacturer.
3. Bonding adhesive shall be as furnished by the membrane manufacturer shall be compatible with all materials to which the membrane is to be bonded.
4. Lap sealant for sealing the exposed edge of the splices shall be trowel or gun consistency as furnished by the membrane manufacturer.
5. Splice Tape: Sure-Seal SecurTAPE and primer as furnished by the manufacturer.
6. Water cutoff mastic shall be as furnished by the membrane manufacturer.
7. Prefabricated accessories (pipe seals, etc.) shall be as furnished by the membrane manufacturer.
8. Temporary sealant shall be as furnished by the membrane manufacturer.

ROOFING (Adhered EPDM Roof System)



9. Pitch Pocket: 30 year warranty detail with stainless steel rain hood. Detail U-16C, with extra layer of Pressure Sensitive Elastoform Flashing extending min. 3 inches beyond the base layer of flashing for 30 warranty. Pourable sealer shall be compatible with materials with which it is used, furnished by membrane manufacturer.
10. Securement Strips and Fasteners: 0.045 inch reinforced securement strips and fasteners furnished by membrane manufacturer.
11. Splice Wash shall be furnished by membrane manufacturer.

2.02 Rigid Thermal Insulation and Cover Board – Minimum R Value = 34.2

- A. Rigid insulations shall be Sure-Seal Polyisocyanurate HP H Polyiso insulation as manufactured by Carlisle. Panels have polyisocyanurate foam core and are faced with glass fiber reinforced felt facers meeting ASTM C 1289-06, Type II, Class 1, Grade 3 (25 psi). Panels shall be 4 feet x 8 feet. Thickness of insulation shall be as indicated.
- B. Tapered insulation shall be HP-H Tapered POLYISO rigid insulation as manufactured by Carlisle. Panels have polyisocyanurate foam core and are faced with glass fiber reinforced felt facers meeting ASTM C 1289-06, Type II, Class 1, Grade 3 (25 psi). **Panels shall be 4 feet x 4 feet.** Thickness of insulation shall be as indicated.
- C. Tapered sumps at roof drains and tapered roof crickets.
- D. Cover Board: High Density Cover Board shall be high density , closed cell polyisocyanurate foam core laminated to coated-glass fiber-mat facer as manufactured Carlisle SecurShield HD Plus, 1/2" thick, 4' x 8' panel, weight 11 lbs with an R-value of 2.5.
- E. Underlayment Board: High Density Cover Board shall be high density , closed cell polyisocyanurate foam core laminated to coated-glass fiber-mat facer as manufactured Carlisle SecurShield HD Plus, 1/2" thick, 4' x 4' panel, weight 11 lbs with an R-value of 2.5.

2.03 ADHESIVES, CLEANERS AND SEALANTS

- A. Low VOC Bonding Adhesive: A low VOC (volatile organic compound) bonding adhesive (less than 250 grams/liter) used for bonding Sure-Seal/Sure-White EPDM membranes to various surfaces. Available in 5 gallon pails.
- B. Sure-Seal SecurTAPE™: A 6" wide (used for Mechanically Fastened Roofing Systems and 30-year Warranty Systems) by 100' long splice tape used for splicing adjoining sections of EPDM membrane. Complies with the South Coast Air Quality Management District Rule 1168.
- C. Low VOC EPDM Primer - A low VOC (volatile organic compound) primer (less than 250 grams/liter) for use with SecurTape or Pressure-Sensitive products.
- D. CAV-GRIP Low VOC Primer - A low VOC (Volatile Organic Compound) primer for use with Carlisle 725 TR Air and Vapor Barrier and FAST Adhesive. Primer to be used on surface of existing roof deck for adherence 1/2 inch underlayment with FAST Adhesive and as a primer for the adherence of the Carlisle 725 TR Air & Vapor Barrier to the top of the 1/2 inch underlayment.
- E. Pourable Sealer: A black, two-component, solvent-free, polyurethane based product used for tie-ins and as a sealant around hard-to-flash membrane penetrating objects such as clusters of pipes and for a daily seal when the completion of flashings and terminations cannot be completed by the end of each work day.

2.04 Metal Ballast Stop, Fascia Extenders and Fascias, Edge Strips, Scuppers

Furnish the metal trim and edge system as manufactured by the Carlisle Tire and Rubber Co., Carlisle, PA, Metal ERA Inc., Firestone Rubber Co. Inc., or approved equal as indicated on the Drawings and specified in the Contract Documents.

- A. General: All metal edgings shall be tested and meet ANSI/SPRI ES-1 standards and comply with International Building Code.
- B. Metal ballast stop, edge strip/fascia, scuppers and related metal work shall be SecurEdge 2000, .050 inch prefinished aluminum in color as selected with extend fascia extender (2 piece), as manufactured by Carlisle.
- C. SecurEdge Coping: Incorporates a 20 gauge anchor cleat with 4 pre-slotted holes, a concealed joint cover and 10 foot continuous sections of coping cap; can accommodate minimum 5 " wide parapet walls. Metal coping cap color shall be as designated by the Owner's Representative.
- D. Termination Bar: A 1" wide and .098" thick extruded aluminum bar pre-punched 6" on center; incorporates a sealant ledge to support Lap Sealant and provide increased stability for membrane terminations.
- E. Provide all accessories necessary for a complete installation including factory-fabricated corners, concealed corner plates, corners and related items.
- F. Color shall be selected from manufacturer's full range of colors including premium colors.

2.05 Vapor Barrier

- A. Carlisle 725TR Air & Vapor Barrier / Temporary Roof: 725TR is a 40-mil composite consisting of 35-mils of self-adhering rubberized asphalt factory laminated to a 5-mil polyethylene film with an adhesion textured surface. 725TR roll dimensions are 39" x 75' and the product is applied after priming an acceptable substrate with CCW 702, 702-LV or Cav-Grip primer.

2.06 Wood Blocking and Plywood

- A. All lumber used for blocking, nailers and fascias, etc. shall be new and in good sound condition of nominal sizes, as indicated on the Drawings, dressed 4 sides.
- B. All lumber shall be preservative pressure treated with wolmanized salts, each piece shall be so labelled.
- C. All plywood used as filler pieces, etc. shall be new CD exterior grade plywood. Plywood shall be in good sound conditions of sizes and thicknesses as indicated on the Drawings.
- D. All perimeter blocking shall be fastened and anchored in accordance with FM 1-49.

Nailer and Blocking Installation:

1. Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons per lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of

each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall also meet the requirements of the current Factory Mutual Loss Prevention Data Sheet 1-49.

2. Install continuous wood nailers at the perimeter of the entire roof and around roof projections and penetrations as shown on the Detail Drawings. Existing nailers that are to remain in place shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons per lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in the drawings shall be left in place. All other woodwork shall be removed.

3. The Architect shall be notified of any condition where the existing nailers to remain do not meet the pull out test meeting the requirements of FM1-49. Provide a pull-out test to confirm that existing nailers and blocking to remain meet the requirements of FM 1-49. Refer to section 01 27 00 Unit Prices for additional information.

4. Nailer and blocking thickness shall be as required to match substrate or insulation height to allow a smooth transition of the membrane.

5. Provide stainless steel, corrosion resistant, fasteners when mechanically attaching roofing products to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

#### 2.07 Sheet Copper

- A. All sheet copper for repairs shall be American made; Thickness shall match existing in areas of repair.

#### 2.08 Roof Walkway Traffic Pads

- A. Protective surfacing for roof traffic shall be Sure-Seal (black). Pressure-Sensitive Walkway Pads (with Factory-Applied Tape on the underside of the walkway) adhered to the membrane surface in conjunction with Sure-Seal Primer. Walkway pads by others, when specified, must be adhered to the EPDM deck membrane with SecurTAPE/Primer.
- B. Roof walkways shall be typically 2'-6" wide unless noted otherwise. Whether show or not, all roof top equipment shall have walk way pad to service area of each piece of serviceable equipment and connecting to a main circulation route originating from a roof access hatch or main access point to roof by ladder.

#### 2.11 Fasteners

- A. Fasteners for blocking and insulation shall be of the screw type suggested and required by the roof membrane manufacturer in order to fulfill all requirements to obtain all manufacturers' guarantees. Nail fasteners are not permitted. The roofing contractor shall be required to arrange for "pull-out" tests as deemed necessary by the roofing membrane manufacturer in order to mechanically fasten to the existing deck. Depending on the type of existing structural, insulation will be mechanically fastened or adhesively bonded to the deck structure. Fasteners for blocking shall be a screw type fastener, no nail fasteners will be accepted.

- B. HP Fasteners: A heavy duty #14 threaded fastener with a #3 phillips drive used for insulation securement into steel, wood plank or minimum 15/32 inch thick plywood.
- C. Pre-Assembled ASAP Fasteners: A pre-assembled 3" diameter Plastic Plate and # 12 threaded fastener with a #3 drive used for insulation attachment into steel or wood decks. Installed using OMG Fastening Tools.
- D. HP Term Bar Nail-Ins: A 1-1/4" long expansion anchor with a zinc plated steel drive pin used for fastening the Carlisle Termination Bar or Seam Fastening Plates to concrete, brick, or block walls.
- E. Seam Fastening Plate: A 2" diameter metal fastening plate used in conjunction with RUSS or EPDM membrane for additional membrane securement.
- F. Polymer Seam Plate: A 2" diameter plastic fastening plate incorporating barbs on the underside of the plate. This plate is required for membrane and RUSS attachment installed in conjunction with steel roof decks. May also be used for insulation attachment.
- G. Insulation Fastening Plates: A nominal 3 inch diameter plastic or metal plate used for insulation attachment.
- H. Sure-Seal Pressure-Sensitive RUSS™ (Reinforced Universal Securement Strip): a 6" or 9" wide, nominal 45-mil thick clean, cured black reinforced EPDM membrane with 3" or 6" wide Factory-Applied Tape (FAT) laminated along one edge. The 6" or 9" wide Pressure-Sensitive RUSS is used horizontally or vertically at the base of walls, curbs, etc., in conjunction with 2" diameter securement plates or bars below the EPDM deck membrane for additional membrane securement.
- I. Vent Pipe Penetrations:
  - 1. Premanufactured : Pre-Molded PS Pipe Seal , 30 year warranty, 90 mil EPDM, Carlisle detail "U-8A.1. Boot to be sized to specific pipe size. **UNIVERSAL BOOT NOT ACCEPTED**
  - 2. Field Wrapped: 30 year warranty, 90 Mil EPDM, Carlisle detail U-8B, to include all round pipes penetrations to be double wrapped with two layers of Pressure-Sensitive Elastoform flashing, terminated with a stainless steel clamping ring 7 sealed with continuous lap sealant.
- J. Insulation Adhesive:
  - 1. FAST Adhesive: A two component insulating urethane adhesive used to attach insulation. Packaging formats include 50 and 15 gallon drums as well as Dual Cartridges and 5 gallon Bag in a Box formats.

### PART 3 - EXECUTION

#### 3.01 Work List

- A. Water test roof drains prior to start of work and the completion of the new work.

- B. Water flood test at completion of project, 24 hour period for all drain sumps extending 2 feet beyond edge of sump, conforming to ASTM 5957.
- C. Remove existing roofing package
- D. Remove existing base flashings
- E. Level roof surface for acceptance of new work
- F. Install Underlayment Board and Vapor Barrier
- G. Install rigid insulation, cover board and crickets where indicated. Insulation thickness shall be as indicated on drawings
- H. Install wood blocking.
- I. Extend vent piping above finished roof as designated.
- J. Apply single-ply membrane and flashings.
- K. Install new pressure treated sleepers to existing mechanical units.
- L. Install metal edge strips / fascias and copings.
- M. Dress-down and repair or replace existing metal flashings to remain where noted.
- N. Install Roof Walkway Traffic Pads.

3.02 Rigid Insulation

A. Rigid insulation and cover-board shall be fastened to the deck as indicated using approved fasteners and adhesives. Attachment shall be at a **minimum** and maybe increased per the manufacturer requirements: See Part 1 for fastening requirements and as approved by the membrane manufacturer and the Architect to comply with the terms of the specified warranty and wind speed. Fasteners shall be as approved by the manufacturer. Joints shall be 1/8 inch or less in width. Joints wider than 1/8 inch shall be filled with spray foam insulation. Offset joints of adjacent boards by half a board longitudinally.

3.03 Installation - Roof Nailers And Blocking

- A. All fasteners shall be screw or bolt type fasteners. Nail fasteners are not allowed or accepted.
- B. General: Provide anchorage for nailers as required for roof and edging to obtain FM 1-49 rating.
  - 1. Secure nailers and blocking to metal deck with stainless steel screws at not greater than 12 inch on center spacing, extending a minimum of 3/4-inch below deck.
  - 2. Secure nailers and blocking to wood substrates with stainless steel screws at not greater than 12 inch on center spacing, extending a minimum of 1-1/2 inch into board substrates and 3/4 inches into sheet materials. Nail and pin fasteners are not allowed, only screw type fasteners are acceptable.
- C. When building up layers of nailers and blocking, fully secure each layer to at least the one below, alternating location of fasteners, spacing at 12 inches on center. Provide fasteners in lengths to penetrate through more than one substrate layer of

blocking. Stagger locations of butt ends of boards, such that no two joints are “lined up”.

**D. Ensure finished height of nailers is same as top surface (high point) of roof insulation.**

3.03 Vapor Barrier

- A. Install vapor barrier without tears or punctures. Attach to air barrier membrane in wall assembly to provide complete seal, if indicated. **Vapor barrier joints / overlap to be located over high point of existing metal deck ribs. Rolled vapor barrier application to run parallel with deck ribs / flutes.**

3.04 Direct Adhered Membrane System

A. Membrane

The single-ply direct-adhered membrane roofing system shall be applied over the rigid insulation or cover board. Installation shall be done by a Roofing Contractor approved by the membrane manufacturer.

B. Membrane Attachment

1. Position 0.090 inch membrane over approved substrate without stretching.
2. Allow membrane to relax approximately one-half hour prior to bonding.
3. Fold sheet back so that half of the underside of the sheet is exposed. Sheet fold shall be smooth without wrinkles or buckles.
4. Apply bonding adhesive evenly, without globs or puddles, with a 9 inch plastic core paint roller. Do not apply bonding adhesive to the splice area. Adhesive shall be firmly applied to both the sheet and the substrate. One (1) gallon of bonding adhesive, applied correctly, will cover 60 square feet of finished surface at moderate temperature. Allow adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
5. Roll the coated membrane into the coated substrate while avoiding wrinkles.
6. Brush down bonded half of the sheet with a pushbroom to achieve maximum contact.
7. Fold back the unbonded half of the sheet and repeat the bonding procedure.
8. Install adjoining sheets in the same manner, lapping edges a minimum of 3 inches.

Note: At all inside angle changes where slope exceeds 2 inches in one horizontal foot, securement strip is required to be installed.

D. Membrane Splicing with Tape

1. General

- a. Tape splices shall be a minimum of 5 ½ inches wide using 6 inch wide SecurTAPE extending 1/8 inch minimum to ½ inch maximum beyond the splice edge. Field splices at roof drains shall be located outside the drain sump.
- b. Prior to SecurTAPE application, the splice area shall be primed with Sure-Seal low VOC Primer.
- c. Cold weather restrictions – When temperatures are below 40 degrees F (5 degrees C): Comply with manufacturers recommendations.

2. Position membrane sheet to allow for an approximate 6 inch overlap. Mark the bottom sheets with an indelible marker ½ inch from the top sheet edge. The pre-marked line on the membrane edge can also be used as a guide for positioning splice tape.
  3. Apply Primer to achieve a thin, even coat on both membrane surfaces. Splice area must be uniform in color, streak-free and free of globs or puddles.
  4. Allow Primer to dry until tacky but does not transfer to a dry finger touch.
  5. Unroll approximately 3 feet of SecurTAPE. Align release film with marked line and press tape down to bottom sheet using firm, even, hand pressure. Continue for the length of the splice. Tape roll ends must be overlapped 1 inch. Allow top sheet to rest on release film on back side of tape.
  6. Pull release film from SecurTAPE beneath the top sheet and allow the top sheet to fall freely onto the exposed tape.
  7. Press the top sheet onto the tape using firm, even hand pressure across the splice towards the splice edge.
  8. Immediately roll the splice with a 2 inch wide steel roller, using positive pressure. Roll across the splice edge, not parallel to it.
  9. Install a 6 inch wide section (with rounded corners) of Sure-Seal Pressure-Sensitive Flashing or Sure-Seal Elastoform Flashing over all field splice intersections and seal edges of flashing with Lap Sealant.
- E. Perimeter Membrane Securement
1. Securement shall be provided at the perimeter of each roof level, roof section, curb flashing, skylight, expansion joint, etc. and at any angle change where slope exceeds 2 inches in one horizontal foot.
  2. Securement shall be as follows:
    - a. EPDM Securement Strip (RUSS) shall be mechanically fastened through the membrane, insulation and into roof deck with approved fasteners.
    - b. Field membrane shall be adhered to PS RUSS strip
- 3.05 Roof Walkway Traffic Pads
- A. Install walkway at all traffic concentration points (such as roof hatches, access doors, rooftop ladders, etc.) and all locations as identified on the drawings.
- 3.06 Edge Strips
- B. Edge strip shall be installed and secured according to an installation detail accepted by the membrane manufacturer. Securement provided by the Contractor shall prevent buckling and prohibit metal gravel stop from pulling free.
  - C. Flashing of the edge strip deck flange must extend 3 inches inches minimum past the point of securement in all directions.
  - D. Flashing of the edge strip deck flange must provide complete coverage to the flange and provide a minimum 3 inch wide splice to the adjoining deck membrane. Use the same splice cement for sealing flashing to the membrane and to the edge strip.
  - E. Wood Nailer shall be installed at the edge strip perimeter of each roof level, shall be pressure treated with salt preservatives.

1. Anchor wood nailers to resist a force of 75 pounds per lineal foot in any direction. The thickness of the nailer shall be such that it conforms to the detail drawings. Any deviations from the details are to be brought to the attention and approved by the Architect.

### 3.07 Flashing

A. Walls, parapets, mechanical equipment, curbs, and similar conditions. Use the longest pieces of materials which are practicable. All flashings and terminations shall be done in accordance with the applicable detail, and the manufacturers latest details for the requested warranty.

1. When using flashing at a vertical surface, complete the splice between the flashing and the main roof sheet before bonding flashing to the vertical surface. The splice shall extend at least 3 inches beyond the membrane at the angle change.
2. When using a continuation of roofing membrane as flashing, bond the membrane to the surface to be flashed without "pig ears".
  - a) Apply bonding adhesive evenly, without globs or puddles, with a 9 inch plastic core paint roller.
  - b) Apply bonding adhesive to both the flashing and the surface to which it is being bonded at a rate covering approximately 60 square feet of finished surface per gallon.
  - c) After the bonding adhesive has dried to the point that it does not string or stick to a dry finger, roll the flashing into the cemented surface. Care must be taken to ensure that the flashing does not bridge where there is a change of direction.
  - d) Fasten to the top of the installed flashing under metal counterflashing or coping cap at a maximum of 12 inches on center.
  - e) Then install flashing as required to form a continuous membrane seal in each corner.

### 3.08 Penetrations

#### A. General

1. Flash all penetrations passing through the membrane.
2. The flashing seal must be made directly to the penetration passing through the membrane system.
3. All existing flashing shall be removed.

#### B. Vent Pipes, Round Supports, etc.

1. Flash pipes with Sure-Seal molded pipe flashings where installation is possible.
2. Molded pipe flashing shall not be cut and patched; deck flanges shall not be overlapped.
3. Where molded pipe flashings cannot be installed, use field fabricated pipe seals.
4. The deck membrane must be secured with a nailer around penetrations larger than 18 inches in diameter.



- C. Pitch Pockets
  - 1. Install a new metal pitch dam at existing pitch pockets and seal with pourable sealer. New dam shall provide minimum 2 inch depth, 1 inch clearance.
- D. Roof Drains
  - 1. Remove existing flashing and cement in preparation for water cut-off Mastic and membrane seal.
  - 2. Provide a smooth finish on the clean mating surfaces between the clamping ring and the drain base.
  - 3. Taper insulation around drain to prevent membrane from bridging and to provide a smooth transition from roof surface to drain clamping ring.
  - 4. The seal between the membrane and the drain base shall be provided by water cut-off mastic under constant, even compression.
  - 5. Follow drain manufacturer's recommended installation procedures.
- 3.09 Surface Splice
  - E. Correction of splices, tears, etc. may be accomplished by splicing a membrane section over the affected area.
    - 1. Select repair membrane which is the same material as that to be repaired.
    - 2. Extend the repair membrane section at least 3 inches in every direction from the splice, tear, etc. to be corrected.
    - 3. To remove field dirt, clean the splice area with soap and water, rinse with clean water, and dry.
- 3.10 Daily Seal
  - A. Care should be exercised to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal loose edge of membrane with temporary seal when weather is threatening.
    - 1. Apply the temporary seal at a rate of 100 lineal feet per gallon (on smooth surface) twelve (12) inches back from edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve a complete seal.
    - 2. After embedding membrane in temporary seal, check for continuous contact. Then weight the edge, providing continuous pressure over the length of the cutoff.
    - 3. When work is resumed, pull sheet free before continuing installation.
- 3.11 Installation Controls
  - A. No membrane work, base flashing or any part of the installation procedure that requires adhesives or bonding will be permitted with the presence of any precipitation or when the temperature is below 25 degrees F. This provision will be strictly enforced by the Owner, Owner's representative and the Architect.
  - B. No Work that generates excessive noise, dust or vibration which includes but is not limited to 1) removal of gravel, 2) ballast conveying operation, 3) spreading of ballast, etc., shall be executed during the period when school is in session.
- 3.12 Sheet Aluminum Installation

- A. Anchor work in place with noncorrosive fasteners, adhesives, setting compounds, tapes and other materials and devices as recommended by manufacturer of each material or system. Provide for thermal expansion and building movements. Comply with recommendations of "Architectural Sheet Metal Manual" by SMACNA.
  - B. Seal moving joints in metal work with elastomeric joint sealants.
  - C. Clean metal surfaces of substance which could cause corrosion.
  - D. Water-tight/weatherproof performance of flashing and sheet metal work is required.
- 3.13 Sheet Copper Repair
- A. All sheet copper repair work shall be performed in strict accordance with the recommended practice and standard specifications of the Copper and Brass Research Association and Copper and Common Sense as recommended by Revere Copper and Brass, Inc.
- 3.14 Additional Metal Repair
- A. All existing metal work to remain, including existing aluminum cleats, shall be repaired and refastened as necessary. If material cannot be properly repaired or refastened as approved by the Architect, it shall be replaced with like materials.
- 3.16 Cutting and Core Drilling
- A. Perform all cutting and core drilling operations that are outlined in Part 1 of this SECTION. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting, verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved Coordination Drawings
  - B. Cut all masonry and concrete with an approved diamond blade concrete saw in a neat straight direction, perpendicular to the plane of the wall or floor.
  - C. Use a core drilling process which produces clean, sharp edges and the minimum hole size which will accommodate the size of pipe sleeve specified. Submit procedures for cutting thru existing steel beams to Architect for review.
  - D. The patching of holes shall be performed by Plumbing Sub-contractor utilizing methods outlined for the finish trade involved. Holes shall be patched to the satisfaction of the Architect.

END OF SECTION

SECTION 07 62 00

SHEET METAL FLASHING, GUTTERS AND TRIM

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.

The drawings on which this Contract is based are listed in Section 00 86 00. Consult all drawings, note all conditions that may affect the work, and care for same executing this contract.

It is intended that all metal work shall be from same manufacturer for consistent matching colors as selected by architect. Items that are not by the same manufacture shall have custom color to match.

The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the masonry restoration and related work including but not limited, to the following:

A. SUMMARY

Furnish and install the following:

1. Aluminum edge trim to tie in gutters to roof edge flashing trim
2. Aluminum gutters and down leaders with splash blocks / subsurface drainage transition to existing connections.
3. Cap flashings, in conjunction with roofing system sheet membrane base flashings.
4. High Temperature Self Adhering Bituminous Water Proofing membrane under all metal work
5. Formed aluminum brake-metal work.
6. Associated bond breakers for dissimilar metals.
7. Sealant in conjunction with sheet metal work specified herein.

- B. Coordination with Commissioning Agent, Commissioning General Requirements and Building Enclosure Commissioning.

1.2 RELATED SECTIONS

- A. Section 01 52 40 - DEMOLITION and CONSTRUCTION WASTE MANAGEMENT: Procedural and administrative requirements for construction and demolition waste disposal.

SHEET METAL FLASHING, GUTTERS AND TRIM

- B. Section 04 01 20 – UNIT MASONRY: Flashing at masonry, installation of through wall flashings furnished by this Section.
- C. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking, nailers.
- D. Section 07 92 00 - JOINT SEALANTS: Sealant and backing material not specified herein.
- E. Flashing sleeves and collars for mechanical and electrical items protruding through roofing: By respective trade sections furnishing same.
- F. Section 07 53 23 Roofing (Adhered EPDM Roof System) Sheet membrane flashings for flanges of curbs, and sheet membrane roofing and flashing system.

### 1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ASTM B 209 - Specification for Aluminum Alloy, Sheet and Plate.
  - 2. ASTM B 221 - Specification for Aluminum Extrusions.
  - 3. FS QQ-A-250d - Aluminum and Aluminum Alloy, Plate and Sheet.
  - 4. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 5. AASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 6. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
- B. The following reference materials are hereby made a part of this Section by reference thereto:
  - 1. SMACNA - Architectural Sheet Metal Manual 6<sup>th</sup> Edition, referred to herein as "Sheet Metal Manual".
  - 2. NRCA - Roofing and Waterproofing Manual.

### 1.4 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's data sheets for each metal type and accessories furnished hereunder, include material specifications, performance data, physical properties and finishes.
  - 2. Certification: Provide certifications that materials and systems comply with

SHEET METAL FLASHING, GUTTERS AND TRIM

the specified requirements for the use indicated.

3. Shop drawings:
  - a. Fully dimensioned large scale design details showing material profiles, splices, flashing terminations and other jointing details, fastening methods and installation details. Indicate material type, sizes, and weights or gages. Indicate extent of adjacent work specified under other Sections of the Specifications.
  - b. Fully detail methods of relieving stresses due to thermal movement, including sealing of expansion seams.
  - c. All details bearing dimensions of actual measurements taken at the project.
4. Selection Samples:
  - a. Metal sample chips, indicating Manufacturer's full range of finish colors for factory finishes available for selection by Architect.
  - b. Manufacturer's sample boards for sealant colors.

- B. Submit the following under provisions of Section 01 70 00 – CONTRACT CLOSEOUT :
  1. Manufacturer's warranties: Include coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture

#### 1.5 MOCK-UP

- A. Provide mock-up elements for field panel at exterior location where directed by Architect. Mock-up will demonstrate quality of work, construction methods, relationship to other work.

#### 1.6 PRE- INSTALLATION CONFERENCES

- A. Installer of the Work of this Section is required to attend pre-installation meeting with Owner, architect and Owner's project manager.

#### 1.7 DELIVERY, STORAGE AND HANDLING

- A. Packing, Shipping, Handling, and Unloading: Protect finish panel faces.
- B. Acceptance at Site: Examine each panel and accessory as delivered and confirm that finish is undamaged. Do not accept or install damaged panels.
- C. Storage and protection:
  1. Stack pre-formed material to prevent twisting, bending, and abrasions.
  2. Provide ventilation.
  3. Prevent contact with materials which may cause discoloration or staining.

### SHEET METAL FLASHING, GUTTERS AND TRIM

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the installation of flashings and sheet metal work with the various trades responsible for installing interfacing materials, and install the work at appropriate times so as not to delay the progress of related work.

1.9 QUALITY ASSURANCE

- A. Company specializing in fabrication and installation of sheet metal flashing work with minimum 5 years documented experience.
- B. Flashing and sheet metal applicator, with a minimum of 5 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.
- C. Industry Standard: Except as otherwise shown or specified, comply with applicable recommendations and details of the "Copper in Architecture" handbook published by the Copper Development Association Inc. (CDA). Conform to dimensions and profiles shown.
- D. Wind Uplift: Provide roof assemblies meeting wind uplift ratings as required by code.
- E. Mock-Up: Before proceeding with final purchase of materials and fabrication of copper roofing components, prepare a mock-up of work. Incorporate materials and methods of fabrication and installation identical with project requirements. Install mock-up at roof area location directed by Architect. Retain accepted mock-up as quality standard for acceptance of completed copper roofing. If accepted, mock-up may be incorporated as part of copper roofing work.
- F. PRE-INSTALLATION CONFERENCE
  - 1. Contractor shall convene two weeks prior to commencing Work of this section.
  - 2. Ensure all contractors responsible for the roof assembly are present. Manufacturer's representative for ridge and fascia vent system will make weekly site inspections to confirm proper installation and warranty compliance.

1.10 WARRANTY - METAL GUTTER SYSTEM

- A. Manufacturer's Standard Warranty: Warranted materials shall be free of defects in material and workmanship for five years after shipment. If, after inspection, the manufacturer agrees that materials are defective, the manufacturer shall, at their option, repair or replace them. For decorative finish warranty, consult manufacturer.

**PART 2 - PRODUCTS**

2.1 MATERIALS

Basis of design in regard to finish color, all aluminum components shall have same color for consistency of project. Colors shall be selected from Metal Era Standard, Premium and Express color palette. Any components not by basis of design shall have custom

SHEET METAL FLASHING, GUTTERS AND TRIM

color to match above described color palette. There will be two colors selected from color palette, one for the fascia, gutters, down leaders, drip edge. Factory fabricated, welded fascia, shop finished to exactly match running fascia. Minimum leg length 12 inches. Fabricate assembly such that the fascia may be field installed without fastener. Fascia shall freely thermal cycle on spring cant substrate. Penetration of either the roofing membrane or the cant water dam. Fascia may be factory modified for true radius application. Edging shall lock membrane, preventing wind pullback.

- A. Aluminum flashing: FS QQ-A-250d sheet aluminum, having a minimum thickness as specified herein below, for applications where indicated:
1. Exposed to weather flashings and trim: 0.050 inch thick
  2. Gutter and downleaders and brackets: 0.050 inch thick
  3. Rain Diverters : 0.050 inch thick
  4. Aluminum Finish:
    - a. Polyvinylidene Fluoride (PVDF), Kynar 500 shop applied four coat resin based, high performance thermoplastic organic coating in custom non-standard color to match Architect's sample, up to four colors shall be selected, conforming to AAMA 605.2, NAAMM - Metal Finishes Manual, and the following:
      - 1) Resin base of 70 percent PVDF by weight, Atochem North America, Inc., product "Kynar 500" or Ausimont USA. product "Hylar 5000".
      - 2) Finish Coating shall be manufactured as one of the following products:
        - a) Glidden Company; product "Visulure".
        - b) Morton International; product "Fluoroceram CL".
        - c) P.P.G. Industries Inc.; product "Duramar XL".
        - d) Valspar Corp., product: "Flurothane".
    - b. Surface Preparation: Properly clean aluminum with inhibited chemical cleaner and pretreat with acid chromate-fluoride-phosphate conversion coating, in accordance with Aluminum Association method AA-C12C42.
    - c. Primer: Corrosion resistant, epoxy or urethane based primer compatible with finish coating, averaging 0.2 to 0.3 mils dry film thickness.
    - d. Barrier Coat: Epoxy-based primer compatible with finish coating, averaging 0.70 to 0.80 mils dry film thickness.
    - e. Finish Coat (Color Coat): Polyvinylidene fluoride enamel averaging 0.70 to 0.80 mil dry film thickness.
    - f. Top Coat: Polyvinylidene fluoride enamel clear top coat averaging 0.45 to 0.55 mils dry film thickness.

## 2.2 ACCESSORIES

- A. Flashing cement: Trowel grade, composed of selected asphalt, solvents, and non- asbestos fillers, conforming to FS SS-C-153 Type 1, ASTM D 2822, Type

### SHEET METAL FLASHING, GUTTERS AND TRIM

1 and ASTM D 4586, Type 1 (Non-asbestos) as manufactured by Karnak Chemical Corporation, product N<sup>o</sup>. 19 "Flashing Cement", or equal as manufactured by Koch Materials Company, J & P Petroleum Products Company or other approved manufacturer.

- B. Dampproofing mastic: Trowel grade, self-priming type composed of selected asphalt, solvents, fibers and non-asbestos fillers, conforming to ASTM D 2822, Type 1 and ASTM D 4586, Type 1 (Non-asbestos) as manufactured by Karnak Chemical Corporation, product N<sup>o</sup>. 86 "Fibrated Trowel Mastic", or equal as manufactured by Koch Materials Company, J & P Petroleum Products Company or other approved manufacturer.
- C. Bituminous Coating: SSPC-Paint 12, Cold-Applied Asphalt Mastic (Extra Thick Film), nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- D. High Temperature Grade Water Barrier Underlayment: Cold applied, self-adhering membrane composed of a high density, cross laminated polyethylene film coated on one side with a layer of butyl rubber or high temperature asphalt adhesive. Provide primer when recommended by water barrier manufacturer.
  - 1. Minimum Thickness: 30 mil.
  - 2. Tensile Strength: ASTM D 412 (Die C Modified); 250 psi.
  - 3. Membrane Elongation: ASTM D412 (Die C Modified); 250%.
  - 4. Permeance (Max): ASTM E96; 0.05 Perms.
  - 5. Acceptable Products:
    - a. Blueskin PE 200 HT, Henry.
    - b. Ultra, W.R. Grace Company.
    - c. CCW MiraDRI WIP 300 High Temperature, Carlisle Coatings and Waterproofing.
  - 6. FLASHING FABRICATION - GENERAL
    - a. Form flashings as required, or to profiles indicated on the Drawings, to protect materials from physical damage and shed water.
    - b. Form sections square and accurate to profile, in maximum possible lengths, free from distortion or defects detrimental to appearance or performance. To the greatest extent applicable, fabricate sheet metal components in shop, and thoroughly clean all joints on both sides of the sheet metal work.
    - c. Fabricate cleats and starter strips of same material as sheet.
    - d. Form pieces in longest practical lengths, with flat lock seams. Hem exposed edges on underside 1/4 inch, miter and seam corners.

SHEET METAL FLASHING, GUTTERS AND TRIM



- e. Fabricate corners from one piece with minimum 18 inch long legs, solder for rigidity, water tight.

## 2.4 ALUMINUM GUTTERS AND DOWN LEADERS

- A. Basis of Design: Metal Era, Inc. - Seal-Tite Gutter System: Designed to accommodate the drainage of large roof areas.
  - A. Standard designs: Model # IG-B
  - B. Acceptable Manufacturers:
    - a. Petersen Aluminum
    - b. Firestone
    - c. Atlas Roofing
- B. PERFORMANCE CHARACTERISTICS:
  - A. Heavy gauge gutter straps securely support large volumes of water, as well as extreme snow and icing conditions.
  - B. Manufactured to rigid tolerances and furnished per required drainage capacity/size.
  - C. Adapts easily to "optional" drainage bars or flow through gravel stops.
- C. Gutter metal gauge: .070", with Kynar 500 finish.
- D. Gutter: standard 12'-0" (3.65 m) lengths.
- E. Exterior gutter system finishes: Kynar 500 from manufacturer's standard colors.
- F. Corners, end caps, expansion joints or exterior brackets shall be fabricated by manufacturer. Factory fabricated, mitered corners shall have 17½" nominal leg lengths. Seal aluminum seams with epoxy metal seam cement and where required for strength, rivet seams and joints. Corners shall be shop mitered and shop welded of same material as the metal fascia and edge strips. Space expansion joints no greater than 30 feet and conceal expansion provisions.
- G. Provide matching edge caps, down leaders, and other special fabrications as detailed.
- H. Downspouts shall be fabricated in continuous lengths of 0.050 aluminum alloy as specified above. Downspouts shall be 5 inches by 6 inches minimum or as indicated on drawings, whichever is bigger. Seams shall be concealed where possible. Fasten to wall with 0.050 aluminum straps to match downspout at 2'-0" on center. Fold edges to avoid sharp corners and obstructions.
- I. Comply with "Architectural Sheet Metal Manual" by SMACNA for each general category of work.
- J. All fastenings for gutters and downspouts shall be stainless steel screw type or drilled expansion type fastenings as approved by the Architect.
- K. Color shall be Kynar baked enamel to match the ballast stop/edge strip.

## SHEET METAL FLASHING, GUTTERS AND TRIM

- L. Color shall be selected from manufacturer's full range of colors including premium colors.

## 2.5 SPLASH BLOCKS

- A. Precast concrete splash blocks: Solid concrete, fan-shaped units, 8-1/2 inches wide at narrow end, 14 inches wide at opposite end, 23-3/4 inches long, and 2-1/4 inches thick.
- B. Adhesives for traffic pads, paver units, splash blocks, and pedestals: As approved by the sheet membrane roofing material manufacturer.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets in place and nailing strips located.
- B. Beginning of work shall constitute acceptance of the conditions of the surfaces to which this work is to be applied.

### 3.2 PREPARATION

- A. Clean surfaces to receive metal panel roofing and side wall panels. Substrate to be smooth and free of defects. Drive all projecting nails or other fasteners flush with substrate.
- B. Water Barrier Underlayment:
  - 1. Install high temperature grade water barrier on clean, dry roof substrate.
  - 2. Remove dust, dirt, and loose fasteners.
  - 3. Remove protrusions from the deck area.
  - 4. Verify substrate has no voids, damaged, or unsupported areas.
  - 5. Repair voids or unacceptable areas before installing membrane.
  - 6. Prime substrates with manufacturer's approved primer if required for proper installation of membrane over substrate.
  - 7. Install membrane in strict accordance with manufacturer's printed application procedures, precautions, and limitations.

## SHEET METAL FLASHING, GUTTERS AND TRIM

8. Start application at low points and lap membrane shingle fashion to prevent water penetration.
9. Membrane Underlayment: Apply horizontally, lapping preceding layer not less than 4-inches (100 mm). End lap membrane not less than 6-inches (150-mm) .
  - a. Maximize adhesion to substrate by brooming or rolling membrane in place after placement.
  - b. Center membrane at valleys, hips, and ridges.
- C. Field measure site conditions prior to fabrication.
- D. Install starter and edge strips, and cleats before starting installation.
- E. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
- F. Insert flashings into reglets to form tight fit. Secure in place with plastic wedges at maximum of 8 inches on center. Seal flashings into reglets with sealant.
- G. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- H. Cleat and seam all joints. Apply plastic cement compound between metal flashings and felt flashings, asphalt shingle roofing or asphalt roll roofing.
- I. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- J. Seal all aluminum joints watertight.
- K. During the installation of work of this Section, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

### 3.3 FLASHING INSTALLATION - GENERAL

- A. Except as otherwise shown on the reviewed shop drawings or specified herein, the workmanship of sheet metal work, method for forming joints anchoring, cleating, provisions for thermal movement, shall conform to the standard details and recommendations of the sheet metal producer and those of producer organizations and research institutions and associations concerning the sheet metal used, in addition to the standards and details set forth in the referenced

#### SHEET METAL FLASHING, GUTTERS AND TRIM

materials specified this Section.

- B. Face nailing will not be permitted, concealed cleating or other concealed method must be used to attach sheet metal work to structure.
- C. Ensure that fastenings do not exceed 8 inches on centers. Use flat head fasteners throughout, and seal all fastener heads after installation thereof.
- D. Fill all slip joints and overlapping surfaces in the assembly with specified sealant material, removing all excess sealant material from the prefinished surfaces immediately, to prevent staining the finish.
- E. Install continuous vents full length of soffits, unless otherwise indicated.
- F. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized asphalt or butyl underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- G. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of copper roofing to profiles, patterns, and drainage arrangements shown and as required for permanently leakproof construction. Provide for thermal expansion and contraction of the work, as indicated. Seal joints as shown and as required for leakproof construction. Shop-fabricate materials to greatest extent possible.
- H. Sealant-Type Joints: Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to conceal sealant completely. When ambient temperature is moderate at time of installation, 40 degrees to 70 degrees F (4 degrees to 21 degrees C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher or lower ambient temperatures. Do not install sealant-type joints at temperatures below 40 degrees F (4 degrees C). Comply with requirements of Division 07 "Joint Sealant" Sections for handling and installing sealants.
- I. Fabricate and install work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves, and avoidable tool marks considering temper and reflectivity of metal. Provide uniform, neat seams with minimum exposure of solder, and sealant. Except as otherwise shown, fold back sheet metal to form a hem on concealed side of exposed edges.
- J. Conceal fasteners and expansion provisions where possible in exposed work and locate so as to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- K. CLEANING
  - 1. Daily clean work areas by sweeping and disposing of debris.
  - 2. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom- clean condition.

### 3.4 INSTALLATION OF GUTTER SYSTEM:

#### SHEET METAL FLASHING, GUTTERS AND TRIM

Oak Hill Middle School  
Classroom Addition  
Newton, Massachusetts

- A. Submit product design drawings for review and approval to Architect or Specifier before fabrication.
  - B. Installing contractor shall check as-built conditions and verify the manufacturer's gravel stop details for accuracy to fit the wall assembly prior to fabrication. The installer shall comply with the roof edging manufacturer's installation guide when setting edging.
  - C. Installer shall furnish mechanical fasteners consistent with manufacturer's instructions; suitable for the substrate to which being installed.
- 3.5 FINAL CLEANING
- A. All Work shall be kept as clean as possible so that cleaning down may be accomplished easily. Protect all surfaces from stain at all times to guard from discoloration.

END OF SECTION

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

SECTION 07 84 00

FIRESTOPPING

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Furnish and install fireproof firestopping, firesafing materials, smoke seals and related accessories required for this Project for all penetrations through fire resistance rated construction, including, but not limited to, penetrations for elevators, plumbing, fire suppression, heating, ventilating and air conditioning, electrical systems, and specialized equipment.
  - 1. Fire resistance rated construction requiring firestopping includes, but is not limited to: floors, rated partitions, smoke barriers, smoke partitions, partitions in rated corridors, passageways and stairs, shaft partitions, shaft wall (vertical and horizontal), area separation fire walls, party wall systems, and temporary fire resistant rated partitions and barriers.
  - 2. Provide removable temporary firestopping (pillows) to maintain fire integrity prior to Owner's final acceptance, to permit installation of electrical, telephone, data and sound system wiring. Replace temporary firestopping with permanent, after wiring systems are completed.
- B. Furnish and install firestopping/smoke seals at construction joints occurring at tops of fire resistance rated partitions, smoke partitions, and temporary partitions between top of partition and underside of deck above.
- C. Furnish and install all firestopping, firesafing, and smoke seals at perimeter of floor/roof construction and exterior wall systems, as indicated and where required by applicable codes.
- D. Furnish and install all firestopping, firesafing, and smoke seals at expansion joints in chase walls where expansion joints are not exposed to view.
- E. Furnish and install all firestopping, firesafing, and smoke seals where required by applicable codes and as additionally required by authorities having jurisdiction at no additional cost to the Owner.
- F. Refer to Section 00 27 00 - Unit Prices

1.2 RELATED REQUIREMENTS

- A. Section 00 27 00 – UNIT PRICES
- B. Section 04 01 20 – UNIT MASONRY: Masonry partitions.
- C. Section 09 29 00 - GYPSUM BOARD: Gypsum wallboard fireproofing.
- D. Division 21 - FIRE SUPPRESSION: Fire protection system penetrations through fire resistance rated construction.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- E. Division 22 - PLUMBING: Plumbing system penetrations through fire resistance rated construction.
- F. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Heating, ventilating and air conditioning system penetrations through fire resistance rated construction.
- G. Division 26 - ELECTRICAL: Electrical penetrations through fire resistance rated construction.

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ASTM E-84 - Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E-119 - Method for Fire Tests of Building Construction and Materials.
  - 3. ASTM E-814 - Test Method of Fire Tests of Through-Penetration Firestops.
  - 4. NFPA 70 - National Electrical Code.
  - 5. UL - Fire Resistance Directory.
  - 6. UL 1479 - Fire Tests of Through Penetration Firestops.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide materials and work to conform to Building Code Requirements in fire resistant wall and floor assemblies.
- B. Manufacturer's certified product test requirements:
  - 1. All firestop/smokeseal material shall be tested by a recognized, independent testing agency and shall conform to both Flame (F-rating) and Temperature (T-rating) requirements of ASTM E-814.
  - 2. Conform to UL Fire Hazard Classification Requirements.
  - 3. Tested and classified non-combustible per ASTM E-84.
- C. Firestops in place shall be of sufficient thickness, width, and density to provide a fire resistance rating at least equal to the floor, wall, or partition construction into which it is installed.
- D. Non-combustible dams shall be constructed:
  - 1. As necessary to achieve fire rating as tested and rated.
  - 2. In conformance with installation requirements for type of floor, wall, and partition construction.
  - 3. As recommended by firestop/smokeseal manufacturer.
- E. Combustible damming materials, if used, must be removed after proper curing.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1.5 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
1. Literature: Manufacturer's product data sheets, specifications, performance data, and physical properties.
    - a. Indicate requirements for manufacturer's descriptive data for products and related materials with FM, UL or Warnock-Hersey illustrations showing systems and approval of materials in systems.
  2. Certification: Manufacturer's written certification stating that firestopping materials, meet or exceed the requirements specified under this Section and that all fire-resistive requirements for the indicated combustibility, Flame (F-rating) and Temperature (T-rating) Ratings have been met.
  3. Manufacturer's installation instructions.
  4. Test reports: Submit fire test reports from recognized, independent testing agent(s) indicating the following:
    - a. Fire test report of firestop material applied to substrate and penetration materials similar to project conditions. Tests to indicate both Flame (F-rating) and Temperature (T-rating) Ratings.
    - b. Test reports of products to be used shall indicate conformance to ASTM E-814.
  5. On-site sample installation to be included in Work: Minimum thirty days prior to application in any area, provide samples of firestop and smoke seal materials and installation in accordance with the following requirements.
    - a. Apply one sample of appropriate firestop and smoke seal material for each different penetration and fire rating required for the work.
    - b. Sample areas will comply with thickness, fire resistance ratings, and finished appearance of the project and applicable fire code.
    - c. Acceptance samples will constitute standard of acceptance for method of application, thickness, and finished appearance for firestop and smoke seal application. The sample(s) shall remain visible during completion of the work and shall remain as part of the completed work.
  6. Shop drawings indicating requirements for penetrations in wall/deck intersections, change of planes, control joints, expansion joints and blank openings.

1.6 QUALITY ASSURANCE

- A. Obtain firestop and smoke seal products from a single manufacturer, except as otherwise approved by Architect.
- B. Environmental Requirements for Volatile Chemicals: Use firestopping caulks that comply with the following limits for VOC content:
1. Firestopping caulks: VOC not more than 250 g/L.
- C. Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- D. Special Inspections: Allow for 3 percent of each type of firestopping system to be removed and inspected for conformance with approved submittals.
  - 1. All firestopping shall be inspected prior to installation of suspended ceilings or concealed by other materials.

1.7 QUALIFICATIONS

- A. Installer, a specialized subcontractor having not less than 3 years documented experience demonstrating previously successful work of the type specified herein.
  - 1. The manufacturer of the firestop material shall submit written certification that the firm to be used for the firestop products has been trained in the application of the products by the manufacturer.

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable code for fire resistance ratings and surface burning characteristics.
- B. Obtain certificate of compliance from authority having jurisdiction indicating approval of combustibility.

1.9 MOCK-UPS

- A. Provide mock-ups under provisions of Section 01 45 00 - QUALITY CONTROL for purpose of verifying quality of firestop installation.
- B. Provide firestop samples and locate as directed. Accepted samples may remain as part of the work.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver and store firestopping materials in original, sealed, packages showing manufacturer's identification and date of packaging.
- B. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Basis of Design: To establish a standard of quality, design, function desired, and appearance, Drawings and specifications have been based on Hilti, Inc. Tulsa OK. products specified herein below.
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Hilti, Inc. Tulsa OK.
  - 2. Bio Fireshield (A Division of Rectroseal), Houston TX.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

3. Dow Corning Corporation, Midland MI.
4. 3M Company, Saint Paul MN.
5. Specified Technologies, Inc., Somerville NJ.
6. Metacaulk, (A Division of Rectroseal), Houston TX.
7. Tremco, Inc., Beachwood OH.

## 2.2 MATERIALS

- A. Firestop mortar: asbestos free, cementitious mortar, U.L. classified as a "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM/UL 1479.
1. Acceptable products include the following, or approved equal:
    - a. Hilti, Inc., product "CP 637 Firestop Mortar".
    - b. Bio Fireshield, product "Novasit K-10".
    - c. Specified Technologies, Inc., product "Spec Seal Mortar".
    - d. Tremco Inc., product "Tremstop M".
- B. Silicone Firestop sealant: Single component, non-combustible silicone elastomer firestop sealant, U.L. classified as a "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL 1479.
1. Acceptable products include the following, or approved equal:
    - a. Hilti, Inc., product "CP 601S Elastic Firestop Sealant".
    - b. Bio Fireshield, product product "Biotherm 100" (Gun Grade) or "Biotherm 200" (Self Leveling).
    - c. Specified Technologies, Inc., product "Spec Seal Pensil 300 Sealant (gun grade)" or "Spec Seal Pensil 300SL" (Self Leveling).
    - d. 3M Company, product "Fire Barrier Silicone Sealants".
    - e. Tremco Inc., product product "Tremsil" (Gun Grade) or "Tremsil S/L" (Self Leveling).
  2. Sealants will not dissolve in water.
- C. Intumescent firestop sealant and caulks: Acrylic based, water resistant sealant, which will not re-emulsify after drying.
1. Acceptable products include the following, or approved equal:
    - a. Hilti, Inc., product "FS-ONE Intumescent Firestop Sealant" or "FS 657 Fireblock".
    - b. Bio Fireshield, product "Biostop 500".
    - c. Specified Technologies, Inc., product "Spec Seal Triple-S Sealant".
    - d. 3M Company, product "Fire Barrier Caulk CP25WB+".
    - e. Tremco Inc., product "Tremstop 1A".
- D. Firestop putty: sticks or pads.
1. Acceptable products include the following, or approved equal:

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- a. Hilti, Inc., product "CP 618 Firestop Putty" or "CFS-P PA Firestop Putty Pad".
  - b. Bio Fireshield, product "Moldable Putty".
  - c. Specified Technologies, Inc., product "Spec Seal Putty Bars and Pads".
  - d. 3M Company, product "Fire Barrier Moldable Putty".
  - e. Tremco Inc., product "Flowable Putty".
- E. Firestop collars: Pre-manufactured fire protective pipe sleeve, UL classified as "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL1479.
1. Provide separated (two piece) firestop collar for application when plastic pipe or telecommunications cabling system is already in place. Provide non-separated firestop collar for application prior to installation of plastic pipe system.
  2. Acceptable products include the following, or approved equal:
    - a. Hilti, Inc., product "CP 643 Firestop Collar", "CP 644N Firestop Collar" and "CFS-CC Firestop Cable Collar".
    - b. 3M Company, Inc., product "Fireshield Firestop Sleeve".
    - c. Specified Technologies, Inc., product "Spec Seal Collars".
    - d. 3M Company, product "Fire Barrier PPD's".
    - e. Tremco Inc., product "Fyrecan sleeve".
- F. Firestop blocks and pillows: UL Classified as "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL1479.
1. Acceptable products include the following, or approved equal:
    - a. Hilti, Inc., product "CFS-BL Firestop Block".
    - b. Bio Fireshield, product "Fireshield Firestop Pillows".
    - c. Specified Technologies, Inc., product "Spec Seal Pillows".
    - d. Tremco Inc., product "Tremstop P.S".
- G. Wrap strips:
1. Acceptable products include the following, or approved equal:
    - a. Hilti, Inc., product "CP 645-E Endless Wrap Strip", or "CP 648-S Firestop Wrap Strip".
    - b. Bio Fireshield, product "FS-195".
    - c. Specified Technologies, Inc., product "Spec Seal Wrap Strip".
    - d. 3M Company, product "Fire Barrier FS195 Wrap Strip".
    - e. Tremco Inc., product "Tremco W.S".
- H. Mineral fiber / ceramic wool non-combustible insulation (fire safing): Provide Hilti, Inc., product "Mineral Wool, Item No. 00236993." Or US Gypsum Company product "Thermafiber" having a minimum density of 4 pounds per cubic foot, Fibrex product "FBX Safing Insulation" having a minimum density of 4 pounds per cubic foot, or

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

provide Manville Corporation product "Ceramic Fiber Insulation" having a minimum density of 6 pounds per cubic foot, or approved equal product to suit conditions and complying with firestop manufacturer's requirements.

1. Provide galvanized steel safing clips for installation of insulation.
  2. Material shall be classified non-combustible per ASTM E-814.
- I. Elastomeric Firestopping: Non halogenated latex based elastomeric coating applied by airless spray, product Hilti, Inc., product "CFS-SP WB 672 Speed Spray", "CFS-S SIL, Specified Technologies, Inc., product "SL Silicone Sealant Self Leveling" or "Spec Seal Elastomeric Firestop Spray".
- J. Firestop Devices: Factory assembled firestopping devices sized to fit specific diameter of penetrant.
1. Acceptable products include the following, or approved equal:
    - a. Floor Slabs:
      - 1) Hilti, "CP680 Series" Cast-In Firestop Device.
      - 2) Hilti, "CFS-DID" Drop-In Device.
      - 3) Hilti, "CP 681" Tub Box Cast-In Kit
    - b. Walls:
      - 1) Hilti, "CP 653" Firestop Sleeve.
      - 2) Hilti, "CFS-SL SK" Firestop Sleeve Kit.
      - 3) Hilti, "CFS-SL GP" Firestop Sleeve Gangplate

### 2.3 ACCESSORIES

- A. Forming and damming materials: Mineral fiberboard or other type as recommended by firestopping manufacturer.
- B. Primer, sealant and solvents: As recommended by manufacturer.
- C. Woven wire mesh: Galvanized 20 gage woven wire mesh "chicken wire" or "poultry fencing", 1 inch spacing.

## **PART 3 - EXECUTION**

### 3.1 INSPECTION

- A. Examine the areas and conditions where firestops are to be installed and notify the Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface to receive firestops shall be free of dirt, dust, grease, oil, form release agents, or other matter that would impair the bond of the firestop material to the substrate or penetrating item(s).
- B. Voids and cracks in substrate shall be filled and unnecessary projection removed prior to installation of firestops.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- C. All penetrating items shall be permanently installed prior to firestop installation.
- D. Substrate shall be frost, free and, when applicable, dry.

3.3 INSTALLATION

A. General

- 1. Installation of firestops shall be performed by applicators/installers qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
- 2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations. Meet building code requirements.
- 3. Coordinate with plumbing, mechanical, electrical, and other trades to assure that all pipe, conduit, cable, and other items which penetrate fire rated construction have been permanently installed prior to installation of firestops. Schedule and sequence the work to assure that partitions and other construction which would conceal penetrations are not erected prior to the installation of firestops.
  - a. Ensure that all firestopping is inspected prior to installation of suspended ceilings or concealed by other finished materials.

B. Dam construction

- 1. Install dams when required to properly contain firestopping materials within openings to achieve required fire resistance rating. Combustible damming material must be removed after appropriate curing. Incombustible damming material may be left as a permanent component of the firestop system.
- 2. Placement of dams shall not interfere with function or adversely affect the appearance of adjacent construction.

C. Installation of single component silicone firestop

- 1. Apply with manual or powered caulking gun.
- 2. Apply minimum 1/2 inch thickness for 2 hour rating. Apply 1/2 inch to both sides of wall penetrations; one side only in floor penetrations.
- 3. Use incombustible insulation to achieve fire resistance rating.
- 4. Surface of gun grade silicone firestop may be tooled using clean, potable water.
- 5. Clean excess material off of adjacent surfaces and tools within 10 minutes using either water or Xylol where the use of such would not be hazardous.

D. Installation of cementitious firestop mortar.

- 1. Add dry powder to water and mix with mechanical mixer or hand mixing tools as recommended by firestop mortar manufacturer. Allow a average mixing time is 3 minutes and provide a average wet density of 70 pounds per cubic foot, plus or minus 5 PCF.
- 2. Do not apply if ambient or substrate temperature is less than 35 degrees Fahrenheit during 24 hours after application.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

3. Wet all surfaces prior to application of firestop mortar.
  4. Mortar may be hand applied or pumped into the opening.
  5. Exposed surfaces shall be finished using conventional plastering tools prior to curing.
  6. When installation around layered cables, it is recommended to increase the fluidity of the firestop mortar to provide a better fill around the cables. Vibrate or move the cables slightly to prevent voids from forming between the cables.
  7. Allow 48 hours for initial cure prior to form removal. For full cure allow 27 days.
  8. Wet material may be cleaned with water. Dry material may require scraping or chipping.
- E. Installation of firestop collars (plastic pipe only)
1. Firestop collars may be surface mounted to a slab or wall or imbedded in Firestop Mortar to a maximum depth of 2 inches.
  2. For wall penetrations with ABS pipe firestop collars must be installed on both sides of the penetration to provide a 2 hour F and T Rating. All other applications required installation on one side only to provide a 2 hour F and T Rating.
- F. Firesafing insulation: Install firestopping safing insulation on safing clips spaced as needed between each stud and floor slab, leaving no voids. Secure safing clips to slab using fasteners recommended by insulation manufacturer. Install sealant over mineral wool in accordance with test requirements.

### 3.4 FIELD QUALITY CONTROL

- A. Inspecting Agency: Owner will engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.
1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.
- B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.
- C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

### 3.5 SCHEDULE

- A. General: Typical penetrations are indicated below with list of standard firestopping/smokeseal approaches. Actual firestopping materials and combination of materials will vary with size of penetration and with individual firestopping manufacturer's approved UL Design System Requirements. Use only UL Design System materials for each penetration that best matches the wall and floor construction.
1. Where penetrations occur for which no listed UL or WH Design System test exists, obtain from the firestop system manufacturer an engineered system

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

acceptable to the authorities having jurisdiction for firestopping such penetrations. Engineered system from manufacturer shall include a detail drawing showing the engineered system and shall contain no disclaimers.

- B. Single metal pipe (non-insulated) and conduit penetrations through floors:
  - 1. Firestop mortar.
  - 2. Silicone Firestop sealant.
  - 3. Intumescent firestop sealant.
  - 4. Firestop putty, sticks or pads.
  - 5. Mineral fiber / ceramic wool non-combustible insulation (fire safing) in conjunction with a firestop sealant.
  
- C. Single metal pipe (non-insulated) and conduit penetrations through walls:
  - 1. (masonry and concrete walls only) Firestop mortar and putty.
  - 2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  - 3. Intumescent firestop sealant with wrap strips.
  
- D. Multiple metal pipe and conduit penetrations through floors:
  - 1. Firestop mortar and wrap strips.
  - 2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  
- E. Multiple metal pipe and conduit penetrations through walls:
  - 1. Firestop mortar and putty.
  - 2. (through masonry walls only) Firestop pillows with woven wire mesh.
  - 3. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  
- F. Insulated metal pipe penetrations through floors:
  - 1. Firestop mortar and wrap strips.
  - 2. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  - 3. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  - 4. Silicone Firestop sealant over wrap strip.
  - 5. Mineral fiber / ceramic wool non-combustible insulation (fire safing) in conjunction with a firestop sealant.
  
- G. Insulated metal pipe penetrations (single and multiple) through walls:
  - 1. Firestop mortar with wrap strips.
  - 2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  - 3. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) and Wrap strips.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

4. (multiple penetrations through masonry walls only) Firestop pillows with woven wire mesh.
- H. Duct penetrations through floors or walls:
1. Rectangular and square ducts: Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing), and steel flanges provided under Division 15.
  2. Round ducts: Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- I. Combustible plastic pipe and conduit penetrations through floors:
1. Firestop mortar with wrap strips.
  2. Firestop mortar with firestop putty and firestop collars.
  3. Silicone firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  4. Silicone firestop sealant and firestop collars.
  5. Intumescent firestop sealant and firestop collars.
  6. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) with firestop collars.
  7. (maximum pipe size 2 inches) Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) with wrap strips.
- J. Combustible plastic pipe and conduit penetrations through walls:
1. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  2. Intumescent firestop sealant with firestop collars.
- K. Cable penetrations through floors:
1. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- L. Cable penetrations through walls:
1. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  3. (single penetrations only) Firestop putty.
  4. (electrical boxes) Firestop pads.
  5. Firestop putty over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- M. Bus ducts through floors:
1. Firestop mortar and wrap strips.



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

2. Intumescent firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing) and 28 gage (minimum) steel cover plate.
- N. Blank openings:
1. Firestop mortar.
  2. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- O. Fire rated joints:
1. Silicone Firestop sealant over backer rod or bond breaker.
- P. Floor to curtain wall assemblies:
1. Silicone Firestop sealant/mastic over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- Q. Construction joints at head of wall/floor assemblies:
1. Silicone Firestop sealant/mastic over mineral fiber / ceramic wool non-combustible insulation (fire safing).
  2. Elastomeric spray over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- R. Smoke barrier sealant for dampers, fire door frames:
1. Silicone Firestop sealant.
- S. Temporary sealing of openings and penetrations:
1. Firestop putty, sticks or pads.
  2. Firestop pillows.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all joint sealer Work as indicated on the Drawings, as required for the completed Work, and as specified herein. This Section includes joint sealants for the following applications:
1. Interior and Exterior joints in the following vertical surfaces and horizontal surfaces:
    - a. Perimeter joints between exterior frames of doors, windows, louvers and masonry both sides (exterior and interior). This shall include sealant between metal drip edge and frames of doors, windows, typical.
    - b. Joints between new soffit panels and trims.
    - c. Joints between conduit, pipe and misc. penetrations through exterior window / storefront / curtain wall panels and masonry.
    - d. Joints in exterior carpentry standing and running trim.
    - e. Joints in interior finished carpentry.
    - f. Joints at interior corners of tile work
    - g. Other joints where indicated on drawings
    - h. All staging, scaffolding and hoisting for the work of this Section.
    - i. In-place Field Mock-Ups
  2. Coordination with Commissioning Agent, Commissioning General Requirements and Building Enclosure Commissioning.

1.03 REFERENCES

- A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work
1. American Society for Testing and Materials (ASTM)

1.04 Related Sections

- A. Section 01 27 00 - UNIT PRICING
- B. Section 02 41 19 - SELECTIVE DEMOLITION
- C. Section 04 01 20 – UNIT MASONRY
- D. Section 06 10 00 – ROUGH CARPENTRY
- E. Section 06 20 00 – FINISHED CARPENTRY
- F. Section 06 61 16 - SOLID SURFACING FABRICATIONS
- G. Section 08 51 13 – ALUMINUM WINDOWS
- H. Section 09 30 00 – TILING

1.05 SUBMITTALS

A. Product Data

Catalog sheets, specifications, and installation instructions for each product specified except miscellaneous materials.

B. Samples for Initial Selection:

1. For general purpose use around windows and at relieving angles, Colors of Exposed Joint Sealants: Match Architect's samples. Provide custom colors as specified.
2. For all other uses: provide Manufacturer's color charts consisting of strips of cured sealants showing the full range of Manufacturer's standard colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-(13-mm-) wide joints formed between two 6-inch-(150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants

D. Quality Control Submittals

1. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
2. Installer's Qualifications Data: Affidavit required under Quality Assurance Article.
3. Company Field Advisor Data: Name, business address, and telephone number of Company Field Advisor.
4. Test Results
  - a. Sealant manufacturer's test reports certifying compatibility with all contiguous materials.
  - b. Sealant manufacturer's test reports certifying that the sealant will not stain contiguous materials.
  - c. The results of field adhesion testing.

1.06 QUALITY ASSURANCE

A. Installer's Qualifications

The persons installing the sealants and their supervisor shall be personally experienced in the installation of sealants and shall have been regularly employed by a company engaged in the installation of sealants for a minimum of two years.

1. Furnish a letter from the sealant manufacturer, stating that the Installer is authorized to install the manufacturer's sealant materials.

B. Container Labels

Include manufacturer's name, trade name of product, kind of material, federal specification number (if applicable), expiration date (if applicable), and packaging date or batch number.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joint sealer materials as recommended by the Manufacturer, to protect from damage.

1.08 PROJECT CONDITIONS

A. Environmental Requirements

1. Temperature: Unless otherwise approved or recommended in writing by the sealant manufacturer, do not install sealants at temperatures below 40 degrees F or above 85 degrees F.
2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
3. Ventilation: Provide sufficient ventilation wherever sealants, primers, and other similar materials are installed in enclosed spaces. Follow manufacturer's recommendations.
4. Do not proceed with installation of joint sealants under the following conditions
  - a. When joint substrates are wet.
  - b. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
  - c. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
  - d. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
  - e. Surfaces are frozen.
  - f. Surfaces are superheated by the sun.

- B. Protection
  - 1. Protect all surfaces adjacent to sealants with non-staining removable tape or other approved covering to prevent soiling or staining.
  - 2. Protect all other surfaces in the Work area with tarps, plastic sheets, or other approved covering to prevent defacement from droppings.
  - 3. Protect any painted surfaces which are not included in the Work from impact or damage.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. General Electric Co., Waterford, NY 12188
- B. Dow Corning Corp., Midland, Michigan 48686
- C. Pecora Corp., Harleyville, PA
- D. ChemRex Inc. - Sonneborn, Shakopee, MN 55379
- E. Tremco Sealing and Coatings, Wading River, NY 11792
- F. Bostik, Midland, MA 01949
- G. Sika Corporation, Lyndhurst, NJ 07071

### 2.02 SEALANTS

- A. Type 1 Sealant - For general use around windows, door frames, louvers, general pipe penetrations, flashings and adjacent concrete walks to exterior walls.

One-part silicone sealant; ASTM C920 classifications type S, grade NS, class 25, uses NT, M, G, A and O: Pecora 890; Tremco Spectrum-1 or Sika's SikaSil WS 295.

Provide custom colors for use around window perimeters, to match window frame or masonry, or other colors as determined by the Architect. It is the intention of this specification that any color produced by the manufacturer is available in the attempt to match the Window, Storefront Curtainwall framing and door systems.

- B. Type 2 Sealant (for concealed bedding only).

One-part butyl rubber sealant; Pecora's BC-158, PTI's 707, Bostik's Chem-Calk 300, or Tremco Butyl.

- C. Type 3 Sealant (use at high temperature applications, e.g., gas flues)

One-part silicone sealant for high temperature; ASTM C920 classifications type S, grade NS, class 25, uses NT, M, G, and A: Dow Corning's Silastic 726 RTV, General Electric's RTV 106, or Tremco Spectrem 1.

- D. Sealant Materials, General Requirements:

1. Only use sealant and primers that comply with the following limits for VOC content:
    - a. Architectural Sealants: 250 g/L.
    - b. Roofing Sealants: 450 g/L.
    - c. Roadway Sealants: 250 g/L.
    - d. Sealant primer: 250 g/L.
  2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted.
- E. Joint Sealer Type AP (Acrylic painters caulk): One component acrylic latex caulking compound, conforming to FS 19-TP-21M and ASTM C 834, paintable within 24 hours after application, with a minimum movement capability of  $\pm 12.5$  percent, equal to one of the following:
1. Sonneborn, product, "Sonolac".
  2. Tremco, product, "Tremflex 834".
  3. Bostik, product, "Chem-Calk 600".
  4. Pecora, product " AC-20+". (Addendum 1, A-1.14)
- F. Joint Sealer Type BP2 (Bitumen modified polyurethane, Multi-component): Pouring grade self-leveling bitumen modified two component urethane sealant, conforming to ASTM C920, Type M, Grade P, Class 25 and FS SS-S-00227E, Type 1, Class A, with a minimum movement capability of  $+50/-25$  percent, equal to one of the following:
1. Tremco, product "Vulkem 202".
  2. Sonneborn, product "Sonomeric 2".
  3. Pecora, product "Urexpan NR-300". (Addendum 1, A-1.14)
- G. Joint Sealer Type HL1 (Horizontal-self-Leveling, 1-component): Pouring grade self-leveling modified urethane or neutral cure silicone sealant, conforming to FS TT-S- 000230C, Type I, Class A, and ASTM C 920 Type S, Grade P, Class 25, with a minimum movement capability of  $\pm 25$  percent, equal to the following:
1. GE silicones, product "Tosseal 817" (silicone).
  2. Sika, product, "Sikaflex 1CSL" (urethane).
  3. Sonneborn, product, "SL1" (urethane).
  4. Tremco, product "Vulkem 45" / 45 SSL (urethane). (Addendum 1, A-1.14)
- H. Joint Sealer Type P1 (Polyurethane 1-component): Low modulus single component gun-grade polyurethane sealant, non-sagging, conforming to FS TT-S-000230C, Type I, Class A, and ASTM C 920, Type S, Class 12-1/2, Grade NS, use NT,M, A and O with a minimum movement capability of  $\pm 25$  percent, equal to the following:
1. Pecora, product "Dynatrol I".
  2. Sika, product "Sikaflex".
  3. Sonneborn, product "Sonolastic NP1".
  4. Tremco, product "Vulkem 116", or "Dymonic". (Addendum 1, A-1.14)
- I. Joint Sealer Type SC (Silicone, general construction): One-part medium modulus, natural cure, synthetic sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, NS, Class 25, use NT, G, A, M, O with a minimum movement capability of  $\pm 50$  percent, equal to the following:
1. Dow Corning, product, "791".

2. GE Silicones, product, "Silpruf".
  3. Pecora, product, "895". (Addendum 1, A-1.14)
  4. Sika, product, "Sika Sil-C 995".
  5. Sonneborn, product, "Sonolastic - OmniSeal".
  6. Tremco, product, "Spectrem 2". (Addendum 1, A-1.14)
- J. Joint Sealer Type SE (Silicone, Exterior construction): One-part low modulus, moisture curing, synthetic rubber sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, NS, Class 25, FS TTS- 001543A, Type, Class A with a minimum movement capability of +100 percent and -50 percent, equal to the following:
1. Dow Corning, product, "790".
  2. GE Silicones, product, "SCS9000 SilPruf NB".
  3. Sika, product "Sika Sil-C 990".
  4. Tremco, product "Spectrem 1". (Addendum 1, A-1.14)

## 2.03 JOINT FILLERS

- A. Elastomeric Tubing Sealant Backings: (for precast panel joints not compatible with Silicone Sealants): Neoprene, butyl or EPDM tubing complying with ASTM D 1056, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 26 deg F (minus 32 deg C). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and to otherwise contribute to optimum sealant performance.

ASTM D 1056, Class SC (oil resistant and medium swell), 2 to 5 psi compression deflection.

- B. Expanded Polyethylene Joint Filler (for existing joints)  
Flexible, compressible, closed-cell polyethylene of not less than 10 psi compression deflection (25 percent).
- C. Closed-Cell Polyurethane or Closed-Cell Expanded polyethylene Joint Filler (for all cast-in-place concrete work).

Resilient, compressible, semi-rigid; W.R. Meadow's Ceramar; A. C. Horn's Closed Cell Plastic Foam Filler, Code 5401; Sonneborn's Sonoflex F.

- D. ASTM D1056, Class RE41 (for masonry joints) where shown on the Drawings.

- E. Filler Sealant (for Parapet Expansion Joints)

Polybutylene impregnated compressible polyurethane foam precompressed to 50% of its uncompressed length: "Polytite" by Polytite Manufacturing Corp. and distributed by W.R. Grace Co.

## 2.04 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

1. For primers used on site and within the weatherproofing/waterproof membrane (interior) of the building comply with V.O.C. requirements specified in Section G01600.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
  1. For cleaners used on site and within the weatherproofing/waterproof membrane (interior) of the building comply with V.O.C. requirements specified in Section G01600.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.
  1. Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
  2. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), O (open-cell material)] or B (bicellular material with a surface skin, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
- D. Bond Breaker Tape

Polyethylene or other plastic tape as recommended by the sealant manufacturer; non-bonding to sealant; self-adhesive where applicable.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine all joint surfaces for conditions that may be detrimental to the performance of the completed Work. Do not proceed until satisfactory corrections have been made.

#### 3.02 PREPARATION

- A. Clean joint surfaces immediately before installation of sealant and other materials specified in this Section.
  1. Remove all loose materials, dirt, dust, rust, oils and other foreign matter that will impair the performance of materials installed under this Section.
  2. Remove protective coatings and similar materials from joint faces with manufacturer's recommended solvents.
  3. Use methods such as grinding, acid etching or other approved and manufacturer's recommended means, if required, to clean the joint surfaces, assuring that the sealant materials will obtain positive and permanent adhesion.

#### 3.03 JOINT BACKING INSTALLATION



- A. Install bond breaker tape in relaxed condition as it comes off the roll. Do not stretch the tape. Lap individual lengths.
- B. Install backer rod of sufficient size to fill the joint width at all points in a compressed state. Compress backer rod at the widest part of the joint by a minimum of 25 percent. Do not cut or puncture the surface skin of the rod.

### 3.04 SEALANT INSTALLATION

- A. Except as shown or specified otherwise, install sealants in accordance with the manufacturer's printed instructions.
- B. Install sealants with ratchet hand gun or other approved mechanical gun. Where gun application is impracticable, install sealant by knife or by pouring, as applicable.
- C. Finishing
  - Tool all vertical, non-sag sealants so as to compress the sealant, eliminating all air voids and providing a neat smoothly finished joint. Provide slightly concave joint surface, unless otherwise indicated or recommended by the manufacturer.
  - 1. Use tool wetting agents as recommended by the sealant manufacturer.

### 3.05 FIELD QUALITY CONTROL

- A. Field Adhesion Testing of Sealants - Test completed elastomeric joints as follows:
  - 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
    - a. Perform 10 tests for the first 1000 feet of joint length for each type of elastomeric sealant and join substrate.
    - b. Perform one test for each 1000 feet of joint length thereafter or one test per each floor per elevation.
  - 2. Test Method – Test joints by hand pull method described below:
    - a. Make knife cuts from one side of the joint to the other, followed by two cuts approximately 2 inches long at sides of joint and meeting cross cut at one end. Place a mark 1 inch from cross-cut end of 2 inch piece.
    - b. Use fingers to grasp 2 inch piece of sealant between cross-cut end and 1" mark, pull firmly at a 90 degree angle or more in direction of side cuts while holding a ruler along sides of sealant. Pull sealant out of joint to the distance recommended by the sealant manufacturer for testing adhesive capability, but not less than that equaling specified maximum movement capability in extension, hold this position for 10 seconds.
    - c. For joints with dissimilar substrates, check adhesion to each substrate separately. Do this by extending cut along one side, checking adhesion to opposite side.

3. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field-adhesion-test log.
4. Inspect tested joints and report on the following:
  - a. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
  - b. Whether sealants filled joint cavities and are free of voids.
  - c. Whether sealant dimensions and configurations comply with specified requirements.
5. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
6. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
7. Evaluation of Field Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.06 CLEANING

- A. Immediately remove misapplied sealant and droppings from metal surfaces with solvents and wiping cloths. On other materials, remove misapplied sealant and droppings by methods and materials recommended in writing by the manufacturer of the sealant material.
- B. After sealants are applied and before skin begins to form on sealant, remove all masking and other protection and clean up remaining defacement caused by the Work.

END OF SECTION

SECTION 08 11 13  
HOLLOW METAL DOORS AND FRAMES

**PART 1 - GENERAL**

1.1 General Provisions

- A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.2 SUMMARY

A. Section Includes:

- 1. Standard and custom hollow metal doors and frames.
- 2. Steel sidelight, borrowed lite and transom frames.
- 3. Louvers installed in hollow metal doors.
- 4. Light frames and glazing installed in hollow metal doors.

B. Related Sections:

- 1. Division 04 Section "Masonry" for embedding anchors for hollow metal work into masonry construction.
- 2. Division 08 Section "Glazing" for glass view panels in hollow metal doors.
- 3. Division 08 Section "Door Hardware".
- 4. Division 09 Sections "Painting" for field painting hollow metal doors and frames.
- 5. Division 26 "Electrical" Sections for electrical connections including conduit and wiring for door controls and operators installed on frames with factory installed electrical knock out boxes.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

- 1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
- 2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
- 3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
- 4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- 5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
- 6. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- 7. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

8. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
10. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
11. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
12. ANSI/NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association.
13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
14. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association.
15. UL 10C - Positive Pressure Fire Tests of Door Assemblies.
16. UL 1784 - Standard for Air Leakage Tests of Door Assemblies.

### 1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.
- B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.
- C. Shop Drawings: Include the following:
  1. Elevations of each door design.
  2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
  3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
  4. Locations of reinforcement and preparations for hardware.
  5. Details of anchorages, joints, field splices, and connections.
  6. Details of accessories.
  7. Details of moldings, removable stops, and glazing.
  8. Details of conduit and preparations for power, signal, and control systems.
- D. Samples for Verification:
  1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.
- B. Quality Standard: In addition to requirements specified, furnish SDI-Certified manufacturer products that comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

- C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to UL10C (neutral pressure at 40" above sill) or UL 10C.
    - 1. Oversize Fire-Rated Door Assemblies Construction: For units exceeding sizes of tested assemblies, attach construction label certifying doors are built to standard construction requirements for tested and labeled fire rated door assemblies except for size.
    - 2. Temperature-Rise Limit: Where indicated and at vertical exit enclosures (stairwell openings) and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.
    - 3. Smoke Control Door Assemblies: Comply with NFPA 105.
      - a. Smoke "S" Label: Doors to bear "S" label, and include smoke and draft control gasketing applied to frame and on meeting stiles of pair doors.
  - D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257. Provide labeled glazing material.
  - E. Energy Efficient Exterior Openings: Comply with minimum thermal ratings, based on ASTM C1363. Openings to be fabricated and tested as fully operable, thermal insulating door and frame assemblies.
    - 1. Thermal Performance (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM C1363 and meet or exceed the following requirements:
      - a. Door Assembly Operable U-Factor and R-Value Ratings: U-Factor 0.37, R-Value 2.7, including insulated door, thermal-break frame and threshold.
    - 2. Air Infiltration (Exterior Openings): Independent testing laboratory certification for exterior door assemblies being tested in accordance with ASTM E283 to meet or exceed the following requirements:
      - a. Rate of leakage of the door assembly shall not exceed 0.25 cfm per square foot of static differential air pressure of 1.567 psf (equivalent to 25 mph wind velocity).
  - F. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier, Installer, and Contractor to review proper methods and procedures for installing hollow metal doors and frames and to verify installation of electrical knockout boxes and conduit at frames with electrified or access control hardware.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project site storage. Do not use non-vented plastic.
  - B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.
  - 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation. Door and frames to be stacked in a vertical upright position.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

#### 1.7 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Building Information Modeling (BIM) Support: Utilize designated BIM software tools and obtain training needed to successfully participate in the Project BIM processes. All technical disciplines are responsible for the product data integration and data reliability of their Work into the coordinated BIM applications.

#### 1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
- B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide steel doors and frames from a SDI Certified manufacturer:
  - 1. Amweld Building Products (AB).
  - 2. CECO Door Products (C).
  - 3. Curries Company (CU).
  - 4. Pioneer Industries (PI).
  - 5. Republic Doors (RP).
  - 6. Steelcraft (S).

#### 2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

- B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.
- C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

## 2.3 HOLLOW METAL DOORS

- A. General: Provide 1-3/4 inch doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8 and ANSI/NAAMM HMMA 867.
- B. Exterior Doors (Energy Efficient): Face sheets fabricated of commercial quality hot-dipped zinc coated steel that complies with ASTM A924 A60. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model, ANSI/SDI A250.4 for physical performance level, and HMMA 867 for door construction.
  - 1. Design: Flush panel.
  - 2. Core Construction: Foamed in place polyurethane and steel stiffened laminated core with no stiffener face welds, in compliance with HMMA 867 "Laminated Core".
    - a. Provide 22-gauge steel stiffeners at 6 inches on-center internally welded at 5" on-center to integral core assembly, foamed in place polyurethane core chemically bonded to all interior surfaces. No stiffener face welding is permitted.
    - b. Thermal properties to rate at a fully operable minimum U-Factor 0.37 and R-Value 2.7, including insulated door, thermal-break frame and threshold.
    - c. Kerf Type Frames: Thermal properties to rate at a fully operable minimum U-Factor 0.38 and R-Value 2.6, including insulated door, kerf type frame, and threshold.
  - 3. Level/Model: Level 3 and Physical Performance Level A (Extra Heavy Duty), Minimum 16 gauge (0.053 inch - 1.3-mm) thick steel, Model 2.
  - 4. Vertical Edges: Vertical edges to be mechanically interlocked with hairline seam. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
  - 5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
  - 6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9".
  - 7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- C. Interior Doors: Face sheets fabricated of commercial quality cold rolled steel that complies with ASTM A 1008/A 1008M. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
  - 1. Design: Flush panel.
  - 2. Core Construction: Manufacturer's standard kraft-paper honeycomb, or one-piece polystyrene core, securely bonded to both faces.

- a. Fire Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
  3. Level/Model: Level 2 and Physical Performance Level B (Heavy Duty), Minimum 18 gauge (0.042-inch - 1.0-mm) thick steel, Model 2.
  4. Vertical Edges: Vertical edges to have the face sheets spot welded and filled full height with an epoxy filler. Welds are to be ground, filled and dressed smooth. Beveled Lock Edge, 1/8 inch in 2 inches (3 mm in 50 mm).
  5. Top and Bottom Edges: Reinforce tops and bottoms of doors with a continuous steel channel not less than 16 gauge, extending the full width of the door and welded to the face sheet. Doors with an inverted top channel to include a steel closure channel, screw attached, with the web of the channel flush with the face sheets of the door. Plastic or composite channel fillers are not acceptable.
  6. Hinge Reinforcement: Minimum 7 gauge (3/16") plate 1-1/4" x 9" or minimum 14 gauge continuous channel with pierced holes, drilled and tapped.
  7. Hardware Reinforcements: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- D. Manufacturers Basis of Design:
1. Curries Company (CU) - Polystyrene Core - 707 Series.
  2. Curries Company (CU) - Energy Efficient - 777 Trio-E Series.

## 2.4 HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Thermal Break Frames: Subject to the same compliance standards and requirements as standard hollow metal frames. Tested for thermal performance in accordance with NFRC 102, and resistance to air infiltration in accordance with NFRC 400. Where indicated provide thermally broken frame profiles available for use in both masonry and drywall construction. Fabricate with 1/16" positive thermal break and integral vinyl weatherstripping.
- C. Exterior Frames: Fabricated of hot-dipped zinc coated steel that complies with ASTM A 653/A 653M, Coating Designation A60.
1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  2. Frames: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.
- D. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
1. Fabricate frames with mitered or coped corners. Profile as indicated on drawings.
  2. Frames: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
- E. Fire rated frames: Fabricate frames in accordance with NFPA 80, listed and labeled by a qualified testing agency, for fire-protection ratings indicated.
- F. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.



## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
  - 2. Stud Wall Type: Designed to engage stud and not less than 0.042 inch thick.
- B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.
- C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.6 LOUVERS

- A. Metal Louvers: Unless otherwise indicated provide louvers to meet the following requirements.
  - 1. Blade Type: Vision proof inverted V or inverted Y.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.
- B. Louvers for Fire Rated Doors: Metal louvers with fusible link and closing device, listed and labeled for use in doors with fire protection rating of 1-1/2 hours and less.
  - 1. Manufacturers: Subject to compliance with requirements, provide louvers to meet rating indicated.
  - 2. Metal and Finish: Galvanized steel, 0.040 inch thick, factory primed for paint finish with baked enamel or powder coated finish. Match pre-finished door paint color where applicable.

## 2.7 LIGHT OPENINGS AND GLAZING

- A. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints at fabricator's shop. Fixed and removable stops to allow multiple glazed lites each to be removed independently. Coordinate frame rabbet widths between fixed and removable stops with the type of glazing and installation indicated.
- B. Moldings for Glazed Lites in Doors and Loose Stops for Glazed Lites in Frames: Minimum 20 gauge thick, fabricated from same material as door face sheet in which they are installed.
- C. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated. Provide fixed frame moldings and stops on outside of exterior and on secure side of interior doors and frames.
- D. Preformed Metal Frames for Light Openings: Manufacturer's standard frame formed of 0.048-inch-thick, cold rolled steel sheet; with baked enamel or powder coated finish; and approved for use in doors of fire protection rating indicated. Match pre-finished door paint color where applicable.

## 2.8 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inches thick.

## 2.9 FABRICATION

- A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.
- B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.
- C. Hollow Metal Doors:
  - 1. Exterior Doors: Provide optional weep-hole openings in bottom of exterior doors to permit moisture to escape where specified.
  - 2. Glazed Lites: Factory cut openings in doors with applied trim or kits to fit. Factory install glazing where indicated.
  - 3. Astragals: Provide overlapping astragals as noted in door hardware sets in Division 08 Section "Door Hardware" on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted.
  - 4. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge strap for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
  - 5. Electrical Raceways: Provide hollow metal doors to receive electrified hardware with concealed wiring harness and standardized Molex™ plug connectors on both ends to accommodate up to twelve wires. Coordinate connectors on end of the wiring harness to plug directly into the electrified hardware and the through-wire transfer hardware or wiring harness specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware". Wire nut connections are not acceptable.
- D. Hollow Metal Frames:
  - 1. Shipping Limitations: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
    - a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
  - 3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  - 4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.

5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
8. Electrical Knock Out Boxes: Factory weld 18 gauge electrical knock out boxes to frame for electrical hardware preps; including but not limited to, electric through wire transfer hardware, electrical raceways and wiring harnesses, door position switches, electric strikes, magnetic locks, and jamb mounted card readers as specified in hardware sets in Division 08 Sections "Door Hardware" and "Access Control Hardware".
  - a. Provide electrical knock out boxes with a dual 1/2-inch and 3/4-inch knockouts.
  - b. Conduit to be coordinated and installed in the field (Division 26) from middle hinge box and strike box to door position box.
  - c. Electrical knock out boxes to comply with NFPA requirements and fit electrical door hardware as specified in hardware sets in Division 08 Section "Door Hardware".
  - d. Electrical knock out boxes for continuous hinges should be located in the center of the vertical dimension on the hinge jamb.
9. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
10. Jamb Anchors: Provide number and spacing of anchors as follows:
  - a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
    - 1) Two anchors per jamb up to 60 inches high.
    - 2) Three anchors per jamb from 60 to 90 inches high.
    - 3) Four anchors per jamb from 90 to 120 inches high.
    - 4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
  - b. Stud Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
    - 1) Three anchors per jamb up to 60 inches high.
    - 2) Four anchors per jamb from 60 to 90 inches high.
    - 3) Five anchors per jamb from 90 to 96 inches high.
    - 4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
    - 5) Two anchors per head for frames above 42 inches wide and mounted in metal stud partitions.
11. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".
12. Bituminous Coating: Where frames are fully grouted with an approved Portland Cement based grout or mortar, coat inside of frame throat with a water based bituminous or asphaltic emulsion coating to a minimum thickness of 3 mils DFT, tested in accordance with UL 10C and applied to the frame under a 3rd party independent follow-up service procedure.

- E. Hardware Preparation: Factory prepare hollow metal work to receive template mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."
  - 1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
  - 2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
  - 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
  - 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

#### 2.10 STEEL FINISHES

- A. Prime Finishes: Doors and frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
  - 1. Shop Primer: Manufacturer's standard, fast-curing, lead and chromate free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; and compatible with substrate and field-applied coatings.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Remove welded in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Prior to installation, adjust and securely brace welded hollow metal frames for square, level, twist, and plumb condition.
- C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."
- D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

- E. Verify tolerances against manufacturers installations instructions for tornado and hurricane storm shelter openings.

### 3.3 INSTALLATION

- A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
  - 1. Set frames accurately in position, plumbed, leveled, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
  - 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
  - 3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
  - 4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.
- C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
  - 1. Non-Fire-Rated Standard Steel Doors:
    - a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
    - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
    - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
    - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
  - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
- D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

### 3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow metal work immediately after installation.
- C. Prime-Coat and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
  - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

END OF SECTION

SECTION 08 31 00  
ACCESS DOORS AND PANELS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Fire resistive rated and non-rated access panels and frames as specified under this Section, furnished by Sections requiring the same and installed under the following Sections:
  - 1. Section 04 01 20 – UNIT MASONRY: Installation of access panels into masonry assemblies.
  - 2. Section 09 29 00 - GYPSUM BOARD: Installation of access panels into gypsum board assemblies.
  - 3. Section 09 30 00 - TILING: Installation of access panels into tiled walls.

1.2 RELATED REQUIREMENTS (INCLUDE THE RED TEXT IN ITS ENTIRETY ALL SECTIONS, ADD RELATED REQUIREMENTS IF NEEDED)

- A. Section 04 01 20 – UNIT MASONRY: Installation of access panels into masonry assemblies.
- B. Section 09 29 00 - GYPSUM BOARD: Installation of access panels into gypsum board assemblies.
- C. Section 09 30 00 - TILING: Installation of access panels into tiled walls.
- D. Division 21 – FIRE PROTECTION: Furnishing access panels required for fire protection systems.
- E.
- F. Division 22 - PLUMBING: Furnishing access panels required for plumbing systems.
- G. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Furnishing accesspanels required for heating/cooling systems.
- H. Division 26 - ELECTRICAL: Furnishing access panels required for electrical systems.

1.3 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets, specifications and installation instructions.
  - 2. Schedule: Submit Schedule of all access panels to be furnished hereunder, indicating locations for each size and type of access door.

- a. The Contractor is responsible to ensure that all of the types/styles of panels and frames specified herein can be furnished by the manufacturer submitted.
  - b. Prior to submitting schedule, coordinate with the work of Division 21 -FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 - HEATING, VENTILATING AND AIR CONDITIONING and Division 26 - ELECTRICAL and meet with the Architect to determine exact quantities and locations required for the installation of access panels.
3. Shop drawings: Large scale details of access doors, indicating all sizes, gages and thickness; provide complete installation details, coordinated to the specific receiving conditions.

#### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver access doors to the site, until all specified submittals have been submitted to, and approved by, the Architect.
- B. Store access door units inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  1. Acudor Products Inc., Cedar Grove, NJ.
  2. Karp Associates Inc., Maspeth, NY.
  3. Nystrom Products Company, Minneapolis, MN.
  4. Williams Brothers Corporation of America, Front Royal, VA.
- B. Single Source: All work of this Section shall be produced by a single manufacturer, unless otherwise approved by the Architect.
- C. Sustainability Requirements:
  1. Recycled content of Steel: Use maximum available percentage of recycled steel. Steel framing products incorporated into the work shall contain not less than 30 percent of recycled steel. (THIS IS A SAMPLE ONLY AND MUST BE MADE SPECIFIC TO WHAT IT IS CUSTOMARILY AVAILABLE FOR YOUR PRODUCTS)
- D. Sealant Materials, General Requirements:
  1. Only use sealant and primers that comply with the following limits for VOC content:
    - a. Architectural Sealants: 250 g/L.
    - b. Roofing Sealants: 420 g/L.



- c. Roadway Sealants: 250 g/L.
- d. Sealant primer: 250 g/L.
- 2. Sealants containing aromatic solvents, fibrous talc, formaldehyde, halogenated solvents, mercury, lead, cadmium, chromium and their compounds, are not permitted. (SAMPLE VOC LANGUAGE FOR SEALANTS, DELETE IF NOT REQUIRED)

## 2.2 ACCESS PANELS - GENERAL

- A. Access panels scheduled for placement in masonry: Furnish with masonry anchors attached to unit frames at factory.

## 2.3 ACCESS PANELS - FOR FIRE RESISTANCE RATED CONSTRUCTION

- A. For fire-resistance rated wall and ceiling surfaces: Standard flush panel door meeting the following requirements:
  - 1. Panel and frame rating: UL "B" label for 90 minutes.
  - 2. Frame type:
    - a. For ceramic tile walls: 16 gage Type 304 stainless steel flanged frame, with flange exposed to view 1 inch or less, equal to:
      - 1) Acudor FW-5050 series
      - 2) Karp KRP-150FR series.
      - 3) Nystrom IT series.
      - 4) Williams WB-FRSS Regular series.
    - b. For masonry walls: 16 gage galvanized bonderized steel flanged frame, with flange exposed to view 1 inch or less.
      - 1) Acudor FW-5050 series
      - 2) Karp KRP-150FR series.
      - 3) Nystrom IT series.
      - 4) Williams WB-FR series.
    - c. For gypsum board walls and ceilings: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead.
      - 1) Acudor FW-5050DW
      - 2) Karp KRP-350FR series.
      - 3) Nystrom IW series.
      - 4) Williams WB-FR series.
  - 3. Door: Insulated Flush panel door as follows:
    - a. Typical wall types : Flush door, Sandwich construction with 2 inch thick mineral wool fiber insulation between two layers of 20 gage galvanized bonderized steel.
    - b. For ceramic tile walls only: Flush door, Sandwich construction with 2 inch thick mineral wool fiber insulation between two layers of 20 gage Type 304 stainless steel.

4. Hinge: Flush continuous piano hinge with stainless steel pin.
5. Closer: Spring closer.
6. Latch: Flush cam latch, operated by Allen or Torx head screwdriver.

#### 2.4 ACCESS PANELS - FOR NON-RATED CONSTRUCTION

- A. For non-rated wall and ceiling surfaces: Flush panel door type meeting the following requirements:
  1. Frame type:
    - a. For tiled walls: 16 gage Type 304 stainless steel flanged frame, with flange exposed to view 1 inch or less, equal to:
      - 1) Acudor UF-5000 series.
      - 2) Karp DSC-214SM series.
      - 3) Nystrom NT series.
      - 4) Williams WB-GP series.
    - b. For masonry walls: 16 gage galvanized bonderized steel flanged frame, with flange exposed to view 1 inch or less.
      - 1) Acudor UF-5000 series.
      - 2) Karp DSC-214SM series.
      - 3) Nystrom NT series.
      - 4) Williams WB-GP series.
    - c. For gypsum board walls and ceilings: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead.
      - 1) Acudor DW-5040 series.
      - 2) Karp KDW series.
      - 3) Nystrom NW series.
      - 4) Williams WB-PL series.
  2. Door: Flush panel door as follows:
    - a. Typical all wall types, except tile: 14 gage galvanized bonderized steel.
    - b. For tiled walls: 14 gage type 304 stainless steel.
  3. Hinge:
    - a. Typical: Concealed spring hinge enabling door to open 175 degrees and permit removal of door from frame.
    - b. Panels greater than 24 by 36 inches: Flush continuous piano hinge with stainless steel pin.
  4. Latch: Flush cam latch, operated by Allen or Torx head screwdriver.

#### 2.5 PASS HOPPER

- A. Pass hopper: As manufactured by Eagle Peak Products, Ham Lake, MN, model N°. PH-700, or approved equal, consisting of the following characteristics:
  1. Dimensions:

- a. 16 inches in length by 16 inches in height.
- b. 7-5/8 inch inner depth to receive wall assembly.
2. 10 gauge stainless steel pivoting hopper with ½ inch diameter pivot pin and pushing.
3. 14 gauge stainless steel frame construction with internal neoprene bumpers.
4. 14 gauge stainless steel flange for field assembly.
5. Pull: Stainless steel staple-shaped wire pull, 4 inches long, with one-inch finger clearance.
6. Slide latch on control room side of unit.
7. Finish: All exposed surfaces shall be N°. 4 satin finish stainless steel.

## 2.6 FACTORY FINISHING

- A. Panel assemblies fabricated from stainless steel: N°. 4 satin finish.
- B. Panel assemblies fabricated from galvanized bonderized steel: Baked on rust inhibitive gray primer finish.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that prepared openings are ready to receive the work of this Section and opening dimensions are as indicated on the shop drawings. Verify that all blocking is set in place and secure.
- B. Beginning of installation means acceptance of project conditions.

### 3.2 INSTALLATION

- A. Install access panels in accordance with manufacturer's instructions and direction from authorities having jurisdiction. Install miscellaneous specialties absolutely level and in true line, with units securely anchored to the surrounding construction.
- B. Test each door and latching device, and make adjustments required to ensure a bind-free operation and proper latching.

END OF SECTION

Section 08 33 23  
OVERHEAD COILING DOORS

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

- A. Furnish and install coiling door assemblies, complete with all related items, including but limited to:
  - 1. Insulated Galvanized Steel Door Slats
  - 2. Vision Lights – 1"x10", 10 rows
  - 3. Electric operator
  - 4. Tracks.
  - 5. Clip angles.
  - 6. Insulated Guides.
  - 7. High Use Package
  - 8. Weather Seal interior side guide
  - 9. Lintel Seal
  - 10. Cylinder Lock
  - 11. Slide Bolts
  - 12. Exhaust Ports
  - 13. Coil housing.
  - 14. Weather seals.
  - 15. Air Ifiltration Package

1.3 RELATED REQUIREMENTS

- A. Section 04 20 00 - UNIT MASONRY: Concrete block wall and brick veneer.
- B. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking.
- C. Section 07 92 00 - JOINT SEALANTS: Perimeter sealant and backup materials
- D. Section 08 71 00 - DOOR HARDWARE: Furnishing cylinders for coiling door[s].

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

OVERHEAD COILING DOORS

1. ANSI/UL 325 - Door, Drapery, Gate, Louver, and Window Operators and Systems.
2. ANSI/DASMA 108 - American National Standards Institute Standard Method For Testing Sectional Garage Doors And Rolling Doors: Determination Of Structural Performance Under Uniform Static Air Pressure Difference.
3. NFRC 102 - Test Procedure for Measuring the Steady-State Thermal Transmittance of Fenestration Systems.
4. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Element.
5. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
6. ASTM A 653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
7. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
8. ASTM A 924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
9. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
10. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
11. NEMA MG 1 - Motors and Generators.

#### 1.5 SYSTEM DESCRIPTION

- A. Design coiling door assembly to withstand wind/suction load of 20 psf, without undue deflection or damage to door or assembly.
- B. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

#### 1.6 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  1. Literature: Manufacturer's product data sheets, specifications, and performance data.
  2. Manufacturer's installation instructions. Indicate installation sequence and procedures, adjustment and alignment procedures and lubrication instructions.
  3. Product Data: Manufacturer's data sheets on each product to be used, including:
    - a. Preparation instructions and recommendations.
    - b. Storage and handling requirements and recommendations.
    - c. Details of construction and fabrication.
    - d. Installation instructions.

### OVERHEAD COILING DOORS

4. Shop Drawings: Include detailed plans, elevations, details of framing members, anchoring methods, required clearances, hardware, and accessories. Include relationship with adjacent construction.
5. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
6. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) long, representing actual product, color, and patterns.
7. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
8. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.
9. Maintenance Data: Lubrication requirements and frequency, periodic adjustments required.
10. Warranty: Provide sample copies of manufacturers' actual warranties for all materials to be furnished under this Section, clearly defining all terms, conditions, and time periods for the coverage thereof.
11. Shop drawings: Fully-dimensioned, large scale details of each type door construction, tracks, guides, counterbalancing and operating mechanisms, electrical characteristics, hood enclosures, and related items; with complete installation details reflecting actual site conditions for each location.

#### 1.7 QUALIFICATIONS

- A. Installer, with a minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and approved by product manufacturer.

#### 1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

#### 1.9 WARRANTY

- A. Provide 5 year warranty under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS. Warranty shall include materials and workmanship, satisfactory operation, and contain any limitations of items specified herein.

#### 1.10 MAINTENANCE

- A. Provide Installers maintenance contract under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS, commencing on Date of Substantial Completion and extending for a period of one year. Maintenance contract shall include the following:

##### OVERHEAD COILING DOORS

1. Emergency callback service for the doors.
  2. Annual examinations of the installation during regular working hours by trained employees of the door manufacturer.
  3. All necessary adjusting, greasing, and oiling.
  4. Cleaning supplies and parts necessary to keep the equipment in proper operation, except any parts needed due to misuse, accident, or neglect caused by others.
- B. Repair work shall be carried out only by the door installer's personnel, using only standard parts furnished by the door manufacturer. Maintenance shall be carried out directly by the installer and shall not be assigned or transferred to any agent.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on the products of Overhead Door Corporation, Inc., Product: "Stormtite 625 Series with perimeter seals by Overhead Door Corporation." exterior insulated Galvanized steel slat coiling door
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
1. Overhead Door Corporation, Inc., Lewisville, TX.
  2. Cornell Iron Works, Inc., Mountaintop, PA.
  3. Raynor Garage Doors, Dixon, IL.
  4. Atlas Door Corporation, Edison, NJ.

### **2.2 INSULATED COILING DOOR COMPONENTS**

- A. Curtain: Interlocking, roll formed, insulated slats with endlocks attached at each end of alternate slats to prevent lateral movement.
1. Curtain: Interlocking roll-formed metal slats as specified with endlocks attached to each end of alternate slats to prevent lateral movement.
    - a. Flat Profile insulated type F-265i with 24 gauge back covering steel or stainless steel; .024 inch (.06 mm) aluminum, for doors up to 20 feet wide fabricated of:
      - 1) 18 gauge galvanized steel.
    - b. Insulation: Slat cavity shall be filled with CFC-free, foamed-in-place, polyurethane insulation.
    - c. Insulated Vision Lites: Provide with uniformly spaced openings. Provide with dual wall polycarbonate lites.
      - 1) Size: 10 inch by 1 inch (254 mm by 25.4 mm), 10 Rows at each door
  2. Performance:
    - a. R-Value: 7.7, U-Value: 0.13.
    - b. Through Curtain Sound Rating: Sound Rating: STC-28 (STC-30+ with

#### **OVERHEAD COILING DOORS**

- c. HZ noise generator) as per ASTM E 90.
- c. Installed System Sound Rating: STC-21 as per ASTM E 90.
- d. U-factor: 0.91 NFRC test report, maximum U-factor of no higher than 1.00.
- e. Air Infiltration: Meets ASHRAE 90.1 & IECC 2012/2015 C402.4.3 Air leakage < 1.00 cfm/ft2.
- 3. Curtain and Hood Finish:
  - a. Galvanized Steel: Slats and hood galvanized in accordance with ASTM A 653 and receive rust-inhibitive, roll coating process, including 0.2 mils thick baked-on prime paint, and 0.6 mils thick baked-on polyester top coat.
    - 1) Polyester Top Coat.
      - (a) Custom polyester as selected by Architect from manufacture's full range of Colors including premium colors
- 4. Weatherseals:
  - a. Vinyl bottom seal, exterior guide and internal hood seals.
  - b. Interior guide weatherseal.
  - c. Lintel weatherseal.
- 5. Bottom Bar: Two metal angles, minimum thickness 3/16 inch, bolted back to back to reinforce curtain in the guides.
  - a. Material:
    - 1) Stainless steel with brushed finish.
- 6. Guides: Three Structural steel angles provided with high usage guide wear strip to minimize wear and reduce sound.
  - a. Material:
    - 1) Steel.
    - 2) High usage guide wear strips.
- 7. Brackets:
  - a. Galvanized steel to support counterbalance, curtain and hood.
- 8. Finish; Bottom Bar, Guides and Brackets:
  - a. PowderGuard Max powder coat color as selected by the Architect...
- 9. Motor: Direct drive, integrated gear motor/brake assembly sized for openings. Provide with a manual hand chain for operation during power outages. Operator and drive assembly is factory pre-assembled and provided with all wiring harnesses needed direct from the factory.
  - a. Supply Voltage: 220/240V AC, 1-phase, operating range 220/240V.
  - b. Left hand mount / Right hand mount. ( To be determined during construction
- 10. Control Panel: Electronic controller with microprocessor self-diagnostics. Digital readout indicates door action, alarm conditions and fault conditions. Time delay self-close timer and non-resettable cycle counter are included. Enclosure is IP54 rated (NEMA 3 equivalent).
- 11. Door Roll: Directly driven, springless roll shall be steel tube with integral shafts, keyed on the Drive End and supported by self-aligning greaseable sealed bearings. Door shall not require any counterbalance device.

OVERHEAD COILING DOORS



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Maintenance Facilities Improvements and Renovations  
Newton, MA

12. Hood: Protecting drive motor, barrel, chain, and sprocket from dirt and debris and extending between the support brackets. Provide with internal hood baffle weatherseal. Fabricated of:
    - a. 24 gauge galvanized steel with intermediate supports as required.
  13. Safety Devices: Provide door with following safety devices:
    - a. Photoelectric sensors that cast an invisible beam across the door opening and reverses the downward motion of the door when an object enters the path of the beam.
    - b. Built-in (to motor assembly) brake mechanism eliminates uncontrolled curtain travel independent of other safeties.
    - c. Sensing Edge Protection (option; not standard)
      - 1) Electric sensing edge.
  14. Actuators:
    - a. One Open/Close/Stop push button station incorporated into Control Panel.
    - b. Interior Push buttons.
    - c. Interior Push buttons both sides on interior middle door
    - d. Exterior Key switch.
    - e. Loop detectors.
    - f. Motion detectors.
    - g. Warning light.
  15. Wind load: Design door assembly to withstand wind/suction load of 20 psf (958 Pa) in conformance with DASMA 108-2012 and as required by local codes without damage to door or assembly components.
  16. Bottom bar: Slat fitted with two 1/8 inch thick (minimum) angles to provide reinforcement and positive contact with floor in closed position, equipped with compressible vinyl coated safety/weather edge.
- B. Counterbalance: Oil tempered helical torsion springs, housed in steel tube or pipe barrel, supporting the curtain designed for a 50,000 cycle life with a deflection not exceeding 0.03 inch per foot of width, equipped with ball or roller bearings, and adjustable by means of external tension wheel.
- C. Brackets: Minimum 3/16-inch thick steel plate, for supporting barrel, counterbalance mechanism, and hood, with a high factor of safety.
- D. Hood: 24 gage, minimum, aluminum, beaded, and flanged to prevent deflection with intermediate support. Equip hood with internal neoprene/rayon baffle weatherseal.
- E. Guides: Continuous, vertical mounted galvanized, formed from three 3/16 inch thick angles. Provide guides with vinyl weather strips to seal against interior and exterior faces of curtain. Provide windlock bars per manufacturer's standard.
- F. Locks: Pin tumble single unit mechanism, installed on each jamb, and designed to accommodate cylinders provided by Section 08710 - DOOR HARDWARE.
- G. Manual Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide.

2.3 ACCESSORIES

- A. Brackets and support clips: Provide guide rail, counterbalance shaft assembly, and hood supports for a complete assembly, finish of supports to match products being supported.

2.4 FABRICATION

- A. Do not fabricate doors until all specified submittals have been submitted to, and approved by, the Architect.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that field measurements are as indicated on reviewed and approved shop drawings.
- B. Beginning of installation means acceptance of existing project conditions.

3.2 INSTALLATION

- A. Perform installation of all items furnished hereunder, except as otherwise specified, in accordance with the approved shop drawings and the recommendations of the manufacturer.
- B. Set entire assembly including doors, guides, and hardware, plumb and true to line, to assure smooth operation. Brace guides internally to provide a completely rigid installation. Attach jambs with not less than 3/8 inch steel bolts spaced not more than 30 inches apart.
- C. Coordinate installation of sealant and backing materials at frame perimeter of coiling overhead door with Section 07 92 00 - JOINT SEALANTS.
- D. Coordinate installation of electrical service with Electrical . Complete wiring from disconnect to unit components.

3.3 TOLERANCES

- A. Maintain dimensional tolerances and alignment with adjacent work. Maximum variation from plumb or level: 1/16 inch. Maximum variation in longitudinal or diagonal warp: 1/8 inch per 10 foot straight edge.

3.4 ADJUSTING

- A. Adjust doors, hardware and operating assembly to ensure a smooth operation without binding.

3.5 CLEANING

- A. Remove all protective films and coverings from assembly components, and clean doors and guides.

End of Section

SECTION 08 51 13  
ALUMINUM WINDOWS

**PART 1 - GENERAL**

1.1 GENERAL

A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this specification and the Contractor shall consult them in detail for instructions.

1.2 The drawings on which this Contract is based are listed in Section 00 86 00. Consult all drawings, note all conditions that may affect the work, and care for same executing this contract.

1.3 SECTION INCLUDES

A. Furnish and install the following:

1. Prefinished extruded aluminum window single hung assemblies with fixed upper sash, including operating hardware, insect screening, and all angles, clips, trims, sill extensions, snap trim and other items required to anchor the systems to the building structure.
2. Prefinished miscellaneous formed aluminum mullion covers, closures, flashings, etc., in conjunction with aluminum windows.
3. Metal to metal sealing of aluminum assemblies.
4. Prefinished aluminum sill pans
5. All flexible membrane flashings, a and sealants for complete installation of system
6. All glass and glazing materials for aluminum windows shall be factory-installed.
7. Shimming and fasteners required for installation.
8. Exterior and Interior and sealants by this Section including primary sealant, interior and exterior perimeter sealant, sealant metal to metal, sealant integral to window system and from snap trim angle to AVB).
9. Metal Flashing and self-healing fully adhered membrane flashings
10. In-place Field Mock-ups for each type of window.
11. Coordination of requirements as describe of 1.6,D of this specification for testing.
12. Coordination with Commissioning Agent, Commissioning General Requirements and Building Enclosure Commissioning.
13. All equipment, staging, scaffolding, hoisting, and demolition for the work of this Section.

1.4 RELATED SECTIONS

A. Section 01 39 90 – MINOR ALTERATION WORK

B. Section 05 50 00 – Metal Fabrications: Steel lintels.

- C. Section 06 10 00 - ROUGH CARPENTRY: Wood blocking, PVC standing and running trim.
- D. Section 07 21 00 - THERMAL INSULATION: Low compression foam insulation.
- E. Section 07 27 13 – MODIFIED BITUMINOUS SHEET AIR BARRIERS
- F. Section 07 92 00 - JOINT SEALANTS: Interior and exterior perimeter sealant and back-up materials.
- G. Section 09 91 00 - PAINTING

## 1.5 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  1. AAMA/WDMA/CSA 101/I.S.2/A440-05 - Standard Specifications for windows, doors and unit skylights.
  2. AAMA 607.1 – Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes for Architectural Aluminum.
  3. AAMA 611 – Voluntary Standards for Anodized Architectural Aluminum.
  4. AAMA 1503.1 - Specification for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
  5. ASTM A 167 - Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet, and Strip.
  6. ASTM A 386 - Zinc Coating on Assembled Steel Products.
  7. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
  8. ASTM B 221 - Aluminum-alloy Extruded Bar, Rod, Wire, Shape, and Tube.
  9. ASTM C 1036 - Flat Glass.
  10. ASTM C 1048 - Heat-Treated Flat Glass.
  11. ASTM E 283 - Rate of Air Leakage through Exterior Entrance and vestibule, Curtains Walls and Doors.
  12. ASTM E 330 Structural Performance of Exterior Entrance and vestibule, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  13. ASTM E 331 - Test method of Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
  14. ASTM E 405 - Wear Testing Rotary Operators for Windows.
  15. ASTM E 546 - Test Method For Frost Point of Sealed Insulating Glass Units.
  16. ASTM E 576 - Test Method for Dew/Frost Point of Sealed Insulating Glass Units in Vertical Position.
  17. ASTM E 773 - Test Method for Seal Durability of Sealed Insulating Glass Units.
  18. ASTM E 774 - Sealed Insulating Glass Units.
  19. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
  20. Consumer Product Safety Commission: 16 CFR 1201 - Architectural Glazing

Standards and Related Material.

21. FS RR-W-356A - Wire Fabric.
22. LSGA - Standards Manual.
23. Applicable recommendations and standards of the AA (Aluminum Association), SIGMA (Sealed Insulated Glass Manufacturers Association) and the FGMA (Flat Glass Marketing Association).

1.6 PERFORMANCE REQUIREMENTS FOR FIXED AND DOUBLE HUNG TYPE WINDOWS

General: Design, fabricate, assemble and erect curtainwall system, and interfacing conditions with contiguous work, to ensure continuity of building enclosure vapor and air barriers and that all segments of the assemblies will be free from leakage under every condition of weather and exposure. In addition to the specified performance requirements, Aluminum assemblies shall conform to, or exceed the requirements of the applicable building code and referenced industry standards for air infiltration, water infiltration, operating forces, deflection and deformation under load.

1. Engineering criteria: The manufacturer for each curtain wall system shall employ the services of a qualified structural engineer, registered to practice in the Commonwealth of Massachusetts, to prepare all calculations and other performance criteria for the respective systems, and bear all costs therefor. All shop drawings for the metal components of the respective systems shall bear the registration stamp of the engineer. Wind loading: Entrance/storefront system shall conform to the 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments:
  - a. Basic Wind Speed: 138 miles per hour zone, B exposure.

1.7 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  1. Literature: for each window assembly type: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder, including glass, window hardware and finish system.
  2. Manufacturer's test data showing compliance with all specified performance requirements. Data shall be based on testing of windows units sized not less than those specified under the Article "Performance Requirements". Additionally:
  3. Manufacturer's installation instructions, indicate special precautions required.
  4. Provide copies of manufacturers' actual warranties for all materials to be furnished under this Section, clearly defining all terms, conditions, and time periods for the coverage thereof. Additionally include the following:
    - a. Glass manufacturer's standard 10 year guarantee covering insulating glass.
  5. Shop drawings:
    - a. 1/4 inch scale elevations of each window.
    - b. Large scale design details of each window type; indicating sizes, types, and gauges of all metal components; glazing details, indicating types and thickness of glass; bracing and stabilizing members; attachment clips and brackets; and

complete installation details;

- c. Furnish all details bearing dimensions of actual measurements taken at the project.

6. Selection Samples:

- a. Sample card indicating Manufacturer's full range of coating colors available for selection by Architect.
- b. Provide physical samples as requested by Architect for initial selection of colors and finishes.
- c. Manufacturer's sample boards for sealant colors, for selections by the Architect.

7. Verification samples:

- a. After receipt of selected colors from the Architect, submit 12 inch long pieces of window framing components, prefinished in the specified finish system in each selected color.
- b. Submit two samples of operating hardware.

8. Sustainable Design Submittals:

- a. Recycled content: Provide manufacturer's written certification of recycled content. Indicate post-consumer and pre-consumer recycled content and provide

documentation certifying products are from recycled sources. (MA-CHPS Credit MC 3).

- b. Sealants: Include certification of data indicating Volatile Organic Compound (VOC) content of all joint sealants. Submit MSDS highlighting VOC limits. (MA-CHPS Credit IEQC 2.1).

- B. Submit manufacturer's warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.

1.8 QUALITY ASSURANCE

- A. The aluminum window assemblies shall be by a single recognized manufacturer specializing in and regularly engaged in, the production of aluminum work of type and quality specified. The design and details as shown on the drawings and the model numbers specified herein are to establish the standards of design and quality and not to limit competition.

- B. Perform work in accordance with AAMA 101.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Protect pre-finished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- B. Store framing and glazing materials in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.
- C. Sequence fabrication and deliveries to avoid delays in construction schedule, and to minimize time of on-site storage.

1.10 ENVIRONMENTAL CONDITIONS

- A. Do not install sealant when ambient temperature is less than 40 degrees Fahrenheit.
- B. Maintain this minimum temperature during and after installation of sealant.

1.11 FIELD MEASUREMENTS

- A. Wherever practicable, check dimensions of openings in the actual framing work, by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress as directed by the Contractor. When necessary to proceed with the fabrication without field measurements, coordinate and control installation tolerances to ensure proper fit of the work of this Section.
- B. Verify that field measurements are as indicated on approved shop drawings.

1.12 SEQUENCING AND SCHEDULING

- A. Coordinate work of this Section with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- B. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

1.13 WARRANTY

- A. Provide the following warranties under provisions of Section 01 70 00 Contract Closeout
  - 1. Total window assemblies: Manufacturer's written warranty for aluminum windows, covering repair or replacement of any unit which leaks, or exhibits defects in materials, finish, design, for a period of 10 years from date of substantial completion of the General Contract.
  - 2. Insulating glass: Glass manufacturer's 10 year written warranty covering insulating glass against defects in materials and workmanship, including failure of seals effective on date of original factory shipment to site.
    - a. Provide coverage in manufacturer's Guarantee for manufacturing defects, including failure of hermetic seal of air space (except by glass breakage) as evidenced by intrusion of dirt or moisture, internal condensation or fogging, deterioration of protected internal glass coating or other visual indications of seal failure or performance.
    - b. Guarantee shall include replacement of defective glass and delivery of replacement glass furnished f.o.b. from point of manufacturer to project site.
  - 3. Tempered glass: Manufacturer's 10 year written guarantee covering against defects in materials and workmanship of Tempered glass and replacement of the same.
  - 4. Aluminum Finish warranty period shall be for 20 years from project date of

substantial completion

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Acceptable Substitutions: The products specified herein establish standards of quality, design and function desired. Under provisions of Massachusetts General Laws, Chapter 149, other equal products not named herein, may be considered for acceptance as an equal by the Architect upon submission of complete product information. Further additional information may be requested by the Architect for determination that the proposed product substitution is fully equal to the specified product(s). There is no guarantee that proposed substitutions will be approved.

### 2.3 MANUFACTURERS

- A. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on EFCO (A Division of Pella), Monett MO, **Series HX45 Thermal broke 4-1/2" Double Hung Windows AW-PG105H**. All operable sashes shall have insect screens.
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
1. EFCO (A Division of Pella), Monett MO.
  2. Kawneer North America (A Division of Alcoa), Norcross GA.
  3. Moduline Windows, Inc. (A Division of Oldcastle Glass Engineered Products), Terrell TX.
  4. Wausau Metals Corporation, Wausau WI.

### 2.4 MATERIALS

- A. All fixed and operable window sections shall be of extruded aluminum. Formed brake metal work shall be of sheet aluminum. Alloys and temper of aluminum shall be as recommended by manufacturer for strength, corrosion resistant, and specified finish, but of not less than 22,000 psi ultimate tensile strength.
- B. Aluminum sections shall be factory prepared extrusions of sizes and profiles indicated on the approved shop drawing details; shall present straight, sharply defined lines and arises; and shall be free from defects impairing strength, durability, or appearance.
- C. Frames specified as thermally-broken shall be equipped with positive, continuous, polyvinyl chloride or polyurethane thermal barrier placed between exterior and interior frame components to the exterior of the glass pane.
1. Frame depth: Calculation of specified frame depths shall not include screen tracks or sill extensions designed to accommodate screens.
- D. All screws, nuts, bolts, rivets and other fastening devices shall be of tempered aluminum or



non-magnetic, type 302/304 stainless steel, compatible with the aluminum frame members and other components of the window systems. All such devices shall be of suitable type and adequate capacity for each intended purpose. The aluminum work shall generally be constructed and erected without use of exposed fasteners; where exposed fasteners must be used, the fasteners shall be finished to match the finish of surrounding aluminum.

1. Where fasteners screw-anchor into aluminum less than 0.125" thick, reinforce the interior with aluminum or non-magnetic stainless steel to receive screw threads, or provide standard non-corrosive pressed-in splined grommet nuts.
  2. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.
- E. Sealant for use within the fabricated aluminum frames and for field sealing of the aluminum frame assemblies shall be type guaranteed by manufacturer for the joint size and movement to remain permanently elastic, non-shrinking and non-migrating.

## 2.5 WINDOW TYPE – DOUBLE HUNG

- A. Thermal Double Hung Windows (Single Hung / Top sash fixed)
1. Frame depth: Nominal 4-1/2 inches.
  2. Frame and vent extrusion wall thickness: not less than 0.080 inch.
  3. Vent depth: Nominal 1-7/8 inches.
  4. Continuous Interlock Meeting Rails
  5. Automatic Sash locks
  6. High Performance Torsion Spring and Extension Spring Rated Class 5 with .30 MAF Ratio. Large Heavy Sash Requiring Minimal Operating Force.
  7. Thermal isolator.
  8. Factory Glazed
  9. Angle reinforced vent corners
  10. Pressure Equalization Design
  11. Color: Custom Color to match existing building window color
  12. Window sash to accommodate 1" thick insulated glass unit.
  13. Extruded Aluminum Screen Frames and Heavy Duty Black Aluminum Screen Mesh. All operable sashes shall have insect screens
  14. 4" Limited Stop Opening
  15. Continuous Snap Trim for installation of windows.
  16. Provide 4 inch limit stops at sashes, removable
- B. Accomplish combinations of operable and fixed units by providing continuous jamb construction. Splicing is not permitted along entire length of the jamb. Vertical sight lines at all fixed to operable horizontals shall not exceed 3.937 inches.
- C. Hardware:
1. 4 Bar Arm Hinged Ventilators: Two 4 Bar Friction Arms per operable sash, size to be appropriate to individual sash weight. Arms are to be concealed in

jamb between the sash and frame.

2. Locking handles, cam type and manufactured from a white bronze alloy with US26D brushed finish (Projection type)
  3. Weather stripping: Double weather-stripped, "Santoprene" or equal (Projection type).
  4. Weather stripping: All sash are weather-stripped with FIN-SEAL® or equal. Two holes per sash and two slots through the window frame facilitate weepage (Double Hung).
  5. Automatic head and sill locks are fabricated of aluminum alloy and finished to match the window (Double Hung)
  6. An optional extruded aluminum spring catch shall be provided at the sill of the lower sash. Windows with spring latches shall also have standard sweep latches at the meeting rail (Double Hung Type)
- D. Sills: 0.125 inch thick extruded aluminum; sloped for positive wash; fit under sash leg to 1/2- inch beyond wall face; one piece full width of opening, depth to accommodate window frame and trim.

## 2.6 WINDOW TYPE – FIXED

A. Aluminum:

1. Extruded aluminum shall be 6063-T6 alloy and tempered.

B. Hardware: N/A

C. Weatherstripping:

1. All weatherstripping shall be Santoprene® or equal.

D. Thermal Barrier:

1. All exterior aluminum shall be separated from interior aluminum by a rigid, structural thermal barrier. For purposes of this specification, a structural thermal barrier is defined as a system that shall transfer shear during bending and, therefore, promote composite action between the exterior and interior extrusions.
2. The perimeter frame thermal barrier shall be thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions.
3. The sash and intermediate rails shall be poured and debridged thermal barrier made of two-part polyurethane.

D. Fabrication:

1. General:

- a. All aluminum frame and vent extrusions shall have a minimum wall thickness of .125" (3 mm).
- b. Mechanical fasteners, welded components, and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all frame and vent corners.
- c. Depth of frame and vent shall not be less than 2" (50 mm).

2. Frame:

- a. Frame components shall be mortise and tenon. Other means of mechanically fastening, i.e., screws shall not be permitted.

3. Ventilator:

- a. All vent extrusions shall be tubular.
- b. Each corner shall be mitered, reinforced with an extruded corner key, hydraulically crimped, and "cold welded" with epoxy adhesive.
- c. Each vent shall utilize two rows of weather stripping installed in specifically designed dovetail grooves in the extrusion. The exterior gasket will be omitted at the vent bottom rail for project out vents and at the vent top rail for project-in vents, allowing air to pressure equalize the void between the vents and frame.

2.7 ALUMINUM BRAKE-METAL AND PANNING WORK

- A. Fabricate and install all extruded aluminum and formed sheet aluminum brake-metal work

in conjunction with the aluminum window as detailed and as reasonably required to complete the work including sill extensions, snap trim pieces, jamb and sill trim, closures, coverings, flashings and other miscellaneous extruded and formed brake-metal work in conjunction with aluminum windows.

1. Provide extruded shapes wherever possible, reserving formed work for conditions where extrusions are not applicable.
  2. Provide sheet metal panning not less than 0.125 inch thick.
  3. Fasten trim clips, clips shall be continuous.
- B. Protect surfaces from marring when forming work. Provide sufficient material thickness with all necessary concealed reinforcement and anchorage to prevent "oil canning" or deformation of the finished work. Material deemed defective by the architect will be replaced at no cost to the Owner.

## 2.8 GLASS AND GLAZING MATERIALS

- A. Glass shall be of thickness and types scheduled in the Drawings and comply with the following:
1. General requirements for glass: Of domestic manufacture, conforming to the referenced standards and with the additional requirements specified herein; factory labeled on each pane stating the strength, type, thickness and quality; with all labels remaining on glass until final cleaning.
  2. Fabricate glass as required to openings with edge clearances and bite on glass as recommended by the manufacturer with clean-cut edges where concealed, and smooth-ground, polished and seamed edges where exposed to view. Do not cut, seam, nip or abrade glass after heat-tempering.
  3. Glass thickness shown are minimum requirements. Provide glass thickness and heat treatment as required to meet specified performance criteria, State and local codes and ordinances.
  4. All insulating glass shall consist of two thickness of glass separated by a hermetically sealed dehydrated sealed air space complying with ASTM E 774-88 and conforming to Class CBA of Insulating Glass Certification Council.
- B. Glazing sealant: One-part high modulus clear silicone sealant, having a useful life expectancy of at least 30 years, GE Silglaze N, Dow-Corning 795 Silicone Building Sealant, Tremco Spectrem 2, or equal.
- C. Compressible foam rod: Polyethylene foam rod, with bond-breaker surface, non gassing, fully compatible with silicone sealant, of appropriate sizes as recommended by the sealant manufacturer for the specific applications.
- D. All sash shall be inside glazed with removable glazing stops. Wrap-around marine glazed sash which require sash disassembly for re-glazing will not be acceptable at single or double hung locations.

## 2.9 GLASS TYPES AND LOCATIONS

- A. General: For locations of glass types, comply with the following descriptions and refer to Door Schedule, Interior Elevations and Exterior Elevations for additional locations, and as additionally noted on Drawings.

1. General: For locations of glass types, comply with the following descriptions and refer to Door Schedule, Interior Elevations and Exterior Elevations for additional locations, and as additionally noted on Drawings.
  2. Glass Types 1/2: Low - E Insulated tempered glass.
- B. Glass Type 1: Fixed Window Unit: Insulated “Low E” Tempered safety Clear glass 1 inch thick units:
1. Components:
    - a. Outer layer: 1/4 inch (6 mm) thick clear tempered glass with Low-E sputter coating over number 2 surface equal to Vitro Architectural Glass “Solarban 70 with clear Glass” on surface #2
    - b. Air space: 1/2 inch (12.7 mm) thick, between each layer of glass.
      - 1) Gas fill: 90% Argon/10% Air.
    - c. Inner layer: 1/4 inch (6 mm) thick clear tempered glass equal to Vitro Architectural Glass “Clear Glass”
  2. Performance Requirements: Glass Type 1 units shall have the following performance characteristics:
    - a. Visible transmittance: 64 percent
    - b. Exterior Reflectance: 13 percent
    - c. Solar heat gain coefficient: 0.27
    - d. U Value – (Winter) Center of glass: 0.24
    - e. Interior reflectance: 12 percent
- C. Glass Type 2: Operable Window Unit: Insulated “Low E” Tempered safety Clear glass 1 inch thick units:
1. Components:
    - a. Outer layer: 1/4 inch (6 mm) thick clear tempered glass with Low-E sputter coating over number 2 surface equal to Vitro Architectural Glass “Solarban 70 with clear Glass” on surface #2
    - b. Air space: 1/2 inch (12.7 mm) thick, between each layer of glass.
      - 1) Gas fill: 90% Argon/10% Air.
    - c. Middle layer: 1/4 inch (6 mm) thick clear tempered glass with Low-E sputter coating over number 4 surface equal to Vitro Architectural Glass “Solarban 70 with clear Glass” on surface #4
    - d. Air space: 1/2 inch (12.7 mm) thick, between each layer of glass.
      - 1) Gas fill: 90% Argon/10% Air.
    - e. Inner layer: 1/4 inch (6 mm) thick clear tempered glass equal to Vitro Architectural Glass “Clear Glass”
  2. Performance Requirements: Glass Type 1 units shall have the following performance characteristics:
    - a. Visible transmittance: 64 percent
    - b. Exterior Reflectance: 13 percent

- c. Solar heat gain coefficient: 0.27
- d. U Value – (Winter) Center of glass: 0.24
- e. Interior reflectance: 12 percent

## 2.7 INSECT SCREENS

- A. Provide: Aluminum framed screen installed with two spring loaded steel pin plungers retainers.
  - 1. Insect screening: FS RR-W-365A, woven 0.011 inch Black aluminum in an 18 by 16 mesh size as manufactured by Phifer Wire Products, Tuscaloosa, AL, or approved equal.
  - 2. Frame color: Custom to match window frames.

## 2.9 ACCESSORIES

- A. Receptor (sub-frame) Provide extruded aluminum receptors at heads and sills, where indicated on Drawings.
  - 1. Receptor construction: Two piece, snap-together design, equipped with thermal break and weather stripping.
- B. Sealant stop trim: Provide manufacturer's standard sealant stop trim at exterior perimeter of all window frames/trim.
- C. All anchors and fasteners, including screws, nuts, bolts, rivets, and other fastening devices shall be of tempered aluminum or non-magnetic type 302/304 stainless steel, warranted by the manufacturer to be non-corrosive and compatible with aluminum frame members and other components of the window assemblies. All such devices shall be of suitable type and adequate capacity for each intended purpose.
  - 1. Finished aluminum work shall generally be without use of exposed fasteners. Provide exposed fasteners only where acceptable to Architect, finish to match surrounding aluminum.
  - 2. For application of hardware, use fasteners that match finish of framing/sash member or hardware being fastened, as appropriate.
  - 3. Provide anchorage at location and spacing recommended by window manufacturer to comply with specified performance criteria.
  - 4. Shims: Provide non-organic, non corrosive fully concealed shims as required to level and plumb window assemblies. Locate shims where recommended by window manufacturer.
- D. Sealant and backer Materials
  - 1. Sealant used within system: As recommended by manufacturer.
  - 2. Perimeter Sealant: Joint Sealer Type SE (Silicone, Exterior construction), One-part low modulus, moisture curing, synthetic rubber sealant, having a useful life expectancy of at least 20 years, conforming to ASTM C 920, Type S, NS, Class 25, FS TT-S-001543A, Type, Class A with a minimum movement capability of +100 percent and -50 percent, equal to the following:
    - a. Dow Corning, product, "790".

- b. GE Silicones, product, "SCS9000 SilPruf NB".
  - c. Sika, product "Sika Sil-C 990".
  - d. Tremco, product "Spectrem 1".
3. Compressible joint bead back-up: Compressible closed cell polyethylene, extruded polyolefin foam or polyurethane foam rod, 1/3 greater in diameter than width of joint. Provide one of the following, or equal.
    - a. Nomaco, Inc., Zebulon NC.; product "Foam Pak II".
    - b. Sonneborn Building Products Inc., Minneapolis MN.; product "Sonofoam".
    - c. Tremco, Beachwood OH.; product "Joint Backing".
    - d. Applied Extrusion Technologies, Inc., Middletown DE., product "Sof Rod".
  4. Primers: Furnish and install joint primers of the types, and to the extent, recommended by the respective sealant manufacturers for the specific joint materials and joint function.
  5. Bond-breaker tape, and temporary masking tape: Of types as recommended by the manufacturer of the specific sealant and caulking material used at each application, and completely free from contaminants which would adversely affect the sealant and caulking materials.
- E. Sealant used within system (not used for glazing): As recommended by window manufacturer.

## 2.10 FABRICATION

- A. Fabricate window units sized to properly fit each opening, allowing for minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal. Prepare window units ready to receive anchors, and furnished with all operating hardware. Engineer window units to fit the openings required without any cutting or fitting on the job site.
1. Rigidly fit joints and corner. Accurately fit and secure corners tight. Make corner joints flush, hairline, and weatherproof. Seal corner joints with sealant. Ensure that joining method(s) do not discolor or damage finish.
  2. Develop drainage holes with moisture pattern to exterior.
  3. Prepare components to receive anchor devices. Fabricate anchorage items.
  4. Permit internal drainage weep holes and channels to migrate moisture to exterior.
- B. Factory glaze to the greatest extent possible. "Wet-Glaze" work in accordance with FGMA Glazing Manual SIGMA and LSGA standards for glazing and installations methods. Additionally:
1. Prior to installing glass, clean glazing channels and framing members.
  2. Remove coatings not completely bonded to substrates.
  3. Remove lacquer from metal surfaces where in contact with glazing sealant.
  4. Protect glass from edge damage at all times. Utilize roller blocks and suction cups.
  5. Replace glass from edge damage or other imperfections which would weaken glass.
  6. Install setting and side blocks in locations recommended by referenced standards.
  7. Center glass in openings. Provide minimum bite and clearances as recommended

by referenced standards. Install in manner to permit easy replacement of glass without dismantling frames.

8. Prevent metal to glass contact at all locations. Protect edges of insulated units from moisture and solvents.
  9. Clean, prime and install stops.
- C. Assemble insect screens of rolled aluminum rectangular sections. Miter and reinforce frame corners. Fit mesh taut into frame and secure. Fit frame with four spring loaded steel pin retainers.
- D. Double weather-strip operable units.

## 2.11 FINISHES

- A. Factory Finish for Exposed Aluminum:
1. Finish all exposed areas of aluminum and components with **High performance 70% PVDF fluoropolymer Ultrapon™**.
    - AA Description: AA-M12-C42-RX
    - Description: 70% PVDF Ultrapon
    - AAMA Guide Spec.: 2605-98
- B. Concealed Steel Items: Galvanized in accordance with ASTM A386 to 2.0 ounces per square foot.
- C. Isolation coating to cementitious and dissimilar materials: Apply one coat of bituminous paint or other acceptable coating to concealed aluminum surfaces in contact with cementitious and dissimilar materials
- D. Color shall be selected from the manufacturer's full range of colors, excluding metallics and exotics.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

### 3.2 INSTALLATION

- A. Install aluminum windows in accordance with the manufacturers' installation instructions, and the herein-referenced standards.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align windows plumb and level, free of warp or twist. Maintain dimensional



tolerances, aligning with adjacent work.

- D. Install sill and sill end angles.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air and vapor barrier materials.
- G. Install operating hardware.
- H. Perform glazing work in accordance with FGMA Glazing Manual SIGMA and LSGA standards for glazing and installations methods.
- I. Ensure that all metal-to-metal and metal-to-glass joints are completely weatherproof, and that adequate provisions have been made to permit expansion and contraction in the metal.
- J. No permanent exposed to view labels of any kind will be permitted to remain on frames or glass.
- K. Install perimeter sealant and backing materials to method required to achieve performance criteria.

### 3.3 TOLERANCES

- A. Maximum Variation from Level or Plumb: 0.06 inches every 3 feet non-cumulative or 1/16 inch per 10 feet, whichever is less.
  - 1. Do not add this tolerance to other allowable tolerances for related work.

### 3.4 ADJUSTING

- A. Adjust operable sash and hardware for smooth operation and tight fit of sash. Lubricate hardware and other moving parts.
- B. Touch-up all scratches, abrasions, and other defects in the prefinished metal surfaces with shop-coat finish material, supplied with the various items to be furnished hereunder.

### 3.5 CLEANING

- A. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom-clean condition.
- B. Remove excess sealant by solvent acceptable to sealant manufacturer. All exposed edges of sealant and gaskets shall be left smooth, uniform in line, and with edges neatly struck.
- C. Clean glass surfaces promptly after installation, exercising care to avoid damage to the same. Remove excess sealing compounds, mortar, paint, labels, dirt, and other contaminants.
- D. Remove protective material from prefinished aluminum surfaces. Wash down exposed

surfaces free of dirt, handling marks, packing tapes, and foreign matter, using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.6 PROTECTION

- A. Protect finished metal surfaces from damage during fabrication, shipping, storage, and erection; advise the Contractor of protective treatment and other precautions required through the remainder of construction.
- B. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of the glass. Do not apply warning markings directly to the glass.
- C. Cover glass To protect it from activities that might abrade the glass surface.

3.7 GLASSBREAKAGE

- A. Replace in kind and thickness all glass breakage caused by the work performed under this Section 08 51 13, and bear all costs therefore.
- B. Replace in kind and thickness all glass breakage, caused by other trades, because of negligence or any other reasons, with the costs being borne by the trade at fault, or the Contractor, as applicable.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
1. Swinging doors.
  2. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
1. Mechanical door hardware.
  2. Cylinders specified for doors in other sections.
- C. Related Sections:
1. Division 08 Section "Hollow Metal Doors and Frames".
  2. Division 08 Section "Flush Wood Doors".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
1. ICC/IBC - International Building Code.
  2. NFPA 70 - National Electrical Code.
  3. NFPA 80 - Fire Doors and Windows.
  4. NFPA 101 - Life Safety Code.
  5. NFPA 105 - Installation of Smoke Door Assemblies.
  6. State Building Codes, Local Amendments.
  7. 521 CMR - Massachusetts Architectural Board Regulations.
- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:
1. ANSI/BHMA Certified Product Standards - A156 Series.
  2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
  3. ANSI/UL 294 - Access Control System Units.
  4. UL 305 - Panic Hardware.

### 1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
  - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
  - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
  - 3. Content: Include the following information:
    - a. Type, style, function, size, label, hand, and finish of each door hardware item.
    - b. Manufacturer of each item.
    - c. Fastenings and other pertinent information.
    - d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
    - e. Explanation of abbreviations, symbols, and codes contained in schedule.
    - f. Mounting locations for door hardware.
    - g. Door and frame sizes and materials.
    - h. Warranty information for each product.
  - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- D. Informational Submittals:
  - 1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

- A. **Manufacturers Qualifications:** Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. **Certified Products:** Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. **Installer Qualifications:** A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- D. **Door Hardware Supplier Qualifications:** Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. **Source Limitations:** Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
- F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- G. **Keying Conference:** Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
  - 1. Function of building, purpose of each area and degree of security required.
  - 2. Plans for existing and future key system expansion.
  - 3. Requirements for key control storage and software.
  - 4. Installation of permanent keys, cylinder cores and software.
  - 5. Address and requirements for delivery of keys.
- H. **Pre-Submittal Conference:** Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
  - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
  - 2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
  - 3. Review sequence of operation narratives for each unique access controlled opening.
  - 4. Review and finalize construction schedule and verify availability of materials.

5. Review the required inspecting, testing, commissioning, and demonstration procedures

- I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

#### 1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

#### 1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
  - 1. Structural failures including excessive deflection, cracking, or breakage.
  - 2. Faulty operation of the hardware.
  - 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.1 SCHEDULED DOOR HARDWARE**

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
  - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to ASSA ABLOY ACCENTRA. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded ASSA ABLOY ACCENTRA.
- D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

### **2.2 BUTT HINGES**

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
  - 1. Quantity: Provide the following hinge quantity:
    - a. Two Hinges: For doors with heights up to 60 inches.
    - b. Three Hinges: For doors with heights 61 to 90 inches.
    - c. Four Hinges: For doors with heights 91 to 120 inches.
    - d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
  - 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
    - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
    - b. Sizes from 3'1" to 4'0": 5" heavy weight.
  - 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
    - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
    - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following:
  - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
  - a. Hager Companies (HA) - BB Series, 5-knuckle.
  - b. Ives (IV) - 5BB Series, 5-knuckle.
  - c. McKinney (MK) - TA/T4A Series, 5-knuckle.

## 2.3 SLIDING AND FOLDING HARDWARE

- A. Sliding and Folding Door Hardware: Hardware is to be of type and design as specified and should conform with ANSI/BHMA A156.14.
  1. Bi-folding Door Hardware: Rated for door panels weighing up to 125 lb.
  2. Manufacturers:
    - a. Hager Companies (HA).
    - b. Johnson Hardware (JO).
    - c. Pemko (PE).

## 2.4 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
  1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
  2. Furnish dust proof strikes for bottom bolts.
  3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
  4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
  5. Manufacturers:
    - a. Burns Manufacturing (BU).
    - b. Rockwood (RO).
    - c. Trimco (TC).
- B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
  1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
  2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.



3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:
  - a. Burns Manufacturing (BU).
  - b. Rockwood (RO).
  - c. Trimco (TC).

## 2.5 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
  1. Threaded mortise cylinders with rings and cams to suit hardware application.
  2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
  3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
  4. Tubular deadlocks and other auxiliary locks.
  5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
  6. Keyway: Manufacturer's Standard. Match Facility Standard.
- C. Large Format Interchangeable Cores: Provide removable cores (LFIC) as specified, core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
- D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents. Cylinders are to be factory keyed with owner having the ability for on-site original key cutting.
  1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
  2. Manufacturers:
    - a. Sargent (SA) - Degree DG1.
- E. Keying System: Each type of lock and cylinders to be factory keyed.
  1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
  2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
  3. Existing System: Field verify and key cylinders to match Owner's existing system.

4. New System: Key locks to a new key system as directed by the Owner.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Three (3).
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).
4. Construction Control Keys (where required): Two (2).
5. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide construction master keyed cylinders.

H. Construction Keying: Provide temporary keyed construction cores.

I. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

## 2.6 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

- a. Lund Equipment (LU).
- b. MMF Industries (MM).
- c. Telkee (TK).

## 2.7 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

- a. Heavy duty 12-gauge wrought steel case.
- b. Stainless steel 3/4" one-piece anti-friction reversible latchbolt with a one-piece hardened stainless steel 1" projection deadbolt.
- c. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
- d. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
- e. Meets UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.
- f. Status indicators inside, outside, or on both sides of doors as specified; available with wording for "locked/unlocked", "vacant/occupied" or custom wording options.

Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status.

- g. Ten-year limited warranty for mechanical functions.
2. Manufacturers:
- a. Corbin Russwin Hardware (RU) - ML2000 Series.
  - b. Sargent Manufacturing (SA) - 8200 Series.
  - c. Schlage (SC) - L9000 Series.

## 2.8 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
- 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
  - 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
  - 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
  - 4. Short-lipped strikes: For locks at double doors.
- B. Standards: Comply with the following:
- 1. Strikes for Mortise Locks and Latches: BHMA A156.13.
  - 2. Strikes for Bored Locks and Latches: BHMA A156.2.
  - 3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
  - 4. Dustproof Strikes: BHMA A156.16.

## 2.9 DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
- 1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
  - 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
  - 3. Cycle Testing: Provide closers which have surpassed 15 million cycles.
  - 4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
  - 5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
  - 6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
  - 7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard..

1. Manufacturers:
  - a. LCN Closers (LC) - 4040 Series.
  - b. Norton Rixson (NO) - 7500 Series.
  - c. Sargent Manufacturing (SA) - 351 Series.

## 2.10 ARCHITECTURAL TRIM

### A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
  - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
  - a. Burns Manufacturing (BU).
  - b. Rockwood (RO).
  - c. Trimco (TC).

## 2.11 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:
  - a. Burns Manufacturing (BU).
  - b. Rockwood (RO).
  - c. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
  - a. Norton Rixson (RF).
  - b. Rockwood (RO).
  - c. Sargent Manufacturing (SA).

## 2.12 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
  1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
  1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
  1. National Guard Products (NG).
  2. Pemko (PE).
  3. Reese Enterprises, Inc. (RE).

2.13 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
  - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
  2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
  3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
  4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

#### 3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

#### 3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

#### 3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.

- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

- B. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. RO - Rockwood
4. SA - SARGENT
5. RF - Rixson

**Hardware Sets**

**Set: 1.0**

Doors: [EX02](#), [EX06](#), [EX07](#)

Description: Exterior HM Sgl

|                                |                                   |       |    |
|--------------------------------|-----------------------------------|-------|----|
| 3 Hinge, Full Mortise, Hvy Wt  | T4A3386 (qty, size, nrp per spec) | US32D | MK |
| 1 Double Cylinder Lock         | DG164 8216 LNL                    | US32D | SA |
| 2 Core                         | DG1 6300 VKC                      | US15  | SA |
| 1 Surface Overhead Stop        | 9-X36                             | 630   | RF |
| 1 Door Closer (offset bracket) | 351 P3/P3A                        | EN    | SA |
| 1 Kick Plate                   | K1050 8" 4BE CSK                  | US32D | RO |
| 1 Head & Jamb Seal             | 2891AS                            |       | PE |
| 1 Sweep                        | 315CN                             |       | PE |
| 1 Threshold (coord w/ details) | 2010APK FG Pemkote FHSL14SS       |       | PE |

**Set: 2.0**

Doors: [EX04](#)

Description: Exterior HM Sgl (In-swing)



Newton Commonwealth Golf Course  
Maintenance Facility Improvements & Renovations  
Newton, Massachusetts 02458

|                                |                                    |       |    |
|--------------------------------|------------------------------------|-------|----|
| 3 Hinge, Full Mortise, Hvy Wt  | T4A3386 (qty, size, nrp per spec)  | US32D | MK |
| 1 Double Cylinder Lock         | DG164 8216 LNL                     | US32D | SA |
| 2 Core                         | DG1 6300 VKC                       | US15  | SA |
| 1 Surface Overhead Stop        | 9-X36                              | 630   | RF |
| 1 Door Closer                  | 351 O; P10 (or to suit conditions) | EN    | SA |
| 1 Head & Jamb Seal             | 2891AS                             |       | PE |
| 1 Sweep                        | 315CN                              |       | PE |
| 1 Threshold (coord w/ details) | 1716AK FHSL14SS                    |       | PE |

**Set: 3.0**

Doors: EX08

Description: Exterior HM Pair - 110 Degree Hold Open

|                                |                                   |       |    |
|--------------------------------|-----------------------------------|-------|----|
| 6 Hinge, Full Mortise, Hvy Wt  | T4A3386 (qty, size, nrp per spec) | US32D | MK |
| 1 Dust Proof Strike            | 570                               | US26D | RO |
| 2 Flush Bolt                   | 555                               | US26D | RO |
| 1 Double Cylinder Lock         | DG164 8216 LNL                    | US32D | SA |
| 2 Core                         | DG1 6300 VKC                      | US15  | SA |
| 2 Surface Overhead Holder      | 9-X26                             | 630   | RF |
| 2 Door Closer (offset bracket) | 351 P3/P3A                        | EN    | SA |
| 2 Kick Plate                   | K1050 8" 4BE CSK                  | US32D | RO |
| 1 Astragal                     | 355CPK                            |       | PE |
| 1 Head & Jamb Seal             | 2891AS                            |       | PE |
| 2 Sweep                        | 315CN                             |       | PE |
| 1 Threshold (coord w/ details) | 1716AK FHSL14SS                   |       | PE |

**Set: 4.0**

Doors: 09

Description: Office

|                               |                                   |       |    |
|-------------------------------|-----------------------------------|-------|----|
| 3 Hinge (heavy weight)        | T4A3786 (qty, size, nrp per spec) | US26D | MK |
| 1 Office/Entry Lock           | DG164 8205 LNL                    | US26D | SA |
| 1 Core                        | DG1 6300 VKC                      | US15  | SA |
| 1 Kick Plate                  | K1050 8" 4BE CSK                  | US32D | RO |
| 1 Door Stop                   | 404; 441CU; overhead per spec     | US26D | RO |
| 1 Head & Jamb Seal (adhesive) | S442BL                            |       | PE |

**Set: 5.0**

Doors: 07

Description: Intern Room

|                               |                                    |       |    |
|-------------------------------|------------------------------------|-------|----|
| 3 Hinge (heavy weight)        | T4A3786 (qty, size, nrp per spec)  | US26D | MK |
| 1 Office/Entry Lock           | DG164 8205 LNL                     | US26D | SA |
| 1 Core                        | DG1 6300 VKC                       | US15  | SA |
| 1 Door Closer                 | 351 O; P10 (or to suit conditions) | EN    | SA |
| 1 Kick Plate                  | K1050 8" 4BE CSK                   | US32D | RO |
| 1 Door Stop                   | 404; 441CU; overhead per spec      | US26D | RO |
| 1 Head & Jamb Seal (adhesive) | S442BL                             |       | PE |
| 1 Mortise Auto Door Bottom    | 434ARL ACP112BL                    |       | PE |

**Set: 6.0**

Doors: 06

Description: Storage Bay / Repair Bay

Newton Commonwealth Golf Course  
Maintenance Facility Improvements & Renovations  
Newton, Massachusetts 02458

|                                |                                    |       |    |
|--------------------------------|------------------------------------|-------|----|
| 3 Hinge, Full Mortise, Hvy Wt  | T4A3386 (qty, size, nrp per spec)  | US32D | MK |
| 1 Double Cylinder Lock         | DG164 8216 LNL                     | US32D | SA |
| 2 Core                         | DG1 6300 VKC                       | US15  | SA |
| 1 Door Closer                  | 351 O; P10 (or to suit conditions) | EN    | SA |
| 1 Kick Plate                   | K1050 8" 4BE CSK                   | US32D | RO |
| 1 Door Stop                    | 404; 441CU; overhead per spec      | US26D | RO |
| 1 Head & Jamb Seal             | 2891AS                             |       | PE |
| 1 Sweep                        | 315CN                              |       | PE |
| 1 Threshold (coord w/ details) | 2716AK FHSL14SS                    |       | PE |

**Set: 7.0**

Doors: 04, 08

Description: Sgl User Toilet - Privacy

|                        |                                    |       |    |
|------------------------|------------------------------------|-------|----|
| 3 Hinge (heavy weight) | T4A3786 (qty, size, nrp per spec)  | US26D | MK |
| 1 Privacy Lock         | V20 8265 LNL                       | US26D | SA |
| 1 Door Closer          | 351 O; P10 (or to suit conditions) | EN    | SA |
| 1 Kick Plate           | K1050 8" 4BE CSK                   | US32D | RO |
| 1 Mop Plate            | K1050 6" 4BE CSK                   | US32D | RO |
| 1 Door Stop            | 404; 441CU; overhead per spec      | US26D | RO |
| 3 Silencer             | 608                                |       | RO |
| 1 Coat Hook            | RM823                              | US32D | RO |

**Set: 8.0**

Doors: 01, 02, 03

Description: Utility; Storage; Repair Bay

|                               |                                    |       |    |
|-------------------------------|------------------------------------|-------|----|
| 3 Hinge, Full Mortise, Hvy Wt | T4A3386 (qty, size, nrp per spec)  | US32D | MK |
| 1 Classroom Lock              | DG164 8237 LNL                     | US26D | SA |
| 1 Core                        | DG1 6300 VKC                       | US15  | SA |
| 1 Door Closer                 | 351 O; P10 (or to suit conditions) | EN    | SA |
| 1 Kick Plate                  | K1050 8" 4BE CSK                   | US32D | RO |
| 1 Door Stop                   | 404; 441CU; overhead per spec      | US26D | RO |
| 3 Silencer                    | 608                                |       | RO |

**Set: 9.0**

Doors: 05

Description: Grinding Room Pair

|                               |                                   |       |    |
|-------------------------------|-----------------------------------|-------|----|
| 6 Hinge, Full Mortise, Hvy Wt | T4A3386 (qty, size, nrp per spec) | US32D | MK |
| 1 Dust Proof Strike           | 570                               | US26D | RO |
| 2 Flush Bolt                  | 555                               | US26D | RO |
| 1 Passage Latch               | 8215 LNL                          | US26D | SA |
| 1 Surface Overhead Stop       | 9-X36                             | 630   | RF |
| 1 Door Stop                   | 404; 441CU; overhead per spec     | US26D | RO |
| 1 Astragal (flatbar)          | 357SP                             |       | PE |
| 2 Silencer                    | 608                               |       | RO |

Notes: Left hand door to have overhead stop set to 110 degrees; right hand door to have floor stop set to approx 120 degrees.

**Set: 10.0**

Doors: 10

Description: Closet Bifold

|                    |                |       |    |
|--------------------|----------------|-------|----|
| 1 Bifold Door Hdwe | HF2/100A       |       | PE |
| 1 Pull             | 853 Mtg-Type 1 | US32D | RO |

**Set: 11.0**

Doors: EX01, EX03, EX05

Description: Overhead Door Assembly

|            |                             |       |    |
|------------|-----------------------------|-------|----|
| 1 Core     | DG1 6300 VKC                | US15  | SA |
| 1 Cylinder | As required                 | US26D | SA |
| 1 Hardware | Supplied with door assembly |       |    |

END OF SECTION

SECTION 08 80 00

GLAZING

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and SUPPLEMENTAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. The Drawings on which this Contract is based are listed in Section 00 86 00. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.2 SUMMARY

- A. The Contractor under this Section shall provide all materials, labor, equipment and appliances required to do all the masonry restoration and related work including but not limited, to the following:
- B. Furnish and install:
  - 1. Tempered safety glass in vision panels and interior hollow metal doors and frames.
  - 2. Tempered safety insulated glass units in exterior hollow metal doors and frames.
  - 3. All materials required to properly install glass furnished hereunder, including sealant, tapes, setting blocks, and spacers.
- C. Work of this section includes installation of glazing beads furnished under related sections.
  - 1. Work of this Section includes application of wood putty to fill all nail or screw holes in wood glazing beads and refinishing of glazing beads to provide a consistent appearance matching the original finish as supplied.
- D. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to ADVERTISEMENT FOR BIDS for time and date.

1.3 RELATED SECTIONS

- A. Section 01 52 40 – DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT: Procedural and administrative requirements for construction and demolition recycling.
- B. Section 06 10 00 - ROUGH CARPENTRY: Installation of steel door and window frames.
- C. Section 06 20 00 - FINISH CARPENTRY: Installation of doors.
- D. Section 07 92 00 - JOINT SEALANTS: Requirements for sealants and backing materials.

GLAZING

- E. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: Steel doors, door and window frames, and related glazing stops, for both fire-resistance rated (labeled) and non-rated (labeled) conditions.

#### 1.4 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. AAMA 804.1 - Ductile Back-Bedding Compound.
  - 2. ASTM C 1036 - Flat Glass.
  - 3. ASTM C 1048 - Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
  - 4. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.
  - 5. Federal Safety Standards for Architectural Glazing Materials 16CFR1201.
  - 6. IGCC: Certified Products Directory, and Certification Guidelines.
  - 7. NFPA Publication 80 - Fire Doors and Windows.
  - 8. SGCC: Certified Products Directory, and Certification Guidelines.
- B. The following reference materials are hereby made a part of this Section by reference thereto:
  - 1. GANA Laminated Glazing Reference Manual (2006 edition).
  - 2. GANA - Glazing Manual (2004 edition).
  - 3. Consumer Product Safety Commission-Safety Standard for Architectural Glazing Materials.

#### 1.5 SEQUENCING

- A. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

#### 1.6 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
  - 1. Field Measurements
    - a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.

- b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.

#### 1.7 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Product literature:
  - 2. Warranty: Provide copies of manufacturers' actual warranties for all materials to be furnished under this Section, clearly defining all terms, conditions, and time periods for the coverage thereof.
  - 3. Shop drawings: Show sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with the work of adjacent trades.
    - a. 1/4 inch scale elevations and plans of each type of glazing assembly,; indicate dimensions, and reference details. Verify dimensions with field measurements.
  - 4. Samples:
    - a. 12 x 12 inch pieces of each specified type and thickness of glass, bearing labels indicating locations where each type of glass will be used.
    - b. Glazing tape: 12 inch length of specified type and size.

#### 1.8 QUALITY ASSURANCE

- A. General: Perform glazing work in accordance with GANA - Glazing Manual, FGMA Glazing Manual and LSGA standards for glazing and installations methods.
  - 1. Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  - 2. Deliver materials in labeled, protective packages, when required.
- B. Storage and Handling Requirements:
  - 1. Store and handle in strict compliance with manufacturer's instructions and recommendations of GANA Glazing Manual. Use clean gloves and tools when handling materials, avoid contamination. Use rolling blocks and suction cups to move glass units not in shipping crates.
    - a. Carefully store materials to avoid overloading any building component or structure.
    - b. Do not unpack material until it is to be set, unless un-packing is required for inspection by the Architect.
  - 2. Protect factory finished materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.

1.10 SITE CONDITIONS

- A. Do not install glazing when ambient temperature is less than 50 degrees Fahrenheit.
- B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.11 WARRANTY

- A. General: Submit warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
- B. Manufacturer Warranty/Guarantee: All shall include replacement of defective glass and mirrors, and delivery of replacement glass products furnished f.o.b. from point of manufacturer to project site.
  - 1. Laminated glass: Manufacturer's 4 year written guarantee covering against defects in materials and workmanship of laminated glass and replacement of the same. Warranty shall be effective from date of original factory shipment to site.
    - a. Provide coverage in Guarantee for manufacturing defects, including failure of laminated glass units as evidenced by edge separation, delamination, or discoloration of inner layer.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Laminated glass:
    - a. Guardian Industries Corporation, Lewiston, PA.
    - b. PPG Industries Inc, Glass Group, Pittsburgh, PA.
    - c. Viracon, Owatonna, MN.
  - 2. Glazing Sealant:
    - a. Dow Corning Corporation, Midland, MI.
    - b. General Electric Company (GE Silicones) Waterford, NY.
    - c. Tremco, Beachwood, OH.

2.2 GLASS - GENERAL

- A. General requirements for glass: Of domestic and foreign manufacture, conforming to the referenced standards and with the additional requirements specified herein; factory labeled on each pane stating the strength, type, thickness and quality; with all labels remaining on glass until final cleaning.
  - 1. Glass thickness shown and heat treatment specified are minimum requirements. Provide glass thickness and heat treatment to meet specified performance criteria, State and local codes and ordinances.
- A. Glass Type A - Clear Tempered Safety Glass: 1/4 inch thick.

## 2.3 GLASS – TYPES AND LOCATIONS

- A. Glass Type A: Nominal 1/4 inch thick laminated glass.
- B. Glass Type B: Insulated “Low E” Tempered safety Clear glass 1 inch thick units:
  - 1. Components:
    - a. Outer layer: 1/4 inch (6 mm) thick clear tempered glass with Low-E sputter coating over number 2 surface equal to Vitro Architectural Glass “Solarban 70 with clear Glass” on surface #2
    - b. Air space: 1/2 inch (12.7 mm) thick, between each layer of glass.
      - 1) Gas fill: 90% Argon/10% Air.
    - c. Inner layer: 1/4 inch (6 mm) thick clear tempered glass equal to Vitro Architectural Glass “Clear Glass”
  - 2. Performance Requirements: Glass Type 1 units shall have the following performance characteristics:
    - a. Visible transmittance: 64 percent
    - b. Exterior Reflectance: 13 percent
    - c. Solar heat gain coefficient: 0.27
    - d. U Value – (Winter) Center of glass: 0.24
    - e. Interior reflectance: 12 percent

## 2.4 FABRICATION

- A. General: Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
- B. Fabricate glass to openings with edge clearances and bite on glass as recommended by the manufacturer with clean-cut edges where concealed, and smooth-ground, polished and seamed edges where exposed to view. Do not cut, seam, nip or abrade glass after heat-tempering.
  - 1. For non-tempered to be cut at site, provide glass larger than required so as to obtain clean cut edges without seaming or nipping.
- C. Fabricate glass with the following edge treatments.
  - 1. Exposed edges: Polished-finished radiused (penciled).
  - 2. Concealed edges: Cut edges with minimum edge work.
  - 3. Butt-joint edges: Flat round and finished with edges eased.

## 2.5 ACCESSORIES

- A. Glazing tape: Preformed butyl-polyisobutylene rubber with 100 percent solids contained in extruded tape roll form and complying with AAMA 804.1; coiled on release paper; of sizes required for proper glazing. equal to one of the following:
  - 1. Protective treatments 3030 or 606.



2. Tremco Preshimmed 440.
  3. Woodmont Chem-Tape 40.
- B. Setting blocks: Neoprene, 80-90 shore A durometer hardness, certified to be “silicone compatible”; sized as follows:
1. Length: 0.1 inch per square foot of glass, but not less than 4 inches.
  2. Width: equal to glazing rabbet space minus 1/16 inch.
  3. Height to suit glazing method and pane weight and area.
- C. Spacers: Neoprene, 60-80 shore A durometer hardness; sized as required.
- D. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION AND PREPARATION**

- A. Inspect receiving surfaces and ensure that they are dry and free from dust, or other foreign materials before glazing. Clean all surfaces with cloth saturated with mineral spirits of high-flash naphtha as recommended by glazing tape manufacturer, before glazing.
- B. Field Measurements: Verify that field measurements are as indicated on approved Shop Drawings.
1. Check all openings, prior to glazing, to make certain that the opening is square, plumb and secure in order that uniform face and edge clearances are maintained.
  2. Determine the actual sizes required by measuring the receiving openings. Size glass and mirrors to permit required clearance and bite around full perimeter of glass, as set forth in the referenced FGMA standards, or as recommended by the glass manufacturer. Do not nip edges, to remove flares or to reduce oversize dimensions, under any circumstance.
- C. Beginning of installation means acceptance of existing conditions.

#### **3.2 INSTALLATION - DRY GLAZING**

- A. Utilize dry glazing methods for field installation of glass in interior doors and frames.
1. Install in vision panels in fire-rated doors and frames to requirements of NFPA 80.
  2. Install so that appropriate UL, Warnock Hersey, fire rated glazing or other approval labeled markings remain permanently visible.
- B. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (2 mm) above sight line.
- C. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.

- D. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane.
- E. Place glazing tape on free perimeter of glazing in manner as described above.
- F. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- G. Knife trim protruding tape.

### 3.3 PROTECTION

- A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of the glass. Do not apply warning markings directly to the glass.
- B. Cover glass To protect it from activities that might abrade the glass surface.

### 3.4 CLEANING

- A. Clean glass surfaces promptly after installation, exercising care to avoid damage to the same. Remove excess glazing tape, labels, dirt, and other contaminants.

End of Section

Section 09 00 06  
RESILIENT FLOORING FILED SUB-BID REQUIREMENTS  
(FILED SUB-BID REQUIRED)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
- C. Specification requirements for the Filed Sub-Bid "RESILIENT FLOORING" include all of the following listed Specification Sections: in their entirety:
  - 1. Section 09 00 06 - RESILIENT FLOORING FILED SUB-BID REQUIREMENTS.
  - 2. Section 09 05 60 – COMMON WORKS FOR FLOORING
  - 3. Section 09 65 23 - RUBBER FLOORING.
- D. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings, not just those pertaining particularly to this Sub-Trade, unless specifically called out otherwise, regardless of where among the Drawings it appears: A0.1, A0.2, A0.3, A1.0, A1.1, A3.0, A3.1, A3.2, A3.3, A3.4, A4.0, A5.0, A5.1
- E. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract.
- F. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in INVITATION TO BID and INSTRUCTIONS TO BIDDERS.
  - 1. The following shall appear on the upper left hand corner of the envelope:  

NAME OF SUB-BIDDER: \_\_\_\_\_  
SUB-BID FOR TRADE: RESILIENT FLOORING
  - 2. Each Sub-Bid submittal for work under this Section shall be on forms furnished by Awarding Authority, as bound herein, accompanied with the required bid deposit.
- G. Sub Sub-Bid Requirements: NONE REQUIRED UNDER THIS SECTION.

1.2 SUMMARY

- A. This Section includes Resilient Flooring Filed-Sub Bid Requirements and includes general requirements for preparation, installation and temporary protection of resilient flooring provided under this Filed-Sub-Bid.

1. Provide independent testing laboratory services to perform relative humidity, moisture vapor emission, and pH tests on in situ concrete slabs, which shall be in addition to testing as may be performed by Owner.
2. Prepare substrates to receive resilient tile flooring as required to ensure specified tolerance level for finish surface of floor tile. Preparation work includes patching, smoothing and leveling substrate, including:
  - a. Grinding down high spots of substrate.(+) 1/4"
  - b. Providing Portland cement-based latex underlayment (filler).(-) 1/4"
3. Protection of finished floors
4. Provide transition and edge strips between flooring types, and abutting materials as detailed on Drawings.

### 1.3 RELATED REQUIREMENTS

- A. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- B. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
- C. Section 03 33 00 – CAST-IN-PLACE CONCRETE: Concrete floor slab substrate.
- D. SECTION 06 10 00 – ROUGH CARPENTRY: Wood Substrates

### 1.4 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
  1. ASTM D4259 - Standard Practice for Abrading Concrete.
  2. ASTM E329 - Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.
  3. ASTM E1907 - Standard Guide to Methods of Evaluating Moisture Conditions of Concrete Floors to Receive Resilient Floor Coverings
  4. ASTM F710 - Preparing Concrete Floors to Receive Resilient Flooring.
  5. ASTM F1482 - Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.
  6. ASTM F1869 – Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
  7. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In-Situ Probes
  8. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

## 1.5 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

## 1.6 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. General: Coordinate flooring work with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
  - 2. Coordinate work of this Filed-Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
  - 3. Coordinate the work of this Section with the respective trades responsible for installing interfacing work.
- B. Pre-Installation Meetings: At least 30 calendar days prior to commencing any flooring work, conduct a pre-installation conference at the Project site. Comply with requirements of Section 01 31 02 - PROJECT MANAGEMENT AND COORDINATION. Coordinate time of meeting to occur prior to installation of work under the related sections named below.
  - 1. Required attendees:
    - a. Owner's Representative.
    - b. Architect.
    - c. General Contractor.
    - d. Project Superintendents representing each floor system installer.
    - e. Manufacturer's technical representative(s) for flooring products as designated by Architect or Contractor.
    - f. Representatives of related trades as directed by the Architect or Contractor, and representatives for installers of related work specified under the following Sections:
      - 1) Section 09 65 23 - Rubber Flooring.
      - 2) Section 09 65 43 - Linoleum Flooring.
  - 2. Agenda:
    - a. Scheduling of preparation and flooring operations.

### RESILIENT FLOORING FILED SUB-BID REQUIREMENTS

- b. Procedures for testing of relative humidity and moisture content of in situ substrates.
- c. Water vapor emission control methods.
- d. Review of staging and material storage locations.
- e. Coordination of work by other trades.
- f. Protection of completed Work.
- g. Establish humidity and temperature limitations for performing the work, to which Architect and Contractor must agree.
- h. Discuss process for inspection and acceptance of completed Work of this Section.

C. Sequencing:

- 1. Phasing: Refer to Section 01 14 00 – WORK RESTRICTIONS, and Drawings for phasing and milestone completion requirements which affect the General Contractor's Work and the Work of this Filed Sub-Bid.
- 2. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- 3. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- 4. Sequence work to ensure resilient flooring is not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, wet work is dry and cured, and work overhead is completed.
- 5. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.
- 6. Field Measurements
  - a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
  - b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
- 7. Ensure that installation of flooring and accessories occurs after other finishing operations, including painting.

1.7 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:

- 1. Test and Evaluation Reports: Include the following:
  - a. Report the Test Deployment Parameters at start of testing and finishing of testing:
    - 1) Start and finish dates and times of testing.
    - 2) Ambient temperature,
    - 3) Ambient relative humidity and dew point temperature.

- 4) Minimum and maximum ambient temperature and relative humidity reached during testing.
  - b. Report the "Factor" used to calculate the actual test area of the Calcium Chloride test site.
  - c. Report the concrete slab thickness (in inches).
  - d. Report all test results in chart form listing the following:
    - 1) Test locations (also mark test locations on floor plan)
    - 2) Type(s) of Existing Floor Coverings
    - 3) Visual Distress Level of existing Floor Coverings
    - 4) Surface Temperature of Concrete
    - 5) pH Paper/ Pencil Reading (ASTM F710)
    - 6) Visual Appearance of Concrete
    - 7) Concrete Slab Age
    - 8) Relative Humidity in Concrete, % (ASTM F2170):
      - a) Depth of hole from top of Slab, in.
      - b) RH in concrete, %
      - c) Temp. in concrete, °F
    - 9) Surface Moisture Meter Test (ASTM E1907):
      - a) 1. Electrical Impedance Test Values or
      - b) 2. Electrical Resistance Test Values
    - 10) x. Moisture Vapor Emission (MVER) - CaC12 Test (ASTM F1869):
      - a) Weight Gain in grams
      - b) Exposure Time/hrs
      - c) MVER Lbs/1000 Sq. Ft./24 hours
  - e. Report all unacceptable substrate and field conditions observed during testing.
- B. Submit 1 copy of test data to the installers of all flooring materials or floor surface coating materials scheduled to be installed.

## 1.8 QUALITY ASSURANCE

- A. General: perform relative humidity, moisture vapor emission (MVER) and acidity/alkalinity (pH) Testing for concrete slabs and floors.
- 1. Resilient Flooring Filed-Subcontractor shall employ and pay for services of an independent testing laboratory to perform relative humidity, moisture vapor emission, and pH tests on concrete slabs as follows. The test shall be witnessed by the General Contractor, Resilient Flooring Filed-Subcontractor and Owner's Project Representative.
    - a. Relative Humidity, Moisture Vapor Emission and pH Testing on all concrete slabs over-which a finished floor provided under this Filed-Sub-Bid is to be installed.
  - 2. Testing Requirements: As specified under Part 3 of this Section.
    - a. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products.

- 1) Perform additional testing after procedures have been performed by the General Contractor to reduce moisture content to ratings acceptable to the various flooring and floor-coating manufacturers. General Contractor's procedures to reduce moisture content may consist of project dehumidification and temporary heating, environmental controls, or moisture mitigation treatment to concrete.
3. Testing Requirements: As specified under Part 3 of this Section.
  - a. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Additional testing shall comply with requirements and in quantities as initially tested, and be included as Work of this Filed Sub-Bid.
    - 1) Perform additional testing after procedures have been performed by the General Contractor to reduce moisture content to ratings acceptable to the various flooring and floor-coating manufacturers. General Contractor's procedures to reduce moisture content may consist of project dehumidification and temporary heating, environmental controls, or moisture mitigation treatment to concrete.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL FLOORING ACCESSORIES**

- A. Filler for patching, smoothing and leveling subfloors and underlayments: Portland cement-based latex underlayment acceptable to flooring manufacturer, equal to the following:
  1. Ardex Americas, Aliquippa, PA. products "Feather Flash" and "Ardex SD-P".
  2. Quikrete Companies., Atlanta, GA., product "Fast-Set Underlayment 1248".
  3. Silpro Masonry Systems Inc., Ayer MA., product "Profinish".
- B. Adhered flooring systems general requirements for adhesives (except as otherwise specified in individual Specification Sections):
  1. General Flooring Adhesives: High moisture resistant and alkali resistant adhesive: Synthetic Polymer, non-flammable in wet state, with NFPA, Class A rated, VOC compliant, capable of withstanding the following in continuous service:
    - a. Up to **99% RELATIVE HUMIDITY** when measured in accordance with ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.
    - b. Up to 8 lbs./1000 sq. ft./ 24 hours MVER when measured in accordance with ASTM F1869 - Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
    - c. VOC content: Less than 50 g/L.
  2. Acceptable adhesives: Provide 99% adhesive as recommended by manufacturer. Adhesives supporting the manufacturer's warranties for use as a 99% RH adhesive will be approved for use.



- C. Temporary Floor Protection final layer: Flame retardant treated in conformance with NFPA 701. Acceptable Products include the following, or approved equal:
  - 1. Holland Manufacturing, Succasunna NJ., product: "Blue Shield Flame StopR."
  - 2. Pro Tect Associates, Northbrook, IL, product "Traffic Guard."
  - 3. Protection from the Ground Up, Escondido, CA., product "Deck Cover FR."
  - 4. Surface Shields, Orland Park, IL, product "Cover Shield."Refer to individual flooring material specifications for further requirements to be used under this specified material.

## 2.2 TESTING EQUIPMENT

- A. For relative humidity testing: Digital Meter and Calibrated Humidity and Temperature probe kit in Compliance with ASTM F2170.
  - a. Minimum 2 point probe calibration.
- B. For calcium chloride testing: Anhydrous calcium chloride testing in accordance with Rubber Manufacturer's Association (RMA) Test requirements and in compliance with ASTM F1869.
- C. For pH testing: In compliance with ASTM F710.
  - 1. pH test paper.
  - 2. Distilled or de ionized water.

## 2.3 SCAFFOLDS AND STAGING

- A. General: Filed Subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and herein.
  - 1. Scaffolding and staging required for use by this Filed Subcontractor pursuant to requirements of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-Trade requiring such scaffolding.
  - 2. Each Filed Subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and as additionally required for dust control).
  - 3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Filed Subcontractor.
  - 4. Scaffolding and staging required for use by this Filed Subcontractor pursuant to requirements of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-Trade requiring such scaffolding.
  - 5. Each Filed Subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to

MGL (Refer to Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and as additionally required for dust control).

6. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Filed Subcontractor.
7. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each work day to prohibit access to the scaffolding by unauthorized individuals.

## 2.4 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed Subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Filed Subcontractor, as referenced under Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that spaces to receive flooring finishes are suitable for installation. Do not proceed with work until unsatisfactory conditions are corrected. Comply with manufacturer's recommendations including the following:
  1. Substrates shall be dry and clean.
  2. Substrates shall be free of depressions, raised areas, or other defects which would telegraph through installed flooring.
  3. Verify concrete substrates have a flat tolerance of 1/8" in 10 linear feet, or more restrictive tolerances as specified under individual resilient flooring Specification Sections included as part of this Filed Sub-Bid.
  4. Temperature of resilient flooring and substrate shall be within specified tolerances.
  5. Moisture condition and adhesive bond tests shall be performed as specified herein.
- B. For applications on concrete:
  1. Verify concrete substrate has been cured and is sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture test
  2. Verify curing, hardening, or breaking compounds have not been used. If there are any, do not proceed until compounds have been removed as specified.
  3. For applications on concrete slab on grade or below grade, verify vapor barrier below slab was installed. If no vapor barrier was installed, do not proceed with work unless written acceptance of such conditions is received and submitted.
  4. Perform testing of in situ concrete, relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings as specified herein. Do not proceed with work until results of moisture condition tests are acceptable.
- C. For applications on wood substrate:

1. Verify wood substrates are installed sound, rigid, smooth, flat, clean and permanently dry.
2. Verify wood surface is free of all contaminants, including sawdust.
3. Verify wood subfloors are constructed of double layer underlayment, and having a minimum total thickness of not less than 1 inch.

### 3.2 SURFACE PREPARATION FOR TESTING

- A. General: Substrates shall be dry and clean. Remove all dirt, debris, sealers, coatings, finishes, film-forming curing compounds, and other substances which may affect the rate of moisture dissipation. Remove all dust by vacuum or other methods. Do not use chemicals of any kind to clean concrete.
  1. Non- chemical methods for removal, such as abrasive grinding or bead-blasting, including methods described in ASTM D4259 may be used on existing slabs with deleterious residues to achieve an appropriate state for testing.
- B. To test for pH at the surface of a concrete slab, use care not to over abrade the surface of the concrete which can result in overstated pH readings.

### 3.3 TESTING IN SITU CONCRETE SUBSTRATES

- A. Scope:
  1. Provide in situ concrete relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings. Includes concrete placed as part of this Work which occurs below grade, above grade (suspended slabs), and slabs on grade.
    - a. Existing building suspended slabs may be excluded from this requirement.
- B. Scheduling:
  1. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than one, nor more than three weeks prior to scheduled flooring installation.
    - a. DO NOT conduct testing unless the slab environment is identical to that in which the finished flooring is to be installed.
  2. In the event new flooring is to be installed over existing resilient flooring, remove the portion of the existing flooring and adhesive directly under the area where testing will be conducted. Patch flooring to match existing construction after completion of testing.
- C. Test result submittals:
  1. Report all test results in chart form listing test dates, time, depth of test well, in situ temperature, relative humidity, moisture vapor and pH levels.
  2. List test locations on chart and show same on marked up Floor Plan Drawings.
  3. Submit results in duplicate. Deliver copies directly to Architect, Owner's Project Representative and General Contractor.
- D. Testing Procedures, quantification of Relative Humidity

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F), and 50 percent (plus or minus 10 percent) relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be Included with the test report.
  2. The number of In situ relative humidity test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000 square feet and 1 per each additional 1,000 square feet.
  3. Drill test holes utilizing a roto hammer drill. Hole diameter shall not exceed outside diameter of the insertable test sleeve by more than 0.04 inch (1mm). Drilling operation must be dry. Do not use water for cooling or lubrication; do not wet-core test hole. Determine the thickness of the concrete slab from Construction Documents. Depths of test holes shall be as follows:
    - a. For elevated slabs (not poured in pans): Drill test holes to a depth equal to 20 percent of the concrete thickness.
    - b. For slabs on grade and elevated slabs in pans: Drill test holes to a depth equal to 40 percent of the concrete thickness.
  4. Vacuum all concrete dust from test hole.
  5. Insert a hole liner, or sleeve, to the full depth of test hole, assuring that the liner is capped or plugged at the end protruding from the concrete surface.
  6. Permit the test site to acclimate, or equilibrate, for 72 hours prior to taking relative humidity readings.
  7. Remove the sleeve plug and place a probe into the sleeve assuring that it reaches the bottom of the test hole.
  8. Allow the probe to sit in the test sleeve for 30 minutes before taking readings.
  9. Read and record temperature and relative humidity at the test site.
- E. Testing Procedures, quantification of concrete moisture vapor emission through Calcium Chloride Testing:
1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F) and 50 percent relative humidity (plus or minus 10 percent). When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
  2. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 In the first 1.000 square feet and 1 per each additional 1,000 square feet.
  3. Tests sites are to be cleaned of all adhesive residue, curing compounds, paints, sealers, floor coverings, and similar materials. 24 hours prior to the placement of test kits.

4. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time.
  5. Expose Calcium Chloride and set dish on concrete surface.
  6. Install test containment dome and allow test to proceed for 60 to 72 hours.
  7. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.
  8. Weigh test dish on site recording weight and stop time.
  9. Calculate and report results as pounds of emission per 1,000 square feet per 24 hours."
- F. Testing Procedures, quantification of Acidity/Alkalinity (pH) Level:
1. At or near the relative humidity test site and each vapor emission (calcium chloride) test site, perform pH test.
    - a. At each testing site, lay down a loose 2 foot by 2 foot sheet of non-perforated sheet backed by plywood. Leave in place for 48 hours.
    - b. Remove sheet and place several drops of distilled or de ionized water onto the concrete surface to form a puddle approximately 1 inches in diameter.
    - c. Allow the water to set for approximately 60 seconds.
    - d. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
  2. Record and report results.
- G. Testing Procedures:
1. Initial testing: Provide 3 tests for the first 1,000 square feet.
  2. Add one test for each additional 1,000 square feet.
  3. Concrete surface area to be tested shall be completely clean as specified herein under Preparation.
  4. Perform moisture tests in strict accordance with the kit manufacturer's Instructions. Moisture tests shall remain undisturbed for 60 to 72 hours.
  5. Immediately after moisture test has been removed from test area, conduct pH test in area previously covered by plastic dome of moisture test kit.
  6. After completion of tests submit 2 copies of test data to the Architect. Submit a copy of the test data to all installers of flooring materials and resinous flooring materials scheduled to be installed.
  7. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Perform such additional testing, at no additional cost to the Owner, after procedures have been performed to reduce moisture content to ratings acceptable to the various flooring and coating manufacturers.

### 3.4 FLOORING PREPARATION – GENERAL REQUIREMENTS

- A. Close spaces to pedestrian and worker traffic during the installation of the flooring.

- B. General: Comply with ASTM F710 and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient flooring adhesive by method acceptable to manufacturer.
1. Fill voids, cracks, and depressions with trowel-applied leveling compounds acceptable to manufacturer. Remove projections and repair other defects to tolerances acceptable to manufacturer.
  2. Remove, by light sanding and grinding, all protruding edges, high spots.
  3. Ensure substrate is flat to a plus or minus 1/8 inch in 10 feet tolerance. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
  4. Ensure that substrate is free from paint, varnish, wax, oil, or other foreign matter.
  5. For concrete substrates:
    - a. Concrete floors with steel troweled (slick) finish shall be properly roughened up (sanded) to ensure suitable adhesion.
    - b. Concrete floors with curing, hardening, and breaking compounds shall be abraded with mechanical methods only to remove compounds. Use blastrac or similar equipment.
  6. For Wood Substrates: Prepare substrate in accordance with manufacturer's recommendations and ASTM F1482.
- C. Removal of existing coatings and adhesives:
1. Painted flooring substrates: Remove all existing coatings on flooring substrates. Certain paints may contain lead. Conform to federal, state and local laws regarding appropriate methods for identifying lead-based paint and removing such paint, and notify Owner if lead-based paint has been identified.
    - a. Remove existing visible lead-based paint in compliance with applicable regulations and requirements of governing agencies having jurisdiction
    - b. Isolate work areas from other workers of this project, provide air sampling results and worker exposure samples as required by referenced regulations. Contractor is responsible for worker safety and environmental exposure of contaminants during the performance of this Work.
    - c. Remove all paint chips and debris using HFOA vacuums. Dispose of caustic waste, paint chips in compliance with Resource Conservation and Recovery Act (RCRA) and all other EPA, state and local authority requirements as might be applicable.
  2. In situ adhesive on flooring substrates: Use of commercial adhesive removers may adversely affect the bonding of a new flooring covering. Comply with The Resilient Floor Covering Institute (RFCI) publication "*Recommended Work Practices for Removal of Resilient Flooring Coverings*" and flooring product manufacturer's written instructions and technical advisories for removal of existing adhesives, so substrate is acceptable for new flooring installation and warranty.
  3. In situ asphalt-based adhesive on flooring substrates: Contact flooring product manufacturer's technical representative to obtain instructions for removal of existing asphalt-base adhesives so substrate is acceptable for new flooring installation and warranty.

- D. Protection of In-situ Conditions: During the operation of work of this Filed Sub-bid, protect surrounding materials and finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all existing surfaces which are soiled or otherwise damaged by Work of this Filed Sub-bid, to match indicated profiles and specified finishes. Materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work in conformance with the Contract Documents.
- E. Use HEPA Vacuum to clean substrate, and ensure that substrate is dry, clean and smooth prior to application of flooring. Perform vacuuming immediately prior to installation.
- F. Apply primers as recommended by adhesive manufacturer's written instructions.
- G. Condition flooring materials, accessories and adhesives to room temperatures for a period of 48 hours minimum, and as additionally required under individual Specification Sections.

### 3.5 FLOORING INSTALLATION GENERAL

- A. Install all products in strict accordance with each manufacturer's written installation procedures and other provisions specified herein.
  - 1. Apply primers as recommended by adhesive manufacturer's written instructions.

### 3.6 ADHESIVE BOND TESTING

- A. Use the specified flooring and recommended adhesive, install approximately 36 by 36 inch sized flooring as specified under individual flooring specification sections. Install test samples approximately 50 feet apart throughout the area, but not less than 1 test per 1000 square feet. Areas next to walls or other light traffic areas should be selected for the bond test. Tape down the perimeter of the flooring to prevent drying of the adhesive at the edges. After a minimum period of 72 hours the flooring should be pulled from the subfloor. If an unusual amount of force is required, the bond could be considered sufficient. Floors demonstrating unsuitable bond to substrate require modifications to flooring installation and may require application of moisture mitigation products. Review all conditions with Architect/Engineer.

### 3.7 PROTECTION

- A. Provide protection of completed flooring areas from construction traffic until Substantial Completion of the General Contract. Cover all floor surfaces with specified protective coverings. Taping edges to maintain position of the protection paper. Reapply papers as required to maintain floor protection.

End of Section

Section 09 00 09  
PAINTING FILED SUB-BID REQUIREMENTS  
(FILED SUB-BID REQUIRED)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
- C. Specification requirements for the Filed Sub-Bid "PAINTING" includes all work of the following listed Specification Sections, in their entirety:
1. Section 09 00 09 - PAINTING FILED SUB-BID REQUIREMENTS.
  2. Section 09 91 00 – PAINTING.
  3. Document 09 91 13 - EXTERIOR PAINTING SCHEDULE.
  4. Document 09 91 23 - INTERIOR PAINTING SCHEDULE.
- D. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings, not just those pertaining particularly to this Sub-Trade, unless specifically called out otherwise, regardless of where among the Drawings it appears: A0.1, A0.2, A0.3, D1.0, D2.0, A1.0, A1.1, A1.2, A2.0, A3.0, A3.1, A3.2, A3.3, A3.4, A4.0, A4.1, A5.0, A5.1
- E. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract.
- F. Sub-Bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in INVITATION TO BID and INSTRUCTIONS TO BIDDERS.
1. The following shall appear on the upper left hand corner of the envelope:  
  
NAME OF SUB-BIDDER: \_\_\_\_\_  
SUB-BID FOR TRADE: PAINTING
  2. Each Sub-Bid submittal for work under this Section shall be on forms furnished by Awarding Authority, as bound herein, accompanied with the required bid deposit.
- G. Sub Sub-Bid Requirements: NONE REQUIRED UNDER THIS SECTION.



1.2 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to INVITATION TO BID for time and date.

1.3 PRE-INSTALLATION CONFERENCE

- A. Installer of the Work of this trade is required to attend pre-installation conferences specified under the following specification sections:
  - 1. General review of painting requirements with Architect

1.4 SEQUENCING

- A. Phasing: Refer to Refer to Section 01 14 00 – WORK RESTRICTIONS, and Drawings for phasing and milestone completion requirements which affect the General Contractor's Work and the Work of this Filed Sub-Bid.
- B. Coordinate work of this Filed Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- C. Do not order or deliver any materials until all schedules and submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- D. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

**PART 2 - PRODUCTS**

- A. General: Filed Subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and herein.
  - 1. Scaffolding and staging required for use by this Filed Subcontractor pursuant to requirements of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-Trade requiring such scaffolding.
  - 2. Each Filed Subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover

scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and as additionally required for dust control).

3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility this Filed Subcontractor.
4. Enclose all exterior scaffolding outside of the construction fence with 8-foot high plywood enclosure at end of each work day to prohibit access to the scaffolding by unauthorized individuals.

## 2.2 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed Subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Filed Subcontractor, as referenced under Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

## **PART 3 - EXECUTION** (Not Used)

End of Section

Section 09 05 06

COMMON WORK RESULTS FOR FLOORING  
(FILED SUB-BID REQUIRED as part of Section 09 00 06)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

- A. This Section includes general requirements for flooring preparation, installation and temporary protection.
  - 1. Provide independent testing laboratory services to perform relative humidity, moisture vapor emission, and pH tests on in situ concrete slabs, which shall be in addition to testing as may be performed by Owner.

1.3 RELATED REQUIREMENTS

- A. Section 03 30 00: - CAST IN PLACE CONCRETE: Concrete sealers/coatings on exposed-to-view concrete floors.
- B. Section 09 05 06 - COMMON WORK RESULTS FOR FLOORING: General requirements for flooring preparation, installation and temporary protection.
- C. Section 09 65 23 - RUBBER FLOORING: Rubber tile and sheet flooring, rubber stair treads and risers.
- D. Section 09 68 13 - CARPETING: Carpet and transition strips.

1.4 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
  - 1. ASTM F-710 - Preparing Concrete Floors to Receive Resilient Flooring.
  - 2. ASTM F-1869 – Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
  - 3. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

## 1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. General: Coordinate flooring work with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Pre-Installation Meetings: At least 30 calendar days prior to commencing any flooring work, conduct a pre-installation conference at the Project site. Comply with requirements of Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION. Coordinate time of meeting to occur prior to installation of work under the related sections named below.
1. Required attendees:
    - a. Architect.
    - b. Construction Manager.
    - c. Project Superintendents representing each floor system installer.
    - d. Manufacturer's technical representative(s) for flooring products as designated by Architect or Construction Manager.
    - e. Representatives of related trades as directed by the Architect or Construction Manager, and representatives for installers of related work specified under the following Sections:
      - 1) Section 03 30 00 – Concrete Sealers.
      - 2) Section 09 65 23 - Rubber Flooring.
  2. Agenda:
    - a. Scheduling of preparation and flooring operations.
    - b. Procedures for testing of relative humidity and moisture content of in situ substrates.
    - c. Water vapor emission control methods.
    - d. Review of staging and material storage locations.
    - e. Coordination of work by other trades.
    - f. Protection of completed Work.
    - g. Establish humidity and temperature limitations for performing the work, to which Architect and Construction Manager must agree.
    - h. Discuss process for inspection and acceptance of completed Work of this Section.
- C. Sequencing:
1. Field Measurements
    - a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
    - b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.
  2. Ensure that installation of flooring and accessories occurs after other finishing operations, including painting.

1.6 RELATIVE HUMIDITY, MOISTURE VAPOR EMISSION AND ACIDITY/ALKALINITY (PH)TESTING

A. Concrete slabs and floors:

1. Construction Manager shall employ and pay for services of an independent testing laboratory to perform relative humidity, moisture vapor emission, and pH tests on concrete slabs as follows. The test shall be witnessed by the Construction Manager, flooring subcontractors and Owner's Project Representative.
  - a. Relative Humidity, Moisture Vapor Emission and pH Testing on all concrete slabs over-which a finished floor is to be installed. This includes, but is not limited to:
    - 1) Resilient sheet flooring, including (but not limited to) linoleum, and vinyl flooring.
    - 2) Resilient tile and plank flooring, including (but not limited to) linoleum, solid vinyl and composite flooring.
    - 3) Static dissipative flooring.
    - 4) Resinous flooring and seamless flooring of all types.
    - 5) Painted floors and concrete sealers.
    - 6) Carpet.
    - 7) Wood flooring of all types.
    - 8) Terrazzo (excluding sand-bed terrazzo systems).
  - b. Perform moisture and pH tests on all concrete floors over-which stone flooring is to be applied.
2. Requirements: As specified under Part 3 of this Section.
  - a. Submit 1 copy of test data to the installers of all flooring materials or coating materials scheduled to be installed.
  - b. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Perform such additional testing, at no additional cost to the Owner, after procedures have been performed to reduce moisture content to ratings acceptable to the various flooring and coating manufacturers.

**PART 2 - PRODUCTS** (Not Used)

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Verify that spaces to receive flooring finishes are suitable for installation. Do not proceed with work until unsatisfactory conditions are corrected. Comply with manufacturer's recommendations including the following:
1. Substrates shall be dry and clean.
  2. Substrates shall be free of depressions, raised areas, or other defects which would telegraph through installed flooring.
  3. Verify concrete substrates have a flat tolerance of 3/16" in ten linear feet.

4. Temperature of resilient flooring and substrate shall be within specified tolerances.
  5. Moisture condition and adhesive bond tests shall be performed as specified herein.
- B. For applications on concrete, verify curing, hardening, or breaking compounds have not been used. If there are any, do not proceed until compounds have been removed as specified.
  - C. For applications on concrete slab on grade or below grade, verify vapor barrier below slab was installed. If no vapor barrier was installed, do not proceed with work unless written acceptance of such conditions is received and submitted.
  - D. Perform testing of in situ concrete, relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings as specified herein. Do not proceed with work until results of moisture condition tests are acceptable.

### 3.2 PREPARATION

- A. General: Comply with flooring manufacturer's requirements for preparation of substrate to receive resilient flooring.
- B. Vacuum clean substrate, and ensure that substrate is dry, clean and smooth prior to application of flooring.
- C. Remove, by light sanding and grinding, all protruding edges, high spots.
- D. Ensure substrate is flat to a plus or minus 1/8 inch in 10 feet tolerance. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
- E. Ensure that substrate is free from paint, varnish, wax, oil, or other foreign matter.
- F. Apply primers as recommended by adhesive manufacturer's written instructions.
- G. Condition flooring materials, accessories and adhesives to room temperatures for a period of 48 hours minimum.

### 3.3 TESTING IN SITU CONCRETE SUBSTRATES

- A. Scope:
  1. Provide in situ concrete relative humidity and surface pH testing to all concrete slabs specified to be covered with floor coverings or resinous coatings. Includes concrete placed as part of this Work which occurs below grade, above grade (suspended slabs), and slabs on grade.
    - a. Existing building suspended slabs may be excluded from this requirement.
- B. Scheduling:

1. Testing shall take place after allowing concrete to dry for a minimum of 90 days. Testing to be scheduled no less than one, nor more than three weeks prior to scheduled flooring installation.
    - a. DO NOT conduct testing unless the slab environment is identical to that in which the finished flooring is to be installed.
  2. In the event new flooring is to be installed over existing resilient flooring, remove the portion of the existing flooring and adhesive directly under the area where testing will be conducted. Patch flooring to match existing construction after completion of testing.
- C. Test result submittals:
1. Report all test results in chart form listing test dates, time, depth of test well, in situ temperature, relative humidity, moisture vapor and pH levels.
  2. List test locations on chart and show same on marked up Floor Plan Drawings.
  3. Submit results in duplicate. Deliver copies directly to Architect, Owner's Project Representative and Construction Manager.
- D. Testing equipment: shall be equal to the following
1. For relative humidity testing:
    - a. Digital Meter and Calibrated Humidity and Temperature probe kit as manufactured by Vaisala Inc. (Boston Office) 10D Gill Street, Woburn, MA, 01801 (telephone 781-933-4500).
      - 1) Minimum 2 point probe calibration.
  2. For calcium chloride testing:
    - a. Anhydrous calcium chloride testing in accordance with Rubber Manufacturer's Association (RMA) Test requirements.
    - b. Test kits: Vaprecision, inc. 2941 West MacArthur Boulevard, Suite 135. Santa Ana, CA 92704 (telephone 800-449-6194).
  3. For pH testing:
    - a. pH test paper by Micro Essential Laboratory, Inc., P.O. Box 100824 4224 Avenue "H", Brooklyn, NY 11210, (telephone 718-338-3618).
    - b. Distilled or de ionized water.
- E. Testing Procedures Quantification of Relative Humidity
1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F), and 50 percent (plus or minus 10 percent) relative humidity. When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
  2. The number of in situ relative humidity test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000 square feet and 1 per each additional 1,000 square feet.

3. Drill test holes utilizing a roto hammer drill. Hole diameter shall not exceed outside diameter of the insertable test sleeve by more than 0.04 inch. Drilling operation must be dry. Determine the thickness of the concrete slab from Construction Documents. Depths of test holes shall be as follows:
    - a. For elevated slabs (not poured in pans): Drill test holes to a depth equal to 20 percent of the concrete thickness.
    - b. For slabs on grade and elevated slabs in pans: Drill test holes to a depth equal to 40 percent of the concrete thickness.
  4. Vacuum all concrete dust from test hole.
  5. Insert a hole liner, or sleeve, to the full depth of test hole, assuring that the liner is capped or plugged at the end protruding from the concrete surface.
  6. Permit the test site to acclimate, or equilibrate, for 72 hours prior to taking relative humidity readings.
  7. Remove the sleeve plug and place a probe into the sleeve assuring that it reaches the bottom of the test hole.
  8. Allow the probe to sit in the test sleeve for 30 minutes before taking readings.
  9. Read and record temperature and relative humidity at the test site.
- F. Testing Procedures - Quantification of Concrete Moisture Vapor Emission through Calcium Chloride Testing.
1. The test site should be maintained at the same temperature and humidity conditions as those anticipated during normal occupancy. These temperature and humidity levels should be maintained for 48 hours prior and during test period. If meeting this criteria is not possible, then minimum conditions should be 75 degrees F (plus or minus 10 degrees F) and 50 percent relative humidity (plus or minus 10 percent). When a building is not under HVAC control, a recording hygrometer or data logger shall be in place recording conditions during the test period. A transcript of this information must be included with the test report.
  2. The number of vapor emission test sites is determined by the square footage of the facility. The minimum number of tests to be placed is equal to 3 in the first 1,000 square feet and 1 per each additional 1,000 square feet.
  3. Test sites are to be cleaned of all adhesive residue, curing compounds, paints, sealers, floor coverings, and similar materials. 24 hours prior to the placement of test kits.
  4. Weigh test dish on site prior to start of test. Scale must report weight to 0.1 grams. Record weight and start time.
  5. Expose Calcium Chloride and set dish on concrete surface.
  6. Install test containment dome and allow test to proceed for 60 to 72 hours.
  7. Retrieve test dish by carefully cutting through containment dome. Close and reseal test dish.
  8. Weigh test dish on site recording weight and stop time.
  9. Calculate and report results as pounds of emission per 1,000 square feet per 24 hours."
- G. Testing Procedures Quantification of Acidity/Alkalinity (pH) Level



1. At or near the relative humidity test site and each vapor emission (calcium chloride) test site, perform pH test.
  - a. At each testing site, lay down a loose 2 foot by 2 foot sheet of non perforated sheet backed by plywood. Leave in place for 48 hours.
  - b. Remove sheet and place several drops of distilled or de ionized water onto the concrete surface to form a puddle approximately 1 inches in diameter.
  - c. Allow the water to set for approximately 60 seconds.
  - d. Dip the pH paper into the water and remove immediately, compare color to chart provided by paper supplier to determine pH reading
2. Record and report results.

H. Testing Procedures:

1. Initial testing: Provide 3 tests for the first 1,000 square feet.
2. Add one test for each additional 1,000 square feet.
3. Concrete surface area to be tested shall be completely clean. Remove all adhesives, residue, debris and sealing compounds. Remove all dust by vacuum or other methods. Do not use chemicals of any kind to clean concrete.
4. Perform moisture tests in strict accordance with the kit manufacturer's Instructions. Moisture tests shall remain undisturbed for 60 to 72 hours.
5. Immediately after moisture test has been removed from test area, conduct pH test in area previously covered by plastic dome of moisture test kit.
6. After completion of tests submit 2 copies of test data to the Architect. Submit a copy of the test data to all installers of flooring materials and resinous flooring materials scheduled to be installed.
7. Provide additional testing in the event test results indicate higher moisture content than recommended by the flooring material and coating material manufacturers for the installation of their products. Perform such additional testing, at no additional cost to the Owner, after procedures have been performed to reduce moisture content to ratings acceptable to the various flooring and coating manufacturers.

### 3.4 FLOOR PREPARATION – GENERAL REQUIREMENTS

- A. General: Comply with ASTM F 710-92 and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient flooring adhesive by method acceptable to manufacturer.
  1. Concrete floors with steel troweled (slick) finish shall be properly roughened up (sanded) to ensure suitable adhesion.
  2. Concrete floors with curing, hardening, and breaking compounds shall be abraded with mechanical methods only to remove compounds. Use blastrac or similar equipment.
- B. Fill voids, cracks, and depressions with trowel-applied leveling compounds acceptable to manufacturer. Remove projections and repair other defects to tolerances acceptable to manufacturer.
- C. Vacuum subfloors immediately prior to installation to remove loose particles.

3.5 ADHESIVE BOND TESTING

- A. Use the specified flooring and recommended adhesive, install approximately 3 by 3 foot sized flooring as specified under individual flooring specification sections. Install test samples approximately 50 feet apart throughout the area. Areas next to walls or other light traffic areas should be selected for the bond test. Tape down the perimeter of the flooring to prevent drying of the adhesive at the edges. After a minimum period of 72 hours the flooring should be pulled from the subfloor. If an unusual amount of force is required, the bond could be considered sufficient. Floors demonstrating unsuitable bond to substrate require modifications to flooring installation and may require application of moisture mitigation products. Review all conditions with Architect/Engineer.

3.6 PROTECTION

- A. Provide protection of completed flooring areas from construction traffic until Substantial Completion of the General Contract. Cover all floor surfaces with heavyweight kraft paper and overlay with red-rosin paper, taping the edges to maintain position of the protection paper. Reapply papers as required to maintain floor protection.

End of Section

SECTION 09 22 16

NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install:
  - 1. Metal furring and framing where indicated on the Drawings, including cross bracing and knee bracing.
  - 2. Metal ceiling framing system, including hanger attachments, wire hangers, and screwable metal tee grid system.
  - 3. Reinforcing plate blocking and gusset plates.
  - 4. Deflection track assemblies at tops of metal stud partitions.
    - a. Provide fire-rated assemblies at fire-rated, corridor, and smoke partitions.
    - b. Provide non fire-rated assemblies at all other partitions.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - ROUGH CARPENTRY:
  - 1. Wood blocking.
  - 2. Installation of metal door frames in veneer plaster work.
- B. Section 07 21 00 - THERMAL INSULATION: Thermal and acoustical batt insulation.
- C. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: Furnishing steel door frames.
- D. Section 08 31 00 - ACCESS DOORS AND PANELS: Shop primed access panels, occurring in partitions and walls.
- E. Section 09 29 00 - GYPSUM BOARD: Gypsum board, applied over metal framing installed by this Section 09 22 16 including: gypsum board, and related trim components.
- F. Section 09 51 00 - ACOUSTICAL CEILINGS: Suspended acoustical tile ceiling, including metal suspension system.

- G. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Supply and return air registers.
- H. Division 26 - ELECTRICAL: Independent hangers for suspended lighting fixtures.

### 1.3 REFERENCES

- A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  1. ASTM C 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process..
  2. ASTM C 645 - Non-Load Bearing Steel Studs, Runners, and Rigid Furring Channels for Screw Application of Gypsum Board.
  3. ASTM C 646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.
  4. ASTM C 754 - Installation of Steel Framing Members to Receive Screw- Attached Gypsum Wallboard.
  5. ASTM E 90 - Method of Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
  6. ASTM E 119 - Fire Tests of Building Construction and Materials.
  7. GA 203 - Installation of Screw-Type Steel Framing Members to Receive Gypsum board.

### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  1. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work
  2. Work of this Section shall be closely coordinated with the work of Section 09 29 00 - GYPSUM BOARD to assure the steady progress of the Contract.

### 1.5 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.

## 1.6 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
- B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer.
- C. Qualifications:
  - 1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
- B. Storage and Handling Requirements:
  - 1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
  - 2. Protect materials from damage due to moisture, surface contamination, corrosion and damage from construction operations and other causes.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Metal components and related items:
    - a. Georgia Pacific Corporation, Gypsum Division, Atlanta, GA.
    - b. Marino Industries Corp., South Plainfield, NJ.
    - c. National Gypsum Company, Gold Bond Products Division, Charlotte, NC.
    - d. Unimast Incorporated, Franklin, Park IL.
    - e. USG Corporation, Chicago, IL.
  - 2. Suspended furring system for ceilings and soffits:
    - a. Armstrong World Industries, Inc., Lancaster, PA.

Non Structural Metal Framing

- b. Chicago Metallic Corporation, Chicago, IL.
  - c. USG Corporation, Chicago, IL.
- B. The design and details as shown on the drawings and the model numbers specified herein are to establish the standards of design and quality and not to limit competition.

## 2.2 DESCRIPTION

- A. Regulatory Requirements:
1. Obtain certificate of compliance from authority having jurisdiction indicating approval of specified products.
  2. Fire resistance ratings: Where gypsum board systems with fire-resistance ratings are indicated, provide materials and assemblies of the rating required, tested per ASTM E 119, which are identical to those indicated by reference to Gypsum Association file numbers in "Fire Resistance Design Manual" or to design designation in the Underwriters Laboratories "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction and to the Owners' insurance underwriters.
    - a. Fire-Test-Response Characteristics: Provide components that comply with rating requirements specified for fire-rated assemblies under UL 2079 for non-load bearing wall systems.
      - 1) Deflection Clips and Firestop Track: Connections and/or top runner provided in fire-resistance-rated assemblies shall be certified by UL 2079 for cyclic movement requirements.

## 2.3 FRAMING MATERIALS

- A. "Hat shaped" Furring channels: 7/8 x 2-3/4 inch, roll-formed, hat-shaped, furring channel 25 gage hot-dip galvanized steel conforming to ASTM C 645.
- B. Resilient furring channels: Roll-formed, hat-shaped, 1/2 x 2-5/8 inch, 26 gage hot-dip galvanized steel conforming to ASTM C 645, with pre-punched holes, equal to Dietrich Industries, Inc., Pittsburgh PA, Metal Channel "RC1".
- C. Studs: 'C-shaped' screw studs, hot-dip galvanized steel complying to ASTM C 645, 18 gage (0.0329 inch [0.84 mm] minimum thickness), of widths indicated on the Drawings, or other gages as required under the specified standards to meet fire resistance ratings.
- D. Runners for metal studs: 'U-shaped' hemmed, hot-dip galvanized steel track conforming to ASTM C645, of gage and width to match respective stud sizes, or heavier gage per design requirements, having 1-1/4 inch leg, provided at tops and bottoms of all studs and at heads of all openings in stud partitions.

- E. Internal reinforcement for various stud conditions, and bracing as required: 10 gage, minimum, galvanized steel.
- F. Furnish cross bracing and knee bracing, as required to assure a completely rigid assembly on metal stud partitions and furred areas.

#### 2.4 DEFLECTION TRACK ASSEMBLIES:

- A. Non Fire-Rated Assemblies:
  - 1. Deflection Track: Manufacturer's standard top runner with extended flanges designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 or ASTM A 568. Thickness as indicated for studs, and width to accommodate depth of studs, and the following configuration.
    - a. Top runner with extended deep flanges that either have V-shaped offsets that compress; slots 1 inch o.c. that allow fasteners attached to studs through the slots; or 16 gage sliding clip assemblies attached to top track and clipped to stud
- B. Fire-Rated Assemblies: Head of wall dynamic fire rated joint systems for head of wall assemblies in compliance with UL 2079 HW-D classified assemblies. Provide one of the following systems:
  - 1. Deflection track / clip system: The Steel Network, Inc., product "VertiClip", including step bushings. Clips and track 20 gage, and of width to accommodate depth of studs indicated.
  - 2. Deflection slip track System: Comply with requirements of ASTM C 645 except configuration, of thickness indicated for studs and width to accommodate depth of studs indicated with flanges offset to accommodate gypsum board thickness.
    - a. Fire Trak Corp., Kimball, MN products:
      - 1) "Shadowline" at balanced and unbalanced fire-rated assembly partitions.
      - 2) "Cavity Shadowline" at shaftwall and chase wall (double stud) partitions.
  - 3. Coordination: Verify with partition schedule on the Drawings to ensure proper depth of flange offsets at various partitions types.

#### 2.5 CEILING AND SOFFIT SUSPENSION MATERIALS

- A. Hanger attachments: Galvanized steel hanger eyes, of size and capacity to safely sustain a live load of at least 150 pounds per hanger attachment.
- B. Hangers: Soft temper, pre-stretched galvanized carbon steel wire, conforming with ASTM A641, with a yield stress load of at least three times design load,

Non Structural Metal Framing

but not less than 12 gage.

- C. Sound isolation hangers (Ceilings Type 10 and Type 12 as indicated on the Drawings): Pre-compressed neoprene rubber and spring isolation hanger designed for high frequency sound waves and low frequency vibrations. Size hangers as recommended by manufacturer for anticipated ceiling load.
1. Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Kinetics, Noise Control Inc., product, "IsoGrid Ceiling Hanger" as specified herein.
  2. Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
    - a. Kinetics, Noise Control Inc., Dublin, OH.
    - b. L.D. Peters and Sons, Inc., New Rochelle NY.
    - c. Mason Industries, Inc., Happaugue NY.
- D. Grid system for direct attachment of finish board: Comprised of double web main furring tees, 1 1/2 inches high by 1-3/8 inches flange face by 0.020 inch thick; double web cross tees, 1 1/2 inches high by 15/16 inch flange face by 0.020 inch thick; 0.020 inch thick wall channels, with 1-1/2 inches interior web height; and all splices, clips, and related items. Provide Underwriters Laboratories Label fire-rated assemblies for locations requiring fire-rated ceilings and soffits
1. Chicago Metallic product "System 640 and System 650 Furring System".
  2. Armstrong World Industries product "Drywall Furring System".
  3. Donn (USG) Corporation, Chicago IL, product "USG Drywall Furring System" with DGLW tees.

## 2.6 ACCESSORIES

- A. Metal sheet plate blocking and bracing, where indicated: galvanized sheet 0.0312 inch thickness (20 gage).
- B. Fasteners:
1. Expansion-type fasteners for securing vertical concrete and masonry surfaces.
  2. Concrete stub nails for securing runners to concrete.
  3. N<sup>o</sup>.7 by 7/16 inch Pan head self-drilling screw to attach metal framing components.
- C. Reinforcing plates for blocking: 20 gage cold rolled sheet steel, provide minimum 6 inch width, or as otherwise indicated on the drawings.



## PART 3 – EXECUTION

### 3.1 INSTALLATION, QUALITY STANDARDS

- A. General: Perform erection procedures for the various gypsum board system conditions, except as otherwise specified, as set forth in GA 201, GA 206, the written instructions of gypsum board manufacturer, together with the additional requirements specified herein and as indicated on the Drawings.
- B. Wherever fire-resistive rated assemblies are indicated on the Drawings, erect gypsum board systems in strict accordance with the manufacturers' UL listed test constructions for the required fire rating on each specific assembly.

### 3.2 INSTALLATION OF FURRING

- A. Install metal furring channel horizontally, with channels spaced not more than 16- inch on centers , and attaching the channels to the masonry or concrete substrates with expansion type fasteners spaced not more than 8 inches on centers. Shim beneath channels as needed to ensure that a uniform receiving plane is maintained throughout.

### 3.3 INSTALLATION OF PARTITION FRAMING, GENERAL

- A. Install metal runners at floor and ceiling to structural elements with suitable fasteners located 2 inches from each end and intermediate fasteners spaced no greater than 24 inches.
- B. Install metal stud framing with open side facing in same direction, engaging floor and ceiling runners.
  - 1. Stud spacing:
    - a. Typical: 16 inches on-center.
    - b. For partitions supporting wall cabinets and other wall mounted equipment: 12 inches on-center.
    - c. For curved partitions space framing closer together than normal to prevent flat areas between framing members.
  - 2. When necessary to splice studs, nest stud with 8 inch overlap and screw studs together with screws on both flanges.
  - 3. Where studs are installed directly to exterior masonry walls, install asphalt felt between stud and wall.
- C. Install studs in direct contact with all door and window frame jambs, abutting partitions, partition corners and existing construction elements; screw fasten with screw through both flanges of studs and track, top and bottom.

- D. Securely anchor studs to jamb and head anchors of steel door and window frames. Over head of frames and openings in partitions, install a horizontal section of runner with a web flange bent at each end, horizontally and secure to strut studs with two screws in each bent web. Provide cripple studs over wall openings.
- E. Where horizontal studs are used for wall reinforcing or framing, cut pieces of stud and install horizontally between vertical studs. Cope horizontal studs to fit between flanges of vertical studs. Bend ends of horizontal studs or install clip angles in order to secure by screwing to vertical studs.
- F. Furnish and install additional cross bracing and knee bracing and other framing elements, as required to assure a completely rigid assembly on metal stud partitions and furred areas, whether or not such bracing has been indicated on the Drawings, and for proper receipt of items which will be attached to partition surfaces.

#### 3.4 INSTALLATION OF DEFLECTION TRACK

- A. Isolate interior metal stud framing and shaft wall framing from building structure to prevent transfer of loading imposed by structural movement due to deflection.
  - 1. Install deflection track top runner in accordance with manufacturer's instructions and as required to attain lateral support and avoid axial loading.
  - 2. Install fire-rated deflection track top runner in accordance with manufacturer's instructions at top of fire-rated, corridor and smoke partitions.

#### 3.5 INSTALLATION OF REINFORCING PLATE BLOCKING

- A. Install steel reinforcing plates in partitions and furred walls for the support of wall mounted objects as follows:
  - 1. Wherever such reinforcing plates are indicated on the drawings.
  - 2. In locations where wall bumpers are to be installed for the protection of wall surfaces from swinging doors. (See Section 08 71 00 - DOOR HARDWARE).
- B. Secure gage sheet metal reinforcing plates to steel studs with 1-1/4", Type "S" bugle head screws.

#### 3.6 INSTALLATION - CEILING SUSPENSION SYSTEM

- A. Coordinate layout and installation of suspension system components for suspended ceilings with other work supported by, or penetrating work of this section. Re-adjust ceiling suspension system, prior to the installation of plaster base and after installation of mechanical and electrical equipment and fixtures by the respective trades.

- B. Install all components of concealed grid system in accordance with the manufacturer's instructions, with current ASTM C 636 requirements, with design and installation of suspended grid system safely sustaining a membrane loading of at least 7.9 pounds per square foot.
- C. Install hangers not more than 24 inches on centers over locations of main tee members. Install hanger wires to hanger attachment with triple twists. Install additional wires as required to provide support for main tees, at intervals not exceeding four feet, wherever main tees must be interrupted in order to install other work and at all other locations as may be directed by the Architect.
- D. Install main tees parallel to long dimension of the area, at spacing not to exceed 48 inches on-center. Secure with hanger wire as the work progresses. Install cross tees as recommended by the system manufacturer, except spacing shall not exceed 16 inches on-center.

### 3.7 TOLERANCES

- A. Install partition and ceiling framing and furring with a maximum variation from true flatness of 1/8 inch per 10 feet, noncumulative.

END OF SECTION

SECTION 09 29 00  
GYPSUM BOARD

**PART 1 - GENERAL**

1.1 SUMMARY

- A. The work of this Section consists of gypsum board (drywall) and trim finishes for partitions, ceilings, and soffits, where shown on the Drawings, as specified herein, for a complete and proper installation.
- B. Furnish and install:
  - 1. Taped, compounded and sanded gypsum board finishes.
  - 2. Abuse resistant gypsum board and primer coating at all walls
  - 3. All trim and accessory components related to gypsum board work.
  - 4. Acoustical joint sealant and backing at perimeter of gypsum board partitions.
  - 5. Firestopping sealant at partition heads and gypsum drywall walls and partitions to abutting dissimilar materials.
  - 6. Patch and repair GWB ceilings, soffits and walls where mechanical work has occurred.
  - 7. Provide GWB chase walls for the routing of new mechanical work.
  - 8. Provide GWB furred walls for the routing of new mechanical work.
- C. Install access panels occurring in gypsum board work furnished by Section 08 31 00 - ACCESS DOORS AND PANELS, and by trades requiring the same.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - CARPENTRY:
  - 1. Supplemental wood framing and blocking supporting gypsum board.
  - 2. Installation of metal door frames in gypsum board work.
- B. Section 07 21 00 - THERMAL INSULATION.
- C. Section 08 31 00 - ACCESS DOORS AND PANELS: Shop primed access panels, occurring in partitions and walls.
- D. Section 09 22 16 - NON-STRUCTURAL METAL FRAMING: Non-load bearing partition and ceiling framing and furring to receive board material.
- E. Section 09 51 00 - ACOUSTICAL CEILINGS: Suspended acoustical tile ceilings.
- F. Section 09 81 00 – ACOUSTICAL INSULATION: Acoustical batt insulation.

- G. Section 09 91 00 - PAINTING: Applied finish coatings.
- H. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Supply and return airregisters.
- I. Division 26 - ELECTRICAL: Independent hangers for suspended lighting fixtures.

### 1.3 REFERENCES

- A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ASTM C 475 - Joint Treatment Materials for Gypsum Wallboard Construction.
  - 2. ASTM C 630 - Water Resistant Gypsum Backing Board.
  - 3. ASTM C 754 - Installation of Steel Framing Members to Receive Screw- Attached Gypsum Board.
  - 4. ASTM C 919 - Use of Sealants in Acoustical Applications.
  - 5. ASTM C 1002 - Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - 6. ASTM C 1047 - Accessories for Gypsum wall board and veneer base.
  - 7. ASTM C 1396 - Gypsum Wallboard.
  - 8. ASTM D 3678 - Polyvinyl chloride material for indoor exposure.
  - 9. ASTM D 1784 - Polyvinyl chloride material for outdoor exposure.
  - 10. ASTM E 90 - Method of Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
  - 11. ASTM E 119 - Fire Tests of Building Construction and Materials.
  - 12. GA 201 - Gypsum Board for Walls and Ceilings.
  - 13. GA 214 - Recommended Specifications for Levels of Gypsum Board Finish.
  - 14. GA 216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
  - 15. GA 220 - Recommended Specifications for Gypsum Board Winter Related Job Problems.
  - 16. UL - Fire Resistance Directory.
  - 17. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
  - 18. ANSI A108.11 - Interior Installation of Cementitious Backer Units.
  - 19. ANSI A118.9 - Cementitious Backer Units.
  - 20. All applicable federal, state and municipal codes, laws and regulations for fire rated assemblies.

### 1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
  - 2. Work of this Section shall be closely coordinated with the work of Section 09 22 16 - NON- STRUCTURAL METAL FRAMING, to assure the steady progress of the Contract.
- B. Sequencing:
  - 1. Do not install gypsum board until all pipes, ducts, conduits, and other such items which are to be enclosed thereby, have been permanently installed, inspected and approved.

## 1.5 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
  - 1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
  - 2. Shop Drawings:
    - a. Details of any special conditions associated with fireproofing.
    - b. Mark-up a set of blackline interior elevations indicate corrections to grid layout and provide dimensioning showing locations of all proposed control joints and expansion joints.
      - 1) Provide interior elevation drawings for interior elevations which are not included as part of the Contract Drawing set.  
recycled content and provide documentation certifying products are from recycled sources.

## 1.6 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
- B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum board.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  - 2. Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer or supplier.

- B. Storage and Handling Requirements:
  - 1. Store materials inside, under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.
    - a. Neatly stack board materials flat to prevent sagging.
  - 2. Handle board materials so to prevent damage to edges, ends and surfaces.
  - 3. Protect trim, accessories and corner beads from being bent or damaged.

## 1.8 SITE CONDITIONS

- A. Environmental Conditions: In accordance with GA 216, maintain minimum ambient temperature of 50 degrees Fahrenheit 48 hours before, during taping and compounding, and until completely dry thereafter.

## **PART 2 - PRODUCTS**

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Gypsum board products:
    - a. United States Gypsum Company, Chicago, IL. (USG).
    - b. National Gypsum Company, Gold Bond Products Division, Charlotte, NC. (Gold Bond).
    - c. G-P Gypsum Corporation, Atlanta, GA.
    - d. Lafarge Corporation, Hendron, VA.
  - 2. Abuse-Resistant Fiberock (ARGB):
    - a. United States Gypsum Company, Chicago, IL. (USG).
    - b. National Gypsum Company, Gold Bond Products Division, Charlotte, NC. (Gold Bond).
  - 3. Polyvinyl chloride trim and accessories:
    - a. Plastic Components, Inc., Miami, FL.
    - b. Vinyl Corporation, Miami, FL.
    - c. Alabama Metal Industries Corporation, (AMICO) Birmingham, AL.
  - 4. Joint Sealants:
    - a. Tremco, Beachwood, OH.
    - b. United States Gypsum Company, Chicago, IL.
    - c. Pecora Corporation, Harleysville, PA.
- B. The design and details as shown on the Drawings and the model numbers specified herein are to establish the standards of design and quality and not to limit competition.

### 2.2 DESCRIPTION

A. Regulatory Requirements:

1. Obtain certificate of compliance from authority having jurisdiction indicating approval of specified products.
2. Fire resistance ratings: Where gypsum board systems with fire-resistance ratings are indicated, provide materials and assemblies of the rating required, tested per ASTM E 119, which are identical to those indicated by reference to Gypsum Association file numbers in "Fire Resistance Design Manual" or to design designation in the Underwriters Laboratories "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction and to the Owners' insurance underwriters.

2.3 BOARD MATERIALS

A. Abuse resistant gypsum board (ARGB) Impact resistant UL type FRX fire resistance type, ASTM C-1278 board 5/8 inch thick with tapered edges and of lengths to minimize end joints. Board shall consist of an exposed face of gypsum and cellulose fibers, an unexposed face having glass fiber-mesh scrim embedded in gypsum and cellulose fibers, and a perlite core. Acceptable product and manufacturer: USG "Fiberock Abuse-Resistant Gypsum Fiber Panels or approved equal.

1. Acceptable products include the following, or approved equal:
  - a. USG Sheetrock
  - b. National Gypsum Company, Gold Bond
  - c. G-P Gypsum Corporation product, "Toughrock Fireguard".
2. Performance properties:
  - a. Surface abrasion: 0.087 inch, when tested in accordance with ASTM D4777 with 25 pound added weight, 50 abrasion cycles.
  - b. Surface indentation: 0.14 inch, when tested in accordance with ASTM D5420 with 72 in-lb drop energy.
  - c. Soft body impact, when tested in accordance with ASTM E695:
    - 1) Surface failure: 180 ft-lb.
    - 2) Deformation failure: 240 ft-lb, with L/240 deflection.
  - d. Penetration failure: More than 300 ft-lb.
  - e. Hard body impact, when tested in accordance with swinging ram apparatus: 99ft-lb.
3. Provide one full coverage coating of manufacturer's recommended primer to prevent flashing of paint equal to USG "Sheetrock Tuff-Hide Primer".

2.4 ACCESSORIES

A. Gypsum board polyvinyl chloride trim accessories, conforming to ASTM D 1784 and C 1047.



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1. J Bead: Edge trim with exposed 1/2 inch face cap, furnish trim model number corresponding to the board thickness where installed.
    - a. Plastic Components model number: 200X-50 (for 1/2 inch thick board) or 200S-58 (for 5/8 inch thick board).
    - b. Vinyl Corp. model number: JB50 (for 1/2 inch thick board) or JB58 (for 5/8 inch thick board).
    - c. AMICO. model number: AMJB50 (for 1/2" thick board) or AMJB58 (for 5/8" thick board).
  2. L-Bead with removable leg: Casing edge trim for joints at ceilings doors and windows, with removable leg strip, furnish trim model number corresponding to the board thickness where installed
    - a. Plastic Components model number: 224-50 (for 1/2 inch thick board) or 224-58 (for 5/8 inch thick board).
    - b. Vinyl Corp. model number: CT-50(for 1/2 inch thick board) or CT-58 (for 5/8 inch thick board).
    - c. AMICO product "Zip Strip" model number: AMZIP50 (for 1/2 inch thick board) or AMZIP58 (for 5/8 inch thick board).
  3. L Bead: casing edge trim, furnish trim for edge conditions not covered by removable leg specified above; model number corresponding to the board thickness where installed
    - a. Plastic Components model number: 221-50 (for 1/2 inch thick board) or 221-58 (for 5/8 inch thick board).
    - b. Vinyl Corp. model number: SB50 (for 1/2 inch thick board) or SB58 (for 5/8 inch thick board).
    - c. AMICO. model number: AMSB50 (for 1/2 inch thick board) or AMSB58 (for 5/8 inch thick board).
  4. Corner beads, 90 degree with 1-1/4 inch flanges:
    - a. Plastic Components model number: 209.
    - b. Vinyl Corp. model number: CB125.
    - c. AMICO. model number: AMCB125.
  5. Arch corner beads with 1-1/4 inch flanges, one flange slotted
    - a. Plastic Components model number: 209A.
    - b. Vinyl Corp. model number: CB125A.
    - c. AMICO. model number: AMCB125A.
  6. Control joints: "V" type joint with nominal 3/16 inch reveal and removable temporary tape:
    - a. Gold bond model "EZ Strip Expansion Joint".
    - b. Plastic Components model number: 2027-16.
    - c. Vinyl Corp. model number: CJV16.
    - d. AMICO. model number: AMDCJV16.
- B. Paper faced trim accessories for use with Abuse Resistant Gypsum Board:
1. Corner beads (at outside corners): Paper-faced galvanized steel sheet for finishing with joint compound conforming with ASTM C-1047,

GYPSUM BOARD

09 29 00 - 6

equal USG product "Sheetrock" Brand Paper-Faced Metal Corner Bead.

- a. Provide curved-edge cornerbead with notched or flexible flanges at curved openings.
2. Casing beads: Paper-faced galvanized steel sheet for finishing with joint compound conforming with ASTM C-1047, equal to USG product "Sheetrock" Brand Paper-Faced Metal Beads and Trims.
  - a. LC-Bead (J-Bead): Use at exposed panel edges.
  - b. L-Bead: Use where indicated
  - c. U-Bead: Use where indicated.
3. Control joints: Solid zinc "V-shaped control joint, having 3/32 inch thick perforated grounds, equal to USG Control Joint No. 093.

C. Tapes and compound:

1. Primer/surfacer (at ARGB only): High build spray applied primer/surfacer USG, product "Tuff-Hide" or approved equal. Primer/surfacer shall be provided by the same manufacturer as the abuse resistant gypsum board.
2. Joint tape (at paper-faced gypsum): Nominal 2 inch wide, high strength, cross- fibered paper drywall tape.
3. Joint tape (at fiberglass faced gypsum): Nominal 2 inch wide, self adhering (adhesive backed), fiberglass mesh tape.
4. Joint Compound for setting fiberglass joint tape:
  - a. Cetainteed, Valley Forge PA., product "ProRock Moisture and Mold Resistant 90".
  - b. Georgia Pacific Gypsum LCC., Pittsburgh PA, product "Densarmor Cote"
  - c. CTS Cement Manufacturing Corporation, Cypress CA., product "Rapid Set OnePass".
5. Joint Compound for setting paper joint tape: 'Speed-setting type compound', field mixed.
  - a. Acceptable products, or approved equal:
    - 1) USG product "Durabond 20".
    - 2) Gold bond product "Stay Smooth 30".
    - 3) Georgia Pacific Gypsum LCC, product "ToughRock All-Purpose Dry Mix"
6. Joint Compound for finishing: field mixed joint compound or factory pre-mixed compound.
  - a. Field-mixed compounds: acceptable products, or approved equal:
    - 1) USG product "Durabond 90".
    - 2) Gold bond product "Stay Smooth 90".
    - 3) Georgia Pacific Gypsum LCC, product "ToughRock Setting Compound 90".
  - b. Factory pre-mixed compounds: acceptable products, or approved equal:

- 1) USG product "Ready-Mixed Joint Compound".
  - 2) Gold bond product "All Purpose Compound".
  - 3) Georgia Pacific Gypsum LCC, product "ToughRock Ready Mix All- Purpose Compound"
- D. Fasteners (interior board systems):
1. Type S, bugle head screws complying with ASTM C 1002, for applying gypsum board to metal framing, ceiling grid system, and furring channels.
    - a. Not less than 1 inch long for single layer gypsum board.
    - b. Not less than 1-5/8 inch [41mm] long for double-layer gypsum board.
  2. Type W, bugle head screws complying with ASTM C 1002, for applying gypsum board to wood plywood backing, and blocking
    - a. Not less than 1-1/4 inch [31mm] long for single layer gypsum board
    - b. Not less than 1-5/8 inch [41mm] long for double-layer gypsum board,
  3. Type S-12, fine thread self-drilling screws complying with ASTM C 1002, for applying gypsum board to light gage metal framing.
    - a. Not less than 1 inch [25 mm] long for 1/2 inch thick single layer gypsum board.
    - b. Not less than 1-1/4 inch [31mm] long for 5/8 inch thick single layer gypsum board.
    - c. Not less than 1-5/8 inch [41mm] long for double-layer gypsum board,
- E. Ceiling buttons, perforated type, 1 inch diameter, for use at multiple layered gypsum board ceiling systems.
- F. Laminating adhesive: USG Durabond Joint Compound 90, USG Ready-mixed All Purpose Compound, or equal.
- G. Joint Sealers (interior acoustical sealant type): One component acrylic latex, permanently elastic, non-staining, non-shrinking, non-migrating and paintable. Acceptable products include the following, or approved equal.
1. Tremco, Beachwood OH; product, "Acoustical Sealant".
  2. United States Gypsum Company, Chicago IL; product "USG Acoustical Sealant".
  3. Pecora Corporation, Harleysville PA; product " AC-20 FTR".
- H. Silicone firestop sealant: Single component, non-combustible silicone elastomer firestop sealant, U.L. classified as a "fill, void, or cavity material" for through penetration firestop system when tested in accordance with ASTM E-814/UL1479.
1. Acceptable products include the following, or approved equal:
    - a. Bio Fireshield, product product "Biotherm 100" (Gun Grade) or "Biotherm 200" (Self Leveling).
    - b. Specified Technologies, Inc., product "Spec Seal Pensil 300 Sealant (gun grade)" or "Spec Seal Pensil 300SL" (Self Leveling).

- c. 3M Company, product "Fire Barrier Silicone Sealants".
    - d. Tremco Inc., product product "Tremsil" (Gun Grade) or "Tremsil S/L" (Self Leveling).
  - 2. Sealants will not dissolve in water.
- I. Intumescent firestop sealant and caulks: Acrylic based, water resistant sealant, which will not re-emulsify after drying.
  - 1. Acceptable products include the following, or approved equal:
    - a. Bio Fireshield, product "Biostop 500".
    - b. Specified Technologies, Inc., product "Spec Seal Triple-S Sealant".
    - c. 3M Company, product "Fire Barrier Caulk CP25WB+".
    - d. Tremco Inc., product "Tremstop 1A".
- J. Liquid sealer for cuts, holes and ends of moisture resistant board; provide one of the following or acceptable equal.
  - 1. Shellac type sealer: mix 4 pounds of orange or bleached shellac dissolved in 1 gallon of denatured ethyl-alcohol.
  - 2. Varnish type sealer: Fast setting marine varnish.

## 2.5 SOURCE QUALITY CONTROL

- A. Obtain gypsum board products from a single manufacturer, or from manufacturers recommended by the prime manufacturer of gypsum boards.

## **PART 3 - EXECUTION**

### 3.1 EXAMINATION

- A. Verify that all items which are to be enclosed by Work of this Section, have been permanently installed, inspected and approved.
- B. Inspect framing and other substrates; verify that they are in proper condition to receive the work of this Section.
- C. Beginning of installation means acceptance of existing substrate and site conditions.

### 3.2 PREPARATION

- A. During the operation of gypsum board work, protect all wood, metal, glass, flooring, and other finished materials against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled.

### 3.3 INSTALLATION - GENERAL

- A. General: Perform erection procedures for the various gypsum board system conditions, except as otherwise specified, as set forth in GA 201, GA 216, GA 220, the written instructions of gypsum board manufacturer, together with the additional requirements specified herein and as indicated on the Drawings.

- B. Where fire-resistive rated assemblies are indicated, erect gypsum board systems in strict accordance with the manufacturers' UL listed test constructions for the required fire rating on each specific assembly.
- C. Install specified control joints where indicated on Drawings and where run of partitions, or furred surfaces exceeds 30 feet. Show locations of all control joints on shop drawings.
  - 1. Locate control joints at corners of head frames of doors.
  - 2. Run vertical control joints continuously to top of partition, shaft wall or furred area, as applicable.

### 3.4 INSTALLATION OF GYPSUM BOARD

- A. Screw fasten only, gypsum board to framing and furring, with ends and edges occurring over firm bearing. At all door jambs screw fasten gypsum panels 8 inches on center to both box studs
  - 1. Erect single layer fire-resistance rated gypsum board vertically.
  - 2. Erect standard and moisture resistant layer board in most economical direction.
  - 3. Erect ceiling and soffit gypsum boards to meet UL requirements, where applicable, stagger end joints over supports. Secure gypsum board with fasteners inserted through ceiling buttons; anchor fasteners directly to framing or suspended support system.
- B. Wherever items penetrate the gypsum board surfaces, use extra care in cutting the gypsum board to ensure a uniformly-dimensioned joint between the penetrating item and the gypsum board, and fill joints with specified sealant material. Verify the expected deflection factor of the penetrating members, and cut the gypsum accordingly, to prevent damage thereto from the deflecting members.
- C. Treat cut edges and holes in moisture resistant gypsum board with approved liquid sealer.
  - 1. If shellac is used, apply in thin layers to dry quickly.
- D. Installing Trim Accessories:
  - 1. General: For trim with back flanges intended for fasteners, attach to framing with same screw fasteners used for gypsum board. Otherwise, attach trim according to manufacturer's written instructions.
    - a. Nailing, stapling, or crimping methods to install trim components is prohibited.
  - 2. Install corner beads at all exterior corners of gypsum boards.
  - 3. Install casings (PVC trim) wherever gypsum board meets a dissimilar material, and in other locations indicated on the Drawings, except at floors where bottom of the board will be concealed by base, integral with flooring, resilient base, wood base or carpeted base.

### 3.5 INSTALLATION OF CEMENT BOARD

- A. Walls:
1. Wall framing substrate: Do not install cement board directly over protrusions from stud plane such as heavy brackets or fastener heads.
  2. Make necessary cut-outs. Install cement board horizontally leaving 1/8 to 3/16 space at all joints, including joints with dissimilar materials. Stagger board joints with those of adjacent rows.
  3. Fasten cement board with 1-1/4 inch length type S bugle head screw. Fasten boards every 8 inches on center in field and along edges. At edge conditions, locate fasteners between 1/2 inch to 2 inches from board edge.
  4. At all joints and corners, fill gap solidly with dry-set or latex-modified, portland cement mortar and imbed 2 inch mesh fiberglass table and smooth material over joint and corner.

### 3.6 APPLICATION OF ACOUSTICAL SEALANT

- A. General: Install sealant and backing in accordance with the recommendations of ASTM C-919 and sealant manufacturer's recommendations.
1. Perform preparation in accordance with C-790. Thoroughly clean all joints, removing all loose mortar, oil, grease, dust, frost, and other foreign materials that will prevent proper adhesion of primers and sealant materials.
  2. If so recommended and furnished by the specific sealant manufacturer, apply primer to all joint surfaces, taking care not to stain adjacent surfaces.
- B. Seal all partition perimeters prior to taping or compounding. Where perimeters are edged with metal trim, apply sealant and backing material between trim and dissimilar material.
- C. Seal all penetrations in partition types designated for "acoustical" insulation. Penetrations to receive sealant include electrical boxes, plumbing, heating and air conditioning ducts, telephone, intercom hookups and similar items.
1. Install joint bead back-up in all joints in excess of 5/8-inch depth, and joints that have no back-up therein, placing the joint bead in the joint in a manner that will assure a constant depth 1/8 inch greater than the sealant and caulking material depth tolerances.
    - a. Set beads into joints continuously, by slightly stretching during placement, to permit compression against sides of joint, without surface wrinkles or buckles.
    - b. Do not stretch back-up material into joints.
    - c. Install bond breaker wherever recommended by the sealant manufacturer to prevent bond of the sealant to surfaces where such bond might impair the Work.
  2. Apply sealant in continuous beads without open joints, voids or air pockets
    - a. The depth of sealant and caulking materials shall be in accordance with manufacturer's recommendations for the specific joint function,

but in no case exceed 1/2-inch in depth, nor less than 1/4-inch, regardless of the joint width.

3. Remove the temporary masking tape immediately after tooling, and before the sealant or caulking material has taken initial set.

### 3.7 APPLICATION OF JOINT TREATMENT

- A. Install joint tape at all joints where gypsum boards abut and where boards form internal corners, whether or not such joints will be concealed from view.
- B. Apply compound to all joints, edges, corners, fastener head depressions and abrasions in the surfaces, whether or not such conditions will be concealed from view. Sand completely smooth all compound surfaces, which will be exposed to view, and leave ready to receive applied coatings or finish.
- C. Provide the minimum levels of gypsum board finishes as defined by the Gypsum Association recommended specifications GA-214 and GA-216, per the following:
  1. At areas hidden from view, except as otherwise specified: Level 2.
  2. At areas hidden from view, requiring a fire rating: Level 2.
  3. At concealed plenum spaces above ceilings attic spaces: Level 2.
  4. At non-occupied spaces (i.e. attics): Level 2.
  5. At surfaces scheduled to receive tile: Level 2.
  6. At surfaces scheduled to receive applied acoustical wall paneling: Level 2.
  7. At surfaces scheduled to receive plastic wall panels specified under Section 09 77 33 - SANITARY WALL PANELS: Level 3.
  8. The following areas shall receive painted finishes with semi-gloss and gloss sheen: Level 5.
    - a. All common areas, office, lobbies, vestibules, intern, and corridors.
    - b. Surfaces subject to long dimensional runs, sun-lit and grazed lighting conditions.
    - c. Boards having glass-fiber facing scheduled to receive a painted finish.
    - d. Spray apply primer at all ARGB in accordance with manufacturer's instructions to produce a Level 5 finish.
  9. All other surfaces, not described herewith above, shall receive "flat" (without any sheen), "pearlescent", and egg-shell low-gloss painted finishes: Level 4.

### 3.8 TOLERANCES

- A. Maximum variation for gypsum board partitions and ceilings from true flatness: 1/8 inch per 10 feet, noncumulative.

### 3.9 CLEANING

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- A. Daily clean work areas by sweeping and disposing of debris, scraps, and deposits of compound and gypsum fill.
- B. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of gypsum fill, and other materials installed under this Section.

END OF SECTION



Section 09 30 00  
TILING  
(FILED SUB-BID REQUIRED)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
  - 1. Filed-Bid Subcontractors on this project are required to provide Payment and Performance Bonds for the full value of their Filed-Bid Subcontractor Contracts, and Filed-Bid Subcontractors must include the full cost of the required Payment and Performance Bonds in the Bid price they submit.
- C. Specification requirements for the Filed Sub-bid "TILE" include all of the following listed Specification Sections: in their entirety:
  - 1. Section 09 30 00 – TILING.
  - 2. Section 09 05 60 – COMMON WORKS FOR FLOORING
- D. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings: A0.1, A0.2, A1.0, A1.1, A3.0, A3.1, A3.2, A4.1, A5.0, A5.1
  - 1. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract. The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing A001, as modified by Addenda.
- E. Filed Sub-Bids for work under this Section shall be for the complete work and shall be filed in manner, time and place as stipulated in Documents 00 11 16 = INVITATION TO BID, 00 21 13 INSTRUCTIONS TO BIDDERS,
  - 1. Each Sub-Bid submittal for work under this Section shall be on forms required by Awarding Authority, accompanied with the required bid deposit in compliance with MGL Chapter 149 Section 44B in the amount of 5 percent of Filed Sub-Bid.
- F. Sub Sub-Bid Requirements: NONE REQUIRED UNDER THIS SECTION.

1.2 SUMMARY

- A. Furnish and install the following:
  - 1. Porcelain floor tile (mud and thin set).
  - 2. Porcelain wall tile.

3. Tile base (scribe full size tile) and associated trim.
  4. Installation systems, adhesives, mortars and grouts.
  5. Fluid applied waterproofing membrane provide 100 percent coverage at all toilet rooms which are not slab-on-grade. Provide anti-fracture membrane at floor tile in rooms which are slab-on-grade.
  6. Installation systems, adhesives, mortars and grouts.
  7. Control joints in tiled floors and walls
  8. Metal transitions strips and trim.
  9. Protection of finished floors
  10. Stone Tresholds and saddles at toilet rooms
- B. Perform drilling and cutting in tile surfaces to accommodate penetrating items of other trades, from templates and instructions furnished by the respective trades.

### 1.3 EXAMINATION OF SITE AND DOCUMENTS

- A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Subcontractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.
- B. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to ADVERTISEMENT FOR BIDS for time and date.

### 1.4 RELATED REQUIREMENTS

- A. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- B. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
- C. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete slab substrate.
- D. Section 07 92 00 - JOINT SEALANTS: Backer rod and sealant at wall control joints and inside corners
- E. Section 08 31 00 - ACCESS DOORS AND PANELS, and by trades requiring the same: access panels, occurring in partitions and walls.
- F. Section 09 22 16 - NON-STRUCTURAL METAL FRAMING: Metal stud framing to receive board installed under Section 09 29 00.
- G. Division 22 - PLUMBING

H. Division 26 - ELECTRICAL:

1.5 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 – REFERENCES / DEFINITIONS. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
1. ANSI A108.1A - Installation of Ceramic Tile in the Wet Set Method, with Portland Cement Mortar.
  2. ANSI A108.1B - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
  3. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
  4. ANSI A108.6 - Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
  5. ANSI A108.9 - Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
  6. ANSI A108.10 - Installation of Grout in Tilework.
  7. ANSI A108.11 - Interior Installation of Cementitious Backer Units.
  8. ANSI A118.1 - Dry-Set Portland Cement Mortar.
  9. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile Setting and Grouting Epoxy and Water-Cleanable Tile Setting Epoxy Adhesive.
  10. ANSI A118.4 - Latex-Portland Cement Mortar.
  11. ANSI A118.6 - Ceramic Tile Grouts.
  12. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
  13. ANSI A137.1 - Specifications for Ceramic Tile.
  14. TCA Handbook for Ceramic Tile Installation, latest edition.
  15. ASTM A185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete (Withdrawn 2013)
  16. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)
  17. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
  18. ASTM C150 - Standard Specification for Portland Cement.
  19. ASTM C256 (Withdrawn Standard) – Method of Test for Flexural Strength of Magnesium Oxychloride Cements (Using Simple Bar with Two-Point or Single-Point Loading).
  20. ASTM C321 (Withdrawn Standard) – Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
  21. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
  22. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.

23. ASTM C627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.
24. ASTM C658 (Withdrawn Standard) - Standard Specification for Chemical-Resistant Resin Grouts for Brick or Tile.

#### 1.6 SEQUENCING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work.
- B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed Subcontract, have been received and approved by the Architect.
- C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Architect in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

#### 1.7 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 00 – SUBMITTAL PROCEDURES:
  1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for each item furnished hereunder.
    - a. Include maintenance data and recommended cleaning materials, and cleaning and stain removal methods.
  2. Selection samples:
    - a. Manufacturer's sample boards for each type and color group of tile specified, and grout colors, for selections by the Architect.
  3. Verification samples:
    - a. Mount tile and apply grout on one 24 by 24 inch cement backerboard board, for each tile type and selected color, to indicate color and texture variations, tile flatness and joint size variations.
    - b. Trim shapes and base, in selected colors in types and shapes indicated for project conditions.
  4. Grade Certificates: Manufacturer's Master Grade Certificates submitted prior to shipment of tile to project.

#### 1.8 QUALITY ASSURANCE

- A. Conform to ANSI/TCA A 137.1 and TCA Handbook for Ceramic Tile Installation.
- B. Installer, with a minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.
- C. Tiles delivered to the job or installed in the work which do not fall within the accepted color and texture range demonstrated by the samples shall be removed from the site and replace with acceptable materials.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver tile in manufacturer's sealed cartons, grade-sealed by the manufacturer in accordance with ANSI A 137.1, with grade-sealed unbroken, and clearly marked as to contents, color, and quantity.
- B. Store and protect containers above floor level, keep dry until ready for use.
- C. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions. Store epoxy mortar and epoxy grouts at 70 degrees Fahrenheit (21° C) temperature for 24 hours prior to use.

1.10 ENVIRONMENTAL CONDITIONS

- A. Do not install setting or grouting materials in a closed, unventilated environment. Ventilate propane or fossil fuel heaters to prevent damage to tile work from carbon-dioxide build up.
- B. Environmental conditions:
  - 1. General: Maintain ambient temperatures between 50 (10° C) and 80 (26° C) degrees Fahrenheit in tiled areas, for 24 hours prior to installation, during installation and for 7 days after completion.
  - 2. Special environmental conditions for epoxy setting and grout materials: Maintain ambient temperatures between 65 degrees Fahrenheit (18° C) and 80 degrees Fahrenheit (27° C) in tiled areas, for 24 hours prior to installation, during installation and for 7 days after completion.
  - 3. When temperature of substrate exceeds 90 (32° C) degrees Fahrenheit, contact manufacturer for instructions.

1.11 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.

1.12 WARRANTY

- A. General: Provide 2 year, non-pro-rated warranty under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS, and in compliance with Section 01 78 36 – WARRANTIES.
  - 1. Warranties shall be effective starting from Date of Project Substantial Completion and are effective for specified term lengths.
- B. Warranty shall provide for cracking, breakage or failure of tile due to defective workmanship.
  - 1. Materials must be compatible and from one source, single source responsibility for waterproofing, installation, Mortars and grouts. Job-site mixtures of sand portland cement and site dilution of additives shall not be permitted.
- C. Special Warranty: The Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of 5 years. This special warranty extends

the period of limitations contained in the General Conditions. Have the warranty countersigned by the installer and manufacturer.

- D. The manufacturer of installation systems, adhesives, grouts and mortars shall provide a comprehensive non pro-rated written five (5) year warranty against defective products which covers replacement materials and labor costs for demolition, tile accessories, and installation systems.
  - 1. Warranty to provide for tile lifting or separation from substrate, and setting bed/grout deterioration, when products have been installed with referenced TCA setting systems using specified setting and grout materials.
  - 2. Warranty excludes structural failure, movement or cracking of substrate materials, and workmanship performed not in accordance with manufacturer's instructions and industry standard guidelines.

#### 1.13 EXTRA MATERIALS

- A. Upon completion of the Work of this Section, deliver to the Owner extra materials in, an amount equal to 3 percent of tile and trim of each color, finish and type installed.
- B. Clearly label and package extra materials securely to prevent damage.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work are limited to the following include the following, or approved equal:
  - 1. Porcelain tile:
    - a. Crossville Ceramics, Crossville, TN.
    - b. Dal-Tile Corp., Dallas TX.
    - c. American Olean., Dallas TX.
    - d. Emil America, Dulles, VA.
    - e. Florim USA, Clarksville, TN.
    - f. Marazzi USA, Sunnyvale, TX.
    - g. Porcelanosa USA, Boston, MA
  - 2. Glass Tile:
    - a. American Olean., Dallas TX.
    - b. Dal-Tile Corp., Dallas TX.
    - c. Lioli Glass Tiles, Houston, TX.
    - d. Oceanside Glass & Tile, Calsbad, CA.
    - e. Tohickon Glass Tiles, Erwinna PA.
    - f. Trend Group USA, Miami FL.
  - 3. Mortars, adhesives & Grouts:
    - a. Ardex Americas, Aliquippa, PA.
    - b. Bostik Corp. (Hydroment), Middleton MA.

- c. C-Cure Chemical Company, Inc., Houston TX
  - d. Laticrete International, Inc., Bethany CT
  - e. MAPEI Americas USA, Deerfield Beach, FL.
  - f. Custom Building Products, Inc., Seal Beach, CA.
4. Edging materials:
- a. Schlüter Systems L.P., Plattsburgh NY.
  - b. Custom Building Products, Inc., Seal Beach, CA.
  - c. Ceramic Tool Company Inc., Waukesha WI.

## 2.2 TILE

- A. Basis of Design and Substitutions: To establish a standard of quality, design and function desired, Drawings and specifications have been based on "Basis of Design" tile products specified herein below. Products from other manufacturers meeting the requirements of these specifications with equivalent ranges of available color groups shall be considered as equal upon submission of complete product information as described in Section 01 25 13 - PRODUCT SUBSTITUTION PROCEDURES. Further additional information may be requested by the Owner or Architect for determination that the proposed product substitution is fully equal to the specified product(s).
- B. Color requirements: The Architect reserves the right to select tiles from full range of colors from all price groups for all Tile Types, without exception.
- C. Porcelain wall tile (Basis of Design): Crossville Ceramics, Crossville, TN., product series "Argent".
  - 1. Sizes and Patterns: 4" x 10" (At wall cabinets) and As indicated on Drawings, in colors selected from full range of colors and price groups offered by manufacturer, without restrictions.
- D. Porcelain floor tile (Basis of Design): Dal-Tile Corp., Dallas TX., product "Harmonist" color body floor tile, nominal 12 by 12 inch.
  - 1. Sizes and Patterns: As indicated on Drawings, in colors selected from full range of colors and price groups offered by manufacturer, without restrictions.
- E. Trim and special shapes: Provide all stops, returns, trimmers, and other shapes indicated or required to produce a completely finished installation.
  - 1. Except as may be otherwise indicated, provide color and finish matching adjacent tile.

## 2.3 SETTING MATERIALS

- A. Thin-set polymer-modified Portland cement dry-set mortar for wall tiles, complying with the bond strength requirements of ANSI A118.4.
  - 1. Acceptable products include the following, or approved equal:
    - a. Mapei product: "Ultraflex LFT.
    - b. Laticrete product number "255 Multimax".
    - c. Custom Building Products " MegaLite Ultimate Crack Prevention Large Format Tile Mortar"

### TILING

- B. Self-leveling underlayment, factory pre-mixed with primer: Provide primer at difficult (for adhesion) substrate conditions when recommended by manufacturer:
  - 1. Acceptable products include the following, or approved equal:
    - a. Mapei product: "Ultra/Plan Extreme" with primer.
    - b. Laticrete product: "86 LatiLevel", with primer.
    - c. Custom Building Products "Level Quik RS", with primer.
- C. Mortar bed (field mix) for thick-set applications:
  - 1. Portland Cement: Conforming to ASTM C150, Type 1.
  - 2. Sand: Dry Natural sand conforming to ASTM C144, graded as recommended by latex additive manufacturer for thickness of leveling bed.
  - 3. Latex additive: Equal to Mapei: "Planicrete 50" or Laticrete "3701 Mortar Admix," meeting the following additional requirements when mixed with mortar:
    - a. Compressive Strength per ASTM C109, 28 day strength: 4,000 pounds per square inch.
    - b. Tensile Strength per ASTM C109, 28 day strength: 630 pounds per square inch.
    - c. Flexural Strength per ASTM C256, 28 day strength: 1,100 pounds per square inch.
- D. Mortar bed (factory pre-mixed) for thick-set applications: Acceptable products are limited to:
  - 1. Mapei product: "3 to-1" with "Planicrete 50" additive.
  - 2. Laticrete product number "3701 Fortified Mortar Bed".
  - 3. Custom Building Products "Fast Setting Thick Bed Mortar"
- E. Mortar for porcelain tile: complying the requirements of ANSI A118.4.
  - 1. Acceptable products include the following or approved equal:
    - a. Mapei product: "Grani-Rapid".
    - b. Laticrete product number 254 Platinum.
    - c. Custom Building Products " Porcelain Tile Mortar"
- F. Mortar for glass tile: complying the requirements of ANSI A118.4.
  - 1. Acceptable products include the following or approved equal:
    - a. Mapei product: "Adesilex P10".
    - b. Laticrete product "Glass Tile Adhesive Mortar.
    - c. Custom Building Products " Glass Tile Premium Thin-Set Mortar"

## 2.4 GROUTING MATERIALS

- A. Epoxy grout, heavy duty: Multi-component epoxy grout, conforming to ANSI 118.3 and ASTM C658.
  - 1. Epoxy Grout shall be non-toxic, non-flammable, non-hazardous during storage, mixing, application and when cured and shall meet the following minimum physical requirements:



- a. Compressive Strength (at 7 days per ASTM C579): 13,000 psi (89.7 MPa) min.
  - b. Shear Bond Strength (at 7 days per ASTM C321): Brick fails.
  - c. Water Absorption (ASTM C413): 0.15 percent maximum
  - d. Temperature resistance (continual): 185 degrees F. (85°C)
  - e. Temperature resistance (intermediate): 212 degrees F. (100°C)
2. The finished epoxy grout shall be chemically and stain resistant to catsup, mustard, tea, coffee, milk, soda, beer, wine, bleach (5% solution), ammonia, juices, vegetable oil, brine, sugar, cosmetics, and blood. It shall also be chemically resistant to dilute acids and alkalis, gasoline, turpentine, and mineral spirits.
3. Acceptable products include the following, or approved equal:
- a. Mapei product: "Kerapoxy IEG" series".
  - b. Laticrete product "Latapoxy, 2000 Industrial Grout".
  - c. Custom Building Products "CEG 100% Solids Commercial Epoxy Grout".

## 2.5 ACCESSORIES

- A. Reinforcing mesh: ASTM A185 2 by 2 inch (50mm by 50mm) size weave of 16/16 wire size; welded fabric, galvanized. Provide in flat sheets, or flatten prior to installation.
- B. Tie wire: 18 gage soft galvanized annealed wire.
- C. Pre-fabricated metal edge treatments and transition strips. Extruded aluminum and stainless steel in profiles as indicated on drawings, with integral provision for anchorage to setting mortars and substrate.
1. Basis of design is Schluter Systems, Plattsburgh, New York.
    - a. Height as required for tile thickness and field conditions, fabricated from extruded aluminum with integrated joint spacer.
  2. Termination trim: 16 gauge stainless steel, having #4 polish finish, in height as required for tile thickness with a perforated anchoring leg. Schlüter, product: "Quadec", or Schlüter product series "Schiene-E", as appropriate to detail condition.
  3. Transition trim for tile: Schlüter, product: "Jolly", clear anodized finish.

## 2.6 SCAFFOLDS AND STAGING

- A. General: Filed Subcontractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and herein.
1. Scaffolding and staging required for use by this Filed Subcontractor pursuant to requirements of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Filed Sub-Trade requiring such scaffolding.

## TILING

2. Each Filed Subcontractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS and as additionally required for dust control).
3. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Filed Subcontractor.

## 2.7 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Filed Subcontractor shall be furnished, installed, operated and maintained in safe conditions by this Filed Subcontractor, as referenced under Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  1. Verify that all concrete substrates are at least 28 calendar days old, completely cured and free of negative hydrostatic conditions or moisture problems.
- B. Beginning of installation means acceptance of substrate and site conditions.

### 3.2 PREPARATION

- A. During the operation of work of this Section, protect surrounding in situ materials and finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all surfaces which are soiled or otherwise damaged by Work of this Section, to match indicated profiles and specified finishes. Materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work in conformance with the Contract Documents.
- B. Ensure that all anchors, plugs, electrical and mechanical work to be in or underneath tile have been installed.
- C. Vacuum clean substrate surfaces.
- D. Seal concrete substrate cracks with filler; level concrete substrate to acceptable flatness tolerances.
  1. The use of PVA bonding agents or gypsum based leveling materials is prohibited.
- E. Apply conditioner or primer to surfaces as recommended by adhesive manufacturer.

### 3.3 INSTALLATION - GENERAL REQUIREMENTS

- A. Installation Standards: The American National Standard Specifications for the Installation of Ceramic Tile, 1992 edition (ANSI A108), is hereby made a part of this specification. All work of this Section shall be installed in accordance with the requirements contained in referenced ANSI A108 standards, and as additionally specified below, and in accordance with the manufacturer's specifications of those products used.
- B. Installation Methods: Schedule of substrate conditions, generic type of tile used, with appropriate setting and grouting methods are listed at end of this Section.
  - 1. Use trowel shapes and sizes as recommended by setting materials manufacturer.
  - 2. Clean porcelain tiles (backs) and remove manufacturer's residue.
  - 3. Back-butter tiles to provide coverage indicated.
- C. Patterns and colors: Tile patterns are shown on the Drawings. Tile Filled Sub-Bidder shall note the required tile layouts including fields, striping, number of colors, and required cutting necessary to produce the representative pattern(s).
- D. Tile Layout and installation
  - 1. Layout tile on room axis, leaving equal sized border units of not less than one-half tile width.
  - 2. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align base and wall joints.
  - 3. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, full without voids, cracks, excess mortar, or excess grout.

### 3.4 INSTALLATION – METAL EDGE TRIM

- A. General: Apply materials in strict accordance with the written instructions and recommendations of edge material and setting materials manufacturers.
  - 1. Ensure that top surface of metal edge and transition strips align with surface plane of tile.
  - 2. Locations: Provide metal edge at every flooring transition between tile and other flooring materials.
- B. Press perforated anchoring leg of trim into troweled dry set mortar bedding. Trowel additional mortar over perforated anchoring leg of trim to ensure full coverage and support of tile edges.
- C. Solidly embed tiles in manner that tiled surface is flush with top of trim profile. Tile may exceed trim height by 1/32 inch [1 mm] to 1/16 inch [1.5 mm], but tile may not be installed lower than height of trim. Maintain a 1/8 inch [3 mm] minimum uniform joint width between edge of tile and metal trim to be filled by grout.

### 3.5 INSTALLATION OF CONTROL JOINTS

- A. General: Provide control joints where indicated on the Drawings, and as directed by the Architect. Where not indicated, provide joints per the following requirements in specific locations approved by Architect:
  - 1. Interior tilework: 24 to 36 feet in each direction, except where exposed to direct sunlight or moisture.
  - 2. Interior tilework exposed to direct sunlight or moisture: 12 to 16 feet in each direction.
  - 3. Where tile abuts restraining surfaces such as perimeter walls, dissimilar floors, curbs, columns, pipes, and where changes occur in substrate materials.
  - 4. At perimeter walls in rooms and spaces larger than 12 feet on one side.
  - 5. As continuation of expansion joints, control joints, and seismic joints in the building structure which occur in tile areas.
- B. Locations: Verify exact locations of joints with Architect prior to commencing tile installation.
- C. Control joints:
  - 1. Form control joints neat, straight, and uniformly wide equal to width of normal tile joint. Cut tile neatly and to accurate radius at exposed junction with pipes.
  - 2. Extend control joints full thickness of tile, setting bed and reinforcing.
- D. Keep open joints free of grout and debris until filled with sealant. Install non-contaminating temporary joint filler to maintain joints in clean condition until installation of joint backing and sealant under Section 07 92 00 - JOINT SEALERS.

### 3.6 FLOORING INSTALLATION – TCNA NUMBER F111

- A. Description: Thick (mud) set tile installation with tile installed using portland cement paste on workable mortar bed.
- B. General: Install in accordance with ANSI A108.1A, TCNA installation method number F111 and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
  - 1. Setting materials:
    - a. Cleavage membrane.
    - b. Wire reinforcing.
    - c. Portland cement mortar bed.
    - d. Bond Coat: Portland cement paste over workable mortar bed.
  - 2. Grout materials: acrylic modified Portland cement sanded grout (ANSI A118.6).
- C. Install cleavage membrane:
- D. Install portland cement mortar leveling bed to a nominal thickness of 1-1/2 inch upwards of 2 inches thickness. Level top with other abutting flooring finish substrates. Screed finish surface.

- E. Install tile over workable mortar bed using unmodified (non-latex) portland cement bond coat.
  - F. Grouting:
    - 1. Allow tile to fully set prior to grouting; do not grout in less than 24 hours after installation of tile.
    - 2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.
- 3.7 FLOORING INSTALLATION – TCNA NUMBER F122 MODIFIED WITH EPOXY GROUT
- A. Description: Thin-set tile installation with reinforced waterproofing membrane.
  - B. General: Install in accordance with ANSI A108.5, and TCNA installation method number F122, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
    - 1. Setting materials:
      - a. Membrane: Anti-fracture membrane (DIN18156, part 2).
      - b. Bonding coat: Latex modified portland cement (ANSI A118.4).
    - 2. Grout materials: Epoxy grout (ANSI A118.3).
  - C. Install liquid applied waterproofing membrane with reinforcing over entire tile substrate area in strict compliance with manufacturer's written instructions.
  - D. Install latex/portland cement mortar bed over cured anti-fracture membrane to a nominal thickness of 3/32 inch.
  - E. Grouting:
    - 1. Allow tile to fully set prior to grouting; do not grout in less than 48 hours after installation of tile.
    - 2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.
- 3.8 WALL TILE INSTALLATION - TCNA NUMBER W244C WITH THIN-SET
- A. General: Install in accordance with ANSI A108.5, TCNA installation method number W244C, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
    - 1. Setting materials: Latex modified Portland cement (ANSI A118.4).
    - 2. Grout materials: Epoxy grout (ANSI A118.3).
  - B. Install latex modified Portland cement mortar bed to a thickness recommended by manufacturer.
  - C. Grouting:
    - 1. Allow tile to fully set prior to grouting; do not grout in less than 24 hours after installation of tile.

2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.

### 3.9 WALL GLASS TILE INSTALLATION - TCNA NUMBER W244C WITH THIN-SET

- A. General: Install in accordance with ANSI A108.5, TCNA installation method number W244C, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
  1. Setting materials: Glass tile mortar (ANSI A118.4).
  2. Grout materials: Hybrid fast cure grout (ANSI A118.6).
- B. Install latex modified Portland cement mortar bed to a thickness recommended by manufacturer.
- C. Grouting:
  1. Allow tile to fully set prior to grouting; do not grout in less than 24 hours after installation of tile.
  2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.

### 3.10 BASE TILE INSTALLATION

- A. General: Scribe full size tiles and install in accordance with ANSI A108.5, TCNA installation method number W244C, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
  1. Setting materials: Latex modified Portland cement (ANSI A118.4).
  2. Grout materials: Acrylic modified Portland cement (unsanded) grout (ANSI A118.6).
- B. Install latex modified Portland cement mortar bed to a thickness recommended by manufacturer.
- C. Grouting:
  1. Allow tile to fully set prior to grouting; do not grout in less than 24 hours after installation of tile.
  2. Grout tile joints in accordance with ANSI A108.10 and as additionally specified.

### 3.11 INSTALLATION - GROUT

- A. Remove spacers, ropes, glue, and similar foreign matter prior to grouting.
- B. Force the maximum amount of the approved grout into joints in accordance with pertinent recommendations contained in ANSI A108.10 and for epoxy grouts, ANSI A108.6.
- C. Fill in joints of cushion-edge tile to depth of the cushion; fill joints of square-edge tile flush with the surface.

- D. Fill all gaps and skips. Do not permit mortar or mounting mesh to show through grouted joints.
- E. Provide hard finished grout which is uniform in color, smooth and without voids, pin holes, or low spots.
- F. Remove all excess grout immediately after installation thereof, wash and rinse tile free from grout film, and tool grout to a uniform density throughout.

### 3.12 REPAIR

- A. Replace cracked chipped, broken, and otherwise defective tiles.
- B. Remove work not complying with requirements of the Contract Documents or the referenced standards, and promptly replace with work which does comply.

### 3.13 CLEANING

- A. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of mortar, grout, and other materials installed under this Section, and wash completed tilework.
  - 1. Do not use acid or acid cleaners to clean tile.
  - 2. When tile is thoroughly clean and dry, polish glazed tile with clean dry cloths.

### 3.14 CURING

- A. Damp cure all tile installations, including portland cement grouts, for 72 hours minimum.
- B. Cover with clean non-staining 40 pound kraft paper. Do not use polyethylene sheets directly over tile on horizontal surfaces.

### 3.15 PROTECTION

- A. Do not permit traffic over finished floor surface until grout and tile materials are fully set, and not less than 72 hours. Protect floor surfaces as directed in Section 09 05 60 Common Works For Flooring

End of Section

SECTION 09 51 00  
ACOUSTICAL CEILINGS

**PART 1 - GENERAL**

1.01 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law - Chapter 149, Sections 44A to 44J inclusive, as amended, and applicable Sections of the MGL, Public Contract Law - Chapter 30.
  - 1. Filed-Bid Subcontractors on this project are required to provide Payment and Performance Bonds for the full value of their Filed-Bid Subcontractor Contracts, and Filed-Bid Subcontractors must include the full cost of the required Payment and Performance Bonds in the Bid price they submit.
- C. Specification requirements for the Filed Sub-bid "Acoustical Ceilings" include all of the following listed Specification Sections: in their entirety:
  - 1. Section 09 51 00- Acoustical Ceilings
- D. The work to be completed by the Filed Subcontractor for the work of this Section is shown on the following listed Drawings: A0.1, A0.2, A1.0, A1.1, A1.2, A3.0, A3.1, A3.2, A4.1, A5.0, A5.1
  - 1. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the Work of this Filed Subcontract. The listing of Contract Drawings above does not limit Filed Subcontractor's responsibility to determine full extent of work of this Section as required by all Drawings listed in the Drawing List on the Drawing A001, as modified by Addenda.
- E. Filed Sub-Bids for work under this Section shall be for the complete work and shall be filed in manner, time and place as stipulated in Documents 00 11 16 = INVITATION TO BID, 00 21 13 INSTRUCTIONS TO BIDDERS
- F. Each Sub-Bid submittal for work under this Section shall be on forms required by Awarding Authority, accompanied with the required bid deposit in compliance with MGL Chapter 149 Section 44B in the amount of 5 percent of Filed Sub-Bid.
- G. Sub Sub-Bid Requirements: NONE REQUIRED UNDER THIS SECTION.

1.02 SUMMARY



Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1. The work of this Section consists of acoustical tile where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, but is not limited to the following.
  - A. Furnish and install the following:
    1. New Suspended acoustical tile ceiling panels including suspension system and associated edge moldings.
    2. Furnish and install joint sealant at ceiling edge angles where abutting walls.
  - B. All equipment, staging, scaffolding, hoisting, and demolition for the work of this Section.
  - C. Install the following furnished under the designated Sections:

#### 1.04 RELATED REQUIREMENTS

- A. Section 08 31 00 - ACCESS DOORS AND PANELS: Shop primed access panels, occurring in partitions and walls.
- B. Section 09 29 00 - GYPSUM BOARD: Suspended drywall construction ceilings and soffits.
- C. Division 22 – FIRE PROTECTION
- D. Division 23 - PLUMBING
- E. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Air diffusion devices in ceiling.
- F. Division 26 - ELECTRICAL:
  1. Fire alarm and smoke detection equipment mounted in ceiling system.
  2. Light fixtures and independent hangers for suspended fixture.

#### 1.05 REFERENCES

- A. Reference Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  1. ASTM A 641 - Zinc-Coated (Galvanized) Carbon Steel Wire
  2. ASTM B 209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  3. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method "UL Classified".
  4. ASTM C 523 - Light reflectance of Acoustical Material by the

Integrating Sphere Reflectometer.

5. ASTM C 635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
  6. ASTM C 636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
  7. ASTM E 84 - Surface Burning Characteristics of Building Material "UL Classified"
  8. ASTM E 119 - Fire Tests of Building Construction and Materials "UL Classified".
  9. ASTM E 413 - Classification for Rating Sound Insulation.
  10. ASTM E 580 - Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
  11. ASTM E 1264 - Classification of Acoustical Ceiling Products.
  12. ASTM E 1414 - Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum. "UL Classified".
  13. UL Fire Resistance Directory and Building Material Directory.
  14. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.
- B. General References: The following reference materials are hereby made a part of this Section by reference thereto:
1. CISCA (Ceilings and Interior Systems Contractors Association) - Acoustical Ceilings: Use and Practice.

#### 1.06 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Pre-Installation Meetings: At least two weeks prior to commencing the work of this Section, conduct a pre-installation conference at the Project site. Comply with requirements of Section 01 31 00 - PROJECT MANAGEMENT AND COORDINATION. Coordinate time of meeting to occur prior to installation of work under the related sections named below.
1. Required attendees: Architect, Construction Manager, Installer's Project Superintendent, manufacturer's technical representative and representatives of other related trades as directed by the Architect or Contractor, and representatives for installers of related work specified under the following Sections:
    - a. Section 09 22 16 – METAL SUPPORT SYSTEMS.
    - b. Section 09 29 00 - GYPSUM BOARD.

- c. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING.
- d. Division 26 - ELECTRICAL

2. Agenda:

- a. Scheduling of suspended ceiling operations.
- b. Review of staging and material storage locations.
- c. Coordination of work by other trades.
- d. Installation procedures for ancillary equipment.
- e. Protection of completed Work.
- f. Establish weather and working temperature conditions to which Architect and Contractor must agree.
- g. Discuss process for manufacturer's inspection and acceptance of completed Work of this Section.

C. Sequencing:

1. Field Measurements:

- a. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
- b. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.

2. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, to allow work which will be concealed by the ceilings to be completed prior to commencing installing the ceilings in such locations.

D. Scheduling:

- 1. Install acoustical units after interior wet work is dry.
- 2. Schedule work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated and overhead work is completed, tested and approved.

## 1.07 SUBMITTALS

A. Information and Review Submittals: Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:

- 1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties for each item furnished hereunder.
- 2. Shop Drawings:
  - a. 1/4 inch scale plans of each room or space; indicate grid layout and related dimensioning, junctions with other work or ceiling finishes, interrelation of mechanical and electrical items related to the system.
  - b. All drawings bearing dimensions of actual measurements taken

Acoustical Ceilings

09 51 00 -4

at the project.

- c. Large scale installation details of special conditions.
- 2. Verification Samples:
  - a. Full size samples of acoustical units, illustrating material and finish.
  - b. 12 inch long samples of suspension system components including main runners, cross runner and edge trim.
  - c. 12 inch long samples of existing exposed spline suspension system components including runners and edge trim for comparison with supplied materials.
    - 1. Indicate location of content of extraction, harvesting, and recovery; indicate the distance between extraction, harvesting, and recovery and the project site. Indicate percentage of product content from qualified locations.
    - 2. Indicate location of manufacturing facility; indicate distance between manufacturing facility and the project site.
- C. Closeout Submittals: Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
  - 1. Bonds and Warranty Documentation:
    - a. Manufacturer's Warranties and guarantees as specified elsewhere herein this Section.
- D. Maintenance Material Submittals: Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS. Clearly label and package extra materials securely to prevent damage.
  - 1. Provide to the Owner, extra ceiling panel and suspension components, 5 percent of each type installed.

#### 1.08 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
- B. Sole Source: Obtain products required for the Work of this Section from a single manufacturer, or from manufacturers recommended by the prime manufacturer of acoustical ceiling panels.

#### 1.09 DELIVERY, STORAGE AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  - 2. Do not deliver acoustical ceiling panels to the project until all concrete, masonry, plaster and other wet work has been completed and dry.
  - 3. Deliver acoustical ceiling panels in original, unopened packages and

store protected in a fully enclosed space.

- B. Storage and Handling Requirements:
  - 1. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
- C. Packaging Waste Management:
- D. Damaged material: Remove any damaged or contaminated materials from job site immediately, including materials in broken packages, packages containing water marks, or show other evidence of damage, unless Architect specifically authorizes correction thereof and usage on project.

#### 1.10 SITE CONDITIONS

- A. Maintain uniform temperature of minimum of 60 degrees Fahrenheit and humidity of 20 to 40 percent prior to, during, and after installation.

#### 1.11 WARRANTY

- A. General: Submit warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
- B. Manufacturer Warranty:
  - 1. In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTAL GENERAL CONDITIONS, the Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Acoustical ceiling panels:
    - a. Armstrong World Industries, Inc., Lancaster, PA.
    - b. USG Interiors Inc., Chicago, IL.
    - c. Certainteed Corporation, Valley Forge, PA.
    - d. Tectum, Inc., Newark, OH.
    - e. Martin Acoustical Products, Bogart, GA.

2. Suspension system:
  - a. Armstrong World Industries, Inc., Lancaster PA.
  - b. USG Interiors Inc., (Donn<sup>®</sup>) Chicago, IL.
  - c. Chicago Metallic Corp., Chicago, IL.

## 2.2 DESCRIPTION

- A. General Description: Manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectance as indicated.
  1. Obtain certificate of compliance from authority having jurisdiction indicating approval of specified products.

## 2.3 PERFORMANCE/DESIGN CRITERIA

- A. Fire Resistance: Where fire-resistance ratings are indicated or required by authorities having jurisdiction, provide materials and construction which are identical to assemblies whose fire-resistance ratings have been tested in compliance with ASTM E 119 by independent agencies acceptable to the Architect and authorities having jurisdiction.
- B. Surface Burning Characteristics: Provide UL Classified material whose surface burning characteristics, when tested in compliance with ASTM E 84 are Class A.
- C. Where the following ratings are specified, provide materials and construction which are identical to those tested by Underwriters Laboratories or equivalent independent testing agencies acceptable to the Architect.
  1. Noise Reduction Coefficient (NRC): Ratings have been tested in compliance with ASTM C423.
  2. Ceiling Attenuation Class (CAC) : Ratings have been tested in accordance with ASTM E1414.
  3. Light Reflectance (LR): Ratings has been tested in compliance with ASTM C523.

## 2.4 ACOUSTICAL CEILING PANELS

- A. Ceiling Type 1 ceiling panel (Typical, unless noted otherwise any ceiling not identified on the Drawings shall be considered Ceiling Type 1):
  1. Panel size: 24 by 24 inch by 3/4 inch thick.
  2. Panel edge: Tegular edge.
  3. Description: ASTM E-1264 Type III, Form 2, Pattern EI, Class A flame spread, wet formed mineral fiber non-directional fissured, medium textured panel, non- combustible, vinyl latex paint finish.
  4. Color: White.
  5. Minimum light reflectance range: LR 0.82 to 0.86.

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Maintenance Facility Improvements and Renovations  
Newton, MA

6. Acoustical characteristics:
    - a. NRC range: 0.70.
    - b. CAC range: 30 to 35.
  7. Acceptable products:
    - a. Armstrong product "Cirrus, Tegular" product number 584.
    - b. Certainteed product "Cashmere High NRC" product number CM-454 NCRP.
    - c. USG product "Eclipse Climaplus" with SLT edge, product number 76775.
    - d. Approved equal.
- B. Type 2 Ceiling (Repair Bay Area):
1. Panel size: 24 by 24 inch by 1/2 inch thick.
  2. Panel edge: Square edge.
  3. Description: ASTM E1264, Type XX, Pattern G, ASTM E84 Class A, gypsum lay-in ceiling panels with sealed edges and back and white vinyl finish on face.
  4. Color: White.
  5. Minimum light reflectance: LR 0.77.
  6. Acoustical characteristics:
    - a. CAC range: 40 to 44
  7. Acceptable products:
    - a. Ceiling Panel:
      - 1) (Basis of Design) USG product " Sheetrock Lay-In Ceiling Tile ClimaPlus Clean Room", product number 3200 or approved equal.
      - 2) Certainteed product "Vinylrock" product number 1142-CRF-1.
      - 3) Armstrong product "Kitchen Zone", product number 673.
    - b. Ceiling grid: 15/16 inch exposed grid, aluminum capped prefinished steel tee suspension system (or all aluminum tee system), in white color matching ceiling tile. Provide with matching hemmed edge wall moldings having aluminum capping or all aluminum edge trim. Exposed face color shall be white matching ceiling tile. Acceptable products include the following, or approved equal:
      - 1) Armstrong: AL Prelude Plus Exposed Tee System
      - 2) Chicago Metallic: 830 Series.
      - 3) Donn; DXLA series.

## 2.5 CEILING GRID

- A. Ceiling Types 1, ceiling grid: Fireguard exposed tee grid in white color. Acceptable products include the following, or approved equal:
1. Armstrong; 15/16" Fireguard Exposed Tee System.

## 2.6 CEILING GRID PERIMETER EDGE TRIM SYSTEM

- A. Perimeter edge trim system at "Floating" suspended ceiling areas. Edge trim

shall be nominal 6 inches height, designed to accommodate straight edges as well as converse curved and convex curved edges as may be indicated on Drawings. Attachment to grid system is provided by a specially designed attachment clip, which snaps into the locks against hems of trim and is screw-attached to the bulb of the intersection suspension system member. Independent sections of trim are joined together using the splice plate.

Acceptable products are:

1. Armstrong: Axiom Perimeter Trim.
2. Chicago Metallic: Infinity suspension trim.
3. Gordon: "Contura".

## 2.7 ACCESSORIES

- A. Edge moldings: Standard edge trim: Grid system manufacturer's standard L-shape edge trim compatible with exposed grid system and color matched.
  1. Armstrong: Model 7800.
  2. Chicago Metallic: Model 1430.01.
  3. USG: Model M7.
- B. Hanger attachments: Of the most appropriate types for the specific receiving surfaces.
- C. Hangers: ASTM A641 Soft temper, pre-stretched galvanized carbon steel wire, with a yield stress of at least 3 times design load, but not less than 12 gage.
- D. Retention clips (Vestibule):
  1. Armstrong product number "0414,"
  2. Chicago metallic product number "935"
  3. USG product number "20428."
- E. Joint Sealer: One component acrylic latex, permanently elastic, non-staining, non-shrinking, non-migrating and paintable.
  1. Tremco, Beachwood OH; product, "Acoustical Sealant".
  2. United States Gypsum Company, Chicago IL; product "USG Acoustical Sealant".
  3. Pecora Corporation, Harleysville PA; product " AC-20 FTR".

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  1. Beginning of installation means acceptance of existing substrate and project conditions.



### 3.2 PREPARATION

- A. Protection of In-situ Conditions: During the operation of work of this Section, protect surrounding materials and finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all existing surfaces which are soiled or otherwise damaged by Work of this Section, to match indicated profiles and specified finishes. Materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work in conformance with the Contract Documents.
- B. Surface Preparation:
  - 1. Carefully examine all receiving surfaces, to which attachments will be made hereunder, and determine the most practical way of making such attachments. Request Architect's approval of any attachment method which differs from that indicated on the approved shop drawings before proceeding with installation.
  - 2. Permit acoustical ceiling tile to reach room temperature and a stabilized moisture content prior to installation.

### 3.3 INSTALLATION

- A. Locate system on room axis, leaving equal sized border units of not less than one-half tile width.
- B. Install all components of the suspended grid systems in accordance with the manufacturer's instructions, the approved shop drawings, conforming to ASTM C- 636 requirements. Ensure a deflection not to exceed 1/360 span of 48-inch simple span.
- C. Install specified edge moldings wherever ceilings intersect a wall or partition surface, and around all items having any dimension of 4 inches or more which penetrate the ceilings, including circular penetrations. Set moldings absolutely level, using as long lengths as practicable, and secure with fasteners recommended by manufacturer for the type of substrate.
  - 1. Sealant Bed: Apply continuous ribbon of acoustical sealant, concealed on back of vertical leg before installing moldings.
  - 2. Screw-attach moldings to substrate at intervals not over 16 inches on center. and not more than 3 inches from ends, leveling with ceiling suspension system to tolerance of 1/8 inch in 12'-0". Miter corners accurately and connect securely.
- D. Install hanger attachments to overhead construction in accordance with the approved shop drawings, spacing the attachments not more than 48 inches on centers over location of each main tee member.
  - 1. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers to span the extra distance.

2. Install hanger wire to attachments with triple twists.
  - E. Install main tees parallel to the long dimension of each area, spacing the tees 48 inches on centers. Secure the bottom of hanger wires through slots in the main tee members and tie with triple twists. Level the main tees as the work progresses.
  - F. Uniformly space the cross tees at 24 inches on centers, and secure the cross tees into the main tees as recommended by the system manufacturer.
  - G. Provide sealant at gaps between new acoustical ceiling edge angles and all irregular walls.
  - H. Fit acoustical ceiling tile units in place, free from damaged edges or other defects detrimental to appearance and function. Install acoustical ceiling tile level, in uniform plane, and free from twist, warp or dents.
    1. Field cut tegular type tile with a tegular reveal at all edge conditions.
    2. Where required by governmental agencies having jurisdiction, install retention clips, provide two clips per ceiling panel installed on opposite sides of panel.
- 3.4 TOLERANCES
- A. Maximum variation from flat and level surface: 1/8 inch in 10 feet.
  - B. Maximum variation from plumb of grid members caused by eccentric loads: 2 degrees.
- 3.5 CLEANING
- A. Properly clean surfaces of panels and open grids free from dirt and handling marks. Wherever surfaces cannot be cleaned by normal methods or have defects, remove and replace with new components.
  - B. Upon completion of the work of this Section in any given area, remove tools, equipment and all rubbish and debris from the work area; leave area in broom- clean condition.
  - C. Clean work under provisions of Section 01 73 00 – EXECUTION.
- 3.6 PROTECTION
- A. Protect finished work under provisions of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.

END OF SECTION

Section 09 65 23  
RUBBER FLOORING  
(FILED SUB-BID REQUIRED AS PART OF SECTION 09 00 06)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.

1.2 SUMMARY

A. Prepare substrates to receive rubber flooring to ensure specified tolerance level for finish surface of carpeting. Preparation work includes patching, smoothing and leveling substrate, including:

4. Grinding down high spots of substrate.
5. Providing Portland cement-based latex underlayment (filler).

B. Furnish and install the following:

4. Smooth surface rubber flooring tile.
5. Smooth surface rubber stair treads/risers.
6. Transition strips wherever edges of resilient rubber flooring materials abut dissimilar flooring, where no thresholds occur.
7. Rubber Base

1.3 RELATED REQUIREMENTS

A. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete substrate for resilient flooring, and concrete sealers.

B. Section 09 05 06 - Common Work Resulting for Flooring

1.4 REFERENCES

A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

4. ASTM E 84 - Surface Burning Characteristics of Building Materials.
5. ASTM F-1344 - Specification for rubber floor tile.
6. ASTM F-710 - Preparing Concrete Floors to Receive Resilient Flooring.
7. ASTM F-1869 - Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
8. FS SS-W-40 - Wall Base: Rubber and Vinyl Plastic.
9. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

## 1.5 REGULATORY REQUIREMENTS

- A. Provide materials and assemblies conforming to applicable building codes and regulatory agencies for flame/fuel/smoke rating requirements of flooring and base trim in accordance with ASTM E 84.
- B. Provide flooring material to meet the following fire test performance criteria as tested by a recognized independent testing laboratory:
  - 1. ASTM E 648 ( Critical Radiant Flux ) of 0.45 watts per sq. cm. or greater, Class 1.
  - 2. ASTM E 662 ( Smoke Generation ) Maximum Specified Optical Density of 450 or less.

## 1.6 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for each item furnished hereunder.
  - 2. Submit the manufacturer's certification that the resilient flooring has been tested by an independent laboratory and complies with the required fire tests.
  - 3. Shop drawings: 1/4 inch scale plans of each flooring area scheduled for Work of this Section; indicate layout of tile units and direction of tile patterns, identify selected colors and patterns.
  - 4. Selection samples:
    - a. Manufacturers' sample chain of colors and patterns available for selection by Architect.
  - 5. Verification samples:
    - a. Full sized flooring tile, illustrating color, and pattern for each type of tile selected.
    - b. Resilient base: Each type and color selected, 24 inches long.
    - c. 12 inch lengths of stair treads, illustrating color.
    - d. Edging: 12 inches long demonstrating profile, thickness, size and color.
    - e. Adhesives, mastics, crack fillers, primers, cleaner, and polish: 1/2 pint metal cans.
    - f. MSDS (Material Safety Data Sheets) are available for adhesives and cleaning agents.
- B. Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS:
  - 4. Maintenance data: Include maintenance procedures, recommended maintenance materials, a suggested schedule for cleaning, stain removal methods, and polishing.

## 1.7 QUALITY ASSURANCE

- A. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years experience in the fabrication of resilient flooring of types equivalent to those specified.

4. Manufacturer capable of providing field service representation.
  - B. Installer's Qualifications: Installer experienced (minimum of 2 years) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to the product manufacturer.
  - C. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials. Comply with applicable regulations regarding VOC (volatile organic compound) content of adhesives.
  - D. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
    4. Avoid color and pattern differential; provide flooring from one production run in any single room or contiguous areas.
- 1.8 DELIVERY, STORAGE AND HANDLING
- A. Deliver resilient flooring and base materials in original, unopened packages and store protected for three days prior to installation in area of installation to achieve temperature stability.
  - B. Store materials in a clean dry, enclosed space off the ground and protected from the weather. Protect adhesives from freezing.
- 1.9 ENVIRONMENTAL CONDITIONS
- A. Maintain uniform temperature of minimum of 65 degrees Fahrenheit and humidity of 20 to 40 percent 48 hours prior to, during, and 48 hours after installation. Store resilient flooring materials and accessories in the spaces where they will be installed for at least 48 hours before beginning installation. Thereafter, maintain a minimum temperature of 55 degrees Fahrenheit in the areas where the work is completed.
- 1.10 SEQUENCING AND SCHEDULING
- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work.
  - B. Sequence work to ensure resilient flooring is not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated and work overhead is completed.
  - C. Install flooring and base after interior wet work is dry.
- 1.11 WARRANTY
- A. Under the provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS, provide manufacturer's standard wear warranties (minimum of 2 year), for all flooring and stair tread materials installed under this Section.

1.12 EXTRA MATERIALS

- A. Upon completion of the Work of this Section, deliver to the Owner extra materials for future repairs and maintenance, from the same manufacturing runs as those installed, in the following amounts:
1. Rubber tile: 5 pieces of each material in each color, and pattern installed.
  2. Resilient base: 24 linear feet of each type and color installed.
  3. Furnish a quantity of adhesive of each type used in sealed cans or containers sufficient to apply the above materials.

**PART 2 - PRODUCTS**

2.1 MANUFACTURERS

- A. Specified Manufacturer: To establish a standard of quality, design and function desired, Drawings and specifications have been based on Roppe Corporation, Fostoria OH, product "Marbleized".
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
1. Roppe Corporation, Fostoria OH.
  2. Johnsonite, Chagrin Falls, OH.
  3. Nora Systems, Inc., Salem, NH. .
  4. Mannington Burke Rubber, Calhoun, CA.

2.2 SMOOTH SURFACE RUBBER TILE FLOORING

- A. Rubber flooring: Smooth surface synthetic rubber flooring, **1/8" inch (0.125)** overall thickness, **complying with ASTM F 1344**.
1. Material: Synthetic rubber, free from reground rubber, natural rubber or coarse fillers.
  2. Wear Warranty: 5 years.
  3. Abrasion Resistance: Taber abrasion test, ASTM C501, H-18 wheel, 500 gram load, 1000 cycles, gram weight loss not greater than the following: 0.40.
  4. Hardness: ASTM D 2240, Shore A, not less than 85.
  5. Slip Resistance: Static coefficient of friction (James Test), ASTM D 2047, equal to or greater than 0.6, ADA guidelines compliance.
  6. Flammability: ASTM E 648 or NFPA 253, result to be not less than 0.45 watts per square centimeter, Class 1.
  7. Smoke Density: ASTM E 662, NFPA 258, NBS smoke density, less than 450.
  8. Burn Resistance: Cigarette and solder burn resistance.
  9. Halogen-Free: Products shall contain no halogens.
  10. Asbestos-Free: Products shall contain no asbestos.
- B. To establish a standard of quality, design and function desired, Drawings and specifications have been based on the rubber floor tile indicated. Products from other manufacturers meeting the requirements of these specifications with

equivalent ranges of available color groups shall be considered as equal upon submission

4. Basis of design rubber tile flooring:
  - a. TYPE 1 Corridor Floor Tile with Water Cut Leaf Patterns: Roppe Corporation, Fostoria OH, "Smooth Marbleized".
    1. Sizes and Patterns: 36" x 36" tile. Patterns as indicated on Drawings. Corridor floor patterns will be comprised of multiple different colors as selected from all available colors and price groups.
  - b. TYPE 2 Floor Tile: Roppe Corporation, Fostoria OH, "Smooth Marbleized".
    - a) Sizes and Patterns: 19 11/16" x 19 11/16" tile. Patterns as indicated on Drawings.
    - b) Colors: Patterns will be comprised of multiple different colors as selected from all available colors and price groups.

## 2.3 RUBBER STAIR TREADS/RISERS AND LANDINGS

- A. Floor and stair treads: One piece nosing-tread-riser combination with raised stud surface design, 4.5 mm (0.18 inches) overall thickness.
  4. Acceptable Products:
    - a. Roppe Products Company: product 96 "Raised Circular Vantage Treads with Riser".
    - b. Nora Systems, Inc.; product Norament 825 C, Article 464/465/466/467.
    - c. Mercer Products Company, Inc.; product "Tread-Riser Combination"
  5. Material: Synthetic rubber free from reground rubber, natural rubber or coarse fillers.
  6. Back of Tile: Smooth, double-sanded back.
  7. Wear Warranty: 5 years.
  8. Slip Resistance: Static coefficient of friction (James Test), ASTM D 2047, equal to or greater than 0.6, ADA guidelines compliance.
  9. Color: As selected.
- B. Landings: Match stair treads:

## 2.4 RESILIENT BASE

- A. Rubber Base: 4 inches high, ribbed back, 1/8 inch thick, rounded top complying with ASTM F1861, Type TP, Thermoplastic Rubber (TBR). Colors shall be as selected. Rubber base shall be furnished in continuous lengths, approximately 100 feet long.
  4. Provide coved base at resilient flooring.
  5. Coved base at sealed concrete floors, and back-of-house spaces not having a finished floor.

6. Provide straight (non-coved) base at carpeted and walk-off entrance mat areas.
- B. Base accessories: Premolded end stops of same material, size and color as base. Job-form all external and internal corners from base material, pre-molded corner pieces will not be acceptable

## 2.5 ACCESSORIES - BASE

### A. Adhesives

4. General: Water resistant, low VOC, acceptable to the resilient flooring manufacturer, for substrate conditions.
  - a. Cove Base Adhesives: Maximum VOC 50 [g/L less water]
5. Acceptable manufacturers/products, include the following or approved equal:
  - a. Advanced Adhesive Technology, Inc, Dalton GA, product: "No. 432 Modified Acrylic Cove Base Adhesive".
  - b. DAP Incorporated, Dayton OH, product: "Cove Base Construction Adhesive".
  - c. W.W. Henry Company, Aliquippa PA., product: "Henry 440 Cove Base Adhesive".
  - d. Roberts Consolidated Industries, Inc., City of Industry, CA, product: "Premium Solvent-Free Cove Base Adhesive".
  - e. Tarkett USA Inc., Solon OH., product "960 Wall Base Adhesive".
- B. Joint Sealer for between the top of wall base and irregular wall surfaces: Plastic filler as recommended by manufacturer.
- C. Cleaning material: Domestic neutral floor detergent having a pH 7 or pH 8, as recommended by the flooring manufacturer.

## 2.6 ACCESSORIES

- A. Filler for patching, smoothing and leveling subfloors and underlayments: Portland cement-based latex underlayment acceptable to flooring manufacturer, equal to the following:
4. Ardex, Inc., products "Feather Flash" and "Ardex SD-P".
  5. Quikrete Companies, product "Fast-Set Underlayment 1248".
  6. Silpro Masonry Systems Inc., product "Profinish".



- B. Adhesives and primers: Water resistant, acceptable by the resilient flooring manufacturer.
- C. Transition strips: Homogeneous vinyl, of profiles required for thickness of abutting materials, in colors as selected by the Architect.
- D. Cleaning material: Domestic floor detergent, as recommended by the flooring manufacturer.
- E. Provide transition/reducing strips, tapered to meet abutting materials.
- F. Provide threshold of thickness and width as shown on the drawings.
- G. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, rubber composition, tapered or bull nose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  - 4. Substrates shall be dry and clean.
  - 5. Substrates shall be free of depressions, raised areas, or other defects which would telegraph through installed flooring.
  - 6. Temperature of resilient flooring and substrate shall be within specified tolerances.
- B. Insure that concrete substrate is dry having a maximum moisture content of 2.5 percent by weight. Perform moisture test in several locations using carbide method dampness meter.
- C. Beginning of installation means acceptance of existing substrate and site conditions.

#### **3.2 PREPARATION**

- A. General: Comply with flooring manufacturer's requirements for preparation of substrate to receive resilient flooring.
- B. Patterns and colors: Resilient tile flooring patterns are shown on the Drawings. The Resilient Flooring Filed subcontractor shall note the required flooring layouts including fields, borders, striping, accent patterns, dots, number of colors, and required cutting necessary to produce the representative pattern(s).
  - 4. The Resilient Flooring Filed subcontractor shall note locations where the installation of tile flooring is not perpendicular to the primary room axis. Provide all cutting and calculate resulting waste in order to produce patterns containing elements where the orientation of the flooring has been placed at an angle to that axis.

- C. Remove, by light sanding and grinding, all protruding edges, high spots. Ensure that substrate is free from paint, varnish, wax, oil, or other foreign matter.
- D. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler. Apply, trowel and float finish subfloor filler and leave a smooth, level, hard surface. Prohibit traffic from area until filler is cured.
- E. Vacuum clean substrate, and ensure that substrate is dry, clean and smooth prior to application of flooring.
- F. Apply primers as recommended by adhesive manufacturer's written instructions.
- G. Condition flooring materials, accessories and adhesives to room temperatures for a period of 48 hours minimum.

### 3.3 INSTALLATION - GENERAL

- A. General: Install all products in strict accordance with each manufacturer's written installation procedures and other provisions specified herein.
- B. Install resilient flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install resilient flooring over concrete slabs until they have been cured and are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture test.
- C. Spread only enough adhesive to permit installation of materials before initial set.

### 3.4 INSTALLATION - FLOOR TILE

- A. Unless otherwise indicate lay flooring in a square grid pattern, with joints and seams parallel to building lines. Lay tile with joints straight and continuous in both directions and with border tile not less than 1/2 the width of the tile.
- B. Lay resilient flooring with arrows in the same direction.
- C. Neatly fit resilient materials to all intersecting surfaces, and make joints as inconspicuous as possible.
- D. Terminate flooring at centerline of door in closed position where adjacent floor finish is of different material or color.
- E. Apply resilient materials to have uniform contact with receiving surfaces throughout, with tight joints, and with all finish surfaces smooth, in true plane, free from buckles, waves, and other imperfections.
- F. Extend resilient flooring to wall lines beneath all movable equipment and movable casework. Fit resilient flooring onto breaks and recesses, against non-resilient bases, around pipes and other protrusions, under saddles, and to and around other fixed surfaces, making neat cuts in the flooring and minimizing joints.
- G. Install reducer strips at exposed edges.

### 3.5 INSTALLATION OF TREADS AND RISERS

- A. Begin installation at bottom step and continue upwards towards each landing. Cut riser part of the tread to fit to the riser of the step below. Trim even with the edge of the riser.
- B. Cut and dry fit treads and risers before installation.
- C. Apply contact adhesive to the substrate and back of the step-tread. Permit contact adhesive to dry to touch.
  - 4. Apply adhesives to steps and risers.
- D. Install tread-riser combination units as recommended by manufacturer using manufacturers removable slip sheet or wax paper to locate step tread before adhering in place.
  - 4. Fit nosing material tight to the nosing of the stair.
- E. Use roller or stair tool to press stair materials into place. Remove excess adhesive.
- F. After installation check adhesive bond to treads and risers.

### 3.6 INSTALLATION OF ACCESSORIES

- A. Resilient edge and transition strips:
  - 4. Install edge strips at all edges of flooring which would otherwise be exposed.
  - 5. Place resilient edge strips tightly butted to flooring and secure with adhesive recommended by the edge strip manufacturer.

### 3.7 PROTECTION

- A. Prohibit all traffic on finished floor areas for a minimum period of 12 hours.
- B. Protect finished floor areas from sun and moisture and construction traffic for a minimum period of 2 calendar days after installation.
- C. Prohibit washing, scrubbing or other similar 'wet' operations to occur on finished floor areas for a minimum period of 5 calendar days after installation.
- D. Provide protection of completed flooring areas from construction traffic until Substantial Completion of the General Contract. Cover all resilient floor surfaces with heavyweight kraft paper and overlay with red-rosin paper, taping the edges to maintain position of the protection paper. Reapply papers to maintain floor protection.

### 3.8 CLEANING

- A. General: Comply with requirements of Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for handling and disposition of all construction and demolition waste.
- B. As installation progresses, continually remove excess adhesive from floor, base and wall surfaces without damage.

4. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings.
- C. Sweep floors to remove all loose dirt and debris.
- D. Not sooner than five days after installation, clean all materials installed hereunder with a non-abrasive commercial detergent approved by the material manufacturers, and thoroughly rinse with clear water.
- E. After cleaning and polishing, ensure that the flooring is be protected with heavy kraft paper.

End of Section

Section 09 67 23  
RESINOUS FLOORING

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

1. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
2. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

1. General: The work of this Section consists of resinous flooring where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, substrate testing and preparation, furnishing and installation of resinous flooring, and temporary protection until Owner's acceptance.
2. Prepare surfaces to receive resinous flooring. The scope as described in Section 09 05 06 Common Works For Flooring is included in the scope of this contractor.
3. Apply multilayered resinous waterproof flooring system with an integral waterproof base turned up at walls, bases, pipe sleeves and pads.
  1. Provide subsequent flooring system touch-up and repairs as required to provide a complete seamless molded waterproof system.
4. Integral 6" high resinous cove base where resinous floor is installed

1.3 RELATED REQUIREMENTS

1. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
2. Section 03 30 00 - CAST-IN-PLACE CONCRETE: Concrete substrate, curbs and equipment pads.
3. Section 04 20 00 - UNIT MASONRY: Masonry partitions and walls.
4. Section 07 92 00 - JOINT SEALANTS: Requirements for sealants and backing materials.
5. Section 09 05 06 - Common Work Resulting for Flooring
6. Division 22 - PLUMBING: "floor-flange" type floor drains.
7. Division 26 - ELECTRICAL:

1.4 REFERENCES

1. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of

Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.

1. ASTM C307 - Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing's.
2. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
3. ASTM C903 - Preparing Refractory Castable Specimens by Cold Gunning.
4. ASTM D412 - Vulcanized Rubber and Thermoplastic Elastomers—Tension.
5. ASTM D570 - Water Absorption of Plastics.
6. ASTM D751 - Standard Test Methods for Coated Fabrics
7. ASTM D2240 - Rubber Property - Durometer Hardness.
8. ASTM D5420 - Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
9. ASTM E84 - Surface Burning Characteristics of Building Materials.
10. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
11. All applicable federal, state and municipal codes, laws and regulations for flammability and smoke generation of interior finishes.

#### 1.5 ADMINISTRATIVE REQUIREMENTS

1. Pre-installation Meetings: Installer of the Work of this Section is required to attend pre-installation conference specified under Section 09 05 60 - COMMON WORK RESULTS FOR FLOORING
  - A. The Manufacturer shall have a minimum of 10 years experience in the production, sales, and technical support of epoxy and urethane industrial flooring and related materials.
  - B. The Applicator shall have experience in installation of the flooring system as confirmed by the manufacturer in all phases of surface preparation and application of the product specified.
  - C. No requests for substitutions shall be considered that would change the generic type of the specified System.
  - D. System shall be in compliance with requirements of United States Department of Agriculture (USDA), Food, Drug Administration (FDA), and local Health Department.
  - E. System shall be in compliance with the Indoor Air Quality requirements of California section 01350 as verified by a qualified independent testing laboratory.
  - F. A pre-installation conference shall be held between Applicator, General Contractor and the Owner for review and clarification of this specification, application procedure, quality control, inspection and acceptance criteria and production schedule.
2. Sequencing:

1. Sequence work to ensure resilient flooring is not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, wet work is dry and cured, and work overhead is completed.
2. Ensure that installation of flooring and accessories occurs after other finishing operations, including painting.

## 1.6 SUBMITTALS

1. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – ELECTRONIC SUBMITTAL PROCEDURES:
  1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, material compositions, and application instructions for all products to be applied hereunder
    - a. Include certification of data indicating Volatile Organic Compound (VOC) content of all floor system components.
  2. Manufacturer's instructions: Manufacturer's installation instructions indicating special procedures, integral base, and perimeter conditions.
    - b. The manufacturer's recommended methods of installation, when approved by the Architect, will become the basis for inspecting and accepting or rejecting actual installation methods used on the Work.
  3. Certification: Material certificates signed by manufacturer certifying that the waterproof mechanical equipment room flooring complies with requirements specified herein.
  4. Selection samples:
    - c. Sample card indicating Manufacturer's full range of colors available for selection by Architect.
  5. Verification samples:
    - d. Samples of each level of slip resistance, aggregate, and pattern available in the specified products from the proposed manufacturer.
    - e. 12 x 12 inch samples of finished surface illustrating material color, texture and finish.
  6. Qualification Submittals: Installer/Applicator's work experience documentation.
2. Closeout Submittals: Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
  1. Manufacturer's warranties: Include coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture.
  2. Manufacturer's warranties: Include coverage of materials and installation and resultant damage from failure of installation to resist penetration of moisture.

## 1.7 QUALITY ASSURANCE

1. Single-Source Responsibility: Obtain resinous flooring materials, including primers, resins, and finish coats, from a single manufacturer.

#### 1.8 MOCK-UPS

1. Provide mock-up under provisions of in field sample
2. Provide installed mock-up of flooring, minimum 25 square feet, illustrating color, texture and finish for each flooring type specified herein, and demonstrating the minimum standard for the Work.
3. Locate mock-ups where directed and include all surfaces and materials scheduled to receive a field applied finish.
4. Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
5. Accepted mock-ups may remain as part of the work; the number of mock-ups shall not be restricted.

#### 1.9 DELIVERY, STORAGE AND HANDLING

1. Deliver products to site in sealed and labeled containers; container labeling shall include manufacturer's name, type of paint, color mix designation, expected coverage, surface preparation instructions, instructions for mixing and reducing, drying time, and clean-up recommendations.
2. Store materials, conforming with applicable codes and fire regulations, in designated spaces. Keep storage area secure when direct access is not required or when not performing work under this Section. Take precautionary measures to prevent fire hazards and spontaneous combustion, maintain a dry-chemical type fire extinguisher in all areas where materials of this Section are being stored or used.
3. Store materials in a well ventilated area at minimum ambient temperature of 45 degrees Fahrenheit and a maximum of 90 degrees Fahrenheit.
4. Do not use the sanitary system for mixing or disposal of refuse material. Carry water to mixing rooms and dump waste material in a suitable refuse receptacle. Remove oily rags and waste each day.

#### 1.10 PROJECT CONDITIONS

1. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
2. Apply flooring materials within temperature and humidity range specified by coating manufacturer.
3. Provide sufficient lighting to maintain 80 foot-candles measured mid-height at substrate surface.



**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

1. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  1. Dur-a-flex Inc., East Hartford Ct.
  2. Crossfield Products Corp. (Dex-o-Tex), Roselle Park, NJ.
  3. General Polymers Corporation, Cincinnati OH. .
  4. Master Builders Inc., Cleveland OH.
  5. Stonhard Inc., Maple Shade, NJ.
  6. Tnemec,

**2.2 PRODUCT DESCRIPTION**

1. Troweled seamless epoxy composition flooring system shall be DUR-A-FLEX , Inc, Poly-Crete SLB (Self Leveling Broadcast Quarts) seamless flooring system as manufactured by Crossfield Products Corp., or approved equal. Flooring system shall meet or exceed the listed minimum physical property requirements when tested according to the referenced test method. Color as select by Architect from full range of manufactures colors.

**2. SYSTEM APPLICATION**

- A. Dur-A-Flex, Inc, Poly-Crete SLB (self-leveling broadcast quartz), seamless flooring system.
  1. System Materials:
    - a. Topping: Dur-A-Flex, Inc, Poly-Crete SL resin, hardener and SL aggregate.
    - b. The aggregate shall be Dur-A-Flex, Inc. Flintshot quartz aggregate.
    - d. Grout coat: Dur-A-Flex, Inc. Dur-A-Glaze Shop Floor resin and hardener.
    - e. Topcoat: Dur-A-Flex, Inc. Armor Top resin and hardener and colorant
- B. Patch Materials
  1. Shallow Fill and Patching: Use Dur-A-Flex, Inc. Poly-Crete MD (up to ¼ inch).
  2. Deep Fill and Sloping Material (over ¼ inch): Use Dur-A-Flex, Inc. Dur-A-Tex UM.

**3. PRODUCT REQUIREMENTS**

- |   |                          |
|---|--------------------------|
| A. Topping                                  | Poly-Crete SL            |
| 1. Percent Reactive                         | 100%                     |
| 2. VOC                                      | 0 g/L                    |
| 3. Bond Strength to Concrete ASTM D 4541    | >400psi, substrate fails |
| 4. Compressive Strength, ASTM C 579         | 9,000 psi                |
| 5. Tensile Strength, ASTM 638               | 2,175 psi                |
| 6. Flexural Strength, ASTM D 790            | 5,076 psi                |
| 7. Impact Resistance @125 mils, MIL D-3134, | Pass                     |
| No visible damage or deterioration.         |                          |
| B. Grout Coat                               | Dur-A-Glaze Shop Floor   |
| 1. VOC                                      | 8 g/L                    |
| 2. Compressive Strength, ASTM D 695         | 17,000 psi               |

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|  |   |
|--|---|
| 3. Tensile Strength, ASTM 638  | 4,000 psi   |
| 4. Flexural Strength, ASTM 790   | 6,250 psi   |
| 5. Flexural Modulus of Elasticity, ASTM 790                                    | 6.2 x 10 <sup>5</sup>   |
| 6. Abrasive Resistance, ASTM D 4060<br>CS17 Wheel, 1,000 gm load, 1,000 cycles | 24 mg loss  |
| 7. Flame Spread/NFPA-101, ASTM E 84  | Class A   |
| 8. Flammability, ASTM D 635  | Self Extinguishing  |
| 9. Indentation, MIL D-3134   | 0.025 Max   |
| 10. Impact Resistance MIL D-3134   | Pass  |
| 11. Water Absorption, MIL D-24613  | 0.04%   |
| <br>A. Top Coat  | <br>Armor Top   |
| 1. Percent Solids  | 95%   |
| 2. VOC   | 0 g/L   |
| 3. Tensile Strength, ASTM D 2370   | 7,000 psi   |
| 4. Adhesion, ASTM 4541   | Substrate Failure   |
| 5. Hardness, ASTM, D 3363  | >4H   |
| 6. 60 <sup>0</sup> Gloss ASTM D 523  | Satin: 50+/-10 Gloss: 75+/-10   |
| 7. Abrasive Resistance, ASTM D4060<br>CS 17 Wheel (1,000 g load) 1,00 cycles   | Gloss/4, Satin/8 mg loss with grit<br>Gloss/10, Satin/12 mg loss without grit |
| 8. Pot Life, 70 F, 50% RH  | 45 Minutes  |
| 9. Full Chemical Resistance  | 7 days  |

3. Accessory materials: Provide all accessory materials not specifically indicated, but are required to achieve the finishes specified.
4. Flooring system is to include additives which will allow moisture of concrete substrate to be 95%+ RH.

### 2.3 PRODUCT MIXING

1. Mix on site with manufacturer supplied mix and measure apparatus to ensure a timely, accurate mix ratio and minimize waste.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

1. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Notify Contractor of any condition that may potentially affect proper application of coatings.
2. Preinstallation Testing, Evaluation and Assessment: Moisture testing of concrete substrate, refer to Specification Section 09 05 60 – COMMON WORK RESULTS FOR FLOORING. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  1. Masonry or concrete: 12 percent.
3. Beginning Work of this Section means acceptance of existing substrate surfaces and site conditions.

### 3.2 PREPARATION - GENERAL

1. General: Comply with requirements specified under Section 09 05 60 – COMMON WORK RESULTS FOR FLOORING, the flooring manufacturer's requirements for preparation of substrate to receive flooring, and as additionally specified herein.
  - A. New and existing concrete surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae growth, laitance, friable matter, dirt, and bituminous products.
  - B. Moisture Testing: Perform tests recommended by manufacturer and as follows.
    - a. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 99% relative humidity level measurement.
    - b. If the relative humidity exceeds 99% then the Owner and/or Engineer shall be notified and advised of additional cost for the possible installation of a vapor mitigation system that has been approved by the manufacturer or other means to lower the value to the acceptable limit.
  - C. Mechanical surface preparation
    - a. Shot blast all surfaces to receive flooring system with a mobile steel shot, dust recycling machine (Blastrac or equal). All surface and embedded accumulations of paint, toppings hardened concrete layers, laitance, power trowel finishes and other similar surface characteristics shall be completely removed leaving a bare concrete surface having a minimum profile of CSP 4-5 as described by the International Concrete Repair Institute.
    - b. Floor areas inaccessible to the mobile blast machines shall be mechanically abraded to the same degree of cleanliness, soundness and profile using diamond grinders, needle guns, bush hammers, or other suitable equipment.
    - c. Where the perimeter of the substrate to be coated is not adjacent to a wall or curb, a minimum 3/16 inch deep and 1/4 inch wide key cut shall be made to properly seat the system, providing a smooth transition between areas. The detail cut shall also apply to drain perimeters and expansion joint edges.
    - d. Cracks and joints (non-moving) greater than 1/8 inch wide are to be chiseled or chipped-out and repaired per manufacturer's recommendations.
  - D. At spalled or worn areas, mechanically remove loose or delaminated concrete to a sound concrete and patch per manufacturer's recommendations.
  
2. Surface Preparation:
  1. Upon acceptance of completed existing surfaces, thoroughly remove all dust and debris by sweeping or by vacuum cleaning.
  2. Remove laitance, curing sealers, existing adhesives and other foreign matter from concrete surfaces with necessary techniques such as shot blasting, muriatic acid etching, surface freezing and power scarification.
  3. If a curing compound exists on concrete slab, thoroughly etch concrete surfaces using well mixed solution consisting of two parts by volume water diluted with one part by volume 30 percent commercial grade hydrochloric acid at a rate of one quart per ten square feet. Apply evenly to thoroughly saturated areas and scrub into surfaces using stiff-bristled broom. Allow

solution to activate undisturbed for not less than five minutes or for duration of boiling effect.

5. Thoroughly remove etching solution by washing down surfaces with clean water; flooded at least three separate times at a rate of two gallons per ten square feet; thoroughly remove all contaminants that may be engrained or latent in surfaces.
6. Perform a test application of a square foot in three locations, such as beneath casework. Allow to set for 72 hours, and test adhesion as recommended by the manufacturer.
7. It is the expressed desire that this finish installation be free of unsightly grinding marks on edges of terminations at drains and other embedded items. A test area indicating what these edges will appear as in the finished product is mandatory.

### 3.3 INSTALLATION - GENERAL

1. Mix and prepare coatings in accordance with manufacturer's written instructions. Thoroughly mix to ensure uniformity of color and mass, unless otherwise directed by the manufacturer of the specific coating used. Except for epoxy mixtures, strain previously opened materials to remove skins, coating lumps, and other foreign matter prior to painting. Dispose of epoxy materials which have begun to set.
2. Apply all materials in strict accordance with the approved manufacturer's printed instruction, and in accordance with the best trade practices. Each coat shall be reviewed and approved by the Architect before succeeding coats are applied.
3. Do not apply successive coating until the preceding coat is thoroughly dry, except as otherwise specified, and in no case in less than minimum period of time recommended by manufacturer.
  1. The system shall be applied in four distinct steps as listed below:
    - a. Substrate preparation
    - b. Topping/overlay application with quartz aggregate broadcast.
    - c. Grout coat application.
    - d. Topcoat application
  2. Immediately prior to the application of any component of the system, the surface shall be dry and any remaining dust or loose particles shall be removed using a vacuum or clean, dry, oil-free compressed air.
  3. The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results in accordance with the Manufacturer's recommendations.
  4. The system shall follow the contour of the substrate unless pitching or other leveling work has been specified by the Architect.
  5. A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.
- 4.

### 3.4 FLOOR TOPPING

1. The topping shall be applied as a self-leveling system as specified by the Architect. The topping shall be applied in one lift with a nominal thickness of 1/8 inch.

2. The topping shall be comprised of three components, a resin, hardener and filler as supplied by the Manufacturer.
3. The hardener shall be added to the resin and thoroughly dispersed by suitably approved mechanical means. SL Aggregate shall then be added to the catalyzed mixture and mixed in a manner to achieve a homogenous blend.
4. The topping shall be applied over horizontal surfaces using ½ inch "v" notched squeegee, trowels or other systems approved by the Manufacturer.
5. Immediately upon placing, the topping shall be degassed with a loop roller.
6. Quartz aggregate shall be broadcast to excess into the wet material at the rate of 1 lbs/sf.
7. Allow material to fully cure. Vacuum, sweep and/or blow to remove all loose aggregate.

### 3.5 INSTALLATION

1. System shall be installed in accordance with the manufacturer's specifications and shall include the following minimum applications:
  - A. Grout Coat
    1. The topcoat shall be squeegee applied and back rolled with a coverage rate of 80-90 sf/gal.
    2. The topcoat shall be comprised of a liquid resin and a liquid hardener that is mixed in the ratio of 1 part hardener to 2 parts resin and installed per the manufacturer's recommendations.
  - B. Topcoat
    1. The topcoat shall be roller applied with dip and roll method at 3 mils.
    2. The topcoat shall be comprised of a liquid resin, hardener and colorant mixed per the manufacturer's instructions.
    3. The finish floor will have a nominal thickness of 3/16 inch.
2. Bonding coat, waterproof membrane and smooth coat shall be applied prior to the installation of mechanical equipment and shall cover all floor surfaces, bases, mechanical pads and pipe sleeves. Colored finish coats shall be applied to all surfaces after all equipment has been installed.
3. Apply composition flooring up vertical abutting surfaces to form a coved base terminating 6 inches above floor in a feathered edge.
4. Feather edge where composition flooring abuts dissimilar material.
5. Allow surfacing to set undisturbed for a minimum period of 48 hours. Maintain temperature at 50 degrees F minimum until floor surfacing has completely cured.
6. Finished surfaces shall be flush, true to plane, and shall be level within permissible degree of tolerance 1/4 inch in 10'-0" in any direction.

### 3.6 CLEANING

1. Upon completion of the work in each area, remove all coating splatters from glass, prefinished surfaces, bright metals, and from other surfaces that have not been painted or finished hereunder. Do not use abrasive paper or abrasive cleaner on any prefinished surface or bright metal. Remove all materials and debris; leave work area in a clean condition.

3.7 PROTECTION AND TOUCH-UP

1. General: Protect finished work under provisions of Section 09 05 60 – COMMON WORK RESULTS FOR FLOORING.
2. Clean up the work area at end of each work day. Remove all cartons, debris, emptied containers, as the work progresses, and finally at completion of work of this Section Legally dispose of same off the Site.
3. During application of coatings, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Properly clean, repair or replace any work so damaged and soiled.
4. Protect all finished surfaces against damage until the date of final acceptance of the work. The Architect will conduct a final review of all work performed. Re-coat or touch-up, all scratches and other blemishes on surfaces, and as directed by the Architect, any areas found which do not comply with the requirements of this Section, and bear all costs therefor.
5. Any re-coating or touch-up work, required after the work of this Section has been reviewed and accepted by the Architect, will be paid for by the Contractor.

End of Section

Section 09 68 13  
TILE CARPETING

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

- A. General: The work of this Section consists of tile carpeting where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, substrate testing and preparation, furnishing and installation of flooring, and temporary protection until Owner's acceptance.
- B. Prepare substrates to receive carpet tile as required to ensure specified tolerance level for finish surface of carpeting. Preparation work includes patching, smoothing and leveling subfloors and underlayment, including:
  - 1. Grinding down high spots of substrate.
  - 2. Providing Portland cement-based latex underlayment (filler).
- C. Furnish and install carpet tile directly adhered over floors, where indicated on the Drawings, including all accessories necessary to complete the work.
- D. There are two types of carpet specified, the Owner reserves the right to select either carpet tile type and may mix and match the two different carpet tile types.

1.3 RELATED REQUIREMENTS

- A. Section 01 60 01 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- B. Section 01 52 40 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
- C. Section 03 30 00 - CAST-IN-PLACE CONCRETE: substrate.
- D. Section 09 68 00 - CARPETING: Broadloom carpet, and related transition strips.

1.4 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely

submission, review and acceptance by the Architect.

1. ASTM D2859 - Test Method for Flammability of Finished Textile Floor Covering Materials.
2. ASTM D5116 - Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
3. ASTM E84 - Surface Burning Characteristics of Building Materials.
4. ASTM E648 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
5. CRI Indoor Air Quality Testing and Labeling Program.
6. NFPA: Publication 253 - Test for Critical Radiant Flux of Floor Covering Systems.
7. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

#### 1.5 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  1. General: Coordinate the work of this Section with the respective trades responsible for installing interfacing and adjoining work for proper sequence of installation, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Pre-installation Meetings: Installer of the Work of this Section is required to attend pre-installation conference specified under Section 09 05 60 - COMMON WORK RESULTS FOR FLOORING.
- C. Sequencing:
  1. Remove and replace existing carpet in accordance with a pre-approved reuse and/or recycling plan.
  2. Sequence work to ensure carpeting is not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, wet work is dry and cured, and work overhead is completed.
  3. Ensure that installation of flooring and accessories occurs after other finishing operations and interior wet work is complete and fully cured, including painting.

#### 1.6 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – Electronic SUBMITTAL PROCEDURES:
  1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, for each item furnished hereunder, including carpet, accessories, adhesives, and leveling materials.
    - a. Recycling Plan: Manufacturer shall also submit a plan for recycling the specified carpet and related items at the end of the carpet's useful life.
  2. Manufacturer's installation instructions: Provide manufacturer's application methods or installation instructions for each item furnished hereunder. Indicate special procedures, and perimeter conditions requiring special attention.



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Maintenance Facility Improvements and Renovations  
Newton, MA

3. Manufacturer's sample warranties.
  4. Manufacturer's certificate: Provide certificate stating that the carpet, and other related materials to be supplied hereunder meet all requirements specified herein.
    - a. Submit certification from the fiber producer verifying use of the branded fiber in the submitted carpet product.
    - b. Certification should include the % recycled content by weight for fibers, describing the source of this recycled content. If virgin nylon is used, the manufacturer shall include, as part of the fiber certification, the precise method that will be used to recapture the nylon at the end of the useful life of the carpet. State whether it will be returned to nylon carpet, yarn production, downcycled to an end use other than carpet yarn used for waste-to-energy conversion, or disposed of in a specified manner.
  5. Indoor Air Quality Test Reports: Submit for specified products, indicating that the test results do not exceed the stated emission criteria of the CRI Indoor Air Quality Testing Program.
  6. Recycling Instructions
    - a. Submit written certification of environmental compliance describing all aspects of recycling programs for carpet uplifted for replacement and for carpet to be installed, including compliance by the carpet manufacturer and carpet trade contractor.
    - b. A representative from the carpet manufacturer shall meet with the contractor in the presence of a representative of the end user and architect/design firm to review the recommended procedures, prior to occupancy of the finished spaces.
  7. Shop drawings: 1/4 inch scale plans of all carpeted areas indicating direction of carpet, location of seams and method of joining seams.
    - a. Show location of different patterns or styles of carpet.
      - 1) Show location of different fiber types, If mixed fiber types are used on the project, the fiber type must be clearly identified to facilitate future recycling.
  8. Selection samples:
    - a. Sample swatches containing manufacturer's full color and blend range.
    - b. Vinyl edge strip sample illustrating manufacturer's full color range.
  9. Verification samples:
    - a. 12 inch long samples of edge strip.
    - b. After initial selection of carpet and color blends has been made by the Architect: 18 by 27 inch sample of selected carpet for final approval of the Architect. Approved samples shall be used as the standard of quality and colors for materials furnished under this Contract.
- B. Submit the following under provisions of Section 01 70 00 – CONTRACT CLOSEOUT.
1. Maintenance Data: Prior to final acceptance of the carpet installation, carpet subcontractor shall deliver to the Architect 3 printed copies of the carpet manufacturer's detailed maintenance recommendations for the care cleaning and stain-removal, and repair of the types of carpets installed. Include product data and Safety Data Sheets (SDS) for cleaning materials.
  2. When the installation is complete, the manufacturer shall deliver (1) a

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Maintenance Facility Improvements and Renovations  
Newton, MA

certificate of recycling, which describes the method by which the uplifted carpet was recycled; and (2) a warranty of recycling, which specifies the method by which the new carpet tile will be recycled at the end of its useful life.

- C. Maintenance Material Submittals: Submit the following under provisions of Section 01 70 00 - CLOSEOUT SUBMITTALS. Clearly label and package extra materials securely to prevent damage.
  - 1. Extra Materials: Deliver to the Owner extra materials for future repairs and maintenance. Clearly label and package securely to prevent damage.
    - a. Owner's carpet stock: An amount equal to 3 percent of each color, pattern and type of carpet installed.
    - b. Stock not turned over to Owner: Recycle waste, unusable scrap, and broadloom carpet damaged during installation through manufacturer's environmental program.
  - 2. Deliver specified overrun and usable pieces of carpet to owner's designated storage space, properly packaged and identified. Redirect small pieces of waste carpet to be appropriately recycled.

#### 1.7 QUALITY ASSURANCE

- A. Applicator: Company specializing in carpet tile installation of the type specified herein with a minimum of three years documented experience, approved by carpet tile manufacturer and participation in manufacturer's environmental program including responsible carpet removal, recycling, and installation.

#### 1.8 ENVIRONMENTAL CONDITIONS

- A. Do not install carpet until areas have been fully enclosed and environmental conditions have reached the levels indicated during occupancy.
- B. Store materials for 3 days (72 hours) prior to installation in area of installation to achieve temperature and humidity stability. Carpet and adhesive must be stored at a minimum temperature of 68 degrees F.
- C. Maintain area of installation at a temperature of at least 68 degrees Fahrenheit, with a relative humidity of between 15 and 65 percent, for a period of 72 hours before, during, and for 72 hours after installation.
  - 1. Ensure surface temperature of carpet substrate is great than 55 degrees Fahrenheit at commencement of carpet tile installation.
- D. Ventilate spaces where work of this Section occurs, during and for a period of 72 hours after completion of curing. Ventilate to dissipate humidity, and to prevent accumulation of fumes, vapors, and gases. Provide temporary fan units and ducting as required to for venting operations

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements:
  - 1. Do not deliver items to the site, until all specified submittals have been submitted to, and approved by, the Architect.
  - 2. Deliver materials in original unopened packages, containers or bundles

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

bearing brand name, and identification of manufacturer, with labels and package seals intact and legible.

- B. Storage and Handling Requirements:
  - 1. Store and handle materials following manufacturer's recommended procedures, and in accordance with material safety data sheets.
  - 2. Protect materials from damage due to moisture, direct sunlight, excessive temperatures, surface contamination, corrosion and damage from construction operations and other causes.
  
- C. Packaging Waste Management: Comply with packaging requirements specified under Section 01 60 00 - PRODUCT REQUIREMENTS.
  - 1. Shipping materials: Manufacturer shall utilize to the greatest extent possible packaging materials which are biodegradable and recyclable.
  - 2. Jobsite packaging waste management: Recycle packaging materials coordinated with general construction waste management specified under Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

1.10 WARRANTY

- 1. General: Submit the following warranties under provisions of Section 01 70 00 - CLOSEOUT SUBMITTALS
- 2. Furnish carpet installer's written guarantee covering prompt and proper replacement of any and all carpeting which indicates improper installation workmanship and/or defective material within twelve months from completion of the installation and acceptance thereof by the Architect, said corrective work being performed by the Carpet installer at no cost to the Owner.
- 3. Furnish carpet manufacturer's warranty which shall contain the following:
  - a. Commencement date for warranty: Date of Project Substantial Completion.
  - b. Wear Warranty - Lifetime of Carpet. No more than 10% face yarn loss by weight in normal use.
  - c. Static Warranty - Lifetime of Carpet.
  - d. Edge Ravel Warranty - Lifetime of Carpet. Guaranteed no edge ravel in normal use (no seam sealers required).
  - e. Delamination Warranty - Lifetime of Carpet. Guaranteed no delamination in normal use (no chair pads required).
  - f. Tuft Bind Warranty - Lifetime of Carpet. Guaranteed not to zipper, wet or dry.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with the criteria specified herein, manufacturers offering products which may be considered the work include, but are not limited to, the following:
1. Tarkett USA, Inc, Aurora, OH.
  2. Interface Americas, Inc., Atlanta, GA
  3. Milliken Design, Inc., Spartansburg, SC.
  4. J+J Flooring

### 2.2 CARPET TILE

- A. General requirements: Carpet tiles, shall conform with or pass tests of the following Standards:
1. ASTM D-2859 (Methenamine Reagent Pill Test).
  2. ASTM E-648 (Flooring Radiant Panel Test): Class I (Minimum Average CRF of 0.48).
  3. NBS Smoke Chamber Test: Maximum average of 450.
  4. AATCC-134 (Electrostatic Propensity): Maximum electrostatic generation below level of human sensitivity.
- B. Carpet Tile (Carpet Type 1) Basis of Design: Tarkett USA, Inc, Aurora, OH, product "*String Theory* ethos modular", having the following characteristics:
1. Construction: Stratatec Patterned Symtex
  2. Gauge: 5/64
  3. Stitch Rate: 9.9 pile units / inch
  4. Tuft Density: 126.7 tufts/sq inch
  5. Pile Height Average: .187 inch
  6. Pile Thickness: .110 inch
  7. Density Factor (UM44D): 6,545 oz/cu yd
  8. Fiber System: Dynex SD / Dynex BCF Nylon with Static Control & Eco-Ensure
  9. Dye Method: 70% Solution Dyed / 30% Yarn Dyed
  10. R-Value: 0.51 Minimum Hr-ft<sup>2</sup>-°F/Btu
  11. Static Coefficient of Friction: ASTM C-1028; Passes ADA requirements.
  12. Static Propensity: AATCC 134: 3.0 kv or less
  13. Flooring Radiant Panel: ASTM E-648 or NFPA 253: Class 1
  14. Acoustic Requirements: Noise Reduction Coefficient (NRC): 0.15 Minimum
  15. Secondary Backing Density: 65 Min. lbs/cu ft +/- 5%
  16. Secondary Backing Recycled Content: 50%
  17. Total Weight: 97.9 oz/sq yd +/- 5%
  18. Third Party Certification: NSF 140 Platinum rating / Cradle to Cradle Certified, v3.1: Silver
  19. Total Product Recycled Content (based on Total Weight): 56.9%

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- 20. Total Product Post Consumer Content (based on Total Weight): 33.8%
- 21. Environmental Impact: No pesticides added to product (US EPA Registered Antimicrobials)
  
- C. Carpet Tile (Carpet Type 2): J+J Flooring, LLC, Seekonk, MA, product "*Impulse III 7246 – Make a Move 1808*" having the following characteristics:
  
- D. Check matching of carpet before installation and ensure there is no visible variation between dye lots.

2.3 ACCESSORIES

- A. Filler for patching, smoothing and leveling flooring substrate: Refer to Section 09 05 60 –COMMON WORK RESULTS FOR FLOORING.
  
- B. Adhesives for carpet tile: NFPA Class A or UBC Class 1 types, as determined by ASTM E-84 Tunnel Test, as recommended by Carpet manufacturer for application and intended use. Acceptable manufacturers include:
  - 1. Advanced Adhesive Technology, Inc, Dalton GA.
  - 2. DAP Incorporated, Dayton OH.
  - 3. W.W. Henry Company, Aliquippa PA.
  - 4. Macklanburg-Duncan Company, Oklahoma City, OK.
  - 5. Roberts Consolidated Industries, Inc., City of Industry, CA.
  
- C. Transition strips, carpet reducers, edgings and accessories: roll-formed stainless steel. Schlüter Systems L.P., product series "Schiene" "Reno-U", "Reno TK" or "Reno-V" as appropriate to transition condition, in height(s) as required for flooring thickness, extruded aluminum, with a perforated anchoring leg. Refer to Interior Drawings.
  - 1. Profiles as indicated, submit shop drawings for all conditions not indicated and obtain Architect's approval for each transition/reducer.

**PART 3 - EXECUTION**

3.1 EXAMINATION

- A. Verification of Conditions: Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
  - 1. Ensure that newly placed concrete has cured for a minimum period of 30 days and that moisture content of concrete is within range specified by adhesive manufacturer.
  - 2. Verify that surfaces are smooth and flat with a maximum variation of 1/4inch in 10 feet, and are ready to receive work.
  - 3. Request correction of defects in receiving surfaces which are not correctable by the methods specified herein. Do not commence work until such defects are entirely corrected
  - 4. Beginning of installation means acceptance of existing substrate and site conditions.
  
- B. Preinstallation Testing, Evaluation and Assessment: Moisture testing of concrete substrate, refer to Specification Section 09 05 60 – COMMON WORK RESULTS FOR

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

FLOORING.

3.2 PREPARATION

- A. General: Comply with requirements specified under Section 09 05 60 – COMMON WORK RESULTS FOR FLOORING, the flooring manufacturer's requirements for preparation of substrate to receive resilient flooring, and as additionally specified herein.
- B. Preheat areas to receive carpet to a minimum temperature of 60 degrees F for 72 hours prior to installation, with a relative humidity between 15 and 60 percent. Maintain minimum temperature of 60 degrees F thereafter.
- C. Measure all areas to receive materials to be furnished and installed hereunder, and verify in the field their actual dimensions, including wall-to-wall dimensions, offsets, door locations, and details, fixed equipment, and all other installed items. Extra charges will not be allowed because of lack of familiarity with actual project conditions. Small pieces of carpet will not be acceptable.

3.3 INSTALLATION

- A. Install carpet tile in accordance with carpet and adhesive manufacturers' instructions. Immediately notify Architect of conflicts. Cement carpet directly to the substrate with specified installation adhesive. Trowel adhesive evenly on the substrate. Install the carpet within thirty minutes after spreading adhesive.
  - 1. Installed carpet tile system shall comply with:
    - a. Requirements of CRI's Green Label Plus (GLP) program for carpet. Provide documentation.
    - b. Requirements of CRI's Green Label Plus program for adhesive. Provide documentation.
    - c. Adhesives, comply with VOC content limits specified by the South Coast Air Quality Management District Rule #1168. Provide documentation.
    - d. No US EPA registered pesticides (antimicrobials) are to be added to the product. Antimicrobial treatments are registered with the EPA as preservatives of the products only, and no health benefit should be claimed or expected. If antimicrobials are added then third party documentation with a seal is required stating that the pesticides used will cause NO HARM to the occupants. Installation adhesives are exempt from this section.
    - e. Product as installed to be securely attached to the floor in compliance with Americans with Disabilities Act (ADA), Section 4.5.3.
- B. Lay carpet tile in a square grid pattern, with joints and seams parallel to building lines. Lay joints straight and continuous in both directions and with border carpet tile not less than 1/2 the width of the tile.
  - 1. Install carpet tile using installation pattern (vertical ashlar, horizontal ashlar, quarter turn, herringbone, unidirectional or other), as directed by Architect.
  - 2. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.
  - 3. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
  - 4. Install borders parallel to walls.

TILE CARPETING

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

5. Roll with appropriate roller for complete contact of product with adhesive to sub-floor.
  6. Trim carpet neatly at walls and around interruptions.
- C. Install specified edging wherever carpeting abuts a dissimilar flooring material, except where wood thresholds, or resilient floor tile trim occurs.
- D. Completed installed product is to be smooth and free of bubbles, puckers, and other defects.

3.4 CLEANING

- A. Daily clean work areas by disposing of carpet scraps. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of adhesives and other materials installed under this Section.
- B. Clean and vacuum carpet surfaces upon completion of the installation.

3.5 PROTECTION

- A. General: Protect finished work under provisions of Section 09 05 60 –COMMON WORK RESULTS FOR FLOORING.
- B. Prohibit traffic from carpet areas for 24 hours after installation.
- C. Protect carpet against damage during construction. Cover with not less than 6-mil thick polyethylene covering with taped joints during construction period whenever protection is required, so that carpet will be without any indication of deterioration, wear, or damage at time of completion.
- D. Damaged carpet will be rejected and recycled. As carpet is installed, remove trimmings, excess pieces of carpet, and installation materials.
- E. Maintain protection of carpeting on each floor or area until work is accepted.

End of Section

Section 09 91 00

PAINTING

(FILED SUB-BID REQUIRED AS PART OF SECTION 09 00 09)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. Filed Sub-Bid Requirements: As provided under Section 09 00 09 - PAINTING FILED SUB-BID REQUIREMENTS and supplemented under the Bidding Requirements, Contract Forms, and Conditions of the Contract, and applicable parts of Division 1 - GENERAL REQUIREMENTS.
1. Work of this Filed Sub-Bid includes all individual specification sections listed in Section 09 00 09.

1.2 SUMMARY

- A. Summary: This Section consists of painting work where shown on the Drawings, as specified herein, for a complete and proper installation. Painting work includes, but is not limited to the surface preparation and application of coated finishes, and subsequent touch-up, of interior and exterior items and surfaces as indicated on the Contract Drawings and as scheduled herein.
1. No attempt is made in this Section to list all surfaces, fixtures and equipment requiring painting on this project. It is the responsibility of the Subcontractor to determine for itself the scope and nature of the Work required for a complete installation from the information provided herein and in the Drawings.
- B. Surfaces and Materials: In general, without limiting the generality thereof, the following surfaces, fixtures and equipment require a painted finish:
1. Gypsum board partition and wall surfaces.
  2. Gypsum board ceilings and soffits.
  3. Exterior Masonry walls
  4. Plywood wainscoting.
  5. Concrete masonry unit partitions and walls.
  6. Metal doors, frames and vision panels.
  7. All doors and frames, Interior / Exterior
  8. Interior guardrails and handrails
  9. All stair parts
  10. Steel mezzanine and plywood flooring
  11. Interior trim and paneling.
  12. Exterior galvanized structural steel
  13. Exposed to view sprinkler piping.
  14. Exposed HVAC ductwork, piping
  15. Exposed plumbing , piping
  16. Exposed ceiling deck, structure and appurtenances
  17. Exposed fire service

PAINTING



18. Exposed electrical conduits, raceways, junction boxes
19. Exposed to view electrical conduit and raceways.
20. Access panels and frames.
21. Pressure wash exterior masonry walls, prep for paint and paint
22. Scrap and sand all exterior masonry walls, prep and paint
23. Exterior site bollards.

C. DO NOT PAINT the following surfaces and materials.

1. Concealed from view surfaces, except as indicated otherwise in the Contract Documents or as specified herein.
2. Chrome or nickel plating, stainless steel, bronze, brass.
3. Aluminum other than mill finished or factory primed.
4. Factory finished mechanical and electrical equipment, pumps, machinery and similar items which occur in mechanical, storage or equipment rooms or areas.
5. Factory finished materials, specialties, and accessories unless otherwise specified.
6. Ceramic tile, acoustical tile, resilient flooring, wood flooring, and other integrally finished floor, wall and ceiling finishes.
7. Prefinished millwork items.
8. Fire resistant testing and certification labels, code required labels, safety warning labels, performance rating plates, nomenclature plates, identification plates, and similar other labels.

1.3 RELATED REQUIREMENTS

- A. Section 01 45 29 - TESTING LABORATORY SERVICES: Chemical analysis; coating thickness.
- A. Section 01 60 00 - PRODUCT REQUIREMENTS: Listing of VOC requirements for adhesives, cleaning/maintenance materials, paints, coatings, and sealants.
- B. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
- C. Section 04 20 00 - UNIT MASONRY: Concrete masonry partitions.
- D. Section 05 50 00 - METAL FABRICATIONS: Shop priming of designated miscellaneous metals.
- E. Section 06 20 00 - FINISH CARPENTRY: Wood trim items, setting and filling of nails, sanding of wood trim.
- F. Section 08 11 13 - HOLLOW METAL DOORS AND FRAMES: Shop priming of metal frames and steel doors.
- G. Section 08 31 00 - ACCESS DOORS AND PANELS, and by trades requiring the same: Shop primed access panels, occurring in partitions and walls.

PAINTING

- H. Section 09 00 09 - PAINTING FILED SUB-BID REQUIREMENTS: Filed Sub-Bid requirements for work of this Section.
- I. Document 09 91 13 - EXTERIOR PAINTING SCHEDULE: Painting schedule for exterior surfaces and materials:
- J. Document 09 91 23 - INTERIOR PAINTING SCHEDULE:
  - 1. Painting schedule for interior surfaces and materials.
  - 2. Painting schedule for Mechanical and Electrical Equipment.
- K. Division 23 - HVAC
- L. Division 26 - ELECTRICAL:

#### 1.4 REFERENCES

- A. Referenced Standards: Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. The standards referenced herein are included to establish recognized minimum quality only. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
  - 1. ANSI/ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
  - 2. ASTM D2016 - Test Method for Moisture Content of Wood.
  - 3. ASTM D523 - Standard Test Method for Specular Gloss.
  - 4. ASTM D520 - Standard Specification for Zinc Dust Pigment.
  - 5. ASTM C834 - Standard Specification for Latex Sealants.
  - 6. All applicable federal, state and municipal codes, laws and regulations for flammability and smoke generation of interior finishes.
- B. DEFINITIONS
  - 1. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials specified herein, whether used as prime, intermediate or finish coats.
  - 2. Sheen: Specular gloss readings in accordance with ASTM D523.
    - a. Flat: less than 5 (measured at 85 degrees)
    - b. Eggshell: 5 – 20 (measured at 60 degrees)
    - c. Satin: 15-35 (measured at 60 degrees)
    - d. Low Luster: 25 – 35 (measured at 60 degrees)
    - e. Semi-Gloss: 30 -65 (measured at 60 degrees)
    - f. Gloss: 65 or more (measured at 60 degrees)
  - 3. Gloss as defined for LEED VOC requirements. Specified specular gloss readings below are as tested in accordance with ASTM D52.
    - a. Flat: less than 15 (measured at 85 degrees), less than 5 (measured at 60 degrees).

- b. Non-Flat: greater than 15 (measured at 85 degrees), greater than 5 (measured at 60 degrees).

## 1.5 ADMINISTRATIVE REQUIREMENTS

### A. Coordination:

- 1. General: The applicator of work specified herein is responsible to ensure that all paints, enamels, and coatings, proposed to be applied hereunder, are compatible with coatings used for shop-primed items and items which have been prime-coated under the work of other trades.
- 2. Immediately notify the Architect in writing of conditions which may require a change in the specifications of this Section before proceeding with the work. Failure to do so, in a timely fashion, so as not to interfere with the schedule of work of this Contract, shall be construed as acceptance of the coatings specified. Perform all corrective measures, at no cost to the Owner, for any defects in the work, resulting from the use of such materials.

### B. Scheduling:

- 1. Sequence painting work to ensure primers and painting is not applied until building is enclosed, sufficient heat is provided, all dust-generating activities have terminated, wet work is dry and cured, and work overhead is completed.
  - a. Painting work should be scheduled so as to minimize touch-ups. Interior painting is to be without flashmarks. Should flashmarks occur due to touch-ups, the Contractor shall be required to redo the entire surrounding wall surface.
  - b. Concrete, masonry, plaster, tile and marble setting and polishing and other wet work shall be completed and dry before commencement of painting work.
  - c. Finish flooring and ceiling work may be scheduled by Contractor to be completed after painting. In such cases, paint subcontractor is required to perform touch-ups as necessary following floor and ceiling installations, without additional cost to Owner.

- C. Do not order materials until all required schedules have been properly submitted, reviewed by the Contractor and Approved by Architect.

## 1.6 SUBMITTALS

### A. Information and Review Submittals: Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:

- 1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, material compositions, and application instructions for all finishing products to be applied hereunder.
  - a. Include certification of data indicating Volatile Organic Compound (VOC) content of all paint materials.
- 2. Samples:
  - a. Manufacturer's color selector for custom mixed colors for Architect's color scheduling.
  - b. Opaque coatings: Two 9 x 12 inch finished samples on hardboard of each color scheduled in each finish for review and approval. Identify

boards with finish type, color mix number and scheduled substrate surfaces or materials.

- B. Closeout Submittals: Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.
  - 1. Color chips: After final approval of all colors and tints by the Architect, submit to the Owner, color chips of all coatings used, with manufacturer's name and mix designation of the coating for the purpose of future re-ordering of coatings. Color chips shall be at least six (6) square inches in size, for each color and tint.

#### 1.7 QUALITY ASSURANCE

- A. Single source responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.
- B. Environmental Requirements for Volatile Chemicals: The volatile organic compound (VOC) content of all field-applied architectural paints, used on the interior walls and ceilings of this Project must meet the VOC limits defined in the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for Architectural Coatings or the South Coast Air Quality Management District (SCAQMD) Rule 1113, and effective February 5, 2016.
  - 1. For interior applications use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA method 24) and the following chemical restrictions:

|  | VOC Limit [g/L less water] |
|--|----------------------------|
| a. Flat coatings                       | 50                         |
| b. Nonflat coatings                    | 10                         |
| c. Nonflat - High gloss coatings       | 150                        |
| d. Aluminum roof coatings              | 400                        |
| e. Basement specialty coatings         | 400                        |
| f. Bituminous roof coatings            | 50                         |
| g. Bituminous roof primers             | 350                        |
| h. Bond breakers                       | 350                        |
| i. Concrete curing compounds           | 350                        |
| j. Concrete/Masonry sealers            | 100                        |
| k. Driveway sealers                    | 50                         |
| l. Dry-fog coatings                    | 150                        |
| m. Faux finishing coatings             | 350                        |
| n. Fire resistive coatings             | 350                        |
| o. Floor coatings                      | 100                        |
| p. Form-release compounds              | 250                        |
| q. Graphic arts coatings (sign paints) | 500                        |
| r. High temperature coatings           | 420                        |
| s. Industrial maintenance coatings     | 250                        |

#### PAINTING

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

|     |  |   |
|-----|--|---|
| t.  | Low solids coatings  | 120   |
| u.  | Magnesite cement coatings  | 450   |
| v.  | Mastic texture coatings  | 100   |
| w.  | Metallic pigmented coatings  | 500   |
| x.  | Multi-color coatings   | 250   |
| y.  | Pre-treatment wash primers   | 420   |
| z.  | Primers, sealers, and undercoaters   | 100   |
| aa. | Reactive penetrating sealers   | 350   |
| bb. | Recycled coatings  | 250   |
| cc. | Roof coatings  | 50  |
| dd. | Rust preventative coatings   | 250   |
| ee. | Shellac - Clear  | 730   |
| ff. | Shellac - Opaque   | 550   |
| gg. | Specialty primers, sealers, and undercoaters   | 100   |
| hh. | Stains   | 250   |
| ii. | Stone consolidants   | 450   |
| jj. | Swimming pool coatings   | 340   |
| kk. | Traffic marking coatings   | 100   |
| ll. | Tub and tile refinish coatings   | 420   |
| mm. | Waterproofing membranes  | 250   |
| nn. | Wood coatings  | 275   |
| oo. | Wood preservatives   | 350   |
| pp. | Zinc-rich primers  | 340   |
| 2.  | Emissions Testing: All interior paints must be tested and determined compliant in accordance with California Department of Public Health (CDPH) Standard Method V1.2-2017, including statement of total VOCs after 14 days.  |   |
| 3.  | Do not use water based paints formulated with aromatic hydrocarbons (organic solvent with a benzene ring in its molecular structure), formaldehyde, halogenated solvents, mercury or mercury compounds, or tinted with pigments of lead, cadmium, chromium VI and their oxides. Water based paints shall be low VOC and shall have a flash point of 61 degrees C or greater. |   |
| 4.  | Where it is necessary to use solvent-based paints, with less than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).   |   |
| 5.  | The following shall be low VOC and not be formulated with aromatic hydrocarbons (organic solvent with a benzene ring in its molecular structure).  |   |
|     | a.   | High performance water based acrylic coatings.    |
|     | b.   | Pigmented acrylic sealers.                        |
|     | c.   | Catalyzed epoxy coatings.                         |
|     | d.   | High performance silicone grafted epoxy coatings. |
| 6.  | Restricted Components: Paints used on this Project shall not contain any of the following:   |   |

PAINTING

- a. 1,2-dichlorobenzene
- b. Alkylphenol ethoxylates (APEs)
- c. Formaldehyde-donors
- d. Heavy metals, including lead, mercury, cadmium, hexavalent chromium and antimony in the elemental form or compounds
- e. Phthalates
- f. Triphenyltins (TPT) and tributyltins (TBT)

1.8 FIELD SAMPLES

- A. Provide field samples under provisions of Section 01 43 39 – Mock-ups for purpose of verifying selected colors.
- B. Paint on-site sample areas, minimum 40 square feet, illustrating selected color, and tint.
- C. Locate samples where directed. The Contractor shall provide in the base Contract, a total amount of samples equal to one sample per room.
- D. Accepted samples may remain as part of the work.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site in sealed and labeled containers; container labeling shall include manufacturer's name, type of paint, color mix designation, expected coverage, surface preparation instructions, instructions for mixing and reducing, drying time, and clean-up recommendations.
- B. Store materials, conforming with applicable codes and fire regulations, in designated spaces. Keep storage area secure when direct access is not required or when not performing work under this Section. Take precautionary measures to prevent fire hazards and spontaneous combustion, maintain a dry-chemical type fire extinguisher in all areas where materials of this Section are being stored or used.
- C. Store paint materials in a well ventilated area at minimum ambient temperature of 45 degrees Fahrenheit and a maximum of 90 degrees Fahrenheit.
- D. Do not use the sanitary system for mixing or disposal of refuse material. Carry water to mixing rooms and dump waste material in a suitable refuse receptacle. Remove oily rags and waste each day.

1.10 PROJECT CONDITIONS

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees Fahrenheit for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
- B. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent unless required otherwise by manufacturer's instructions.

- C. Apply paints and finishes above minimum temperature conditions in strict accordance with manufacturer's instructions.
- D. Provide sufficient lighting to maintain 80 foot-candles measured mid-height at substrate surface.

#### 1.11 SEQUENCING AND SCHEDULING

- A. The applicator of work specified herein is responsible to ensure that all paints, enamels, and coatings, proposed to be applied hereunder, are compatible with
- B. coatings used for shop-primed items and items which have been prime-coated under the work of other trades.
- C. Immediately notify the Architect in writing of conditions which may require a change in the specifications of this Section before proceeding with the work. Failure to do so, in a timely fashion, so as not to interfere with the schedule of work of this Contract, shall be construed as acceptance of the coatings specified. Perform all corrective measures, at no cost to the Owner, for any defects in the work, resulting from the use of such materials.
- D. Painting work should be scheduled so as to minimize touch-ups. Interior painting is to be without flashmarks. Should flashmarks occur due to touch-ups, the Contractor shall be required to redo the entire surrounding wall surface.

#### 1.12 WARRANTY

- A. General: Submit the following warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS, and in compliance with Section 01 78 36 – WARRANTIES.
  - 1. Warranties shall be effective starting from Date of Project Substantial Completion and are effective for specified term lengths.
- B. Manufacturer's Warranties: In addition to the specific guarantee requirements of the GENERAL CONDITIONS and SUPPLEMENTAL GENERAL CONDITIONS, the Contractor shall obtain in the Owner's name the standard written manufacturer's guarantee of all materials furnished under this Section where such guarantees are offered in the manufacturer's published product data. All these guarantees shall be in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Paints and general finishes:
    - a. Benjamin Moore & Company, Montvale, NJ.
    - b. California Paints, Cambridge MA,
    - c. Akzo Nobel Paints, LLC, Devoe High Performance Coatings, Strongsville, OH.

- d. Pittsburgh Paints / PPG Industries, Inc., Pittsburgh PA.
  - e. Pratt & Lambert Inc., Buffalo, NY.
  - f. Sherwin Williams, Cleveland OH.
2. Cold galvanizing touch-up paint:
- a. ZRC Worldwide Inc., Marshfield MA.
  - b. Duncan Galvanizing, Malden Ma.
  - c. Rustoleum Corp., Vernon Hills IL.
3. Caulking
- a. Pecora Corporation, Harleysville PA.
  - b. Sonneborn Building Products Inc., Minneapolis MN.
  - c. Tremco, Beachwood OH.

## 2.2 MATERIALS

- A. Coatings: Ready mixed, except for field catalyzed coatings with good flow and brushing properties; capable of drying or curing free of streaks or sags. Color pigments shall be processed to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating. Provide best quality grade, where manufacturer makes more than one grade of any material specified.
- B. Liquid zinc coating, for touch-up of welds, scratches, and abrasions in galvanized steel: Low VOC organic zinc-rich coating containing 92% metallic zinc, by weight in the dried film (ASTM D520, Type III) and conforming to SSPC Paint 20, Type II,
- 1. Level 1. Liquid zinc coating shall be recognized under the Component Program of Underwriter's Laboratories, Inc. as an equivalent to hot-dip galvanizing; conforming to MIL-P-21035B and SSPC Paint 29, Type II, Level I, for repair of hot-dip galvanizing and meeting the requirements for Zinc-Rich Paints.
    - a. VOC limit: not more than 250 g/L.
- C. Joint sealant for fill of minor cracks in plaster prior to painting: One component acrylic latex caulking compound, conforming to FS 19-TP-21M and ASTM C834, paintable within 24 hours after application, with a minimum movement capability of  $\pm 12.5$  percent, equal to one of the following:
- 1. Pecora, product "AC-20+".
  - 2. Sonneborn Building Products Inc., product, "Sonolac".
  - 3. Tremco, product, "Trimflex 834".

## 2.3 ACCESSORIES

- A. Accessory materials: other materials not specifically indicated, but are required to achieve the finishes specified of commercial quality.
- B. Cleaning Materials:
- 1. Tri-Sodium Phosphate (TSP) substitute products:
    - a. Savogran, Norwood MA, products "TSP-PF", or "Liquid TSP Substitute".
    - b. Custom Building Products, Seal Beach, CA., product "Custom T.S.P. Substitute".

## PAINTING



- c. DAP Inc., Baltimore MD., product "T.S.P. Substitute Heavy Duty Cleaner".

## 2.4 RESTORATION CLEANERS

A. Heavy Duty Restoration Cleaner: "Sure Klean Heavy Duty Restoration Cleaner" concentrated, general purpose acidic restoration cleaner for brick, terra cotta, sandstone, granite and many other masonry surfaces. Dissolves heavy atmospheric soiling. Not suitable for limestone, marble, travertine, concrete or cast stone surfaces.

- i. Form: Clear liquid
- ii. Color: Light amber
- iii. pH 1:3 Dilution: 1.5
- iv. Specific Gravity: 1.13
- v. Flash Point: None

### B. Paint Strippers

1. Heavy Duty Alkaline Paint Stripper: "Sure Klean Heavy Duty Paint Stripper". Solvent-alkaline gel for removal of multiple layers of paint and graffiti from porous masonry surfaces. Highly effective on variety of paint types. Remains active for up to 24 hours. Neutralize treated surfaces with "Sure Klean Limestone & Masonry Afterwash" or "Sure Klean Restoration Cleaner". Do not use on polished marble or aluminum surfaces. May damage or raise grain on wood surfaces.

### 2. Standard Grade

- i. Form: Gel
- ii. Color: Light Brown
- iii. pH: 14
- iv. Specific Gravity: 1.27
- v. Flash Point: > 175 degrees F.

### 3. Spray Grade

- i. Form: Loose paste.
- ii. Color: Brown
- iii. pH: 14
- iv. Specific Gravity: 1.39
- v. Flash Point: 138 degrees F.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Notify Contractor of any condition that may potentially affect proper application of coatings.
- B. Measure moisture content of surfaces, do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Gypsum board: 12 percent.

2. Masonry or concrete: 12 percent.
  3. Interior wood: 15 percent.
- C. Beginning Work of this Section means acceptance of substrate surfaces and site conditions.

### 3.2 PREPARATION

- A. Furnish and lay suitable drop cloths in all areas where coating work is being done to protect floors and all other surfaces from damage during the work. Protect adjoining surfaces with painter's mask tape.
- B. Prior to preparing surfaces or finishing, remove all finish hardware for painting doors and frames, except hinges and locks on exterior door; remove electrical plates, light fixture trim and fittings. Re-install hardware and other removed items after painted surfaces are thoroughly dry.
- C. Mix coatings thoroughly, unless otherwise directed by the manufacturer of the specific coating used, to ensure uniformity of color and mass. Strain previously opened coatings to remove skins, lumps, and other foreign matter prior to painting.
- D. Thin or reduce materials only as recommended by the specific material manufacturer, and only with the approval of the Architect.
- E. Impervious surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to thoroughly dry.
- F. Concrete and unit masonry surfaces scheduled to receive paint finish:
1. Remove all loose scale and mortar, dirt, salt or alkali powder and other surface contaminates, using a detergent expressly formulated for cleaning of concrete and masonry.
  2. Remove oil and grease with a solution of tri-sodium phosphate.
  3. Remove stains caused by weathering corroding metals with a solution of sodium metasilicate after thoroughly wetting with water.
  4. Thoroughly rinse the cleaned surfaces with clear water, and allow the surfaces to completely dry, allow a minimum of 4 hours before commencing application of coatings.
- G. Shop primed steel surfaces:
1. Remove rust, blistered and defective shop prime paint, and all foreign materials, down to bright metal by wire brushing, scraping, sanding, or commercial paint remover. Feather edges to make touch-up patches inconspicuous.
  2. Remove all grease or dirt with mineral spirits.
  3. Spot prime bare metal with alkyd base metal primer product of the finish coating manufacturer. Seal top and bottom edges of metals doors with primer.
- H. New galvanized surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- I. New interior wood items scheduled to receive paint finish.

### PAINTING

1. Smooth minor defects and remove all foreign matter by sanding, and if necessary, steel wool.
2. Wash sap spots and knots with mineral spirits. When dry, touch up knots, pitch streaks, and sappy sections with commercial stain sealer.
3. Fill up nail holes and cracks with wood putty or plastic wood after primer of first coat of finish is dry, and sand smooth.

### 3.3 HEAVY DUTY PAINT STRIPPER / PRESSURE WASHING

- a. Testing: Apply separate test panels. The first panel should dwell 1 to 2 hours, the second 4 to 6 hours and the third 12 hours or overnight. After all panels have been pressure rinsed, evaluate results and determine optimum dwell time.
- b. Application:
  - (1) Remove all loose and peeling paint using pressure water or scraper. Surface should be thoroughly dry before applying paint stripper.
  - (2) Apply a heavy coat of stripper to produce a buildup of approximately 1/8 inch.
  - (3) Allow paint stripper to remain on the surface until the paint is obviously "lifted" or dissolved. If stripper is left on the surface unattended, take precautions to prevent pedestrians from coming near treated surfaces.
  - (4) Using pressure rinsing equipment, thoroughly rinse the stripper and solubilized paint from the surface. Use as much water as possible.
  - (5) Reapply stripper as required. Shorter dwell times are frequently adequate on second applications where only small amounts of paint remain.
  - (6) When all paint has been removed, use the appropriate Sure Klean restorative cleaner to neutralize the surface, remove all traces of stripper, and "pigment shadow". Use Sure Klean Restoration Cleaner for brick, terra cotta, sandstone and other siliceous type masonry. Use Sure Klean Limestone Afterwash for limestone, concrete, cast stone and other calcareous type masonry.
  - (7) Allow to dry thoroughly prior to repainting.

### 3.4 APPLICATION

- A. Apply all materials in strict accordance with the approved manufacturer's printed instruction, and in accordance with the best trade practices. Each coat shall be reviewed and approved by the Architect before succeeding coats are applied.
- B. Do not apply successive coating until the preceding coat is thoroughly dry, and in no case in less than 24 hours after the preceding coat.
- C. Number of coats is indicated under Painting Schedules. Number of coats is indicated as a minimum number to be applied over scheduled substrates. An additional coat or coats may be required for proper color coverage of substrate as

determined by the Architect, at no additional cost to the Owner. Examples of these conditions include, but are not limited to:

1. Dark colored substrates may require an additional primer or intermediate coat to stabilize color, if final applied top-coat color is light.
  2. Pre-finished or pre-primed products may require an additional field applied coat to stabilize the shop/factory applied base color prior to application of top-coat finishes.
  3. Dark color top coat finishes may require additional finish coat over white or light-colored substrates to obtain correct color density.
- D. Apply each coat to a uniform finish; Apply primer and first coat of slightly lighter in color tint than the scheduled color of the final coat.
- E. Sand lightly between coats to achieve required finish and remove sanding dust prior to applying succeeding coat.
- F. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- G. Prime back surfaces of all interior and exterior woodwork scheduled for painted finish with primer.

### 3.5 CLEANING

- A. Upon completion of the work in each area, remove all coating splatters from glass, prefinished surfaces, bright metals, and from other surfaces that have not been painted or finished hereunder. Do not use abrasive paper or abrasive cleaner on any prefinished surface or bright metal. Remove all materials and debris; leave work area in a clean condition.

### 3.6 PROTECTION AND TOUCH-UP

- A. During painting work, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Properly clean, repair or replace any work so damaged and soiled.
- B. Protect all painted and finished surfaces against damage until the date of final acceptance of the work. The Architect will conduct a final review of all work performed hereunder. Re-coat or touch-up, all scratches and other blemishes on surfaces, and as directed by the Architect, any areas found which do not comply with the requirements of this Section, and bear all costs therefore.
- C. Any re-coating or touch-up work, required after the work of this Section has been reviewed and accepted by the Architect, will be paid for by the Contractor.

### 3.7 PAINTING SCHEDULE

- A. Colors: The Architect will furnish a schedule of colors for each area and surface. Tinting and matching shall be to the satisfaction of the Architect. No limit is placed on the number of colors that may be required, or the number of colors in any one room, area, or surface. Premium paints of deep-hued, bright, pigment intensive, accent and primary colors may be scheduled for up to 25 percent of all interior and exterior surfaces without additional cost to the Owner.

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1. Colors of priming coats (and body coats where specified) shall be lighter in tint than those of finish coat.
  2. Colorants: Pure, non-fading pigments, mildew-proof, ultra-violet resistant, finely ground in approved medium; and be lime proof, when used in coatings to be applied on masonry, concrete, plaster, and gypsum board surfaces.
- B. Paint Schedule for exterior surfaces and materials: Refer to Document 09 91 13.
- C. Paint Schedule for interior surfaces and materials: Refer to Document 09 91 23.
- D. Painting Schedule for mechanical and electrical equipment: Refer to Document 09 91 23.

End of Section

Document 09 91 13

EXTERIOR PAINTING SCHEDULE  
(FILED SUB-BID REQUIRED AS PART OF SECTION 09 00 09)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. Sub-Bid Requirements: As provided under Section 09 00 09 - PAINTING FILED SUB-BID REQUIREMENTS and supplemented under the Bidding Requirements, Contract Forms, and Conditions of the Contract, and applicable parts of Division 1 - GENERAL REQUIREMENTS.
  - 1. Work of this Filed Sub-Bid includes all individual specification sections listed in Section 09 00 09.
- B. General: Number of coats scheduled herein below is minimum required, refer to Article entitled "APPLICATION" in specification Section 09 91 00 - PAINTING, regarding coverage.

1.2 PAINTING SCHEDULE FOR EXTERIOR SURFACES AND MATERIALS

- A. Exterior METAL, ALUMINUM, new, mill finish and as scheduled to receive paint:
  - 1. One coat primer:
    - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
    - b. Devoe Coatings: Devflex 4020PF DTM Primer and Flat Finish.
    - c. Moore: "Acrylic Metal Primer", N°. P04.
    - d. Pittsburgh: "Pitt-Tech DTM Primer/Finish", 90 Series.
    - e. Sherwin-Williams: "DTM Acrylic Primer/Finish", B66W1 Series.
  - 2. Two coats acrylic gloss enamel:
    - a. California: Everlife 100% Acrylic Waterborne High Gloss ", N°. 521.
    - b. Devoe Coatings: Devflex 4216HP High Performance Waterborne Acrylic Semi-Gloss Enamel.
    - c. Moore: "Acrylic Gloss Enamel", N°. P28.
    - d. Pittsburgh: "Pitt-Tech DTM Exterior Waterborne High Gloss Enamel", 90-300 Series.
    - e. Sherwin-Williams: "DTM Acrylic Gloss Coating", B66 Series.
- B. Exterior METAL, FERROUS, new, shop primed and existing:
  - 1. One coat rust inhibitive primer. (touch up bare metal at existing and shop primed surfaces).
    - a. California: "Everlife Oil-based Metal Primer, N°. 21150.
    - b. Devoe Coatings: Devguard 4160 Multi-Purpose Tank & Structural Primer.
    - c. Moore: "Corotech Universal Metal Primer" N°. V131
    - d. Pittsburgh: "Speedhide Industrial Rust Inhibitive Primers", 6-208/6-212 Series.
    - e. Sherwin-Williams: "Kembond HS Universal Metal Primer", B50 Series.
  - 2. Two coats acrylic gloss enamel:

EXTERIOR PAINTING SCHEDULE

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

- a. California: "Everlife 100% Acrylic Waterborne High Gloss ", N°. 521..
  - b. Devoe Coatings: Devflex 4208QD Waterborne Gloss Enamel.
  - c. Moore: "Acrylic Gloss Enamel", N°. HP28
  - d. Pittsburgh: "Pitt-Tech DTM Exterior Waterborne High Gloss Enamel", 90-300 Series.
  - e. Sherwin-Williams: "DTM Acrylic Gloss", B66 Series
- C. Exterior METAL, GALVANIZED (other than handrails):
1. Wash primer apply if recommended by individual paint manufacturer.
  2. One coat primer.
    - a. California: "Rust-Stop DTM 100% Acrylic Latex Semi-Gloss".
    - b. Devoe Coatings: Devflex 4020PF Direct To Metal Primer and Flat Finish.
    - c. Moore: "DTM. Acrylic Gloss Enamel", HP28
    - d. Pittsburgh: "Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel", 90-712 Series.
    - e. Sherwin-Williams: "DTM Acrylic Primer/Finish", B66-W1 Series.
  3. Two coats of gloss finish direct-to-metal acrylic enamel paint.
    - a. California: "Rust-Stop DTM 100% Acrylic Latex Semi-Gloss".
    - b. Devoe Coatings: Devflex 659 Gloss DTM Waterborne Acrylic Enamel.
    - c. Moore: "DTM Acrylic Gloss Enamel", HP28
    - d. Pittsburgh: "Pitt-Tech Int/Ext Industrial DTM Primer/Finish Enamel", 90-374 Series.
    - e. Sherwin-Williams: "DTM Acrylic Coating", B66-100 Series.
- D. Exterior CMU Masonry walls to receive - matt finish:
1. One coat block filler:
    - a. Moore: "Ultra Spec Masonry Acrylic Sealer 608
    - b. PPG: "Speedhide Interior Masonry Latex Block Filler", 6-7 Series.
    - c. Sherwin-Williams: "PrepRite Int. Ext Block Filler", B25-W25 Series.
  2. Two coats acrylic semi-gloss paint: 13-16 mils per one coat "wet" / 6.0-7.5 mils per coat "dry"
    - a. Basis of Design: Sherwin-Williams: "Conflex XL" CF11
    - b. Benjamin Moore
    - c. PPG

End of Document

Document 09 91 23

INTERIOR PAINTING SCHEDULE  
(FILED SUB-BID REQUIRED AS PART OF SECTION 09 00 09)

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. Sub-Bid Requirements: As provided under Section 09 00 09 - PAINTING FILED SUB-BID REQUIREMENTS and supplemented under the Bidding Requirements, Contract Forms, and Conditions of the Contract, and applicable parts of Division 1 - GENERAL REQUIREMENTS.
  - 1. Work of this Filed Sub-Bid includes all individual specification sections listed in Section 09 00 09.
- B. General: Number of coats scheduled herein below is minimum required, refer to Article entitled "APPLICATION" in specification Section 09 91 00 - PAINTING, regarding coverage.

1.2 MANUFACTURER'S DESIGNATIONS

- A. Manufacturer's designations used in Schedule are defined as follows:
  - 1. "Moore": Benjamin Moore & Company, Montvale, NJ.
  - 2. "California": California Paints, Andover MA.
  - 3. "Carboline": Carboline, Inc., St. Louis MO.
  - 4. "International": International Paint LLC (Division of Akzo Nobel), Forth Worth TX.
  - 5. "Masterchem": Masterchem Industries, Imperial MO,
  - 6. "PPG": PPG Paints / PPG Industries, Inc., Pittsburgh PA.
  - 7. "Sherwin Williams": Sherwin Williams, Cleveland OH.
  - 8. Tnemec": Tnemec Company, Inc., Kansas City, MO.

1.3 PAINTING SCHEDULE FOR INTERIOR SURFACES AND MATERIALS

- A. Interior CONCRETE walls and partitions:
  - 1. One coat acrylic primer.
    - a. California: "Prime Choice 100% Acrylic Universal Primer", N<sup>o</sup>. 50600.
    - b. Moore: "Ultra Spec Masonry Acrylic Sealer 608.



- c. PPG: "Perma-Crete Acrylic Alkali Resistant Primer", N°. 4-603.
  - d. Sherwin-Williams: "Lox-On Interior Acrylic Masonry Primer" A24W8300 Series.
2. Two coats acrylic semi-gloss paint:
- a. California: "Fres-Coat Unite 100% Acrylic Latex Semi-Gloss", N°. 563.
  - b. Moore: "Ultra Spec 500 Semi Gloss N539.
  - c. PPG: "Speedhide", 6-500 Series.
  - d. Sherwin-Williams: "ProMar 200 Latex Semi-Gloss".
- B. Interior CONCRETE MASONRY walls and partitions:
1. One coat block filler:
- a. California: "Mason-Cote 100% Acrylic Latex Block Filler", N°. 3751.
  - b. Moore: "Ultra Spec Masonry Acrylic Sealer 608
  - c. PPG: "Speedhide Interior Masonry Latex Block Filler", 6-7 Series.
  - d. Sherwin-Williams: "PrepRite Int. Ext Block Filler", B25-W25 Series.
2. Two coats acrylic semi-gloss paint:
- a. California: "Fres-Coat Unite 100% Acrylic Latex Semi-Gloss", N°. 563.
  - b. Moore: "Ultra Spec 500 Semi Gloss N539.
  - c. PPG: "Speedhide", 6-500 Series.
  - d. Sherwin-Williams: "ProMar 200 Latex Semi-Gloss".
- C. Interior underside of METAL DECKING, exposed to view joists, overhead steel, sprinkler piping, conduits, ducts and similar items:
1. Two coats waterborne acrylic dry fall finish:
- a. California: "Economy Latex Dry Fall Spray Flat", N°. 3701.
  - b. Moore: "Coronado Late Dry Fall Flat N110.
  - c. PPG: "Speedhide Latex Dry Fog Spray Paint", 6-714/715 Series.
  - d. Sherwin-Williams: "Pro Industrial Waterborne Acrylic Dryfall, Flat", B42 Series.
- D. Interior EXPOSED DUCTWORK, Insulated and Wrapped

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

1. Apply one prime coat and two finish coats of a paint recommended by the approved paint manufacturer for application on the exposed wrapping material.
- E. Interior GYPSUM BOARD (drywall) partitions:
1. One coat latex primer.
    - a. California: "Elements 100% Acrylic White Primer", N°. 74600.
    - b. Moore: "Ultra Spec 500 Interior Latex Primer", N°. N534.
    - c. PPG: "Pure Performance Interior Latex Primer", N°. 9-900.
    - d. Sherwin-Williams: "Harmony Interior Latex Primer", B11W900 Series.
  2. Two coats eggshell paint:
    - a. California: "Elements 100% Acrylic Zero VOC Eggshell", N°. 731.
    - b. Moore: "Ultra Spec 500 Low Sheen Eggshell N537.
    - c. PPG: "Pure Performance Eggshell", N°. 9-300.
    - d. Sherwin-Williams: "Harmony Low Odor Interior Latex Eg-Shel", B9 Series".
- F. Interior GYPSUM BOARD (drywall) ceilings and underside of soffits:
1. One coat latex primer.
    - a. California: "Elements 100% Acrylic White Primer", N°. 74600.
    - b. Moore: "Ultra Spec 500 Primer N534.
    - c. PPG: "Pure Performance Interior Latex Primer", N°. 9-900.
    - d. Sherwin-Williams: "Harmony Interior Latex Primer", B11W900 Series.
  2. Two coats flat paint:
    - a. California: "Elements Zero VOC Flat 100% Acrylic", N°. 733.
    - b. Moore: "Ultra Spec 500 Latex Flat N536.
    - c. PPG: "Pure Performance, Flat", 9-100 Series.
    - d. Sherwin-Williams: "Harmony Low Odor Interior Latex Flat", B5 Series.
- G. Interior METAL, ALUMINUM, shop primed and previously painted (includes counter supports):

1. Touch up bare metal with latex metal primer.
    - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
    - b. Moore: "Metal Primer", N°. P04.
    - c. PPG: "Pitt-Tech DTM Primer/Finish 100% Acrylic", 90-709/712 Series.
    - d. Sherwin-Williams: "DTM Acrylic Primer Finish", B66 W11 Series.
  2. Two coats acrylic semi-gloss enamel:
    - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
    - b. Moore: "Ultra Spec 500 DTM Acrylic Semi-Gloss", N°. HP29.
    - c. PPG: "Pitt-Tech Plus High Performance, Semi -Gloss DTM Industrial Enamel", 90-1210 Series.
    - d. Sherwin-Williams: "Sher-Cryl HPA Semi-Gloss", B66 Series.
- H. Interior METAL, FERROUS, excluding railings, to receive semi-gloss finish:  
(includes galvanized metal doors and frames):
1. One coat of rust prohibitive primer for unfinished metal surfaces, and touch up bare metal at shop primed, existing and previously coated surfaces:
    - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
    - b. Moore: "Acrylic Metal Primer", N°. P04.
    - c. PPG: "Pitt-Tech DTM Primer/Finish 100% Acrylic", 90-709/712 Series
    - d. Sherwin-Williams: "DTM Acrylic Primer Finish", B66 W1 Series.
  2. Two coats acrylic semi-gloss enamel:
    - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
    - b. Moore: "Ultra Spec 500 DTM Acrylic Semi-Gloss", N°. HP29.
    - c. PPG: "Pitt-Tech Plus High Performance, Semi -Gloss DTM Industrial Enamel", 90-1210 Series.
    - d. Sherwin-Williams: "Sher-Cryl HPA Semi-Gloss", B66 Series.
- I. Interior METAL, GALVANIZED, (includes exposed ductwork):
1. Touch-up with metal primer.
    - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.

- b. Moore: "Acrylic Metal Primer", N°. P04.
  - c. PPG: "Pitt-Tech DTM Primer/Finish 100% Acrylic", 90-709/712 Series.
  - d. Sherwin-Williams: "DTM Acrylic Primer Finish" B66 W1 Series.
2. Two coats acrylic semi-gloss enamel:
- a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
  - b. Moore: "Ultra Spec 500 DTM Acrylic Semi-Gloss", N°. HP29.
  - c. PPG: "Pitt-Tech Plus High Performance, Semi -Gloss DTM Industrial Enamel", 90-1210 Series.
  - d. Sherwin-Williams: "Sher-Cryl HPA Semi-Gloss", B66 Series.
- J. Interior exposed METAL, PIPING: Same as specified for ferrous metal.
- K. Interior METAL, RAILINGS, (handrails and guardrails) to receive aliphatic acrylic polyurethane finish:
- 1. First coat, epoxy undercoat:
    - a. International: "Interseal 670 HS" at 5.0 mils DFT.
    - b. Tnemec: "69 Color High-Build Epoxoline II" at 3.0 mils DFT.
    - c. Moore: "Corotech Polyamind Coating", V400 series.
    - d. PPG: "PPG All Weather DTR" 97 Series @ 5 mils DFT, 18 Month Recoat
    - e. Sherwin-Williams: "Recoatable Epoxy Primer" @4.0-6.0 mils DFT.
  - 2. Second coat, high gloss aliphatic acrylic polyurethane coating:
    - a. International: "Interthane 990" at 4.0 mils DFT.
    - b. Tnemec: "74 Endura Shield" at 4.0 mils DFT.
    - c. Moore: "Corotech Aliphatic Acrylic Urethane", V500 series.
    - d. PPG: "Pitt-Thane Ultra" 95-800 Series @ 4 mils DFT.
    - e. Sherwin-Williams: "Acrolon 218 HS Acrylic Polyurethane" @ 3.0-6.0 mils DFT.
- L. Interior WOOD TRIM, new, unfinished, to receive painted (opaque) finish:
- 1. One coat acrylic stain-blocking primer-sealer (undercoater):
    - a. California: "Wipe-Out 100% Acrylic Latex Stain Block", N° 52500.

- b. Moore: "Fresh Start High-Hiding All Purpose Primer, N° 046.
  - c. PPG: "Seal Grip Interior/Exterior Universal Primer/Sealer", 17-921 series.
  - d. Sherwin-Williams: "PrepRite ProBlock Primer/Sealer", B51 W620 Series.
2. Two coats acrylic semi-gloss enamel:
- a. California: "Fres-Coat Unite Semi-Gloss", N°. 563.
  - b. Moore: "Ultra Spec 500 Latex Semi Gloss N539.
  - c. PPG: "Speedhide Interior Semi-Gloss", 6-500 Series.
  - d. Sherwin-Williams: "ProMar 200 Zero VOC Semi-Gloss", B31-2600 Series.
- M. Interior WOOD TRIM, shop primed, to receive painted (opaque) finish:
- 1. Touch up bare wood with acrylic stain-blocking primer-sealer (undercoater):
    - a. California: "Wipe-Out 100% Acrylic Latex Stain Block", N° 52500.
    - b. Moore: "Fresh Start High-Hiding All Purpose Primer, N° 046.
    - c. PPG: "Seal Grip Interior/Exterior Universal Primer/Sealer", 17-921 series.
    - d. Sherwin-Williams: "PrepRite ProBlock Primer/Sealer", B51 W620 Series.
  - 2. Two coats acrylic semi-gloss enamel:
    - a. California: "Fres-Coat Unite Semi-Gloss", N°. 563.
    - b. Moore: "Ultra Spec 500 Latex Semi Gloss N539.
    - c. PPG: "Speedhide Interior Semi-Gloss", 6-500 Series.
    - d. Sherwin-Williams: "ProMar 200 Zero VOC Semi-Gloss", B31-2600 Series.
- 1.4 PAINTING SCHEDULE FOR FIRE RESISTIVE AND RATED DESIGNATIONS
- A. In compliance with Massachusetts State Building Code, Ninth Edition (referencing 2015 International Building Code) and as additionally specified herein, provide identification for all fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions and any other wall or partition which is required to have protected openings or penetrations.
  - B. In compliance with the 2015 International Building Code and as additionally specified herein, provide identification for all fire walls, fire barriers, fire partitions,

smoke barriers and smoke partitions and any other wall or partition which is required to have protected openings or penetrations.

1. Application:
  - a. Apply to outside of fire rated shafts, and to both sides of partitions to be located within 15 feet of the end of each wall and at intervals not to exceed 30'-0" horizontally for entire length of partition or wall, or once on any partition 30'-0 feet or less in length.
  - b. Locate identification in all accessible concealed floor, floor-ceiling and attic spaces. Locate identification within 12 to 18 inches above finished ceilings.
  - c. Apply stenciled lettering by spray or brush, or provide permanent signage. Identification shall be waterproof, fade-proof and non-combustible. Signage shall be mechanically fastened or permanently adhered to partition.
  - d. Stencil character height: 3 inch (76mm) minimum, sans-serif block lettering font, having minimum 3/8 inch width (9.5mm) strokes, with wording in all capital lettering.
  - e. Color: Easily identifiable color, contrasting with background, acceptable to authorities having jurisdiction.
2. Apply stenciled lettering to the following types of partitions using wording specified:
  - a. Applied identification for 2 hour fire rated partitions shall read: "2 HOUR FIRE WALL - PROTECT ALL OPENINGS".
  - b. Applied identification for 1 hour fire rated partitions shall read: "1 HOUR FIRE WALL - PROTECT ALL OPENINGS".
  - c. Applied identification for Smoke barriers shall read: "1 HOUR SMOKE BARRIER - PROTECT ALL OPENINGS".

#### 1.5 PAINTING SCHEDULE FOR MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black enamel.
- B. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- C. Remove unfinished louvers, grilles, covers and access panels on and paint as scheduled above.

- D. Plywood backboards for electrical panels and other equipment. Paint both front and back surfaces and all edges of plywood backboards before backboards are installed.
  - 1. One coat latex primer-sealer (undercoater):
    - a. Moore: "Ultra Spec 500 Latex Primer N534.
    - b. PPG: "Pure Performance Interior Latex Primer".
    - c. Sherwin-Williams: "Harmony Interior Latex Primer" B11W900.
  - 2. Two coats latex semi-gloss paint:
    - a. Moore: "Ultra Spec 500 Semi Gloss N539.
    - b. PPG: "Pure Performance Interior Semi-gloss", 9-500 Series.
    - c. Sherwin-Williams: "Harmony Interior Latex Semi-gloss" B10 Series.
- E. Prime and paint insulated and exposed cold pipes, conduit, electrical boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are located in storage, mechanical or equipment spaces or those items which are factory prefinished.
- F. Exposed to view un-insulated hot pipes within finished painted areas: Two coats heat-resistant enamel conforming to Federal Specification TT-E-496, Type I, applied when surfaces are less than 140 degrees Fahrenheit.

End of Document

SECTION 10 14 00

SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install the following informational and directional signage:
1. Interior acrylic plate signage.
  2. Emergency response labeling for all exterior doors, new and existing.
  3. All rooms have a sign, rooms with multiple door entries to have signage at each door entry.
  4. Handicapped Accessible Signage.

1.2 RELATED SECTIONS

1.3 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 Electronic Submittal Procedures
1. Literature: Manufacturer's product data sheets, specifications, physical properties for each item furnished hereunder.
  2. Schedule: The Architect will prepare and issue a schedule for all identification devices to be furnished hereunder, including character types, and colors.  
.After receipt of the Architect's schedule, prepare and submit shop drawings and verification schedule.
  3. Shop drawings:
    - a. Plan drawing showing location of each interior [and exterior] sign. Coordinate plan with schedule.
    - b. Elevation drawings showing full size elevations of each sign. Indicate for each sign: sign styles, lettering and locations, and overall dimensions.
    - c. Large scale design details of signs, showing attachment clips and brackets; and complete installation details.
  4. Selection samples:
    - a. Sample plastic chips indicating Manufacturer's full range of colors available for initial selection by Architect.
  5. Verification samples:
    - a. Full size sample sign, of type, style and color specified including method of attachment.
    - b. Full size sign in specified finish and typeface. Approved sample may be used in finished Project.



1.4 REGULATORY REQUIREMENTS

- A. Comply with all applicable federal, state and municipal codes, laws and regulations regarding signage for exits and handicapped barriers.

1.5 QUALITY ASSURANCE

- A. Sign fabricator specializing in the work of this Section with a minimum of 3 years experience.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivered packaged signs, labeled in name groups.
- B. Store all materials in an elevated dry location, protected by waterproof coverings. Store adhesive tape at ambient room temperature.

1.7 ENVIRONMENTAL CONDITIONS

- A. Do not install adhesive applied signs when ambient temperature is below 70 degrees Fahrenheit. Maintain this minimum during and after installation of signs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Interior plaque signs:
    - a. Apco New England, Franklin, MA.
    - b. Design Communications, Boston, MA.
    - c. Sunshine Sign, North Grafton, MA.
    - d. General Sign Company, Norwood, MA.
    - e. Back Bay Sign Company, Somerville, MA.
  - 2. Individual letter signage:
    - a. ARK Ramos, Oklahoma City, OK.
    - b. Gemini Inc., Cannon Falls, MN
    - c. Matthews International Corporation, Pittsburgh, PA.
    - d. Metal Arts, Mandan, ND.

2.2 SIGNAGE - GENERAL

- A. General: Provide sign copy to comply with the requirements indicated in the Drawings, for sizes, styles, spacing, content, positions, materials, finishes and colors of letters.
  - 1. All Signs shall conform to United States "Americans with Disabilities Act"

and Commonwealth of Massachusetts Regulation 521 CMR: Architectural Access Board.

2. Final placing and sizing of lettering shall be done as part of the shop drawing approval process, at which time the manufacturer shall make recommendations for Architect's review. Lettering shall have stroke width to height ratio and width to height ratio in accordance with the Americans with Disabilities Act.
- B. Installation of all signs shall be done by vandal-proof method, fully described on the shop drawings.

### 2.3 INTERIOR PLAQUE SIGNAGE

- A. Photopolymer plaque signage (general requirements): Identification signs with raised tactile graphics, text, and Grade 2 Braille. Signs shall consist of 1/32 inch thick synthetic light sensitive photo emulsion permanently bonded to a rigid phenolic substrate, aluminum or acrylic plaque.
1. Raised lettering: Minimum above the surface of the sign 1/32", and be in compliance with Americans with Disabilities Act.
    - a. Bond photopolymer permanently to sign plaque, with appropriate laminating film, as recommended by the photopolymer manufacturer.
  2. Lettering height: As selected by the Architect.
  3. Lettering font: As selected by the Architect.
  4. Screenprinting: All screen printing graphics, including raised areas of tactile plaques except Braille, shall be screen printed in a contrasting color so as to meet the color contrast requirements of Americans with Disabilities Act.
    - a. All non-tactile text shall be screen printed with catalyzed epoxy ink. Applied vinyl lettering and graphics is not acceptable.
    - b. Apply screen printing inks evenly without pinholes, scratches or orange-peeling.
  5. Graphics: All text, symbols and graphics shall be reproduced utilizing computer generated digital art. All screen printed graphics shall utilize photographically prepared screens and shall be printed in accordance with industry standards. Hand-cut screens are not acceptable.
    - a. All edges and corners and letter forms shall be true and clean. Letterforms, color areas, or lines with rounded positive or negative corners, built-up edges, bleeding and spattering shall not be accepted.
    - b. Prepare artwork from typesetters reproduction of the test specified, minimum 1200 dpi resolution, camera ready artwork. All camera ready artwork and typesetting shall be no less than 75 percent of actual finished size.
  6. Mounting: Surface applied by means of silastic adhesive mounting.
  7. Sign colors: As selected by Architect from manufacturer's standard and standard special colors.

- a. All signs shall be two color signs.
- 8. Allow one room identification sign for every room entry door on the plans.
- B. Handicapped accessible locker Sign (photopolymer plaque sign): Upper case numbers, 6 by 8 in. sizes with round corners and border,
  - 1. Locker number and graphics shall be accompanied by the numerals in Grade 2 Braille. Coordinate locations with Section 10 51 13 - METAL LOCKERS.

## 2.4 ACCESSORIES

- A. Exposed mounting hardware: [Chrome plated] Brass or bronze screws.
- B. Adhesive tape: Double sided tape, permanent adhesive.
- C. Fasteners for entrance and exit signs: Concealed metal fasteners, non-corrosive to sign material or mounting surface.
- D. Anchors and inserts for cast aluminum letters:
  - 1. Aluminum collars, matte finished to match letter edges.
  - 2. Mounting studs: Threaded type 304 stainless steel studs.
- E. Fasteners for interior brass plate signage: N<sup>o</sup>. 6 brass wood screws, round head.

## 2.5 FINISHES

- A. Colors and Surface Textures: For exposed sign material that requires selection of materials with integral or applied colors, surface textures or other characteristics related to appearance, provide color matches indicated.
- B. Metal Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations.
- C. Aluminum Finishes: Finish designations prefixed by AA conform to the system established by the Aluminum Association for designation aluminum finishes
  - 1. Class II Clear Anodized Fine Satin Finish: AA-M31C21 A31 (Mechanical Finish: Fine satin direction textured' Chemical Finish: Fine matte etched finish' Anodic Coating, Class II Architectural, clear film thicker than 0.4 mil.)
- D. Paints: Paint for signs is acrylic polyurethane enamel, eggshell finish. Paint for background of tactile photo-polymer signs is eggshell finish automotive grade lacquer. All surfaces shall be cleaned, primed and pre-treated according to the manufacturer's specifications and noted in Shop Drawings as part of the finished surface work.
- E. Inks:

1. Inks for metal signs, glass and wall surfaces are Alkyd enamel based inks.
2. Inks for plastic signs are lacquer based inks.
3. Inks for tactile graphics on photo-polymer signs are eggshell finish Low Odor Vinyl Ink.
4. Inks for filling acid-etched graphics in metal signs are semi-gloss epoxy ink.
5. All inks and paints are evenly applied without pin-holes, scratches or application marks. Prime coats or other surface pre-treatments, where recommended by the manufacturers are included in the work and noted in the shop drawings as part of the finished surface work.

## 2.6 SIGNAGE – EXTERIOR DOORS FOR EMERGENCY RESPONSE

- A. Single sign at each exterior door opening, 2 Signs of equal size where mounted to glass, with 6 inch high letters in Helvetica font. Reference detail 1/A6.01 for Emergency Service Response Numbering for designations.
  1. Panel Face: Size: 7"x7" x.080"
    - a. 080" aluminum sheet.
    - b. 2 inch corner radius.
    - c. Reflective White 3M Scotchlite 510-10 vinyl or equivalent.
  2. Text/Graphics:
    - a. Apply Reflective White Vinyl over the the red reflective text weeded out.
    - b. Red Vinyl: 3M Scotchcal™ Opaque - Tomato Red 7725-13.
  3. Mounting:
    - a. Attach sign to wall using non-corrosive vandal proof hardware. Where mounted to glass, provide backer on inside of glass to match sign size.
    - b. Paint screw head to match sign face.
  4. Provide a second complete set on door signage including fasteners to Owner for Attic stock.

## PART 3 - EXECUTION

### 3.1 INSTALLATION - GENERAL

- A. Locate sign units and accessories where indicated, locations in accordance with the approved shop drawings. Use mounting methods of the type described and in compliance with manufacturer's instructions.
- B. Install signs plumb, level and true to height indicated, with sign surfaces free from distortion or other defects in appearance.
- C. Shop fabricate signs where practical and deliver to site completely assembled. All joints of such fabricated work are completely smooth without apparent marks showing throughout the finish. All work "broken down" is erected so that all parts fit accurately with hairline joints, with all joints flush. Joints in lighted

signs shall be light-proof.

- D. Wall and door mounted signs: Attach to surfaces as follows:
  - 1. Vinyl Tape Mounting: Use very high bond, double sided foam tape, of thickness indicated, to mount signs to smooth nonporous surface. Use construction adhesive in conjunction with foam tape.
  - 2. Silicone Adhesive Mounting: Use appropriate liquid silicone adhesive to attach sign units to irregular, porous , or vinyl-covered surfaces. Use double-sided vinyl tape to hold the sign in place until the adhesive has fully cured.
- E. Dimensional Letters and Numbers: Mount letters and numbers using threaded studs, foam tape and construction adhesive as indicated in the detail drawings. Provide heavy paper template to establish letter spacing and to locate holes for fasteners.
- F. Cast Metal Plaques: Mount plaques using concealed fasteners.

### 3.2 CLEANING

- A. Clean and polish installed signs.
- B. Upon completion of the work of this Section in any given area, remove tools and all rubbish and debris from the work area; leave area in broom-clean condition.
- C. Remove all names, stamps and decals of sign manufacturers, and installers. No visible advertising of any kind is permitted.

### 3.3 SCHEDULES

- A. At each alarmed exit door: Provide sign, 9 inches high by 18 inches wide, having 3 inch high raised letters identifying "EMERGENCY EXIT ONLY" followed by 1 inch high raised letters identifying " ALARM WILL SOUND". Provide with Grade 2 Braille strip.
- B. Classroom signage: nominal 6 by 8 inch size sign, having 1-1/2 inch high letters, identifying the faculty member' family name and Braille strip; verify faculty names and mounting locations with Architect.
- C. Room numbers: For each door frame off corridors, and stairwells, identify room numbers, with 1 inch high die cut lettering. Mount lettering horizontally, centered on door frame at head of door.
- D. At each door to the following room types, provide: nominal 6 by 8 inch size sign, having 1-1/2 inch high letters identifying room label, a maximum of 2 lines
- E. At toilet room doors: provide: nominal 6 by 8 inch size sign, having 3 inch high international symbol for men/women (as appropriate) beneath provide 5/8 inch high text "MEN" or "WOMEN" (as appropriate), raised 1/32 inch and a Grade 2 Braille strip.

MSBA Accelerated Repair Program - Project: # 201601720035  
Quashnet Elementary School  
Windows & Door, EIFS, Roof Replacement and Accessibility Upgrades Project  
Mashpee, Massachusetts

1. At each wheelchair accessible toilet room, provide international handicap symbol.

END OF SECTION

Section 10 21 15  
TOILET COMPARTMENTS

**PART 1 - GENERAL**

1.1 GENERAL PROVISIONS

- A. The BIDDING REQUIREMENTS, CONTRACT FORMS, and CONTRACT CONDITIONS as listed in the Table of Contents, and applicable parts of Division 1 - GENERAL REQUIREMENTS, shall be included in and made a part of this Section.
- B. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 SUMMARY

- A. Furnish and install:
  - 1. Floor/wall mounted phenolic toilet partitions with overhead bracing.
  - 2. Urinal screens, matching toilet partition design and finish.

1.3 RELATED REQUIREMENTS

- A. Section 06 10 00 - ROUGH CARPENTRY: In wall blocking for partition panel support.
- B. Section 09 30 00 - TILING: Ceramic tile wall and floor finishes.
- C. Section 10 28 13 - TOILET ACCESSORIES: Furnishing templates, providing and installing toilet accessories surface mounted to toilet compartments, and integral with compartments.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ANSI A 117.1 - Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.
  - 2. ASTM A 167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and strip.

1.5 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 Electronic Submittal Procedures:
  - 1. Literature: Manufacturer's product data sheets, specifications, and manufacturer's warranty for each item furnished hereunder. Include information panel construction, hardware, and accessories.
  - 2. Shop drawings:
    - a. 1/2 inch scale dimensioned plans and elevations of each toilet room condition showing toilet compartment and urinal screen layout.

- b. Large scale design details of showing attachment clips and brackets; and complete installation details.
- 3. Samples:
  - a. Selection samples: Manufacturer's full range of color chips, for selection by the Architect; up to two-color combinations for doors and partitions may be selected in each area.
  - b. Verification samples: 6 inch square samples of each color and finish on same substrate to be used in Work, for color verification after selections have been made.

#### 1.6 FIELD MEASUREMENTS

- A. Take field measurements before preparation of shop drawings and fabrication, where possible, to ensure proper fitting of Work.
- B. Allow for adjustments within specified tolerances wherever taking of field measurements before fabrication might delay Work.

#### 1.7 REGULATORY REQUIREMENTS

- A. Partition Fire Resistance Rating: NFPA, Class "A".

#### 1.8 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing inserts and anchorages furnished by this Section; make arrangements for delivery, receipt and installation of inserts and anchorages to prevent delay of the Work.

#### 1.9 WARRANTY

- A. Furnish the following manufacturer's warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS. Manufacturer's warranties are in addition to, and not in lieu of, other liabilities which the Contractor may have by law or other provisions of the Contract Documents.
  - 1. Manufacturer's written warranty, for a minimum period of 10 years from date of Substantial Completion. Warranty shall cover panel, pilaster and door material and manufacturing workmanship against defects, including delamination of surfacing, corrosion and breakage.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS AND MODELS

- A. Toilet compartments: Flush type, floor supported, of standard height and depth, except for sizes of handicapped compartments, which shall be as indicated on the Drawings. Acceptable models are the following, or approved equal:
  - 1. Accurate Partition Corp., Lyons IL., series "Black-core Phenolic".
  - 2. Bobrick Washroom Equipment, Inc., Clifton Park NY., series "1181.67".
  - 3. Metpar Corporation, Westbury, NY., series "Overhead Braced".
  - 4. General Partitions Manufacturing Corp., Deer Park NY., series "30".



- B. Urinal screens: Flush type, 42 inch high, 18 inches deep matching construction and finish of toilet partitions, with wall attachment and floor post support. Acceptable models are the following, or approved equal:
  - 1. Accurate Partition, "Floor Anchored Black-core Phenolic".
  - 2. Bobrick Washroom Equipment, Inc., Clifton Park NY., series "1181".
  - 3. General Partitions series "FSH-1".

## 2.2 FABRICATION

- A. Pilasters (stiles), doors and locker end panels: 3/4 inch [19 mm] thick, solid phenolic (black) core with integrally bonded decorative "matte finish" melamine surface on both sides, in color(s) selected by Architect from standard and premium range. Laminated surfaces are not acceptable.
  - 1. Door widths; except as otherwise indicated, provide the following widths:
    - a. Standard stalls, 24 inches.
    - b. Handicapped accessible stalls, 34 inches or greater.
  - 2. Pilasters (stiles) shall run full height, floor to ceiling with secure attachment at both ends.
  - 3. Colors: As selected by the Architect from the manufacturer's full range of available colors.
- B. Panels: 3/4 inch thick, of same material and finish as pilasters and doors.
- C. Pilaster floor and ceiling shoes: 4 inches high formed stainless steel with satin finish.
- D. Hardware and fittings: Type 302/304 stainless steel, except as specified otherwise.
  - 1. Door hinges: Gravity type self-closing hinge fabricated from 14 gage type 302/304 cast stainless steel with a satin finish. Hinge shall be fully adjustable up to 360 degrees, with a type 302/304 stainless steel pivot pin.
  - 2. Door latch with nylon slides. Door keeper, one piece 14 gage stainless steel.
  - 3. Door stop: 14 gage stainless steel. Plated Zamac door stops are not acceptable.
  - 4. Panel to stile connection: Full panel height "U" shape stainless steel channel.
  - 5. Panel to wall connection: Full panel height "U" shape stainless steel channel or "Double T" shape extruded aluminum channel, clear anodized.

## 2.3 ACCESSORIES

- A. Equip all doors with combination coat hook and bumper.
- B. Provide "Z" clip fasteners for all locker end panels.
- C. Anchorages and Fasteners: Through-bolted stainless steel with theft-resistant heads. Chrome plated steel or brass are not acceptable.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
- B. Verify correct spacing of plumbing fixtures.
- C. Ensure wall blocking is coordinated with location of anchors before commencing with installation.
- D. Beginning of installation means acceptance of existing conditions.

#### **3.2 INSTALLATION - GENERAL**

- A. Comply with manufacturer's recommended procedures and installation sequence, and as specified herein.
- B. Install pilasters, partitions, urinal screens, and doors rigid, straight, plumb and level. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Set pilaster units with anchorages having minimum 2 inches penetration into structural floor, unless otherwise recommended by partition manufacturer.
- D. Attach panel brackets securely to walls using anchor devices.
- E. Anchor urinal screen panels to walls with two panel brackets and tube vertical upright anchored to floor.
- F. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.
- G. Hang door and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- H. Ensure that all holes in partitions, as required for attachment of related items, are accurately located and drilled, in accordance with the templates furnished by the accessory manufacturer. Conceal all evidence of drilling, cutting, and fitting in the finished work.
- I. No permanent exposed to view labels of any kind will be permitted to remain on the partitions, urinal screens, or doors.

#### **3.3 FIELD QUALITY CONTROL**

- A. Ensure that all work is free from dents, tool marks, warpage, buckle, open joints, or other defects. Protect compartments during erection, and after erection, and until final approval of the entire project by the Architect.

#### **3.4 ADJUSTMENT**

- A. Adjust and align hardware to provide a uniform clearance at vertical edges of doors not to exceed 3/16 inch.

- B. Adjust hinges to locate doors in partial-open position (approximately 30 degrees open) when unlatched. Return outswing doors to closed position.
- C. Test operation of movable parts, and make all adjustments necessary to ensure proper operation.

3.5 CLEANING

- A. Upon completion of the installation, remove all evidence of tapes and other packing materials; touch-up all scratches and surface defects and thoroughly clean and polish all exposed to view surfaces.
- B. Provide protection as necessary to prevent damage during remainder of construction period.

End of Section

SECTION 10 28 13  
TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install toilet accessories.
- B. Install Owner-furnished (OFCl) toilet accessories.
- C. Furnish concealed anchorage devices for handicap handrails for installation under Section 06 10 00 - ROUGH CARPENTRY.
- D. Furnish toilet and bath accessory templates, to locate anchorage reinforcement, to trades responsible.

1.2 RELATED REQUIREMENTS

- A. Section 06 10 00 - ROUGH CARPENTRY:
  - 1. Wood blocking.
  - 2. Installation of concealed anchorage devices for grab bars in toilet rooms: Section 10 28 13 - TOILET ACCESSORIES.
- B. Section 09 29 00 - GYPSUM BOARD: Gypsum board partitions and metal framing.
- C. Section 09 30 00 - TILING: Tiled walls as substrate for toilet accessories.
- D. Section 10 21 15 - TOILET COMPARTMENTS: Partition-mounted accessories.

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ANSI A 117.1 - Specifications for Making Buildings and Facilities Accessible To and Usable by Physically Handicapped People.

1.4 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 Electronic Submittal Procedures :
  - 1. Literature: Manufacturer's product data sheets, for each item furnished hereunder.
  - 2. Schedule: Complete schedule, indicating types, quantity, and model numbers of accessories for each location in which the accessories will be installed.

3. Selection samples: Sample color chips indicating each manufacturer's full range of colors available for selection by Architect.
4. Verification samples: Complete units, as requested by Architect.

#### 1.5 REGULATORY REQUIREMENTS

- A. Conform to applicable codes and accessibility regulations, and comply with ANSI A 117.1 for installation of work.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages, containers or bundles bearing brand name, identification of manufacturer or supplier and item identification number corresponding with approved schedule.
- B. Store materials inside, under cover, and in manner to keep them dry, protected from weather, surface contamination, corrosion and damage from construction traffic and other causes.

#### 1.7 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

#### 1.8 WARRANTY

- A. Deliver to the Owner upon completion of the work of this Section, applicable manufacturer's standard warranties.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufactures and models: To establish a standard of quality, design, function desired, and appearance, Drawings and specifications have been based on manufacturers and model numbers specified herein below. Manufacturers offering products which may be considered as equal include the following:
  1. A&J Washroom Accessories, Inc., (A&J) New Windsor, NY.
  2. American Specialties, Inc. (ASI), Yonkers, NY.
  3. Bobrick Washroom Equipment, Inc. (Bobrick), Clifton Park, NY.
  4. Bradley Corporation / Washroom Accessories Division, (Bradley) Menomonee Falls, WI.

#### 2.2 TOILET ACCESSORIES

- A. Manufacturer: To establish a standard of quality, design, function desired, and appearance, Drawings and specifications have been based on manufacturers

and model numbers specified herein below. Manufacturers offering products which may be considered as equal include the following:

1. A&J Washroom Accessories, Inc., (A&J) New Windsor, NY.
  2. American Specialties, Inc. (ASI), Yonkers, NY.
  3. Bobrick Washroom Equipment, Inc. (Bobrick), Clifton Park, NY.
  4. Bradley Corporation / Washroom Accessories Division, (Bradley) Menomonee Falls, WI.
  5. VonDrehle Corporation, Hickory, NC.
- B. Toilet paper Dispenser: Dual Aluminum Toilet Tissue Dispenser, Die cast aluminum bracket with high density plastic toilet tissue spindle. 13"W x 1 3/4"H x 4"D. capacity: 2 standard rolls 1000 sheet two ply or 1500 sheet single ply rolls.
1. AJW model N<sup>o</sup> U806-NC
  2. Bobrick model N<sup>o</sup> # 2740
  3. Bradley model N<sup>o</sup> 5241-50
- C. Waste receptacles: Semi Recessed mounted waste receptacle fabricated from type 304 satin finished stainless steel with all welded construction. Waste receptacle shall have radiused front and sides. Top edges shall be hemmed, and bottom with recessed finger grip furnished with a nominal 12 gallon capacity heavy gage vinyl liner and clips. With heavy duty vinyl coated liner
1. A&J model N<sup>o</sup>. U410.
  2. ASI model N<sup>o</sup>. 0458.
  3. Bobrick model No. B-43644
  4. Bradley model N<sup>o</sup>. 344.
- D. Coat/robe hook: Surface mounted satin finish stainless steel double robe hook, fabricated from 22 gage type 304 stainless steel, protrudes from wall nominally 1-7/8 inches.
1. A&J, model N<sup>o</sup>. UX112-SF.
  2. ASI model N<sup>o</sup>. 7345-S.
  3. Bobrick model N<sup>o</sup>. B-76727.
  4. Bradley model N<sup>o</sup>. 9124.
- E. Grab bars (of lengths and configurations as indicated on Drawings): Stainless steel, minimum wall thickness 18 gage (Stub's gage), with non-slip knurled, peened or striated surface.
1. Grab bars: 1 inch diameter with satin finished ends, concealed mounting and snap flange with cover secured by 4 set-screws, equal to:
    - a. &J series UG10.
    - b. ASI series 3700.
    - c. Bobrick series: B-530-X18.
    - d. Bradley series (n/a). 852

Newton Commonwealth Golf Course  
Maintenance Facility Improvements and Renovations  
Newton, MA

2. Grab bars: 1-1/4 inch diameter with satin finished ends, concealed 1/8 inch thick mounting flange with snap-on cover, equal to:
    - a. A&J series UG2X.
    - b. ASI series 3700.
    - c. Bobrick series B-5806.99.
    - d. Bradley series 832.
- F. Mirrors, framed: 18 inches wide by 30 inches high, having the following:
1. Frame: one piece 3/4/ by 3/4 inch type 304 18 gage stainless steel roll formed frame, with continuous integral stiffener on all sides. Corners shall be heliarc welded, ground and polished smooth. corners
  2. Back: 20 gage galvanized steel back attached to frame with concealed screws.
  3. Mirror glass: 1/4 inch thick safety glass, ASTM C 1048 FT, fully tempered, complying with Class 1 clear, quality q3 glazing select, conforming to ANSI Z97.1, with Class 1, standard commercial quality, electro-copper back-plating protected by a corrosion-resistant zinc-coating.
  4. Acceptable models:
    - a. ASI model N°. 0600.
    - b. Bobrick model N°. B-2908-1830.
    - c. Meek model N°. M1210.
  5. Shelf units at individual toilet rooms: One piece 5 inch deep shelf, integral with frame with hemmed 3/8 inch to 1/2 inch return hemmed dropped edge on front and sides. Satin finish, matching mirror frame
    - a. Acceptable models:
      1. A&J model N°. U705.
      2. ASI model N°. 0605.
      3. Bobrick model N°. B-292.
      4. Bradley model N°. 7805.
      5. Meek model N°. M1210, with M3110 "integral shelf".
- G. Mirrors, tilt framed: 18 inches wide by 30 inches high, fixed frame mirror with closed sides, having the following:
1. Frame: 3/4/ inch exposed face stainless steel roll formed frame, beveled, with top extending from wall 4 inches and bottom extending 1 inch. Corners shall be heliarc welded, ground and polished smooth. corners
  2. Back: 20 gage galvanized steel back attached to frame with concealed screws.
  3. Mirror glass: 1/4 inch thick safety glass, ASTM C 1048 FT, fully tempered, complying with Class 1 clear, quality q3 glazing select, conforming to ANSI Z97.1, with Class 1, standard commercial quality, electro-copper back-plating protected by a corrosion-resistant zinc-coating.
  4. Acceptable models:
    - a. Bobrick model B-2938.

- b. Meek model M4410.
- H. Paper towel dispenser: Semi recessed mounted towel dispenser cabinet with lock holding one standard 8 or 9 inch core with 800 ft paper towel roll
  - a. San Jamar – T1100 TBK - Recess in wall alcove
  - b. Bobrick model No.
  - c. Bradley model No.

## 2.3 LOCKS

- A. General: All locks shall be keyed alike. Provide four (4) keys, for lockable accessories, to the Owner.

## 2.4 INSTALLATION ACCESSORIES

- A. Fasteners, screws, and bolts: Type 304 stainless, tamperproof.
- B. Expansion shields: Fiber, lead or rubber as recommended by accessory manufacturer for component and substrate.

## 2.5 FABRICATION

- A. Form exposed surfaces from single sheet of stock, free of joints. Form surfaces flat without distortion, scratches or dents. Weld and grind smooth joints of fabricated components.
- B. Back paint components where contact is made with building finishes to prevent electrolysis.
- C. Shop assemble components and package complete with anchors and fittings. Hot dip galvanize exposed and painted ferrous metal and fastening devices. Provide steel anchor plates, adapters, and anchor components for installation.

## 2.6 FACTORY FINISHING

- A. Ferrous metals: Clean and treat, spray apply one coat of baked-on rust and moisture-resistant primer, followed by two coats of baked-on synthetic enamel, in selected colors. Ensure that finish coating is uniform in color intensity and degree of gloss, throughout.
- B. Chrome/Nickel Plating: ASTM 456, Type SC2, satin finish.
- C. Stainless steel: Number 4 satin finish, except as otherwise specified above under the Article entitled "Toilet Accessories".

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Provide templates and rough-in measurements as required. Deliver inserts and rough-in frames to site at appropriate times for building-in by other trades
- B. Coordinate with trades responsible for providing receiving surfaces on  
Toilet Accessories



- which accessories will be installed.
- C. Exact locations of accessories within each room or area shall be as directed by the Architect.

### 3.2 INSTALLATION

- A. Perform installation work in accordance with the approved shop drawings and the manufacturer's installation instructions.
- B. Install toilet accessories absolutely level and in true line, securely and rigidly anchored with theft proof fasteners of the size and type most appropriate for the specific receiving surface, concealing the fasteners as far as practicable.

### 3.3 ADJUSTING

- A. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

### 3.4 CLEANING

- A. Remove all protective films and coverings from accessories, and clean and polish each piece. Remove all rubbish, packing materials, and debris, caused by the work of this Section.

END OF SECTION

Section 10 40 00

SAFETY SPECIALTIES

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Furnish and install:
  - 1. Fire extinguisher cabinets (rated and non-rated types).
  - 2. Combination fire extinguisher cabinets with blankets.
  - 3. Fire extinguishers: Provide 20 pound capacity extinguishers at locations called out on the Drawings (refer to general notes on Drawings).

1.2 RELATED SECTIONS

- A. Section 04 20 00 - UNIT MASONRY: Concrete masonry unit partitions.
- B. Section 06 10 00 - ROUGH CARPENTRY: Wood rough-in framing and blocking.
- C. Section 09 22 16 - NON-STRUCTURAL METAL FRAMING: Framed wall openings
- D. Section 09 29 00 - GYPSUM BOARD: Gypsum wallboard finishes.

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. NFPA 10 – Standard for Portable Fire Extinguishers, 2018 or Current Edition.

1.4 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 Electronic Submittal Procedures:

1. Literature: Manufacturer's product data sheets, indicating: fabrication specifications, finishes, dimensions of cabinet and rough opening, and installation instructions.
2. Shop drawings: Details showing unit dimensions, methods of construction, attachment clips and brackets; and complete installation details.
3. Selection samples: Samples indicating metal finishes available for selection by Architect.
  - a. Provide additional samples as requested by Architect to facilitate initial selection of colors and finishes
4. Verification samples: Fire extinguisher cabinet in specified size, finishes, and door type, if requested by Architect.

#### 1.5 REGULATORY REQUIREMENTS

- A. Obtain certificate of compliance from authority having jurisdiction indicating approval of fire extinguisher cabinets and their installed locations.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Do not deliver cabinets or extinguishers to the site, until all specified submittals have been submitted to, and approved by, the Architect.
- B. Store cabinets and extinguishers inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  1. J.L. Industries, Bloomington MN.
  2. Larsen Manufacturing Co., Minneapolis MN.
  3. Potter-Roemer, Union NJ.
  4. Strike First Corporation of America, Front Royal, VA (fire extinguishers only).
  5. Amerex Corporation, Trussville, AL (fire extinguishers only).

#### 2.2 FIRE EXTINGUISHERS CABINETS AND BRACKETS

- A. Fire extinguisher cabinets:
  1. Cabinet construction:
    - a. Non-rated cabinet construction: 18 gage cold-rolled steel with factory applied baked acrylic enamel corrosion-resistant finish.
    - b. Fire-resistance rated cabinet construction for up-to a two hour wall rating: 18 gage cold-rolled steel double wall construction with fire barrier material lining in

compliance with ASTM E-814 (UL1479). Provide cabinet with factory applied baked acrylic enamel corrosion-resistant finish.

- c. Cabinet color: White.
- 2. Cabinet trim style for plan holder cabinet: Trimless cabinet with drywall stop.
- 3. Cabinet trim style typical extinguisher cabinets: Rolled edge, semi-recessed cabinet.
  - a. Protruding from wall: 2-1/2 inches.
- 4. Door and trim: Cold-rolled steel with factory applied white thermally fused polyester coating, acceptable to receive a field applied recoating.
  - a. Style: Solid panel doors for plan holder cabinet.
  - b. Vertical duo design with clear tempered safety glass.
  - c. Vigilante alarm: Provide 9 volt, battery operated (battery included), plunger activated vigilante alarm.
  - d. Handles: Red door handles having raised letters "FIRE".
  - e. Lettering: Factory furnished decals for field application, as directed by Architect.
    - 1) Pattern: Vertical reading.
    - 2) Color: Red, White or Black, as selected by Architect.
- 5. Cabinet construction: 18 gage cold-rolled steel with factory applied white baked acrylic enamel finish.
- 6. Acceptable products (non rated):
  - a. Cabinets for 20 pound capacity extinguishers:
    - 1) JL Industries "Ambassador Series", model number 2015.
    - 2) Larsen "Architectural Series", model number 2712-R.
    - 3) Potter-Roemer, "Alta Series", model number 7025.
- 7. Acceptable products (1 hour rated):
  - a. Cabinets for 20 pound capacity extinguishers:
    - 1) JL Industries "Ambassador Series", model number 2015-FX.
    - 2) Larson "Architectural Series", model number FS-2712-R.
    - 3) Potter-Roemer, "Alta Series", model number FRC-7025.
- B. Wall mounting Bracket: 16 gage steel surface mounted bracket, with red glossy polyester thermo-set coating, equal to the following. Provide with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface, letter size, style as required by code, location as selected by Architect.
  - 1. JL Industries, model number "MB-810".
  - 2. Larsen model number 864.
  - 3. Potter-Roemer, model number 3903.

### 2.3 FIRE EXTINGUISHERS

- A. Type 1 (20 pound capacity) Extinguishers: Multi-purpose dry chemical type (mono amonium phosphate), 20 pound capacity, multi-purpose rated '20A, 120B:C'; with metal valves and siphon tubes, replaceable molded valve stem seals, pressure gauges and hose discharge.

## 2.4 FIRE BLANKET CABINETS AND BLANKETS

- A. Provide 2 to be located in the field during construction. Combination fire extinguisher and blanket cabinet: Surface mounted combination fire extinguisher/fire blanket cabinet. Provide solid door labeled with red letters "FIRE EXTINGUISHER" (vertical) and "FIRE BLANKET" (horizontal),. equal to:
  - 1. JL Industries, not acceptable equal.
  - 2. Larsen Manufacturing Co., model "FB 3612-SM".
  - 3. Potter-Roemer, model number 6609.
- B. Fire blanket: Nominal 62 by 80 inch sized woven wool blanket, treated with fire resistant chemicals meeting FS-CS-191-53.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
- B. Verify that prepared openings are ready to receive extinguisher cabinets.
- C. Beginning of installation means acceptance of project conditions.

### 3.2 INSTALLATION

- A. Install fire extinguisher cabinets in accordance with manufacturer's instructions in locations indicated, and as additionally directed by regulatory authority having jurisdiction.
  - 1. Provide cabinets for locations as indicated, and as additionally directed by Architect and local regulatory authority.
- B. Do not commence installation of fire extinguisher cabinets until immediately adjacent surfaces have been completely installed and finished.
- C. Install cabinets absolutely level and in true line, with units securely anchored to the surrounding construction. Fit trim pieces accurately and tight to adjacent construction.
  - 1. Maximum variation from plumb and level: 1/8 inch.
  - 2. Maximum offset from true dimensional alignment: 1/4 inch.

### 3.3 CLEANING AND ADJUSTMENT

- A. Upon completion of the work of this Section in any given area, remove tools, and all packaging and debris from the work area; leave area in broom-clean condition.
- B. After adjacent work is complete:
  - 1. Test each door and latching device, and make adjustments required to ensure a bind-free operation and proper latching.

2. Remove all tape and other packing materials from fire extinguisher cabinets .
3. Thoroughly clean and polish all exterior and interior surfaces of extinguisher cabinets, take care to remove dirt from corners. Clean metal and [glass] [plastic] surfaces with mild cleaning agents as recommended by manufacturer.
4. Touch-up all scratches and other surface defects, using same materials and colors as shop finish.

END OF SECTION

SECTION 10 51 13

METAL LOCKERS

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Furnish and install the following:
1. Metal lockers for complete with all required metal bases, sloped tops, closures and filler pieces.

1.2 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 Electronic Submittal Procedures:
1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for each item furnished hereunder.
  2. Warranty: Provide sample copies of manufacturers' actual warranties, clearly defining all terms, conditions, and time periods for the coverage thereof.
  3. Shop drawings:
    - a. 1/4 inch scale (minimum) plans of each area with specified lockers, include layout of all lockers, closures, and filler panels and large scale details of locker construction; and details of accessory items.
    - b. Large scale details of locker and bench construction, showing filler panels, sloping top components, attachment clips, brackets and complete installation details.
  4. Selection samples: Manufacturer's color chips, comprising at least 8 different colors, for selections by the Architect.
  5. Verification samples:
    - a. One full sized double-tiered corridor-student locker for review of construction and locker features. Sample locker does not have to be in selected color. Locker sample will be returned to vendor following project completion.
- B. Submit manufacturer's warranties under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.

1.3 QUALITY ASSURANCE

- A. Obtain locker and benches from a single manufacturer, or from manufacturers recommended by the prime manufacturer of lockers.

- B. Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.

#### 1.4 QUALIFICATIONS

- A. Manufacturer, with a minimum of 3 years experience demonstrating previously successful work of the type specified herein.

#### 1.5 DELIVERY, STORAGE AND HANDLING

- A. Do not order or fabricate lockers, until all specified submittals have been submitted to, and approved by, the Architect.
- B. Store lockers inside, under cover, and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, corrosion and damage from construction traffic and other causes.

#### 1.6 SEQUENCING AND SCHEDULING

- A. Coordinate the work of this Section with the respective trades responsible for installing interfacing work, and ensure that the work performed hereunder is acceptable to such trades for the installation of their work.
- B. Coordinate schedule of construction, size of access and route to place of installation to prevent delay of installation due to physical impediments. Any work involving the demolition and reconstruction of partitions, walls, floors, roofing, windows, or doors to place and install the work of this Section shall be performed at no additional cost to the Owner.

#### 1.7 EXTRA MATERIALS

- A. Upon completion of the Work of this Section, deliver to the Owner extra materials for future repairs and maintenance.
  - 1. Provide spare keyed cylinders (with keys), an amount equal to 10 percent of total lockers.
  - 2. Provide two master keys.
- B. Clearly label and package extra materials securely to prevent damage.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Specified Manufacturer (Basis of Design): To establish a standard of quality, design and function desired, Drawings and specifications have been based on Republic Storage Systems Company, Inc., Canton OH.
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:

#### METAL LOCKERS



1. Debourgh Manufacturing Company, La Junta CO.
2. Lyon Metal Products, Inc., Aurora IL.
3. Penco Products, Inc., Oaks PA.
4. Republic Storage Systems Company, Inc., Canton OH.

## 2.2 MATERIALS

- A. Sheet Steel: Mild cold-rolled and leveled steel, free from buckle, scale, and surface imperfections.
- B. Fasteners: Cadmium, zinc, or nickel plated steel; exposed bolt heads, slotless type; self-locking nuts or locker washers for nuts on moving parts.
  1. Locker assembly fasteners shall be "pop" type rivets with aluminum bodies and steel mandrels. Rivets shall be backed up by washers to ensure correct rivet expansion and secure fastening.
- C. Equipment: Hooks and hang rods of cadmium-plated or zinc-plated steel or cast aluminum.

## 2.3 LOCKER TYPES

- A. Locker Type 1: Double tier wardrobe locker 12 inches wide by 15 inches deep by 78 inches high at front with a compartment height of 36 inches. Five percent to be handicapped accessible.
  1. Basis of design, equal to Republic Storage Systems Company, Inc., Canton OH; product: "Heavy Duty Corridor Series Locker".
  2. Body: Backs, sides, tops, bottoms and shelves sides minimum 24-gage. Flange tops, bottoms and shelves on four sides, and backs on two sides.
    - a. Form exposed ends of non-recessed lockers of minimum 16-gage steel.
    - b. Lower shelf:
      - 1) Standard locker: 6 inches above finished floor.
      - 2) Handicapped accessible locker: 9 inches above finished floor.
    - c. Top shelf:
      - 1) Standard locker: Manufacturer's standard height.
      - 2) Handicapped accessible locker: 48 inches above finished floor.
  3. Door frame: 16 gage channel or 12 gage angles, with continuous door stop/strike integral with frame on both sides of opening.
  4. Door: Flush design without louvers or perforations, 14 gage steel, formed with full channel shape on lock bar side, channel formation on hinge side and flanged top and bottom. Perforate top and bottom flanges for locker ventilation. Fabricate to swing 180 degrees.
  5. Hinges: Two 5 knuckle, 2 inch high full loop pin hinge welded to frame and riveted to inside of door flange.
  6. Door handle:
    - a. Latch design: operable by "club fist" as required by

Massachusetts Architectural Access Board Regulations.

- b. Latching method: three point latching with spring steel latch contained in a lock bar under tension. Lock bar contained in door channel by self-lubricating polyethylene guides. Lock bar is limited in travel by concealed elastomeric cushioning devices. Provide frame hooks welded to door frame, furnished with soft rubber silencers at each hook.
  - c. Pocket: Recessed formed 20 gage stainless steel pocket encased with molded ABS thermoplastic cover.
7. Locking method - Built-in Combination Locks: All lockers shall be equipped with built-in combination locks. Locks shall have three-number combination dialing and be capable of at least five different combination changes.
    - a. Locks are to be installed on lockers using security-type machine screws.
    - b. Provide Owner with Master key and combination change key chart and combination control charts upon completion of locker installation.
  8. Base: 4" Metal Z base with closed ends and fillers.
  9. Sloping tops: 20 gage steel minimum having a sloped rise approximately 18 to 25 degrees, finished to match lockers, in lengths as long as practicable but not less than 4 lockers. Provide closures at ends finish to match lockers
  10. Filler panels: 18 gage steel minimum, factory-fabricated and finished to match locker units.
  11. Trim: 18 gage steel minimum; Provide at jambs and head of recessed lockers, finished to match locker units. Secure with concealed fasteners.
  12. Accessories:
    - a. Double prong hook mounted to underside of locker top or back of locker.
    - b. Single prong hook mounted on each side of locker.
    - c. Number Plates: Provide each locker door with polished aluminum number plate with black numerals not less than 1/2 inch height.
    - d. Handicapped accessible locker.:

## 2.4 FACTORY FINISHING

- A. Clean, degrease, and neutralize metal; prime and finish with two coats of baked enamel finish. Color selections are based on the following:
  1. Locker Type 1: Lockers are half-height lockers, some stacked and some lower units only. See plans for locations. Custom colors to match Architect's samples. Up to 2 different colors may be required. Door and locker body colors may be different.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Verify that field measurements are as indicated on reviewed and approved shop drawings.
- B. Beginning of installation means acceptance of existing conditions.

#### 3.2 PREPARATION

- A. During the operation of work of this Section, protect the work of other trades against undue soilage and damage by the exercise of reasonable care and precautions. Repair or replace any work so damaged and soiled to match original finishes.

#### 3.3 INSTALLATION

- A. Do not commence installation of lockers until immediately adjacent surfaces have been completely installed and finished.
- B. Perform installation work in accordance with the approved shop drawings and the manufacturer's installation instructions.
- C. Furnish and install all sloped top pieces as required, refer to the Drawings for the various conditions.
- D. Furnish and install all filler pieces as required to completely fill recesses, and to align with ends of partitions. Refer to the Drawings for the various conditions.
- E. Set lockers absolutely level and in true line, with units bolted together and to the surrounding partitions, to provide a rigid and secure installation. Conceal screw heads and bolts as far as practicable, leaving exposed panels completely free from unused bolt holes.
- F. Locate locker benches where shown on the Drawings.

#### 3.4 ADJUSTING AND CLEANING

- A. Test each door and latching device, and make adjustments required to ensure a bind-free operation and proper latching.
- B. Remove all tape and other packing materials from locker surfaces, and thoroughly clean and polish all exterior and interior surfaces.
- C. Touch-up all scratches and other surface defects, using same materials and colors as shop finish.

#### 3.5 PROTECTION

- A. Protect locker finish surfaces and hardware from damage until Owners

#### METAL LOCKERS

Final Acceptance.

END OF SECTION

SECTION 10 56 13

METAL STORAGE SHELVING

**PART 1 - GENERAL**

1.01 GENERAL REQUIREMENTS

- A. Refer to the General conditions for Bid and Performance requirements governing the work and equipment to be furnished under this Section of the Specifications.
- B. This Section shall be a lump sum bid. Refer to Equipment Bid Form attached.

1.02 WORK INCLUDED

- A. Furnish all items of equipment listed in this Specification. Include delivery to the building, unpacking, setting in place, leveling, and scribing to wall and floors, as required. Shelving units and lockers shall be anchored to the walls and floors with fasteners and bolts appropriate to the materials at each installation location.
- B. Remove all debris, dirt and rubbish accumulated as a result of this installation and leave the premises clean and ready for use. This shall include cleaning equipment interiors, exteriors, worktops, and the vacuuming of carpeted floor areas.
- C. Verify and confirm all building dimensions relative to equipment to be furnished and installed by taking actual field dimensions at the job site prior to equipment fabrication.
- D. Become familiar with job conditions and building measurements to coordinate the planning, design, delivery and installation of equipment furnished under these Specifications with all other related trades and associated work during the term of this contract.
- E. The Equipment Contractor shall supply an installation of equipment that is equal to or exceeding the quality and function described in this minimum requirement specification and shown on the drawings.
- F. Upon delivery and installation of equipment specified herein, the Equipment Contractor shall obtain a signed acknowledgment from the Owner's field representative indicating delivery condition of such specified work.

1.03 QUALITY CONTROL AND GUARANTEE

- A. All equipment shall be unconditionally guaranteed for a period of one (1) calendar year from the date of acceptance of installation.
- B. Catalog cuts, specifications, color selection samples and other descriptive material shall be furnished with each bid showing clearly on what equipment proposed bid is based on. These shall be submitted for each item. Bids submitted without such material shall be rejected.
- C. Owner reserves the right to accept or reject any bid, any part of any bid, or modify quantities, if it is considered in the best interest of the Owner to do so.

#### 1.04 CONSTRUCTION AND QUALITY

- A. For purposes of identification of style and level of quality of equipment desired, these Specifications refer to Metal Storage Shelving as currently manufactured by the Borroughs Mfr. Corporation or equal.
- B. These references are not intended to be restrictive or limiting to competitive makes and models of comparable quality and design. Proposals using competitive makes and models must submit sufficient illustrative material with their proposal to permit comparisons. Colors shall be selected by the Architect.

#### 1.05 EXAMINATION AND ACCEPTANCE

- A. The Equipment Contractor shall examine space in which equipment is to be installed to assure that conditions are satisfactory for the installation of this equipment, and report in writing to the Architect any deficiency in the work of other contractors affecting specified work. Commencement of specified work shall be construed as acceptance of space conditions.
- B. Before final acceptance by the Owner, specified equipment shall be tested for acceptance as determined by the Architect.
- C. Before final acceptance, turn over keys and other similar loose and detachable parts to an approved representative of the Owner and obtain a signed receipt for presentation to the Architect.
- D. If it becomes necessary for temporary use of any item of specified equipment before all parts are complete, the Equipment Contractor shall adjust the equipment as far as possible in order to make temporary use as effective as possible.

### **PART 2 - MATERIALS AND CONSTRUCTION**

#### 2.1 GENERAL

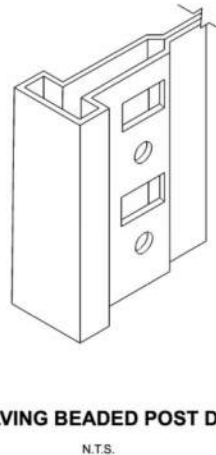
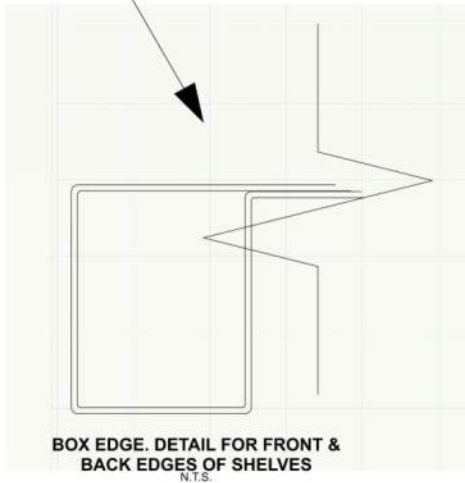
Shelving: Shelving shall be clip-type adjustable steel shelving of first quality, with all metal components chemically cleaned prior to application of finish. Each section shall be **72”H (Parts Storage / Open Storage Rooms) / 84” H (Repair Bay)** and be provided with seven (7) shelves including top and bottom, bases, clips, shims, sway-braces, uprights, for a complete installation. Finish shall be as selected by the Architect from the full range of colors available from the manufacturer.

#### 2.2 COMPONENTS SPECIFICATIONS

- A. Beaded Post: Uprights shall be of 1” x 1-13/16”, 13-gauge angle steel punched 1” on centers. Front posts shall be a beaded-type post to allow maximum shelf width openings. Minimum material thickness shall be 14 ga. The minimum face width shall be 7/8” to give strength in the down aisle direction and the maximum face width shall be 1” to prevent intrusion of the shelf opening and growth or creepage. The tail flanges of the post shall be welded 6” or less on center for column strength. Posts to be punched on 1-1/2” centers for vertical shelf adjustment. One-piece posts shall be available in heights ranging from 3’3” to 16’3” in order to allow unrestricted multi-level height placement and to reduce the number of components required. (No splicing shall be required unless post height requirements exceed 16’3”). See detail at end of section.
- B. Base Strips: Beaded post base strips shall be 22 ga. steel formed to fill in the space between the lower edge of the bottom shelf and shall act as a spacer to ensure that the top edge of the bottom shelf shall be 3” above the floor. Base strips shall keep dirt and refuse from collecting under shelving units.

- C. Shelf Clips: Non-binding, saddle type shelf clips shall be 12-gauge hot-rolled steel, one-piece construction. Shelf clips shall allow easy adjustment of shelf position without requiring use of tools or moving of adjoining shelves. Each shelf shall be provided with four (4) shelf clips.
- D. Shelves: Shelves shall be manufactured with 18-gauge, cold rolled commercial grade steel and shall be provided with "Class-2" reinforcing at front and rear with the front and rear edges of the shelf formed into a closed, welded box shape and the corners lapped and welded to give the shelf maximum strength and rigidity. Shelf surface shall be punched on 2" centers to allow for fixed shelf dividers (except 42" x 30" and 42" x 32"). One edge of each shelf shall be pierced to allow for the attachment of label holders. See detail at end of section.
- E. Back Sway Braces: Provide one pair of braces for each 3' or 4' section of shelving. Cross braces shall be made from 3/4" x 12 ga. band steel. Cross bracing shall be available for sides and backs. All cross braces shall attach on 30" vertical centers and shall be bolted together in the center for added stability. Sufficient cross bracing shall be provided to ensure structural integrity.
- F. Sliding Type Shelf Dividers: Sliding type shelf dividers shall be formed from 22 ga. steel and snap into place over front and rear shelf flanges. They must hold their position firmly yet be easily readjusted. Each divider shall have built-in label holder. Sliding type shelf dividers shall be available in 4-1/2" and 6" heights and in 12", 15", 18" and 24" depths.
- G. Fixed Type Shelf Divider: Fixed type dividers shall be made of 22 ga. steel, flanged on top and bottom and pierced to be attached with push-in rivets. Dividers shall be available in heights from 6" to 18" in 3" increments, and in 12", 15", 18", 24" and 36" depths. Dividers must be notched at top front and rear so as not to interfere with shelves' box edge. Front edge shall be beaded, for safety and added strength, rear edge shall be flanged for extra rigidity. Fixed dividers shall be adjustable on 2" centers and held in place with push-in rivets. Push-in rivets shall be included with each divider.
- H. Angle Type Shelf Divider: Angle type dividers shall be 22 ga. steel, flanged and pierced to align with holes on the top surface of the shelf. Angle type dividers shall be available in 1-1/2" and 3" heights and 12" and 18" depths. Angle type dividers shall be adjustable on 2" centers and held in place with push-in rivets. Push-in rivets shall be included with each divider.
- I. Full Length Steel Label Holders: Steel label holders shall be curl-formed from 24 ga. steel to hold and retain standard 7/8" label. Label holders shall attach with push-in rivets. Steel label holders shall be available in 24", 36", 42" and 48" lengths.
- J. Magnetic and Plastic Label Holders: Label holders shall hold standard 7/8" labels and be available in 4' strips which can be easily cut to length with ordinary household scissors.
- K. Bin Fronts: Bin fronts shall be used on the front of shelves and posts to keep items within the bin. Bin fronts shall be made of a minimum 22 ga. steel. All bin fronts have a 1/2" bead on top and bottom edges. Attachment clips shall be provided for 1-1/2" bin front. Bolts shall be provided for 3" and 6" sizes. Bin fronts shall be available in 36", 42" and 48" widths and 1-1/2", 3" and 6" heights.
- L. Shelf Boxes: Shelf boxes shall be made of 20 ga. steel with sides slotted at 1" intervals to receive box partitions. Hand-pull and label holder for 7/8" label shall be formed into the front, while the back of the box projects upward to engage shelf above and prevent accidental removal. Shelf boxes shall be 4-5/8" high and shall be available in 11", 17" and 23" depths and 5-9/16", 8-3/8" and 11-3/16" widths. Box partitions shall be 22 ga. engaged in shelf box side slots to compartmentalize the box. Each partition shall have a formed-in label holder to accept a standard 7/8" label.
- M. Shelf Box Guides: Shelf box guides shall be angle shaped, 18 ga. steel, bolt behind the front flange of the angle post and extend 5" back along the edge of the shelf to prevent shelf boxes from becoming lodged behind the front flange of the post.

- N. Framed Doors: Doors shall be 20 ga. and shall be attached to 16 ga. and 14 ga. welded steel frame. Entire frame assembly shall bolt to the face of the shelving (used with angle post units only). Three point locking shall be achieved by means of upper and lower throw bolts and a center cam, all activated by one locking handle. Left- and right-hand doors shall interlock for security. Framed doors shall be available in 36", 42" and 48" widths and 3'3", 4'0", 4'3", 6'3" and 7'3" heights. Framed doors shall be available to fit shelving up to 7'3" tall. A 4'0" tall door shall be available for use above ledges.
- O. Sliding Doors: Sliding doors shall be of 20 ga. steel and shall be designed to span two 36" wide by 7'3" high units of adjoining angle post closed sections. Sliding doors shall be supplied with header and base, including track. Sliding doors shall lock in the middle with one built-in, grooved key lock. Sliding doors shall roll on steel ball bearing rollers.
- P. Hardware: Bolted, structural connections shall use grade 5 bolts. Unless otherwise stated, all necessary hardware shall be included in the part number and shall be shipped as part of the total hardware requirement.
- Q. Bases: Bases shall be channel shaped with ends constructed to engage upright "T's" and lock in place with a spring fastener.
- R. All steel shelving components shall be cleaned, phosphatized and etched prior to application of baked enamel finish. Finish selection shall be by the Architect from the full range of colors available from the manufacturer.



**END OF SECTION**



Section 11 31 00

RESIDENTIAL APPLIANCES

**PART 1 - GENERAL**

1.1 SUMMARY

- A. Provide residential appliances,
  - 1. 30 in wide Microwave / Vent
  - 2. 30 in wide Electric Oven / Cooktop
  - 3. 28 in wide Refrigerator / Freezer w Icemaker
  - 4. Washer / Dryer with hookups

1.2 RELATED SECTIONS

- A. Section 06 40 00 - ARCHITECTURAL WOODWORK: Kitchen cabinets.
- B. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING:
  - 1. Exhaust ducts to microwave hoods, (including connections).
  - 2. Exhaust ducts to clothes dryers, (including connections).
- C. Division 26 - ELECTRICAL: Electrical supply to appliances.

1.3 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 00 - SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets and specifications, for each product installed and furnished hereunder clearly indicating configurations, sizes, materials, finishes, locations, utility connections and locations. Include information on accessories and options.
  - 2. Manufacturer's installation instructions: Indicate special procedures, perimeter conditions and conditions requiring special attention.
  - 3. Manufacturer's certificates: Certify that Products provided under this Section meet or exceed UL and specified requirements.
  - 4. Manufacturer's sample warranties.
  - 5. Shop drawings for coordination: Provide dimensioned locations for utility connections.
- B. Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS:
  - 1. Manufacturer's warranties: Include coverage of installed equipment.
  - 2. Maintenance Data: Include lubrication and periodic maintenance requirement schedules.

1.4 REGULATORY REQUIREMENTS

- A. Products requiring electrical connections: Listed and classified by UL, as suitable for the purpose specified and indicated.
- B. Provide and install the work of this Section in conformance with all applicable federal, state and municipal codes, laws and regulations regarding utilities, health, fire protection and

safety.

#### 1.5 QUALITY ASSURANCE

- A. Certification labels: Provide residential equipment which complies with standards and bears certification labels as follows:
  - 1. Energy ratings: Provide energy guide labels with energy cost analysis (annual operating costs) and energy information as required by Federal Trade Commission.
  - 2. UL standards: Provide residential equipment with UL labels.

#### 1.6 DELIVERY, STORAGE AND HANDLING

- A. Store all materials in original packaging in protected interior location.
- B. Coordinate schedule of construction, size of access and route to place of installation to prevent delay of installation due to physical impediments. Any work involving the demolition and reconstruction of partitions, walls, floors, roofing, windows or doors to place and install the work of this Section shall be performed at not additional cost to the Owner.

#### 1.7 WARRANTY

- A. Provide manufacturer's standard warranties under the provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS.

### **PART 2 - PRODUCTS**

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Frigidaire Corp./ Division of Electrolux Home Products Inc., Martinez, GA.
  - 2. General Electric Company, (GE) Appliances Division, Louisville KY.,

#### 2.2 EQUIPMENT

- A. Appliance Schedule:
  - 1. Refrigerator: GE Profile Model PBV10R5VBB/Black
  - 2. Oven Range: GE Profile Model PSS93BPT/Black
  - 3. Washer: GE Profile Model PFW950SPTDS/ Black
  - 4. Dryer: GE Profile Model PFD95ESPTDS/ Black
  - 5. Microwave: GE Profile Model PVM90005BLTS/Black

#### 2.3 FINISHES

- A. Finish Colors: Provide manufacturer's standard colors as selected by Architect.

### **PART 3 - EXECUTION**

#### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section. Notify the Contractor, and copy to Architect, in writing of any conditions detrimental to the proper and timely completion of the work, and do not proceed with the work until said conditions are corrected.
- B. Verify clearances required for equipment.

- C. Verify ventilation outlets, service connections, and supports are correct and in required location.
- D. Verify that electric power is available and of the correct characteristics.
- E. Beginning of installation means acceptance of existing site conditions.

### 3.2 INSTALLATION

- A. Install each product in accordance with manufacturers' instructions.
  - 1. Maximum variation for installed equipment, from true position of 1/16 inch in 8 feet for plumb and level and a maximum of 1/32 inch offsets in adjoining surfaces intended to be flush.
- B. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.
- C. Anchor equipment using devices appropriate for equipment, substrate and expected usage.

### 3.3 ADJUSTING

- A. Adjust work under provisions of Section 01 73 00 - EXECUTION.
- B. Adjust equipment to ensure proper working order and conditions.
- C. Remove and replace equipment creating excessive noise, or vibration.
- D. After installation is completed, insure that operating parts work freely and fit neatly. Adjust hardware and catches as required. Repair or replace damaged parts dents, buckles, abrasions, scraps or other damage affecting the appearance or serviceability.

### 3.4 CLEANING

- A. At completion of each work day, remove tools and all crating boxes, coverings, rubbish and debris from the work area; leave area in broom-clean condition.
- B. Upon completion of the work of this Section, remove tools and all crating boxes, coverings, rubbish and debris from the work area; leave area in broom-clean condition.
- C. Clean Work under provisions of Section 01 73 00 - EXECUTION:
  - 1. Wash and clean appliances.
  - 2. Clean and polish glass, plastic, hardware and accessories, fixtures and fittings.
- D. Remove protective coverings from prefinished work just prior to Owner's acceptance of facility.

END OF SECTION

SECTION 12 24 00

WINDOW TREATMENTS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Examine all the other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other sections affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. It is understood that the Contractor has examined the site and made his own estimates of the facilities and difficulties attending to the execution of the work, and has based his price thereon
- E. Except for unforeseeable, concealed or subsurface conditions, as determined by the Architect, the Contractor shall make no claim for additional cost due to existing conditions at the site, which in the opinion of the Architect, with reasonable diligence could have been ascertained by the Contractor in his examination of the site

1.02 The Work to be performed under this Section shall include providing all labor, materials and equipment required to furnish and install window shades and related work necessary for the proper completion of the operations as required by the Contract Documents.

- A. Provide shades for all new windows, unless noted otherwise, including interior windows and vision panels
- B. Provide all staging, scaffolding, hoisting and trash disposal required by the work of this Contract
- C. All shades shall be (Type 1) for the project.

1.03 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24  
ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, for each item furnished hereunder, including floor mat, accessories, adhesives, and leveling materials. Include manufacturer's

application methods or installation instructions for each item furnished hereunder.

2. Manufacturer's warranties: Include coverage of materials and installation and resultant damage from failure of installation.
3. Manufacturer's certificate: Provide certificate stating that the floor mat, and other related materials to be supplied hereunder meet all requirements specified herein.
4. Selection samples: Sample swatches containing manufacturer's full color and blend range.
5. Verification samples: (submit [two] each): After initial selection of floor mat and color blends has been made by the Architect: 18-inch by 36-inch sample of selected floor mat for final approval of the Architect. Approved samples shall be used as the standard of quality and colors for materials furnished under this Contract.

#### 1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installation of roller shades similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain roller shades through one source from a single manufacturer.
- C. Fire-Test Response Characteristics
  1. Flame-Resistance Ratings: Passes NFPA 701.
- D. Corded Window Covering Product Standard: Provide roller shades complying with WCMA A100.1.
- E. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
  2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory packages, marked with manufacturer and product name.

#### 1.06 PROJECT CONDITIONS

- B. Environmental Limitations: Do not install roller shades until construction and wet and dirty finish work in spaces, including painting, is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operable glazed units' operation hardware throughout the entire operating range. Notify Architect of discrepancies. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

### PART 2 – PRODUCTS

#### 2.01 WINDOW SHADES

- A. Manufacturer and type: For the purposes of establishing level of quality, shades shall be MechoShade 'Mecho/5' chain operated units by MechoShade Systems, Inc., Long Island City, NY,. Similar products by Phifer Incorporated, Hunter Douglas Window Fashions, Levolor, Shade Technologies, Inc., or others may be considered equal and will be subject to the approval of the Architect.

## 2.02 APPLICATIONS/SCOPE

- A. Roller Shade Schedule:
  - 1. Shade Type 1: Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces designated on the Drawings unless specifically noted herein.

## 2.03 SHADE CLOTH

- A. Visually Transparent Single-Fabric Shade cloth: MechoShade Systems, Inc., ThermoVeil group, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range. 1% open/99% UV Blockage.
  - 1. Type 1: Series1000 (2-3% Open) Series Dense Basket Weave. Color: The color is to be selected from the manufacturer full range of colors. The intent is to match the window frame color.

## 2.04 SHADE BAND

- A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
- B. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
- C. Shade band and Shade Roller Attachment:

Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Roller tubes less than 1.55 inch (39.37 mm) in diameter for manual shades, and less than 2.55 inches (64.77 mm) for motorize shades are not acceptable.

  - 1. Provide for positive mechanical engagement with drive / brake mechanism.
  - 2. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
  - 3. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
  - 4. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

## 2.05 SHADE FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
- B. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design. Fabricate hem as follows:
  - 1. Bottom hem weights.

- C. Provide battens in standard shades as required to ensure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

## 2.06 COMPONENTS

### A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

### B. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
4. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
5. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
6. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
7. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
8. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.

### C. Drive Bracket / Brake Assembly:

1. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
2. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
3. The brake shall be an over -running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
4. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.
5. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

- D. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

## 2.07 ACCESSORIES

- A. Fascia:
  - 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
  - 2. Fascia shall be able to be installed across two or more shade bands in one piece.
  - 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
  - 4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
  - 5. Notching of Fascia for manual chain shall not be acceptable.
- B. Warranty: Interior Shades – Ten-year manufacturer’s warranty on manually operated components except bead chain which is a maintenance/service item. Ten-year manufacturer’s warranty on shade cloth with provision that it will not deteriorate, sag or main fit for use for the full warranty period when used as an interior rollershade.

## PART 3 – EXECUTION

### 3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.02 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer’s written instructions, located so shade band is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

### 3.03 ADJUSTING

- A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

### 3.04 CLEANING AND PROTECTION

- A. Clean roller shade surfaces after installation, according to manufacturer’s written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
- C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION



SECTION 12 48 43

FLOOR MATS

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install the following:
  - 1. Rolled entrance matting directly adhered over floors, where indicated on the Drawings, including all accessories necessary to complete the work.
  - 2. Sub-floor filler, to ensure the specified tolerance level for finish surface of matting.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - ROUGH CARPENTRY: Installing metal thresholds.
- B. Section 08 71 00 - DOOR HARDWARE: Furnishing metal thresholds.

1.3 REFERENCES

- A. Comply with applicable requirements of the following standards and those others referenced in this Section, under the provisions of Section 01 42 00 - REFERENCES. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.
  - 1. ASTM E 648 - Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source.
  - 2. ASTM E 84 - Surface Burning Characteristics of Building Materials.
  - 3. All applicable federal, state and municipal codes, laws and regulations regarding flammability and smoke generation of interior finishes.

1.4 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 ELECTRONIC SUBMITTAL PROCEDURES:
  - 1. Literature: Manufacturer's product data sheets, specifications, performance data, physical properties, for each item furnished hereunder, including floor mat, accessories, adhesives, and leveling materials. Include manufacturer's

application methods or installation instructions for each item furnished hereunder.

2. Manufacturer's warranties: Include coverage of materials and installation and resultant damage from failure of installation.
3. Manufacturer's certificate: Provide certificate stating that the floor mat, and other related materials to be supplied hereunder meet all requirements specified herein.
4. Selection samples: Sample swatches containing manufacturer's full color and blend range.
5. Verification samples: (submit [two] each): After initial selection of floor mat and color blends has been made by the Architect: 18-inch by 36-inch sample of selected floor mat for final approval of the Architect. Approved samples shall be used as the standard of quality and colors for materials furnished under this Contract.

#### 1.5 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
  1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein.

#### 1.6 FIELD SAMPLES

- A. Provide field samples under provisions of Section 01 45 00 - QUALITY CONTROL for purpose of verifying selected colors, styles and texture.
- B. Accepted samples may remain as part of the work.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Maintain a temperature of at least 60 degrees Fahrenheit, with a relative humidity of between 15 and 60 percent, for a period of 48 hours before, during, and after installation.
- B. Store all mat materials under cover in dry, well-ventilated spaces as soon as delivered. Protect floor matting from damage, dirt, stain, moisture, and mildew.

#### 1.8 ENVIRONMENTAL CONDITIONS

- A. Store materials for 3 days prior to installation in area of installation to achieve temperature and humidity stability.
- B. Maintain minimum 70 degrees Fahrenheit ambient temperature 3 days prior to, during, and 24 hours after installation of materials.

#### 1.9 SEQUENCING AND SCHEDULING

- A. Sequence work to ensure floor mat is not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated and work overhead is completed.
- B. Install floor mat after interior wet work is complete and fully cured.

#### 1.10 WARRANTY

- A. Provide 10 year warranty under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS. Warranty shall include texture retention, wear, and static protection and edge ravel resistance and run resistance strength for the life of the matting. Commencing on the date of substantial completion.
- B. Mat installer's written guarantee covering prompt and proper replacement of any and all floor matting which indicates improper installation workmanship and/or defective material within twelve months from completion of the installation and acceptance thereof by the Architect, said corrective work being performed by the mat installer at no cost to the Owner.

#### 1.11 EXTRA MATERIALS

- A. Upon completion of the Work of this Section, deliver to the Owner extra materials for future repairs and maintenance, an amount equal to 25 square feet for each color, pattern and type of mat installed.
- B. Clearly label and package extra materials securely to prevent damage.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or approved equal:
  - 1. Mats, Inc., Stoughton, MA.
  - 2. Arden Architectural Specialties, Inc., St. Paul, MN.
  - 3. Balco Inc., Wichita, KS.
  - 4. Construction Specialties, Inc., Muncy, PA.

#### 2.2 WALK-OFF ROLL-UP FLOOR MATS

- A. Manufacturers: Subject to compliance with all of the requirements specified herein, manufacturers offering products which may be incorporated in the work include the following, or equal:
  - 1. Mats Inc., Stoughton, MA.
  - 2. Tek Stil Concepts Inc., Haddonfield, NJ.
  - 3. Pawling Corporation, Wassaic, NY.

- B. Roll-up floor matting: To establish a standard of quality, design and performance desired, specifications have been based on a "Sisal Nop" appearance matting, manufactured by Mats Inc., Stoughton MA product "Supreme Nop", all weather polypropylene carpet matting with waffle rubber backing with perimeter transition strips., conforming to the following:

1. Criteria:

|                     |  |
|---------------------|--|
| Manufacturing:      | Needle felt.   |
| Pile Fiber:         | 100 % UV stabilized polypropylene.                                 |
| Pile (face) Weight: | 33.9 ounces per square yard  |
| Total Weight:       | 73 ounces per square yard  |
| Primary Backing:    | High density synthetic   |
| rubber Roll Width:  | 6'-7"  |
| Color:              | As selected by Architect from manufacturer's full available range. |
| Dye Method:         | Solution dyed  |

## 2.3 FINISHES

- A. Finish coatings for aluminum to conform to Finish Designation system: AAMA 607.1.
1. Exposed Aluminum Surfaces: (AA designation M12C22A41) Architectural Class I anodic coating, 0.7 mil thickness or greater, prepared with a mechanical M12, chemical C22 pre-treatment, clear anodized in color.

## 2.4 ACCESSORIES

- A. Adhesives for matting: NFPA Class A or UBC Class 1 types, as determined by ASTM E-84 Tunnel Test and as recommended by mat manufacturer.
- B. Subfloor filler: Premix latex-type as recommended by the floor mat manufacturer.

## 2.5 FABRICATION

- A. Fabricate frame to be truly straight, level and square. Provide frame pieces in longest available lengths to minimize joints. Space unavoidable joints evenly about centerline of mat and spline butt-joints with connecting pins. Form corners with tightly mitered joints or use prefabricated jointless corners.
- B. Provide frames and mats to sizes, shapes, and profiles indicated on approved shop drawings. Provide one-piece mats except where size exceeds manufacturer's recommended limit for easy removal and cleaning. Where more than one-piece mats are used, locate seams away from main traffic pattern.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Inspect all surfaces and verify that they are in proper condition to receive the work of this Section.
- B. Request correction of defects in receiving surfaces which are not correctable by the methods specified herein. Do not commence work until such defects are entirely corrected. Beginning of installation means acceptance of existing substrate and site conditions.

### 3.2 PREPARATION

- A. Remove sub-floor ridges, and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- B. Apply, trowel, and float filler to leave smooth, flat and hard surface, as required to ensure that floor mated surfaces will be level to within 1/8 inch tolerance in 10 feet in any direction.
- C. Prohibit traffic until filler is cured.
- D. Thoroughly sweep and vacuum all surfaces and remove all foreign matter.
- E. Measure all areas to receive materials to be furnished and installed hereunder, and verify in the field their actual dimensions, including wall-to-wall dimensions, offsets, door locations, and details, fixed equipment, and all other installed items. Extra charges will not be allowed because of lack of familiarity with actual project conditions. Use largest floor mat widths to produce minimum number of seams. Small pieces of floor mat will not be acceptable.
- F. Unroll floor mat for adjustment to environmental conditions at least 24 hours prior to installation.

### 3.3 INSTALLATION

- A. Apply adhesive and install and entry mat in accordance with manufacturer's written instructions.
- B. Cement floor mat directly to the substrate with specified installation adhesive. Trowel adhesive evenly on the substrate. Install the floor mat within thirty minutes after spreading adhesive.
- C. Apply a 6 inch wide band of specified seaming adhesive continuously at each seam location, before bedding the floor mat therein, ensuring that each floor mat edge will be embedded therein at least 3 inches.
- D. Apply a continuous band of specified edge adhesive around entire perimeter edge of each floor mated area, and embed the floor mating therein.
- E. Roll all floor mat areas with a 30 pound floor mat roller to ensure proper

contact of floor mat with adhesive, and to remove all bubbles and buckles. Carefully roll seams and edges with the roller centered over the seam.

- F. Run all floor mat in the same direction. Plan and install floor mat in all areas so that single pieces per area shall be used to the fullest extent possible. No seams will be permitted in areas which are 12 feet, or less, in width.
- G. Carefully measure all cut-outs at the project.
- H. Make all seams in floor mating by back-cutting the floor mat [or mat] on an angle so that the face yarn of abutting pieces intermingles, and provides a practically invisible transition at each seam location. Center seams, occurring at door openings, parallel to, and directly under, the doors. Seams occurring at corridor change of direction shall follow wall line parallel to floor mat direction. Do not center seams, perpendicular to, in the path of travel to doors.
- I. Install specified edging wherever floor mating abuts a dissimilar flooring material, except where wood thresholds, or resilient floor tile trim occurs.

#### 3.4 CLEANING

- A. Daily clean work areas by disposing of floor mat scraps.
- B. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of adhesives and other materials installed under this Section.
- C. Clean and vacuum floor mat surfaces upon completion of the installation.

#### 3.5 PROTECTION

- A. Prohibit traffic from floor mat areas for 24 hours after installation.

End of Section

**SECTION 21 00 00**

**FIRE PROTECTION  
(Filed Sub-Bid Required)**

|  |    |
|--|----|
| PART 1 - GENERAL .....                                   | 1  |
| 1.1 FILING SUB-BIDS.....                                 | 1  |
| 1.2 GENERAL PROVISIONS.....                              | 1  |
| 1.3 DESCRIPTION OF WORK .....                            | 1  |
| 1.4 RELATED WORK.....                                    | 3  |
| 1.5 CODES, ORDINANCES, AND PERMITS.....                  | 3  |
| 1.6 DISCREPANCIES IN DOCUMENTS.....                      | 4  |
| 1.7 MODIFICATIONS IN LAYOUT.....                         | 4  |
| 1.8 RECORD DRAWINGS.....                                 | 5  |
| 1.9 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS ..... | 6  |
| 1.10 SHOP DRAWINGS AND MATERIAL SCHEDULES .....          | 6  |
| 1.11 COORDINATION DRAWINGS .....                         | 7  |
| 1.12 GUARANTEE .....                                     | 7  |
| 1.13 DRAWINGS .....                                      | 8  |
| 1.14 SYSTEM DESCRIPTION .....                            | 8  |
| 1.15 ALARM FACILITIES .....                              | 9  |
| 1.16 PIPE MARKER IDENTIFICATION SYSTEM.....              | 9  |
| 1.17 VALVE TAGS.....                                     | 9  |
| 1.18 IDENTIFICATION SIGNS.....                           | 9  |
| 1.19 PAINTING.....                                       | 9  |
| 1.20 WATER SUPPLY TEST DATA .....                        | 10 |
| 1.21 HOISTING EQUIPMENT AND MACHINERY.....               | 10 |
| 1.22 STAGING AND SCAFFOLDING .....                       | 10 |
| 1.23 BREAKDOWN.....                                      | 10 |
| 1.24 VISIT TO SITE .....                                 | 10 |
| PART 2 - PRODUCTS .....                                  | 11 |
| 2.1 GENERAL .....  | 11 |
| 2.2 PIPE AND FITTINGS.....                               | 11 |
| 2.3 JOINTS .....   | 12 |
| 2.4 VALVES .....   | 12 |
| 2.5 SPRINKLERS .....                                     | 13 |
| 2.6 FIRE DEPARTMENT CONNECTION .....                     | 14 |
| 2.7 FIRE STANDPIPE EQUIPMENT.....                        | 15 |

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

|                          |   |    |
|--------------------------|---|----|
| 2.8                      | SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS..... | 15 |
| 2.9                      | HANGERS AND SEISMIC RESTRAINTS .....            | 15 |
| 2.10                     | ALARM DEVICES .....                             | 16 |
| 2.11                     | DOUBLE CHECK VALVE ASSEMBLY .....               | 16 |
| 2.12                     | ACCESS DOORS.....                               | 17 |
| 2.13                     | DUCTILE IRON PIPE.....                          | 17 |
| 2.14                     | EXTERIOR GATE VALVES .....                      | 18 |
| 2.15                     | FIRE HYDRANTS .....                             | 18 |
| 2.16                     | DETECTABLE UNDERGROUND WARNING TAPE .....       | 19 |
| 2.17                     | FIRESTOP SYSTEMS.....                           | 19 |
| 2.18                     | SCAFFOLDS AND STAGING .....                     | 19 |
| 2.19                     | HOISTING MACHINERY AND EQUIPMENT.....           | 20 |
| PART 3 - EXECUTION ..... |   | 20 |
| 3.1                      | WORKMANSHIP AND INSTALLATION METHODS.....       | 20 |
| 3.2                      | WORK COORDINATION AND JOB OPERATIONS .....      | 20 |
| 3.3                      | CUTTING AND CORE DRILLING .....                 | 21 |
| 3.4                      | CLEANING AND PROTECTION .....                   | 22 |
| 3.5                      | SLEEVES, INSERTS, AND ESCUTCHEONS .....         | 22 |
| 3.6                      | TESTING.....                                    | 23 |
| 3.7                      | FIRESTOP SYSTEMS:.....                          | 23 |
| 3.8                      | SEISMIC RESTRAINTS.....                         | 24 |

END OF INDEX



**SECTION 21 00 00**

**FIRE PROTECTION  
(Filed Sub-Bid Required)**

**PART 1 - GENERAL**

**1.1 FILING SUB-BIDS**

- A. Sub-bids for Work under this Section shall be for the complete Work required hereunder and shall be filed in a sealed envelope with the Awarding Authority before the time and date and at the location indicated in the Instructions to Bidders and at that time will be publicly opened and read aloud.
- B. Procedure for filing Sub-Bids shall be as set forth in the Instructions to Bidders contained in this Project Manual and shall conform to all requirements of the Commonwealth of Massachusetts General Laws, Chapter 149, as amended to date.
- C. Every Sub-Bid submitted for Work under this Section shall be on a form furnished by the Awarding Authority as required by Section 44G of Chapter 149, as amended, which form is required to be completely filled in. A sample bid form for Subcontractors is contained in this Project Manual and the bid form to be used in filing a Sub-Bid is available at the office of the Architect.
- D. Every Sub-Bid filed with the Awarding Authority shall be accompanied by bid security in the form and amount stipulated in the Instructions to Bidders.
- E. No sub-sub bids are required for this Section.

**1.2 GENERAL PROVISIONS**

- A. All the Contract Documents and General Provisions of the Contract including, but not limited to, General and Supplementary Conditions, and Division 1 Specification Sections apply to this Section.

**1.3 DESCRIPTION OF WORK**

- A. Provide all labor, materials, equipment, services and accessories necessary to Design, Furnish and Install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein. The Design shall conform to the documents and shall be subject to approval by the Architect.

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Maintenance Facilities Improvements and Renovations  
Newton, MA

- B. Without limiting the generality thereof, the work to be performed under this Section includes:
1. Fire Service connecting to Municipal water main in Undine Road.
  2. A hydraulically designed automatic sprinkler system to provide 100% protection for the new and existing building as noted on the Drawings. Refer to Fire Protection Criteria on the Drawings. Prepare Working Drawings for approval of the Architect, the local authority having jurisdiction, and the owner's insurance company under stamp of an independent Massachusetts Registered Professional Fire Protection Engineer.
  3. Hydrant flow test.
  4. Backflow Control Device
  5. Fire Department Connections.
  6. Pipe and Fittings
  7. Valves
  8. Hangers
  9. Sprinkler Heads
  10. Furnishing and installation of Supervisory Switches and Controls
  11. Systems Identification
  12. Flushing and Testing of the interior and exterior system as provided herein.
  13. Drilling, Coring, Cutting & Patching of holes and openings (where the largest dimension thereof does not exceed 12 inches), for Fire Protection Piping and Equipment. All such holes require sleeves.
  14. Scaffolding, Rigging, and Staging required for all Fire Protection Work. Comply with Division 1 requirements.
  15. Provide Seismic Restraints for all Fire Protection Systems conforming to the requirements of Section 230548 which Section is herein incorporated by reference as work of the Fire Protection Sub Contractor. Seismic Restraints are required in both new and existing building.
  16. Furnishing of Access Panels
  17. Smoke and Firestopping Seals and sealing of all wall penetrations as detailed on the drawings. Refer to Division 07 which defines the firestopping materials and methods.
  18. When open-flame or spark producing tools such as blower torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch through the Local Fire Department where work is being performed and until it is completed.

19. It is the responsibility of this fire protection contractor to provide skilled and properly licensed Sprinklerfitter Foreman, Journeyman, and Apprentices for each project. At any time when an unlicensed labor is found to be on the job, it is the sole responsibility of this fire protection contractor to replace these workers with properly licensed personnel immediately. Any and all work found to be incorrect, defective, installed in contrary to state, local or NFPA standards, regulations or good engineering practices, shall be expeditiously corrected without delay to the project schedule and at no additional cost to the Owner or General Contractor.

#### **1.4 RELATED WORK**

- A. The following items of work related to the Fire Protection Work are included under other Sections of the Specifications:
  1. Cutting & Patching beyond 1.3B.13 above: SECTION 010450 - CUTTING AND PATCHING.
  2. Installation of Access Panels: Respective finish section.
  3. Excavation and Backfill: DIVISION 31
  4. Finish Painting: SECTION 099000: PAINTING
  5. Wiring for Supervisory Switches, Electrical Alarm, and Flow Switches, and Power Wiring: SECTION 260000 - ELECTRICAL
  6. Temporary Facilities: SECTION 015000 - TEMPORARY FACILITIES

#### **1.5 CODES, ORDINANCES, AND PERMITS**

- A. Perform all work in accordance with the following Codes:
  1. 780 CMR: The State Building Code.
  2. 527 CMR: The Fire Prevention Regulations.
  3. NFPA-13-2013, NFPA-24-2013, NFPA 25-2014, NFPA-241-2013, and Owner's insurance company requirements.
  4. All applicable Local, State, and Federal Codes, Statutes, or Regulations.
  5. City of Newton Fire Department.
  6. City of Newton Building Department.
- B. Obtain all permits, inspections, and approvals, from the governing authorities and pay all fees and include cost in the bid, including approvals for the cross connection control device. Provide the Owner with the cross connection permit for the device in the Owner's name.

## **1.6 DISCREPANCIES IN DOCUMENTS**

- A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.
- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.
- E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

## **1.7 MODIFICATIONS IN LAYOUT**

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.
- C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.

- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

## **1.8 RECORD DRAWINGS**

- A. General: Refer to DIVISION 01 - GENERAL REQUIREMENTS for general requirements for maintaining as-built drawings and submitting final reproducible record documents.
- B. The General Contractor will provide two sets of black or blue line on white Drawings to the Fire Protection Subcontractor, one set of which shall be maintained at the site and which shall, at all times, be accurate, clear, and complete, showing the actual locations of all equipment and piping as it is being installed. The Record Drawings shall be available to the Architect/Engineer's field representative at all times.
- C. Provide electronic AutoCAD drawings to indicate revisions to piping size and location both exterior and interior; including locations of valves and other equipment requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.
- D. Include in the Record Drawings any addenda, sketches, and supplementary Drawings issued during the course of construction.
- E. Non-availability of Record Drawings or inaccuracies therein will postpone the final inspection until they are available.
- F. All valves shown on these Drawings shall be numbered with numbers corresponding to those on the valve charts.
- G. All costs related to the foregoing requirements shall be paid by the Fire Protection Subcontractor.

## **1.9 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS**

- A. Provide operating instructions to the owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed. At the completion of the project, turn over to the Architect four (4) complete manuals in three-ring, loose-leaf binders, containing the following:
1. Complete Shop Drawings of all equipment.
  2. Operation description of all systems.
  3. Names, addresses, and telephone numbers of all suppliers of the system.
  4. Preventive maintenance instructions for all systems.
  5. Spare parts list of all system components.
  6. Service contracts or forms required after occupancy.
  7. Valve tag chart noting location of any and all valves controlling the fire protection systems including main control, main drain, auxiliary drain, drum drip, inspectors test connections and any low point drains connected to these systems.
  8. Copy of NFPA 25, latest edition.
- B. Provide DVD recording of operation and maintenance training sessions and include as part of O & M Manual submittal. Training session video recording and DVDs shall be performed by a professional videographer. Provide indexed table of contents for DVD recording.
- C. Both O&M's and training Videos shall be saved on BMS server and provide a Control page weblink to O&Ms and Training videos.

## **1.10 SHOP DRAWINGS AND MATERIAL SCHEDULES**

- A. Refer to SECTION 013300 - SUBMITTALS for substitution of equipment and submittal of Shop Drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in or additional connections, piping, supports or construction, same shall be provided as the responsibility, and at the expense, of the Fire Protection Subcontractor.
- B. Fabrication of any material or performing of any work prior to the final approval of the Submittals will be entirely at the risk of the Subcontractor. The Subcontractor is responsible for furnishing and installing materials called for in the Contract Documents, even though these materials may have been omitted from approved Submittals.

- C. Submit Shop Drawings for the following materials and equipment.
1. Coordinated Working Drawings and hydraulic calculations including size, type, length, temperature rating of sprinkler heads, piping and the like. Indicate flow test results, design criteria, hydraulic reference points, diffuser and light locations.
  2. Access Panels and Covers
  3. Sprinkler Heads
  4. Hangers and Seismic Restraints
  5. Pipe, Fittings, and Appurtenances
  6. Systems Identification
  7. Valves
  8. Fire Department Connection
  9. Cross Connection Device

#### **1.11 COORDINATION DRAWINGS**

- A. Before materials are purchased or Work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces.
- B. Coordination Drawings are for the Contractor's and the Architect's use during Construction and shall not be construed as replacing any Shop or Record Drawings required elsewhere in these Contract Documents.
- C. Detailed procedures for Coordination Drawings are contained in DIVISION 01 of these Contract Documents.

#### **1.12 GUARANTEE**

- A. Guarantee all work under this Section free from defects in workmanship or materials for a period of one (1) year from the date of final acceptance of the building, as set forth in the Contract.
- B. Replace any such defective work developing during this period, unless such defects are clearly the result of bad usage of equipment by others. Where such defective work results in damage to work of other Sections of the Specifications, restore such work to its original condition by mechanics skilled in the affected trade.

### **1.13 DRAWINGS**

- A. All work shown on the Drawings is intended to be approximately correct to scale but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting. To carry out the true intent and purpose of the plans, furnish all necessary parts to make a complete working system ready for use.
- B. The Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- C. Refer to the Architectural, Structural, and Other Mechanical and Electrical Drawings which indicate the construction in which this work shall be installed. Locations shown on the plans shall be checked against the general and detailed drawings of the construction proper. All measurements must be taken at the building.

### **1.14 SYSTEM DESCRIPTION**

- A. The existing building and the new addition are to be 100% sprinklered with an automatic sprinkler system. The system shall be designed in accordance with NFPA-13-2013. Do not reduce sizes of sprinkler fire main nor the sizes of risers shown on the drawings.
- B. Building is to be 100% sprinklered including all closets and Electric rooms.
- C. Refer to Fire Protection Criteria on the Drawings. Conform to the zoning shown on the plans.
- D. Locations of sprinkler heads are shown in some of the areas to be sprinklered only to establish the patterns and design intent. Major equipment and runs of piping may also be shown. Refer to reflected ceiling plan for location of all sprinkler heads. All sprinkler heads are to be installed dead center of tile.
- E. The documents require that the building be covered 100%. This includes all closets, combustible concealed spaces, and other areas as required under NFPA-13-2013. These areas are to be included in the Sub-contractor's bid whether or not the heads are shown on the sprinkler plans.



### **1.15 ALARM FACILITIES**

- A. Furnish and install all Supervisory Switches, Flow Switches, Pressure Switches, and other Alarm Devices. Install all such devices on the piping and coordinate with the Electrical Subcontractor who shall wire all such devices to the Fire Alarm System. Every shutoff valve installed on this project shall have a supervisory trouble switch wired to the Fire Alarm Panel.

### **1.16 PIPE MARKER IDENTIFICATION SYSTEM**

- A. Mark all piping installed under this Section with a marking system in basic colors conforming to those specified in ANSI/ASME A-13.1. Markings shall indicate pipe content and direction of flow. Apply markers every 20 feet on center on piping which is exposed in mechanical or storage areas and above suspended accessible ceilings. Also, apply at all access panels, valves, tee joints, alarms, and/or controls.
- B. Adhesive system may be used throughout except at the mechanical rooms in which case markings shall be painted on.

### **1.17 VALVE TAGS**

- A. All valves installed in the Fire Protection Contract shall be tagged. Tags shall be secured to valves with chain link and shall be marked with 3/4 inch high letters as to function. All valve tags shall indicate the Fire Zone.
- B. A corresponding framed Valve Tag Chart shall be installed within each Sprinkler Riser or Control Valve Room indicating location of each valve and the section it serves. This chart shall also be included within the Owner's O&M Manual with valve tag locations noted on the As-Built Sprinkler drawings.

### **1.18 IDENTIFICATION SIGNS**

- A. All equipment and systems shall be identified with signs furnished and attached in accordance with NFPA 13.

### **1.19 PAINTING**

- A. All interior exposed piping is to be painted and all painting, except as noted, will be done by the Painting Subcontractor. All uncovered piping and hangers shall be thoroughly cleaned of rust, oil, and other containments by the Fire Protection Subcontractor and left ready to receive primer coat.
- B. Painting for pipe markings shall be done under this Section.

**1.20 WATER SUPPLY TEST DATA**

- A. The following water supply data is included as information available to bidders.
- B. A hydrant flow test was performed on January 13, 2020, by Boston Water and Sewer Commission at 61 Undine Road, Boston, MA.
- C. Flow Test Results:
  - 1. Static Pressure = 72 PSI
  - 2. Residual Pressure = 66 PSI
  - 3. Flow = 1,736 GPM
  - 4. Estimated Flow at 20 PSI = 5,572 GPM

**1.21 HOISTING EQUIPMENT AND MACHINERY**

- A. Unless otherwise specified, all hoisting and rigging equipment and machinery required for the proper and expeditious prosecution and progress of the Work of this Section shall be furnished, installed, operated and maintained in safe condition by each sub-contractor, as specified under Section 015000, TEMPORARY FACILITIES AND CONTROLS.

**1.22 STAGING AND SCAFFOLDING**

- A. Unless otherwise specified, each sub-contractor shall provide all lifts and man-lifts, and furnish, erect and maintain in safe condition, all staging and scaffolding as specified under Section 015000 Temporary Facilities and Controls, as needed for proper execution of the work of this Section. Staging and scaffolding shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

**1.23 BREAKDOWN**

- A. Submit a breakdown of the contract price to aid the Architect in determining the value of the work installed as the job progresses.
- B. No requisition will be approved until the breakdown is delivered to the Architect.

**1.24 VISIT TO SITE**

- A. Prior to submitting a bid, visit the site of work and become familiar with existing conditions at the site of the work. Any assumptions made are at this Subcontractor's expense.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. All materials and equipment furnished under this Section shall be new, unused, first quality of a manufacturer of established reputation and shall be U.L./F.M. approved. Each valve, fitting, section of pipe, and piece of equipment shall have cast or indelibly stamped thereon the manufacturer's name and pressure rating where applicable. All threads for fire department connection shall conform to the standards of the Local Fire Department.

**2.2 PIPE AND FITTINGS**

- A. Pipe and fittings shall conform to the latest A.S.A., A.S.T.M., C.A., and F.S. Standards. All grooved products shall be of one manufacturer to conform to NFPA Standards.
- B. All piping installed under this Section shall be in accordance with the following:

| <u>Service</u>   | <u>Materials</u>                                   |
|--|--|
| Trim piping around alarm valves, sprinkler piping 1-1/2 inch and smaller | ASTM A-53, Schedule 40 black steel pipe            |
| Sprinkler and standpipe piping 2 inch and larger                         | Schedule 10, ASTM A-135 U.L./F.M. black steel pipe |
| Dry sprinkler system, regardless of size                                 | ASTM A-53, Schedule 40 galvanized steel pipe       |
| Underground service  | CL 52 ductile iron pipe                            |
- C. Fittings on fire line piping, 2 inch and larger, shall be Victaulic Fire Lock Ductile Iron Fittings conforming to ASTM A-536 with integral grooved shoulder and back stop lugs and grooved ends for use with Style 009-EZ or Style 005 couplings.
- D. Fittings for standpipes and risers, 2-1/2 inch and larger, and where ever required to conform to Seismic Requirements shall be Victaulic Vic-Flex Style 75 or 77 with Fire Lock Gasket.
- E. Branch line fittings shall be welded or shall be Victaulic 920/920N Mechanical Tees.
- F. Schedule 10 pipe shall be roll grooved. Schedule 40 pipe where used with mechanical couplings shall be rolled groove and shall be threaded where used with screwed fittings.

- G. Fittings for threaded piping shall be malleable iron screwed sprinkler fittings.
- H. All pipe and fittings shall be U.L./F.M. approved for sprinkler and standpipe service. All pipe and fittings shall be black for wet system.
- I. Fittings on underground fire service piping shall be 250 psi gray iron fittings with mechanical joint ends. Coordinate with site contractor to assure all joints are properly thrust blocked.
- J. Grooved fittings shall be manufactured by Victaulic, Grinnell, Anvil, or equal.

### **2.3 JOINTS**

- A. Threaded pipe joints shall have an approved thread compound applied on male threads only. Teflon tape shall be used for threads on sprinkler heads.
- B. Joints on piping, 2 inch and larger, shall be made up with Victaulic, or equal, Fire Lock Style 005, rigid coupling of ductile iron and pressure responsive gasket system for wet or dry sprinkler system as recommended by manufacturer. Couplings on dry systems shall be galvanized. Cutting, roll grooving, lubrication, and assembly of all joints shall be made strictly in accordance with manufacturer's recommendations. Exercise particular caution in the use of lubricant to avoid "squeeze out" of lubricant when system is in service.
- C. Grooved joints and fittings shall be manufactured by Victaulic, Grinnell, Anvil, or equal.
- D. Furnish and install where piping crosses building expansion joints a listed expansion joint. Expansion joints shall be Metraflex "Fireloop", or manufactured by Flexonic Company or Hyspan, or equal. Expansion joints shall be UL approved for use for fire sprinkler systems.
- E. All joints on Fire Service under slab shall be restrained up to the service stub flange connection above slab.

### **2.4 VALVES**

- A. All shutoff and control valves shall be U.L./F.M. approved, indicating type valves equipped with a supervised trouble switch wired to the fire alarm system. Shutoffs and zone valves may be either OS&Y indicating gates or butterfly valves.
- B. Gate valves shall be outside screw and yoke indicating type, 175 psi W.P. and U.L./F.M. listed, Jenkins or equal. All such valves shall have supervised trouble switch.

- C. Butterfly valves shall be Victaulic Series 705-W for 2-1/2 inch and larger, and Milwaukee indicating type U.L./F.M. butterfly for threaded service. Coordinate with Electrical Sub-contractor to have factory installed monitor switches compatible with the remainder of the Fire Alarm System.
- D. Check valves shall be iron body bronze mounted U.L./F.M., 175# W.P. or U.L./F.M. wafer checks. Grooved end valves shall be Victaulic Style 717 Fire Lock Check Valve.
- E. Pressure relief valves shall be located on wet systems pressure regulating valves and downstream of check valves per NFPA-13-2013. Pressure relief valves shall be listed and not less than 1/2 in. in size and shall be by AGF, Watts, Cla-Val or equal.
- F. Ball drips shall be Potter Roemer #5682, 3/4 inch straight design ball drip valve, or by Victaulic, Viking, or equal.
- G. Drains shall be provided in the systems as may be required by field conditions. Provide drains at all low points and wherever necessary to insure that all portions of the sprinkler piping may be completely drained. Test connections shall be provided as required to test all portions of the system. Pipe low point drains and test connections to suitable receptor as determined in field or shown on Drawings.
- H. Install an inspector's test connection at the furthest point of each sprinkler zone. Run discharge back to a suitable receptor. Exterior wall penetration is permitted with test drain but only as approved by the Architect.
- I. Valves shall be manufactured by Victaulic, Nibco, Viking, or equal. Inspector's test stations shall be manufactured by AFG, Tyco, Victaulic, or equal.

## **2.5 SPRINKLERS**

- A. All sprinklers to be used on this project shall be Quick Response type and shall be stamped with date of manufacture and temperature rating. Temperature ratings shall be determined by the location of the heads per NFPA 13-2013, section 8.3.2.5, and shall be minimum 155 degrees F. throughout except in special areas around heat producing equipment, skylights, and attics in which case use temperature rating to conform with hazard as specified in NFPA 13-2013. Orifice diameter and K factor shall be appropriate to meet the hydraulic design criteria, the available water supply, and NFPA Standards.
- B. Furnish spare heads of each type installed located in a cabinet along with special sprinkler wrenches. The number of spares and location of cabinet shall be in complete accord with NFPA 13-2013.
- C. Sprinklers shall be manufactured by Tyco, Victaulic, Viking, or equal.

- D. Upright sprinkler heads in areas with no ceilings shall be Tyco Model "TY-FRB" Quick Response, upright natural brass finish heads. Include heavy duty sprinkler guards on all upright sprinkler heads.
- E. Sidewall heads shall be Tyco Model "TY-FRB" Quick Response with white polyester head and escutcheon.
- F. Pendent wet sprinkler heads shall be Tyco Model "TY-FRB" Quick Response recessed adjustable escutcheon, white polyester finish.
- G. Concealed heads shall be Tyco Model "RFII" Quick Response concealed type, 1-1/2 inch adjustment white cover plate. In special areas, as may be noted on the Drawings, provide alternate cover plate finishes.
- H. Dry pendent sprinkler heads shall be Tyco Model "DS-1" Quick Response dry type, white polyester finish, and white escutcheon.
- I. Dry upright sprinkler heads shall be Tyco Model "DS-1" Quick Response dry type, chrome plated finish.
- J. Dry sidewall sprinkler heads shall be Tyco Model "DS-1" dry horizontal sidewall heads, white polyester finish, and white escutcheon.
- K. Use of flexible stainless steel hose with fittings for fire protection service that connect sprinklers to branch lines in suspended ceilings is acceptable. Flexible hoses shall be UL/FM approved and shall comply with NFPA 13 standards. Hose assemblies shall be type 304 stainless steel with minimum 1-inch true-bore internal hose diameter. Ceiling bracket shall be galvanized steel and include multi-port style self-securing integrated snap-on clip ends that attach directly to the ceiling with tamper resistant screws.

## **2.6 FIRE DEPARTMENT CONNECTION**

- A. Fire Department Inlet Connection shall be Croker #6350 Series; 4 inch Storz inlet x 4 inch outlet, 30 degree elbow, brass plate, and stamped "Sprinkler-Standpipe". Install 1/2" ball drip valve and chrome plated trim wall fitting on bottom of inlet fitting body. Provide access panel for servicing the ball drip.
- B. Each fire department connection shall be designated by a sign as follows:
  - 1. The sign shall have raised or engraved letters at least 3-inch letters "FDC" in height on a plate.
  - 2. The sign shall indicate the type of system for which the connection is intended.

- C. Fire Department Connection shall be manufactured by Croker, Potter Roemer, Elkhart, or equal.

## **2.7 FIRE STANDPIPE EQUIPMENT**

- A. Fire Department Valves shall be Croker Series 5015 Fire Department Valves fitted with 2-1/2 inch x 1-1/2 inch reducer, caps and chains all conforming to Local Fire Department thread standard. Valves shall be polished chrome plated and shall be mounted in a recessed cabinet as indicated on Drawings.
- B. Valves shall be manufactured by Croker, Potter Roemer, Elkhart, or equal.

## **2.8 SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS**

- A. Furnish and install All Supplementary Steel, Channels, and Supports required for the proper installation, mounting, and support of all equipment.
- B. Supplementary Steel and Channels shall be firmly connected to building construction in a manner approved by the Architect.
- C. The type and size of the Supporting Channels and Supplementary Steel shall be determined by the Fire Protection Subcontractor and shall be sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.
- D. All Supplementary Steel and Channel shall be installed in a neat and workmanlike manner parallel to the walls, floor, and ceiling construction. All turns shall be made with 90 degree fittings, as required to suit the construction and installation conditions.

## **2.9 HANGERS AND SEISMIC RESTRAINTS**

- A. Hangers shall be furnished, installed, and supported from the building structure in accordance with NFPA - 13, Section 230548 and Drawing VS-1.
- B. All piping whether in new or existing building shall be seismic restrained.
- C. Hangers shall not be installed directly into the roof deck. Provide supplementary steel per paragraph 2.8 above as required to support piping from structure.

## **2.10 ALARM DEVICES**

- A. Flow switches shall be vane type water flow detectors with 0-90 Sec. Adjustable non-accumulative retard device and (2) single pole double throw contacts, Notifier Series WFD Potter, VSR.F or equal. At base of standpipe risers, flow switch shall be a non-water discharge, auto-test vane type water flow detector with 0-90 second adjustable non-accumulative retard device and (2) single pole double throw contacts, Potter VSR.AT or equal. The flow switch shall be paired with either a single gang box test switch, Potter ATC-1 for testing a single device or ATC-4 for testing up to four devices.”
- B. Supervisory switches on all O.S. & Y. gate valves shall be Notifier NGV complete with mounting bracket.
- C. The wet system alarm device shall be Reliable Model ‘E’ alarm valve with “E1” trimmings. Package to include electric bell.
- D. Refer to Drawings for additional devices. Co-ordinate, prior to ordering devices, with the Electrical Sub-Contractor to assure device compatibility with the Fire Alarm System.
- E. Alarm valves shall be as manufactured by Reliable, Victaulic, Tyco, or equal. Flow, pressure, and supervisory switches shall be manufactured by Potter, Notifier, System Sensor, or equal.

## **2.11 DOUBLE CHECK VALVE ASSEMBLY**

- A. Double check valve assembly shall be State approved, U.L./F.M. approved, with iron body bronze mounted construction complete with supervised OS & Y gate valves and test cocks. Furnish two spare sets of gaskets and repair kits.
- B. Double check valve assembly shall be of one of the following:
  - 1. Watts Series 757-OSY
  - 2. Wilkins 350A-OSY
  - 3. Conbraco Series 4S-100
  - 4. Or equal.
- C. In the name of the owner pay for, file for, and obtain required permits from D.E.P. and/or local authority whichever has jurisdiction prior to installation.



## **2.12 ACCESS DOORS**

- A. Furnish Access Doors for access to all concealed control valves, drains, inspector's tests, supervisory devices, and to all other concealed parts of the system that require accessibility for the proper operation and maintenance of the system. These doors shall be installed under the appropriate Section of the Specifications for the surface upon which the panels are mounted.
- B. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or non-public areas, positioned so that the valve or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12 inch x 16 inch). When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.
- C. Refer to Section 083100 - Access Doors and Frames, for all product requirements for furnishing access panels.
- D. Coordinate locations and schedule with the work of trades involved with construction in which access panels will be installed.
- E. Access Door Shop Drawings shall be submitted to the Architect for approval.
- F. All access panels shall be keyed alike. Coordinate keying with other trades.

## **2.13 DUCTILE IRON PIPE**

- A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated, 350 psi.
  - 1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Glands, Gaskets, and Bolts: AWWA C111, ductile or gray iron glands, rubber gaskets, and steel bolts.
- B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated, 350 psi.
  - 1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
  - 2. Gaskets: AWWA C111, rubber.

- C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, round-grooved ends.
  - 1. Grooved-End, Ductile-Iron Pipe Appurtenances: ASTM A47, malleable-iron castings or ASTM A536, ductile-iron castings with dimensions matching pipe, 350 psi.
  - 2. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions, Include ferrous housing sections, gasket suitable for water, and bolts and nuts. Joints shall be Tyton.
  - 3. Gaskets: AWWA C111.
- D. Flanged Ductile Iron Pipe: AWWA C115/A21.11, with factory applied screwed long hub flanges.
  - 1. Flanges: ASME B16.1 250 psi pressure ratings, as necessary.
  - 2. Wall Sleeve Castings, size and types shown on the drawings, shall be hot dipped galvanized per ASTM A123.
- E. Cement Mortar Internal Lining: Cement mortar lining and bituminous seal coat as per AWWA C104.
- F. Exterior Pipe Coating: The exterior of pipe shall have the standard asphaltic coating.

#### **2.14 EXTERIOR GATE VALVES**

- A. All gate valves shall conform in design and manufacturing to the latest issue of AWWA Standard C500 "Resilient-Seated Gate Valves for Water Supply", rated at 150 psi working pressure with a minimum 300 psi pressure test
- B. All valves shall have a 2 inch operating nut, mechanical joint hubs (except for wet tapping sleeves).
- C. Coordinate direction of valves opening with the local Water Department.

#### **2.15 FIRE HYDRANTS**

- A. Hydrants shall conform to the requirements of Boston Water & Sewer Commission, AWWA C502, and be designed for 150 psi working pressure tested to 300 psi hydrostatic. Hydrants shall be 6 inch mechanical joint show, 4-1/4 inch valve opening, open COUNTER CLOCKWISE with 2-1/2 inch hose nozzles and 4-1/2 inch pumper connection, National Standard Threads, operating nut and nozzle cap with non-kink safety chains. Bury length shall be 5'-0"
- B. Hydrant shall be the compression type, closing with the pressure. They shall be traffic model with safety flange and stem couplings.

- C. Hydrant shall be able to be rotated 360 degrees. They shall have a positive closing, self-cleaning drain valve and drainage area shall be completely bronze or brass lined.

## **2.16 DETECTABLE UNDERGROUND WARNING TAPE**

- A. Detectable warning tape shall be installed 12" directly above all buried utilities. Detectable warning tape shall consist of a nominal 4.5 mil (0.0045") overall thickness and 6" wide, with a solid aluminum foil core. The imprinted warning message is "Buried, or Encased" to prevent rub-off, and is impervious to acids, alkalis and other destructive elements found in soil. The imprint is as such that it allows for total reflectivity. A tape must be visibly seen before it can be read. The tape shall meet the testing requirements of ASTM D-882, Method A.
- B. Legend/Color & Imprint:
  - 1. Tape shall read "CAUTION BURIED WATER LINE BELOW".
  - 2. Tape color coding shall be Blue.

## **2.17 FIRESTOP SYSTEMS**

- A. General: Provide firestopping at all new fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 078400 - Firestopping, for all product requirements for maintaining integrity of fire-rated construction at penetrations.

## **2.18 SCAFFOLDS AND STAGING**

- A. General: Trade Contractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - Temporary Facilities and Controls and herein.
  - 1. Scaffolding and staging required for use by this Trade Contractor pursuant to requirements of Section 01 50 00 - Temporary Facilities and Controls shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Trade Contract requiring such scaffolding.
  - 2. Each Trade Contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - Temporary Facilities and Controls and as additionally required for dust control).

3. General Contractor is responsible to provide enclosures required for temporary heat; refer to Section 01 50 00 - Temporary Facilities and Controls.
  - a. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Trade Contractor.

## **2.19 HOISTING MACHINERY AND EQUIPMENT**

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Trade Contractor shall be furnished, installed, operated and maintained in safe conditions by this Trade Contractor, as referenced under Section 01 50 00 - Temporary Facilities and Controls.

## **PART 3 - EXECUTION**

### **3.1 WORKMANSHIP AND INSTALLATION METHODS**

- A. All work shall be installed in a first-class manner consistent with the best current trade practices. All materials shall be securely installed plumb and/or level, and all flush mounted equipment shall have front edge flush with finished wall surface.
- B. Protect all concealed heads. Coordinate and advise finishing trades so as to prevent painting of sprinkler heads or inadvertent filling with paint or jointing compound of required air spaces in the case of the concealed type sprinkler heads.
- C. Training:
  1. Train the Owner's maintenance personnel on troubleshooting procedures, and servicing and preventative maintenance schedules and procedures.
  2. Schedule training with Owner through the Architect with at least 7 days prior notice.

### **3.2 WORK COORDINATION AND JOB OPERATIONS**

- A. The equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same.
- B. Before materials are purchased or work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces.

- C. Coordination Drawings are for the Contractor's and the Architect's use during construction and shall not be construed as replacing any Shop or Record Drawings required elsewhere in these Contract Documents.
- D. Detailed procedures for Coordination Drawings are contained in DIVISION 01 - GENERAL REQUIREMENTS of these Contract Documents.
- E. Particular attention shall be directed to the coordination of piping and other equipment installed in the ceiling areas. Coordinate the elevations of all piping in hung ceiling areas to insure adequate space for the installation of recessed lighting fixtures before other mechanical equipment is installed.
- F. Furnish to the General Contractor, and all other Subcontractors, all information relative to the portion of the Fire Protection installation that will affect them, sufficiently in advance so that they may plan their work and installation accordingly.
- G. In case of failure to give proper information as indicated above, sufficiently in advance, pay for all back-charges for the modification, renovation, and relocation of any portion of the work already performed.
- H. Obtain from the other trades, all information relative to the Fire Protection Work to be executed in conjunction with the installation of their respective equipment.

### **3.3 CUTTING AND CORE DRILLING**

- A. Perform all cutting and core drilling operations that are outlined in Part 1 of this SECTION. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the walls, floors, overhead structure, and other structural components is maintained until permanent work is installed. Prior to any coring or cutting, verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved Coordination Drawings.
- B. Cut all masonry and concrete with an approved diamond blade concrete saw in a neat straight direction, perpendicular to the plane of the wall or floor.
- C. Use a core drilling process which produces clean, sharp edges and the minimum hole size which will accommodate the size of pipe sleeve specified.
- D. Patch all holes up to the sizes indicated in this Section with material and methods as are specified in the Section of the Specifications for the finish trade involved. Holes which are improperly done due to poor materials or method, shall be patched to the satisfaction of the Architect by the finish trade and back-charged to this Subcontractor.

### **3.4 CLEANING AND PROTECTION**

- A. Protect all materials and equipment during shipment and installation and properly handle and store at the job site so as to prevent damage. Assume full responsibility for protection of work until its completion and final acceptance.
- B. Keep the premises reasonable clean at all times and remove rubbish caused by the Fire Protection work as directed by the Architect.
- C. Upon completion of this work, clean all sprinklers, and equipment and replace damaged parts. Failure to fulfill this obligation will result in back-charges for correction of the defective work by others.

### **3.5 SLEEVES, INSERTS, AND ESCUTCHEONS**

- A. All piping passing through slabs, floors, walls, and partitions shall be sleeved and all such sleeves shall be furnished and installed by the Fire Protection Subcontractor as detailed on the Drawings and herein specified. Fire Protection Contractor, shall do his core drilling as approved by the Architect and the cored opening shall have a sleeve caulked and leaded in place. Set sleeves in concrete floors and walls as soon as forms set and before concrete is poured.
- B. All pipes passing through floor, whether slab-on grade or above grade levels shall be sleeved with sleeve extending 1 inch above floor. This includes all piping in toilet room pipe space, stairwells, closets, and partitions. In mechanical penthouses, pipe sleeves shall extend 4 inches above floor.
- C. All sleeves shall be Schedule 40 galvanized steel pipe and shall be reamed. There shall be annular space between the sleeve and pipe per NFPA requirements. Sleeves on drywall, masonry, or concrete walls and partitions shall be flush with wall on both sides.
- D. The space between sleeve and pipe, in all cases, shall be filled with U.L./F.M. approved caulking compound. This includes pipes concealed in chases and/or partitions.
- E. Inserts, where required, shall be furnished and set by the Fire Protection Subcontractor and, where necessary, may be drilled or power driven and shall be sized such that the insert will not exceed a depth of penetration of 1 inch into concrete.
- F. Escutcheons: All exposed pipe, uncovered, passing through walls, or floors, or ceilings, shall be fitted with C.P. brass spun or split type escutcheons with approved clamping device for holding in position. Floor escutcheons shall be deep enough to fit over sleeves, fastened to pipe, and extend down to floor.

### **3.6 TESTING**

A. Flush the system and test all work in the presence of the Architect and/or Engineer and as required by NFPA and the Insurance Company. The flushing and testing procedures to be followed are specified herein. At the completion of the testing, submit fully executed copies of Contractor's Material and Test Certificate for both above ground and underground piping as contained in NFPA-13.

1. Water Supply:

a. Flushing: Underground/exterior service entrance shall be flushed at a minimum velocity of 10 fps in accordance with NFPA Standards 13, 14, and 24. The Fire Protection sub-contractor shall coordinate with Division 33 and shall notify the Water and Fire Departments prior to testing of the entire exterior system.

2. Sprinkler System:

a. Hydrostatic Testing: The interior system shall be hydrostatically tested at 200 psi for 2 hours in accordance with NFPA 13 paragraph 25.2.1.

b. Operational Testing: Water flow switches and associated alarm systems shall be tested by water flow through the inspectors test assemblies in accordance with NFPA 13, 25.2.3.

c. Main Drain Test: A flow test shall be performed on the main drain valve and recorded on the Contractor's test certificate in conformance with NFPA 13, 25.2.3.4.

d. Backflow Preventor Flow Test: The double check valve assembly shall be flow tested in conformance with NFPA 13, 25.2.5. Provide piping and or valving arrangement to preform full flow testing of backflow device.

e. Underground Piping: Underground piping and fire sprinkler lead in connections to each building shall be hydrostatically tested, flushed and chlorinated in accordance with NFPA 24, the Local DPW, and any other pertinent laws or governing standards. Flushing, Testing and chlorination reports shall be given to the owner for review and included in the O&M Manuals for the fire protection systems.

### **3.7 FIRESTOP SYSTEMS:**

A. General: Install firestop systems at all new fire-rated construction where penetrated by the Work of this Section.

B. Refer to Section 078400 - Firestopping, for all installation requirements for maintaining integrity of fire-rated construction at penetrations.

**3.8 SEISMIC RESTRAINTS**

- A. The independent engineer responsible for design of seismic restraints shall visit the project upon completion of the work to certify the installation is consistent with the approved shop drawings. The certification shall be submitted to the Architect and must precede the closing in of ceilings.

END OF SECTION



**SECTION 22 00 00**

**PLUMBING  
(Filed Sub-Bid Required)**

PART 1 - GENERAL .....1

1.1 FILING SUB-BIDS .....1

1.2 GENERAL PROVISIONS .....1

1.3 DESCRIPTION OF WORK .....2

1.4 RELATED WORK .....3

1.5 CODES, ORDINANCES, AND PERMITS .....4

1.6 DISCREPANCIES IN DOCUMENTS .....4

1.7 MODIFICATIONS IN LAYOUT .....5

1.8 SHOP DRAWING AND MATERIAL SCHEDULES .....5

1.9 COORDINATION DRAWINGS .....6

1.10 RECORD DRAWINGS .....6

1.11 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS .....7

1.12 GUARANTEE .....8

1.13 DRAWINGS .....8

1.14 VALVE TAGS, NAMEPLATES, AND CHARTS .....9

1.15 PIPE MARKER IDENTIFICATION SYSTEM .....9

1.16 SANITARY, WASTE, VENT AND GARAGE WASTE AND VENT SYSTEMS .....10

1.17 DOMESTIC WATER SYSTEMS (POTABLE & NON-POTABLE) .....10

1.18 EQUIPMENT FURNISHED BY OTHERS .....11

1.19 DEMOLITION .....11

1.20 PAINTING .....12

1.21 HOISTING EQUIPMENT AND MACHINERY .....12

1.22 STAGING AND SCAFFOLDING .....13

1.23 BREAKDOWN .....13

1.24 VISIT TO SITE .....13

PART 2 - PRODUCTS .....13

2.1 GENERAL .....13

2.2 PIPE AND FITTINGS .....13

2.3 JOINTS .....15

2.4 VALVES .....16

2.5 INSULATION .....17

2.6 TRAPS .....17

2.7 DRAIN VALVES .....18

2.8 SHOCK ABSORBERS .....18

2.9 PIPING ACCESSORIES .....18

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

|                         |   |    |
|-------------------------|---|----|
| 2.10                    | HYDRANTS AND HOSE BIBB .....                                  | 19 |
| 2.11                    | CLEANOUTS .....   | 19 |
| 2.12                    | ACCESS DOORS .....  | 19 |
| 2.13                    | SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS.....               | 20 |
| 2.14                    | HANGERS, ANCHORS, GUIDES, AND PIERS .....                     | 20 |
| 2.15                    | DRAINS .....  | 22 |
| 2.16                    | PLUMBING FIXTURES.....  | 22 |
| 2.17                    | BACKFLOW PREVENTERS.....                                      | 26 |
| 2.18                    | UNION AND NIPPLES .....                                       | 26 |
| 2.19                    | WATER HEATER .....  | 26 |
| 2.20                    | TEMPERING VALVES .....  | 27 |
| 2.21                    | RECIRCULATING HOT WATER PUMPS .....                           | 28 |
| 2.22                    | WATER METER.....  | 28 |
| 2.23                    | MANHOLE AND PRECAST CONCRETE OIL/GAS SEPARATOR STRUCTURE..... | 28 |
| 2.24                    | WATERTIGHT FOUNDATION LINK SEAL .....                         | 29 |
| 2.25                    | FIRESTOP SYSTEMS.....   | 29 |
| 2.26                    | SCAFFOLDS AND STAGING.....                                    | 30 |
| 2.27                    | HOISTING MACHINERY AND EQUIPMENT .....                        | 30 |
| PART 3 - EXECUTION..... |   | 30 |
| 3.1                     | WORKMANSHIP AND INSTALLATION METHODS.....                     | 30 |
| 3.2                     | WORK COORDINATION AND JOB OPERATIONS.....                     | 31 |
| 3.3                     | CUTTING AND CORE DRILLING .....                               | 31 |
| 3.4                     | CLEANING AND PROTECTION .....                                 | 32 |
| 3.5                     | SLEEVES, INSERTS, AND ESCUTCHEONS .....                       | 32 |
| 3.6                     | TESTING .....   | 33 |
| 3.7                     | CHLORINATION.....   | 34 |
| 3.8                     | INSTALLATION OF FIRESTOP SYSTEMS .....                        | 34 |
| 3.9                     | SEISMIC RESTRAINTS .....                                      | 34 |
| 3.10                    | SYSTEM SHUTDOWNS .....  | 34 |

END OF INDEX

**SECTION 22 00 00**

**PLUMBING  
(Filed Sub-Bid Required)**

**PART 1 - GENERAL**

**1.1 FILING SUB-BIDS**

- A. Sub-bids for Work under this Section shall be for the complete Work required hereunder and shall be filed in a sealed envelope with the Awarding Authority before the time and date and at the location indicated in the Instructions to Bidders and at that time will be publicly opened and read aloud.
- B. Procedure for filing Sub-Bids shall be as set forth in the Instructions to Bidders contained in this Project Manual and shall conform to all requirements of the Commonwealth of Massachusetts General Laws, Chapter 149, as amended to date.
- C. Every Sub-Bid submitted for Work under this Section shall be on a form furnished by the Awarding Authority as required by Section 44G of Chapter 149, as amended, which form is required to be completely filled in. A sample bid form for Subcontractors is contained in this Project Manual and the bid form to be used in filing a Sub-Bid is available at the office of the Architect.
- D. Every Sub-Bid filed with the Awarding Authority shall be accompanied by bid security in the form and amount stipulated in the Instructions to Bidders.
- E. The Filed Sub-Bidder for the work of this SECTION 220000 shall list, in Paragraph E, of the FORM FOR SUB-BID, the name of each person, firm, or corporation, whom he proposes to use to perform the following classes of work or part thereof, at the bid price therefore:

| CLASS OF WORK | PARAGRAPH NUMBERS |
|---------------|-------------------|
| Insulation    | 2.5               |

**1.2 GENERAL PROVISIONS**

- A. All the Contract Documents and General Provisions of the Contract including, but not limited to, General and Supplementary Conditions, and Division 1 Specification Sections apply to this Section.

### 1.3 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.
- B. The work covered by this Section of the Specifications includes the furnishing of all labor and materials and in performing all operations in connection with the installation of the Plumbing Work.
- C. Without limiting the generality thereof, the work to be performed under this Section includes:
  - 1. Complete Sanitary, Waste & Vent System as shown on the drawings.
  - 2. Garage waste and vent system including precast concrete oil/gas separator structure and access manhole.
  - 3. Potable Cold, Hot, and Hot Water Re-circulation System.
  - 4. Non-Potable Cold Water System.
  - 5. Insulation.
  - 6. Potable Water Heating Equipment.
  - 7. Fixtures and Equipment
  - 8. Connection to Equipment Furnished by Others
  - 9. Flushing, Sterilization, and Tests
  - 10. Furnishing of Access Panels
  - 11. Drilling, Coring and Cutting & Patching of holes and openings where the largest dimension thereof does not exceed 12 inches for Plumbing Piping and Equipment.
  - 12. Demolition of existing Plumbing Equipment and Disconnecting, Capping, and otherwise making inactive, all existing Plumbing Services in the various areas where Demolition and Removal Work is required; and removing, relocating, and reinstalling existing Plumbing items to the extent specifically noted in the documents. Remove all piping hangers and equipment in accordance with the description in paragraph 1.19.
  - 13. Scaffolding, Rigging, and Staging required for all Plumbing Work. Comply with Division 1 requirements.
  - 14. Provide Seismic Restraints for all Plumbing Systems conforming to the requirements of Section 230548 which Section is herein incorporated by reference. Seismic restraints are required on all new systems whether in new or existing building.
  - 15. Preparation of Co-ordination Drawings.

16. Smoke and Firestopping Seals and sealing of all wall and floor penetrations as detailed on the drawings. Refer to Section 078400 which defines the firestopping materials and methods.
17. Prior to start of the work, the Plumbing Sub-Contractor shall identify and locate all of the existing sanitary drains located below slab and provide the services of an outside firm who shall run an underground video camera, locating all lines including depth, preparing a video and identifying any problem areas. The Plumbing Sub-Contractor shall rod-out and power wash all existing sanitary drains prior to making any tie-ins. Turn over a copy of the video and report to the Architect. At completion of each phase of work and before turning over the particular phase for occupancy, prepare a similar video of all the new main lines that are installed including the existing ones. The video and report shall document each major run and any branch pipe which is 4 in. in size or over and over 30 feet in length identifying in a report form the start of the pipe and video and stating the length to each branch along the video. At the end of the project the video shall document all of the buried systems. The video requirement is for all underground sanitary drainage pipe.
18. When open-flame or spark producing tools such as blower torches, welding equipment, and the like are required in the process of executing the work, the General Contractor shall be notified not less than twenty four hours in advance of the time that the work is to begin and the location where work is to be performed. Provide fire protective covering and maintain constant non-working fire watch, paying all fees, where work is being performed and until it is completed. Fee for fire watch shall be included in the bid.

#### **1.4 RELATED WORK**

A. The following Related Work will be performed under the designated Sections:

1. Cutting and Patching beyond 1.3C.11 above: SECTION 010450 - CUTTING AND PATCHING
2. Flashing for vents through roof: SECTION 075100 - ROOFING & FLASHING
3. Electric Power Wiring: SECTION 260000 - ELECTRICAL
4. HVAC Equipment: SECTION 230000 - HVAC
5. Excavation and Backfill: DIVISION 31 - EARTHWORK
6. Finish Painting: SECTION 099000 - PAINTING
7. Installation of Access Panels: SECTION describing material in which panel is installed.
8. Toilet Room Accessories: SECTION 108000 - TOILET ACCESSORIES
9. Temporary Facilities: SECTION 015000 - TEMPORARY FACILITIES

## **1.5 CODES, ORDINANCES, AND PERMITS**

- A. Perform all work in accordance with the requirements of the City of Newton Building Department, Massachusetts State Plumbing Codes, D.E.P., A.D.A., NFPA, The Architectural Barrier Code, and applicable State and Federal Laws. Give all requisite notices, file all requisite plans, and obtain all permits required to perform all Plumbing Work. Where the Contract Documents indicate more stringent requirements than the above Codes and Ordinances, the Contract Documents shall take precedence.
- B. Obtain all permits, inspections, and approvals, from the governing authorities and pay all fees and include cost in the bid, including approvals for the cross connection control device. Provide the Owner with the cross connection permit for the device in the Owner's name.
- C. Owner will pay all related Gas Utility Company back charges for demolition of existing service and meter.

## **1.6 DISCREPANCIES IN DOCUMENTS**

- A. Where Drawings or Specifications conflict or are unclear, advise Designer in writing before Award of Contract. Otherwise, Designer's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or unclarities thus resolved.
- B. Where Drawings or Specifications do not coincide with manufacturers' recommendations, or with applicable codes and standards, alert Designer in writing before installation. Otherwise, make changes in installed work as Designer requires within Contract Price.
- C. If the required material, installation, or work can be interpreted differently from drawing to drawing, or between drawings and specs, this contractor shall provide that material, installation, or work which is of the higher standard.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a component. In cases such as this, where the contractor has failed to notify the Designer of the situation in accordance with the paragraph above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner either concealed or exposed per the design intent.

- E. In cases covered by the paragraph above, where the contractor believes he needs engineering guidance, he shall submit a sketch identifying his proposed solution and the Designer shall review, note if necessary, and approve the sketch.

## **1.7 MODIFICATIONS IN LAYOUT**

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of mechanical and electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with structure and other trades and to meet architectural requirements.
- B. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Designer.
- C. Check Contract Drawings as well as Shop Drawings of all subcontractors to verify and coordinate spaces in which work of this Section will be installed.
- D. Maintain maximum headroom at all locations. All piping and associated components to be as tight to underside of structure as possible.
- E. Make reasonable modifications in layout and components needed to prevent conflict with work of other trades and to coordinate according to Paragraphs A, B, C, D above. Systems shall be run in a rectilinear fashion.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Designer for review and approval.

## **1.8 SHOP DRAWING AND MATERIAL SCHEDULES**

- A. Refer to SECTION 013000 - SUBMITTALS for submittal of Shop Drawings. If apparatus or materials are substituted for those specified, and such substitution necessitates changes in or additional connections, piping, supports or construction, same shall be provided as the responsibility, and at the expense, of the Plumbing Subcontractor.
- B. Fabrication of any material or performing of any work prior to the final approval of the Submittals will be entirely at the risk of the Subcontractor. The Subcontractor is responsible for furnishing and installing materials called for in the Contract Documents, even though these materials may have been omitted from approved Submittals.
- C. Submit Shop Drawings for the following materials and equipment.
  - 1. Valves, Piping, couplings and Fittings

2. Fixtures, Drains and Equipment including Supports
3. Backflow Preventers
4. Access Panels and Covers
5. Insulation
6. Drains, and Hydro Mechanical Specialties
7. Hose Bibs, Wall Hydrants
8. Hangers, Anchors, Guides, and Supports including Seismic Restraints
9. Cleanouts
10. Piping Identification System
11. Water Heating Equipment
12. Precast concrete oil/gas separator and access manhole

### **1.9 COORDINATION DRAWINGS**

- A. Before materials are purchased or Work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces (match lines).
- B. Coordination Drawings are for the Contractor's and the Architect's use during Construction and shall not be construed as replacing any Shop or Record Drawings required elsewhere in these Contract Documents.
- C. Detailed procedures for Coordination Drawings are contained in DIVISION 01 - GENERAL REQUIREMENTS of these Contract Documents.

### **1.10 RECORD DRAWINGS**

- A. General: Refer to DIVISION 01 - GENERAL REQUIREMENTS for general requirements for maintaining as-built drawings and submitting final reproducible record documents.
- B. The General Contractor will provide two sets of Drawings to the Plumbing Subcontractor, one set of which shall be maintained at the site and which shall, at all times, be accurate, clear, and complete, showing the actual locations of all equipment and piping as it is being installed. The Record Drawings shall be available to the Architect/Engineer's field representative at all times.



- C. Provide electronic AutoCAD drawings to indicate revisions to piping size and location both exterior and interior; including locations of valves and other equipment requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.
- D. Include in the Record Drawings any addenda, sketches, and supplementary Drawings issued during the course of construction.
- E. Non-availability of Record Drawings or inaccuracies therein will postpone the final inspection until they are available.
- F. All valves shown on these Drawings shall be numbered with numbers corresponding to those on the valve charts.
- G. All costs related to the foregoing requirements shall be paid by the Plumbing Subcontractor.

#### **1.11 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS**

- A. Provide operating instructions to the Owner's designated representative with respect to operation functions and maintenance procedures for all equipment and systems installed. At the completion of the project, turn over to the Architect four (4) complete manuals, in three-ring, loose-leaf binders, containing the following:
  - 1. Complete Shop Drawings of all equipment.
  - 2. Operation description for all systems.
  - 3. Names, addresses, and telephone numbers of all suppliers of the system.
  - 4. Preventative maintenance instructions for all systems.
  - 5. Spare parts lists of all system components.
  - 6. Four copies of video of below slab piping.
  - 7. Valve tag chart.
  - 8. Provide USB Drive with electronic copies of Items 1-7 above.
- B. Provide USB Drive recording of operation and maintenance training sessions and include as part of O & M Manual submittal. Training session video recording and USB Drives shall be performed by a professional videographer. Provide indexed table of contents for USB Drive recording.
- C. Both O&M's and training Videos shall be saved on BMS server and provide a Control page weblink to O&Ms and Training videos.

**1.12 GUARANTEE**

- A. Refer to Division 1 of the Contract. Guarantee all work under this Section free from defects in workmanship and materials for a period of one (1) year from the date of final acceptance of the building, as set forth in the Contract. Replace any such defective work developing during this period, unless such defects are clearly the result of bad usage of equipment by others. Where such defective work results in damage to work of other Sections of the Specifications, restore such work to its original condition by mechanics skilled in the affected trade.

**1.13 DRAWINGS**

- A. All work shown on the Drawings is intended to be approximately correct to scale, but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting. To carry out the true intent and purpose of the plans, furnish all necessary parts to make complete working systems ready for use. The Plumbing Drawings are intended to show the main stacks and risers and may or may not necessarily show all runout piping particularly in lavatories and gang toilet areas. Contractor shall include all runout piping to all referenced scheduled fixtures and equipment appearing on the Plumbing Drawings.
- B. All floor drains installed on this project, including all kitchen floor drains and trough drains, shall be equipped with trap primers. The trap primer and piping is not shown on the drawings and shall be located in the field by the Contractor as dictated by field piping conditions.
- C. The Plumbing Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- D. Refer to the Architectural, Structural, and other Mechanical and Electrical Drawings, which indicate the construction in which this Work shall be installed. Locations shown on the plans shall be checked against the general and detailed Drawings of the construction proper. All measurements shall be taken at the Building.

#### **1.14 VALVE TAGS, NAMEPLATES, AND CHARTS**

- A. All valves on pipes of every description shall have neat circular brass valve tags at least 1-1/2 in. in diameter attached with brass hook to each valve stem. Stamp on these valve tags, in letters as large as practical, the number of the valve and the service, such as "H.W., C.W.", for hot water and cold water respectively. The numbers for each service shall be consecutive. Where valves are located above ACT ceilings, furnish and install valve finder ceiling tack, tack shall be minimum 7/8 in. diameter with 1/2 in. steel point, color as determined by Owner.
- B. All valves on tanks and pumps shall be numbered by 3 in. red metal discs with white numbers 2 in. high, secured to stem of valves by means of small solid link brass chain, to correspond to numbers indicated for valves on the Record Drawings and on two (2) printed detailed lists. These printed lists shall state the numbers and locations of each valve and the fixture or group of fixtures which it controls, and other necessary information such as requiring the opening or closing of another valve or valves when any one valve is to be opened and closed, and shall be prepared in form to meet approval of the Architect, and shall be framed under glass.
- C. Nameplates, catalog numbers, and rating identifications shall be securely attached to Electrical and Mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.

#### **1.15 PIPE MARKER IDENTIFICATION SYSTEM**

- A. Mark all piping installed under this Section and at all Access Panels with a marking system in basic colors conforming to those specified in ANSI/ASME A-13.1. Markings shall indicate pipe content and direction of flow. Markers shall be applied at all valves and tee joints, and on straight runs of pipe at every 20 ft.-0 in. on center.
- B. Markers shall be vinyl snap-around pipe type system. Adhesive markings are not acceptable.
- C. Clearly mark potable and non-potable water system with 4 inch wide colored bands, with arrow for direction of flow, every twenty-five (25) feet on center on all piping installed whether it is concealed or exposed and also on both sides of floor and/or wall penetrations. Mark potable water green and non-potable yellow. Within 6 in. of each band identify with letter "Potable C.W.", Non-Potable H.W." Color of letter shall match banding.

**1.16 SANITARY, WASTE, VENT AND GARAGE WASTE AND VENT SYSTEMS**

- A. Furnish and install complete Sanitary, Waste, Vent, Kitchen Garage Waste and Vent Systems (all hereinafter called Drainage Systems) to convey wastes from all Soil and Waste Stacks, Fixtures, and Equipment as indicated and/or described in these Plans and Specifications. Urinal waste shall be 2 in. cast iron or sizes indicated on the drawings. Waste piping smaller than 3 in. shall not be used underground. The use of double "Y's" in the horizontal shall not be permitted. All piping shall be installed straight and true and located concealed within building construction.
- B. All horizontal Drainage Systems Piping within the building, 3 in. and smaller, shall be pitched at least 1/4 in. per ft. in the direction of flow. Drainage Piping 4 in. and larger shall be pitched at least 1/8 in. per ft. Make changes in direction of drainage lines with 45 wyes, long turn wyes, or sweep bends.
- C. Furnish and install all cleanouts indicated on the Drawings and/or where required in Drainage Pipes regardless of size so that the distance between cleanouts does not exceed 45 ft. o.c. Cleanouts shall be installed at the base of all risers and at each change of direction.
- D. Refer to drawings for termination points, which generally are connection to existing piping or to 10 feet outside the building.
- E. The Garage Drainage System shall be a complete separate system piped from the interceptor through the roof without interconnection to any other building Drainage System including sanitary waste and vent.

**1.17 DOMESTIC WATER SYSTEMS (POTABLE & NON-POTABLE)**

- A. Furnish, install, sterilize, and test in accordance with the documents and the Plumbing Code, complete potable and non-potable Domestic Cold, Hot, and Hot Water Recirculating Systems including all piping, valves, low point drains, shock absorbers, hangers, insulation, backflow preventers and water heating equipment. Clearly mark the systems as provided above. This work shall start as indicated on the Drawings.
- B. In general, piping shall pitch upward in the direction of flow with each branch and riser separately valved and with 1/2 in. hose end drain on the outlet side of the valve and at all low points in the system. Install shutoff valves for each battery of fixtures and other valves as necessary to isolate any part of each system.
- C. Install shock absorbers on hot and cold water piping to each fixture. Provide shock absorbers at all quick closing valves and as shown on the Drawings and/or specified.

- D. Install a 1/2 inch hose bibb in each toilet room provided with a floor drain. The hose bibb shall be installed under a lavatory.
- E. Install a 1/2 inch hose bibb in each mechanical room.
- F. Furnish and install a ball valve, balancing valve and check valve at each hot water recirculation line before it connects to another hot water recirculation line.

**1.18 EQUIPMENT FURNISHED BY OTHERS**

- A. Miscellaneous items, including but not necessarily limited to the following, shall be furnished and set by others as specified in other SECTIONS of the Documents.
  - 1. Dishwashers
  - 2. Kitchen Equipment
- B. Verify the extent of the connection requirements from the General, Architectural, and Mechanical Plans and Specifications.
- C. The Plumbing Subcontractor shall be responsible in making final connections to all equipment furnished by others, to ascertain complete cross-connection prevention compliance, and to furnish and install vacuum breaker and backflow preventers which may be required to be Code compliant and are not so furnished with the equipment.
- D. All sinks are intended to be "Accessible" and all drain outlets on all sinks and lavatories where furnished by the Plumbing Subcontractor or the other SECTIONS shall have an off-set drain. Set all roughing tight to wall in all cases to comply with ADA Standards. Provide where required ADA insulation kits to prevent injury where a barrier is not included in the casework. Refer to Equipment Drawings.

**1.19 DEMOLITION**

- A. When and as directed by the General Contractor perform all demolition work.
- B. All hangers, valves, piping, pumps, fixtures, controllers, and other miscellaneous equipment and materials in the existing building not specifically designated for reuse in the documents shall remain the property of the Owner.

- C. Remove as indicated existing Plumbing piping, fixtures, and equipment including all hangers and supports and disconnect all Plumbing connections to equipment to be removed under other Sections of the Specifications. Clean, recondition, and relocate where indicated all items to be reused.
1. Carefully remove shower and toilet room fixtures and trim and deliver in good condition to an on-site location designated by the Architect. The Owner will review all the fixtures and trim and select the items to be kept and the items to be disposed. The disposal of all items not wanted by Owner is specified by the Demolition Section.
  2. In cases where main piping is to remain, remove all existing piping to fixtures being removed and cap said piping back to riser or main. All caps or plugs to be installed shall be of like material as pipe being capped or plugged.
  3. All piping, valves, hangers, and fittings shall be removed from ceiling and walls as indicated and placed on the floor by this Section. The General Contractor shall remove from the floor and dispose.
  4. Any disputes between this Subcontractor and other Contractors or Subcontractors relative to the responsibility for removal of equipment shall be referred to the Architect for decision. The Architect's decision shall be firm and binding and to whomever he designates responsibility for removal of equipment shall do so without any additional cost to the Owner.

#### **1.20 PAINTING**

- A. All interior exposed piping is to be painted and all painting, except as noted, will be done by the Painting Subcontractor. All uncovered piping and hangers shall be thoroughly cleaned of rust, oil, and other containments by the Plumbing Subcontractor and left ready to receive primer coat.
- B. Painting for pipe markings shall be done under this Section.

#### **1.21 HOISTING EQUIPMENT AND MACHINERY**

- A. Unless otherwise specified, all hoisting and rigging equipment and machinery required for the proper and expeditious prosecution and progress of the Work of this Section shall be furnished, installed, operated and maintained in safe condition by each sub-contractor, as specified under Section 015000, TEMPORARY FACILITIES AND CONTROLS.

**1.22 STAGING AND SCAFFOLDING**

- A. Unless otherwise specified, each sub-contractor shall provide all lifts and man-lifts, and furnish, erect and maintain in safe condition, all staging and scaffolding as specified under Section 015000 Temporary Facilities and Controls, as needed for proper execution of the work of this Section. Staging and scaffolding shall be of adequate design, erected and removed by experienced stage builders having all accident prevention devices required by Federal, state and local laws.

**1.23 BREAKDOWN**

- A. Submit a breakdown of the contract price to aid the Architect in determining the value of the work installed as the job progresses.
- B. No requisition will be approved until the breakdown is delivered to the Architect.

**1.24 VISIT TO SITE**

- A. Prior to submitting a Bid, visit the site of work and become familiar with existing conditions. Any assumptions made are at this Subcontractor's expense.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. All materials and equipment furnished under this SECTION shall be new, unused, first quality of a manufacturer of established reputation. Each valve, fitting, section of pipe, and piece of equipment supplied to project shall have cast or indelibly stamped thereon the manufacturer's name, pressure rating where applicable, type, and any other specific information provided by manufacturer. Materials shall conform to Massachusetts Code as a minimum requirement and shall appear on the Massachusetts Approved Plumbing Products list.

**2.2 PIPE AND FITTINGS**

- A. Pipe and fittings shall conform to the latest A.S.A., A.S.T.M., C.A., and F.S. standards.

B. All piping installed under this SECTION shall be in accordance with the following:

| <u>Service</u>  | <u>Material</u>   |
|---|---|
| Underground Drainage and Vent piping  | Service weight cast iron soil pipe-coated bearing collective trademark of the Cast Iron Soil Pipe Institute (CISPI) |
| Above ground Drainage and Vent, piping 2 in. and larger                               | No Hub cast iron soil pipe and fittings bearing collective trademark of the CISPI                                   |
| Above ground drainage, and Vent piping 2 in. and smaller                              | Type 'L' hard tempered copper tubing  |
| Trap primer piping from Primer to floor drain   | Type 'K' soft rolled copper tubing with Swaged ends   |
| Domestic water piping above ground (potable & non-potable) and Pump Force Main Piping | Type 'L' hard tempered copper tubing  |
| Indirect waste piping   | Type 'L' hard tempered copper tubing coated with two (2) coats of white epoxy paint                                 |

C. Fittings for underground Drainage Piping shall be service weight bell and spigot pattern C.I. soil pipe fittings. Above ground shall be no hub C.I. soil pipe fittings, Massachusetts Standard.

D. Fittings for sweat drainage piping and force main piping shall be cast bronze or wrought copper of recessed drainage pattern.

E. Fittings for Type 'L' hard tempered copper tubing for potable and non-potable water piping 2-1/2 inch in size and smaller shall be copper press fittings.

1. Acceptable Manufacturers:

- a. Viega North America,
- b. Elkhart Products Corporation
- c. Victaulic
- d. Or equal

2. Material:

- a. ASTM B88 and ANSI/ASME B16.22. O-rings for copper press fittings shall be EPDM.



3. Installation of copper press fittings and installation are to be made in strict accordance with the manufacturers installation instructions. All tubing is to be reamed prior to the installation of the fitting. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.
- F. Grooved joint piping systems for domestic water piping 3-inch and larger shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves, and specialties shall be the products of a single domestic manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by the manufacturer. Grooved ends shall be clean and free from indentations, projections, and roll marks in the area from pipe end to groove for proper gasket sealing. A factory trained field representative shall provide on-site training for contractor's field personnel in the proper use of grooving tools and installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
  1. Couplings for Copper Grooved Tube: Victaulic Style 607. Installation ready rigid coupling for direct stab installation without field disassembly.

### **2.3 JOINTS**

- A. Joints for underground cast iron bell and spigot soil pipe shall be made up with resilient gaskets. Above ground shall be made up of heavy duty – 4 band stainless steel clamps, and gaskets. Couplings shall be in compliance with CISPI 310 and shall bear the mark of NSF International. Couplings shall be Husky “SD 4000”, Clamp - All HI-TORQ 125, Mission “HW”, or equal.
- B. Copper water tubing and fittings shall be assembled with press or grooved fittings depending on pipe size.
- C. Grooved Joint Lubricants: Lubricate gasket in accordance with the manufacturer’s published instructions with lubricant approved for the gasket elastomer and fluid media.
- D. Copper waste and vent tubing and force main tubing with sweat fittings shall be assembled with lead free solder, Silverbrite, Oatey, Harris, or equal, and a non-corrosive flux recommended by the manufacturer.
- E. Joints between copper waste/vent tubing and cast iron shall be made with cast iron threaded fittings and copper thread by sweat fittings.

- F. Joints between copper tubing and ductile iron water pipe or at flanged joints to tanks shall be made with a combination iron and brass flange with composition gasket and iron bolts.
- G. Joints at water heaters or other tanks having threaded connections shall be made up with dielectric unions.
- H. Joints between floor or wall flanges and fixtures shall be made with one-piece special molded neoprene gaskets which shall be furnished by the fixture manufacturer.
- I. Threaded pipe joints including plastics shall be made up with teflon tape.

**2.4 VALVES**

- A. Furnish and install valves where indicated on the Drawings or where specified and located so that they may be operated, repaired, or replaced with a minimum effort and repacked under pressure.
- B. The following list of valves is intended only as a guide for type and quality. Valves shall be as manufactured by Apollo, Milwaukee, Nibco, Elkhart, Watts, Victaulic, or approved equal.

|  |  |
|--|--|
| Shutoff valves                                     | Apollo #94VLF-A<br>lead-free ball valves   |
| Balancing valves                                   | ThermOmegaTech Circuit Solver CS, self-acting<br>thermostatic recirculation balance valve.     |
| Stop and waste valves<br>1 in. and smaller         | Apollo #95LF-203 through<br>#95LF-205, lead-free   |
| Check valves                                       | Walworth #406 SJ   |
| Drain valves                                       | Apollo #77WLF-HC ball valve with cap and chain<br>1/2 in. x 3/4 in. hose end                   |
| Backwater Valve (Drainage Systems)<br>Above ground | Watts BV-200, cast iron backwater with<br>gasketed cover, bronze seat, and no-hub connections. |

Backwater Valve (Drainage Systems)  
Below grade

Watts BV-240, cast iron backwater with gasketed cover, bronze seat, and no-hub connections, and epoxy coated 20-inch x 16-inch x custom height steel access cover. Coordinate custom height of housing enclosure based on invert elevations noted on drawings.

## 2.5 INSULATION

- A. Insulation for all water piping whether concealed or exposed shall be 1 in. thick, heavy density, preformed snap-on insulation equal to Johns Manville Micro-Lok HP, 850 degrees snap-on system. Insulation for cold water piping shall have a factory applied vapor barrier with ends and butts sealed with overlapping 4 in. sealing strips.
- B. Valves and fittings shall be insulated with pre-formed fiberglass fitting insulation cut from dense fiberglass blanket and covered with pre-molded P.V.C. fitting covers. P.V.C. covers shall overlap the adjoining insulation and shall be secured with pressure sensitive vinyl tape over a vapor barrier adhesive seal at the joints. (Note: Staples or tacks are not permitted on covers).
- C. All insulation shall have self-sealing type, all service jacket (ASJ-SSL) factory applied. At all exposed piping, cover jacket with continuous P.V.C. jacket.
- D. Sealers, solvents, tapes, and adhesives, and mastics used in conjunction with the installation of insulation under this Section shall possess the maximum possible fire safe qualities available and shall be NFPA approved.
- E. Covering shall be applied over clean and dry surfaces. No covering shall be applied until after the approval of all pressure and leakage tests.
- F. Insulation shall be as manufactured by Johns Manville, Inc., Owens-Corning Fiberglass Corporation SSL II-ASJ, or Knauf Insulation 1000. Insulation shall be applied by skilled insulation mechanics in a first class manner.

## 2.6 TRAPS

- A. Furnish and install traps with cleanouts on all fixtures and equipment requiring connection to the sanitary system of the same size and material as the pipe on which they occur. Traps installed on threaded pipe shall be recessed drainage pattern.

**2.7 DRAIN VALVES**

- A. It shall be possible to drain the water from all sections of the Potable and Non-Potable Hot and Cold Water Piping. Furnish and install 1/2 in. x 3/4 in. hose end ball valves with cap and chain. (see 2.4 for model no.)

**2.8 SHOCK ABSORBERS**

- A. Furnish and install, where shown on Drawings and where required to prevent water hammer, Zurn Manufacturing Company model 1260-XL lead free shock absorbers, or equal, as manufactured by J.R. Smith Manufacturing Company, Watts Manufacturing Company, or equal.
- B. Installation of absorbers shall be as per manufacturer's recommendations.

**2.9 PIPING ACCESSORIES**

- A. Pressure and Temperature Relief Valves shall be A.S.M.E. rated temperature relief 210 deg. F. double BTU rated, self-closing, as manufactured by Watts Regulator Company or equal by Wilkins, McDonnell and Miller, or equal.
- B. Vacuum reliefs shall be lead free Watts Regulator Company #LFN36 or equal by Wilkins or Lawler.
- C. Temperature gauges shall be 4-1/2 in. diameter dial thermometers, any angle, and range of 30 degrees F. to 240 degrees F. as manufactured by Weiss Instruments, U.S. Gauge, Trerice or equal.
- D. Potable and non-potable Water system pressure gauges shall be 4-1/2 in. diameter with a range of 0 to 160 psi as manufactured by Weiss Instruments, U.S. Gauge, Trerice or equal.
- E. Natural gas system pressure gauges shall be 4 inch diameter with a range of 0 to 30 inches of water as manufactured by Weiss Instruments, U.S. Gauge, Trerice or equal.
- F. Furnish and install where piping crosses building expansion joints on the domestic water piping, expansion joints and anchors sized for 1-1/2 in. expansion per one hundred feet. Expansion joints shall be Metraflex "Metraloop", or manufactured by Flexonic Company or Hyspan, or equal. Piping shall be anchored and guided to force the expansion in the proper direction. Domestic water expansion joints shall be NSF approved.

- G. Trap primer connections are required on all floor drains to maintain trap seal. The requirement for trap primer connections shall include all floor drains in the kitchen including trough drains furnished by others. Trap primers shall be Precision Plumbing Products, Inc., Model PRO1-500 flow activated prime-pro trap-primer valve or shall, where appropriate, be Zurn, Watts, Smith or equal in-line connections installed on flush valve supply. Electronic trap primer shall be Precision Plumbing Products, Inc. Model MPB-500 mini-prime electronic trap-primer manifold, 120 volt, single phase. Furnish distribution units as required. Provide PPP AG-500 air gap fitting at all locations.

## **2.10 HYDRANTS AND HOSE BIBB**

- A. Wall hydrants shall be Zurn Series Z-1310-PB Ecolotrol cast brass 3/4 in. non-freeze wall hydrant with integral backflow preventer, 3/4 in. hose connections, polished nickel bronze face, loose key handle, brass wall sleeve, and fitted with brass locknut.
- B. Hose bibb shall be T & S Brass or equal model #B-720 modified, chrome plated, 3/4 in. hose end, integral stop, vacuum breaker, modified with lock shield and loose tee handle.
- C. Hydrants shall be manufactured by Zurn, J.R. Smith, Watts, or equal. Hose bibbs shall be manufactured by T&S Brass, Speakman, Chicago, or equal.

## **2.11 CLEANOUTS**

- A. Cleanout plugs on the Sanitary System shall be of heavy cast brass of the screwed type. Plugs shall be full size up to and including 4 inch.
- B. For piping running under floor slab, cleanouts shall be brought up to just under the floor slab level. Furnish and install access cover for all floor-type cleanouts, Zurn ZN-1400 Series with scoriated nickel bronze or by Watts, J.R. Smith, or equal. In the garage area and at exterior locations use Zurn model #Z-1474 cleanout housing set over brass cleanout plug.

## **2.12 ACCESS DOORS**

- A. Furnish Access Doors for access to all concealed control valves, cleanouts, valves, expansion joints, and to all other concealed parts of the Plumbing System that require accessibility for the proper operation and maintenance of the system. These doors shall be installed under the appropriate SECTION of the Specifications as determined by the surface upon which the panels are mounted.

- B. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the valve or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12 in. x 16 in.). Furnish Access Doors for each pipe space to permit thorough inspection of same. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.
- C. Refer to Section 083100 - Access Doors and Frames, for all product requirements for furnishing access panels.
- D. Coordinate locations and schedule with the work of trades involved with construction in which access panels will be installed.
- E. Access Door Shop Drawings shall be submitted to the Architect for approval.
- F. All access panels shall be keyed alike. Coordinate keying with other trades.

### **2.13 SUPPLEMENTARY STEEL, CHANNEL, AND SUPPORTS**

- A. Furnish and install all supplementary steel, channels, and supports required for the proper installation, mounting, and support of all equipment.
- B. Supplementary Steel and Channels shall be firmly connected to building construction in a manner approved by the Architect.
- C. The type and size of the Supporting Channels and Supplementary Steel shall be determined by the Plumbing Subcontractor and shall be sufficient strength and size to allow only a minimum deflection in conformance with the manufacturer's requirements for loading.
- D. All Supplementary Steel and Channel shall be installed in a neat and workmanlike manner parallel to the walls, floor, and ceiling construction. All turns shall be made with 90 deg. fittings, as necessary to suit the construction and installation conditions.

### **2.14 HANGERS, ANCHORS, GUIDES, AND PIERS**

- A. All piping shall be supported from the Building Structure by means of approved hangers and supports. Piping shall be supported to maintain required grading and pitching of lines, to prevent vibration, and to secure piping in place, and shall be so arranged as to provide for expansion and contraction.
- B. Hangers shall not be installed directly into the roof deck. Provide supplementary steel per paragraph 2.13 above as required to support piping from structure.

- C. The spacing for hangers for horizontal piping shall be in accordance with the following:
1. Cast Iron Soil Pipe: 5 ft.-0 in. at the hubs for 5 ft. lengths. For 10 ft. lengths, use one (1) hanger at the hub and one (1) at midpoint of the length. Install cast iron pipe in accordance with CISPI Handbook - latest edition.
  2. Copper Tubing: 6 ft.-0 in. o.c. for 1-1/4 in. and smaller, and 10 ft.-0 in. o.c. for 1-1/2 in. and larger.
  3. Steel Pipe: 10 ft.-0 in. o.c. for 1-1/2 in. and over; 8 ft. - 0 in. for 1-1/4 in.; 6 ft. - 0 in. for 1 in. and smaller.

D. Hanger rod diameter shall be as follows:

| Pipe Size           | Rod Diameter |
|---------------------|--------------|
| 1/2 in. thru 2 in.  | 3/8 in.      |
| 2-1/2 in. and 3 in. | 1/2 in.      |
| 4 in. and 5 in.     | 5/8 in.      |
| 6 in.               | 3/4 in.      |
| 8 in. and over      | 7/8 in.      |

- E. Vertical lines shall be adequately supported at their bases by a suitable hanger placed in the horizontal line near the riser and at every 10 ft. interval.
- F. All Hangers shall be adjustable Clevis Hanger. Hanger rods shall have machine threads. Malleable iron brackets of approved type shall be used along the walls. All Hangers for copper tubing shall be copper plated except where pipe is insulated, in which case, Steel Clevis Hanger and pipe shield shall be used.
- G. Piping shall not be hung from the hangers of other trades.
- H. Provide seismic restraints for all piping per requirements of the MA Building Code and Section 230548.
- I. Hangers shall be manufactured by Grinnell, Carpenter and Paterson, Fee and Mason, or equal.
- J. Wire and strap hangers will not be permitted in this installation.
- K. Install a 14 gauge metal pipe shield between pipe insulation and all pipe hangers. Hangers shall be sized so that the pipe insulation passes through the hanger and is supported on the shield.

## 2.15 DRAINS

- A. Furnish and install all floor drains where shown on the Drawings.
- B. All floor drains in flooring systems without waterproofing membranes shall have galvanized iron clamping rings with 6-pound lead flashing to bond 9 in. in all directions. All drains shall be checked with Architect's Drawings to determine depth of the flashing collar. Brass extension pieces shall be provided if necessary.
- C. All floor drains installed on this project shall be fitted with Automatic Trap Primer Connections. Field determine appropriate location for Trap Primer valve and drain piping.
- D. Drain Schedule:
  - 1. Type "A" – (General) Zurn #ZN-415-5BZ-P dura coated cast iron body with bottom outlet, combination invertible membrane clamp, adjustable collar, seepage slots, type BZ polished nickel bronze, light-duty, leveling strainer, trap primer connection.
  - 2. Type "B" – (Mechanical Room) Zurn #Z-550-Y-P, 9 in. diameter top, dura coated cast iron body bottom outlet, seepage pan, combination membrane flashing clamp, frame for medium-duty, cast iron, heel-proof slotted grate, sediment bucket, cast iron grate, trap primer connection
  - 3. Type "C" - Zurn #Z-512-G-Y-VP Galvanized heavy duty cast iron body sediment bucket, heavy duty ductile iron secured grate, caulk bottom outlet.
- E. Drains shall be of one manufacturer, by Zurn, J.R. Smith, Watts, or equal.
- F. In bathrooms, Kitchen, and Mechanical Rooms, coordinate all floor drain locations in field with Architect. Floor drains shall be set at an elevation/grade to allow for floor drainage from all directions. Drain locations shall not conflict with toilet partition walls.

## 2.16 PLUMBING FIXTURES

- A. Furnish and install all fixtures and equipment, including supports, connections, fittings, and any incidentals, to make a complete installation in accordance with the Drawings and as specified.
- B. The Architect shall be final judge as to whether fixtures and trim fulfill the requirements of the Specifications and as to whether they are of suitable quality.
- C. All fixtures requiring hot and cold water shall have the cold water faucet on the right hand side of the fixture and the hot water faucet on the left hand side of the fixture.
- D. Escutcheons shall be furnished and installed on all supplies and traps. Escutcheons shall be one (1) piece chrome plated brass with set screws.



- E. All fixtures shall have the manufacturer's guaranteed label or trademark indicating first quality. All acid resisting enameled ware shall bear the manufacturer's symbol signifying acid resisting material.
- F. Unless otherwise specified, faucets and all exposed fittings shall be chromium plated.
- G. All supply pipes shall run in a reasonable straight vertical line from the stops to faucets. Traps shall be installed perpendicular to walls.
- H. Vitreous china and acid resisting enameled fixtures shall be of one manufacturer by Sloan, American Standard, Toto, or equal. Trim shall be Symmons, Speakman, Chicago, T & S Brass, or equal. Flush valves shall be Sloan, Toto, Zurn, or equal. Water coolers and drinking fountains shall be manufactured by Elkay, Just, Filtrine, or equal. Stainless steel sinks shall be Elkay, Just, Kindred, or equal.
- I. Note: All fixtures and fittings shall be vandal proof mounted, unless specifically noted otherwise.
- J. Carefully coordinate roughing for flush valves so that the dimension from top of fixture to C-L of flush valve is a minimum of 6 in..

K. Fixture Schedule:

1. P-1 Wall Mount Water Closet, Accessible:

American Standard Afwall Millennium FloWise, 2257.101, ADA, wall mounted vitreous china elongated bowl, 1.28 gallon per flush, 1-1/2 inch inlet spud.

Sloan Royal 111-1.28, 1.28 gallon per flush, manual flush valve.

Olsonite 10CT solid plastic white open front seat with check hinge.

Zurn 300# carrier to suit. Carefully coordinate with Architect's plans to fit in wall. Use Z-1209 where required by field conditions.

Height and location shall meet Accessibility Standards. Locate handle of flush valve to wide side of toilet stall.

2. P-1A Floor Mount Water Closet, Accessible:

American Standard Madera FloWise, 3461.001, ADA, floor mounted, 16.5 inches high, vitreous china elongated bowl, 1.28 gallon per flush, 1-1/2 inch inlet spud.

Sloan Royal 111-1.28, 1.28 gallon per flush, manual flush valve.

Olsonite 10CT solid plastic white open front seat with check hinge.

Provide stainless steel floor flange, gasket and stainless steel nuts and bolts.

Locate handle of flush valve to wide side of toilet stall.

3. P-2 Lavatory, Accessible:

American Standard Decorum 9024.001EC, wall mounted 20 in. x 18 in. vitreous china lavatory, 4 in. centers, punched for concealed armchair carrier.

Chicago EQ-A12C-23ABCP, deck mounted sensor faucet, 0.35 GPM, and integral thermostatic mixing valve.

McGuire Model 155-WC, 1-1/4 in. offset drain with open grid strainer.

McGuire Model H-167 (pair) C.P., 3/8 IPS angle supply with loose key stop.

McGuire Model B-8902 C.P., 1-1/4 in. x 1-1/2 in. cast brass adjustable 'P' trap with cleanout and #17 ga. tubing outlet to wall.

Zurn #Z-1231 floor mounted concealed arm chair carrier.

Wrap all exposed roughing under lavatory with molded Truebro "Handi-lav" lavatory roughing protection kit.

4. P-3 Mop Receptor:

Stern-Williams MTB-2424-BP, 24 in. x 24 in. x 10 in. molded stone mop service basin with stainless steel rim guard on exposed sides, 3 in. caulk connection, stainless steel strainer, splash guard. Plumbing Subcontractor to include caulking and sealant to seal between unit, finished wall and floor.

T&S Brass model B-0665-BSTP service sink fitting, polished chrome, brace to wall, integral screwdriver stops, vacuum breaker, 3/4 in. hose end, 2 in. lever handles, provide 1/2 in. check valve on each supply to fitting with access panel.

Furnish and install 1/2" hot and cold reduced pressure backflow preventer capped for future soap dispenser.

5. P-4 Shower, Accessible:

Symmons 1-25-FSB-E-VB Safetymix Pressure Balancing Mixing valve with lever handle, factory pre-set temperature limit stops, FS hand spray unit with 2.0 GPM flow restrictor, in-line vacuum breaker, 60 in. flexible hose, 30 in. wall mounted slide bracket rod with heavy duty (250 lb) anchors.

Aquarius model S4136-BF-OT-3/4-MAS, open top shower enclosure with right or left mounting as shown on Architect's Drawings. Unit shall be white acrylic with Massachusetts AAB threshold and shall include fold-up seat, continuous grab bar, curtain rod, drain body, and water retention strip or collapsible dam.

6. P-5 Sink, Accessible:

Just SL-ADA-2219-A-GR, self-rimming countertop mounted 6" deep, 18 ga. Type 304 stainless steel sink with rear outlet; three (4) hole punched.

Chicago #1102-GN8AE25-369AB concealed deck faucet with 8 in. swing gooseneck spout, 2-3/8 inch wrist blade handles, E-2805 0.5 GPM aerator and vegetable spray.

LKAD-35 crumb cup strainer 1-1/2" offset tailpiece and stainless steel ground seat stopper.

1-1/2" x 2" chrome plated p-trap with cleanout, waste outlet with escutcheon.

McGuire Model H-167 (pair) C.P., 3/8 IPS angle supply with loose key stop and escutcheons.

Wrap all exposed roughing under lavatory with molded Truebro "Handi-lav" lavatory roughing protection kit.

7. P-6 Clothes Washer Box:

Symmons No. W-602-X Laundry-Mate Supply and Drain Fixture, recessed mounting box 1/2 in. hot and cold water connections, 2 in. waste connection, integral stops and check valves on supplies.

8. P-7 Electric Water Cooler with Bottle Fill (Hi-Lo):

Elkay EZWS-EDFPBM117K, Bi-level, stainless steel water cooler with bottle filling station, #4 satin finish stainless steel bowls, flexi-guard safety bubbler, push button actuator, ADA compliant.

1-1/4 in. x 1-1/2 in. rough p-trap with cleanout; 1/2 in. ball valve stop.

9. P-8 Emergency Eyewash:

Guardian model G1750 Emergency Eye/Face Wash, wall mounted, stainless steel.

Guardian model G6020 Thermostatic mixing valve, flow of 13 gallons. Mixing valve shall be surface mounted on wall above emergency eyewash.

1-1/4 in. x 1-1/2 in. rough p-trap with cleanout; (pair) 1/2 in. ball valve stops.

## **2.17 BACKFLOW PREVENTERS**

- A. Backflow preventers shall be reduced pressure type furnished complete with shutoff valves, Massachusetts Approved. Backflow preventers 2-1/2 inch and smaller shall be Watts #LF009-QT-S. Backflow preventers 3 inch and larger shall be Watts 957-QT. Backflow preventers shall be lead free, all bronze, complete with strainer and soft seated check valve. Size shall be as indicated on Drawings.
- B. Mount backflow preventer 3 ft.(+/-) above finished floor. Provide indirect waste funnel and run pipe to an air gapped discharge at sink or floor drain. Furnish a spare parts kit and parts list mounted in the vicinity of the device.
- C. Prior to the installation of devices in the name of the Owner file for, pay for, and obtain all required permits and approvals for cross connection control devices from the Authority having Jurisdiction.
- D. Backflow preventers shall be of one manufacturer, by Watts, Wilkins, Beeco, or equal.

## **2.18 UNION AND NIPPLES**

- A. All connections between copper tubing and galvanized piping or between copper tubing and all tanks (such as water heaters, chillers, and similar equipment) shall be made with dielectric unions and nipples.
- B. All connection to Water Heaters, Meters, Pumps, and other equipment requiring maintenance or alteration shall be made up with unions. Unions on brass piping, 2 in. and smaller, shall be brass composition "E" in strict accordance with Federal Specification WW-U-516. On plastic piping, use unions of the same material as the piping.
- C. All close and shoulder nipples shall be corresponding materials as the pipe and shall be extra heavy.

## **2.19 WATER HEATER**

- A. Furnish and install as shown on drawings, AO Smith model #DEL-120 with an 120 gallon storage capacity, two 6,100 watt elements, a recovery rate of 24 GPH at 100 degree F temperature rise. The water heater will be equipped for 240 volts, single phase operation. The water heater includes 2 heating elements, non-simultaneous operation.

- B. The water heater shall have 150 psi working pressure and be equipped with extruded high density anode rod. All internal surfaces of the heater exposed to water shall be glasslined with an alkaline borosilicate composition that has been fused-to-steel by firing at a temperature range of 1400°F to 1600°F.
- C. Electric heating elements shall be medium watt density with zinc plated copper sheath. Each element shall be controlled by an individually mounted thermostat and high temperature cutoff switch.
- D. The outer jacket shall be of backed enamel finish and shall enclose the tank with foam insulation. Electrical junction box with heavy duty terminal block shall be provided.
- E. The drain valve shall be located in the front for ease of servicing.
- F. Heater tank shall have a three year limited warranty as outlined in the written warranty.
- G. Expansion Tank: Furnish and install as shown on plans a 15 gallon (10 gallon acceptance volume), 16" diameter x 24" (high) pre-charged steel thermal expansion tank with a fixed FDA approved butyl bladder. The tank shall have a top NPT stainless steel system connection and a .301" - 32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and stamped 150 psi working pressure. Tank shall be Wessels model number TTA-30 or by Amtrol, Taco, or approved equal.

## **2.20 TEMPERING VALVES**

- A. Tempering valves shall be as manufactured by Powers, Acorn Controls, Heat Timer Corp, or equal.
- B. Furnish and install where shown for temperature control at the domestic storage tank, Symmons model 7-200-W Thermostatic Water Mixing Valve, inlet check-stops, outlet volume/shutoff valve, dial thermometer, and test connection. Capacity of 12 gpm with a 10 psi drop. Valves are to be furnished in rough bronze finish and are to be factory assembled and tested.
- C. Furnish and install a 4 in. diameter thermometer on the outlet side of each tempering valve as manufactured by U.S. Gauge Company, Powers Regulator Company, and/or Tetric Company.

## **2.21 RECIRCULATING HOT WATER PUMPS**

- A. Circulators shall be all-bronze booster type, Grundfos Magna3 32-60 or equal by Bell & Gossett, Taco or approved equal.
- B. Circulators shall be connected to the building management System by Division 23.

## **2.22 WATER METER**

- A. Furnish and install water meter with inlet strainer in accordance with the standards of the Local Water Department. Coordinate the installation with the water department and include in the Plumbing Bid the cost of the meter. Refer to Part 1 of this section regarding assessments, and the like.

## **2.23 MANHOLE AND PRECAST CONCRETE OIL/GAS SEPARATOR STRUCTURE**

- A. Manholes and precast concrete structures shall be constructed as shown on Drawings. Conform accurately to indicated dimensions.
  - 1. Precast concrete manhole barrel, base, and cone sections shall conform to ASTM C-478 and shall be furnished complete with integral cast aluminum polymer coated steel steps. Sections shall be assembled with Kentseal #2 gaskets, or equal.
  - 2. Brick for constructing channels and adjustments to grade shall be waterstruck sewer brick, Grade 'A' concrete brick conforming to ASTM C-55, or precast concrete grade rings mortared in place.
  - 3. Cement mortar for parging and for joining brick shall be made of one (1) part portland cement and two (2) parts sand mixed to the proper consistency. Add approximately twenty (20) pounds of hydrated lime for each sack of cement.
  - 4. Precast concrete structures for oil/gas separator shall be as manufactured by A. Rotondo & Sons, Inc. or equal by Scituate Concrete pipe or Shea precast. Structures shall conform to the form and dimensions shown, be reinforced with ASTM A-615-79 Grade 60 reinforcing steel having a minimum 1" cover, and constructed of 5,000 PSI concrete. All field joints shall be sealed with rubber gasket and shall be grouted with hydraulic cement for watertightness. Design loading for all structures shall meet H-20 wheel loading design
- B. Conform to the Concrete Section of the specification for 4,000 PSI 6% air entrained concrete for all concrete structures for the work of this section. Including reinforcing steel where detailed.

- C. Cast iron manholes, frames, and covers, shall be of the form, dimensions, and manufacture shown on the Contract Drawings. Manhole extensions shall be neatly and accurately brought to dimensions of the base of the frame. Casting shall be of tough gray iron, free from cracks, holes, and cold shuts. All castings shall be made accurately to dimensions and shall be machined to provide even bearing surfaces. Covers must fit the frames in any position and, if found to rattle under traffic, shall be replaced. Filling to obtain tight covers will not be permitted. No plugging, burning-in, or filling will be allowed. All castings shall be carefully coated inside and out with coal tar pitch varnish of approved quality.
- D. Castings shall be as detailed on drawings or castings that appear on the Massachusetts Highway Department approval list for manhole frame & cover castings. Castings shall be by LeBaron Foundry, Neenah Foundry, or Campbell Foundry.

#### **2.24 WATERTIGHT FOUNDATION LINK SEAL**

- A. Use a mechanical seal, consisting of rubber links shaped to continuously fill the annular space between the pipe and the wall opening.
- B. Link-Seal pressure plates shall be molded of glass reinforced nylon. Hardware shall be 316 Stainless Steel, Per ASTM F593-95 Tensile Strength = 85,000 psi, average. Coloration shall be throughout elastomer for positive field inspection.
- C. Each link shall have permanent identification of the size and manufacturer's name molded into the pressure plate and sealing element.
- D. The contractor will submit to verify the modular seals are domestically manufactured at a plant with a current ISO-9001:2000 registration.
- E. Modular mechanical seals shall be manufactured by EnPro Industries, Trumbull, Eaton, Pipeline Seal & Insulator, or approved equal.

#### **2.25 FIRESTOP SYSTEMS**

- A. General: Provide firestopping at all new fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 078400 - Firestopping, for all product requirements for maintaining integrity of fire-rated construction at penetrations.

## **2.26 SCAFFOLDS AND STAGING**

- A. General: Trade Contractors shall obtain required permits for, and provide scaffolds, staging, and other similar raised platforms, required to access their Work as specified in Section 01 50 00 - Temporary Facilities and Controls and herein.
1. Scaffolding and staging required for use by this Trade Contractor pursuant to requirements of Section 01 50 00 - Temporary Facilities and Controls shall be furnished, erected, maintained in a safe condition, and dismantled when no longer required, by this Trade Contractor requiring such scaffolding.
  2. Each Trade Contractor is responsible to provide, maintain and remove at dismantling, all tarpaulins and similar protective measures necessary to cover scaffolding for inclement weather conditions other than those required to be provided, maintained and removed by the General Contractor pursuant to MGL (Refer to Section 01 50 00 - Temporary Facilities and Controls and as additionally required for dust control).
  3. General Contractor is responsible to provide enclosures required for temporary heat; refer to Section 01 50 00 - Temporary Facilities and Controls.
    - a. Furnishing portable ladders and mobile platforms of all required heights, which may be necessary to perform the work of this trade, are the responsibility of this Trade Contractor.

## **2.27 HOISTING MACHINERY AND EQUIPMENT**

- A. All hoisting equipment, rigging equipment, crane services and lift machinery required for the work by this Trade Contractor shall be furnished, installed, operated and maintained in safe conditions by this Trade Contractor, as referenced under Section 01 50 00 - Temporary Facilities and Controls.

## **PART 3 - EXECUTION**

### **3.1 WORKMANSHIP AND INSTALLATION METHODS**

- A. All work shall be installed in a first-class manner consistent with the best current practices. All materials shall be securely installed plumb and/or level, and all flush mounted equipment shall have front edge flush with finished wall surface.
- B. All piping shall be installed true to line and grade in the case of underground piping. All piping above ceilings or exposed shall be grouped together, be parallel to each other, and be either parallel or perpendicular to the structure. Utilize gang hangers wherever feasible. Group all valves together where feasible.



- C. Training:
  - 1. Train the Owner's maintenance personnel on troubleshooting procedures, and servicing and preventative maintenance schedules and procedures.
  - 2. Schedule training with Owner through the Architect with at least 7 days prior notice.

### **3.2 WORK COORDINATION AND JOB OPERATIONS**

- A. The equipment shall not be installed in congested and possible problem areas without first coordinating the installation of same.
- B. Particular attention shall be directed to the coordination of piping and other equipment installed in the ceiling areas. Coordinate the elevations of all piping in hung ceiling areas to insure adequate space for the installation of recessed lighting fixtures before other mechanical equipment is installed.
- C. Furnish to the General Contractor, and all other Subcontractors, all information relative to the portion of the Plumbing installation that will affect them, sufficiently in advance so that they may plan their work and installation accordingly.
- D. In case of failure to give proper information as indicated above sufficiently in advance, pay for all back-charges for the modification, renovation, and relocation of any portion of the work already performed.
- E. Obtain from the other trades, all information relative to the Plumbing Work to be executed in conjunction with the installation of their respective equipment.

### **3.3 CUTTING AND CORE DRILLING**

- A. Perform all cutting and core drilling operations that are outlined in Part 1 of this SECTION. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting, verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved Coordination Drawings
- B. Cut all masonry and concrete with an approved diamond blade concrete saw in a neat straight direction, perpendicular to the plane of the wall or floor.
- C. Use a core drilling process which produces clean, sharp edges and the minimum hole size which will accommodate the size of pipe sleeve specified. Submit procedures for cutting thru existing steel beams to Architect for review.

- D. The patching of holes shall be performed by Plumbing Sub-contractor utilizing methods outlined for the finish trade involved. Holes shall be patched to the satisfaction of the Architect.

### **3.4 CLEANING AND PROTECTION**

- A. Protect all materials and equipment during shipment and so as to prevent damage. Water closets, lavatories, and sinks shall be boarded over and all other fixtures shall be protected with pasted on paper. Post notice prohibiting the use of the fixtures prior to completion. Assume full responsibility for protection of work until its completion and final acceptance.
- B. Keep the premises reasonably clean at all times and remove rubbish caused by the Plumbing Work as directed by the Architect.
- C. Upon completion of this work, clean all fixtures and equipment installed herein and replace damaged parts. Failure to fulfill this obligation will result in back-charges for correction of the defective work.

### **3.5 SLEEVES, INSERTS, AND ESCUTCHEONS**

- A. All piping passing through slabs, floors, walls, partitions, foundation walls and grade beams, shall be sleeved and all such sleeves shall be furnished and installed by the Plumbing Subcontractor as detailed on the Drawings and herein specified. Set sleeves in concrete floors and walls as soon as forms are set and before concrete is poured. Core drilling openings shall have a sleeve caulked and grouted in place.
- B. All pipes passing through floor, whether slab-on grade or above grade levels, shall be sleeved with sleeve extending 1 in. above floor. This includes all piping in toilet room pipe space, stairwells, closets, partitions and pre-cast planks.
- C. All sleeves shall be Schedule 40 galvanized steel and shall be reamed. There shall be a minimum of 1 in. annular space between the sleeve and pipe provide greater clearance where seismic requirements dictate. Sleeves on insulated pipe shall be large enough to allow insulation to pass through sleeve. Sleeves on drywall, masonry, or concrete walls and partitions, shall be flush with wall on both sides.
- D. The space between sleeve and pipe in all cases shall be filled with a U.L./F.M. approved caulking compound. This includes pipes concealed in chases and/or partitions.
- E. Inserts where required shall be furnished and set by the Plumbing Subcontractor and where necessary may be drilled or power driven and shall be sized such that the insert will not exceed a depth of penetration of 1 in. into concrete.

- F. Escutcheons: All exposed pipe, uncovered, passing through walls or floors or ceilings shall be fitted with C.P. brass spun or split type escutcheons with approved clamping device for holding in position. Floor escutcheons shall be deep enough to fit over sleeves, fastened to pipe, and extend down to floor.

### **3.6 TESTING**

- A. Test all Work in the presence of the Architect and/or Engineer and as required by Local Codes.
- B. After Sanitary, Waste, and Vent Piping is in place and before being buried or furred in, plug lower ends and fill the system with water up to the top of stacks. Piping is to be left tight under these conditions and water level shall be maintained intact for the period of at least four (4) hours.
- C. Test all water piping by applying a hydrostatic pressure of 150 PSIG using a pump for this purpose. Make sure that all lines are properly plugged or capped and that air has been vented before applying pressure which shall remain constant without pumping for two (2) hours at least.
- D. Any leaks in joints or evidence of defective pipe on fittings disclosed by test shall be immediately corrected by replacing defective parts with new joints or materials. No makeshift repair effected by caulking threaded pipe with lead wool, application or Wilky or patented compounds will be permitted.
- E. Gas/Oil Separator Manhole Exfiltration Test:
  - 1. Plug pipes in manhole; remove water in manhole; observe plugs over period of not less than 2 hours to ensure there is no leakage into manhole.
  - 2. Fill manhole with water to within 4 inches of top of cover frame. Prior to test, allow manhole to soak from minimum of 4 hours to maximum of 72 hours; after soak period, adjust water level inside manhole to within 4 inches of top of cover frame.
  - 3. Measure water level from top of manhole frame; at end of 4 hour test period, again measure water level from top of manhole frame; there shall be no drop in water level during test period.
  - 4. When unsatisfactory test results are achieved, repair manhole and retest until result meets criteria; repair visible leaks regardless of quantity of leakage.
- F. Provide testing report for all systems tested.

### **3.7 CHLORINATION**

- A. Upon completion of the Plumbing Work, thoroughly chlorinate the entire domestic water system before putting same in service. Chlorinate all work in the presence of the Architect and/or Engineer. The chlorinating agent shall be as a solution of sodium hypochlorite. Water shall be fed slowly into the new line with chlorine in the proper amount to produce a dosage of 50 PPM. Open and close all valves while system is being chlorinated.
- B. After the sterilization agent has been applied for 24 hours, pay for an independent testing agency to test for residual chlorine and for presence of bacteria. A residual of not more than 5 PPM shall be required in all parts of the line.
- C. If test show 5 PPM or greater of residual chlorine, flush out system until all traces of the chemical used are removed.
- D. Provide testing report from independent testing agency.

### **3.8 INSTALLATION OF FIRESTOP SYSTEMS**

- A. General: Install firestop systems at all fire-rated construction where penetrated by the Work of this Section.
- B. Refer to Section 078400 - Firestopping, for all installation requirements for maintaining integrity of fire-rated construction at penetrations.

### **3.9 SEISMIC RESTRAINTS**

- A. The independent engineer responsible for design of seismic restraints shall visit the project upon completion of the work to certify the installation is consistent with the approved shop drawings. The certification shall be submitted to the Architect and must precede the closing in of ceilings.

### **3.10 SYSTEM SHUTDOWNS**

- A. Coordinate shutdowns of existing systems with the Owner and submit a written request at least ten working days in advance. Minimize system shut downs as much as possible. Submit a list of all affected areas, the proposed work to be performed, and the expected length of the shut-down including time for retesting.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- B. Provide temporary services to maintain active system during extended shut-downs as required for demolition and construction phasing.

END OF SECTION

**SECTION 23 00 00**

**HVAC  
(Filed Sub-Bid Required)**

**PART 1 – GENERAL**

|      |  |    |
|------|--|----|
| 1.1  | TIME, MANNER, AND REQUIREMENTS FOR SUBMITTING SUB-BIDS .....   | 1  |
| 1.2  | RELATED DOCUMENTS .....  | 2  |
| 1.3  | WORK TO BE PERFORMED.....                                      | 2  |
| 1.4  | DEFINITIONS .....  | 3  |
| 1.5  | RELATED WORK .....   | 4  |
| 1.6  | PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION ..... | 4  |
| 1.7  | PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION ..... | 4  |
| 1.8  | CODES, ORDINANCES, AND PERMITS .....                           | 5  |
| 1.9  | QUALITY ASSURANCE .....  | 5  |
| 1.10 | DISCREPANCIES IN DOCUMENTS.....                                | 7  |
| 1.11 | CONTRACT DRAWINGS.....   | 7  |
| 1.12 | COORDINATION DRAWINGS.....                                     | 8  |
| 1.13 | ACCESSIBILITY .....  | 9  |
| 1.14 | ROUGH IN .....   | 9  |
| 1.15 | DEMOLITION.....  | 9  |
| 1.16 | NOTIFICATION OF RELATED TRADES .....                           | 9  |
| 1.17 | MECHANICAL INSTALLATIONS.....                                  | 9  |
| 1.18 | CUTTING AND PATCHING .....                                     | 10 |
| 1.19 | SUBMITTALS .....   | 10 |
| 1.20 | SUBSTITUTIONS .....  | 12 |
| 1.21 | PRODUCT LISTING.....   | 12 |
| 1.22 | NAMEPLATE DATA.....  | 12 |
| 1.23 | DELIVERY, STORAGE AND HANDLING.....                            | 12 |
| 1.24 | RECORD DOCUMENTS .....   | 13 |
| 1.25 | OPERATION AND MAINTENANCE DATA .....                           | 13 |
| 1.26 | WARRANTIES .....   | 14 |
| 1.27 | ENERGY REBATE PROGRAM .....                                    | 14 |

**PART 2 - PRODUCTS**

|     |  |    |
|-----|--|----|
| 2.1 | ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT ..... | 14 |
| 2.2 | HIGH VOLUME, LOW SPEED FANS.....                       | 17 |
| 2.3 | HANGERS & ATTACHMENTS.....                             | 20 |
| 2.4 | MECHANICAL IDENTIFICATION .....                        | 23 |

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

|      |  |    |
|------|--|----|
| 2.5  | MECHANICAL INSULATION .....  | 25 |
| 2.6  | EXTRUDED ALUMINUM RAIN RESISTANT WALL LOUVERS .....  | 26 |
| 2.7  | REFRIGERANT PIPING .....   | 27 |
| 2.8  | TERMINAL HEATING UNITS (ELECTRIC) .....  | 29 |
| 2.9  | HEAT PUMP UNITS.....   | 30 |
| 2.10 | POWER AND GRAVITY VENTILATORS .....  | 32 |
| 2.11 | METAL DUCTWORK .....   | 33 |
| 2.12 | DUCTWORK ACCESSORIES.....  | 35 |
| 2.13 | AIR OUTLETS AND INLETS .....   | 39 |
| 2.14 | CONDENSATE DISCHARGE PUMPS .....   | 42 |
| 2.15 | ACCESS DOORS .....   | 42 |
| 2.16 | FIRESTOPPING AND SEALANTS.....   | 43 |
| 2.17 | AUTOMATIC TEMPERATURE CONTROLS AUTOMATIC TEMPERATURE CONTROLS<br>ELECTRIC/ELECTRONIC ..... | 46 |

PART 3 - EXECUTION

|      |   |    |
|------|---|----|
| 3.1  | INSTALLATION OF HIGH VOLUME, LOW SPEED FANS .....                   | 51 |
| 3.2  | INSTALLATION OF HANGERS & ATTACHMENTS .....                         | 53 |
| 3.3  | INSTALLATION OF MECHANICAL IDENTIFICATION .....                     | 55 |
| 3.4  | INSTALLATION OF MECHANICAL INSULATION.....                          | 56 |
| 3.5  | INSTALLATION OF EXTRUDED ALUMINUM RAIN RESISTANT WALL LOUVERS ..... | 57 |
| 3.6  | INSTALLATION OF REFRIGERANT PIPING AND ACCESSORIES .....            | 58 |
| 3.7  | INSTALLATION OF TERMINAL HEATING UNITS (ELECTRIC).....              | 58 |
| 3.8  | INSTALLATION OF HEAT PUMP UNIT SYSTEMS .....                        | 60 |
| 3.9  | INSTALLATION OF POWER AND GRAVITY VENTILATORS.....                  | 60 |
| 3.10 | INSTALLATION OF METAL DUCTWORK.....                                 | 61 |
| 3.11 | INSTALLATION OF DUCTWORK ACCESSORIES .....                          | 63 |
| 3.12 | INSTALLATION OF AIR OUTLETS AND INLETS .....                        | 64 |
| 3.13 | INSTALLATION OF CONDENSATE DISCHARGE PUMPS.....                     | 64 |
| 3.14 | INSTALLATION OF ACCESS DOORS.....                                   | 65 |
| 3.15 | INSTALLATION OF FIRESTOPPING AND SEALANTS .....                     | 65 |
| 3.16 | AUTOMATIC TEMPERATURE CONTROLS .....                                | 66 |
| 3.17 | TESTING, ADJUSTING AND BALANCING.....                               | 68 |

END OF INDEX

**SECTION 23 00 00**

**HVAC  
(Filed Sub-bid Required)**

**PART 1 – GENERAL**

**1.1 TIME, MANNER, AND REQUIREMENTS FOR SUBMITTING SUB-BIDS**

- A. Sub-bids shall be submitted in accordance with the provisions of Massachusetts General Laws (Ter Ed) Chapter 149, Sections 44A to 44I, inclusive, as amended. The time and place for submission of sub-bids shall be as set forth in the INSTRUCTIONS TO BIDDERS.
- B. Each sub-bid filed with the Awarding Authority must be accompanied by BID BOND, or CASH, or CERTIFIED CHECK, or TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the MASSACHUSETTS DEPARTMENT OF CONSERVATION AND RECREATION in the amount of five-percent (5%) of the bid amount. A bid accompanied by any other form of bid deposit will be rejected.
- C. Each sub-bid, submitted for the work of this SECTION, shall be on a form furnished by the Awarding Authority, as required by Section 44F of Chapter 149, as amended.
- D. Work to be done under this SECTION is shown on Drawings numbered: M0.0, MD1.0, M1.0, M2.0, M4.0.
- E. The Filed Sub-Bidder for the work of this SECTION 230000 shall list, in Paragraph E, of the FORM FOR SUB-BID, the name of each person, firm, or corporation, whom he proposes to use to perform the following classes of work or part thereof, at the bid price therefore:

| CLASS OF WORK                 | PARAGRAPH NUMBERS                  |
|-------------------------------|------------------------------------|
| Insulation                    | 2.5, 3.4                           |
| Sheetmetal & Accessories      | 2.11, 2.12, 2.13, 3.10, 3.11, 3.12 |
| Automatic Temperature Control | 2.17, 3.16                         |
| Air & Water Balancing         | 3.17                               |

If Sub-Bidder intends to perform, with persons of his own staff, the classes of work listed above, he must nevertheless list his own name therefore, under Paragraph E, of the FORM FOR SUB-BID.



## 1.2 RELATED DOCUMENTS

- F. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- G. Refer to SECTION 012300, ALTERNATES, for alternates which may affect the work of this SECTION.
- H. The Drawings indicate the general extent, only, of the demolition, removals, and alteration work to be performed. Prior to commencing any demolition and removals work, carefully examine all conditions as they exist at the project, and verify with the Architect the actual extent of the demolition and removals work. Be fully responsible for removing all existing materials which would otherwise interfere with the proper installation or function of the new work, whether or not such existing materials or conditions have been indicated, such work being performed without additional cost to the Contract; and perform the required demolition, removals, and alteration work, except where specifically noted to the contrary in the various trade SECTIONS of the Specifications, in which cases the specific trades shall perform such designated segments of the demolition and removals work.

## 1.3 WORK TO BE PERFORMED

- A. General:
  - 1. The work described herein shall be interpreted as work to be done by the HVAC Subcontractor. Work to be performed by other trades will always be specifically referenced to that trade.
  - 2. Furnish all staging, rigging, temporary support, labor, materials, and perform all operations in connection with the installation of the HVAC work.
  - 3. The building is to be commissioned and this contractor shall provide all labor required to fully test and demonstrate that all systems operate as designed. HVAC contractor shall provide startup reports for each DCU system and the exhaust fan.
- B. Without limiting the generality thereof, the work to be performed under this Section includes:
  - 1. Exhaust Fans
  - 2. Ductwork, Hanger, Damper, etc.
  - 3. Ductless Heating and Cooling systems.
  - 4. Equipment Nameplates
  - 5. Factory Tests
  - 6. Diffusers, Registers and Grilles

C. Design Narrative

The following is the HVAC system narrative, which defines the scope of work and capacities of the HVAC system as well as the Basis of Design.

1. CODES

All work installed under Section 23 00 00 shall comply with the City of Newton Building Code and all state, county, and federal codes, laws, statutes, and authorities having jurisdiction.

2. DESIGN INTENT

The work of Section 23 00 00 is shown on the drawings and specifications. All work is new and consists of furnishing all materials, equipment, labor, transportation, facilities, and all operations and adjustments required for the complete and operating installation of the Heating, Ventilating and Air Conditioning work and all items incidental thereto, including testing.

3. BASIS OF DESIGN: (MASS CODE)

Massachusetts Code values are listed herein based on Barnstable County values as determined from ASHRAE 2011 Handbook weather data.

Outside: Winter 9°F, Summer 87°F DB 74°F WB (ASHRAE 0.4 % Design Data)

Inside: 69°F +/- 2 (adj.) deg. F for heating. Unoccupied temperature setback will be provided to maintain 55 °F DB during heating season and 85°F DB during cooling season. Temperature within occupied spaces shall not vary more than +/- 3°F from occupant setpoint, from head to foot, and within each zone.

**1.4 DEFINITIONS**

A. Most terms used within the documents are industry standard. Certain words or phrases shall be understood to have specific meanings as follows:

1. Provide: Furnish and install completely connected up and in operable condition.
2. Furnish: Purchase and deliver to a specific location within the building or site.
3. Install: With respect to equipment furnished by others, install means to receive, unpack, move into position, mount and connect, including removal of packaging materials.
4. Conduit: Raceways of the metallic type which are not flexible. Specific types as specified.
5. Connect: To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.

6. Subject to Mechanical Damage: Equipment and raceways installed exposed and less than eight feet above finished floor in mechanical rooms or other areas where heavy equipment may be in use or moved.

#### **1.5 RELATED WORK**

- A. Cutting beyond the requirements as stated herein, and patching of all openings regardless of size, is specified in the respective Sections of the trade responsible for furnishing and installing similar new materials.
- B. For flashing of vents through roof and setting of roof curbs and flashing refer to Details.
- C. For power wiring of mechanical equipment refer to Section 26 00 00 - ELECTRICAL
- D. For excavation and backfill of below grade mechanical and related systems refer to Division 31.

#### **1.6 PRODUCTS FURNISHED, BUT NOT INSTALLED UNDER THIS SECTION**

- A. Furnish pipe sleeves for placement into formwork by the Generator Contractor, Refer to Section 033000.
- B. Furnish access panels and doors for installation by the General Contractor: (Coordinated by Architect)
  1. Furnish access panels and doors for installation in walls, ceiling and floors at locations to permit access for adjustment, removal, replacement and servicing of all concealed equipment, valves, volume dampers, materials, etc. installed under this Section of the specifications.
  2. Access panels will be installed under this Section of the related trades of the finished surfaces in which they are located.
  3. Access panels shall be located in closets, storage rooms and/or other non-public areas if possible, positioned so that the equipment can be easily reached, and the size shall be sufficient for this purpose (min. 16" x 16"). When access panels are required in corridors, lobby or other habitable areas, they will be located as directed by the Owner's Representative.
  4. Access panels shall be per specification. Required fire resistance of walls and ceilings shall be maintained.

#### **1.7 PRODUCTS INSTALLED, BUT NOT FURNISHED UNDER THIS SECTION**

- A. Install duct-mounted smoke detectors which will be furnished by the Electrical subcontractor. The HVAC Subcontractor shall wire the appropriate fan to shut down upon detection of smoke. The Electrical Subcontractor shall power wire and wire the smoke detector to the fire alarm panel.

## **1.8 CODES, ORDINANCES, AND PERMITS**

- A. Perform all work in accordance with the requirements of the City of Newton Building Department, State of Massachusetts Building Code, and applicable State and Federal Laws. Give all requisite notices, file all requisite plans, and obtain all permits required to perform HVAC Work. Pay all fees and include in the Bid. All HVAC equipment shall be installed to meet all State, Local and Federal sound ordinances.
- B. Refer to GENERAL CONDITIONS for local connection and permit fees and information regarding Utility Company back charges.
- C. Codes, laws and standards provide a basis for the minimum installation criteria acceptable. The drawings and specifications illustrate the scope required for this project, which may exceed minimum codes, laws and standards.
- D. Give all notices, file all plans, obtain all permits and licenses, and obtain all necessary approvals from authorities having jurisdiction. No work shall be covered before examination and approval by the Owner's Representative, inspectors, and authorities having jurisdiction. Replace imperfect or condemned work to conform to requirements, satisfactory to Owner's Representative, and without extra cost to the Owner. If work is covered before examination and approval, this Contractor shall pay costs of uncovering and reinstalling the covering, whether it meets contract requirements or not.

## **1.9 QUALITY ASSURANCE**

- A. Codes and Standards:
  - 1. HI Compliance: Design, manufacture, and install HVAC pumps in accordance with HI Hydraulic Institute Standards".
  - 2. UL Compliance: Design, manufacture, and install HVAC pumps in accordance with UL 779 "Motor Operated Water Pumps".
  - 3. ANSI Standards: Comply with ANSI A13.1 for pipe, valve, and equipment identification.
  - 4. I=B=R Compliance: Provide cast iron boilers that have been tested and rated in accordance with Institute of Boiler and Radiator Manufacturers (I=B=R) "Testing and Rating Standard for Cast Iron and Steel Heating Boiler", and bear I=B=R emblem on nameplate affixed to boiler.
  - 5. NFPA Compliance: Install oil fire cast iron boilers in accordance with NFPA Standard 31 "Standard for the Installation of Oil Burning Equipment".
  - 6. ASME Compliance: Construct cast iron boilers in accordance with ASME Boiler and Pressure Vessel Code, Section IV "Heating Boilers".
  - 7. UL and NEMA Compliance: Provide cast iron boiler ancillary electrical components, which have been listed and labeled UL, and comply with NEMA Standards.

8. FM Compliance: Provide control devices and control sequences in accordance with requirements of Factory Mutual System (FM).
  9. IRI Compliance: Provided control devices and control sequences in accordance with requirements of Industrial Risk Insurance (IRI).
  10. AMCA Compliance: Test and rate air handling units in accordance with AMCA standards.
  11. AGA Compliance: Provide gas controls and devices in accordance with American Gas Associates.
  12. ARI Compliance: Test and rate air handling units in accordance with ARI 430 "Standard for Central-Station Air Handling Units", display certification symbol on units of certified models.
  13. ASHRAE Compliance: Construct and install refrigerant coils in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigeration".
  14. NFPA Compliance: Provide air handling unit internal insulation having flame spread rating not over 25 and smoke developed rating no higher than 50; and complying with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".
  15. UL and NEMA Compliance: Provide electrical components required as part of air handling units, which have been listed and labeled by UL and comply with NEMA standards.
  16. NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of air handling units.
- B. MSS Standard Practices: Comply with the following standards for valves:
1. MSS SP-45: Bypass and Drain Connection Standard
  2. MSS SP-67: Butterfly Valves
  3. MSS SP-70: Cast Iron Gate Valves, Flanged and Threaded Ends
  4. MSS SP-71: Cast Iron Swing Check Valves, Flanged
  5. MSS SP-72: Ball Valves with Flanged or Butt-Welding Ends for General Service
  6. MSS SP-78: Cast Iron Plug Valves, Flanged and Threaded Ends
  7. MSS SP-80: Bronze Gate, Globe Angle and Check Valves
  8. MSS SP-84: Steel Valves - Socket Welding and Threaded Ends
  9. MSS SP-85: Cast Iron Globe and Angle Valves, Flanged with Threaded Ends
  10. MSS SP-92: MSS Valve User Guide

- C. Automatic Temperature Control Contractor Qualifications: Firms specializing in installation of Automatic Temperature control system for not less than 5 years.
  - 1. Codes and Standards:
    - a. Electrical Standards: Provide electrical components of control systems which have been UL-listed and labeled, and comply with NEMA standards.
    - b. NEMA Compliance: Comply with NEMA standards pertaining to components and devices for pneumatic control systems.
    - c. NFPA Compliance: Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

#### **1.10 DISCREPANCIES IN DOCUMENTS**

- A. Where Drawings or Specifications conflict or are unclear, advise Architect in writing before Award of Contract. Otherwise, Architect's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted.
- B. Where Drawings or Specifications do not coincide with manufacturer's recommendations, or with applicable codes and standards, alert Architect in writing before installation.
- C. Of the required material, installation, or work can be interpreted differently from drawing to drawing, for between drawings and specs, this contractor shall provide that material, installation, or work which is of the more stringent.
- D. It is the intent of these contract documents to have the contractor provide systems and components that are fully complete and operational and fully suitable for the intended use. There may be situations in the documents where insufficient information exists to precisely describe a certain component or subsystem, or the routing of a system. In cases such as this, where the contractor has failed to notify the Architect of the situation in accordance with Paragraph (A) above, the contractor shall provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in workmanlike manner.

#### **1.11 CONTRACT DRAWINGS**

- A. All work shown on the Drawings is intended to be approximately correct to scale, but shall be taken in a sense as diagrammatic. Sizes of pipes and general method of running them are shown, but it is not intended to show every offset and fitting which is only possible after final coordination with all sub-contractors and submission of coordination drawings. No additional compensation will be allowed for offsets and fittings not specifically shown of the contract drawings. To carry out the true intent and purpose of the plans, furnish all necessary parts to make complete working systems ready for use.

- B. The HVAC Drawings and Specifications are intended to supplement each other so that any details shown on the Drawings and not mentioned in the Specifications, or vice-versa, shall be executed the same as if mentioned in the Specifications and shown on the Drawings.
- C. Refer to the Architectural, Structural, and other Mechanical and Electrical Drawings which indicate the construction in which this work shall be installed. Locations shown on the plans shall be checked against the general and detailed Drawings of the construction proper. All measurements must be taken at the building.

#### **1.12 COORDINATION DRAWINGS**

- A. Before materials are purchased or work is begun, the respective Subcontractor shall prepare and submit to the Architect Coordination Drawings showing the size, elevation and location of his equipment, fixtures, ductwork, conduit, and piping lines relevant to the complete system. He shall ensure that these drawings are compatible and correctly annotated and cross-referenced at their interfaces.
- B. Coordination drawings are for the Contractor's and the Architect's use during construction and shall not be construed as replacing any shop or record drawings required elsewhere in the Contract Drawings.
- C. All coordination drawings shall be prepared in a large enough scale to accurately identify work of each trade and in addition to each sub-contractors systems, shall also show architectural floor plan, reflected ceiling plan, and structural framing with grid identification.
- D. The coordination drawing shall be started by the sheet metal sub-contractor and after applying all ductwork, the drawing shall be submitted for ductwork approval by the engineer. After approval, the drawing shall be circulated to the remaining sub-contractors for application of their work.
- E. During coordination drawing preparation the sub-contractors shall meet periodically to discuss overall coordination of all sub systems, and shall adjust their systems accordingly. When all drawings are complete the general contractor shall submit to the architect and engineers for review.
- F. Areas of conflict that cannot be resolved between the sub-contractor must be flagged on the drawings with adequate information to assist the architect and engineer in resolving noted issues.
- G. Refer to DIVISION 01 – GENERAL REQUIREMENTS of these Contract Documents for additional procedures relative to the preparation of Coordination Drawings.

**1.13 ACCESSIBILITY**

- A. Install equipment and materials to provide required access for servicing and maintenance. Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing.
- B. Extend all grease fittings to an accessible location.

**1.14 ROUGH IN**

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

**1.15 DEMOLITION**

- A. Where existing heating equipment (i.e. coils, fans, radiation, pumps etc.) are called to be removed, it shall include all associated piping, valves, wiring, controls, hangers, associated ductwork, and all associated appurtenances.
- B. Where existing piping (i.e. water, condensate, drain etc.) and ductwork are called to be removed, it shall include all associated hangers, insulation, valves, controls, dampers and all associated appurtenances.
- C. This Sub-contractor shall disconnect, lower to floor, and stack near-by all noted mechanical systems being removed. The General Contractor shall remove from the building and dispose of in a legal manner.

**1.16 NOTIFICATION OF RELATED TRADES**

- A. Notify all other trades responsible for installing chases, inserts, sleeves, anchors, louvers, etc. when ready for such installation and for final checking immediately before concrete is placed. Cooperate with such trades to obtain proper installation.
- B. Leave openings in walls for pipes, ducts, etc. for mechanical and electrical work as shown on Drawings or required by layout of mechanical or electrical systems.

**1.17 MECHANICAL INSTALLATIONS**

- A. Coordinate mechanical equipment and materials installation with other building components.
- B. Verify all dimensions by field measurements.
- C. Arrange for chases, slots, and openings in other building components to allow for mechanical installations.



- D. Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.
- E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the work. Give particular attention to large equipment requiring positioning prior to closing-in the building.
- F. Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.
- G. Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.
- H. Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
- I. Coordinate connection of mechanical system with overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

#### **1.18 CUTTING AND PATCHING**

- A. Drilling, coring, and cutting of new and existing structures (through walls, floors, ceiling, etc.) where the largest dimension does not exceed 12" shall be by this Contractor.
- B. Throughout the performance of the cutting and coring work, ensure that the structural integrity of the existing walls, floors, overhead structure, and other structural components, which are to remain, is maintained until permanent work is installed. Prior to any coring or cutting verify all locations of same with the General Contractor. All cutting and coring is to be performed in accordance with approved coordination drawings. All cutting or coring of structural must receive approval of the Architect prior to proceeding.
- C. No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.
- D. Patching of surfaces shall be by the trade responsible for the surface penetrated.
- E. Refer to DIVISION 01 – GENERAL REQUIREMENTS for addition reference.

#### **1.19 SUBMITTALS**

- A. Refer to DIVISION 01 – GENERAL REQUIREMENTS for submittal definitions, requirements, and procedures. The following paragraphs supplement the requirements of Division 01.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- B. Submittal of Shop Drawings, product data, and samples will be accepted only when submitted by the General Contractor. Data submitted by Sub-contractors and material suppliers directly to the Architect/Engineer will not be processed. Submittals will be electronic unless physical sample are required.
- C. Provide submittals for the following equipment:
1. Valves
  2. Meters and Gages
  3. Hangers and Attachments
  4. Mechanical Identification
  5. Mechanical Insulation
  6. Refrigerant and Condensate Piping
  7. Terminal Heating Units
  8. Ductless cooling units
  9. Power and Gravity Ventilators
  10. Metal Ductwork
  11. Ductwork Accessories
  12. Ductless cooling unit condenser supports
  13. Air Outlets and Inlets
  14. Exterior Wall Louvers
  15. Variable Frequency Drives
  16. Automatic Temperature Controls
  17. Air Testing and Balancing
- D. If a Shop Drawing is not accepted after two submissions, a third submission from the same manufacturer will not be considered.
- E. Check Shop Drawings and other submittals to assure compliance with contract documents before submittal to A/E.
- F. Review of Shop Drawings is final and no further changes shall be considered without written application. Shop Drawings review does not apply to quantities, nor relieve this Contractor of his responsibility for furnishing materials or performing his work in full compliance with these Contract Drawings and Specifications. Review of these shop drawings shall not be considered a guarantee of the measurements of this building or the conditions encountered.

## **1.20 SUBSTITUTIONS**

- A. If materials or equipment are substituted for specified items that alter the systems shown or its physical characteristics, or which have different operating characteristics, clearly note the alterations or difference and call it to the attention of the a/e. Under no circumstances shall substitutions be made unless material or equipment has been successfully operated for at least three consecutive years.
- B. Any modifications to the design, as a result of approving a substitution, shall be the responsibility of this contractor. Any additional cost to this contractor or any other contractor, directly or indirectly, as a result of such substitutions, shall be the responsibility of this contractor.

## **1.21 PRODUCT LISTING**

- A. Prepare listing of major mechanical equipment and materials for the project.
- B. Provide all necessary information.
- C. Submit to the A/E through the General Contractor, within twenty (20) days of signing contract, this listing indicating all equipment and manufacturers, as a part of the submittal requirement. If the product list is not submitted, it will be the responsibility of the sub-contractor to submit one (1) of the three (3) named equal manufacturers.
- D. When two or more items of same material or equipment are required they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in work, except as otherwise indicated.
- E. Provide products, which are compatible within systems and other connected items.

## **1.22 NAMEPLATE DATA**

- A. Provide permanent operational data nameplate on each item of power operated mechanical equipment, indicating manufacturer, product name, mode, number, serial number, capacity, operating, and power characteristics labels of tested compliances, and similar essential data. Locate nameplates in an accessible location.

## **1.23 DELIVERY, STORAGE AND HANDLING**

- A. Refer to Section General Conditions for delivery, storage, and handling of equipment. The following paragraphs supplement the requirements of Section General Conditions.

- B. Deliver products to project properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.
- C. Store equipment and materials off-site. Protect stored equipment and materials from damage.
- D. Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

#### **1.24 RECORD DOCUMENTS**

- A. Refer to DIVISION 01 – GENERAL REQUIREMENTS for requirements for record documents. The following paragraphs supplement the above.
- B. Mark Drawings to indicate revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned from column lines; concealed equipment, dimensioned to column line; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located.

#### **1.25 OPERATION AND MAINTENANCE DATA**

- A. Refer to Division 01 – General Requirements for procedures and requirements for preparation and submittal of maintenance manuals. The following paragraphs supplement the requirements of Division 01.
- B. In addition to the information required by Division 01 for maintenance data, include the following information:
  - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of all replaceable parts.
  - 2. Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and user summer and winter operating instructions.
  - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
  - 4. Servicing instructions and lubrication charts and schedules.

5. Provide DVD recording of operation and maintenance training sessions and include as part of O & M Manual submittal. Provide indexed table of contents for DVD recording.

**1.26 WARRANTIES**

- A. The contractor shall provide a one (1) year minimum warrantee on all product (unless otherwise stated in the product specification for a specific product) and labor for work under this section.
- B. Refer to Division 01 – General Requirements for additional procedures and submittal requirements for warranties.

**1.27 ENERGY REBATE PROGRAM**

- A. This project has been designed to incorporate equipment approved for energy rebate such as high efficiency motors, ductless cooling equipment, etc. Meet with Utility Company prior to submitting shop drawing to ascertain that submittal meets program guidelines. HVAC contractor shall fill out Utility Company Gas and Electric rebate applications on behalf of the owner.

**PART 2 - PRODUCTS**

**2.1 ELECTRICAL REQUIREMENTS FOR MECHANICAL EQUIPMENT**

- A. Pursuant to Massachusetts General Laws Chapter 141, a Massachusetts Licensed electrician shall install all low and line voltage wiring required by this section.
- B. General: The following are basic requirements for simple or common motors. For special motors, more detailed and specific requirements are specified in the individual equipment specifications.
  1. All motors for all mechanical equipment shall be premium efficiency matching the following:

|    | HP  | RPM  | Efficiency |
|----|-----|------|------------|
| a. | 1   | 1800 | 85.5%      |
| b. | 1.5 | 1800 | 86.5%      |
| c. | 2   | 1800 | 86.5%      |
| d. | 3   | 1800 | 89.5%      |
| e. | 5   | 1800 | 89.5%      |
| f. | 7.5 | 1800 | 91.0%      |
| g. | 10  | 1800 | 91.7%      |
| h. | 15  | 1800 | 93.0%      |
| i. | 20  | 1800 | 93.0%      |
| j. | 25  | 1800 | 93.6%      |
| k. | 30  | 1800 | 94.1%      |

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- l. 40 1800 94.1%
- m. 50 1800 94.5%

2. Torque characteristics shall be sufficient to satisfactorily accelerate the driven loads.
3. Motor sizes shall be large enough so that the driven load will not require the motor to operate in the service factor range.
4. 2-speed motors shall have 2 separate windings on poly-phase motors.
5. Temperature Rating: Rated for 40° C. environment with maximum 50° C temperature rise for continuous duty at full load (Class A Insulation).
6. Starting Capability: Frequency of starts as indicated by automatic control system, and not less than 5 evenly time spaced starts per hour for manually controlled motors.
7. Service Factor: 1.15 for poly-phase motors and 1.35 for single phase motors.
8. Motor Construction: NEMA Standard MG 1, general purpose, continuous duty, Design "B", except "C" where required for high starting torque.
9. Frames: NEMA Standard No. 48 or 54; use driven equipment manufacturer's standards to suit specific application.
10. Bearings:
  - a. Ball or roller bearings with inner and outer shaft seals.
  - b. Re-greasable, except permanently sealed where motor is normally inaccessible for regular maintenance.
  - c. Designed to resist thrust loading where belt drivers or other drives produce lateral or axial thrust in motor.
  - d. For fractional horsepower, light duty motors, sleeve type bearings are permitted.
11. Enclosure Type:
  - a. Open drip-proof motors for indoor use where satisfactorily housed or remotely located during operation.
  - b. Guarded drip-proof motors where exposed to contact by employees or building occupants.
  - c. Weather protected Type I for outdoor use, Type II where not housed.
12. Overload Protection: Built-in thermal overload protection and, where indicated, internal sensing device suitable for signaling and stopping motor at starter.
13. Noise Rating: "Quiet".

14. Efficiency: "Energy Efficient" motors shall have a minimum efficiency as scheduled in accordance with IEEE Standard 112, test method B. If efficiency not specified, motors shall have a higher efficiency than "average standard industry motors", in accordance with IEEE Standard 112, Test Method B.
  15. Nameplate: Indicate the full identification of manufacturer, ratings, characteristics, construction, special features and similar information.
- C. Starters, Electrical Devices, And Wiring: (Provided by the HVAC Contractor for Each Packaged Piece Of HVAC Equipment Requiring Such):
1. Motor Starter Characteristics:
    - a. Enclosures: NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division.
    - b. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition.
  2. Manual Switches shall have:
    - a. Pilot lights and extra position for multi-speed motors.
    - b. Overload Protection: Melting alloy type thermal overload relays.
  3. Magnetic Starters:
    - a. Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated.
    - b. Trip-free thermal overload relays, each phase.
    - c. Interlocks, switches and similar devices as required for co-ordination with control requirements of Division 23 Controls Sections.
    - d. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts.
    - e. Externally operated manual reset.
    - f. Under-voltage release or protection.
  4. Capacitors:
    - a. Individual unit cells.
    - b. All welded steel housing.
    - c. Each capacitor internally fused.
    - d. Non-flammable synthetic liquid impregnant.
    - e. Craft tissue insulation.
    - f. Aluminum foil electrodes.

- g. KVAR size shall be as required to correct motor power factor to 90% or better and shall be installed on all motors 1 horsepower and larger, that have an uncorrected power factor of less than 85% at rated load.
- 5. Disconnect Switches (Those specified under this Section):
  - a. Fusible Switches: Fused, each phase; general duty; horsepower rated; non-fusible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.
  - b. Non-fusible Switches: For equipment 2 horsepower and smaller, shall be horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

## 2.2 HIGH VOLUME, LOW SPEED FANS

### A. GENERAL

#### 1. SUMMARY

##### a. Section Includes

- 1) The ceiling-mounted, circulation fan is the model scheduled with the capacities indicated. The fan shall be furnished with standard mounting hardware and variable speed control to provide cooling and destratification.

##### b. Summary of Work

- 1) Installation of the fan, miscellaneous or structural metal work (if required), field electrical wiring, cable, conduit, fuses and disconnect switches, other than those addressed in the installation scope of work, shall be provided.

### B. HIGH VOLUME, LOW SPEED FANS

- 1. Regulatory Requirements: The entire fan assembly (without light kit) shall be ETL-certified and built pursuant to the construction guidelines set forth by UL standard 507 and CSA standard 22.2.
- 2. Sustainability Characteristics: The fan shall be designed to move an effective amount of air for cooling and destratification over an extended life. The fan components shall be designed specifically for high volume, low speed fans to ensure lower operational noise. Sound levels from the fan operating at maximum speed measured in a laboratory setting shall not exceed 55 dBA. Actual results of sound measurements in the field may vary due to sound reflective surfaces and environmental conditions.



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Maintenance Facilities Improvements and Renovations  
Newton, MA

3. Good workmanship shall be evident in all aspects of construction. Field balancing of the airfoils shall not be necessary.
4. The onboard fan controller shall be constructed using a variable frequency drive (VFD) that is pre-wired to the motor and factory-programmed to minimize the starting and braking torques for smooth and efficient operation. The onboard controller shall be prewired to the motor using a short run of flexible conduit with a dedicated ground conductor to minimize electromagnetic interference (EMI) and radio frequency interference (RFI). A 15-ft incoming power cord shall be pre-wired to the controller with one of the following plugs: NEMA L6-20P Twist-Lock Plug, NEMA L6-30P Twist-Lock Plug, NEMA L15-20P Twist Lock Plug, NEMA L16-20P Twist-Lock Plug.
5. The fan shall be equipped with ten (10) Powerfoil airfoils of precision extruded aluminum alloy. The airfoils shall be connected by means of two (2) high strength locking bolts per airfoil. The airfoils shall be connected to the hub and interlocked with zinc plated steel retainers.
6. The fan shall be equipped with ten (10) Powerfoil winglets on the ends of the airfoils and ten (10) AirFences™ positioned on the airfoils at the optimum location for performance. Both the winglet and AirFence shall be molded of polypropylene.
7. The fan motor shall be an AC induction type inverter rated at 1725 RPM, 200–250/400–480 VAC, 50/60 Hz, three-phase
8. The motor shall be totally enclosed, fan cooled (TEFC) with an IP42 NEMA classification. A NEMA 56C standard frame shall be provided for ease of service. The motor shall be manufactured with a double baked Class F insulation and be capable of continuous operation in -30oF to 122oF (-34oC to 50oC) ambient conditions.
9. The fan gearbox shall be a NitroSeal™ Drive designed specifically for the Powerfoil X2.0. The gearbox shall include a high-efficiency, hermetically sealed, nitrogen-filled, offset helical gear reducer with two-stage gearing, a 2-1/2" (6.4 cm) hollow output shaft, cast iron housing, double lip seals, high quality SKF Explorer Series bearings with crowned cages for optimal lubrication flow, and precision machined gearing to maintain backlash less than 11 arc-minutes over the life of the unit. Lubrication shall be high-grade, low-foaming synthetic oil with extreme pressure additives and a wide temperature range.
10. The gearbox shall be equipped with a hollow shaft threaded to accept a ¾" NPT fitting in which wiring, piping, etc., can be routed to below the fan. A standard junction box can be affixed to this hollow shaft to allow for installing optional features such as lights or cameras. The inclusion of the hollow shaft shall be specified at the time of order.
11. The fan shall be equipped with a mounting post that provides a structural connection between the fan assembly and extension tube. The mounting post shall be formed from A36 steel, contain no critical welds, and be powder coated for corrosion resistance and appearance.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

12. The fan mounting system shall be designed for quick and secure installation on a variety of structural supports. The mounting yoke shall be of welded construction and made from low carbon A36 steel no less than 3/16" (0.5 cm) thick, per ASTM A36, and be powder coated for appearance and resistance to corrosion. No mounting hardware substitutions, including cast aluminum, are acceptable.
  13. All mounting bolts shall be SAE Grade 8 or equivalent.
  14. The fan hub shall be made of precision cut aluminum for high strength and light weight. The hub shall consist of two (2) aluminum plates, ten (10) aluminum spars and one (1) aluminum spacer fastened with a pin and collar rivet system.
  15. The hub shall be secured to the output shaft of the gearbox by means of (10) high strength bolts. The hub shall incorporate five (5) safety retaining clips made of 1/4" (0.6 cm) thick steel that shall restrain the hub/airfoil assembly.
  16. The fan shall be equipped with a safety cable that provides an additional means of securing the fan assembly to the building structure. The safety cable shall be  $\varnothing 3/8$ " (1 cm) diameter and fabricated out of 7 x 19 zinc galvanized steel cable. The end loops shall be secured with swaged Nicopress® sleeves, pre-loaded and tested to 3,200 lbf (13,345 N).
  17. Field construction of safety cables is not permitted.
  18. The fan is equipped with a wall control providing 100% control of all fan functions. The wall control shall be a digital keypad device mounted within a cast zinc cover. The cover shall be capable of mounting to a standard switch box.
  19. Equipped with touchpad controls and an LED display for controlling the fan's direction, operation, speed, and programming. Communication between the fan VFD and wall control is by a standard CAT5 (or higher) Ethernet cable. The wall control comes standard with 150 ft of factory-assembled CAT5 Ethernet cable.
  20. Equipped with a simple diagnostic program to identify faults in the system. Provisions shall be made for retrieving fan operation and diagnostic data (fault messages) through the remote wall control.
  21. Includes a 10–30 VDC pilot relay for seamless fire control panel integration. The pilot relay can be wired Normally Open or Normally Closed in the field.
  22. Included for installations with extension tubes 4 ft (1.2 m) or longer to limit the potential for lateral movement.
- C. Manufacturer:
1. Big Ass Fans
  2. Macro Air
  3. Or equal

## 2.3 HANGERS & ATTACHMENTS

### A. Horizontal-Piping Hangers and Supports:

1. General: Except as otherwise indicated, provide factory-fabricated horizontal piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacture for each piping service. Select size of hangers and supports to exactly fit pip size for bare piping, and to insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
  - a. Adjustable Steel Clevises Hangers: MSS Type 1.
  - b. Steel Pipe Clamps: MSS Type 4.
  - c. Pipe Slides and Slide Plates: MSS Type 35, including one of the following plate types:
    - 1) Plate: Unguided type.
    - 2) Plate: Guided type.
    - 3) Plate: Hold-down clamp type.
  - d. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
  - e. Pipe Stanchion Saddles: MSS Tube 37, including steel pip base support and cast-iron floor flange.
  - f. Adjustable Pipe Saddle Supports: MSS Type 38, including steel pipe base support and cast-iron floor flange.
  - g. Single Pipe Rolls: MSS Type 41.
  - h. Adjustable Roller Hangers: MSS Type 43.
  - i. Pipe Roll Stands: MSS Type 44.
  - j. Pipe Rolls and Plates: MSS Type 45.
  - k. Adjustable Pipe Roll Stands: MSS Type 46.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
  - a. Carpenter and Patterson, Inc.
  - b. Corner & Lada Co., Inc.
  - c. Elcen Metal Products Co.
  - d. Fee & Mason Mfg. Co.; Div. Figgie International
  - e. ITT Grinnel Corp.
  - f. Or approved equal

B. Vertical-Piping Clamps:

1. General: Except as otherwise indicated, provide factory-fabricated vertical-piping clamps, complying with MSS SP-58, of one of the following types listed, selected by Installer to suit vertical piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Select size of vertical piping clamps to exactly fit pipe size of bare pipe. Provide copper-plated clamps for copper-piping systems.
  - a. Two-Bolt Riser Clamps: MSS Type 8.
  - b. Four-Bolt Riser Clamps: MSS Type 42.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
  - a. Carpenter and Patterson, Inc.
  - b. Corner & Lada Co., Inc.
  - c. Elcen Metal Products Co.
  - d. Fee & Mason Mfg. Co.; Div. Figgie International
  - e. ITT Grinnel Corp.
  - f. Or approved equal

C. Hanger-Rod Attachments:

1. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-pipe hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
  - a. Steel Turnbuckles: MSS Type 13.
  - b. Swivel Turnbuckles: MSS Type 15.
  - c. Malleable Iron Sockets: MSS Type 16.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
  - a. Carpenter and Patterson, Inc.
  - b. Corner & Lada Co., Inc.
  - c. Elcen Metal Products Co.
  - d. Fee & Mason Mfg. Co.; Div. Figgie International
  - e. ITT Grinnel Corp.
  - f. Or approved equal

D. Building Attachments:

1. General: Except as otherwise indicate, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
  - a. Concrete Inserts: MSS Type 18.
  - b. Top Beam C-Clamp: MSS Type 19.
  - c. Side Beam or Channel Clamps: MSS Type 20.
  - d. Center Beam Clamps: MSS Type 21.
  - e. Welded Beam Attachments: MSS Type 22.
  - f. C-Clamps: MSS Type 23.
  - g. Top Beam Clamps: MSS Type 25.
  - h. Side Beam Clamps: MSS Type 27.
  - i. Steel Beam Clamps W/Eye Nut: MSS Type 28.
  - j. Linked Steel Clamps W/Eye Nut: MSS Type 29.
  - k. Malleable Beam Clamps: MSS Type 30.
  - l. Steel Brackets: One of the following for indicated loading:
    - 1) Light Duty: MSS Type 31.
    - 2) Medium Duty: MSS Type 32.
    - 3) Heavy Duty: MSS Type 33.
  - m. Side Beam Brackets: MSS Type 34.
  - n. Plate Lugs: MSS Type 57.
  - o. Horizontal Travelers: MSS Type 58.
2. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
  - a. Carpenter and Patterson, Inc.
  - b. Corner & Lada Co., Inc.
  - c. Elcen Metal Products Co.
  - d. Fee & Mason Mfg. Co.; Div. Figgie International
  - e. ITT Grinnel Corp.
  - f. Or approved equal

E. Saddles and Shields:

1. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
2. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
3. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
4. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
  - a. Elcen Metal Products Co.
  - b. Pipe Shields, Inc.
  - c. Carpenter Patterson, Inc.
  - d. ITT Grinnel Corp.
  - e. Or approved equal

F. Miscellaneous Materials:

1. Metal Framing: Provide products complying with NEMA STD ML 1.
2. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A 36.
3. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.
4. Heavy Duty Steel Trapezes: Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.
5. Pipe Guides: Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

## 2.4 MECHANICAL IDENTIFICATION

A. Plastic Pipe Markers:

1. Snap-On Type: Provide manufacturer's standard pre-printed, semi-rigid snap-on, color-coded pipe markers, complying with ANSI A13.1
2. Insulation: Furnish 1" thick molded fiberglass insulation with jacket for each plastic pipe marker to be installed on uninsulated pipes subjected to fluid temperatures of 125EF (52EC) or greater. Cut length to extend 2" beyond each end of plastic pipe marker.

3. Small Pipes: For external diameters less than 6" (including insulation if any), provide full-band pipe markers, extending 360 degrees around pipe at each location, fastened by one of the following methods:
  - a. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
  - b. Adhesive lap joint in pipe marker overlap.
  - c. Laminated or bonded application of pipe marker to pipe (or insulation).
  - d. Taped to pipe (or insulation) with color-coded plastic adhesive tape, not less than 3/4" wide; full circle at both ends of pipe marker, tape lapped 1-1/2".

B. Valve Tags:

1. Brass Valve Tags: Provide 19-gage polished brass valve tags with stamp-engraved piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 5/32" hole for fastener.
  - a. Provide 1-1/2" diameter tags, except as otherwise indicated.
  - b. Provide size and shape as specified or scheduled for each piping system.
  - c. Fill tag engraving with black enamel.
2. Valve Tag Fasteners: Provide manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

C. Valve Schedule Frames:

1. General: For each page of valve schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSB-grade sheet glass.

D. Plastic Equipment Markers:

1. General: Provide manufacturer's standard laminated plastic, color-coded equipment markers. Conform to the following color code:
  - a. Green: Cooling equipment and components.
  - b. Yellow: Heating equipment and components.
  - c. Yellow/Green: Combination cooling and heating equipment and components.
  - d. Blue: Equipment and components that do not meet any of the above criteria.
2. Nomenclature: Include the following, matching terminology on schedules as closely as possible:
  - a. Name and plan number.
  - b. Equipment service.
  - c. Design capacity.
    - 1) Other design parameters such as pressure drop, entering and leaving conditions, rpm, etc.

3. Size: Provide approximate 2-1/2" x 6" markers for each piece of equipment.
4. Application: Provide equipment labels for the following equipment:
  - a. Exhaust Fans
  - b. Ductless Heating and Cooling Units

## **2.5 MECHANICAL INSULATION**

### **A. Piping Insulation Materials:**

1. Fiberglass Piping Insulation: ASTM C 547, Class 45 required.
  - a. Class 1 for use to 450 degrees F; Class 2 for use to 650 degrees F; Class 3 for use to 1200 degrees F.
    - 1) Flexible Unicellular Piping Insulation: ASTM C 534, Type as required.
  - b. Type I - tubular; Type II - sheet. For use between -40 degrees F and 200 degrees F.
    - 1) Jackets for piping Insulation: ASTM C 921, with vapor barrier for piping with temperatures below ambient.
    - 2) Encase pipe fittings insulation with one-piece pre-molded PVC fitting covers, fastened as per manufacturer's recommendations.
    - 3) Encase straight pipe insulation, where exposed in occupied areas, with one piece 20-mil thick PVC Jacketing. Fasten and seal as per manufacturer's recommendations.
    - 4) Staples, Bands, Wires and Cement: As recommended by insulation manufacturer for applications indicated.
    - 5) Adhesives, Sealants and Protective Finishes: As recommended by insulation manufacturer for applications indicated.

### **B. Piping Insulation Application and Thickness:**

1. Application: Cold Piping (40 Degrees F to Ambient):
  - a. Insulate the following cold HVAC piping systems:
    - 1) HVAC make-up water piping.
    - 2) Air conditioner condensate drain piping.
    - 3) Refrigerant liquid and suction piping.
  - b. Insulate each piping system specified above with the following type and thicknesses of insulation with vapor barrier:
    - 1) Fiberglass: 1 1/2" thickness for all pipe sizes.
  - c. Flexible Unicellular: (Refrigerant piping only) 1" thick for pipes sizes up to 1-1/2" (largest size permitted).



- d. All refrigerant and condensate piping installed outside of the building shall be installed in a UV resistant PVC enclosure sealed water tight similar to Slim Duct, Line Hyde, or approved equal.
- e. All refrigerant and condensate piping installed inside the building shall be installed in a Protective PVC enclosure similar to Slim Duct, Line Hyde, or approved equal.

## **2.6 EXTRUDED ALUMINUM RAIN RESISTANT WALL LOUVERS**

### **A. AIR Construction Requirements**

- 1. Louvers shall be model EHH-401 as manufactured by Greenheck, or an approved equal. Louver frame shall be 4 inch deep channel style with 0.081 inch extruded aluminum wall thickness. Louver blades shall be horizontal stationary style located on approximate 2 inch centers with 0.081 inch extruded aluminum wall thickness. Bird screen shall be internally mounted 0.75 inch x 0.051 inch flattened expanded aluminum. Finish of all materials shall be mill only. The Louvers shall be AMCA certified louvers

### **B. Performance Requirements**

- 1. Louvers shall be AMCA Licensed when tested in accordance with AMCA 500-L Air Performance and Water Penetration test procedures. Free area for size 48 inch x 48 inch louver shall not be less than 6.72 square feet (42%). Airflow resistance at 1000 feet per minute free area intake velocity shall not be greater than 0.19 inch water gauge pressure drop. Airflow resistance at 1000 feet per minute free area exhaust velocity shall not be greater than 0.2 inch water gauge pressure drop. Beginning point of water penetration is above 1250 feet per minute free area intake velocity.
- 2. Louvers shall be designed and manufactured to withstand a minimum 25 pound per square foot wind load.

### **C. Provide the following Manufacturer's Options:**

- 1. 70% Kynar Paint (AAMA 2605)
- 2. Clear Anodize (204-R1 Class II, or 215-R1 Class I)
- 3. Clip angles
- 4. 0.5 inch x 0.047 inch square stainless steel wire cloth bird screen

## 2.7 REFRIGERANT PIPING

- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for refrigeration piping where applicable; base pressure rating on refrigerant piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in refrigerant piping systems. Where more than one type of materials and products are indicated, selection is Installer's option.
- B. Material: Provide pipes and pipe fittings in accordance with the following listing:
  - 1. Tube Size 4-1/8" and Smaller: Copper tube; Type ACR, hard-drawn temper; wrought-copper, solder-joint fittings; brazed joints.
- C. Soldered Joints: Solder joints using silver-lead solder, ASTM B32, Grade 96 TS.
- D. Brazed Joints: Braze joints using American Welding Society (AWS) classification BCuO-4 for brazing filler metal.
- E. Piping Specialties: Provide piping specialties complying with Division-23 "Hydronic Piping" in accordance with the following listing:
  - 1. Pipe escutcheons.
  - 2. Drip pans.
  - 3. Sleeves.
  - 4. Sleeve seals.
- F. Refrigerant Valves and Accessories: Special valves required for refrigerant piping include the following types.
  - 1. Globe Shutoff Valves: Forged brass, packed, back seating, winged seal cap, 300 degrees F (149 degrees C) temperature rating, 500 psi working pressure. Provide shut-off valves at all terminal units and equipment for services.
  - 2. Check Valves: Forged brass, accessible internal parts, soft synthetic seat, fully guided piston and stainless steel spring, 250 degrees F (121 degrees C) temperature rating, 500 psi working pressure.
  - 3. Manufacturer: Subject to compliance with requirements, provide globe and check valves of one of the following:
    - a. Henry Valve CO.
    - b. Parker Hannifin Corp.; Refrigeration & Air Cond. Div.
    - c. Sporlan Valve Co.
    - d. Or approved equal

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

4. 2-Way Solenoid Valves: Forged brass, designed to conform to ARI 760, normally closed, teflon valve seat, NEMA 1 solenoid enclosure, 24 volt, 60 Hz., UL-listed, ½” conduit adapter, 250 degrees F (121 degrees C) temperature rating, 400 psi working pressure.
5. Manufacturer: Subject to compliance with requirements, provide solenoid valves of one of the following:
  - a. Alco Controls Div.; Emerson Electric Co.
  - b. Automatic Switch Co.
  - c. Sporland Valve CO.
  - d. Or approved equal
6. Refrigerant Strainers: Brass shell and end connections, brazed joints, monel screen, 100 mesh, UL-listed, 350 psi working pressure.
7. Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL-listed, 200 degrees F (93 degrees C) temperature rating, 500 psi working pressure.
8. Refrigerant Filter-Driers: Steel shell, ceramic fired desiccant core, solder connections, UL-listed, 500 psi working pressure.
9. Refrigerant Filter-Driers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron coverplate with steel cap screws, replaceable filter-drier core, 500 psi working pressure.
10. Evaporator Pressure Regulators: Provide corrosion-resistant, spring loaded, stainless steel springs, pressure operated, evaporator pressure regulator, in size and working pressure indicated, with copper connections.
11. Refrigerant Discharge Line Mufflers: Provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL-listed.
12. Manufacturer: Subject to compliance with requirements, provide refrigeration accessories of one of the following:
  - a. Alco Controls Div.; Emerson Electric CO.
  - b. Henry Valve CO.
  - c. Parker-Hannifin Corp.; Refrigeration & Air Conditioning Div.
  - d. Sporlan Valve Co.
  - e. Or approved equal

## 2.8 TERMINAL HEATING UNITS (ELECTRIC)

### A. Electric Propeller Unit Heaters (UH)

1. Materials and Equipment:
  - a. General: Except as otherwise indicated, provide manufacturer's standard electric propeller unit heater materials and components as indicated by published product information, designed and constructed as recommended by manufacturer, and as required for a complete installation.
2. Heating Elements:
  - a. General: Except as otherwise indicated, provide manufacturer's standard heating elements of types, sizes, capacities, and ratings for duty indicated; consisting of resistance elements in steel sheath with extended fins, or with spirally finned sheath.
  - b. Heating Capacity: Size elements for indicated fan speed, CFM, room heating load (BTUH), entering air temperature, and electric inputs (watts, voltage, phase).
3. Casings:
  - a. General: Provide casings braced and reinforced to provide required stiffness, and with adjustable heating element supports and brackets. Provide rounded corners. Phosphatize and paint casings inside and out with single coat of baked-on enamel; and zinc plate hardware. Include fan orifice (venturi) in casing, as well as threaded hanger connections (weld nuts). Fabricate from 18-gage galvanized steel.
4. Air Deflectors:
  - a. General: Provide manufacturer's standard air deflectors of the following types:
    - 1) 4-way finned louvers.
    - 2) Cone diffusers.
    - 3) Vane outlets.
    - 4) Louver outlets.
5. Motors:
  - a. General: Provide totally enclosed shaded-pole, or permanent-split capacitor motors, Class "B" insulation, resiliently mounted, tap wound with built-in thermal overload protection, and with sleeve type or permanently lubricated ball bearings.
  - b. Internal Electrical Wiring: Provide units with high temperature, heat-resistant electrical wiring enclosed in flexible metal conduit extending from terminal junction box to electrical devices. Provide fusing for motor and control circuit wiring.

- c. Devices: Provide propeller unit heaters with the following devices:
  - 1) Thermally activated fan switch to keep fan motor operating until residual heat is dissipated.
  - 2) Disconnect switch.
  - 3) Automatic reset, high limit cut-out switch located in discharge air stream.
  - 4) Magnetic contractor.
  - 5) Transformer.
- 6. Fans:
  - a. General: Provide aluminum propeller fans which are balanced statically and dynamically, of indicated capacity. Provide fans suitable for standard or sparkproof application.
- 7. Manufacturers: Subject to compliance with requirements, provide propeller unit heaters of one if the following:
  - a. Chromalox Div.; Emerson Electric Co.
  - b. Federal Pacific Electric Co.
  - c. Gould Inc.
  - d. Markel Nuton Div.; Scoville Inc.
  - e. TPI Corporation.
  - f. Or approved equal

## **2.9 HEAT PUMP UNITS**

- A. Evaporator:
  - 1. General: The unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board, and fan motor. The unit in conjunction with the wired, wall mounted controller shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry nitrogen before shipment from factory.
  - 2. Cabinet: The casing shall be ABS plastic factory finish. Cabinet shall be designed for suspension mounting and horizontal operation. The rear cabinet panel shall have provisions for a field installed filtered outside air intake connection.
  - 3. Fan: The evaporator fan shall have three high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of four (4) speeds: Low, M1, M2 and Hi.

4. Vane: There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall provide a choice of five (5) vertical airflow patterns selected by remote control. There shall also be a set of vertical vanes to provide horizontal swing airflow movement selected by remote control.
5. Filter: Return air shall be filtered by means of an easily removable washable filter.
6. Coil: The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.
7. Control: The control system shall consist of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. Field wiring shall run directly from the indoor unit to the wall mounted controller with no splices. For A-Control, a three (3) conductor 14 ga. AWG wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units. Where separate power is supplied to the indoor and outdoor units, a two (2) 20 ga. AWG wire shall be run between the units to provide forbidirectional control communication. The system shall be capable of automatic restart when power is restored after power interruption. The system shall have self-diagnostics ability, including total hours of compressor run time. Diagnostics codes for indoor and outdoor units shall be displayed on the wired controller panel. DCU systems shall be capable of remote monitoring or alarm notification via text/email.

B. Condensing:

1. General: The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all necessary operation functions. The outdoor unit shall be capable of operating at 0°F, (-18°C) ambient temperature without additional low ambient controls. The outdoor unit shall be able to operate with a maximum height difference of 100 feet and have maximum refrigerant tubing length of 165 feet between indoor and outdoor units without the need for line size changes, traps or additional oil. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.
2. Cabinet: The casing shall be constructed from galvanized steel plate, coated with a finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a factory finish. The fan grille shall be of ABS plastic.
  - a. Outdoor unit shall seacoast protective coating by the equipment manufacturer

3. Fan: The fan motor shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and expelling it through the front. The fan shall be provided with a raised guard to prevent contact with moving parts.
4. Coil: The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be controlled by a microprocessor controlled step motor.
5. Compressor: The compressor shall be a scroll compressor with variable speed inverter technology. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which results in vast energy savings. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be intermittently applied to the compressor motor to maintain enough heat. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.
6. Electrical: The electrical power of the unit shall be as indicated on the drawings. The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.
7. Manufacturer: Subject to compliance with requirements, provide heat pumps shall be of one of the following:
  - a. Mitsubishi Equipment
  - b. LG
  - c. Greenheck Fan Corp.
  - d. Toshiba Carrier
  - e. Or approved equal

## **2.10 POWER AND GRAVITY VENTILATORS**

- A. General: Except as otherwise indicated, provide standard prefabricated power and gravity ventilator units of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation.
- B. Refer to Division-23 automatic temperature control for control sequence.

C. Roof Fans:

1. Type: Centrifugal fan, direct or belt driven as scheduled. Provide aluminum, or galvanized steel, weatherproof housings as scheduled. Provide square base to suit roof curb. Provide permanent split-capacitor type motor for direct driven fans; capacitor-start, induction-run type motor for belt driven fans. Fan shall have seacoast protective coating by the equipment manufacturer.
2. Electrical: Provide factory-wired non-fusible type disconnect switch at motor in fan housing. Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection.
3. Bird Screens: Provide removable bird screens, 1/2" mesh, 16-ga. aluminum or brass wire.
4. Gravity Operated Dampers: Provide gravity-actuated, felt edge, louvered dampers in curb bases.
5. Manufacturer: Subject to compliance with requirements, provide centrifugal roof ventilators of one of the following:
  - a. Carnes Co., Div. of Wehr Corp.
  - b. Cook Co., Loren.
  - c. Greenheck Fan Corp.
  - d. Penn Ventilator Co., Inc.
  - e. Power Line Fans; Div. of Torin Corp.
  - f. Or approved equal

D. Prefabricated Roof Curbs:

1. Manufacturer of ventilating unit shall provide his standard roof curb compatible with unit being provided. Curb shall be insulated and sloped to allow for level installation of device. Provide all necessary nailers, cants, etc. for a complete installation.

## 2.11 METAL DUCTWORK

A. Ductwork Materials:

1. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections including piping, seam marks, roller marks, stains and discolorations, and other imperfections, including those which would impair painting.
2. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lock forming quality, with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations.



3. Aluminum Sheet: In Locker Room areas and dishwasher exhaust provide aluminum sheet complying with ASTM B 209, Alloy 3003, Temper H14. Dishwasher exhaust shall have all seams soldered vapor tight.

B. Miscellaneous Ductwork Materials:

1. General: Provide miscellaneous materials and products of types and sizes indicated and, where not otherwise indicated, provide type and size required to comply with ductwork system requirements including proper connection of ductwork and equipment.
2. Fittings: Provide radius type fittings fabricated of multiple sections with maximum 15 degree change of direction per section. Unless specifically detailed otherwise, use 45 degree laterals and 45 degree elbows for branch takeoff connections. Where 90 degree branches are indicated, provide conical type tees.
3. Duct Liner: Fibrous glass, complying with Thermal Insulation Manufacturers Association (TIMA) AHC-101; of thickness indicated on the drawings.
4. Duct Liner Adhesive: Comply with ASTM C 916 "Specification for Adhesives for Duct Thermal Insulation".
5. Duct Liner Fasteners: Comply with SMACNA HVAC Duct construction Standards, Article S2.11.
6. Duct Sealant: Non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation details, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork.
7. Ductwork Support Materials: Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.
  - a. For exposed stainless steel ductwork, provide matching stainless steel support materials.
  - b. For aluminum ductwork, provide aluminum support materials except where materials are electrically separated from ductwork.
8. Flexible Ducts: Corrugated aluminum complying with UL 181.
  - a. Where installed in unconditioned spaces other than return air plenums, provide 1" thick continuous flexible fiberglass sheath with vinyl vapor barrier jacket.

C. Fabrication:

1. Shop fabricated ductwork in 4, 8, 10 or 12-ft lengths, unless otherwise indicated or required to complete runs. Preassembled work in shop to greatest extent possible, so as to minimize field assembly of systems. Disassemble systems only to extent necessary for shipping and handling. Match-mark sections for reassembly and coordinated installation.

2. Shop fabricated ductwork of gages and reinforcement complying with SMACNA "HVAC Duct Construction Standards".
  3. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Except as otherwise indicated, fabricate elbows with center-line radius equal to 1-1/2 times associated duct width; or squared metered elbows with double thickness turning vanes. Limit angular tapers to 30 degrees for contracting tapers and 20 degrees for expanding tapers.
  4. Fabricate ductwork with accessories installed during fabrication to the greatest extent possible. Refer to section "Ductwork Accessories" for accessory requirements.
  5. Fabricate ductwork with duct liner in each section of duct where indicated. Laminate liner to internal surfaces of duct in accordance with instructions by manufacturers of lining and adhesive, and fasten with mechanical fasteners.
- D. Factory-Fabricated Low Pressure Round And Oval Ductwork:
1. General: Provide factory-fabricated duct and fittings.
  2. Material: Material type shall be as indicated or, galvanized sheet steel complying with ASTM A 527, lock forming quality, with ASTM A 525, G90 zinc coating, mill phosphatized.
  3. Gage: 28-gage minimum for round and oval ducts and fittings, 4" through 24" diameter.
  4. Seams: All seams shall be spiral lock seams.
  5. Elbows: One piece construction for 90 degrees and 45 degree elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.
  6. Divided flow Fittings: 90 degree tees, constructed with saddle tap spot welded and bonded to duct fitting body.
  7. Manufacturers: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following:
    - a. Semco Mfg., Inc.
    - b. United Sheet Metal Div., United McGill Corp.
    - c. Or approved equal

## 2.12 DUCTWORK ACCESSORIES

- A. Dampers:
1. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct construction Standards".

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

2. Automatic Control Dampers: Refer to Division-23 section "Automatic Temperature Control" for control dampers; not work of this section.
  3. Backdraft Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at .05" static pressure. Construct blades of 16-ga. aluminum, provide 1/2" diameter ball bearings, 1/2" diameter steel axles spaced on 9" centers. Construct from 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under: 4" x 1-1/4" x 16 ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up. Provide felted or rubber trim to assure tight, leak-proof seal when closed.
  4. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
    - a. Air Balance, Inc.
    - b. Airgarde Corp.
    - c. American Warming & Ventilating, Inc.
    - d. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
    - e. Louvers & Dampers, Inc.
    - f. Penn Ventilator Co.
    - g. Ruskin Mfg. Co.
    - h. Or approved equal
- B. Fire Dampers:
1. Fire Dampers: Provide fire dampers, of types and sizes indicated. Construct casings of 11-ga. galvanized steel. Provide fusible link rated at 160 to 165 degrees F (71 to 74 degrees C) unless otherwise indicated. Provide owner with a spare fusible link for each damper. Provide out of air stream type damper in open position and with positive lock in closed position, and with the following additional features:
    - a. Damper Blade Assembly: Curtain type.
    - b. Blade Material: Steel, match casing.
    - c. Blade Material: Stainless steel.
  2. Motor-Driven Fire/Smoke Dampers: Provide line voltage motor-driven fire/smoke dampers in types and sizes indicated on drawings, with casing constructed of 11-ga. galvanized steel with bonded red acrylic enamel finish, fusible link 160 to 165 degrees F (71 to 74 degrees C), unless otherwise indicated, and curtain type stainless steel interlocking blades, with electric motor equipped with instant closure clutch, stainless steel cable damper blade linkage, motor mounting bracket, and 32" long wire leads for connecting to smoke detector, and with the following construction features:
    - a. Unit Assembly: Motor mounted outside air stream.

3. Manufacturer: Subject to compliance with requirements, provide fire dampers of one of the following:
    - a. Air Balance, Inc.
    - b. American Warming & Ventilating, Inc.
    - c. Arrow Louver and Damper; Div. of Arrow United industries, Inc.
    - d. Louvers & Dampers, Inc.
    - e. Penn Ventilator Co.
    - f. Phillips-Aires
    - g. Ruskin Mfg. Co.
    - h. Or approved equal
- C. Turning Vanes:
1. Manufactured Turning Vanes: Provide double thickness airfoil turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c, and set into side strips suitable for mounting in ductwork.
  2. Manufacturer: Subject to compliance with requirements, provide turning banes of one of the following:
    - a. Aero Dyne Co.
    - b. Airsan Corp.
    - c. Anemostat Products Div.; Dynamics Corp. of America.
    - d. Barber-Colman Co.
    - e. Duro Dyne Corp.
    - f. Environmental Elements Corp.; Subs, Koppers Co., Inc.
    - g. Hart & Cooley Mfg. Co.
    - h. Register & Grille Mfg. Co., Inc.
    - i. Souther, Inc.
    - j. Or approved equal
- D. Duct Hardware:
1. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
    - a. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.

- b. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.
  2. Manufacturer: Subject to compliance with requirements. Provide duct hardware of one of the following:
    - a. Ventfabrics, Inc.
    - b. Young Regulator Co.
    - c. Or approved equal
- E. Duct Access Doors:
  1. General: Provide duct access doors of a size as required to service and maintain device in duct. Provide on (1) access door at each control damper, humidifier, coil, fire damper, and any device that requires attention.
  2. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one side hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.
  3. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:
    - a. Air Balance, Inc.
    - b. Duro Dyne Corp.
    - c. Register & Grille Mfg. Co., Inc.
    - d. Ruskin Mfg. Co.
    - e. Ventfabrics, Inc.
    - f. Zurn Industries, Inc.; Air Systems Div.
    - g. Or approved equal
- F. Flexible Connectors:
  1. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibration of connected equipment.
  2. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:
    - a. American/Elgen Co.; Energy Div.

- b. Duro Dyne Corp.
- c. Flexaust (The) Co.
- d. Ventfabrics, Inc.
- e. Or approved equal

## **2.13 AIR OUTLETS AND INLETS**

### **A. Ceiling Air Diffusers:**

1. **General:** Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation. Stamped face diffusers will not be acceptable.
2. **Performance:** Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw, drop and noise criteria ratings for each size device as listed in manufacturer's current data.
3. **Ceiling Compatibility:** Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.
4. **Types:** Provide ceiling diffusers of type, capacity, throw, blow and with accessories as listed on diffuser schedule.
  - a. Ceiling Diffusers shall be of the restricted multi-orifice jet induction and air mixing type consisting of louver sections with built-in diffusing vanes. The vanes shall be arranged to discharge air from adjacent louvers at an angle of 45 degrees in opposite directions to insure rapid mixing of primary and room air. Diffusing vanes shall be welded and mechanically fastened to the adjacent louver sections to make a rigid unit. The vanes shall extend to the discharge edges of the louvers. Where louver sections join the core frame, the louver ends shall be welded to the core frame. The leading edge of each louver shall be hemmed and the louver ends shall be rounded and hemmed before welding to the core frames.
  - b. Diffusers shall be fabricated of aluminum or steel-welded construction, and shall be provided with a removable core permitting easy access to the neck connection. The diffuser neck shall extend no less than 1" above the core to accommodate an internal duct connection to prevent leakage into the ceiling space.
  - c. Finish shall be baked enamel. Color as selected by A/E.

- d. Diffusers shall be steel of the fixed louvered face type with a minimum of four vaned assemblies. The louvered face shall be removable. The diffuser neck shall be sized to fit outside of the duct. Access to damper adjustment shall be provided through the face of the diffuser.
- e. Diffusers shall be finished with a baked enamel color as selected by A/E.
- 5. Diffuser Dampers:
  - a. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of diffuser. Provide in each ceiling diffuser.
- 6. Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
  - a. Price
  - b. Metalaire – “5000 IV”
  - c. Titus
  - d. Or approved equal
- B. Wall Registers And Grilles:
  - 1. General: Except as otherwise indicated, provide manufacturer's standard registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
  - 2. Performance: Provide registers and grilles that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device and listed in manufacturer's current data.
  - 3. Compatibility: Provide registers and grilles with border styles that are compatible with adjacent systems, and that are specifically manufactured to fit into wall and ceiling construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of construction which will contain each type of register and grille.
  - 4. Types: Provide registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule:
  - 5. Pattern: Register and grille patterns shall have style as identified on Drawings:
  - 6. Dampers: Opposed Blade adjustable assembly, key operated from face of register.
  - 7. Accessories:
    - a. Plaster Frame: Perimeter frame designed to act as plaster stop and register or grille anchor. Provide where required.
    - b. Operating Keys: Tools designed to fit through register or grille face and operate volume control device and/or pattern adjustment.
  - 8. Finish: Register and Grille Finishes shall be baked enamel color as selected by the Architect.

9. Manufacturer: Subject to compliance with requirements, provide registers and grilles of one the following:
  - a. Price
  - b. Carnes Co.
  - c. Titus Products Div.; Philips Industries, Inc.
  - d. Or approved equal

C. CEILING REGISTERS AND GRILLES:

1. General: Except as otherwise indicated, provide manufacturer's standard "Egg-Crate" type registers and grilles where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.
2. Compatibility: Provide registers and ceiling grilles with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling construction.
3. Types: Provide registers and grilles of type, capacity, and with accessories and finishes as listed on register and grille schedule.
4. Register and Grille Materials:
  - a. Aluminum Construction: Manufacturer's standard extruded aluminum frame and core.
5. Register and Grille Faces:
  - a. 1/2" x 1/2" "Egg-Crate" with 1" border frame.
6. Register and Grille Dampers:
  - a. Opposed Blade: Adjustable opposed blade damper assembly, key operated from face of register (provide for registers only).
7. Register and Grille Finishes shall be baked enamel color as selected by the Architect.
8. Manufacturer: Subject to compliance with requirements, provide registers and grilles of one of the following:
  - a. Price
  - b. Carnes Co.
  - c. Titus Products Div.; Philips Industries, Inc.
  - d. Or approved equal





3. Masonry Construction Acudor UF-5000
4. Fire Rated Construction Acudor FB-5060

D. Access Door Shop Drawings shall be submitted to the Architect for approval.

## **2.16 FIRESTOPPING AND SEALANTS**

### **A. General**

1. All firestop products and systems shall be designed and installed so that the basic sealing system will allow the full restoration of the thermal and fire resistance properties of the barrier being penetrated with minimal repair if penetrants are subsequently removed. For applications where combustible penetrants are involved, i.e. insulated and plastic pipe, a suitable intumescent material must be used.
2. This section specifically addresses pipe, duct, cable, and wiring penetrations of fire wall firestops and smoke stops for all bearing and non-bearing walls and floors assemblies.

### **B. References**

1. American Society For Testing and Materials Standards (ASTM):
  - a. ASTM E 814: Standard Test method For Fire Tests of Through-Penetration Firestops
  - b. ASTM E84: Standard Test Method For Surface Burning Characteristics of Building Materials
2. Underwriters Laboratories Inc.:
  - a. UL 1479 Fire Tests of Through-Penetration Firestops
  - b. UL 723 Surface Burning Characteristics of Building Materials
3. UL Fire Resistance Directory:
  - a. Through Penetration Firestop Device (XHJI)
  - b. Fire Resistive Ratings (BXUV)
  - c. Through Penetration Firestop Systems (XHEZ)
  - d. Fill, Void, or Cavity Material (XHHW)

### **C. Definitions**

1. Firestopping: The use of a material or combination of materials in a fire-rated structure (wall or floor) where it has been breached, so as to restore the integrity of the fire rating on that wall or floor.
2. System: The use of a specific firestop material or combination of materials in conjunction with a specific wall or floor construction type and a specific penetrant(s), constitutes a "System".

3. Barrier: Any bearing or non-bearing wall or floor that has an hourly fire and smoke rating.
4. Through-Penetration: Any penetration of a fire-rated wall or floor that completely breaches the barrier.
5. Membrane-Penetration: Any penetration in a fire-rated wall that breaches only one side of the barrier.
6. Construction Gaps: Any gap, joint, or opening, whether static or dynamic, where the top of a wall may meet a floor; wall to wall applications, edge to edge floor configurations; floor to exterior wall; or any linear breach in a rated barrier. Where movement is required, the firestopping system must comply with UL2079 for dynamic joints.

D. Quality Assurance

1. Firestopping systems (materials and design):
  - a. Shall conform to both Flame (F) and Temperature (T) ratings as required by local building codes and as tested by nationally accepted test agencies per ASTM E814 or UL 1479 fire tests in a configuration that is representative of field conditions.
  - b. The F rating must be a minimum of one (10 hour but not less than the fire resistance rating of the assembly being penetrated. T rating when required by code authority shall be based on measurement of the temperature rise on penetrating item(s). the fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
  - c. For joints, must be tested to UL2079 with movement capabilities equal to those of the anticipated conditions.
2. Firestopping materials and systems must be capable of closing or filling through openings created by 1) the burning or melting of combustible pipes, cable jacketing, or pipe insulation materials, or 2) deflection of sheet metal due to thermal expansion (electrical & mechanical duct work).
3. Firestopping material shall be asbestos and lead free and shall not incorporate nor require the use of hazardous solvents.
4. Firestopping sealants must be flexible, allowing for normal pipe movement.
5. Firestopping materials shall not shrink upon drying as evidenced by cracking or pulling back from contact surfaces.
6. Firestopping materials shall be moisture resistant, and may not dissolve in water after curing.
7. All firestopping materials shall be manufactured by one manufacturer (to the maximum extent possible).
8. Installation of firestopping systems shall be performed by a contractor (or contractors) trained or approved by the firestop manufacturer.

9. Material used shall be in accordance with the manufacturer's written installation instructions.

E. Materials

1. Intumescent Firestop Sealants and Caulks:
  - a. STI SpecSeal S100 and S500 Sealant
  - b. 3M Fire Barrier Caulk CP25WB+
2. Latex Firestop Sealant:
  - a. STI SpecSeal LC150 Sealant
3. Silicone Firestop Sealants and Caulks:
  - a. STI SpecSeal Pensil 100 and 300
  - b. 3M Fire Barrier Silicone Sealants
4. Firestop Putty:
  - a. STI SpecSeal Firestop Putty Bars and Pads
  - b. 3M Fire Barrier Moldable Putty
5. Firestop Collars:
  - a. STI SpecSeal Firestop Collars
  - b. 3M Fire Barrier PPD's
6. Wrap Strips:
  - a. SpecSeal Wrap Strip
  - b. 3M Fire Barrier FS195 Wrap Strip
7. 2-Part Silicone Firestop Foam:
  - a. STI SpecSeal Pensil 200
  - b. 3M Fire Barrier 2001 Silicone Foam
8. Firestop Mortar:
  - a. STI SpecSeal Mortar
9. Composite Board:
  - a. 3M Barrier Sheet Material
    - 1) Accessories:
      - a) Forming/Damming Materials: Mineral Fiberboard or other type as per manufacturer recommendation.

**2.17 AUTOMATIC TEMPERATURE CONTROLS AUTOMATIC TEMPERATURE CONTROLS  
ELECTRIC/ELECTRONIC**

- A. The following incidental work shall be furnished by the designated contractor under the supervision of the control contractor.
1. The HVAC Contractor shall:
    - a. Install automatic valves and separable wells that are specified to be supplied by the control contractor.
    - b. Furnish and install all necessary valved pressure taps, water, drain and overflow connections and piping.
    - c. Provide, on magnetic starters furnished, all necessary auxiliary contacts, with buttons and switches in the required configurations.
  2. The sheetmetal contractor shall:
    - a. Install all automatic dampers.
    - b. Provide necessary blank-off plates (safing) required to install dampers that are smaller than duct size.
    - c. Assemble multiple section dampers with required interconnecting linkages and extend required number of shafts through duct for external mounting of damper motors.
    - d. Provide necessary sheetmetal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation and affix and seal permanently in place only after stratification problem has been eliminated.
    - e. Provide access doors at each automatic damper control equipment.
- B. Electric Wiring:
1. All electric wiring and wiring connections, either line voltage or low voltage, from the ATC related panels to the individual control devices i.e. valves, dampers, etc. required for the installation of the control system, as herein specified, shall be provided by the control contractor unless specifically shown on the electrical drawings or called for in the electrical specifications.
  2. The wiring installation shall be in accordance with National and Local Codes and with the Electrical portion of these specifications. All wiring shall be run concealed wherever possible. Exposed wiring in occupied areas shall be run in raceways. Raceways shall be Wiremold 200 series with all elbows, raceways, covers, mounting stops, box extensions and wiring for a complete and neat installation. All wiring located in mechanical spaces, boiler rooms, fan rooms, etc. shall be installed in metal conduit. 120 volt power source to control panels shall be provided by the electrical contractor.

3. All wiring above ceilings, in all mechanical spaces shall follow routing of piping and where not possible shall be in conduit. All exposed wire shall be bundled and wire tied and shall be supported to adjacent piping. Draped and free floating wire will not be allowed.
4. All terminations of wire at control devices shall be looped and supported adequately.
5. All wiring shall comply with the requirements of the electrical section of the specification.

C. Controls Systems Wiring

1. All conduit raceways, wiring, accessories and wiring connections required for the installation of the Controls Systems shall be provided by the Controls Contractor except as shown on the Electrical Trade documents. All wiring shall comply with the requirements of applicable portions of the Electrical Trade work and all local and national electric codes and the requirements of the AHJ.
  - a. All Controls Systems wiring materials and installation methods shall comply with the original equipment manufacturer recommendations and standards.
  - b. The sizing type and provision of cable, conduit, cable trays and raceways shall be the design responsibility of the Controls Contractor.
  - c. Class 2 Wiring
    - 1) All Class 2 (24VAC or less) wiring shall be installed in conduit unless otherwise specified.
  - d. Conduit is not required for Class 2 wiring in concealed accessible locations. Class 2 wiring not installed in conduit shall be supported every 5ft. from the building structure utilizing metal hangers designed for this application. Wiring shall be installed parallel to the building structural lines.
2. Class 2 signal wiring and 24VAC power may be run in the same conduit. Power wiring 120VAC and greater shall not share the same conduit with Class 2 signal wiring.
3. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
  - a. All circuits are continuous and free from short circuits and grounds.
  - b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megohms.
  - c. All circuits are free from induced voltages.
4. Provide complete testing for all cables and wiring. Provide all equipment, tools, and personnel as necessary to conduct these tests.

5. Provide for complete grounding of all signal and communication cables, panels and equipment so as to ensure integrity of Controls Systems operation. Ground cabling and conduit at panel terminations. Do not create ground loops.

D. Line Voltage Power Sources

1. 120-volt AC circuits for the Controls Systems shall be taken by the Controls Contractor from electrical trade panelboards and circuit breakers as designated on the electrical drawings. Control systems shall be powered by emergency power circuits.
2. Circuits used for the Controls Systems shall be dedicated to these Controls Systems and shall not be used for any other services.
3. Controls DDC terminal unit controllers may use 120-volt AC power from motor power circuits.

E. Controls Systems Raceways

1. All wiring shall be installed in conduit or raceway except as noted elsewhere in the Specification. Minimum conduit size 3/4".
2. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Architect.
3. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the supporting surface.
4. UL/ULC Listed Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls and for final connection to equipment.

F. Penetrations

1. Firestopping for all penetrations used by dedicated Controls Systems conduits and raceways shall be by other trades.
2. All openings in fire proofed or fire stopped components shall be closed by other trades using approved fire resistive sealant.
3. All wiring passing through penetrations, including walls, shall be in sleeves, conduit or enclosed raceway.
4. No penetrations through building structural elements, slabs, ceilings and walls shall be made before receipt of written approval from the Architect.

G. Controls Systems Identification Standards

1. Node Identification: All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node environmental location.

2. Cable shall be labeled at every termination with cross-referencing to record documentation.
  3. Raceway Identification: Exposed covers to junction and pull boxes of the FMS raceways shall be identified at primary points.
  4. Wire Identification: All low and line voltage wiring shall be identified by a number, as referenced to the associated shop and record drawing, at each termination.
  5. Wires and cabling shall not be spliced between terminations. Cable shields shall be single end grounded – typically at the panel end outside the panel.
  6. Suggested color coding, for use at the Contractors option, are:
    - a. Analog Input Cable            Yellow
    - b. Analog Output Cable        Tan
    - c. Binary Input Cable           Orange
    - d. Binary Output Cable        Violet
    - e. 24 VAC Cable                Gray
    - f. General Purpose Cable       Natural
    - g. Tier 1 Comm Cable           Purple
    - h. Other Tier Comm Cable       Blue
  7. Provide permanent identification labels at all valve and damper actuators to indicate open and closed positions.
- H. Field Panel And Device Installations And Locations
1. The Controls Systems panels, enclosures and cabinets shall be located as coordinated with the Architect at an elevation of not less than 2 feet from the bottom edge of the panel to the finished floor. Each cabinet shall be anchored per the manufacturer’s recommendations.
  2. All field devices shall be installed per the manufacturer recommendation and in accessible locations as coordinated with the Architect.
  3. Panels to be located in damp areas or areas subject to condensation shall be mounted with wall standoffs.
  4. Conduit configurations entering or leaving panels and devices shall be such as to preclude condensation traps.



Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- I. Dampers: Provide automatic control dampers as indicated, with damper frames not less than formed 13 ga galvanized steel. Provide mounting holes for enclosed duct mounting. Provide damper blades not less than formed 16 ga galvanized steel, with maximum blade width of 8". Equip dampers with motors, with proper rating for each application.
  - 1. Secure blades to 1/2" diameter zinc plated axles using zinc hardware. Seal off against spring stainless steel blade bearings. Provide blade bearings of nylon and provide thrust bearings at each end of every blade. Construct blade linkage hardware of zinc plated steel and brass. Submit leakage and flow characteristics, plus size schedule for controlled dampers.
  - 2. Operating Temperature Range: From 20 degrees to 200 degrees F ( 29 degrees to 93 degrees C).
  - 3. Provide parallel or opposed blade design (as selected by manufacturer's sizing techniques) with inflatable seal blade edging, or replaceable rubber seals, rated for leakage at less than 10 cfm sq. ft. of damper area, at differential pressure of 4" w.g. when damper is being held by torque of 50 inch pounds.
  
- J. Room Thermostats: (Appropriate thermostat determined by Sequence of Operation). AHU thermostats and DCU unit thermostats shall be furnished by AHU/DCU manufacturer and field installed by ATC Contractor. Electric Unit Heaters can have integrated thermostats. Electric radiant panels shall have wall mounted thermostats.
  - 1. Line Voltage On Off Thermostats: Provide thermostats of bi metal actuated open contact, or bellows actuated enclosed snap switch type, or equivalent solid-state type; UL listed at electrical rating comparable with application. Provide bimetal thermostats which employ heat anticipation. Equip thermostats which control electric heating loads directly, with Off position on dial wired to break ungrounded conductors.
  - 2. Low Voltage On Off Thermostats: Comply with general requirement indicated for line voltage thermostats. Provide thermostats of bimetal operated mercury switch type, with either adjustable or fixed universal anticipation heater.
  - 3. Low Voltage Modulating Thermostats: Provide potentiometer type, operated by vapor filled bellows.
  
- K. Clocks: Provide electronic time clocks specified as part of temperature control sequences, of 7 day, 24 hour type, with weekend or skip day features. Equipment time clocks with battery back-up to maintain time schedule in case of power failure.
  
- L. Electronic Sensors: Provide electronic temperature and relative humidity sensors of supersensitive resistance type, which are vibration and corrosion resistant, and of wall mounted immersion, duct mounting, averaging or bulb type as required for application.

- M. Damper Actuators: Provide direct or reverse acting proportional low voltage (24V) control (refer to sequence of operation). Units shall be provided with an integral helical spring to return motor shaft to normal position. Motor and gear train shall be oil-immersed. Select actuator to produce smooth unobstructed movement in a 30 to 60 second timing stroke.
1. Provide two-way, two position and modulating damper and valve actuators as required in the sequence of operation.
  2. Equip motors for outdoor locations and for outside air intakes with "O ring" gaskets designed to make motors completely weatherproof, and equip with internal heaters to permit normal operation at 40 degrees F ( 40 degrees C).
  3. Furnish non spring return motors for dampers larger than 25 sq. ft., and for valves larger than 2 1/2", sized for running torque rating of 150 inch pounds, and breakaway torque rating of 300 inch pounds. Size spring return motors for running torque rating 150 inch pounds, and breakaway torque rating of 150 inch pounds.
- N. Provide standard steel cabinets as required to contain temperature controllers, relays, switches, and similar devices, except limit controllers and other devices excluded in sequence of operations. Provide full enclosure cabinets, with painted gray finish.
- O. Touch screen interface:
1. Provide color LCD touch screen interface for building control system.
  2. Touch panel shall allow operators to monitor and control building HVAC systems.
  3. System shall allow operators to control and adjust HVAC system schedules and setpoints.
  4. Lifeguard/Ranger Station HVAC AHU System shall be capable of connecting to the internet and emailing the owner system alarms and capable of monitoring the system via the internet.
- P. Sequence of Operations:
1. Zoning is based on common exterior exposures and rooms of like usages.
  2. Refer to HVAC Control Diagram Drawings.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION OF HIGH VOLUME, LOW SPEED FANS**

- A. Fan location must have a typical bar joist or I-beam structure from which to mount the fan.
- B. Mounting structure must be able to support weight and operational torque of fan.
- C. Fan location must be free from obstacles such as lights, cables, or other building components.

- D. Check fan location for proper electrical requirements. Consult installation guide for appropriate circuit requirements.
- E. Each fan requires dedicated branch circuit protection.
- F. The fan shall be installed by a factory-certified installer according to the manufacturer's Installation Guide, which includes acceptable structural dimensions and proper sizing and placement of angle iron for bar joist applications.
- G. Minimum Distances
- H. Airfoils must be at least 10 ft above the floor.
- I. Installation area must be free of obstructions such as lights, cables, sprinklers or other building structures with the airfoils at least 2 ft clear of all obstructions.
- J. The structure the fan is attached to shall be capable of supporting a torque load of up to 300 ft·lb of torque
- K. The fan shall not be located where it will be continuously subjected to wind gusts or in close proximity to the outputs of HVAC systems or radiant heaters.
- L. In buildings equipped with sprinklers, including ESFR sprinklers, fan installation shall comply with all of the following:
  - 1. The HVLS fan shall be centered approximately between four adjacent sprinklers.
  - 2. The vertical clearance from the HVLS fan to the sprinkler deflector shall be a minimum of 3 ft.
  - 3. All HVLS fans shall be interlocked to shut down immediately upon receiving a waterflow signal from the alarm system in accordance with the requirements of NFPA 72 - National Fire Alarm and Signaling Code.
- M. WARRANTY
  - 1. The manufacturer shall replace any products or components defective in material or workmanship for the customer free of charge (including transportation charges within the USA, FOB Lexington, KY), pursuant to the complete terms and conditions of the Big Ass Fans Non-Prorated Warranty in accordance to the following schedule:

|                             |                   |
|-----------------------------|-------------------|
| a. Airfoils                 | Lifetime (Parts)  |
| b. Hub                      | Lifetime (Parts)  |
| c. Motor                    | 15 years (Parts)† |
| d. Gearbox                  | 15 years (Parts)† |
| e. Light Kit                | 5 Years (Parts)   |
| f. Controller               | 15 years (Parts)† |
| g. All other fan components | 15 years (Parts)† |
| h. Labor                    | 1 year            |

2. † 15-year parts warranty only valid with factory installation; 7-year parts without factory installation. “Lifetime” means a period ending seven (7) years after manufacturer discontinues manufacturing the product.
3. †† All reasonable costs of repair or replacement will be paid or reimbursed provided customer obtains pre-approval; full warranty contains details.

### **3.2 INSTALLATION OF HANGERS & ATTACHMENTS**

- A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.
- B. Proceed with installation of hangers, supports and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.
- C. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purposes of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.
- D. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2500 psi is indicated, install reinforcing bars through the openings at the tops of inserts.
- E. Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.
  1. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

2. Prevent electrolysis in support of copper tubing by the use of hangers and supports which are copper plated, or by other recognized industry methods.
3. Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
4. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.
5. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.
6. Insulated Piping: Comply with the following installation requirements:
  - a. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
  - b. Shields: For pipe sizes up to and including 4" provide heavy gage shield at each hanger point.
  - c. Saddles: For all pipe sizes over 4" provide saddle at each hanger point. Completely fill void in saddle with loose insulation.
- F. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer for loading and stresses to connected equipment.
- G. Fabricate and install anchor by welding steel shapes, plates, and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.
- H. Where expansion compensators are indicated, install anchors in accordance with expansion unit manufacturer's written instructions, to limit movement of piping and forces to maximums recommended by manufacturer for each unit.
- I. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.
- J. Provide concrete housekeeping bases for all floor-mounted equipment. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.
- K. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

L. Adjusting and Cleaning:

1. Hanger Adjustment: Adjust hangers so as to distribute loads equally on attachments.
2. Support Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.
3. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

### 3.3 INSTALLATION OF MECHANICAL IDENTIFICATION

- A. Coordination: Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.
- B. General: Install pipe markers of the following type on each system indicated to receive identification, and include arrows to show normal direction of flow:
1. Plastic pipe markers, with application system as indicated. Install on pipe insulation segment where required for hot non-insulated pipes.
- C. Locate pipe markers and color bands as follows wherever piping is in or above occupied spaces or corridors, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.
1. Near each valve and control device.
  2. Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.
  3. Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.
  4. At access doors, manholes and similar access points which permit view of concealed piping.
  5. Near major equipment items and other points of origination and termination.
  6. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
  7. On piping above removable acoustical ceilings.
- D. Valve Identification:
1. General: Provide valve tag on every valve, cock, and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system.

2. Mount valve schedule frames and schedules in machine rooms where indicated or, if not otherwise indicated, where directed by Architect/Engineer.

E. Mechanical Equipment Identification:

1. General: Install engraved plastic laminate sign or plastic equipment marker on or near each major item of mechanical equipment and each operational device, as specified herein if not otherwise specified for each item or device.
2. Lettering Size: Minimum 1/4" high lettering for name of unit where viewing distance is less than 2' - 0", 1\2" high for distances up to 6' - 0", and proportionately larger lettering for greater distances. Provide secondary lettering of 2/3 to 3/4 of size of the principal lettering.

F. Adjusting and Cleaning:

1. Adjusting: Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.
2. Cleaning: Clean face of identification devices, and glass frames of valve charts.

### 3.4 INSTALLATION OF MECHANICAL INSULATION

A. Installation of Piping Insulation:

1. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on heating piping beyond control valve, located within heated space; on condensate piping between steam trap and union; and on unions, flanges, strainers, flexible connections, and expansion joints. (Couplings in mechanical grooved systems will be insulated.)
2. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
3. Install insulation on pipe systems subsequent to installation of heat tracing, painting, testing, and acceptance tests.
4. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with full-length units of insulation, with a single cut piece to complete run. Do not use cut pieces or scraps abutting each other.
5. Clean and dry pipe surfaces prior to insulating. Butt installation joints firmly together to ensure a complete and tight fit over surfaces to be covered.
6. Maintain integrity of vapor-barrier jackets on pipe insulation, and protect to prevent puncture or other damage.

7. Cover valves, fittings and similar items in each piping system with equivalent thickness and composition of insulation as applied to adjoining pipe run. Install factory molded, precut or job fabricated units (at Installer's option) except where specific form or type is indicated.
  8. Extend piping insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.
  9. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.
- B. Installation of Ductwork Insulation:
1. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
  2. Install insulation materials with smooth and even surfaces.
  3. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
  4. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
  5. Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where otherwise indicated.
  6. Lined Ductwork: Except as otherwise indicated, omit insulation on ductwork where internal insulation or sound absorbing linings have been installed.
- C. Protection and Replacement:
1. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.
  2. Protection; Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

### **3.5 INSTALLATION OF EXTRUDED ALUMINUM RAIN RESISTANT WALL LOUVERS**

- A. General Contractor is responsible for installation of Louvers in accordance with the following:
1. EXAMINATION
    - a. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.



- b. Notify Architect of unsatisfactory preparation before proceeding.
- 2. PREPARATION
  - a. Clean opening thoroughly prior to installation.
  - b. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- 3. INSTALLATION
  - a. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.
  - b. Install louvers plumb, level, in plane of wall, and in alignment with adjacent work.
  - c. Install joint sealants as specified in Section 07 92 00.
- 4. CLEANING
  - a. Clean louver surfaces in accordance with manufacturer's instructions.
  - b. Touch-up, repair or replace damaged products before Substantial Completion.

### **3.6 INSTALLATION OF REFRIGERANT PIPING AND ACCESSORIES**

- A. Piping Installations:
  - 1. Locations and Arrangements: Drawings indicate the general location and arrangement of piping systems. Locations and arrangements of piping take into consideration pipe sizing and friction loss, and other design consideration. So far as practical, install piping as indicated.
  - 2. Install pipe sleeves at all wall and floor penetrations.
  - 3. Install escutcheons at all exposed pipe wall penetrations.

### **3.7 INSTALLATION OF TERMINAL HEATING UNITS (ELECTRIC)**

- A. Installation Of Electric Heating Terminals:
  - 1. Install electric heating terminal units including components as indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices; complying with applicable installation requirements of NEC and NECA's "Standard of Installation".
  - 2. Coordinate with other electrical work, including wiring/cabing, as necessary to properly interface installation of heating terminal units with other work.
  - 3. Clean dust and debris from each heating terminal as it is installed to ensure cleanliness.
  - 4. Comb out damaged fins where bent or crushed before covering elements with enclosures.
  - 5. Touch-up scratched or marred heating terminal enclosure surfaces to match original finishes.

6. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer published torque tightening values for equipment connectors. Where manufacturer's torqueing requirements are not indicated, tighten connectors and terminal to comply with tightening torques specified in UL Std. 486A.

B. GROUNDING:

1. Provide equipment grounding connections for electric heating terminals as indicated, Tighten connections to comply with tightening torque values specified in UL std. 486A to assure permanent and effective grounding.

C. ELECTRICAL WIRING:

1. General: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electric Installer.
  - a. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 260000 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
  - b. Upon completion of installation of electric heating terminals, and after building circuitry has been energized, test heating terminals to demonstrate capability and compliance with requirements. Where possible, field correct malfunctioning units, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.
  - c. Replace electric heating terminals and accessories which are damaged and remove damaged items from construction site.

D. ADJUSTING AND CLEANING:

1. General: After construction is completed, including painting, clean unit exposed surfaces, vacuum clean terminal coils and inside of cabinets.
2. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
3. Install new filter units for terminals requiring same.

### **3.8 INSTALLATION OF HEAT PUMP UNIT SYSTEMS**

#### **A. General:**

1. Verify all dimensions by field measurements. Verify roof structure, mounting supports, wall structure, and membrane installations are completed to the proper point to allow installation of wall mounted and roof mounted units. Examine rough-in for refrigerant piping systems to verify actual locations of piping connections prior to installation. Do not proceed until unsatisfactory conditions have been corrected.
2. Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

#### **B. Field Quality Control:**

1. Provide the services, to include a written report, of a factory authorized service representative to examine the field assembly of the components, installation, and piping and electrical connections.
2. Charge systems with refrigerant and oil, and test for leaks. Repair leaks and replace lost refrigerant and oil.

#### **C. Demonstration:**

1. Provide the services of a factory authorized service representative to provide start-up service and to demonstrate and train the Owner's maintenance personnel as specified below.
2. Start-up service: Place units into operation and adjust controls and safeties. Replace Damaged Or Malfunctioning Components And Controls.

#### **D. Training:**

1. Train the Owner's maintenance personnel on start-up and shut-down procedures, troubleshooting procedures, and servicing and preventative maintenance schedules and procedures.
2. Schedule training with Owner through the Architect/Engineer with at least 7 days prior notice.

### **3.9 INSTALLATION OF POWER AND GRAVITY VENTILATORS**

- A. General: Except as otherwise indicated or specified, install ventilators in accordance with manufacturer's installation instructions and recognized industry practices to insure that products serve the intended function.
- B. Coordinate ventilator work with work of roofing, walls and ceilings, as necessary for proper interfacing.

- C. Ductwork: Connect ducts to ventilators in accordance with manufacturer's installation instruction, and details on drawings.
- D. Roof Curbs: Furnish roof curbs to roofing Installer for installation.
- E. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- F. Remove shipping bolts and temporary supports within ventilators. Adjust dampers for free operation.
- G. Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of unit at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.
- H. City of manufacturer's touch-up paint.
- I. General: Furnish to Owner, with receipt, one spare set of belts for each belt driven power ventilator.

### **3.10 INSTALLATION OF METAL DUCTWORK**

- A. Installation of Metal Ductwork:
  - 1. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve air-tight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately with internal surface smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.
  - 2. Sealing: All ductwork joints and seams shall be sealed with flexible duct sealer to assure an airtight installation.

3. Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1-1/2". Fasten to duct and substrate.
    - a. Where ducts pass through fire-rated floors, walls, or partitions, provide firestopping between duct and substrate.
  4. Coordination: Coordinate duct installation with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.
  5. Installation: Install metal ductwork in accordance with "SMACNA HVAC Duct Construction Standards".
- B. Installation of Duct Liners:
1. General: Install duct liners in accordance with SMACNA "HVAC Duct Construction Standards".
- C. Installation of Flexible Ducts:
1. Maximum Length: For any duct run using flexible ductwork, do not exceed 4'-0" extended length.
  2. Installation: Install in accordance with Section II of SMACNA's, "HVAC Duct Construction Standards, Metal and Flexible".
- D. Installation of Kitchen Exhaust Ducts:
1. General: Fabricate joints and seams with continuous welds for watertight construction. Provide for thermal expansion of ductwork through 2000 degrees F (1093 degrees C) temperature range. Install without dips or traps which may collect residues. Provide access openings at each change in direction, locate on sides of duct 1-1/2" minimum from bottom, and fitted with grease-tight covers of same material as duct.
  2. Kitchen exhaust hood ductwork shall be fabricated and installed in full accordance with the requirements of NFPA Bulletin 96. Duct work shall be fabricated of 16 gauge minimum thickness, black steel with all joints welded. Duct shall be properly attached to exhaust hoods and fans. Required clean-out access doors shall be installed in the vertical face of the ductwork. Only opposed blade dampers may be used in kitchen make-up air duct work requiring balancing.
- E. Field Quality Control:
1. Leakage Tests: After each duct system, which is constructed for duct classes over 3" is completed, test for duct leakage in accordance with SMACNA "HVAC Air Duct Leakage Test Manual". Repair leaks and repeat tests until total leakage is less than 1% of system design air flow.

F. Equipment Connections:

1. General: Connect metal ductwork to equipment as indicated, provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery.

G. Adjusting and Cleaning:

1. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
2. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.
3. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until final connections are to be completed.
4. Balancing: Refer to Division 23 section "Testing, Adjusting, and Balancing" for air distribution balancing of metal ductwork. Seal any leaks in ductwork that become apparent in balancing process.

### 3.11 INSTALLATION OF DUCTWORK ACCESSORIES

- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90 degree elbows in supply, return, and exhaust air systems, and elsewhere as indicated.
- C. Install splitter damper with adjusting rod in each supply branch. Install according to detail on drawings.
- D. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter.
- E. Operate installed ductwork accessories to demonstrate compliance with requirements. Test for air leakage while system is operating. Repair or replace faulty accessories, as required to obtain proper operation and leakproof performance.
- F. Adjusting: Adjust ductwork accessories for proper settings, install fusible links in fire dampers and adjust for proper action.

- G. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- H. Furnish extra fusible links to owner, one link for every 10 installed of each temperature range; obtain receipt.

### **3.12 INSTALLATION OF AIR OUTLETS AND INLETS**

- A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling module.

### **3.13 INSTALLATION OF CONDENSATE DISCHARGE PUMPS**

- A. Examine areas and conditions under which pumps are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to installer.
- B. INSTALLATION OF EQUIPMENT
  - 1. General: Install equipment in accordance with manufacturer's installation instructions. Install units plumb and level, firmly anchored in drain pans and locations indicated, and maintain manufacturer's recommended clearances.
  - 2. Accessories: Install equipment accessories not installed at factory.
  - 3. Connections: Connect discharge piping as indicated and terminate where indicated on the contract documents.
  - 4. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to electrical installer.
    - a. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division-26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- C. FIELD QUALITY CONTROL
  - 1. General: Start-up equipment, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.

D. CLOSEOUT PROCEDURES

1. Training: Instruct Owner's personnel in operation and maintenance of condensate discharge pumps.

**3.14 INSTALLATION OF ACCESS DOORS**

- A. General: Install access doors in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended function.
- B. All access doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the item or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12" x 16"). Furnish access doors to permit thorough inspection. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

**3.15 INSTALLATION OF FIRESTOPPING AND SEALANTS**

A. Examination

1. Examine the areas and conditions where firestops are to be installed and notify the architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected by the contractor in a manner acceptable to the architect and in accordance with Section 078400.
2. Verify that environmental conditions are safe and suitable for installation of firestop products.
3. Verify that all pipe, conduit, cable, and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.

B. Installation

1. General:
  - a. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
  - b. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, and manufacturer's recommendations.
  - c. Unless specified and approved, all in conjunction with through-penetrants shall remain intact and undamaged and may not be removed.
  - d. Seal holes and penetrations to ensure an effective smoke seal.



- e. In areas of high traffic, protect firestopping materials from damage. If the opening is large, install firestopping materials from damage. If the opening is large, install firestopping materials capable of supporting the weight of a human.
  - f. Insulation types specified in other sections shall not be installed in lieu of firestopping material specified herein.
  - g. All combustible penetrants (e.g. non-metallic pipes or insulated metallic pipes) shall be firestopped using products and systems tested in a configuration representative of the field condition.
2. Dam Construction: When required to properly contain firestopping materials within openings, damming or packing materials may be utilized. Combustible damming material must be removed after appropriate curing. Noncombustible damming materials may be left as a permanent component of the firestop system.
- C. Field Quality Control
- 1. Prepare and install Firestopping system in accordance with manufacturer's printed instructions and recommendations.
  - 2. Follow safety procedures recommended in the Material Safety Data Sheets.
  - 3. Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.
  - 4. All areas of work must be accessible until inspection by the applicable Code Authorities.
  - 5. Correct unacceptable firestops and provide additional inspection to verify compliance with this specification.
  - 6. Cleaning
  - 7. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.
  - 8. Leave finished work in neat, clean condition with no evidence of spill overs or damage to adjacent surfaces.

### **3.16 AUTOMATIC TEMPERATURE CONTROLS**

- A. Installation of Control Systems:
- 1. General: Install systems and materials in accordance with manufacturer's instructions, roughing-in drawings and details shown on drawings.
  - 2. Control Wiring: Install control wiring, without splices between terminal points, color-coded. Install in neat workmanlike manner, securely fastened. Install in accordance with National Electrical Code.
    - a. Install circuits over 25-volt with color-coded No. 12 wire in electric metallic tubing.

- b. Install circuits under 25-volt with color-code No. 18 wire with 0.031" high temperature 105 deg. F. (41 deg. C) plastic insulation on each conductor and plastic sheath over all.
  - c. Install electronic circuits with color-coded No. 22 wire with 0.023" polyethylene insulation on each conductor with plastic-jacketed copper shield over all.
  - d. Install low voltage circuits, located in concrete slabs and masonry walls, or exposed in occupied areas, in electrical conduit.
  - e. Power sources from lighting circuits and wall outlets shall not be used to power ATC controllers.
3. Controllers and safety devices:
- a. All safety devices such as freezestats, duct mounted heat detectors, smoke detectors, etc., shall be hard wired to shut down the fans independently. Provide audible alarm with silence switch as well as DDC indication.
  - b. All supply, return and exhaust fans shall be provided with pressure differential switches. Current sensing devices, starter axillary contacts, and relay contacts are unacceptable proof of fan operation.
- B. Adjusting and Cleaning:
- 1. Start-Up: Start-up, test, and adjust pneumatic control systems in presence of manufacturer's authorized representative. Demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment.
  - 2. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
  - 3. Final Adjustment: After completion of installation, adjust thermostats, control valves, motor and similar equipment provided as work of this section.
    - a. Final adjustment shall be performed by specially trained personnel in direct employ of manufacturer of primary temperature control system.
- C. Closeout Procedures:
- 1. Owner's Instructions: Provide services of manufacturer's technical representative for one 8-hour day to instruct Owner's personnel in operation and maintenance of control systems, and 16 hours of onsite instruction on running and basic troubleshooting of the ATC control system.
  - 2. Validation: The automatic temperature control contractor shall completely check out, calibrate and test all connected hardware and software to insure that the system performs in accordance with the approved specifications and sequence of operation submitted.
    - a. Witnessed validation demonstration shall consist of:
      - 1) Execute digital and analog commands in English and graphic mode.
      - 2) Demonstrate all specified diagnostics.

- 3) Demonstrate scan, update, and alarm responsiveness.
3. Training:
- a. All training shall be by the automatic temperature control contractor and shall utilize specified manuals and as-build documentation.
  - b. Operator training shall include:
    - 1) Sequence of Operation review.
    - 2) Sign on-Sign off.
    - 3) Modifying warning limits, alarm limits and start-stop times.
    - 4) System initialization.
    - 5) Use of Portable Operators Terminal.
    - 6) Troubleshooting of sensors (determining bad sensors).
    - 7) Point disable/enable.
    - 8) Software review of Sequence of Operation programs.
    - 9) Modification of control programs.
    - 10) Add/Delete/Modify data points.
    - 11) Use of diagnostics.
    - 12) Review of initialization.
  - c. Training shall be for Owner-designated personnel at the subject site, and shall be scheduled by the Owner with two week notice.

### **3.17 TESTING, ADJUSTING AND BALANCING**

A. Requirements:

1. Requirements include verification of HVAC system operation, measurement of all system capacity, and establishment of the quantities of the mechanical systems as required to meet specifications, and recording and reporting the results.
2. Test, adjust and balance the following mechanical systems:
  - a. Supply air systems.
  - b. Return air systems.
  - c. Exhaust air systems.
  - d. Outside air systems.
  - e. Hydronic heating and cooling systems.
  - f. Verify temperature control system operation.
3. Do not include:
  - a. Testing boilers and pressure vessels for compliance with safety code.

- b. Installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing. Contact Mechanical Contractor and the Engineer for direction.

B. Report:

1. Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
  - a. General Information and Summary.
  - b. Air Systems.
  - c. Hydronic heating and cooling systems.
  - d. Temperature Control Systems.
2. Contents: Provide the following minimum information, forms and data:
  - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.
  - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system.
  - c. Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

C. Quality Assurance:

1. An independent testing, adjusting, and balancing agency certified by the AABC or NEBB as a Test and Balance Engineer in those testing and balancing disciplines required for this project.
2. Codes and Standards:
  - a. AABC: "National Standards For Total System Balance".
  - b. ASHRAE: ASHRAE Handbook, 1984 Systems Volume, Chapter 37, Testing, Adjusting, and Balancing.

3. Pre-Balancing Conference: Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a conference with the Architect/Engineer and Mechanical Contractor. The objective of the conference is final coordination and verification of system operation and readiness for testing, adjusting, and balancing.
4. System Operation: Systems shall be fully operational prior to beginning procedures. All new automatic temperature controls shall be fully operational. Test, adjust and balance the air systems before refrigerant systems. Test, adjust and balance air conditioning systems during summer season, and heating systems during winter season, including at least a period of operation at outside conditions within 5° F. wet bulb temperature of maximum summer design condition, and within 10°F. dry bulb temperature of minimum winter design condition. Take final temperature reading during seasonal operation.

D. Preliminary Procedures:

1. Air Systems:
  - a. Obtain drawings and become thoroughly acquainted with the systems.
  - b. Compare drawings to installed equipment and field installations.
  - c. Walk the system from the system air handling equipment to terminal units to determine variations in installation.
  - d. Check filters for cleanliness.
  - e. Check all dampers (volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.
  - f. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross check with required fan volumes.
  - g. Determine best locations in main and branch ductwork for most accurate duct traverses. Traverses shall be performed in each supply and return duct main and sub-mains for each AHU and return air fan.
  - h. Place outlet dampers in the full open position.
  - i. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.
  - j. Verify lubrication of all motors and bearings.
  - k. Check fan belt tension.
  - l. Check fan rotation.
2. Hydronic Systems:
  - a. Open valves to full open position. Close coil bypass valves.
  - b. Remove and clean all strainers.

- c. Examine hydronic systems and determine if water has been treated and cleaned.
  - d. Check pump rotation.
  - e. Check expansion tanks to verify noted air pressure and that the system is completely full of water.
  - f. Check air vents at high points of system and determine if all are installed and operating freely.
  - g. Set temperature controls so all coils are calling for full flow.
  - h. Check operation of automatic bypass valves.
  - i. Check and set operating temperatures of chillers, boilers, and heat exchangers to design requirements.
  - j. Verify lubrication of all motors and bearings.
3. Measurements:
- a. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerance specified in the referenced standards. Instruments shall be properly maintained and protected against damage.
  - b. Provide instruments meeting the specifications of the referenced standards.
  - c. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
  - d. Apply instrument as recommended by the manufacturer.
  - e. Use instruments with minimum scale and maximum subdivisions and with scaled ranges proper for the value being measured.
  - f. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
  - g. Take all reading with the eye at the level of the indicated value to prevent parallax.
  - h. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.
  - i. Take measurements in the system where best suited to the task.
- E. Testing, Adjusting, and Balancing:
- 1. Test, adjust and balance all noted systems according to SMACNA standards and as follows:
    - a. Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.
    - b. Cut insulation and ductwork for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- c. Patch insulation, ductwork, and housings, using materials identical to those removed.
  - d. Seal ducts and test for and repair leaks.
  - e. Seal insulation to re-establish integrity of the vapor barrier.
  - f. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.
  - g. Retest, adjust and balance system subsequent to significant system modifications, and resubmit test results.
2. System Deficiencies:
- a. The Balancing Contractor shall advise the Mechanical Contractor and the Engineer of all system deficiencies in writing. Report all motors not running, missing dampers, inoperative valves and controls, lack of access, etc.
  - b. Upon completion of system deficiencies, Balancing Contractor shall balance and record data.
- F. Subject to compliance with the above requirements and certifications, provide the services of air and water testing and balancing.

END OF SECTION

**SECTION 26 00 00**  
**ELECTRICAL**  
**(Filed Sub-Bid Required)**

|   |    |
|---|----|
| PART 1 - GENERAL.....   | 1  |
| 1.1 TIME, MANNER, AND REQUIREMENTS FOR SUBMITTING SUB-BIDS..... | 1  |
| 1.2 RELATED DOCUMENTS .....                                     | 1  |
| 1.3 WORK TO BE PERFORMED.....                                   | 2  |
| 1.4 ALTERNATES.....   | 3  |
| 1.5 DEFINITIONS .....   | 3  |
| 1.6 ITEMS TO BE FURNISHED ONLY .....                            | 4  |
| 1.7 ITEMS TO BE INSTALLED ONLY .....                            | 4  |
| 1.8 RELATED WORK .....  | 4  |
| 1.9 INSPECTION OF SITE.....                                     | 4  |
| 1.10 CONTRACTOR’S REPRESENTATIVE.....                           | 4  |
| 1.11 COOPERATION .....  | 5  |
| 1.12 CODES, ORDINANCES, AND PERMITS .....                       | 5  |
| 1.13 ELECTRICAL ROOMS OR SPACES.....                            | 5  |
| 1.14 SUBMITTALS.....  | 6  |
| 1.15 GUARANTEE .....  | 6  |
| 1.16 ELECTRICAL CHARACTERISTICS .....                           | 6  |
| 1.17 TEMPORARY LIGHT & POWER .....                              | 7  |
| 1.18 TEMPORARY ELECTRICAL SUPPORT FACILITIES.....               | 7  |
| 1.19 RECORD DRAWINGS .....                                      | 7  |
| 1.20 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS .....       | 7  |
| 1.21 COORDINATION DRAWINGS.....                                 | 8  |
| 1.22 INSPECTIONS AND TESTS.....                                 | 9  |
| 1.23 RETURN AIR PLENUM .....                                    | 9  |
| 1.24 ENERGY REBATE PROGRAM.....                                 | 10 |
| 1.25 TECHNOLOGY SYSTEM PROVISIONS.....                          | 10 |
| 1.26 TRADE RESPONSIBILITY FOR INTERCONNECTIONS MATRIX.....      | 11 |
| PART 2 - PRODUCTS.....  | 12 |
| 2.1 GENERAL .....   | 12 |
| 2.2 RACEWAYS AND FITTINGS .....                                 | 13 |
| 2.3 CONDUCTORS .....  | 16 |
| 2.4 ACCESS DOORS .....  | 20 |
| 2.5 SLEEVES, INSERTS AND OPENINGS .....                         | 21 |
| 2.6 WIRING DEVICES.....   | 22 |
| 2.7 LIGHTING FIXTURES .....                                     | 25 |
| 2.8 LIGHTING CONTROLS.....                                      | 32 |
| 2.9 ELECTRICAL POWER EQUIPMENT .....                            | 36 |



Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

|                          |   |     |
|--------------------------|---|-----|
| 2.10                     | ELECTRICAL SYSTEM CONTROLS AND INSTRUMENTS .....                  | 38  |
| 2.11                     | GROUNDING SYSTEM .....  | 38  |
| 2.12                     | PANELBOARDS .....   | 39  |
| 2.13                     | FIRE ALARM AND DETECTION SYSTEM (ADDRESSABLE TYPE).....           | 41  |
| 2.14                     | SURGE PROTECTION .....  | 59  |
| 2.15                     | ELECTRIC SERVICE .....  | 64  |
| 2.16                     | LADDER TRAY/WIREWAYS .....  | 65  |
| 2.17                     | SEALS.....  | 66  |
| 2.18                     | VARIABLE FREQUENCY DRIVES (VFD'S) .....                           | 67  |
| 2.19                     | EMERGENCY BATTERY SYSTEM .....                                    | 73  |
| 2.20                     | INTRUSION ALARM SYSTEM .....                                      | 73  |
| PART 3 - EXECUTION ..... |   | 76  |
| 3.1                      | INSPECTION AND ACCEPTANCE.....                                    | 76  |
| 3.2                      | WORK COORDINATION AND JOB OPERATIONS .....                        | 76  |
| 3.3                      | PLANS AND SPECIFICATIONS .....                                    | 77  |
| 3.4                      | IDENTIFICATION.....   | 77  |
| 3.5                      | PROTECTION AND CLEANUP.....                                       | 83  |
| 3.6                      | PORTABLE OR DETACHABLE PARTS .....                                | 84  |
| 3.7                      | SAFETY PRECAUTIONS .....  | 84  |
| 3.8                      | MOUNTING HEIGHTS.....   | 84  |
| 3.9                      | WORKMANSHIP AND INSTALLATION METHODS.....                         | 85  |
| 3.10                     | FEEDER CIRCUITS .....   | 93  |
| 3.11                     | BRANCH CIRCUITS.....  | 93  |
| 3.12                     | FIREPROOFING AND WATERPROOFING .....                              | 93  |
| 3.13                     | CUTTING AND PATCHING .....  | 94  |
| 3.14                     | MECHANICAL SYSTEM COORDINATION .....                              | 94  |
| 3.15                     | DISTRIBUTION EQUIPMENT TESTING .....                              | 94  |
| 3.16                     | ARC FLASH HAZARD ANALYSIS / SHORT-CIRCUIT/COORDINATION STUDY..... | 98  |
| 3.17                     | STORAGE AND INSTALLATION OF EQUIPMENT.....                        | 106 |
| 3.18                     | WASTE MANAGEMENT.....   | 106 |
| 3.19                     | TRAINING .....  | 106 |
| 3.20                     | FIRESTOP SYSTEMS .....  | 106 |

END OF INDEX

**SECTION 26 00 00**

**ELECTRICAL  
(Filed Sub-Bid Required)**

**PART 1 - GENERAL**

**1.1 TIME, MANNER, AND REQUIREMENTS FOR SUBMITTING SUB-BIDS**

- A. Sub-bids shall be submitted in accordance with the provisions of Massachusetts General Laws (Ter Ed) Chapter 149, Sections 44A to 44I, inclusive, as amended. The time and place for submission of sub-bids shall be as set forth in the INSTRUCTIONS TO BIDDERS.
- B. Each sub-bid filed with the Awarding Authority must be accompanied by BID BOND, or CASH, or CERTIFIED CHECK, or TREASURER'S CHECK or CASHIER'S CHECK, issued by a responsible bank or trust company, payable to the CITY OF NEWTON in the amount of five-percent (5%) of the bid amount. A bid accompanied by any other form of bid deposit will be rejected.
- C. Each sub-bid, submitted for the work of this SECTION, shall be on a form furnished by the Awarding Authority, as required by Section 44F of Chapter 149, as amended.
- D. Work to be done under this SECTION is shown on Drawings numbered: ED1.0, E0.1, E0.2, E0.3, E1.0, E2.0, E2.1, E3.0, E3.1, E3.2, E4.0, E4.1.
- E. The Filed Sub-Bidder for the work of this SECTION 260000 shall list, in Paragraph E, of the FORM FOR SUB-BID, the name of each person, firm, or corporation, whom he proposes to use to perform the following classes of work or part thereof, at the bid price therefore:

| CLASS OF WORK | SECTION NUMBER |
|---------------|----------------|
| None          |                |

If Sub-Bidder intends to perform, with persons of his own staff, the classes of work listed above, he must nevertheless list his own name therefore, under Paragraph E, of the FORM FOR SUB-BID.

**1.2 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### **1.3 WORK TO BE PERFORMED**

- A. Work described herein shall be interpreted as work to be done by the Electrical Subcontractor. Work to be performed by other trades will be referenced to a particular contractor or subcontractor.
- B. Provide all labor, materials, tools, and equipment, to complete the installation of the electrical system. Install, equip, adjust, and put into operation the respective portions of the installation specified, and so interconnect various items or sections of work in order to form a complete and operating whole. Systems may reference in singular or plural terms, also refer to drawings to confirm quantities. The work shall consist of, but shall not necessarily be limited to, the following:
1. Primary, secondary and low tension ductbanks, manholes and handholes.
  2. Secondary distribution equipment, including main breaker/CT service cubicle, metering, surge protective devices, variable frequency drives, distribution panels, and panelboards including feeders and subfeeders.
  3. Fire alarm system, addressable.
  4. Emergency power system, including battery units, fixture integral battery system, emergency lighting and exit signs.
  5. Lighting systems exterior and interior fixtures, and a complete automated addressable lighting control system with all sensors occupancy, daylight, photosensors, and switches.
  6. All raceway systems, including boxes, couplings, and fittings.
  7. All branch circuit wiring systems, including wiring devices, plates.
  8. Excavation and backfill within building foundation walls for any underground raceways.
  9. Connections for all building equipment, including heating, ventilation and air conditioning, plumbing and fire protection.
  10. Drilling, Coring, Cutting & Patching of holes and openings where the largest dimension thereof does not exceed 12 inches, for Electrical conduit, wiring, and Equipment.
  11. Electrical Contractor to furnish and install, removing when no longer needed, all temporary lifts, hoists, staging, scaffolding, rigging, labor and materials, and temporary support to perform all operations in connection with the installation of this work.
  12. Fire stopping shall be performed Electrical Contractor.
  13. Provide Seismic Restraints for all Electrical Systems conforming to the requirements of Section 230548 which Section is herein incorporated by reference.
  14. Coordination Drawings.

15. Provisions for technology systems including 120 volt power sources, cable tray, outlet boxes and raceway system for voice, data, cable TV, and local sound systems for Technology Systems, including all work shown on technology drawings and as specified under Section 270000 Technology.
16. Integrated Electronic Security System provisions, IESS including 120 volt power sources, cable tray, j-hooks, raceways, and backboxes for security systems as shown on drawings. Coordination with the Owner's Security Vendor responsible for installing and wiring the IESS System.
17. Alternates affecting this section.
18. Commissioning Requirements per Section 019113 – GENERAL COMMISSIONING REQUIREMENTS
19. All testing of equipment installed.
20. Any other item of work hereinafter specified or indicated on electrical drawings.
21. Electric Vehicle Supply Equipment (EVSE)
22. Photovoltaic System
23. Emergency Responder Radio Signal Amplification system (BDA System)
24. Lightning protection system

#### **1.4 ALTERNATES**

- A. Refer to Section 01 23 00 for Alternates affecting this section.
- B. Include in your bid a separate price for amounts to be added or deducted from base bid amount for the following areas of Electrical work.
  1. Alternate #4 Photovoltaic system - Add photovoltaic array & Lightning protection System. Provisions only for PV System, including conduit, to be included in base bid.

#### **1.5 DEFINITIONS**

- A. Most terms used within the documents are industry standard. Certain words or phrases shall be understood to have specific meanings as follows:
  1. Provide: Furnish and install completely connected up and in operable condition.
  2. Furnish: Purchase and deliver to a specific location within the building or site.
  3. Install: With respect to equipment furnished by others, install means to receive, unpack, move into position, mount and connect, including removal of packaging materials.
  4. Conduit: Raceways of the metallic type which are not flexible. Specific types as specified.
  5. Connect: To wire up, including all branch circuitry, control and disconnection devices so item is complete and ready for operation.
  6. Subject to Mechanical Damage: Equipment and raceways installed exposed and less than eight feet above finished floor where heavy equipment may be in use or moved.

**1.6 ITEMS TO BE FURNISHED ONLY**

- A. Furnish the following items for installation under designated sections.
1. Duct type smoke detectors – SECTION 230000, HVAC.

**1.7 ITEMS TO BE INSTALLED ONLY**

- A. Install the following items furnished under designated sections.
1. Specialty Backboxes –Section 270000, Technology.

**1.8 RELATED WORK**

- A. The following related work is to be performed under designated sections.
1. Finish Painting: SECTION 099100, PAINTING.
  2. Automatic Temperature Control: SECTION 230000, HEATING, VENTILATING, AND AIR CONDITIONING.
  3. Payment for energy for temporary light and power shall be made by General Contractor.
  4. Cutting and Patching beyond 1.3, B.10 above: DIVISION 1 – GENERAL REQUIREMENTS.
  5. Hardware: SECTION 087100, FINISH HARDWARE.
  6. Temporary light and power: SECTION 015000, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.
  7. Security Systems: Owner’s Vendor.
  8. Access Panels: Access panels will be furnished under this section but installed under Section 081100. Refer to Section 081100 for access panel requirements.
  9. Commissioning: Section 019100, GENERAL COMMISSIONING REQUIREMENTS.

**1.9 INSPECTION OF SITE**

- A. Electrical bidders shall inspect site. Failure to inspect existing conditions or to fully understand work which is required shall not excuse Electrical Subcontractor from its obligations to supply and install work in accordance with specifications and the drawings and under all site conditions as they exist.

**1.10 CONTRACTOR’S REPRESENTATIVE**

- A. Retain a competent representative on the project.

### **1.11 COOPERATION**

- A. Work shall be carried on under usual construction conditions, in conjunction with other contractors work. Cooperate with other contractors, coordinate work and proceed in a manner as not to delay progress.
- B. Before proceeding, examine all construction drawings and consult other contractors to coordinate installation and avoid interference.
- C. In case of dispute, the Architect will render a decision in accordance with General and Supplementary General Conditions.

### **1.12 CODES, ORDINANCES, AND PERMITS**

- A. Codes and Ordinances:
  - 1. All material and work provided shall be in accordance with the following codes and standards as most recently amended.
    - State Building Code
    - National Electric Code, 2023 Edition
    - State Department of Public Safety
    - NFPA 101 "Life Safety Code"
    - NFPA Standards
    - Standards of the Underwriters Laboratories (UL)
    - Occupational Safety and Health Act (OSHA)
    - Americans with Disabilities Act (ADA)
    - Energy Conservation Code
    - City of Newton
  - 2. Where contract documents indicate more stringent requirements than codes, the contract documents shall take precedence.
- B. Permits: Be responsible for filing documents, payment of fees, and securing of inspection and approvals.
- C. The town will pay backcharges for utility company work in conjunction with the permanent electric service.
- D. Refer to SECTION 002113 - INSTRUCTIONS TO BIDDERS.

### **1.13 ELECTRICAL ROOMS OR SPACES**

- A. Be responsible for ensuring that the dedicated space and clearances required in the NEC, Sections 110-26 and 110-16 are maintained for all electrical equipment.

- B. Call other contractors' attention to the requirements contained in the above mentioned code sections, prior to the installation of equipment by other contractors, in order to ensure no violations.

#### **1.14 SUBMITTALS**

- A. Refer to Section 013300 - SUBMITTAL PROCEDURES for information relative to submission of shop drawings. Six copies are required. No equipment for which review is required shall be installed prior to review, except at Contractor's own risk. Shop Drawings will be required for all electrical equipment.
- B. Notwithstanding any restrictions upon contractor proposed substitutions, should apparatus or materials be permitted by Architect to be substituted for those specified for good cause, and such substitution necessitates changes in or additional connections, piping, supports, or construction, same shall be provided. Assume cost and entire responsibility thereof.
- C. Submit the following samples:
  - 1. Lighting fixtures as may be requested.
  - 2. Other items as may be requested.

#### **1.15 GUARANTEE**

- A. Keep work in repair without expense to Owner as far as concerns defects in workmanship or materials for a period of not less than one year from date of substantial completion.

#### **1.16 ELECTRICAL CHARACTERISTICS**

- A. In general, and unless specifically indicated otherwise, all building service, heating, ventilating, air conditioning, and plumbing equipment shall be of the following characteristics.
  - 1. Motors up to and including 1/3 HP shall be suitable for 120 volts, one phase operation.
  - 2. Motors larger than 1/3 HP shall be suitable for 208 volts, three phase operation.
  - 3. Electric heating equipment 1.5 KW and less shall be suitable for 120 volt single phase operation. Over 1.5 KW shall be 208 volt, three phase.
- B. Power Factor: All equipment provided rated greater than 1,000 watts and lighting equipment greater than 15 watts with an inductive reactance load component shall have a power factor of not less than 90 percent under rated load conditions.

**1.17 TEMPORARY LIGHT & POWER**

- A. Refer to and comply with SECTION 015000, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS.

**1.18 TEMPORARY ELECTRICAL SUPPORT FACILITIES**

- A. Refer to and comply with SECTION 015000, CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS and the following:
- B. Provide own field office and/or storage facilities which shall be located as directed or permitted by General Contractor and in accordance with local regulations. Provide all tools, equipment, ladders, and temporary construction required for execution of the work.
- C. All scaffolding, ladders, and other temporary construction shall be rigidly built in accordance with all local and state requirements, and shall be removed upon completion.

**1.19 RECORD DRAWINGS**

- A. Refer to and comply with SECTION 017700, PROJECT CLOSEOUT and the following.
- B. Provide two sets of black or blue line on white drawings to maintain and submit record drawings, one set shall be maintained at site and which shall be accurate, clear, and complete showing actual location of all equipment as installed. Record drawings shall be updated at least monthly. Record drawings shall show outlet from which homeruns are taken, and location of all junction boxes and access panels. These drawings shall be available to Architect/Engineer field representative.
- C. Any addenda sketches and supplementary drawings issued during course of construction shall be attached to drawings.
- D. At completion, submit an accurate checked set of drawings.
- E. After approval of these drawings, photo reproductions of original tracings shall be revised to incorporate changes, including addenda sketches and supplementary drawings. Fit-up drawings for tenant areas shall also be revised in the same manner. These "as-built" photo reproductions shall be certified as correct and delivered to the Architect along with two sets of black line prints and an AutoCad CD, 2014 or later.

**1.20 OPERATING INSTRUCTIONS AND MAINTENANCE MANUALS**

- A. Refer to and comply with SECTION 017700, PROJECT CLOSEOUT and the following:



- B. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full three days of Electrical Subcontractor's time shall be included in contract. Cost of providing a manufacturer's representative at site for instructional purposes shall also be included.
- C. Maintenance Manuals:
  - 1. Provide four copies of complete manuals containing the following:
    - a. Complete shop drawings of equipment.
    - b. Operation description of systems.
    - c. Names, addresses, and telephone numbers of suppliers of systems.
    - d. Vendors' P.O. numbers for equipment installed.
    - e. Preventive maintenance instructions for systems.
    - f. Spare parts list of system components.
  - 2. All information shall be in binders.

#### **1.21 COORDINATION DRAWINGS**

- A. Before materials are purchased or work is begun, prepare and submit to the Architect, Coordination Drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these Drawings are compatible and correctly annotated and cross-referenced at their interfaces. Refer to Division 01 – GENERAL REQUIREMENTS for additional requirements.
- B. The General Contractor shall be responsible for the coordination of all mechanical and electrical work. Before materials are fabricated or work begun, he shall submit to the Architect complete Coordination Drawings in the form of reproducible drawings at not less than ¼ inch scale. Congested areas and sections through shafts shall be prepared at not less than 3/8 inch scale. The General Contractor may request electronic files, from the Architect, to generate the indication of the building shell background for the Coordination Drawings.
- C. Coordination Drawings shall indicate the necessary offsets for all ductwork, piping, conduit, and other items to clear the work of all other trades and to maintain the required ceiling height and partition layout. Each subcontractor shall indicate both top and bottom elevations of their equipment taking into account hangers, flanges, and other accessories.
- D. Prepare Coordination Drawings as follows:
  - 1. The General Contractor shall require the HVAC Subcontractor to prepare original Drawings showing all his/her equipment, ducts, and piping on these transparencies.

2. The General Contractor shall have vellum transparencies made therefrom.
  3. The General Contractor shall then require the PLUMBING Subcontractor to indicate all Plumbing piping and heating lines.
  4. The General Contractor shall then require the FIRE PROTECTION Subcontractor to indicate all his/her equipment and piping on these transparencies.
  5. The General Contractor shall then require the ELECTRICAL Subcontractor to indicate all his/her equipment and conduit lines on these transparencies.
  6. The General Contractor shall resolve conflicts and then submit these transparencies to the Architect for review.
- E. Coordination Drawings shall bear the signature of all Subcontractors involved indicating that all space conditions have been satisfactorily resolved. In addition, the Drawings shall bear the Contractor's stamp bearing the notation "Drawings Have Been Checked and Coordinated with All Trades". Drawings without these notations will not be accepted by the Architect.
- F. If any space conflicts cannot be resolved by the Contractor, he shall immediately notify the Architect and request disposition of the conflict.
- G. Coordination Drawings are for the Contractor's and Architect's use during construction and shall not be construed as replacing any Shop, As-Built, or Record Drawings required elsewhere in these Contract Documents.
- H. Architect's review of Coordination Drawings shall not relieve the Contractor from his overall responsibility for coordination of all work performed pursuant to the Contract or from any other requirement of the Contract.
- I. Refer to Division 01 – General Requirements for further requirements and procedures.

## **1.22 INSPECTIONS AND TESTS**

- A. Inspection: If inspection of materials installed shows defects, such defective work, materials, and/or equipment shall be replaced and inspection and tests repeated.
- B. Tests: Make reasonable tests and prove integrity of work and leave electrical installation in correct adjustment and ready to operate. All panels and switchboards shall have phases balanced as near as practical. A consistent phase orientation shall be adhered to at all terminations.

## **1.23 RETURN AIR PLENUM**

- A. All areas above hung ceiling. All wiring systems including telephone and/ or data, shall either be run in conduit or shall be "UL listed" plenum cable.

**1.24 ENERGY REBATE PROGRAM**

- A. This project has been designed to incorporate equipment approved for energy rebate such as fixtures, drivers, and lamps. Provide accordingly and file all forms required by utility company on behalf of the Owner. Obtain Utility Co. approval for light fixtures and controls prior to submitting shop drawings.
- B. All light fixtures shall be listed in the most up to date DLC or Energy Star list.

**1.25 TECHNOLOGY SYSTEM PROVISIONS**

- A. Responsibilities of the Electrical Contractor: The Electrical Contractor shall be responsible for furnishing and installing all related building preparation including, but not limited to: outlet boxes with plaster rings, 120 volt, power, surface raceways, conduits with bushings, conduit stubs with bushings, sleeves with bushings (all conduits, stubs, sleeves, etc. shall be brought to an accessible ceiling of the same floor), backboxes, plaster rings, pull strings, j-hooks (every 5 feet along main paths to communication closets) bonding, grounding, core drilling, cutting, environmental seals, seismic supports, etc., for a completely operational system, as specified. Special backboxes furnished by the Communications System contractors, shall be installed by Electrical Contractor.
- B. Responsibilities of the Communications System Contractors: The Communications System Contractor will be responsible for furnishing, installing, wiring, programming, troubleshooting, training and warranty service of all cabling, terminal equipment, headend equipment, as specified in Section 27 00 00 for a completely operational system.
- C. Keep fully informed as to the shape, size and position of all openings required for all apparatus and give information in advance to build openings into the work.
- D. All distribution systems which require pitch or slope such as plumbing drains, steam and condensate piping shall have the right of way over those which do not. Confer with other trades as to the location of pipes, ducts, lights and apparatus and install work to avoid interferences.
- E. Coordinate exact locations and roughing in dimensions of all work before installation and make all final connections as required. Any changes required to avoid interference or to provide adequate clearances for Code and maintenance requirements shall be made at no additional costs.
- F. Structural elements of the project shall not be relocated, altered or changed to accommodate the work without written authorization from the Architect.
- G. Work that is installed before coordination with other trades, or that causes interference with the work of other trades shall be changed to correct condition.

- H. Obtain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.
- I. Attend project coordination meetings to coordinate work of this Section, work of other trades and project and phasing retain a complete set of Project Drawings and Specifications for coordination and to determine the full scope of work.

**1.26 TRADE RESPONSIBILITY FOR INTERCONNECTIONS MATRIX**

| Device                          | Furnished By | Installed By | Power Wiring          | Control Wiring | Fire Alarm Wiring | Notes |
|---------------------------------|--------------|--------------|-----------------------|----------------|-------------------|-------|
| Fire Dampers                    | 230000       | 230000       | N/A                   | N/A            | N/A               |       |
| Hydronic Control Valves         | 230000 (ATC) | 230000       | N/A                   | 230000 (ATC)   | N/A               | 1     |
| Hydronic Control Valve Actuator | 230000 (ATC) | 230000 (ATC) | 230000 (ATC)          | 230000 (ATC)   | N/A               | 1     |
| Sheet Metal Damper              | 230000       | 230000       | N/A                   | N/A            | N/A               | 1     |
| Sheet Metal Damper Actuators    | 230000 (ATC) | 230000 (ATC) | 230000 (ATC)          | 230000 (ATC)   | N/A               | 1     |
| Electrical Energy Meters        | 260000       | 260000       | 260000 & 230000 (ATC) | 230000 (ATC)   | N/A               | 2     |
| Domestic Water Meters           | 22 00 00     | 22 00 00     | 260000 & 230000 (ATC) | 230000 (ATC)   | N/A               | 2     |
| Airflow Measuring Stations      | 230000 (ATC) | 230000 (ATC) | N/A                   | 230000 (ATC)   | N/A               |       |
| DDC Panels                      | 230000 (ATC) | 230000 (ATC) | 260000 & 230000 (ATC) | 230000 (ATC)   | N/A               | 3     |
| VFDs at AHU, EFs, ERV, Pumps    | 230000 (ATC) | 230000 (ATC) | 260000                | 230000 (ATC)   | N/A               |       |

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

| Device                         | Furnished By | Installed By | Power Wiring          | Control Wiring | Fire Alarm Wiring | Notes |
|--------------------------------|--------------|--------------|-----------------------|----------------|-------------------|-------|
| Electric Unit Heaters          | 260000       | 260000       | 260000                | 230000 (ATC)   | N/A               | 2     |
| Hydronic Unit Heaters          | 230000 (ATC) | 230000 (ATC) | 260000 & 230000 (ATC) | 230000 (ATC)   | N/A               |       |
| VRF Heat Exchangers            | 230000 (ATC) | 230000 (ATC) | 260000                | 230000 (ATC)   | N/A               |       |
| VRF Branch Circuit Controllers | 230000 (ATC) | 230000 (ATC) | 260000                | 230000 (ATC)   | N/A               |       |
| VRF Outdoor Units              | 230000 (ATC) | 230000 (ATC) | 260000                | 230000 (ATC)   | N/A               |       |
| VRF Indoor Units               | 230000 (ATC) | 230000 (ATC) | 260000                | 230000 (ATC)   | N/A               |       |

**Notes:**

1. Division 230000 and Division 230000 (ATC) Contractors shall fully coordinate all airflow damper and hydronic valves sizes and quantities.
2. Division 260000 Contractor shall provide all line-voltage power wiring required for meters; Section 230000 (ATC) Contractor shall provide all low-voltage power wiring required for meters.
3. Division 260000 shall provide power at main DDC Panel. Division 230000 (ATC) shall provide power to all other DDC Panels.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Product specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: non-metallic sheathed cable is not specified; therefore, it is not acceptable.
- B. For purpose of establishing a standard of quality and not for purpose of limiting competition, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.

- C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project and not part of a
- D. manufacturers' standard product line will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers' products will be unacceptable.
- E. Where Specifications list manufacturers' names and/or "as approved" or "Equal approved by Architect", other manufacturers' equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by Architect.
- F. All material shall be new and shall be UL listed.

## **2.2 RACEWAYS AND FITTINGS**

### **A. Raceways - General:**

1. No raceway shall be used smaller than 3/4 in. diameter and shall have no more than four 90 deg. bends in any one run, and where necessary, pull boxes shall be provided. Only rigid metal conduit or intermediate metal conduit is allowed for in-slab work. Cable systems, if allowed to be used by other sections of this specification, shall not be used exposed or in slabs, whether listed by "UL" for such use or not.
2. Rigid metal conduit conforming to, and installed in accordance with, Article 344 shall be heavy wall zinc coated steel conforming to American Standard Specification C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, where raceway may be subject to mechanical damage.
3. Intermediate metal conduit conforming to, and installed in accordance with Article 342, may be used for all applications where rigid metal conduit is allowed by these specifications.
4. Electrical Metallic Tubing (EMT), conforming to, and installed in accordance with, Article 358 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings, where exposed but not subject to mechanical damage, and may be used for fire alarm work.
5. Surface metal raceways conforming to, and installed in accordance with, Article 386 shall be used where raceways cannot be run concealed in finished spaces.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

6. Flexible metal conduit shall be used for final connections to recessed lighting fixtures from above ceiling junction boxes and for final flexible connections to motors and other rotating or vibrating equipment. Liquid tight flexible metal conduit shall be used for the above connections which are located in moist locations. All flexible connections shall include an insulated grounding conductor.
7. Rigid non-metallic conduit may be used for underground electric and low tension services and shall be polyvinyl chloride (PVC) schedule 40, 90 deg. C.
8. PVC Schedule 40 shall not be used in slabs, where it penetrates slab or foundation wall. PVC Schedule 40 may be used for outside and below slab feeders and branch circuits. Below slab conduits do not require concrete encasement.
9. Acceptable manufacturers:
  - a. Pittsburgh Standard Conduit Company
  - b. Republic Steel and Tube
  - c. Youngstown Sheet and Tube Company
  - d. Carlon
  - e. Or equal
10. Fittings:
  - a. Provide insulated bushings on all raceways 1 inch diameter or larger.
  - b. Manufacturer's standard fittings shall be used for raceway supports.
  - c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
  - d. Couplings for rigid metal and intermediate metal conduit shall be threaded type.
  - e. Threadless fittings for EMT shall be watertight compression type or set-screw type (dry-locations). All fittings shall be concrete tight. No diecast fittings allowed except for raceways larger than 1 inch diameter.
  - f. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.
  - g. Wall entrance seals shall be equal to O.Z. Gedney type "WSK".
  - h. Couplings, elbows and other fittings used with rigid nonmetallic conduit shall be of the solvent cemented type to secure a waterproof installation.
  - i. Acceptable manufacturers:
    1. O.Z.
    2. Crouse Hinds
    3. Appleton
    4. EFCOR
    5. Steel City
    6. Or equal.

B. Outlets, Pull and Junction Boxes:

1. Outlets:

- a. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations or surface mounted shall be of the cast-metal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps not allowed in new construction. Thru the wall boxes are not permitted.
- b. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of Code. Boxes shall not be less than 1-1/2 in. deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4 in. octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4 in. square or of comparable volume.
- c. Far side box supports shall be Caddy J-1A.
- d. Acceptable manufacturers:
  1. Appleton
  2. Crouse Hinds
  3. Steel City
  4. RACO
  5. Or equal.

2. Pull and Junction Boxes: Where indicated on plans, and where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish, and install appropriately designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code.

Boxes in moist or wet areas shall be galvanized type. Boxes larger than 4-11/16 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.



a. Acceptable Manufacturers:

1. Brasch
2. Hoffman
3. Keystone
4. Lee Products Co.
5. McKinstry Inc.
6. Eldon Inc.
7. Or equal.

## 2.3 CONDUCTORS

A. All conductors shall be a minimum size of #12 AWG except for control wiring and fire alarm wiring where #14 AWG may be used. For all exit sign circuits, normal/emergency, emergency only circuits, exterior lighting circuits, and also where distance from panelboard to first outlet exceeds 80', #10 AWG shall be minimum size wire allowed. All feeder and branch circuit conductor shall be color coded as follows:

|    |                    |         |                         |
|----|--------------------|---------|-------------------------|
| 1. | 208Y/120V          | Phase A | Black                   |
| 2. | 208Y/120V          | Phase B | Red                     |
| 3. | 208Y/120V          | Phase C | Blue                    |
| 4. | Grounded Conductor | 120/208 | White                   |
| 5. | Equipment Ground   | 120/208 | Green                   |
| 6. | Isolated Ground    | 120/208 | Green with Orange Trace |

B. All conductors not installed in accordance with color scheme shall be replaced. All conductors larger than #6 AWG must be identified with colored tape.

C. Connections throughout the entire job shall be made with solderless type devices.

1. For #10 AWG and smaller: spring type.
2. For #8 AWG and larger: circumferential compression type.
3. Acceptable manufacturers:
  - a. 3M "Scotchlock"
  - b. IDEAL "Wingnut"
  - c. BURNDY
  - d. MAC
  - e. Or equal

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

4. Any splices made up in ground mounted pull boxes shall be resin cast waterproof type or waterproof pressure type, as manufactured by King Technology, St. Louis, MO.
- D. Conductors shall be copper, soft drawn, and annealed of 98 percent conductivity. Conductors larger than #10 AWG shall be stranded; #10 AWG and smaller shall be solid. Conductors shall be insulated for 600 volts and be of following types:
  1. All conductors shall have heat/moisture resistant thermoplastic insulation type THHN/THWN (75 deg. C) except as follows:
    - a. In sizes #1 AWG and larger: Crosslinked polyethylene insulation type XHHW (75 deg. C – 90 deg. C) may be used.
    - b. Fire alarm system conductors shall be #14 AWG, type THHN, solid. Color coding of fire alarm conductors shall be in accordance with fire codes.
    - c. Fixture whips #16AWG type "SF".
- E. Conductors 100Amperes and higher may be Aluminum, unless specifically noted otherwise on the drawings. All conductor and conduit sizing shown on the drawings is done using copper conductors, where the electrical contractor utilizes Aluminum conductors for feeders 100Amperes or higher it is the responsibility of the electrical contractor to convert the feeder size and conduit size to comply with NEC aluminum conductor ampacity based on NEC 310.15(B)(16). Utilize conduit fill tables in the NEC to size conduit for aluminum conductors.
- F. Where stranded Aluminum conductors are utilized terminate cable using a compression connector system that is compatible with aluminum conductors for a high quality connection, Utilize Thomas and Betts compression connector system or equal. Compression type pigtail adapters are also acceptable.
- G. Stranded conductors for all wiring systems except fire alarm will be allowed if installed and terminated as specified under Execution Section.
- H. Type MC cable may be used for concealed branch circuits where allowed by code if installed and terminated as specified under Execution Section. Armor to be galvanized steel and shall be UL listed for two-hour firewall penetration. Light steel armor is acceptable.
- I. Type MC Fire Alarm Control Cable with red armor may be used for fire alarm where concealed and allowed by code.
- J. Low energy fire alarm cable may be used for fire alarm when concealed and allowed by code.

K. Acceptable manufacturers:

1. AFC Cable Systems
2. Cornish
3. Crescent
4. General Cable
5. Okonite
6. Or equal.

L. Installation of conductors and cables

1. Install all power and 120 volt control wire and cable in approved raceways. When low tension wiring is run exposed, install it in conduit. Plenum rated low tension cable may be used for installation above suspended ceilings where it is allowed by the Code and is allowed in the specification for the specific system.
  - a. Wire Size:
    1. Install minimum No. 12 AWG for power and lighting circuits.
    2. Install minimum No. 10 AWG for 120 volt 20 ampere branch circuits of 75 feet to 150 feet length, and minimum No. 8 AWG for the circuits of 150 feet to 250 feet unless otherwise shown on the drawings or required by the equipment shop drawings.
    3. Install minimum No. 10 AWG for 277 volt 20 ampere branch circuits of more than 150 feet unless otherwise shown on the drawings.
2. Metal clad cable type MC may be used for branch circuit wiring above suspended ceilings and for device wiring in the metal stud partitions. MC cable shall not be used for a termination at the panels (homeruns) and where they run exposed. Any wiring associated with Smoke control systems can not be installed in MC cable as it does not meet 780 CMR Section 909.12.1.
3. Bundle conductors #10 and smaller in branch circuit panelboards, signal cabinets, signal control boards in switchboards and motor control centers.
4. Homerun Circuits:
  - a. Follow homerun circuit numbers shown on the drawings to connect circuits to the panelboards. Where homerun circuit numbers are not shown on the drawings, divide similar types of connected loads among phase busses so that currents in each phase are within 10% of each other during normal usage.
  - b. Wire multi-wire branch circuit homerun with two or three single phase and one common neutral conductor to a panel in a such manner that each phase circuit is fed from the adjacent circuit breakers. Do not combine circuits so that any homerun has more than three circuits (total of five wires) installed in one conduit, unless the circuit conductors are de-rated in strict accordance with the referenced Electrical Code.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- c. Branch circuit wiring in the classrooms, laboratories and offices shall be provided with a dedicated neutral conductor for each phase conductor.
5. Properly group feeders, branch circuit and auxiliary system wiring passing through pull boxes and/or being made up in panelboards; neatly bind each group of wires together with plastic cable ties, and trim loose ends of the ties.
6. Peel branch circuits and auxiliary system wiring out of the wiring gutters at the terminal cabinet and panels at 90 degrees to circuit breakers and terminal lugs before making connections.
7. Color code conductors No. 6 AWG and larger by applying colored plastic tape at ends and where connections and splices are made. Wrap tape around the conductor three complete turns.
8. Splices and Terminations:
  - a. Make splices and joints by means of UL-listed, solderless connectors rated 600 volt, of sizes and types required by manufacturer's recommendations, with temperature ratings equal to that of wire.
  - b. Attach copper wire to panelboards, switchboards, disconnect switches and other electrical equipment by means of bolt-on lugs with hex screws. Properly size lugs; do not cut strands from a conductor in order to fit conductor into a lug.
  - c. Connectors for cables 250 MCM and larger shall have two clamping elements and terminals for bus connections shall have two bolt holes.
9. Identification: Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems." Label feeder and branch circuits in pull and junction boxes, handholes and at cable terminations in the panelboards, motor control centers, and switchboards. Use non-ferrous tags or labels stamped or printed to correspond with markings on the drawings or marked so that feeder or cable may be identified readily. If suspended tags are provided, attach with nylon line or cable lacing.
10. Connect branch circuits to the breakers in multi-phase panelboards required to balance loads.
11. Provide handle ties for multiwire branch circuits as required in the NEC
12. Low Tension Cables: Provide separation from power wiring and lighting fixtures as follows:
  - a. Lighting fixtures - at least 6 inches.
  - b. Power branch circuit wiring with MC type cable - at least 12 inches.
  - c. Power branch circuit wiring in metal conduit - at least 6 inches.

13. When low-tension cables are not in conduit or trays, support cables from the deck and/or beams, spacing supports no farther apart than 6'-0" on center. Provide hangers, clips or other approved method of grouping the cables and keeping them away from other systems. Take care to ensure that ties, clips and other support devices do not compress the cable or damage cable insulation; use J-hooks whenever possible.
14. Cable Supports:
  - a. Provide cable supports for vertical feeders required by the referenced Electrical Code.
  - b. Support vertical feeders at each floor level.
  - c. Support and secure metal-clad cable Type MC at intervals not exceeding 6 feet and within 12 inches from every outlet box, junction box or cabinet.
  - d. Support metal clad cable Type MC with cable supports equal to Caddy WMX-6, MX-3, and clamps equal to Caddy 449. Where cables are supported by the structure and only need securing in place, then cable ties will be acceptable.
15. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
16. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
17. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
18. For wiring in high temperature areas or high temperature equipment (i.e. boiler rooms, water heaters/boosters), furnish conductors for 90°C dry and wet rating.

## 2.4 ACCESS DOORS

- A. Furnish Access Doors for access to all concealed junction boxes and to all other concealed parts of the Electrical System that require accessibility for the proper operation and maintenance of the system. These doors shall be installed under the appropriate SECTION of the Specifications as determined by the surface upon which the panels are mounted.
- B. All Access Doors shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that the valve or part can be easily reached, and the size shall be sufficient for this purpose (minimum size 12 in. x 16 in.). Furnish Access Doors for each pipe space to permit thorough inspection of same. When access doors are required in corridors, lobbies, or other habitable areas, they shall be located as directed by the Architect.

- C. Access doors shall be prime painted and completed with cylinder lock and two keys as manufactured by Acudor, Inland Steel Products Company "Milcor", or Walsh-Hannon-Gladwin, Inc., "Way Loctor". Type shall be as follows:

|                         |                |
|-------------------------|----------------|
| Acoustical Tile Ceiling | Acudor AT-5020 |
| G.W.B. Surfaces         | Acudor DW-5040 |
| Masonry Construction    | Acudor UF-5000 |
| Fire Rated Construction | Acudor FB-5060 |

- D. Access Door Shop Drawings shall be submitted to the Architect for approval.

## **2.5 SLEEVES, INSERTS AND OPENINGS**

- A. Sleeves: Provide sleeves of proper sizes for all openings required in concrete floors and walls. Sleeves passing through floors shall be set with top of sleeve 1 in. above finished floor. Core drilling will also be acceptable if in accordance with any structural standards. Any unsleeved openings shall be waterproofed.
- B. Inserts: Provide inserts or other anchoring devices in concrete and masonry construction as required to support raceways and equipment.
- C. Openings: Where an opening is required in concrete slabs to allow passage of a multitude of raceways, give adequate notice to General Contractor so he may box out opening in form work.
- D. Sleeves or openings through slabs for passage of future cables shall be located within 6 inches of walls and shall be in a single row and shall be proofed whether used or not.
- E. Any openings through fire rated surfaces shall be closed off with fireproofing materials providing the same rating as the surface penetrated.
- F. Acceptable Manufacturers:
1. Specified Technologies Inc.
  2. Thomas & Betts
  3. International Protective Coatings Corp.
  4. 3M Fire Protection Products
  5. Dow Corning
  6. Or equal.

## 2.6 WIRING DEVICES

### A. Manufacturers:

1. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - a. Cooper Wiring Devices.
  - b. Hubbell.
  - c. Leviton.
  - d. Pass & Seymour.
  - e. Or equal

### B. Straight Blade Receptacles:

1. Duplex Receptacles: Comply with NEMA WD 1, NEMA WD 6 configuration NEMA5-20R, UL 498 and FS W-C-596. Specification grade industrial series, straight-blade, 2 pole 3 wire grounding type, back and side wired, nylon face, rated for 120 volts, 20 amperes. Hubbell No.5362 or equal. Hubbell No.5362WR or equal for weather-resistant listed receptacles. Receptacles that are controlled by an automatic control device shall be marked per NEC with the international power symbol. Provide as indicated on the drawings with one controlled face and split circuit hot tab equal to Hubbell BR20C1 series.
2. Ground fault interrupter (GFI) receptacles: Duplex receptacles conforming to UL 943, specification grade heavy duty, feed-through type, rated for 120 volt, 20 amperes, NEMA 5-20R, GFI Class "A" with a sensitivity to leakage 5 milliamps, weather-resistant and tamper-resistant listed. Hubbell No. GF20LA or equal.
3. Transient-Voltage Surge-Suppressor (TVSS) Receptacles: Duplex type, NEMA 5-20R configuration, with integral transient-voltage surge protection in a minimum of 3 modes: line-to-ground, line-to-neutral, and neutral-to-ground; listed as complying with UL 1449. Hubbell HBL5362SA or equal.
4. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Specification grade, straight-blade, 2 pole 3 wire grounding type, back and side wired. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Listed as tamper-resistant with "T" marking. Hubbell BR20TR or equal.
5. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Straight blade; equipment grounding contacts connected only to the green grounding screw terminal of the device, with inherent electrical isolation from mounting strap. Hubbell CR 5253IG or equal.
6. Duplex Receptacles with Integral USB jacks, 125 V, 20 A: Specification grade, straight-blade, 2 pole 3 wire grounding type, back and side wired. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. "USB" marking indicates USB receptacle duplex grounding type NEMA 5-20R equal to Hubbell MX20X2 or equal

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Maintenance Facilities Improvements and Renovations  
Newton, MA

- C. All standard 15 and 20 ampere, 125 and 250 volt non-locking type receptacles located 5 ft. -6 in. or below within Auditorium, Gymnasium, Pre-schools and elementary school age classrooms, medical clinic areas, dental offices and any other areas that are listed in NEC 406.12 shall be tamper resistant type receptacles whether indicated or not by the "T" marking on the drawings.
  
- D. Exterior Outlets with Lockable Covers:
  - 1. Provide exterior outlets with lockable covers at all exterior outlet locations. Provide GFCI Circuit Breakers on all branch circuits. Provide in-use weatherproof locking covers with cord retention. Provide Taymac MX3200 for single gang vertical MX3300 for single gang horizontal and MX6200 for double duplex.
    - a. Equal manufacturers
      - 1. RACO
      - 2. Hubbell
      - 3. Or equal
  
- E. Hazardous (Classified) Location Receptacles:
  - 1. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1. Cooper Crouse-Hinds.
      - 2. Appleton Electric.
      - 3. Hubbell.
      - 4. KH Industries.
      - 5. Or equal
  
- F. Twist-Locking Receptacles:
  - 1. Single Convenience Receptacles, 125 V and 250 V, 20 A: Comply with NEMA WD 1, NEMA WD6 and UL 498. Hubbell HBL2310 (L5-20R), HBL2320 (L6-20R), or equal.
  
- G. Cord Reels
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hubbell.
    - b. Cooper Crouse-Hinds.
    - c. Appleton Electric.
    - d. KH Industries.
  - 2. Industrial grade retractable power cord reel with the following features:
    - a. Cast Aluminum construction, including mounting base
    - b. 12 position adjustable guide arm
    - c. Adjustable ratchet can be engaged (positive lock) or disengaged (constant tension) as needed
    - d. Adjustable ball stop



Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- e. 6' Feeder Cord included
  - f. White powder-coat finish
  - g. Universal mounting overhead, wall or detached from bracket completely.
  - h. Adjustable cable stop.
  - i. Voltage 125 VAC
  - j. Slip Ring Rating 600V/30A
  - k. Payout End Blk Duplex/Duplex Outlet Box
  - l. Feeder End 5-20P
  - m. Max. Amperage 20 Amps
  - n. Gauge/Conductor 12/3
  - o. Cord Length 25 Feet
  - p. Mounting Bracket with 340 deg. pivot base.
  - q. Cord Type/Color SJO/White Cord Reel
  - r. Color White
  - s. Hubbell Model#HBLI25123GF220M1 or equal.
3. For WP Cord Reel provide as follows:
- a. Hubbell Model#HBLW25123 or equal.
  - b. Hubbell Model#HBLPOB1 receptacle enclosure
  - c. Install two duplex receptacles in receptacle enclosure.
  - d. Provide GFCI type circuit breaker for all WP Cord Reels
- H. Snap Switches:
- 1. Comply with NEMA WD 1 and UL 20.
  - 2. Switches, heavy duty, side wired, 120/277V, 20A:
  - 3. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way).
    - b. Hubbell; C1221 (single pole), C1222 (two pole), C1223 (three way).
    - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way).
    - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way).
- I. Securely fasten wiring devices in place, plumb, level, and true to finished lines and surfaces.
- J. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- K. Provide gaskets on all wiring device plates where devices are on walls separating conditioned and non-conditioned spaces and exterior walls.
- L. Composition material of wiring devices to be nylon with ivory finish. Outlets intended for computer use shall be grey finish, outlets on emergency shall be red finish.

M. Wall Plates:

1. Single and combination types to match corresponding wiring devices.
  - a. Plate-Securing Screws: Metal with head color to match plate finish.
  - b. Material for Finished Spaces: White- finish Type 302 stainless steel.
  - c. Material for Finished Spaces installed in concrete: Satin-finished Type 302 stainless steel.
  - d. Material for Unfinished Spaces: Galvanized steel.
  - e. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
2. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum.

N. Finishes:

1. Color: Wiring device catalog numbers as specified do not designate device color.
  - a. Wiring Devices Connected to Normal Power System: Grey for computer circuits white for convenience receptacles other devices as selected by Architect, unless otherwise indicated or required by referenced Electrical Code or device listing.
  - b. Wiring Devices Connected to Emergency Power System: Red.
  - c. Isolated-Ground Receptacles: Orange.

## 2.7 LIGHTING FIXTURES

A. General

1. Submit the following in accordance with project submittal procedures:
  - a. Catalog Data: Submit catalog data describing luminaires, lamps, and ballasts. Include data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.
  - b. Performance Curves/Data:
    1. Submit certified photometric data for each type of luminaire.
    2. Submit supply-air, return-air, heat-removal, and sound performance data for air handling luminaires.
  - c. Drawings: Submit shop drawings for non-standard luminaires.
  - d. Calculations: Submit as requested to support equal product proposals.
  - e. Warranty: Submit warranties for luminaires and for electronic ballasts.
2. All lamps, ballasts, led sources, drivers, and controls shall meet the latest utility company incentive requirements. Refer to the latest program requirements documentation and coordinate with the utility company to ensure compliance.

B. Quality Assurance

1. Comply with the National Electrical Code (NEC) and the State Building Code (MBC) for components and installation.
2. Provide luminaires listed and labeled by a nationally recognized testing laboratory (NRTL) for the application, installation condition, and the environments in which installed.
3. Use manufacturers that are experienced in manufacturing luminaires, lamps and ballasts similar to those indicated for this Project and have a record of successful in-service performance.
4. Coordinate luminaires, mounting hardware and trim with the ceiling system.

C. LED Assemblies

1. LED luminaires shall conform to UL 1598 and to UL 8250 – Safety Standard for Light-Emitting Diode (LED) Light Sources for Use in Lighting Products.
2. Products shall be lead and mercury free.
3. Photometric characteristics shall be established using IESNA LM-79-08, IESNA Approved Method for the Electrical and Photometric Measurement of Solid-State Lighting Products.
4. Color characteristics of LED luminaires shall be as follows in accordance with ANSI C78.377 – Specifications for the Chromaticity of Solid State Lighting Products.
5. LED and driver cooling system shall be passive and shall resist the buildup of debris.
6. LED luminaire output after 50,000 hours of operation shall be not less than 70 percent of the initial lumen output when determined in accordance with IESNA LM-80-08 – IESNA approved Method for Measuring Lumen Maintenance of LED Lighting Sources.
7. LED source package electrical characteristics:
  - a. Supply voltage: 120 V, 208 V, 240 V, 277 V, or 480 V as indicated on the Drawings. Provide step-down transformers if required to match driver input voltage rating.
  - b. Total harmonic distortion (current): Not more than 10 percent
  - c. Power factor: Not less than 90 percent
  - d. RF interference: Meet FCC 47 CFR Part 15/18
  - e. Transient protection: IEEE C62.41 Class A.

D. Extra Materials

1. Furnish the following extra materials matching products installed. Package with protective covering for storage and identify with labels describing contents.
  - a. One (two percent of quantity of LED drivers of each type, but not less than one of each type).

E. Interior General:

1. Furnish interior luminaries that comply with requirements specified below, indicated on the Drawings, and as required to meet conditions of installation.
2. Metal parts shall be free from burrs and sharp corners and edges.
3. Metal components shall be formed and supported to prevent sagging and warping.
4. Steel parts shall be finished with manufacturer's standard finish applied over a corrosion-resistant primer. Finish shall be free from runs, streaks, stains, holidays or defects.
5. Doors and frames shall be smooth operating and free from light leakage under operating conditions. Relamping shall be possible without the use of tools. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.
6. Luminaires shall have minimum reflecting surface reflectance as follows unless specified otherwise on the Drawings:
  - a. White Surfaces: 85 percent
  - b. Specular Surfaces: 83 percent
  - c. Diffusing Specular Surfaces: 75 percent
7. Lenses, diffusers, covers and globes shall be 100 percent virgin acrylic unless specified otherwise on the Drawings. Lenses shall have 0.125 inches minimum thickness. Lenses for fluorescent troffers shall be injection molded.
8. Luminaires shall conform to UL 1598 - Luminaires. Provide product with damp location listing or wet location listing as required by installation location.

F. Interior Accessories

1. Provide stud supports, mounting brackets, frames, plaster rings and other accessories required for luminaire installation.
2. Furnish hangers as specified below and as required by conditions of installation:
  - a. Stem hangers shall be made of 1/2-inch steel tubing with 45 degrees swivel ball hanger fitting and ceiling canopy. Finish the same as the luminaire.
  - b. Rod hangers shall be made of 1/4 inch threaded zinc-plated steel rod.
  - c. For HID luminaires provide hook hangers that are integrated assemblies matched to the luminaire and line voltage; equip with threaded attachment, power cord and locking type plug. Provide a safety chain or cable for each luminaire that will attach to the building structure, the ballast housing, and to the reflector/diffuser assembly.
3. Use NRTL-listed T-bar safety clips for lay-in luminaires.

4. Where indicated on the Drawings or where lamp breakage is detrimental, such as above food counters, provide open fluorescent luminaires with:
  - a. Self-locking sockets or lamp retainers, two per lamp, and clear polycarbonate protective lamp sleeves with end caps over each lamp. Sleeve shall have a light transmission of 95 percent and shall be rated for the thermal profile of the lamp and ballast.

G. Interior Installation

1. Install interior lighting system in accordance with the NEC, manufacturer's installation instructions, approved shop drawings, and NECA National Electrical Installation Standards.
2. Have the manufacturer's installation instructions available at the Project site.
3. Mounting heights specified or indicated on the Drawings are to the bottom of the luminaire for ceiling-mounted fixtures and to the center of the luminaire for wall-mounted fixtures.
4. Where the ceiling forms the protective membrane of a fire resistive assembly, install protective coverings over luminaires in accordance with NRTL requirements.
5. Install slack safety wires as described below for luminaires in or on suspended ceilings.
  - a. Wire shall be minimum 12 gage galvanized soft annealed steel wire conforming to ASTM A641.
  - b. Attach wire to the building structure directly above the attachment point on the box or luminaire; make trapezes of framing channel material as required to span obstacles
  - c. Secure wire(s) at each end with not less than three tight turns in 1-1/2 inches.
6. Support pendant-mounted or cable-supported luminaires directly from the structure above using a 9 gage wire or an approved alternate support without using the ceiling suspension system for direct support.
  - a. Install seismic restraints for pendant-mounted and cable-supported luminaires.
  - b. Pendants, rods, cables, or chains 4 ft or longer shall be braced to prevent swaying using three cables at 120 degrees separation.
7. Connect luminaires in suspended ceilings using 6 ft. lengths of flexible wiring method arranged accommodate not less than 4 inches of differential seismic movement in any direction.

H. Interior Quality Control

1. Make electrical connections, clean interiors and exteriors of luminaires, install lamps, energize and test luminaires, inspect interior lighting system, and deliver spare parts in accordance with manufacturer's instructions and NECA National Electrical Installation Standards:
2. Test electronic dimming ballasts for full range dimming capability.
  - a. Burn-in dimmer controlled fluorescent lamps at full output for not less than 100 hours before dimming.
  - b. Check for visually detectable flicker over the full dimming range.
3. Prior to turnover to Owner, replace lamps that were installed and used during construction if more than 15 percent of their rated lamp life has been used.

I. Exterior - General

1. Furnish exterior luminaires that comply with requirements specified in this Section and in the luminaire schedule on the Drawings.
2. Luminaire photometric characteristics shall be based on IESNA approved methods for photometric measurements performed by a recognized photometric laboratory.
3. Luminaire housing shall be primarily metal.
  - a. Metal parts shall be free from burrs and sharp corners and edges.
  - b. Sheet metal components shall be fabricated from corrosion-resistant aluminum, formed and supported to prevent sagging and warping.
  - c. Exposed fasteners shall be stainless steel.
4. Doors and frames shall be smooth operating and free from light leakage under operating conditions.
  - a. Relamping shall be possible without the use of special tools.
  - b. Doors, frames, lenses and diffusers shall be designed to prevent accidental falling during relamping and when secured in the operating position.
  - c. Door shall be removable for cleaning or replacing lens.
5. Luminaires shall have minimum reflecting surface reflectance as follows unless scheduled otherwise:
  - a. White surfaces: 85 percent
  - b. Specular surfaces: 83 percent
  - c. Diffusing specular surfaces: 75 percent
6. Provide lenses, diffusers, covers and globes as scheduled on the Drawings fabricated from materials that are UV stabilized to be resistant to yellowing and other changes due to aging or exposure to heat and ultraviolet radiation.
7. Doors shall have resilient gaskets that are heat-resistant and aging-resistant to seal and cushion lens and refractor.

J. Exterior Poles and Accessories

1. Furnish poles and accessories that comply with requirements specified in this Section and the luminaire schedule on the Drawings.
2. Pole, base, and anchorage shall carry the luminaires, supports, and appurtenances at the indicated height above grade without deflection or whipping.
3. Mountings, fastenings and other appurtenances shall be fabricated from corrosion-resistant materials that are compatible with poles and luminaires and will not cause galvanic action at contact points. Mountings shall correctly position luminaires to provide scheduled light distribution.
4. A reinforced access handhole shall be located in the wall of each metal pole.
5. A welded ½ inch grounding lug shall be accessible through the handhole of each metal pole. Grounding connection shall be designed to prevent electrolysis when used with copper ground wire.
6. Metal poles shall have anchor type bases and galvanized steel anchor bolts and leveling nuts.
7. Metal poles shall have a metal base cover that covers the entire base plate and anchorage.
8. Protect painted, anodized, or brushed pole finishes during shipment and installation. Minimum protection shall consist of spirally wrapping each pole shaft with protective paper secured with tape, and shipping small parts in boxes.
9. Aluminum poles shall be fabricated from corrosion resistant aluminum Alloy 6063-T6 or Alloy 6005-T5 for wrought alloys or Alloy 356-T4 for cast alloys.
  - a. Poles shall be square or round, tapered or straight as indicated on the Drawings.
  - b. Aluminum poles over 30 ft. tall shall include factory-installed vibration dampers.
  - c. Poles shall be seamless extruded or spun seamless type with minimum 0.188 inch wall thickness.
  - d. Tops of shafts shall be fitted with a round or tapered cover.
  - e. Base shall be anchor bolt mounted, made of cast 356-T6 aluminum alloy in accordance with ASTM B 108/B 108M, Standard Specification for Aluminum-Alloy Permanent Mold Castings and shall be machined to receive the lower end of shaft. Joint between shaft and base shall be welded.
  - f. Hardware, except anchor bolts, shall be either 2024-T4 anodized aluminum alloy or stainless steel.
10. The poles EPA capacity shall meet the wind rating in the geographical area in which its installed. Refer to AASHTO wind map and provide appropriate wind rating with the paired light fixture. Wind rating shall be a minimum of 100MPH with 130MPH gust rating.
11. Anchor bolts shall be steel rod having minimum yield strength of 50,000 psi. The top 12 inches of the anchor bolt shall be galvanized in accordance with ASTM A153/A153M.

12. Manufacturers: Subject to compliance with requirements, provide products as scheduled or specified on the Drawings.
  13. Fuses and Fuse holders
    - a. Furnish fuse overcurrent protection for each pole-mounted luminaire to isolate faulted ballasts from the lighting circuit.
    - b. Use 600 volt, Class CC, time-delay, current-limiting fuses.
    - c. Select fuses rated between 200 percent and 300 percent of the luminaire ballast or driver maximum current.
    - d. Manufacturer: Bussman LP-CC or approved equal.
  14. Furnish in-line fuse holders for installation in pole hand hole or transformer base.
    - a. Use non-breakaway type fuse holders unless breakaway poles are indicated on the Drawings.
    - b. Use breakaway type fuse holders where breakaway poles are indicated on the Drawings.
    - c. Load and line terminal sizes and types shall correspond to line and load conductor sizes and quantities.
    - d. Both breakaway and non-breakaway fuse holders shall have insulating boots.
    - e. Manufacturers: Ferraz Shawmut "FEC" for phase conductor(s), "FEBN" for neutral conductor, or approved equal.
- K. Exterior Installation
1. Install products in accordance with manufacturer's instructions, NECA/IESNA 501, and approved shop drawings.
  2. Locations of luminaires and poles shown on the Drawings are diagrammatic. Coordinate luminaire locations with building finishes, building structure, paving and striping, utility piping, security fences, and existing trees. Obtain approval for location changes through LANL Subcontract Technical Representative (STR).
  3. Set poles and luminaires plumb, square, level and secure.
  4. Install surface mounted luminaires directly to an outlet box which is supported from structure.
  5. Install in-grade luminaires flush with surrounding surface. Coordinate pitch or grading of surface with General Contractor to allow drainage away from fixture.
  6. Install lamps in luminaires in accordance with manufacturer's instructions.
  7. Concrete Foundations:
    - a. Construct concrete foundations with exterior 4000 psi concrete and reinforcing conforming to DIVISION 03 - CONCRETE.
    - b. Comply with details on the Drawings and manufacturer's recommendations for foundation dimensions, reinforcing, anchor bolts, nuts and washers.
    - c. Position power conduits and ground rod to terminate within the pole shaft area and one inch above the top of the foundation.
    - d. Cure concrete foundations for seven full curing days before erecting poles.
  8. Pole Erection
    - a. Do not install poles without luminaires.



- b. Use fabric web slings to raise and set poles.
- c. Use leveling nuts or shims to make poles plumb. When leveling nuts are used, set the lower nuts not more than 1 inch from the concrete foundation.
- d. Tighten anchor bolt nuts and other pole hardware to torque recommended by manufacturer.
- e. After pole is leveled, pack non-shrink grout between anchor base and concrete foundation to provide a full bearing surface. Use a short piece of 1/2 in. diameter pipe to make a drain hole through grout; arrange to drain condensation from interior of pole.
- f. Set embedded poles to depth indicated on the Drawings, but not less than 1/6 of pole length below finish grade.
- g. Auger holes large enough to permit the use of tampers the full depth of the hole.
- h. Backfill in 6 inch layers and thoroughly tamp each layer so compaction of backfill is equal to or greater than that of the undisturbed earth.

## 2.8 LIGHTING CONTROLS

### A. Photo Sensor

- 1. Photo sensors shall at minimum meet the specifications listed below:
- 2. General Specifications:
  - a. Shall be Class 2, low voltage.
  - b. Ambient light sensor designed to interface directly with the analog input of the Lighting Control System.
  - c. Sensor shall supply an analog signal to the ALCS proportional to the light measured.
  - d. Sensor output shall provide for zero or offset based signal.
  - e. Sensor shall be capable of a fully adjustable response in the range between 0 and 10,000 foot candles with a +/- 1 percent accuracy at 70 deg F.
  - f. Input: 10VDC.
  - g. Minimum Output: 0 VDC.
  - h. Maximum Output: 10 VDC.
  - i. Sensor housing shall be flame retardant and meet UL 94 HB standards.
  - j. Operating Temp: -10 deg C to 60 deg C.
  - k. The sensitivity adjustments shall be at sensor body, and outside of the sensor's viewing angle.
  - l. The sensor housing shall be flame retardant and meet UL 94HB standards

3. Exterior:
  - a. Outdoor models shall have a hood over the aperture to shield the sensor from direct sunlight. The outdoor sensor circuitry shall be completely encased in an optically clear epoxy resin. Outdoor sensors shall mount to a standard threaded 1/2 in. conduit or fit a 1/2 in. knockout. The Outdoor sensor range shall be between 0 and 750 FC.

B. Occupancy Sensors

1. Environmental:
  - a. Operating Temperature Range: 0 deg. C to 40 deg. C
  - b. Relative Humidity: 0 percent to 95 percent non-condensing
  - c. Ceiling Mount Occupancy/Vacancy Sensors
  - d. Sensing mechanism:
    1. Dual technology (ultrasonic / passive infrared):
      - a) Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
      - b) Utilize an operating frequency of 32kHz or 40kHz that shall be crystal controlled to operate within plus or minus 0.005 percent tolerance.
      - c) Electrical: Rating: 12 VDC input voltage, up to 40 mA current draw.
      - d) Sensors shall turn off or reduce lighting automatically after reasonable time delay when a room or area is vacated by the last person to occupy the space
      - e) Sensor shall accommodate all conditions of space utilization and all irregular work hours and habits.
      - f) Sensors shall be UL listed.
      - g) Sensors shall be fully adaptive and adjust their sensitivity and timing to ensure optimal lighting control for any use of the space
      - h) Sensors shall have field adjustable controls for time delay and sensitivity to override any adaptive features. Sensor timeouts shall be configurable by System software.
      - i) Power failure memory:
      - j) Controls incorporate non-volatile memory. Should power be interrupted and subsequently restored, settings and learned parameters saved in protected memory shall not be lost.
      - k) Provide all necessary mounting hardware and instructions.
      - l) Sensors shall be Class 2 devices.
      - m) Indicate viewing directions on mounting bracket for all Ceiling mount sensors.

- n) Provide customizable mask to block off unwanted viewing areas for all ceiling mounted sensors using infrared technology. Field prepare proper maskings for each space to eliminate unnecessary sensing beyond the space in which the sensor is located.
  - 1) Provide an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options.

C. Power Packs

1. General:

- a. Power pack shall be a self-contained transformer and relay module.
- b. The internal relay shall control up to 20A for 120, 230, 277VAC or 347VAC ballast loads and 120VAC incandescent loads.
- c. Power packs shall provide a 24 VDC, 150 mA output.
- d. Power packs shall be capable of parallel wiring without regard to AC phases on primary.
- e. Power pack can be used as a standalone, low voltage switch, or can be wired to sensor for auto control.
- f. Construction shall be high impact, UL rated plastic case
- g. Power pack shall be UL/CUL Listed, FCC Certified, UL 2043 plenum rated and meets ASHRAE 90.1 requirements
- h. To ensure quality and reliability, power and auxiliary relay packs shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1 percent.
- i. Shall at minimum meet the following environmental specifications:
  - 1. Operating Temperature Range: 0 deg. C to 40 deg. C
  - 2. Relative Humidity: 0 percent to 95 percent non-condensing

D. Examination

- 1. Site Verification: Verify that wiring conditions, which have been previously installed under other sections or at a previous time, are acceptable for product installation in accordance with manufacturer's instructions.
- 2. Inspection: Inspect all material included in this contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

E. Installation

1. The Electrical Contractor, as part of the work of this section, shall coordinate, receive, mount, connect, and place into operation all equipment. The Electrical Contractor shall furnish all conduit, wire, connectors, hardware, and other incidental items necessary for properly functioning lighting control as described herein and shown on the plans (including but not limited to System Field Devices, 0-10V dimming ballasts, fixed output ballasts, 0-10V LED drivers and communication wire). The Electrical Contractor shall maintain performance criteria stated by manufacturer without defects, damage, or failure.
2. Power: The contractor shall test that all branch load circuits are operational before connecting loads to sensor system load terminals, and then de-energize all circuits before installation.
3. Related Product Installation: Refer to other sections listed in Related Sections for related products' installation.

F. Sensor Installation

1. Adjust sensitivity to cover area installed
2. Set time delay on occupancy sensors that are connected to the lighting control system to the minimum. Time delays shall be controlled via Central Control Software.
3. Sensor shall be powered through Input Module. No external power packs shall be used for powering sensors.
4. Install occupancy sensors on vibration free stable surface.
5. Install atrium and skylight light sensor facing toward window or skylight.
6. Install interior light sensor in ceiling facing the floor.

G. Wiring Installation

1. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 3/4 inch.
2. Wiring within Enclosures: Comply with NEC & CEC. Separate power-limited and non power-limited conductors according to conductor manufacturer's written instructions.
3. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
4. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

H. Field Quality Control

1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
2. Perform the following field tests and inspections with the assistance of a factory-authorized service representative:
  - a. Operational Test: After installing lighting controllers and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - b. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Lighting control devices will be considered defective if they do not pass tests and inspections.
4. Prepare test and inspection reports.

I. Testing

1. Upon completion of all line, load and interconnection wiring, and after all fixtures are installed and lamped, a qualified factory representative shall completely configure and test the system.
2. At the time of checkout and testing, the owner's representative shall be thoroughly instructed in the proper operation of the system.

**2.9 ELECTRICAL POWER EQUIPMENT**

A. Motor Controls - Manual and magnetic:

1. Individually-mounted magnetic starters shall be NEMA rated across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated.
2. Starters shall be of maintained contact type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1 FVNR, unless noted otherwise.
  - a. Starters shall have OL reset button, green push-to-test type pilot light to indicate "ON", and "HAND-OFF-AUTO" switch in cover.
  - b. Provide Class 20 fixed heater overloads with auto/manual reset.
  - c. Provide four sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.
  - d. Motor starters shall have NEMA I enclosures. Those in wet locations shall be NEMA 3R.

- e. Acceptable Manufacturers:
    - General Electric
    - Westinghouse/Cuttler-Hammer
    - Square D/Groupe Schneider
    - Siemens
    - Allen Bradley
    - Or equal
  - 3. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.
- B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.
- 1. Provide motor terminal boxes for each motor not furnished with same.
- C. Disconnect Switches:
- 1. Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three pole toggle switches are not acceptable as substitute for disconnect switches.
  - 2. Disconnect switches shall be of fused or unfused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches for use with current limiting fuses shall be rejection type and those used in conjunction with motors shall be horsepower rated. Provide oversize termination lugs if required by conductor size.
  - 3. Enclosures shall be of proper NEMA type for intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with ANSI #24 dark gray baked enamel finish.
  - 4. Acceptable Manufacturers:
    - a. Westinghouse/Cuttler-Hammer
    - b. Square D/Groupe Schneider
    - c. Siemens
    - d. Or equal
- D. Fuses:
- 1. Provide a complete set of fuses for each item of fusible type equipment. Each fuse initially installed shall be provided with Bussmann SAMI-indicating fuse covers.

2. Turn over to authorized representative of Owner upon completion a spare set of fuses of each different type and ampere rating installed. These spares shall be bound with twine and tagged.
3. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
4. All fuses in distribution panelboards and switchboards shall be class "L" above 600 amperes and class "RK1" for 600 amperes and below.
5. Main, Feeder, and Branch Circuits:

Circuits 601 amperes and above shall be protected by (Bussmann type KRP-C LOW-PEAK) current limiting time delay fuses.

Circuits 0-600 amperes shall be protected by (Bussmann "LOW-PEAK" dual element), KPS-RK (600 volts), UL class RK-1.

6. Acceptable Manufacturers:
  - a. Bussmann, Division of McGraw
  - b. Gould/Shawmut
  - c. GEC-ALSTHOM
  - d. Or equal

## **2.10 ELECTRICAL SYSTEM CONTROLS AND INSTRUMENTS**

- A. Provide a complete power system consisting of branch circuits, motor disconnect switches, pushbutton stations, motor starters, and other devices to connect up and leave in operating condition each piece of electrically operated equipment provided either under this section or other Divisions.
- B. The Electrical Subcontractor shall provide a 120 volt source with a disconnect switch at one location next to the main automatic temperature control panel.
- C. All control wiring not indicated in the electrical specifications or not shown on electrical drawings will be provided by Temperature Control Subcontractor.

## **2.11 GROUNDING SYSTEM**

- A. All equipment and systems shall be grounded. Refer especially to NEC Section 250 Requiring Connections to Building Steel, Foundation, Water Service, and Interior Piping. Provide transformer pad grounding to be in accordance with local utility company standards.
- B. The grounded conductor shall be supplemented by an equipment grounding system.

- C. The equipment grounding system shall be installed so all conductive items in close proximity to electrical circuits operate continuously at ground potential and provide a low impedance path for ground fault currents.
- D. Grounding conductors shall be so installed as to permit shortest and most direct path to ground.
- E. Maximum measured resistance to ground of 5.0 ohms shall not be exceeded. Ground separately derived systems (dry type transformers) in accordance with Article 250 by grounding neutral to transformer ground lug and providing insulated grounding electrode conductor to nearest effectively grounded building steel or, if unavailable, to nearest available effectively grounded metal water pipe.
- F. Equipment grounding conductors and straps shall be sized in compliance with Code Table 250-122.
- G. Grounding conductors shall be insulated with green color. Grounding conductors for use on isolated ground receptacles shall be green with trace color to differentiate between normal ground conductors.
- H. Branch circuits shall consist of phase and grounded conductor installed in common metallic raceway. The raceway system may not serve as the grounding conductor. All circuits shall have a separate insulated grounding conductor installed. Any flexible cable system or non-metallic raceway system shall have an insulated grounding conductor. Any cable system for use on isolated ground circuits shall have both an isolated ground conductor as well as an equipment ground conductor, both of which shall be insulated.
- I. Each electrical expansion fitting shall be furnished with a bonding jumper. Provide grounding bushings and ground connections for all raceways terminating below equipment where there is no metal-to-metal continuity.
- J. Continuity between all metallic and non-metallic raceway systems and equipment shall be maintained.

## **2.12 PANELBOARDS**

- A. Panelboards shall be dead-front, door in door safety type equipped with single or multi-pole circuit breakers suitable for 120/240 volt, 1 phase, 3 wire operation.



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Maintenance Facilities Improvements and Renovations  
Newton, MA

- B. Buses shall be copper. Panelboards shall have a circuit directory card mounted in a frame with plastic cover on inside of door. Panelboards to have a copper ground bus with terminals for each circuit. Panelboards serving isolated ground receptacles shall have a separate ground bus for terminations of the isolated grounds. The isolated ground bus shall be mounted to the panel tub via non-conducting means with a separate grounding conductor run to the normal panel ground bus. Provide oversized lugs for any termination requiring same due to oversized conductors. Provide 200 percent neutral buses on all 120/240 volt panelboards.
- C. Cabinets shall be minimum of 20 inches wide and be made of code gauge steel. Surface type shall be ordered without knockouts.
- D. Trims shall be made of code gauge steel, surface or flush as indicated. Panelboards shall be keyed alike. Trims shall be provided with full length piano hinge on one side, and secured to tub with sufficient quantity of latches opposite the hinge side to allow trim to fit flush with tub and when released, allow full access to wiring gutters. Inner door shall allow access to circuit breakers only.
- E. Panelboards shall be of the following types with minimum circuit breaker frame sizes listed below. Refer to schedules for larger circuit breaker frame sizes due to fault current availability.
1. 120/240 volt, single phase, four wire. Symmetrical interrupting capacity 10,000 AIC.  
Style
- |                          |                            |
|--------------------------|----------------------------|
| Eaton type PRL-1         | BAB Breakers<br>(bolt-on)  |
| Square D type NQOD       | QOB Breakers<br>(bolt-on)  |
| Siemens type CDP-7       | BQ Breakers<br>(bolt-on)   |
| General Electric Type AQ | HHQB Breakers<br>(bolt-on) |
2. Distribution Panels:
    - a. Where scheduled as circuit breaker type, symmetrical interrupting capacity 65,000 AIC.
- |                            |               |
|----------------------------|---------------|
| Easton type PRL-3          | FD Breakers   |
| Square D I-Line type       | FA Breakers   |
| Siemens SPP                | FXD6 Breakers |
| General Electrical Spectra | THED Breakers |
| Or equal                   |               |
- F. Panelboards and distribution panels shall be of same manufacturer as switchboard. Refer to drawings where higher interrupting are required.

- G. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 150 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
    4. Instantaneous trip.
    5. Long- and short-time pickup levels.
    6. Long- and short-time time adjustments.
    7. Ground-fault pickup level, time delay, and I2t response.
  8. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (5-mA trip).
  9. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
  10. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.

## **2.13 FIRE ALARM AND DETECTION SYSTEM (ADDRESSABLE TYPE)**

A. Description:

1. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, and wiring as shown on the drawings and specified herein.
2. The fire alarm system shall comply with requirements of latest NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.
3. The fire alarm manufacturer shall be of the highest caliber and insist on the highest quality. The system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.
4. The FACP and peripheral devices shall be manufactured 100 percent by a single U.S. manufacturer (or division thereof).
5. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and shall be in compliance with the UL listing.

6. Each designated zone shall transmit separate and different alarm, supervisory and trouble signals to the FACP.
7. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

B. Scope:

1. An intelligent reporting, microprocessor controlled fire detection and system shall be installed in accordance with the specifications and drawings.
2. Basic Performance:
  - a. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded onto NFPA Style 7 (Class A) Signaling Line Circuits (SLC).
  - b. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D).
  - c. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z).
  - d. Digitized electronic signals shall employ check digits or multiple polling.
  - e. Power for initiating devices and notification appliances must be from the main fire alarm control panel, the transponder to which they are connected or to a Field Charging Power Supply (FCPS).
  - f. A single ground or open on any system signaling line circuit, initiating device circuit, or notification appliance circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
  - g. Alarm signals arriving at the main FACP shall not be lost following a power failure (or outage) until the alarm signal is processed and recorded.
3. Basic System Functional Operation:

When a fire alarm condition is detected and reported by one of the system initiating devices or appliances, the following functions shall immediately occur:

- a. The FACP alarm LED on the FACP shall flash.
- b. A local piezo-electric signal in the FACP control panel shall sound.
- c. The 80-character LCD display on the local FACP node and on the intelligent network display shall indicate all information associated with the fire alarm condition, including the type of alarm point, and its location within the protected premises.
- d. Printing and history storage equipment shall log the information associated with the fire alarm control panel condition, along with the time and date of occurrence.

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Maintenance Facilities Improvements and Renovations  
Newton, MA

- e. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated on either local outputs or points located on other network nodes.

4. Software Modifications:

- a. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
- b. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm network on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

5. Certifications:

- a. Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer and trained on network applications. Include names and addresses in the certification.

C. Applicable Publications:

The publications listed below form a part of this specification. The publications are referenced in text by the basic designation only.

1. National Fire Protection Association (NFPA) - USA:

|         |                          |
|---------|--------------------------|
| No. 72  | National Fire Alarm Code |
| No. 70  | National Electric Code   |
| No. 101 | Life Safety Code         |

2. Underwriters Laboratories Inc. (UL) - USA:

|         |  |
|---------|--|
| No. 50  | Cabinets and Boxes                                       |
| No. 268 | Smoke Detectors for Fire<br>Protective Signaling Systems |

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

|          |  |
|----------|--|
| No. 864  | Control Units for Fire Protective Signaling Systems                      |
| No. 268A | Smoke Detectors for Duct Applications                                    |
| No. 521  | Heat Detectors for Fire Protective Signaling Systems                     |
| No. 228  | Door Closers-Holders for Fire Protective Signaling Systems               |
| No. 464  | Audible Signaling Appliances   |
| No. 38   | Manually Actuated Signaling Boxes  |
| No. 346  | Waterflow Indicators for Fire Protective Signaling Systems               |
| No. 1481 | Power supplies for Fire Protective Signaling Systems                     |
| No. 1076 | Control Units for Burglar Alarm Proprietary Protective Signaling Systems |
| No. 1971 | Visual Notification Appliances   |

3. Local and State Building Codes.
4. All requirements of the Authority Having Jurisdiction (AHJ).

D. Approvals:

1. The system must have proper listing and/or approval from the following nationally recognized agencies:

|      |                                     |
|------|-------------------------------------|
| UL   | Underwriters Laboratories Inc.      |
| FM   | Factory Mutual                      |
| MEA  | Material Equipment Acceptance (NYC) |
| CSFM | California State Fire Marshal       |

2. The fire alarm control panel, shall meet the modular labeling requirements of Underwriters Laboratories, Inc. Each subassembly, including all printed circuits, shall include the appropriate UL modular label. Systems which do not include modular labels which may require return to the manufacturer for system upgrades, and are not acceptable.

E. Equipment and Material - General:

1. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling (fire alarm) system. The authorized representative of the manufacturer of the major equipment, such as control panels, shall be responsible for the satisfactory installation of the complete system.
2. All equipment and components shall be installed in strict compliance with each manufacturer's recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc. before beginning system installation. Refer to the riser/connection diagram for all specific system installation/termination/wiring data.
3. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place. (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

F. Conduit and Wire:

1. Conduit:
  - a. Conduit shall be in accordance with the National Electrical Code (NEC), local and state requirements.
  - b. Conduit fill shall not exceed 40 percent of interior cross sectional area where three or more cables are contained within a single conduit.
  - c. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760.
  - d. Wiring for 24 volt control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.
  - e. Conduit shall not enter any FACP, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
  - f. Conduit shall be 3/4 inch (19.1 mm) minimum.
2. Wire:
  - a. All fire alarm system wiring must be new, unless specified herein.

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Maintenance Facilities Improvements and Renovations  
Newton, MA

- b. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 16 AWG (1.02 mm) for initiating device circuits and signaling line circuits, and 14 AWG (1.32 mm) for notification appliance circuits.
  - c. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).
  - d. Wiring used for the SLC multiplex communication loop shall be twisted and shielded unless specifically excepted by the fire alarm equipment manufacturer.
  - e. All field wiring shall be completely supervised.
3. Terminal Boxes, Junction Boxes and Cabinets:
    - a. All boxes and cabinets shall be UL listed for the intended purpose.
  4. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
  5. The FACP shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution Panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The FACP cabinet shall be grounded securely to either a cold water pipe or grounding rod.
- G. Fire Alarm Control Panel:
1. Fire alarm control panel shall be equal to Notifier NFS-640. Edwards, Simplex, Siemens and FCI are considered equals. Each shall contain a microprocessor based central processing unit (CPU). The FACP shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, transponders, local and remote operator terminals, and other system controlled devices.
  2. Node Capacity and General Operation:
    - a. Each node shall provide, or be capable of, expansion to 198 intelligent addressable devices per loop. FACP shall support 2 intelligent loops.
    - b. Each FACP node shall include a full featured operator interface control and annunciation panel which shall include a backlit Liquid Crystal Display (LCD), individual, color coded system status LEDs, and an alpha-numeric keypad for field programming and control of the node.
    - c. All programming or editing of the existing programming the system shall be achieved without special equipment or interrupting the alarm monitoring functions of the fire alarm control panel.

- d. Each FACP node shall provide the following features:

|                           |                                |
|---------------------------|--------------------------------|
| Block Acknowledge         | Printer Interface              |
| Charger Rate Control      | CRT Display Interface          |
| Control-by-Time           | Non-Alarm Module Reporting     |
| Day/Night Sensitivity     | Periodic Detector Test         |
| Device Blink Control      | Remote Page                    |
| Drift Compensation        | Trouble Reminder               |
| NFPA 72, Sensitivity Test | Upload/Download to PC computer |
| System Status Reports     | Verification Counters          |
| Security Monitor          | Points Walk Test               |
| Alarm Verification        | Maintenance Alert              |

3. Loop Interface Board (LIB):

- a. Loop interface boards shall be provided to monitor and control each of the Signaling Line Circuit (SLC) loops in the network node. The loop interface board shall contain its own microprocessor and shall be capable of operating in local mode in the case of a failure in the main CPU of the control panel. In local mode, the loop interface board shall detect alarms and activate output devices on its own SLC loop.
- b. The LIB shall not require any jumper cuts or address switch settings to initialize SLC Loop operations.
- c. The loop interface board shall provide power to, and communicate with, all of the intelligent detectors and addressable modules connected to its SLC Loop over a single pair of wires. This SLC Loop shall be capable of operation as NFPA Style 4, Style 6, or Style 7.
- d. The LIB shall be able to drive two Style 4 SLC loops, each up to 10,000 feet in length, for an effective loop span of 20,000 feet.
- e. The loop interface board shall receive analog information from all intelligent detectors and shall process this information to determine whether normal, alarm, or trouble conditions exist for that particular detector. The loop interface board software shall include software to automatically adjust and compensate for dust accumulation to maintain detector performance as it is affected by environmental factors. The analog information may also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
- f. The LIB shall communicate with each intelligent addressable detector and addressable module on its SLC loop and verify proper device function and status. Communication with up to 198 intelligent devices shall be performed every six seconds or less.



4. Enclosures:
  - a. Control panels shall be housed in UL listed cabinets suitable for semi-flush mounting. Cabinets shall be corrosion protected, given a rust-resistant prime coat, and the manufacturer's standard finish.
  - b. The back box and door shall be constructed of .060 steel with provisions for electrical conduit connections into the sides and top.
  - c. The door shall provide a key lock and include a transparent opening for viewing all indicators. For convenience, the door shall have the ability to be hinged on either the right or left-hand side.
  - d. The control unit shall be modular in structure for ease of installation, maintenance, and future expansion.
5. FACP nodes shall be designed so that it permits continued local operation of remote transponders under both normal and abnormal network communication loop conditions. This shall be obtained by having transponders operate as local control panels upon loss of network communication.
6. FACP nodes shall be modular in construction to allow ease of servicing. Each CPU and transponder shall be capable of being programmed on site without requiring the use of any external programming equipment. Systems, which require use of external programmers or change of EPROMs are not acceptable.
7. The CPU and associated equipment are to be protected so that they will not be affected by voltage surges or line transients including RFI and EMI.
8. FACP Power Supplies:
  - a. Main power supplies shall operate on 120 VAC, 60Hz, and shall provide all necessary power for the FACP.
  - b. Each main supply shall provide 3.0 amps of usable notification appliance power, using a switching 24 VDC regulator.
  - c. The main power supply shall be expandable for additional notification appliance power in 3.0 ampere steps.
  - d. Each main power supply shall provide a battery charger for 60 hours of standby using dual-rate charging techniques for fast battery recharge. It shall charge 55 Amp hour batteries with-in a 48 hour period.
  - e. The supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults on sensitive addressable modules.
  - f. It shall provide meters to indicate battery voltage and charging current.
  - g. The main power supply shall be power-limited per 1995 UL864 requirements.

9. System Circuit Supervision:

- a. Each FACP node shall supervise all circuits to intelligent devices, transponders, annunciators and peripheral equipment and annunciate loss of communications with these devices. The FACP CPU shall continuously scan the above devices for proper system operation and upon loss of response from a device shall sound an audible trouble, indicate which device or devices are not responding and print the information on the printer.
- b. Sprinkler system valves, standpipe control valves, PIV, and main gate valves shall be supervised for off-normal position.

10. Field Wiring Terminal Blocks:

- a. For ease of service, all wiring terminal blocks shall be the plug-in type and have sufficient capacity for 18 to 12 AWG wire. Fixed terminal blocks are not acceptable.

11. Operators Terminal:

Provide the following functions in addition to any other functions required for the system.

- a. Acknowledge (ACK/STEP) Switch:
  1. Activation of the control panel Acknowledge switch in response to a single new Alarm and/or trouble condition shall silence the local panel piezo electric signal and change the system alarm or trouble LED from flashing mode to steady-ON mode. If additional new alarm or trouble conditions exist or are detected and reported in the system, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
  2. Depressing the acknowledge switch shall also silence all remote annunciator piezo sounders.
- b. Signal Silence Switch:
  1. Activation of the signal silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm activation. The selection of notification circuits and relays which are silence able by this switch shall be fully field programmable within the confines of all applicable standards.

- c. System Reset Switch:
    - 1. Activation of the system reset switch shall cause all local electronically-latched initiating devices, software zones, output devices and circuits, to return to their normal condition.
    - 2. If an alarm condition(s) still exists, or if they reoccur in the system after system reset switch activation, the system shall then resound the alarm conditions.
  - d. System Test Switch:
    - 1. Activation of the system test switch shall initiate an automatic test of all intelligent/addressable detectors in the local system. The system test shall activate the electronics in each intelligent sensor, simulating an alarm condition and causing the transmission of the alarm condition from that sensor to the fire alarm control panel. The fire alarm control panel shall interpret the data from each sensor installed in the system. A report summarizing the results of this test shall be displayed automatically on the system LCD and on any CRTs or printers in the system.
  - e. Lamp Test Switch:
    - 1. Activation of the lamp test switch shall sequentially turn on all LED indicators, system liquid crystal display and local piezo signal, and then automatically return the fire alarm control panel to the previous condition.
12. Field Programming:
- a. The system shall be programmable, configurable and expandable in the field without the need for special tools or electronic equipment and shall not require field replacement of electronic integrated circuits.
  - b. All local FACP node programming shall be accomplished through the FACP keyboard or through the video display terminal.
  - c. All field defined programs shall be stored in non-volatile memory.
  - d. The programming function shall be enabled with a password that may be defined specifically for the system when it is installed. Two levels of password protection shall be provided in addition to a key-lock cabinet. One level is used for status level changes such as zone disable or manual on/off commands. A second (higher-level) is used for actual change of program information.
13. Specific System Operations:
- a. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent detectors in the FACP node from each system keypad or from the keyboard of the video terminal. Sensitivity range shall be within allowed UL limits.

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Newton, MA

- b. Alarm Verification: Each of the intelligent addressable detectors in the system may be independently selected and enabled for alarm verification. Each FACP shall keep a count of the number of times each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
- c. System Point Operations:
  - 1. All devices in the FACP node may be enabled or disabled through the local keypad or video terminal.
  - 2. Any FACP node output point may be turned on or off from the local system keypad or the video terminal.
- d. Point Read: The FACP node shall be able to display the following point status diagnostic functions without the need for peripheral equipment. Each point will be annunciated for the parameters listed:
  - 1. Device Status
  - 2. Device Type
  - 3. Custom Device Label
  - 4. Software Zone Label
  - 5. Device Zone Assignments
  - 6. Detector Analog Value
  - 7. All Program Parameters
- e. System Status Reports: Upon command from a password-authorized operator of the system, a status report will be generated, and printed, listing all local FACP system status.
- f. System History Recording and Reporting: Each FACP node shall contain a history buffer that shall be capable of storing a minimum of 400 system events. Each local activation will be stored and time and date stamped with the actual time of the activation, until an operator requests that the contents be either displayed or printed. The contents of the history buffer may be manually reviewed, one event at a time, and the actual number of activations may also be displayed and or printed.
  - 1. The history buffer shall use non-volatile memory. Systems which use volatile memory for history storage are not acceptable.

- g. Automatic Detector Maintenance Alert: Each FACP node shall automatically interrogate each intelligent system detector and shall analyze the detector responses over a period of time.
  - 1. If any intelligent detector in the system responds with a reading that is below or above normal limits, then the system will enter the trouble mode, and the particular intelligent detector will be annunciated on the system display, network display and printed on the optional system printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.

H. Addressable Devices – General:

- 1. Addressable devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches.
- 2. Addressable devices which use a binary address setting method, such as a Dip switch, are difficult to install and subject to installation error. This type of device is not an allowable substitute.
- 3. Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the FACP signaling line circuit.
- 4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
- 5. Smoke detector sensitivity shall be set in the fire alarm control panel and shall be adjustable in the field through the field programming of the system. Sensitivity may be automatically adjusted by the panel on a time-of-day basis.
- 6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
- 7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base shall include a relay base and an isolator base designed for Class A applications.

8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
  9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
  10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
  11. A magnetic test switch shall be provided to test each detector for 100 percent obscuration, reported to the FACP.
  12. Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
  13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100 percent of the alarm threshold.
- I. Carbon Monoxide Detector
1. Features
    - a. Listed to UL standard 2075 for the Standard For Safety for Gas and Vapor Detector and Sensors
    - b. Tested to UL 2075 using UL 2034 Sensitivity limits for carbon monoxide gas
    - c. Surface mounts to a wall using the supplied enclosure rear housing
    - d. Flush mounts in a 2 x 4 (1-1/2 inch deep minimum) [5.08 cm x 10.16 cm (3.81 cm deep minimum)] single gang switch, or handy
    - e. electrical box
    - f. Small, low profile, attractive unit in a white plastic case
    - g. Detector alarms at multiple levels of exposure to carbon monoxide based on time weighted averages of the gas present
    - h. Inexpensive, easy to install. Microcomputer control allows mostly automatic operation
    - i. Test & Reset switch conducts internal tests and actuates alarm relay
    - j. Visual display: Green - Normal operation
    - k. FLASHING Amber - Trouble Contact your installer or Macurco Tech Support
    - l. Red - Danger! Move to fresh air (hazardous condition is present)
    - m. Highly linear electrochemical sensor

- n. N.O. or N.C. SPST Alarm Relay and N.C. SPST Trouble relay to connect to Alarm Control Panels
  - o. Buzzer: Produces repeating loud tone bursts during alarm, and chirps if sensor trouble is found
2. Specifications
- a. Voltage: 9-32 VDC
  - b. Current (normal / alarm): 15mA / 35mA @ 9-32V
  - c. Size: 3-1/8 X 5-1/8 X 1-1/2 inch (7.94 x 13.02 x 3.81 cm)
  - d. Alarm Relay: SPST, 100mA, 40VDC
  - e. Trouble Relay: SPST, 100mA, 40VDC
  - f. Buzzer Rating: 85 dBA at 10 Feet
  - g. Shipping Weight: One pound
  - h. Operating Temp. Range: 40°F (4.4°C) to 100°F (37.8°C)
  - i. Alarm Setting: Per UL 2034
  - j. Color: White
  - k. Designed for use with a UL Listed Fire Alarm/Burglary Control Panel
  - l. End-of-Life Indication: 10 years after installation
3. Manufacturer:
- a. Macurco CM-E1
  - b. Or equal
- J. Addressable Pull Box (manual station):
- 1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key. Stations shall be of the double action type.
  - 2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
  - 3. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches or larger.
  - 4. Stations shall be suitable for surface mounting or semiflush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.

K. Intelligent Photoelectric Smoke Detector:

1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.

L. Intelligent Thermal Detectors:

1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit. Up to 99 intelligent heat detectors may connect to one SLC loop.

M. Intelligent Duct Smoke Detector:

1. The in-duct smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

N. Addressable Dry Contact Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLC loops.
2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
3. The IDC zone may be wired for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.

O. Two Wire Detector Monitor Module:

1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).



2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.

P. Addressable Control Module:

1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100 percent of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
4. Audio/visual power shall be provided by a separate supervised power loop from the main fire alarm control panel or from a supervised, UL listed remote power supply.
5. The control module shall be suitable for pilot duty applications and rated for a minimum of .6 amps at 30 VDC.

Q. Isolator Module:

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC loop. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC Loop. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

R. Batteries and External Charger:

1. Battery:

- a. Batteries shall be 12 volt, Gell-Cell type.
- b. The battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 10 minutes of alarm upon a normal AC power failure.
- c. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills and leakage shall not be required.

S. LCD Alphanumeric Display Annunciator:

1. The alphanumeric display annunciator shall be a supervised, back-lit LCD display containing a minimum of 80 characters for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions from either the network node or complete network, via the INA.
3. Up to 32 LCD annunciators may be connected to a specific (terminal mode) EIA 485 interface. LCD annunciators shall not reduce the annunciation capacity of the system. Each LCD shall include vital system wide functions such as, system acknowledge, silence and reset.
4. LCD display annunciators shall mimic the local control panel 80 character display or network annunciator and shall not require special programming.

T. Audio/Visual Unit (Xenon Strobe):

1. Combination horn strobe units - Provide Non-Addressable 75 Cd, Red Sync. Two Wire. Comprised of a 24 VDC Xenon Flash Tube entirely solid state. The unit shall require a sync. Control module. Provide True 75 Cd from all axis.
2. Combination horn strobe units - Provide Non-Addressable 110 Cd, Red Sync. Two-Wire. Comprised of a 24 VDC Xenon Flash Tube entirely solid state. The unit shall require a sync. Control module. Provide True 110 Cd from all axis.
3. Visual only – Provide Non-Addressable 15 Cd, Red Sync. Two-Wire comprised of a 24 VDC Xenon flash tube entirely solid state.

U. Cellular Alarm Transmission:

1. Provide a cellular RF communicator equal to Starlink #SLE-LTEV-CFB and all programming antennae, battery back-up and testing to connect to a UL listed central station. Cellular communicator shall report Contact ID to report by device. Provide one year of monitoring by a UL listed central station.

V. Exterior Strobe-Light:

1. Provide wall mounted, 24 v.d.c. Strobe, color Red with WRR wall bracket.

W. Key Box:

1. Proved key repository box equal to Supra Safe 2HSR with tamper switch or as required by Fire Department.

X. Provide clear plastic covers with local audible alarm for all pull stations as indicated on drawings.

Y. Field Quality Control

1. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.
2. Service personnel shall be qualified and experienced in the inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall be permitted to include, but shall not be limited to, individuals with the following qualifications:
  - a. Factory trained and certified.
  - b. National Institute for Certification in Engineering Technologies (NICET) fire alarm certified.
  - c. International Municipal Signal Association (IMSA) fire alarm certified.
  - d. Certified by a state or local authority.
  - e. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
3. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.
4. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing.
5. Minimum System Tests: Test the system according to the procedures outlined in NFPA 72.
6. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.
7. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.
8. Final Test, Certificate of Completion, and Certificate of Occupancy:
  - a. Test the entire system new and existing devices as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

Z. Training

1. Provide 4 hours of owner training with manufacturer's representative present.

**2.14 SURGE PROTECTION**

A. Scope

1. This section describes the materials and installation requirements for surge protective devices (SPD) for the protection of all main service and panelboards.

B. Submittals

1. Submit shop drawings and product information for approval and final documentation in the quantities listed according to the Conditions of the Contract. All transmittals shall be identified by customer name, customer location, and customer order number.
2. Submittals shall include UL 1449 3rd Edition Listing documentation verifiable by visiting [www.UL.com](http://www.UL.com), clicking "Certifications" link, searching using UL Category Code: VZCA and VZCA2:
  - a. Short Circuit Current Rating (SCCR)
  - b. Voltage Protection Ratings (VPRs) for all modes
  - c. Maximum Continuous Operating Voltage rating (MCOV)
  - d. I-nominal rating (I-n)
  - e. SPD shall be UL listed and labeled as Type 1 or Type 4 intended for Type 1 or Type 2 applications
3. Upon request, an unencapsulated but complete SPD formally known as TVSS shall be presented for visual inspection.
4. Minimum of ten year warranty

C. Related Standards

1. IEEE C62.41.1, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits,
2. IEEE C62.41.2, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits,
3. IEEE C62.45, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits.
4. National Electrical Code: Article 285
5. UL 1283 - Electromagnetic Interference Filters
6. UL 1449, Third Edition, effective September 29, 2009 – Surge Protective Devices

D. Quality Assurance

1. Manufacturer Qualifications: Engage a firm with at least 5 years experience in manufacturing transient voltage surge suppressors.
2. Manufacturer shall be ISO 9001 or 9002 certified.
3. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of ten years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
4. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.

E. Delivery, Storage And Handling

1. Handle and store equipment in accordance with manufacturer's Installation and Maintenance Manuals. One copy of this document to be provided with the equipment at time of shipment.

F. Manufacturers

1. Provide an internally mounted Surge Protective Devices (SPD) formerly called Transient Voltage Suppressor (TVSS) by:
  - a. Siemens Industry.
  - b. Current Technology
  - c. LEA
  - d. Liebert
  - e. APT
  - f. Or equal

G. Electrical Distribution Equipment

1. Service Entrance
  - a. SPD shall be UL 1449 labeled as Type 1 or Type 4 intended for Type 1 or Type 2 applications, verifiable at UL.com, without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
  - b. SPD shall be factory installed integral to electrical distribution equipment.
  - c. SPD shall be UL labeled with 20kA I-nominal (I-n)
  - d. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR).

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Newton, MA

- e. Standard 7 Mode Protection paths: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
  - f. True 10 Mode Protection paths: SPD shall provide “directly connected protection elements” between all possible modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
  - g. SPD shall be connected external of the distribution equipment with an appropriately sized 200kA SCCR rated disconnect.
  - h. SPD shall meet or exceed the following criteria:
2. Maximum 7-Mode surge current capability shall be [300kA] per phase.
  3. Maximum 10-Mode surge current capability shall be [300kA] per phase.
  4. UL 1449 - Third Edition Revision; effective September 29, 2009 Voltage Protection Ratings shall not exceed the following:

| <u>VOLTAGE</u> | <u>L-N</u> | <u>L-G</u> | <u>N-G</u> | <u>L-L</u> | <u>MCOV</u> |
|----------------|------------|------------|------------|------------|-------------|
| 120/240        | 800V       | 800V       | 800V       | 1200V      | 150V        |

- a. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

| <u>System Voltage</u> | <u>Allowable</u> | <u>System</u>          | <u>Voltage</u> | <u>MCOV</u> |
|-----------------------|------------------|------------------------|----------------|-------------|
|                       |                  | <u>Fluctuation (%)</u> |                |             |
| 120/240               | 25%              |                        |                | 150V        |

- b. SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz.
- c. Suppression components shall be heavy duty ‘large block’ MOVs, each exceeding 30mm diameter.
- d. SPD shall include a serviceable, replaceable module.
- e. SPD shall be equipped with the following diagnostics:
  1. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
  2. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
  3. Form C dry contacts
  4. Optional – Surge Counter
- f. No other test equipment shall be required for SPD monitoring or testing before or after installation.
- g. SPD shall have a response time no greater than 1/2 nanosecond.
- h. SPD shall have a 10 year warranty.

5. Distribution Panel

- a. SPD shall be UL 1449 labeled as Type 4 intended for Type 1 or Type 2 applications, verifiable at UL.com, without need for external or supplemental overcurrent controls. Every suppression component of every mode, including N-G, shall be protected by internal overcurrent and thermal overtemperature controls. SPDs relying upon external or supplementary installed safety disconnectors do not meet the intent of this specification.
- b. SPD shall be factory installed integral to electrical distribution equipment.
- c. SPD shall be UL labeled with 20kA I-nominal (I-n)
- d. SPD shall be UL labeled with 200kA Short Circuit Current Rating (SCCR).
- e. Standard 7 Mode Protection paths: SPD shall provide surge current paths for all modes of protection: L-N, L-G, L-L, and N-G for Wye systems; L-L, L-G in Delta and impedance grounded Wye systems.
- f. SPD shall be connected to the buss of the distribution equipment with an appropriately sized 200kA SCCR rated disconnect.
- g. SPD shall meet or exceed the following criteria:
  - 1. Maximum 7-Mode surge current capability shall be 100kA per phase.
  - 2. Maximum 10-Mode surge current capability shall be 150kA per phase.

6. UL 1449 - Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

| <u>VOLTAGE</u> | <u>L-N</u> | <u>L-G</u> | <u>N-G</u> | <u>L-L</u> | <u>MCOV</u> |
|----------------|------------|------------|------------|------------|-------------|
| 120/240        | 800V       | 800V       | 800V       | 1200V      | 150V        |

- a. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

| <u>System Voltage</u> | <u>Allowable</u>       | <u>System</u> | <u>Voltage</u> | <u>MCOV</u> |
|-----------------------|------------------------|---------------|----------------|-------------|
| <u>120/240</u>        | <u>Fluctuation (%)</u> | <u>25%</u>    | <u>150V</u>    | <u>150V</u> |
| 120/240               | 25%                    |               |                | 150V        |

- b. SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz.
- c. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.
- d. SPD shall include a serviceable, replaceable module.
- e. SPD shall be equipped with the following diagnostics:
  - 1. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.

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Newton, MA

2. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
  3. Form C dry contacts
  4. Optional – Surge Counter
- No other test equipment shall be required for SPD monitoring or testing before or after installation.

- f. SPD shall have a response time no greater than 1/2 nanosecond.
- g. SPD shall have a 10 year warranty.

7. Branch Panels

- a. The panelboard shall be UL 67 Listed and the SPD shall be UL 1449 labeled as Type 1 or as Type 4 intended for Type 1 or Type 2 applications.
- b. The unit shall be top or bottom feed according to requirements. A circuit directory shall be located inside the door.
- c. SPD shall meet or exceed the following criteria:
  1. Maximum 7-Mode surge current capability shall be 100kA per phase.
  2. Maximum 10-Mode surge current capability shall be 150kA per phase.
  3. UL 1449 - Third Edition Revision; effective September 29, 2009, Voltage Protection Ratings shall not exceed the following:

| <u>VOLTAGE</u> | <u>L-N</u> | <u>L-G</u> | <u>N-G</u> | <u>L-L</u> | <u>MCOV</u> |
|----------------|------------|------------|------------|------------|-------------|
| 120/240        | 800V       | 800V       | 800V       | 1200V      | 150V        |

- d. UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):

| <u>System Voltage</u> | <u>Allowable System Voltage<br/>Fluctuation (%)</u> | <u>MCOV</u> |
|-----------------------|---|-------------|
| 120/240               | 25%   | 150V        |

- e. SPD shall incorporate a UL 1283 listed EMI/RFI filter with minimum attenuation of - 50dB at 100 kHz.
- f. Suppression components shall be heavy duty 'large block' MOVs, each exceeding 30mm diameter.
- g. SPD shall include a serviceable, replaceable module.
- h. SPD shall be equipped with the following diagnostics:
  1. Visual LED diagnostics including a minimum of one green LED indicator per phase, and one red service LED.
  2. Audible alarm with on/off silence function and diagnostic test function (excluding branch).
  3. Form C dry contacts
  4. Optional – Surge Counter



- i. No other test equipment shall be required for SPD monitoring or testing before or after installation.
- j. SPD shall have a response time no greater than 1/2 nanosecond.
- k. SPD shall have a 10 year warranty.
- l. The unit shall have removable interior.
- m. The main bus shall be [copper] [aluminum] and rated for the load current required.
- n. The unit shall include a 200 percent rated neutral assembly with copper neutral bus.
- o. The unit shall be provided with a safety ground bus.
- p. The field connections to the panelboard shall be main lug or main breaker.
- q. The unit shall be constructed with flush or surface mounted trim and shall be in a NEMA Type 1 enclosure.

H. Installation

- 1. Install per manufacturer's recommendations and contract documents.

I. Adjustments And Cleaning

- 1. Remove debris from installation site and wipe dust and dirt from all components.
- 2. Repaint marred and scratched surfaces with touch up paint to match original finish.

J. Testing

- 1. Check tightness of all accessible mechanical and electrical connections to assure they are torqued to the minimum acceptable manufacture's recommendations.
- 2. Check all installed panels for proper grounding, fastening and alignment.

K. Warranty

- 1. Equipment manufacturer warrants that all goods supplied are free of non-conformities in workmanship and materials for one year from date of initial operation, but not more than eighteen months from date of shipment.

**2.15 ELECTRIC SERVICE**

- A. Coordinate and cooperate with Eversource, hereinafter called utility company, with respect to providing service and metering.
- B. Provide all primary system raceways, elbows, pull wires and all pad grounding. Utility company will provide pad mounted transformer and primary conductors including making up of all terminations and connections.

- C. Provide secondary service complete including all conductors, raceways, and connectors at transformer. Provide oversized lugs if required due to conductor sizing. Coordinate attachment of secondary conductors to the transformer terminals with utility company.
- D. General contractor will do all excavation and back filling in accordance with utility company standards.
- E. Metering: All usage will be on one secondary meter. Meter will be located on exterior pedestal or building exterior mounted. Provide meter socket and 1 ½ in. conduit between current transformers and meter socket.
- F. All work shall be in accordance with these standards, the National Electric Safety Code and state and local requirements. Additional specifications, when required, shall be furnished by the utility engineer.
- G. Approval of all construction completed by the customer shall be obtained from the utility, including approval of plans before construction and of grounding installation prior to backfilling. Plans shall show location of transformer pad(s) and conduit type, size, number, and location.
- H. General Trades Contractor will do all excavation and back filling in accordance with utility company standards and will provide the concrete pad for transformer.
- I. All work to be done in accordance with utility company standards.

## **2.16 LADDER TRAY/WIREWAYS**

- A. Provide aluminum ladder tray with 6 in. rung spacing with 4 in. side rail. Ladder tray shall be as manufactured by B-Line. "Ladder Type". Provide all hangers required. The size of cable tray shall be as indicated on drawings.
- B. Wireway:
  - 1. This specification covers NEMA type 1 wireway used to house and protect communication cable. The wireway system shall consist of wireway and appropriate fittings to complete the installation per the electrical drawings.
  - 2. Metal wireway (NEMA type 1) is to be utilized in dry interior locations only as covered in article 362 part a of the national electrical code, as adopted by the national fire protection association and as approved by the American National Standards Institute. The wiremold "c" or "sp" series is listed by underwriters' laboratories under file no. E137690 guide zoyx.
  - 3. The wireway system specified herein shall be the "c" or "sp" system as manufactured by the wiremold company. Systems of other manufacturers may be considered equal if, in the opinion, and the written approval of the engineer, they meet all the performance standards specified herein

4. The wireway and all system components must be UL Listed in full compliance with their standard UL870, "electrical wireways, auxiliary gutters and associated fittings". It shall be manufactured from 16-gauge cold rolled steel, finished in ASA 61 gray powder coat paint. All sizes larger than 6 in. x 6 in. shall be manufactured from 14-gauge cold rolled steel, finished in ASA 61 gray powder coat paint. A factory installed divider shall be available to separate power and low voltage wiring housed in the same wireway sections.
5. A full complement of fittings for the raceway shall be available including, but not limited to, 45 deg. and 90 deg. flat, vertical inside and outside elbows, tee and cross fittings, couplings for joining sections of wireway, reducers, hangers, end blanks, a field installed divider and all other components necessary to make the system workable. The fittings shall have an ASA 61 gray powder coat paint finish to match the wireway.
6. Prior to and during installation, refer to system layout drawing containing all elements of the system. Installer shall comply with detailed manufacturer's instruction sheets which accompany system components as well as complete system instruction sheets, whichever is applicable.
7. All wireway systems shall be mechanically continuous and connected to all electrical boxes and cabinets, in accordance with manufacturer's installation sheets.
8. All connections shall be checked to make sure they are correctly tightened and to insure that all wireway shall be electrically continuous and bonded in accordance with the national electric code for proper grounding.
9. All wireway systems shall be installed complete. Work shall include fastening all wireway and appropriate fittings to install a complete wireway system as indicated on the electrical and/or communication drawings and in the applicable specifications

## 2.17 SEALS

### A. Water Tight Seals

1. Conduits entering from the exterior or below grade shall have water tight fittings on the outside and on the inside of the conduit.
  - a. Fittings on the outside of the conduit shall be O-Z Gedney type FSK or approved equal. Provide type WSK if penetration is within two feet of the high water table. Provide grounding attachment.
  - b. Fittings on the inside of the conduit shall be O-Z Gedney type CSBI or approved equal. Provide type CSBG if penetration is within two feet of the high water table. Provide a blank fitting to seal spare or empty conduits.
  - c. O-Z Gedney type CSM fitting may be used when sealing within a sleeve or cored hole.
2. Submit on seals to be used.

B. Environmental Seals

1. Provide seals on raceways exposed to widely different temperatures, as in refrigerating or cold storage areas. Install seal to prevent circulation of air from warmer to colder sections through the raceway.

C. Hazardous Area Seals

1. Provide explosion proof seals as required by the Electric Code.

D. Smoke and Fire Stopping Seals

1. Provide a seal around raceways or cables penetrating full height walls (slab to slab), floors or ventilation or air handling ducts so that the spread of fire or products of combustion shall not be substantially increased.
2. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be firestopped using approved methods and NRTL listed products to maintain the fire resistance rating.
3. Fire stopping in sleeves or in areas that may require the addition or modification of installed cables or raceways shall be a soft, pliable, non-hardening fire stop putty. Putty shall be water resistant and intumescent. Provide for all sleeves and raceways.
4. Firestopping in locations not likely to require frequent modification shall be NRTL listed putty, caulk or mortar to meet the required fire resistant rating.
5. Box penetrations into a fire rated wall or shaft shall have a fire stopping pad installed on the back of the box.
6. Firestopping of cable trays or busways through walls shall be with a non-hardening putty or with seal bags.
7. Firestopping materials shall be NRTL listed to UL 1479 (ASTM E814). Installation methods shall conform to a UL firestopping system. Submit specifications and installation drawings for the type of material to be used. Firestopping materials shall be as manufactured by 3M, International Protective Coatings Corp., RayChem or approved equal.

**2.18 VARIABLE FREQUENCY DRIVES (VFD'S)**

- A. The variable frequency drives (VFD's) shall be solid state, with a Pulse Width Modulated (PWM) output waveform (VVI, six-step, and current source drives are not acceptable). The VFD package as specified herein shall be enclosed in a NEMA 1 enclosure, completely assembled and tested by the manufacturer. The VFD shall employ a full wave rectifier (to prevent input line notching), DC Line Reactor, capacitors, and Insulated Gate Bipolar Transistors (IGBT's) as the output switching device (SCR's, GTO's and Darlington transistors are not acceptable). The drive efficiency shall be 97 percent or better at full speed and full load. Fundamental power factor shall be 0.98 at all speeds and loads.

B. Specifications at 208 volts:

1. Input VAC +/-10 percent (capable of operation to 250 VAC), 3 phase, 48-63Hz. Output 0 - Input Voltage, 3 phase, 0 to 500 Hz for drives up to 75 HP; 0 to 120 Hz for drives over 75 HP. Operation above 60 Hz. shall require programming changes to prevent inadvertent high speed operation. Environmental operating conditions: 0 to 40 C @ 3 kHz switching frequency, 0 to 3300 feet above sea level, less than 95 percent humidity, non-condensing. Units shall be UL, CUL and CA approved.

C. All VFD's shall have the following standard features:

1. All VFD's shall have the same customer interface, including digital display, keypad and customer connections; regardless of horsepower rating. The keypad is to be used for local control, for stepping through the displays and menus.
2. The VFD shall give the user the option of either (1) displaying a fault, (2) running at a programmable preset speed, (3) hold the VFD speed based on the last reference revised, or (4) cause a Warning to be issued, if the input reference (4-20mA or 2-10V) is lost; as selected by the user. The VFD shall provide a programmable relay output for customer use to indicate the loss of reference condition.
3. The VFD's shall utilize plain English digital display (code numbers and letters are not acceptable). The digital display shall be a 40-character (2 line X 20 characters/line) LCD display. The LCD shall be backlit to provide easy viewing in any angle. All set-up parameters, indications, faults, warnings and other information must be displayed in words to allow the user to understand what is being displayed without the use of a manual or cross-reference table.
4. The VFD's shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time.
5. The VFD shall have the ability to automatically restart after an overcurrent, overvoltage, or loss of input signal protective trip. The number of restart attempts, trial time, and time between reset attempts shall be programmable. If the time between reset attempts is greater than zero, the time remaining until reset occurs shall count down on the display to warn an operator that a restart will occur.
6. The VFD shall be capable of starting into a rotating load (forward or reverse) and accelerate or decelerate to setpoint without safety tripping or component damage (flying start).
7. The VFD shall be equipped with an automatic extended power loss ride-through circuit which will utilize the inertia of the load to keep the drive powered. Minimum power loss ride-through shall be one-cycle, based on full load and not inertia. Removing power from the motor is not an acceptable method of increasing power loss ride-through.
8. The customer terminal strip shall be isolated from the line ground.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

9. Prewired 3-position Hand-Off-Auto switch and speed potentiometer. When in "Hand", the VFD will be started, and the speed will be controlled from the speed potentiometer. When in "Off", the VFD will be stopped. When in "Auto", the VFD will start via an external contact closure, and its speed will be controlled via an external speed reference.
  10. The drive shall employ three current limit circuits to provide trip free operation.
  11. The Slow Current Regulation limit circuit shall be adjustable to 125 percent (minimum) of the VFD's variable torque current rating. This adjustment shall be made via the keypad, and shall be displayed in actual amps, and not as percent of full load. The Rapid Current Regulation limit shall be adjustable to 170 percent (minimum) of the VFD's variable torque current rating. The Current Switch-off limit shall be fixed at 255 percent (minimum, instantaneous) of the VFD's variable torque current rating. The overload rating of the drive shall be 110 percent of its variable torque current rating for 1 minute every 10 minutes, and 140 percent of its variable torque current rating for 2 seconds every 15 seconds, input line fuses standard in the drive enclosure. VFD shall have a DC Line Reactor to reduce the harmonics to the power line and to increase the fundamental power factor.
  12. The VFD shall be optimized for a 3 kHz carrier frequency to reduce motor noise and provide high system efficiency. The carrier frequency shall be adjustable by the start-up engineer in ACH 501 units. The VFD shall have a manual speed potentiometer in addition to using the keypad as a means of controlling speed manually.
- D. All VFD's to have the following adjustments:
1. Five programmable critical frequency lockout ranges to prevent the VFD from continuously operating at an unstable speed.
  2. PI Setpoint controller shall be standard in the drive, allowing a pressure or flow signal to be connected to the VFD, using the microprocessor in the VFD for the closed loop control.
  3. Two programmable analog inputs shall accept a current or voltage signal for speed reference, or for reference and actual (feedback) signals for PI controller. Analog inputs shall include a filter; programmable from 0.01 to 10 seconds to remove any oscillation in the input signal. The minimum and maximum values (gain and offset) shall be adjustable within the range of 0-20 MA and 0-10 Volts. Additionally, the reference must be able to be scaled so that maximum reference can represent a frequency less than 60 Hz, without lowering the drive maximum frequency below 60 Hz.
  4. Six programmable digital inputs for maximum flexibility in interfacing with external devices. One digital input is to be utilized as a customer safety connection point for fire, freeze, and smoke interlocks (Enable). Upon remote, customer reset (reclosure of interlock), drive is to resume normal operation.

- E. The following operating information displays shall be standard on the VFD digital display. The display shall be in complete English words (alpha-numeric codes are not acceptable):
1. Output Frequency
  2. Motor Speed (RPM, Percent or Engineering units)
  3. Motor Current
  4. Calculated Motor Torque
  5. Calculated Motor Power
  6. DC Bus Voltage
  7. Output Voltage
  8. Heatsink Temperature
  9. Analog Input Values
  10. Keypad Reference Values
  11. Elapsed Time Meter
  12. kWh meter
- F. Speed Command Input shall be via:
1. Keypad.
  2. Two Analog inputs, each capable of accepting a 0-20mA, 4-20mA, 0-10V, 2-10V signal. Input shall be isolated from ground, and programmable via the keypad for different uses.
  3. Floating point input shall accept a three-wire input from a Dwyer photohelic (or equivalent type) instrument.
- G. Accessories to be furnished and mounted by the drive manufacturer.
1. Customer Interlock Terminal Strip-provide a separate terminal strip for connection of freeze, fire, smoke contacts, and external start command. All external interlocks and start/stop contacts shall remain fully functional whether the drive is in hand, Auto or Bypass.
  2. All wires to be individually numbered at both ends for ease of troubleshooting.
  3. Door interlocked thermal magnetic circuit breaker which will disconnect all input power from the drive and all internally mounted options. The disconnect handle shall be thru-the-door type, and be padlockable in the "Off" position.

4. Manual transfer to line power via contactors. Include motor thermal overload and fuse or circuit breaker protection while in bypass operation. A three position selector switch to control the bypass contactor and the drive output contactor is to be mounted on the enclosure door. When in the "Normal" mode, the bypass contactor is open and the drive output contactor is closed. In the "Test" position both contactors are open, and in the "Bypass" position, the drive output contactor is open, and the bypass contactor is closed. The drive output contactor shall also open when a stop command is given, isolating the motor from the drive. Start/stop signals and safety interlocks will work in drive and bypass modes.

Pilot lights shall be provided for indication of "Normal" operation, "Bypass" operation, and "External Fault". All pilot lights shall be push-to-test type.

5. Service contactor (drive input contactor) which provides the ability to service the drive (electrically isolate the drive while in bypass operation without having to remove power from the motor). The service contactor shall open when the drive is switched to bypass, and also be controlled by a switch which is mounted inside the drive enclosure so that its access is limited to service personnel only.
6. A class 20 bimetallic thermal motor overload relay shall be provided to protect the motor in bypass.

#### H. Compliance to IEEE – 519

1. The VFD manufacturer shall provide calculations specified to this installation showing that the Total harmonic Distortion for the VFD's, reflected into the electrical distribution system is limited to the level defined by IEEE - 519 (latest edition) for general systems. Harmonic analysis shall be included with VFD submittal for approval by the engineer.
2. The VFD manufacturer shall conduct on site harmonic measurements before and after start up of the VFD's. Results of the measurements, showing harmonic contribution of the VFD's, shall be provided to the engineer one month after start up.
3. Three phase A. C. input line reactors shall be provided as a minimum, with all VFD's. The line reactors are to provide attenuation of line side voltage transients, thus preventing overload trips or other unnecessary V.F.D. shutdown, and provide a reduction in harmonic distortion.
4. Line reactors shall have the following requirement:
  - a. Two or Three percent line impedance.
  - b. 150 percent continuous current rating for one minute.
  - c. Saturation rating no less than 2.5 times the continuous current rating.
  - d. U.L. recognized.



Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- I. General: Install variable frequency drives where indicated, in accordance with manufacturer's published installation instructions, complying with recognized practices to ensure that variable frequency drives comply with requirements and serve intended purposes.
- J. Access: Provide access space around control panels for service as indicated, but in no case less than that recommended by manufacturer.
- K. Support: Install drive control panels on walls where indicated on drawings. Provide necessary Unistrut and structural steel to provide adequate support as required by manufacturer.
- L. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
  - 1. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
- M. Start-Up
  - 1. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.
- N. Adjusting and Cleaning:
  - 1. Alignment: Check compatibility of control panel to motor and where necessary, adjust frequency and provide necessary filters to assure noise free operation of motors. Verify response from control panel to motor to assure turn down ratio specified and that static pressure signals are being received and that drives are controlling as specified and within recommended tolerances by manufacturer. Provide start-up report prepared by manufacturer's representative to assure operation is as specified.
  - 2. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
- O. Acceptable Manufacturers:
  - 1. Allen – Bradley
  - 2. ABB

3. Siemens
4. Honeywell
5. Or equal

## **2.19 EMERGENCY BATTERY SYSTEM**

- A. Provide a 12 volt emergency battery system constructed in accordance with UL Standard 924 and installed in accordance with Article 700 of the Electrical Code in locations indicated on the Drawings.
- B. Battery units and remote heads shall be as manufactured by Emergi-Lite, Inc., Chloride, Inc., Dual Light, Mule Lighting, or equal and shall be of the voltage, capacity and model indicated on the Drawings. Provide units of capacities as required to meet the number of lighting fixtures connected to each unit. Batteries shall be NRTL listed for carrying rated load for 90 minutes.
- C. Battery unit shall be arranged for 60 cycle input with AC voltage as indicated on the Drawings, including heavy gauge sheet cabinet with fully automatic solid-state controlled charger. Unit shall be fully restorable in 12 hours or less and shall include Trickle charger, heavy duty two contact AC supervisory relay, voltmeter, ammeter, protection fuse, ready pilot light, charging pilot light, test switch, knockouts provided in housing for both AC input and DC output to remote heads. Unit shall be provided in the wall-mounting hardware.
- D. Provide five minute time delay relay to maintain emergency lighting in HID source lighted areas for three minutes after return of normal power.
- E. Remote heads shall be of the voltage, wattage and type indicated on the Drawings and shall be housed in an aluminum cylinder with fully adjustable swivel-mounted on a single gang stainless switch plate unless indicated otherwise on Contract Drawings.
- F. Exit signs shall be provided with integral battery back-up

## **2.20 INTRUSION ALARM SYSTEM**

- A. Intrusion Alarm Control Panel
  1. Provide an intrusion system as required and as shown on the plans. The cost of monitoring the facility at a UL listed central station shall be included for a period of one year.
  2. The intrusion alarm panel shall be fully integrated to the USP.
  3. Provide all labor, materials, equipment, and services to perform all operations required for the complete installation and related work as shown in all contract documents.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

4. All motion detectors, roof hatches and exterior doors shall report and be individually annunciated on the intrusion alarm system. For locations that are exterior access control doors, each door contact shall be double pole, double throw. One pole shall be wired to the intrusion alarm system and the other shall be wired to the access control system and programmed in accordance with the access control specification. Each exterior door shall be wired and individually reported to the intrusion alarm system.
  5. Keypads shall be able to arm and disarm the intrusion alarm system
  6. Once armed, any motion detector, door contact, or glass break shall both cause the audible sounder to sound and call the central station.
  7. The control panel shall be capable of supporting Dynamic Host Communication Protocol (DHCP) Internet Protocol (IP) addressing.
  8. The control panel shall be capable of two-way network communication using standard Ethernet 10BaseT in a LAN, WAN, or Internet configuration.
  9. Provide an addressable intrusion alarm control panel complete with enclosure, power supply, and door lock.
  10. The panel must support up to 500 addressable points.
  11. The panel must be able to support 16 independent partitions.
  12. Provide with battery back up and battery harness for a minimum of 4 hours.
  13. Provide DMP500 series or approved equal.
- B. Intrusion Alarm Keypad
1. Provide 32 character platinum keypad as shown on the drawings.
  2. The keypads can be used to both arm and disarm the intrusion system.
  3. Provide DMP 7060A-P or approved equal.
- C. PIR Motion Detectors
1. Provide motion detectors of "home run" type as shown on the drawings. Sensors shall process their signals independently and shall have coverage patterns individually adjustable.
  2. Each PIR shall be wired to the intrusion alarm system.
  3. Provide long range detectors as shown on the plans and as required.
  4. Wiring connections shall be made in equipment cabinets. Conductors other than that of detector will not be allowed at each device. Detectors shall not be wired in series or with door contacts. There shall be no exposed wiring leading to/from detectors.
  5. Catalog, model and type numbers itemized herein for motion detectors are those of DMP.
  6. Detectors shall be mounted on ceiling type wiremold box.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

7. Fields of view that are directed at heat sources such as fans, radiators and other areas that may cause false alarms shall be masked out.
  8. Provide DMP models 6155LX, AP750, FX series, KX-08, and SX-360Z or approved equal.
  9. Provide one (1) addressable input module per motion, DMP 700 series or approved equal.
- D. Door Contacts/Switches
1. Provide recessed door contacts/switches as shown on the drawings. Contacts shall be 3/4 inch and have wire leads of sufficient length for splices to be made in wiremold box or mud type box located adjacent to door. Provide GE model #1078C or approved equal for interior doors. Provide DPDT contacts for all exterior doors, GE model #1076-D or approved equal.
  2. In event that circumstances prevent the use of recessed contacts in some locations, surface contacts may be used, subsequent to approval of Architect.
  3. Wiring for door contacts shall be concealed.
  4. Door contacts shall not be wired in series with exception of double doors which may be wired to panel as single door location.
  5. There shall be no splices in door frames or jambs. Door contact connections shall be made in wiremold or mud switch box located adjacent to door.
  6. Provide one (1) addressable input module per door contact.
- E. Overhead Door
1. Overhead door contact as shown on the drawings. Provide one (1) input module per device.
  2. Provide Sentrol 2200 series or approved equal.
- F. Glass Break Detectors.
1. Provide glass break detectors as shown on the drawings. Provide one (1) input module per device.
  2. Provide DMP 5812A or approved equal.
- G. Addressable Input Module
1. Provide single input module devices for all non-addressable inputs (motions, door contacts, glass break detectors, duress button).
  2. Provide DMP 700 series or approved equal.
- H. Indoor Security Siren.
1. Provide interior security siren(s) as shown on the drawings.
  2. Provide DMP 335 or approved equal.
- I. Outdoor Security Siren:
1. Provide outdoor siren(s) as shown on the drawings. The horn shall draw 550ma at 12VDC.

2. Provide Ademco 748LC or approved equal.
- J. Intrusion Alarm Panel Accessories and Modules
1. Interface Adapter Module. Provide one (1) loop adapter bus card per system. Provide DMP 461 or approved equal.
  2. Loop/Zone expansion interface card. Provide a minimum of two (2) expansion cards per system. Provide a sufficient amount of zone cards to handle 574 points as required. Provide DMP 481 zone or approved equal.
  3. Dual Phone Line Module. Provide one (1) DMP 893A module or approved equal per system.
  4. Eight Input Module. Provide one (1) DMP 712-8 module or approved equal per system.
  5. Zone Expansion Module. The individual zone expansion module shall be used to monitor door contacts, motion detectors, glass break detectors, and other monitor points. Provide one (1) DMP 711 module or approved equal per device as required.
  6. Relay Output Module. Provide one (1) DMP 860 relay output module or approved equal per system. Provide with four (4) relays.
- K. Central Station Monitoring: Provide monitoring at a UL Listed central station for a period of one year.

### **PART 3 - EXECUTION**

#### **3.1 INSPECTION AND ACCEPTANCE**

- A. Examine all surfaces and contiguous elements to receive work of this section and correct, as part of the Work of this Contract, any defects affecting installation. Commencement of work will be construed as complete acceptability of surfaces and contiguous elements.

#### **3.2 WORK COORDINATION AND JOB OPERATIONS**

- A. Equipment shall not be installed in congested and possible problem areas without first coordinating installation of same with other trades. Relocate electrical equipment installed in congested or problem areas should it interfere with the proper installation of equipment to be installed by other trades.
- B. Particular attention shall be directed to coordination of lighting fixtures and other electrically operated equipment requiring access which is to be installed in ceiling areas. Coordinate with other trades, the elevations of equipment in hung ceiling areas to insure adequate space for installation of recessed fixtures before said equipment is installed. Conflicts in mounting heights and clearances above hung ceilings for installation of recessed lighting fixtures or other electrically operated equipment requiring access shall be brought to the attention of Architect for a decision prior to equipment installation.

- C. Furnish to General Contractor and other subcontractors information relative to portions of electrical installation that will affect other trades sufficiently in advance so that they may plan their work and installation.
- D. Obtain from other trades information relative to electrical work which he, the Electrical Subcontractor, is to execute in conjunction with installation of other trades' equipment.
- E. Lighting fixtures in mechanical spaces or utility/ storage rooms shall only be installed after all mechanical equipment is in place.

### **3.3 PLANS AND SPECIFICATIONS**

- A. Plans:
  - 1. Drawings showing layout of electrical systems indicate approximate location of raceways, outlets, and apparatus. Runs of feeders and branch circuits are schematic and are not intended to show exact routing. Final determination as to routing shall be governed by structural conditions and as indicated on the approved coordination drawings.
- B. Specifications:
  - 1. Specifications supplement drawings and provide specifics pertaining to methods and material to be used.

### **3.4 IDENTIFICATION**

- A. Equipment shall be marked for ease of identification as follows:
  - 1. Provide screw-on nameplates on switchboards, panelboards, F.A. terminal cabinets, starters, and disconnect switches. Nameplates to be of black phenolic with white engraving. For starters and disconnect switches lettering shall be minimum of ¼ in. high. Nameplates on panelboards shall have the following information.
    - a. Line 1 - Panel designation in ½ in. high letters.
    - b. Line 2 - Utilization voltage in 3/8 in. high letters.
    - c. Line 3 - Distribution source "Fed from ¼ in. high letters.
  - 2. Neatly typed directory cards listing circuit designations shall be fastened inside the cover of panelboards. Spare circuits shall be penciled.
  - 3. Provide Signage on all rooms that contain Fire alarm control equipment within it. Where a Fire alarm control panel is located within a separate room provide permanent signage that reads " FIRE ALARM CONTROL PANEL INSIDE" with minimum 7" high by 10" width with 2-inch high block letters a 0.5" letter stroke - white letters on a contrasting red background. The sign shall be permanently attached, at normal eye level to the door leading to the fire alarm control panel(s).

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

4. Color coding schedules. If there is more than a single system voltage, different voltages shall have separate color codes, as previously specified. A copy of the color code schedule shall be affixed to each secondary switchboard and distribution panel and shall be of the phenolic nameplate type as previously specified. A typewritten color code schedule shall also be affixed, under plastic, inside each panelboard door.
5. Outlet boxes both concealed and exposed shall be identified as to panel origination and circuit number by means of fibre pen on the inside of coverplate.
6. Special system outlet boxes concealed above hung ceilings shall be identified as to system by spray painting during roughing. The following systems shall be identified.
  - a. Fire Alarm - red.
  - b. Normal/Emergency - yellow.
  - c. Security - blue.
  - d. Sound - green.
7. Wiring device plates on devices connected to normal-emergency circuits shall be red in color.
8. All conductors in boxes larger than standard outlet boxes, in all wireways, and trench headers. shall be grouped logically and be identified.
9. Grounding conductors and neutrals shall be labeled in panels, and wireways. as to circuits associated with.
10. Power and raceway identification:
  - a. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
  - b. Colors for Raceways Carrying Circuits at 600 V or Less:
  - c. Black letters on an orange field.
  - d. Legend: Indicate voltage and system or service type (Power, Lighting, Emergency, Control).
  - e. Colors for Raceways Carrying Circuits at More Than 600 V:
  - f. Black letters on an orange field.
  - g. Legend: "DANGER CONCEALED HIGH VOLTAGE WIRING" with 3-inch- high letters.
  - h. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
  - i. Tape and Stencil for Raceways Carrying Circuits More Than 600 V: 4-inch- wide black stripes on 10-inch centers diagonally over orange background that extends full length of raceway. Stop stripes at legends.
  - j. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
  - k. Write-On Tags: Polyester tag, with corrosion-resistant grommet and cable tie for attachment to conductor or cable. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

11. Armored metal clad cable identification:
  - a. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
  - b. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.
12. Power and Control Cable identification:
  - a. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
  - b. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
  - c. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.
  - d. Write-On Tags: Polyester tag, with corrosion-resistant grommet and cable tie for attachment to conductor or cable. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
  - e. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
13. Conductor Identification materials:
  - a. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
  - b. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
  - c. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
  - d. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
  - e. Write-On Tags: Polyester tag, with corrosion-resistant grommet and cable tie for attachment to conductor or cable. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
14. Underground warning tape:
  - a. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical and communications utility lines but not less than 4 mils thick and 6 inches wide.
  - b. Printing on tape shall be permanent and shall not be damaged by direct-burial service.



Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- c. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.
  - d. Color and Printing:
    - 1. Comply with ANSI Z535.1 through ANSI Z535.5.
    - 2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE, HIGH VOLTAGE.
    - 3. Inscriptions for Orange-Colored Tapes: TELEPHONE CABLE, CATV CABLE, COMMUNICATIONS CABLE, OPTICAL FIBER CABLE.
15. Warning labels and signs:
- a. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
  - b. Baked-Enamel Warning Signs:
  - c. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. Nominal size, 7 by 10 inches.
  - d. Metal-Backed, Butyrate Warning Signs:
  - e. Weather-resistant signs, non-fading, preprinted, cellulose-acetate butyrate signs with galvanized-steel backing; and with colors, legend, and size required for application. Nominal size 10 by 14 inches.
  - f. Safety signs shall warn of potential electrical hazard and shall include, but are not limited to, the following legends:
    - g. Multiple power source warning.
    - h. Workspace clearance warning.
    - i. Potential electric arc flash hazard.
16. Equipment identification labels:
- a. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
  - b. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.
  - c. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.
17. Cable ties:
- a. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  - b. Minimum Width: 3/16 inch.
  - c. Color: Black except where used for color-coding.
  - d. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, Type 6/6 nylon.
  - e. Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, self-locking. UL 94 Flame Rated.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

18. Verify identity of each item before installing identification products. Coordinate names, abbreviations, colors, and other designations used in electrical identification work with corresponding designations specified or indicated. Install numbers, lettering, and colors as approved in submittals and required by code.
19. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
20. Apply identification devices to surfaces that require finish after completing finish work.
21. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
22. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
23. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
24. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
25. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
26. Outdoors: UV-stabilized nylon.
27. In Spaces Handling Environmental Air: Plenum rated.
28. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trench or concrete envelope exceeds 16 inches overall.
29. Renovation Projects: For alterations and additions to existing facilities, use existing identification system. Where systems have not been standardized, use the identifying and marking system specified in this standard.
30. Distribution Equipment: Identify major components of the distribution system (such as circuit breakers, switches, transformers, switchboards, panelboards, motor control centers) with nameplates. Nameplates on disconnect switches and control stations shall identify the equipment served.
31. Identification Schedule:
  - a. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for service, feeder, and branch circuits more than 30A and 120V to ground: Identify with self-adhesive vinyl label applied at 10-foot maximum intervals.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- b. Power-Circuit Conductor Identification, 600 V or Less: Identify conductors in the panels, pull and junction boxes, manholes, handholes.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors for ungrounded service, feeder and branch-circuit conductors as specified in Division 26 Section "Low-Voltage Power Conductors".
    - a) Factory applied continuous color coding for conductors No.8 AWG and smaller.
    - b) Field-applied, color coding conductor tape: For conductors No.6 AWG and larger. Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made.
  - 2. Lighting and Receptacle Outlet Boxes: Identify with the panel and circuit number.
- c. Power-Circuit Conductor Identification, above 600 V: For conductors in the vaults, pull and junction boxes, manholes and handholes, use write-on tags.
- d. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
- e. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
- f. Terminal Blocks: Attach numbered nameplates to terminal blocks which require identification numbers; use the designations shown on the wiring diagrams. Install nameplate at the top of vertically mounted terminal blocks and at the end of horizontally mounted terminal blocks. Indicate the individual terminal point designation shown on the wiring diagrams.
- g. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
- h. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in the finished spaces.
- i. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Apply warning, caution, and instruction signs where required by the referenced Electrical code, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install self-adhesive warning labels or baked-enamel warning signs with approved legend where instructions or explanations are needed for system or equipment operation. Install metal-backed, butyrate warning signs for outdoor items.
- j. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch high letters for emergency instructions at equipment used for power transfer, load shedding and other emergency operations.

- k. Safety sign for the switchboards and panelboards: Provide a sign to warn qualified persons of potential electric arc flash hazard.
- l. All electrical distribution equipment and mechanical/plumbing/fire protection equipment fed from the electrical distribution system shall contain in addition to the identification requirements listed in this section shall be labelled where they are fed from. For example Distribution panel 4DP1A is fed from MSB-1A, its label shall be "4DP1A fed from MSB-1A" submit full labeling scheme for review and approval.
- m. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to the disconnect switches and protection equipment, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a) Indoor Equipment: Self-adhesive, laminated acrylic or melamine label.
    - b) Outdoor Equipment: Engraved, laminated acrylic.
    - c) Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  - 2. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved laminated acrylic. Panelboard directories shall identify the load name and location (i.e. AHU-1, Room #, FCU-1, Room #).

### **3.5 PROTECTION AND CLEANUP**

- A. Protection:
  - 1. Materials and equipment shall be suitably stored and protected from weather.
  - 2. During progress of work, pipe and equipment openings shall be temporarily closed so as to prevent obstruction and damage.
  - 3. Be responsible for maintenance and protection of material and equipment until final acceptance.
- B. Cleanup:
  - 1. Keep job site free from accumulation of waste material and rubbish. Remove all rubbish, construction equipment, and surplus materials from site and leave premises in a clean condition.
  - 2. At completion, equipment with factory finished surfaces shall be cleaned and damaged spots touched up with the same type paint applied at factory.

3. Particular attention is called to Section 110-12(c) of the NEC, which requires that internal parts of electrical equipment not be contaminated by construction operations.

### **3.6 PORTABLE OR DETACHABLE PARTS**

- A. Retain possession of and be responsible for spare parts, portable and detachable parts, and other removable portions of installation including fuses, keys, locks, blocking clips, inserts, lamps, instructions, drawings, and other devices or materials that are relative to and necessary for proper operation and maintenance of the system until final acceptance, at which time such parts shall be installed or turned over to the Owner, as the case may be.

### **3.7 SAFETY PRECAUTIONS**

- A. Provide proper guards, signage, and other necessary construction required for prevention of accidents and to insure safety of life and property. Remove any temporary safety precautions at completion.

### **3.8 MOUNTING HEIGHTS**

- A. All electrical equipment shall be mounted at the following heights unless noted or detailed otherwise on drawings. Notes on architectural drawings shall supersede those noted below or detailed on the electrical drawings. If mounting height of an electrical component is questionable, obtain clarification from Architect before installation.
  1. Duplex convenience outlets, microphone outlets, and telephone outlets - 18 inches.
  2. Light switches, pushbutton stations, HOA switches, and all other toggle or control switches for the operation of heating, ventilating, and air conditioning, plumbing, and general service - 48 inches.
  3. Clock outlets - 84 inches.
  4. Fire alarm pull stations - 48 inches.
  5. Fire alarm audio visual signals - 80 inches or 6 inches below ceiling, whichever is lower.
  6. Panelboards for lighting, power, telephone, and other auxiliary systems – 78 in. to top.
  7. Equipment located in lobbies shall be located as detailed on architectural drawings.
  8. All receptacles, light switches, fire alarm signals, and clocks sharing a common location shall be symmetrically arranged.
  9. Exterior and interior wall brackets shall be as detailed on architectural drawings.
- B. Mounting heights given are from finished floor to centerline. In the case of a raised floor, surface of raised floor is the finished floor.

### 3.9 WORKMANSHIP AND INSTALLATION METHODS

- A. Work shall be installed in first-class manner consistent with best current trade practices. Equipment shall be securely installed plumb and/or level. Flush-mounted outlet boxes shall have front edge flush with finished wall surface. No electrical equipment shall be supported by work of other trades. Cable systems shall be supported and not draped over ducts and piping or laid on ceiling suspension members. Lighting fixtures shall be installed to agree with Architects reflected ceiling plans.
- B. Supports:
1. Support work in accordance with best industry practice and by use of standard fittings.
  2. In general, walls and partitions will not be suitable for supporting weight of panelboards, dry type transformers and the like. Provide supporting frames or racks extending from floor slab to structure above.
  3. Provide supporting frames or racks for equipment, intended for vertical surface mounting in free standing position where no walls exist.
  4. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members, rigidly bolted or welded together and adequately braced to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of equipment.
  5. Provide  $\frac{3}{4}$  in. thick painted plywood mounting surfaces in all electric and telephone areas and for all equipment on free standing racks. All plywood shall be fire retardant and painted both sides and edges with 2 coats of white paint.
  6. No work for exposed installations in damp locations shall be mounted directly on any building surface. In such locations, flat bar members or spacers shall be used to create a minimum of  $\frac{1}{4}$  in. air space between building surfaces and work.
  7. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric raceways or cables for support. All outlet, pull, and junction boxes shall be independently supported.
  8. Nothing shall rest on, or depend for support on, suspended ceiling or its mounting members.
  9. Support surface or pendant mounted lighting fixtures:
    - a. From outlet box by means of an interposed metal strap, where weight is less than five pounds.
    - b. From outlet box by means of a hickey or other direct threaded connection, where weight is from five to fifty pounds.
    - c. Directly from structural slab, deck or framing member, where weight exceeds fifty pounds.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- d. Pendant lighting fixtures shall be supported by threaded rods in non-public areas and by manufacturers standard tube hangers with swivel aligner and canopy in public areas. Provide non-standard pendant lengths where required to mount fixtures at elevations either called for on drawings or as shown in architectural elevations.
  10. Support recessed lighting fixtures directly from structural slabs, decks or framing members, by means of jack chain or air craft cable, one at each end of fixture at opposite corners.
  11. Where support members must of necessity penetrate air ducts, provide airtight sealing provisions which allow for a relative movement between the support members and the duct walls.
  12. Provide channel sills or skids for leveling and support of all floor mounted electrical equipment.
  13. Where permitted loading is exceeded by direct application of electrical equipment to a slab or deck, provide proper dunnage to distribute the weight in a safe manner.
  14. Support metallic raceways by either running within steel frame or hung from the building frame. Anything hung from building frame shall be attached with metallic fasteners.
- C. Fastenings:
1. Fasten electric work to building structure in accordance with the best industry practice.
  2. Where weight applied to attachment points is 100 pounds or less, fasten to building elements of:
    - a. Wood -- with wood screws.
    - b. Concrete and solid masonry -- with bolts and expansion shields.
    - c. Hollow construction -- with toggle bolts.
    - d. Solid metal -- with machine screws in tapped holes or with welded studs.
  3. Where weight applied to attachment points exceeds 100 pounds, fasten as follows:
    - a. At field poured concrete slabs, provide inserts with 18 in. minimum length slip-through steel rods, set transverse to reinforcing steel.
    - b. Where building is steel framed, utilize suitable auxiliary channel or angle iron bridging between structural steel elements to establish fastening points. Bridging members shall be suitably welded or clamped to building steel. Provide threaded rods or bolts to attach to bridging members.
  4. Floor mounted equipment shall not be held in place solely by its own dead weight. Provide floor anchor fastenings. Floor mounted equipment over 72 inches in height shall also be braced to nearest wall or overhead structural elements.
  5. For items which are shown as being mounted at locations where fastenings to the building construction element above is not possible, provide suitable auxiliary channel or angle iron bridging to building structural elements.

6. Fastenings for metallic raceways using the fastening as support shall be of the metallic type. Fastenings to hold raceways or cables in place may be via traps.

D. General Raceway Installation:

1. Install the various types of raceways in permitted locations as previously specified. All raceways shall be run concealed. Consult Architect for instruction for raceways which must be exposed in public spaces.
2. Raceways for normal emergency or emergency only wiring cannot contain other conductors.
3. Raceways shall be properly aligned, grouped, and supported in accordance with code. Exposed raceways shall be installed at right angles to or parallel with structural members. Concealed raceways may take most direct route between outlets.
4. Raceways run on trapeze hangers shall be secured to the trapeze.
5. Raceways shall be continuous and shall enter and be secured to all boxes in such a manner that each system shall be electrically continuous from service to all outlets. Provide grounding bushings and bonding jumpers where raceways attach to painted enclosures or terminate below equipment.
6. Where raceways enter boxes, cabinets, tap boxes, other than those having threaded hubs, a standard locknut shall be used on the outside and locknut and bushing on the inside.
7. Where raceways terminate below equipment and there is no direct metal to metal continuity, provide grounding bushings on raceways and interconnect with equipment grounding conductor.
8. All empty raceways shall be provided with a pull wire.
9. All raceway sleeves, stub-ups, or stub-outs, where not connected to a box or cabinet, shall be terminated with a bushing.
10. All raceway joints shall be made up tight and no running threads will be permitted.
11. Where raceways are cut, the inside edge shall be reamed smooth to prevent injury to conductors.
12. All vertical raceways passing through floor slabs shall be supported.
13. Raceways shall not be installed in concrete slabs above grade or below waterproofed slabs.
14. Electric raceways and/or sleeves passing through floors or walls shall be of such size and in such location as not to impair strength of construction. Where raceways alter structural strength or the installation is questionable, the structural engineer shall be contacted for approval.
15. Raceways shall not run directly above or below heat producing apparatus such as boilers, nor shall raceways run parallel within 6 inches of heated pipes. Raceways crossing heated pipes shall maintain at least a 1 inch space from them.
16. Raceways shall be installed in such a manner as to prevent collection of trapped condensates, and all runs shall be arranged to drain.



Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

17. Raceways passing between refrigerated and non-refrigerated spaces and those penetrating enclosures with air movement shall be provided with seals.
18. Raceways feeding fire and jockey pumps shall be rigid metal conduit either run below slab or inside 2 hour rated enclosure. Final connections to motors shall be liquidtight flexible conduit.
19. Where two alternate wiring methods interconnect such as EMT to flexible metal conduit, an outlet box shall be provided.
20. All empty raceways entering building and all sleeves or core drilled openings through floors shall be sealed.
21. Each exterior raceway or assembly in a ductbank shall be provided with continuous warning tape installed 12 inches above raceway or ductbank.
22. Underground rigid non-metallic raceways where allowed and run as a ductbank encased in concrete shall be installed with plastic spacers to ensure a separation of 3 inches between raceways. Top of ductbanks shall be 30 inches below grade, unless otherwise detailed.
23. Elbows and extensions of rigid non-metallic raceway systems which penetrate slabs shall be rigid or intermediate metal conduit.
24. Raceways used for transformer connections shall be flexible type and shall contain a grounding conductor.
25. Raceways entering building through foundation wall into a basement area shall be provided with wall entrance seals or with other acceptable waterproofing method.
26. Underground non-metallic raceways shall be fully surrounded by a selected backfill to prevent more than the desired deflection and, in power raceways is needed to provide room for heat dissipation and good compaction of backfill. Separation Between Direct-Buried, Non-encased Ducts: 3 inches minimum for like services, and 12 inches minimum between power and signal ducts, unless shown otherwise on the drawings. Raceways formation for non-encased ducts shall be built up layer by layer. After each layer is placed, the selected backfill shall be placed over it to the specified depth. This fill should be spread evenly and compacted to provide continuous support for the next tier of raceways. Any temporary spacers used should be removed from each layer of raceway as soon as backfill is completed in that layer. A maximum of 9 conduits shall be grouped in the same trench unless otherwise noted on the drawings.
27. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
28. Run conduit concealed in finished areas above suspended ceilings, in wall spaces. Exposed conduit runs in finished areas require Architect's approval. Properly group conduit runs. Install conduit parallel to walls, structure and ceilings, and support with proper hangers and clamps. Running conduits at the bottom of structural members in exposed conditions is not allowed. Check door swings before installing back boxes for switches and receptacles.
29. Where conduit passes through a building expansion joint, use weatherproof, telescopic type expansion fittings which permit at least 4 inches of movement.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

30. Form bends in conduit by means of a conduit bending machine or by an approved hickey. To fasten conduit to outlet boxes, cabinets, use locknuts and insulated throat bushings of compatible material.
31. Cut conduit ends square, thread conduit, and ream to remove burrs and sharp edges. Field threads shall be of the same type and have the same effective length as factory cut threads. Turns, wherever required in exposed conduit runs, shall be made by the use of factory-made bends, or field-made bends that meet the requirements of this Section and Electric Code. In the event of a multiplicity of conduits making the same turn, a steel junction box with a removable steel cover may be used. Offsets and bends for changes in elevation of exposed conduit runs shall be made at walls or beams and not in open spaces between walls or beams. Rout conduits required to avoid interfere with the operation or maintenance of equipment.
32. Plug or cap conduit ends as soon as conduit is installed, to prevent entrance of moisture or other debris during construction. Do not pull wire into any conduit until the conduit system is complete.
33. Drawings, in relation to the routing of conduits, are diagrammatic. Except where additional conduits may be required to avoid derating of branch circuits, elsewhere within this Section, the number and size of conduits and wire shall be furnished and installed as indicated by the drawings. Coordinate routing of conduits in the field with the building structure. Run conduit in straight lines parallel and perpendicular to walls, beams, and columns and with right angle bends and threaded conduit fittings. Maintain 12 inches clearance between conduit and surface with temperatures exceeding 104 degrees F.
34. Conduits passing through floors, walls and beams shall be of such size, number, and in such locations so as not to impair the strength of the construction.
35. Rout raceways in ceiling spaces in an orderly and organized manner, and to eliminate or minimize the number of junction boxes required. Support and secure conduits by means of rods, clamps and other conduit support devices approved by the Architect. Do not use wire to support conduits.
36. Where rigid metal conduit is threaded in the field, use a standard conduit cutting die providing 3/4 inch taper per foot.
37. Conduit and EMT runs shall be mechanically and electrically continuous from service entrance to outlets. Secure conduit to cabinet, junction box, pull box or outlet box with locknut outside and bushing inside, or with liquid-tight, threaded, self-locking, cold-weld wedge adapter. Locknuts and bushings or self-locking adapters will not be required where conduits are screwed into tapped connections. Before installing conductions, protect vertical conduit runs that terminate in bottoms of wall boxes or cabinets from entrance of foreign material.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

38. Size rigid steel conduit, EMT and flexible metallic conduit required by the referenced Electrical Code, except as otherwise specified or shown on the drawings. Check raceway sizes to determine that equipment grounding conductor fits in same raceway with phase and neutral conductors to meet Massachusetts Electrical Code percentage of fill requirements.
  39. Where conduit is secured rigidly on opposite sides of building expansion joints, and where runs of exposed conduit are long and subject to stress, provide expansion fittings capable of safely deflecting and expanding to twice the distance of structural movement. Provide separate external copper bonding jumper secured with grounding straps on each end of fitting.
  40. Install a pull or junction box every 100 feet of straight conduit run, and wherever there is an equivalent of four 90 degree elbows or a total of 360 degree bend. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
  41. Install sealing fittings at following points, and elsewhere as shown:
  42. Where conduits enter or leave hazardous areas equipped with explosion proof lighting fixtures, switches, receptacles, and other electrical devices.
  43. Where conduits pass from warm to cold locations.
  44. Pull cords: In each empty raceway, provide nylon fishing line having tensile strength not less than 200 lbs, or provide No. 14 AWG steel wire. Label each end of each line or wire with a securely attached tag which indicates the location of the other end.
  45. Liquid-tight type flexible conduits installed in the air-handling plenum space shall be with a plenum- rated outer jacket.
  46. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- E. General Outlet Box Installation:
1. Boxes shall be set flush with finish surface and provided with proper type extension rings or plaster covers. Thru the wall boxes are not permitted. Check device or fixture to be mounted to box to ensure box orientation is proper.
  2. In addition to boxes shown, install additional boxes where needed to prevent damage to cables and wires during pulling-in operation.
  3. Plug unused openings on all remove knockouts.
  4. Where required for horizontal and vertical alignment of boxes in stud partitions, bar hangers spanning two studs shall be used. Device boxes for insertion type receptacles shall be provided with far side box supports where there are less than two entering nonflexible raceways, and where bar rangers are not provided.
  5. Boxes flush mounted in fire rated partitions and on opposite sides of the partition shall be separated by a distance of 24 inches in accordance with UL listing for the box.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

6. Locations of outlets indicated on drawings are approximate. For items exposed to view, refer to architectural drawings and coordinate locations with masonry joints, panel joints, ceiling grids, and structural members.
  7. In case of conflict with standard mounting heights and device alignment, consult Architect prior to roughing.
  8. Check all door swings on architectural drawings to ensure lighting switches are installed on strike side of door.
  9. The right to make any reasonable change in location of outlets prior to roughing is reserved by Architect. "Reasonable change" shall be interpreted as movement within 10 feet of location shown.
  10. Obtain dimensioned plan from Architect for floor outlets.
  11. Outlet boxes for use where surface metal raceways are allowed shall be of a type specifically designed to be used with such surface metal raceway systems.
- F. Conductor Installation:
1. No conductors shall be pulled into individual raceways until such raceway system is complete and free of debris. No harmful lubricants shall be used to ease pulling.
  2. All conductors shall be wired so that grounded conductor is unbroken; switches in all cases being connected in ungrounded conductor.
  3. Connections throughout the entire job shall be made with solderless type devices of approved design satisfactory to Inspector of Wires.
  4. All taps and splices shall be insulated equal to that of conductor insulation.
  5. All conductors of each feeder in pull boxes and wireways shall be grouped, tied together, supported, and identified.
  6. All conductors in panelboards and other wiring enclosures shall be neatly formed and grouped.
  7. All conductors of emergency only and/or normal/emergency shall be run in separate raceway systems to final outlet box.
  8. Provide support for conductors in vertical raceways in accordance with Article 300-19.
  9. Strip insulation from conductors with approved tools and only of sufficient length for proper termination. Cutting of conductor stranding is unacceptable.
  10. Taps from paralleled conductors shall be of a type which tap each conductor, such as ILSCO "PTA" series.
  11. Grounding conductors are to be identified as to associated power circuits.

G. Type MC Cable Installation:

1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
  - a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Horizontally run cable supports such as Caddy WMX-6, and clamps on vertical runs such as Caddy CJ6 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will also be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of types specifically designed for use with cable, i.e., romex connectors not acceptable.
  - b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co., not with hacksaw.
  - c. Use split "insuliner" sleeves at terminations.
  - d. Any cable system used in conjunction with isolated ground circuits shall have both an isolated ground conductor and an equipment ground conductor.

H. Stranded Conductor Installation:

1. If Electrical SubContractor selects stranded conductors for # 10 AWG and smaller, terminate such conductors as follows:
  - a. No stranded conductor may be terminated under a screwhead. Provide insulated terminal lugs for all screw connections equal to Thomas & Betts "STA-KON" type RC with forked tongue and turned up toes. Installation of lugs shall be done with compression tool such as T&B WT-145C which prevents opening of tool until full compression action is completed.
  - b. Backwired wiring devices shall be of clamp type; screw tightened. Force fit connections not allowed.
2. Stranded conductors will not be allowed for fire alarm work.

I. Accessibility:

1. Electrical equipment requiring service or manual operation shall be accessible.
2. Work switches for equipment within accessible hung ceiling spaces, such as fan powered terminal boxes, shall be located at terminal box, and so located so as to be accessible.

J. Vibration Elimination: All equipment connections to rotating equipment or equipment capable of vibration shall be made up by flexible raceways.

K. Wiring Device Gaskets: Provide wiring device gaskets at coverplates where device is mounted in wall separating conditioned and non-conditioned spaces.

### **3.10 FEEDER CIRCUITS**

- A. Provide feeders as called for on the drawings.
- B. Feeders shall be defined as any circuit originating from the main building switchboard and/or distribution panels.
- C. All feeder conductors shall be continuous from origin to panel or equipment termination without splicing.
- D. All feeders shall be conductors pulled into raceways. Cable systems are not allowed for feeders unless specifically indicated.

### **3.11 BRANCH CIRCUITS**

- A. Provide all branch circuit wiring and outlets for a complete and operating system. The system shall consist of insulated conductors connected to the panelboards and run in raceways or as cable systems if permitted under products section, to the final outlet and shall include outlet boxes, supports, fittings, receptacles, plates, fuses, for a fully functional system.
- B. Provide dedicated neutrals for all lighting circuits and all circuits originating from panelboards fed from K-rated transformers.
- C. Physical arrangement of branch circuit wiring shall correspond to circuit numbering on drawings. Combining of circuits and raceways will be allowed up to a 3 phase, 4 wire circuit or 3 phase 6 wire (dedicated neutrals) in a single raceway. Any combination of homeruns such as this, however, shall be indicated on record drawings. When a common grounded conductor is used for more than one circuit, the arrangement shall be such that a receptacle, fixture, or other device may be removed or disconnected without disconnecting the grounded conductor for other circuits. Ground fault circuit breakers and isolated ground outlets shall be wired with separate neutrals and separate grounding conductors per circuit. A consistent phase orientation shall be adhered to throughout project at terminations.
- D. Circuits feeding three phase equipment shall not be combined into common raceways, unless specifically indicated.
- E. All wiring in panelboards and cabinets shall be neatly formed and grouped.

### **3.12 FIREPROOFING AND WATERPROOFING**

- A. Refer to 078110 – FIRESTOPPING, for requirements.
- B. Waterproof all openings in slabs and walls.

### **3.13 CUTTING AND PATCHING**

- A. Penetrations through new and existing construction as required for the Work of this Section:
  - 1. Coring: Perform all coring for required work.
  - 2. Notify Masonry Sub-Contractor of exact locations and sizes for openings required in masonry, to be executed under Section 042000 – Unit Masonry, utilizing lintels furnished per Section 055000 – Metal Fabrications.
  - 3. Cut openings in new and existing non-masonry construction where required for penetrations. All cutting shall conform to the requirements of Section 017329 – Cutting and Patching, and 024119 – Demolition.
  - 4. Refer to Section 024119 – Demolition for restrictions on all alterations to structural elements.

### **3.14 MECHANICAL SYSTEM COORDINATION**

- A. The HVAC System Subcontractor will be providing various items of mechanical services equipment and control apparatus. Electrical Subcontractor shall furnish disconnect switches and starters and connect up power wiring to this equipment.
- B. The Mechanical and Electrical Subcontractor shall closely coordinate their respective portions of work.
- C. If, due to local regulations, electric heating equipment furnished by the mechanical systems subcontractor is required to be installed by licensed electricians in order to allow connection by Electrical Subcontractor's licensed electricians, it will then be HVAC Subcontractor's responsibility to engage and pay for services of such licensed electricians.
- D. Power wiring to be provided by Electrical Subcontractor is the line voltage power supply wiring. Control wiring is responsibility of HVAC System Subcontractor unless specifically indicated on electrical drawings, or in this Division of the specifications. Temperature Control Subcontractor shall refer to electrical drawings for location of all magnetic starters.
- E. 120 volt control wiring source to the temperature control panel is the responsibility of Electrical Subcontractor.

### **3.15 DISTRIBUTION EQUIPMENT TESTING**

- A. All dry-type transformers, individual motor starters, switchboard and main distribution panels, motor controls, motor control centers, feeder conductors, and emergency systems shall be tested in accordance with the following. In general, all tests shall be done in accordance with the 1995 Acceptance Testing Specifications of the International Electrical Testing Association.

- B. The Testing Subcontractor may be an independent contractor or a manufacturer of the equipment, which is to be tested.
- C. Test report forms, delineating tests to be made, and method of recording same shall be submitted prior to commencing work. Test reports when submitted shall include interpretation of results and recommendation for any corrective work required.
- D. Switchboard and Main Distribution Panels:
  - 1. Visual Inspection:
    - a. Check for foreign material within bus enclosure.
    - b. Check for missing hardware.
    - c. Inspect entire assemblies for transit damage or factory defects.
    - d. Check for all bus dimensions and bracing per specifications.
    - e. Check ratings of current transformers and potential transformers.
    - f. Check ratings of all protective relays per drawings.
  - 2. Physical Inspection:
    - a. Torque all bus hardware to proper tension.
    - b. Circuit breaker interlocks all work properly.
    - c. All doors and hinged panels open and close properly.
    - d. Relay blocking removed from all control and protective relays.
    - e. All circuit breakers operate, close and trip mechanically.
    - f. Torque all feeder conductors to terminal manufacturers' recommendations.
  - 3. Electrical Testing:
    - a. Breakers operated electrically trip and close from local and remote positions.
    - b. All circuit breakers calibrated to manufacturer's respective time current curves as specified.
      - 1. Long time pick-up amps.
      - 2. Long time delay tripping at 300 percent of current setting.
      - 3. Resets okay at 80 percent of pick-up value.
      - 4. Short time pick-up current.
      - 5. Short time delay trip time at 105 percent of setting.
      - 6. Instantaneous minimum pick-up current.
    - c. All protective relays calibrated to manufacturer's characteristic time curves for pick-up, drop-out, instantaneous and time delay.
    - d. All instruments calibrated for accuracy.
    - e. Protective relay schemes to be electrically tested by primary injection of current through current transformers and the tripping of associated circuit breakers.
    - f. Insulation resistance tests made on all circuit breakers, line to load breaker open, line to ground breaker closed, 3 poses tested individually. Switchgear bus to be tested phase to phase and phase to ground with Megohmmeter type instrument. Relays also to be insulation resistance tested.



- E. Transformers:
1. Visual inspection for transit damage such as broken porcelain, brazed connections broken off, core shifted on frame, winding damage, and loose parts.
  2. Insulation resistance tests in accordance with U.S.A.S.I. Standard C571222 and NEMA TRI-2.055.
  3. D.C. over-potential test procedures and A.C. voltage values for factory proof testing of C57.12968 and NEMA TRI-2.055. The ratio applied for converting A.C. test potential to equivalent D.C. value is 1.6.
  4. Acceptance test voltage for new transformers at D.C. value will be 75 percent of equivalent A.C. voltage used for factor proof testing the value will be 65 percent.
  5. Transformers shall be subjected to a ratio and polarity test to prove the polarity and winding ratio as in accordance with nameplate specifications.
  6. Torque all connections to terminal manufacturers' recommendations.
- F. Starters:
1. Visual inspection to determine:
    - a. Shipping damage.
    - b. Proper bussing and contactor sizes.
    - c. Correct overload relay heater ratings. Any incorrectly sized overloads shall be replaced by the contractor who originally provided same.
  2. Electrical Testing:
    - a. Electrical operation of control relays, timing relay, and contactor coils.
    - b. Insulation resistance test on all current carrying bus to ground and between phases.
    - c. Calibration check of overload heater to ascertain tripping point and time delay at 300 percent of heater rating.
- G. Conductors: All secondary service conductors and all feeder conductors from switchboards and distribution panels shall be tested.
1. Visual and mechanical inspection: Conductors to be inspected for physical damage and proper connection and sizing in accordance with single line diagram.
  2. Conductor connections shall be torque tested to manufacturer's recommended values.
  3. Electrical Tests: Perform insulation resistance test on each conductor with respect to ground and adjacent conductor.
  4. Perform continuity test to insure proper conductor connection.

H. Emergency Systems:

1. Emergency Generator - Prior to the emergency generator test specified under the emergency generator specification, the testing contractor shall perform the following:
  - a. Visual and Mechanical Inspection:
    1. Inspect for physical damage.
    2. Compare nameplate rating and connection with specifications and single line diagram.
    3. Inspect for proper anchorage and grounding. Verify engine cooling and fuel system integrity.
  - b. Electrical and Mechanical Tests:
    1. Perform a dielectric absorption test on generator winding with respect to ground. Determine polarization index.
    2. Perform phase rotation test to determine compatibility with load requirements.
    3. Test protective relay devices in accordance with applicable sections of these specifications.
    4. Perform dc over potential test between winding and ground.
2. Automatic Transfer Switches:
  - a. Visual and Mechanical Inspection:
    1. Inspect for physical damage.
    2. Verify that the short circuit withstand rating exceeds the available short circuit duty.
    3. Compare equipment nameplate information and connections with single line diagram and report any discrepancies.
    4. Check switch to ensure positive interlock between normal and alternate sources. (Mechanical and Electrical).
    5. Check tightness of all control and power connections.
    6. Perform manual transfer operation.
    7. Ensure manual transfer warnings are attached and visible to operator.
  - b. Electrical Tests:
    1. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions.
    2. Measure contact resistance in normal and alternate source position.
    3. Set and calibrate in accordance with the project electrical engineer's specifications.
      - a) Voltage and frequency sensing relays.
      - b) All time delay relays.
      - c) Engine start and shutdown relay.
    4. Perform automatic transfer by tests.
      - a) Simulating loss of normal power.
      - b) Return to normal power.

- c) Simulating loss of emergency power on return to normal.
  - d) Simulate all forms of single phase conditions.
- 5. Monitor and verify correct operation and timing.
  - a) Normal voltage sensing relays.
  - b) Engine start sequence.
  - c) Time delay upon transfer.
  - d) Alternate voltage sensing relays.
  - e) Automatic transfer operation.
  - f) Interlocks and limit switch function.
  - g) Timing delay and retransfer upon normal power restoration.
  - h) Engine cool down and shutdown feature.
- I. Grounding Grids or Electrodes: Measurement of resistance from ground grids or electrodes to earth to determine adequacy of grounding system in building and compliance with specifications and/or electrical code.
- J. Settings of Adjustable Devices: Using the result of the fault current and coordination study specified hereinafter, the Testing Contractor shall set all adjustable devices.
- K. In addition to the testing requirements of this Section refer to Section 019113 - GENERAL COMMISSIONING REQUIREMENTS and Section 260800 – COMMISSIONING OF ELECTRICAL SYSTEMS, for additional requirements.

### **3.16 ARC FLASH HAZARD ANALYSIS / SHORT-CIRCUIT/COORDINATION STUDY**

- A. Trade Contract:
  - 1. Work of this Section is part of the Electrical trade contract. Refer to Section 26 00 00 for additional information about this work.
- B. Related Documents:
  - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- C. Scope:
  - 1. The Electrical SubContractor shall furnish short-circuit and protective device coordination studies as prepared by the manufacturer of the switchgear provided for the project.
  - 2. The Electrical SubContractor shall furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current version of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2002, the IEEE Guide for Performing Arc-Flash Calculations.

3. The scope of the studies shall include new distribution equipment supplied by switchgear manufacturer furnishing the electrical distribution equipment for this project.

D. References:

1. Institute of Electrical and Electronics Engineers, Inc. (IEEE):
  - a. IEEE 141 – Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems
  - b. IEEE 242 – Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems
  - c. IEEE 399 – Recommended Practice for Industrial and Commercial Power System Analysis
  - d. IEEE 241 – Recommended Practice for Electric Power Systems in Commercial Buildings
  - e. IEEE 1015 – Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
  - f. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations
2. American National Standards Institute (ANSI):
  - a. ANSI C57.12.00 – Standard General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers
  - b. ANSI C37.13 – Standard for Low Voltage AC Power Circuit Breakers Used in Enclosures
  - c. ANSI C37.010 – Standard Application Guide for AC High Voltage Circuit Breakers Rated on a Symmetrical Current Basis
  - d. ANSI C 37.41 – Standard Design Tests for High Voltage Fuses, Distribution Enclosed Single- Pole Air Switches, Fuse Disconnecting Switches and Accessories.
3. The National Fire Protection Association (NFPA)
  - a. NFPA 70 -National Electrical Code, latest edition
  - b. NFPA 70E – Standard for Electrical Safety in the Workplace

E. Submittals For Review/Approval:

1. The studies shall be submitted to the design engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment drawings for manufacturing. If formal completion of the study may cause delays in equipment shipments, approval from the Engineer may be obtained for a preliminary submittal of data to ensure that the selection of device ratings and characteristics will be satisfactory to properly select the distribution equipment. The formal study will be provided to verify preliminary findings.

F. Submittals For Construction:

1. The results of the short-circuit, protective device coordination and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. For large system studies,
2. requiring more than five (5) copies of the report will be provided without the section containing the computer printout of the short- circuit input and output data. Electronic PDF copies of the report shall be provided upon request.
3. The report shall include the following sections:
  - a. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
  - b. Short-Circuit Methodology Analysis Results and Recommendations
  - c. Short-Circuit Device Evaluation Table
  - d. Protective Device Coordination Methodology Analysis Results and Recommendations
  - e. Protective Device Settings Table
  - f. Time-Current Coordination Graphs and Recommendations
  - g. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
  - h. Arc Flash Labeling section showing types of labels to be provided. Section will contain descriptive information as well as typical label images.
  - i. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.

G. Qualifications:

1. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.
2. The Registered Professional Electrical Engineer shall be an employee of the equipment manufacturer.
3. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed in the past year.

H. Computer Analysis Software:

1. The studies shall be performed using SKM Systems Analysis Power\*Tools for Windows (PTW) software program.

I. Studies:

1. The Electrical SubContractor shall furnish an Arc Flash Hazard Analysis Study per NFPA 70E -Standard for Electrical Safety in the Workplace, reference Article 130.3 and Annex D. This study shall also include short-circuit and protective device coordination studies.

J. Data:

1. Electrical SubContractor shall furnish all data as required for the power system studies. The Engineer performing the short-circuit, protective device coordination and arc flash hazard analysis studies shall furnish the Contractor with a listing of required data immediately after award of the contract. The Electrical SubContractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to the release of the equipment for manufacturing.
2. Source combination may include present and future motors and generators.
3. Load data utilized may include existing and proposed loads obtained from Contract Documents provided by Owner, or General Contractor.
4. If applicable, include fault contribution of existing motors in the study. The Electrical SubContractor shall obtain required existing equipment data, if necessary, to satisfy the study requirements.

K. Short-Circuit Analysis:

1. Transformer design impedances shall be used when test impedances are not available.
2. Provide the following:
  - a. Calculation methods and assumptions
  - b. Selected base per unit quantities
  - c. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis
  - d. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.

- e. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
  - f. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.
- 3. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.
  - 4. Protective Device Evaluation:
    - a. Evaluate equipment and protective devices and compare to short circuit ratings
    - b. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short- circuit stresses
    - c. Switchgear Manufacturer shall notify Owner in writing, of any circuit protective devices improperly rated for the calculated available fault current.
- L. Protective Device Time-Current Coordination Analysis:
- 1. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.
  - 2. Include on each TCC graph, a complete title with descriptive device names.
  - 3. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.
  - 4. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
  - 5. Plot the following characteristics on the TCC graphs, where applicable:
    - a. Electric utility's overcurrent protective device
    - b. Medium voltage equipment overcurrent relays
    - c. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
    - d. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
    - e. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves
    - f. Medium voltage conductor damage curves
    - g. Ground fault protective devices, as applicable
    - h. Pertinent motor starting characteristics and motor damage points, where applicable
    - i. Pertinent generator short-circuit decrement curve and generator damage point
    - j. The largest feeder circuit breaker in each motor control center and applicable panelboard.

6. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.
  - a. Provide the following:
    1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
    2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
    3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.
    4. The study shall include a separate, tabular printout containing the recommended settings of all
    5. adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram
    6. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
    7. Switchgear Manufacturer shall notify Owner in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

M. Arc Flash Hazard Analysis:

1. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis (Section 2.03) and the protective device time-current coordination analysis (Section 2.04).
2. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.
3. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.
4. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.



5. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations
6. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.
7. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.
8. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
  - a. Fault contribution from induction motors should not be considered beyond 5 cycles.

For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.
9. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.
10. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

11. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.
  12. Provide the following:
    - a. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
    - b. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
    - c. The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.
- N. Field Adjustment:
1. Electrical SubContractor shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.
  2. Electrical SubContractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.
  3. Switchgear manufacturer shall notify the design engineer in writing of any required major equipment modifications.
- O. Arc Flash Labels:
1. Electrical SubContractor shall provide a 4.0 in. x 4.0 in. Brady thermal transfer type label of high adhesion polyester for each work location analyzed.
  2. The labels shall be designed according to the following standards:
    - a. UL969 – Standard for Marking and Labeling Systems
    - b. ANSI Z535.4 – Product Safety Signs and Labels
    - c. NFPA 70 (National Electric Code) – Article 110.16
  3. The label shall include the following information:
    - a. System Voltage
    - b. Flash protection boundary
    - c. Personal Protective Equipment category
    - d. Arc Flash Incident energy value (cal/cm<sup>2</sup>)
    - e. Limited, restricted, and prohibited Approach Boundaries
    - f. Study report number and issue date
  4. Labels shall be printed by a thermal transfer type printer, with no field markings.

5. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
  - a. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
  - b. Wall Mounted Equipment – Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
  - c. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

### **3.17 STORAGE AND INSTALLATION OF EQUIPMENT**

- A. The electrical subcontractor shall store and install electrical equipment and wiring listed for dry locations only after the building is watertight.

### **3.18 WASTE MANAGEMENT**

- A. Separate and recycle materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
- B. Set aside and protect materials suitable for reuse and/or remanufacturing.
- C. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.
- D. Coordinate with Section 017400 – CLEANING AND WASTE MANAGEMENT.

### **3.19 TRAINING**

- A. All training shall be scheduled with the user. Training shall be videotaped and a DVD delivered to the Owner. Refer to each specific system for amount of training required. Training is to be completed separately after the systems have been verified operational.

### **3.20 FIRESTOP SYSTEMS**

- A. General: Install firestop systems at all new and existing fire-rated construction where penetrated by the Work of this Section.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- B. Refer to Section 078400 - Firestopping, for all installation requirements for maintaining integrity of fire-rated construction at penetrations.

END OF SECTION 260000

**SECTION 31 10 00**  
**SITE PREPARATION**

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. Provide all labor, materials, equipment, services and accessories necessary to furnish and install the work of this Section, complete and functional, as indicated in the Contract Documents and as specified herein.
- B. The principal work of this Section includes, but may not be limited to, the following:
1. Clearing, grubbing, and disposing of vegetation, including bushes, trees, stumps, roots and debris within work limit lines.
  2. Stripping and storage of topsoil within the stockpile areas to be designated by the Architect or shown on the drawings.
  3. Protection of trees and other vegetation, stone walls, and objects indicated on the drawings or designated by the Architect.
  4. Removal of existing pavements, curbs, sidewalks, steps, signage and posts, fencing and all other site improvements that interfere with construction as indicated on the drawings. Pavement shall be properly disposed of at an off-site landfill.
  5. Installation and relocation of construction fencing during construction phasing.
  6. Coordination of the disconnection and capping of utilities and/or removal or relocation of utilities and utility poles as required.

**1.3 RELATED WORK**

- A. Carefully examine all of the Contract Document for requirements which affect the work of this Section. Other specifications which directly relate to the work of this Section include, but are not limited to, the following:
1. Section 312000 – EARTH MOVING
  2. Section 321216 – ASPHALT PAVING
  3. Section 321313 – CONCRETE PAVING
  4. Section 321600 – CURBS
  5. Section 329000 – TURF & GRASSES

6. Section 330000 – SITE UTILITIES

**PART 2 - PRODUCTS - NOT APPLICABLE**

**PART 3 - EXECUTION**

**3.1 PERFORMANCE**

- A. The Contractor shall accept the site as he finds it and shall remove all stumps, rocks, paving, improvements, and rubbish in the contract area. When the Contractor is ready to proceed with the clearing of trees from the site, he shall notify the Architect who will clearly identify in the field all trees to be saved. All other trees and brush shall be cleared from the area as directed. All rocks, strips, obstructions to work and undesirable material shall be removed from the site a properly and legally disposed of at an approved land fill site.
- B. All trees and shrubs to remain shall be protected during the entire progress of the work. This includes protection of the root system. All trees shall be fenced with snow fencing as detailed on the drawings and maintained during course of construction.
- C. Prior to excavating and after tree, stump, brush, etc., removal, strip the topsoil from the area of the buildings and the excavation and grading boundaries and stockpile on the site where directed by the Architect.
- D. All topsoil must be stripped from areas to be occupied by either site improvements or building construction prior to the on-site storage of any materials or the installation of any temporary construction facilities.
- E. Any existing abandoned/unused foundation members, cesspools, septic tanks, or similar subsurface facilities encountered within the project area are to be destroyed and removed in their entirety.
- F. Construct around stockpiles, a silt barrier consisting of filter socks, snow fence, and environmental fabric as detailed on the drawings. This installation shall be coordinated as to timing and placement with the Engineer, and the Newton DPW.

END OF SECTION

**SECTION 31 20 00**  
**EARTH MOVING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. The Contractor, Subcontractors, and/or suppliers providing goods and services referenced in or related to this Section shall also be bound by the Related Documents identified in Division 00 Information Available to Bidders and Division 01 General Requirements.

**1.2 SUMMARY**

- A. This Section includes the following:
1. Site excavating, grading, filling, backfilling, compacting, and preparing sub-grades to the lines and grades shown to the lines and grades herein or as indicated on the Drawings for the entire project (whichever is deeper) including but not limited to: foundations, footings, retaining walls, slab-on-grade components, site utility lines and structures, walks, pavements, lawns, athletic fields and plantings.
  2. Excavating all types of materials to limits indicated or required, including soil, rock, and other materials for new, below-grade construction and other site improvements as shown on the Drawings. All topsoil, subsoil, root balls, organic soil, existing fill, and other deleterious matter should be entirely removed from within the proposed building footprint. All topsoil, subsoil, organic material, root balls, and other deleterious material shall be entirely removed from within the paved areas.
  3. Compacted structural fill where indicated on the Drawings or where required below building areas.
  4. Processed aggregate for pavements and other improvements.
  5. Reclaimed pulverized pavements (reclaimed pavement borrow) for road sub base.
  6. Crushed Stone and porous fill for pavements, under building slabs and footings.
  7. General fill for establishing project sub-grades under paved areas and where shown on the Drawings.
  8. Excavation of rock and/or boulders, including replacement with suitable earthwork materials.
  9. Rehandling, hauling and placing of stockpiled materials for use in refilling, filling, backfilling, grading and such other operations. Stockpiling shall include protection to maintain materials in a workable condition.
  10. Removal of encountered unsatisfactory soils, including lawful off-site disposal and replacement with suitable earthwork fill material.
  11. Utility bedding material for site utilities.

12. Securing trenching permit
13. Construction of rip rap swales and level spreaders.
14. Protecting existing buildings, utilities, roads, pavements, lawns, plantings and other improvements from damage due to construction.
15. Excavation & Backfill within the building for all underground Plumbing, subsoil drainage, conduits, and the like.
16. Excavation for any new subsurface equipment, structure, footing, slab, or light pole base or any other excavation which is required to accomplish the Work described in the Drawings or Specifications.
17. Adhere to the Project Schedule, perform all work in order to meet Project Schedule to ensure Substantial Completion date, this shall include work performed during winter months. Additional compensation shall not be provided for work during winter conditions.

### **1.3 RELATED WORK**

- A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specifications that directly relate to the work of this section include, but are not limited to, the following:
  1. Section 003100 – Available Project Information
  2. Section 012200 – Unit Prices
  3. Section 014000 – Testing Laboratory Services
  4. Section 015000 – Construction Facilities and Temporary Controls
  5. Section 210000 – Fire Protection
  6. Section 220000 – Plumbing
  7. Section 260000 – Electrical
  8. Section 311000 – Site Preparation
  9. Section 312500 – Erosion and Sedimentation Controls
  10. Section 321216 – Asphalt Paving
  11. Section 321313 – Concrete Paving
  12. Section 321600 – Curbs
  13. Section 329200 – Turf & Grasses
  14. Section 329300 – Plantings
  15. Section 330000 – Site Utilities



- B. Excavation shall comprise and include the satisfactory removal and disposal of all materials encountered within the lines and grades shown in the drawings and in the specifications regardless of the nature of the materials, and shall be understood to include but not limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavations and associated backfill within the lines and grades shown in the drawings and in the specifications, except in rock as defined below, shall be included in the base bid.

#### **1.4 SUBSURFACE CONDITIONS**

- A. Protect all pipe lines, sewers, drains, poles, wiring, and the like that interfere in any way with the work whether or not they are specifically shown on the Drawings. Notify the proper authorities that items are protected, supported, and/or relocated as necessary to adjust them to the new work.
- B. Verify inverts and locations of all existing utilities having a direct bearing on the work of this Section prior to installation of any work of this Section. Transmit above information to the Architect who shall make any alterations to the Contract Drawings as required by the existing conditions.
- C. No extra compensation will be made for compliance with the above.
- D. Notify public utilities companies, in writing, at least 72 hours before excavating a public way in accordance with the provision of Chapter 82, Section 40A, of the Massachusetts General Laws, in order to prevent accidental damage.

#### **1.5 INTERPRETATION OF SITE CONDITIONS**

- A. During the course of construction, all interpretations of soil conditions, classification of materials and soil suitability, determine acceptability of methods and soil suitability, determining acceptability of methods and equipment to carry out the intent of the Specifications, shall be made by the Architect and/or Soils Laboratory. The decision of the Architect shall be final and binding on the Contractor.

- B. This project is Unclassified –
1. Unclassified excavation shall comprise and include the satisfactory removal and disposal of all materials encountered within the lines and grades shown in the drawings and in the specifications regardless of the nature of the materials, and shall be understood to include but not limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavations and associated backfill within the lines and grades shown in the drawings and in the specifications, except in rock as defined below, shall be included in the base bid.
  2. The Contractor will be paid for excavations beyond the lines and grades shown in the drawings and specifications using the Unit Prices found under Division 01 “Unit Prices” and following the method of measurement and verification of quantities as defined in this specification.

## 1.6 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the subbase course and proposed improvements.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil or earthwork products imported from off-site for use as fill or backfill.
- E. Excavation: Removal of material encountered above subgrade elevations.
1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  2. Mass Excavation: Excavations more than 8 feet in width and pits more than 30 feet in either length or width.
  3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Mass Rock or Earth: Excavated material that is greater than 8’ in both length and width.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- H. Rock: Excavated rock material in beds, ledges, unstratified masses, and conglomerate deposits that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
  - 1. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; Caterpillar 325D or equal, equipped with a 42-inch wide, short-tip-radius rock bucket.
  - 2. Mass Excavation: Late-model, track-mounted loader; Caterpillar 963C or equal; or Late-model, track-mounted hydraulic excavator; Caterpillar 325D or equal, equipped with a 42-inch wide, short-tip-radius rock bucket.
- I. Boulder: An excavated, individual rock fragment or natural stone with a volume of less than 1 c.y. in trenches and less than 3 c.y. in mass earth excavations. All boulders exceeding these definitions shall be classified as “rock” and shall fall within “mass” or “trench” subcategory based on definitions in this section. Material classified as “Rock” and excavated and paid for shall not be eligible to be classified as “boulder” for additional payment purposes. All excavated boulder material, to be disposed of on-site, or processed for re-use on-site, is not eligible for compensation under allowance and is part of base bid.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Layer placed between the subgrade and base course for pavement or other site improvements.
- L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- M. Trench Rock or Earth: An excavation of any length where the width is less than twice the depth and where the shortest distance between the excavation sides does not exceed eight (8') feet. All other excavations shall be defined as open excavations.
- N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- O. SSHB: “Standard Specifications for Highways and Bridges”, Commonwealth of Massachusetts, Massachusetts Highway Department, 1988 edition, including all supplements to date.
- P. Unsatisfactory/Unsuitable Soils: Any material generated, excavated and/or collected by earth moving activities or other contract work that does not meet any of the product specifications contained in contract documents.

## 1.7 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specifications Sections.
- B. Product Data: For the following:
  - 1. Each type of plastic warning tape.
  - 2. Drainage fabric.
  - 3. Separation fabric.
- C. Samples: For the following:
  - 1. 50-lb samples, sealed in airtight containers, of each proposed soil material from on-site or borrow sources, for Owner's independent laboratory testing agency. Samples shall be delivered to the site seven (7) calendar days in advance or time planned on incorporating them into the work. Owner's testing lab will confirm submitted test results and compaction curve data. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the Architect and the Geotechnical Engineer
  - 2. 5-lb sample to Architect's office for visual conformance confirmation.
  - 3. 12-by-12-inch sample of drainage fabric.
  - 4. 12-by-12-inch sample of separation fabric.
  - 5. 4-foot strip of each type of warning tape.
- D. Material Test Reports: From an approved qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - 1. Complete mechanical/sieve analysis classification according to SSHB and ASTM D 2487 for every 400 cubic yards of on-site or borrow soil material proposed for fill and backfill. Washed sieve shall be performed for 200 sieve on all materials.
  - 2. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.
  - 3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.
  - 4. Test sampling shall conform to the requirements of ASTM D-75, and ASTM D-3665.
- E. All installation of materials prior to testing and/or review and response by Architect is at Contractor's risk.
- F. Submit a dewatering plan for review by the Geotechnical Engineer at least two weeks before the start of construction.
- G. Submit a temporary earth support system layout and design at least two weeks before the start of construction.

## 1.8 QUALITY ASSURANCE

- A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code" and SSHB, Section 120 and State Fire Codes.
- B. The Owner may retain the services of a Geotechnical Engineer to periodically observe the earthwork operations including observing the subgrade of footings, slabs, parking lots, and roadways.
- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.
- D. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1, Section "Project Coordination".
  - 1. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, Engineer, consultants, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
- E. Testing: Compaction tests will be required by the Owner and will be paid for by the Owner. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting.

All retesting in these areas shall be paid for by the Contractor. See Division 1, Section "Quality Control Services". Contractor is required to compensate testing laboratory, directly, for all material test reports.
- F. Density and Compaction Testing: The Contractor is responsible to schedule compaction tests and to allow adequate time for the proper execution of said tests.
- G. Protect all benchmarks, monuments, and property boundary pins. Replace if destroyed by Contractor's operations.
- H. The presence of the independent testing and inspection firm and/or the Geotechnical Engineer does not include supervision or direction of the actual work of the Contractor, his employees or agents. Neither the presence of the independent testing and inspection firm and/or the Geotechnical Engineer, nor any observations and testing performed by them, nor failure to give notice of defects shall excuse the Contractor from defects discovered in his work.

- I. Costs related to retesting due to unacceptable quality of work and failures discovered by testing shall be paid for by the Contractor at no additional expense to Owner.

### **1.9 PROJECT CONDITIONS**

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated. Note that school operations must be maintained throughout construction.
  1. Notify Architect not less than two days in advance of proposed utility interruptions.
  2. Do not proceed with utility interruptions without Architect's written permission.
  3. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active. Contact Digsafe (811) prior to any earthwork or demolition operations.
- C. Contractor is responsible to properly obtain a trenching permit per 520 CMR 14.00 from appropriate local or state agency.

### **1.10 UNIT PRICES**

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
  1. 12 inches outside of concrete forms at footings.
  2. 6 inches outside of minimum required dimensions of concrete cast against grade.
  3. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
  4. 12 inches outside width and bottom of drainage structures, including catch basins and manholes.
  5. Pavements: bottom elevation of the specified subbase course.
  6. 6 inches beneath pipe in trenches, and 24 inches wider than inside diameter of the pipe.
  7. Planting Areas: 48" below proposed finish elevations area as specified for typical planting installation.
  8. Lawn Areas: 18" below indicated finish grades.
- B. Boulder Measurement: Volume of all boulders excavated and slated for removal from site. Individual boulders to be measured by method mutually agreed upon by the Contractor and Owner.

- C. Limits and measurements do not represent dimensions of excavation requirements mandated by safety and other regulatory agencies. Rock required to be removed to conform to safety regulations will not be measured for payment.

#### **1.11 COORDINATION**

- A. Prior to start of earthwork, the Contractor shall arrange an onsite meeting with the Architect, Engineer, the Geotechnical Engineer, and the independent testing firm for the purpose of establishing the Contractor's schedule of operations, and scheduling observation and testing procedures and requirements
- B. As construction proceeds, the Contractor shall be responsible for notifying the Geotechnical Engineer and the independent testing firm prior to the start of earthwork operations requiring observation and/or testing.
- C. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to ensure the steady progress of all work of the Contract.

#### **1.12 SUBSURFACE SOIL DATA**

- A. Subsurface explorations have been performed at the site by the Geotechnical Engineer. The results of the explorations are included in the geotechnical report prepared by Professional Service Industries, Inc. (PSI) and dated August 27, 2020 and July 7, 2022.
- B. The subsurface explorations and geotechnical report were performed primarily for use in preparing the foundation design and are included for the convenience of the contractor. Use and interpretation of these data for purposes of the work shall be the responsibility of the Contractor. Subsurface conditions and groundwater levels are not considered as accurate for any times or locations other than the specific time and location of each of the explorations.
- C. Contractor may, at his own expense, conduct additional subsurface testing as required for his own information after approval by the Owner.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

- B. Fill material shall be free from frost/ice and snow, rocks with a diameter greater than 2/3 of the loose lift thickness as specified herein, and foreign matter, such as construction debris, asphalt, trash, wood, roots, leaves, sod, and organic matter. All fill material shall be maintained by the contractor at suitable moisture contents for proper placement and compaction as specified herein.
- C. Offsite pulverized pavement and crushed concrete are not acceptable for fill material.
- D. Obtain off-site material as herein specified consisting of clean granular material from off-site Borrow Pits as approved by the Soils Laboratory prior to trucking to the site.
  - 1. Maintain borrow source material in a clean condition, uncontaminated by organic soils or other deleterious materials. If borrow material from the cut sectors is stockpiled, such stockpiles shall be suitable protected, drained, and maintained to insure full availability of the materials.
  - 2. Material weighing less than 100 lbs. per cubic foot (maximum laboratory dry weight) is not acceptable as fill material. Placed material shall be free of all objectionable material such as leaves, grass, and roots.

**2.2 PROCESSED GRAVEL FOR SUB-BASE**

- A. Processed gravel for sub-base, where called for on the Drawings and Specifications shall be from off-site sources and shall conform to the following gradation requirements of MHD Standard M1.03.0 Type 'C':

| <u>Sieve Size</u> | <u>% finer of weight</u> |
|-------------------|--------------------------|
| 2 Inch            | 100                      |
| ½ Inch            | 50-85                    |
| No. 4             | 40-75                    |
| No. 50            | 8-28                     |
| No. 200           | 0-10                     |



**2.3 GENERAL FILL (ORDINARY FILL)**

- A. Ordinary Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within  $\pm 2$  percentage points of optimum moisture content and conform to the following gradation:

| <u>Sieve Size</u> | <u>% finer by weight</u> |
|-------------------|--------------------------|
| 6 Inch            | 100                      |
| 1 Inch            | 50-100                   |
| No. 4             | 20-100                   |
| No. 20            | 10-70                    |
| No. 60            | 5-45                     |
| No. 200           | 0-20                     |

**2.4 GRANULAR FILL**

- A. Wherever granular fill is called for in the Drawings or Specifications, the material shall be brought from off-site sources and shall be free of ice, snow, sod, rubbish, or other deleterious material and conform to the following gradation:

| <u>Sieve Size</u> | <u>% finer by weight</u> |
|-------------------|--------------------------|
| 2 Inch            | 100                      |
| No. 10            | 30-95                    |
| No. 40            | 10-70                    |
| No. 200           | 0-15                     |

**2.5 STRUCTURAL FILL**

- A. The Structural Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Structural Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within  $\pm 2$  percentage points of optimum moisture content.
- B. Fill placed within buildings and within an area extending 5 feet beyond the limits of buildings, including within utility trenches inside buildings, shall consist of Structural Fill.

- C. Structural Fill for fill and backfill within building areas (under footings and slabs) and adjacent to foundation walls except where other materials are specified or detailed. Materials shall be clean bank-run or processed gravel free from recycled material, foreign substances (bricks, concrete, asphalt, etc), frozen material, lumps of clay, loam or vegetable matter, be obtained from a single source and shall meet the following grain size gradation:

| <u>Sieve Size</u> | <u>% finer by weight</u> |
|-------------------|--------------------------|
| 3 Inch            | 100                      |
| ½ Inch            | 50-100                   |
| No. 4             | 30-85                    |
| No. 20            | 15-60                    |
| No. 60            | 5-35                     |
| No. 200*          | 0-10                     |

\*0-5% Under sidewalks.

**2.6 GRAVEL BORROW**

- A. Gravel Borrow fill where called for on the Drawings and Specifications shall be from off-site sources and shall conform to the following gradation requirements of MHD Standard M1.03.0 Type 'B'.

| <u>Sieve Size</u> | <u>% finer of weight</u> |
|-------------------|--------------------------|
| 3"                | 100                      |
| 1/2"              | 50-85                    |
| No. 4             | 40-75                    |
| No. 50            | 8-28                     |
| No. 200           | 0-10                     |

**2.7 DENSE GRADED CRUSHED STONE**

- A. Dense graded crushed stone for floor slabs and where called for on the Drawings and Specifications shall be from off-site sources and shall conform to the following gradation requirements of MHD Standard M2.01.7.

| <u>Sieve Size</u> | <u>% finer of weight</u> |
|-------------------|--------------------------|
| 2 Inch            | 100                      |
| 1-1/2 Inch        | 70-100                   |
| ¾ Inch            | 50-85                    |
| No. 4             | 30-55                    |
| No. 50            | 8-24                     |
| No. 200           | 3-10                     |

## **2.8 CRUSHED STONE**

- A. Where designated on the Drawings and Specifications as crushed stone, the material shall consist of processed stone and shall conform to MHD, Section M2.01.0 through M2.01.6, size as indicated on the drawings.

## **2.9 WASHED STONE**

- A. Crushed stone not to exceed 3" and shall be double washed prior to arriving on the site.

## **2.10 SAND BORROW**

- A. Where designated on the Drawings and Specifications as sand borrow, the material shall consist of clean inert, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials and shall conform to the following gradation requirements of MHD Standard M1.04.0 Type a.

## **2.11 GEOTEXTILES**

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 2; AASHTO M 288.
  - 2. Elongation: 50% minimum; ASTM D 4632
  - 3. Grab Tensile Strength: 160 lbs; ASTM D 4632.
  - 4. Trapezoid Tear Strength: 60 lbs; ASTM D 4533.
  - 5. CBR Puncture Strength: 410 lbs; ASTM D 6241
  - 6. Apparent Opening Size: No. 70 sieve maximum; ASTM D 4751.
  - 7. Permittivity: 1.50 sec-1 minimum; ASTM D 4491
  - 8. UV Stability: 70% after 500 hours' exposure; ASTM D 4355.
- B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; complying with AASHTO M 288 and the following, measured per test methods referenced:
  - 1. Survivability: Class 1; AASHTO M 288.
  - 2. Elongation: 15% maximum; ASTM D 4632
  - 3. Grab Tensile Strength: 315 lbs; ASTM D 4632.
  - 4. Trapezoidal Tear Strength: 120 lbs; ASTM D 4533.
  - 5. Puncture Strength: 1,000 lbs; ASTM D 6241.
  - 6. Apparent Opening Size: No. 40 sieve, maximum; ASTM D 4751.
  - 7. Permittivity: 0.05 sec-1 minimum; ASTM D 4491.
  - 8. UV Stability: 70% after 500 hours' exposure; ASTM D 4355.

## **2.12 MODIFIED ROCKFILL**

- A. Where designated on the Drawings and Specifications as MODIFIED ROCKFILL, the material shall be hard, durable, angular in shape, resistant to wreathing and shall meet the gradation requirements of MHD Standard M2.02.4.

## **2.13 UNSUITABLE SOILS**

- A. Unsuitable material shall be material having at least one of the following properties:
1. Material with a maximum unit dry weight per cubic foot less than 100 lbs., as determined by ASTM D1557.
  2. Material containing greater than 3% organic matter by weight, topsoil, organic silt, peat, construction debris, roots and stumps.
  3. Material which has a Liquid Limit greater than 55 when tested in accordance with ASTM D 4318.
  4. Materials that do not meet one of the gradation specifications in this section.
  5. Material classified as unsuitable by the Geotechnical Engineer.
  6. Unsuitable material shall be disposed of off-site as directed by the Architect.
  7. Materials that are unstable as a result of inadequate construction dewatering, excessive subgrade disturbance, or other means and methods used by the Contractor are not considered unsuitable materials.
  8. Onsite processed material that is not well graded and that exhibits honeycombing during placement and compaction.

## **PART 3 - EXECUTION**

### **3.1 ENVIRONMENTAL CONTROLS**

- A. Prior to commencement of any work, provide the Architect with detailed drawings, reports, etc., as required to adequately define proposed methods to protect the environment of the project and the surrounding area in accordance with local, state, and federal regulations and as herein described. Conform to the Order of Conditions.
- B. All proposed drainage systems, as shown on the project plans, or which may be required during the course of the work, shall be maintained functional at all times. The exposed areas of subgrade in both cut and fill sectors shall be graded to positively drain. In impounded surface water areas, no additional fill material shall be placed. Failure to maintain positive drainage of the subgrade shall be adequate cause for the Architect to order temporary suspension of the work.

- C. Provide and maintain, for the entire course of the operations of the project, erosion and silt control measures to prevent the intrusion of any silt, oil, chemical, or other pollutants to any downstream drainage way, conduit, stream, etc., or abutting property beyond the project limit lines. In the event of failure to comply, the Contractor assumes the cost of all damages resultant there from.
- D. Provide for the control of dust to the satisfaction of the Architect.

### **3.2 REFERENCE POINTS**

- A. Locate and maintain bench marks, monuments, and other reference points. If destroyed or disturbed, place as directed by the Architect and/or local and state authorities.

### **3.3 LAYOUT**

- A. Provide and pay for the services of a Registered Land Surveyor who will provide the following:
  - 1. Monuments or stakes on all property corners so that the entire locus is staked in the field.
  - 2. Center line location and grade for the access ways, parking areas.
  - 3. Building, Utility and Curb Layouts.
- B. Protect and preserve all such monumentation after being established and replace same if damaged.
- C. The Surveyor shall locate and maintain as-built drawings, including swing ties to all valves, stubs, manholes, angle, points, etc., herein installed. At the completion of the work, submit as-built drawings for submission to the Architect.

### **3.4 EQUIPMENT**

- A. All Earth Work under this Section shall be performed with earth moving equipment capable of efficiently completing the scope of the work and subject to the approval of the Soils Laboratory and/or the Architect.

### **3.5 MOISTURE CONTROL (All Soils)**

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
- B. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

- C. Remove and replace, or scarify and air-dry, all soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
  - 1. Stockpile or spread and dry removed wet satisfactory soil material.
- D. The Contractor is alerted that the nature of native materials at this site is such that they are sensitive to moisture. On-site materials are difficult to handle and compact and are easily disturbed when wet. The Contractor shall plan and conduct his excavation and filling operations considering the nature of the on-site materials.

### **3.6 PROTECTION OF SUBGRADE**

- A. The Contractor shall employ special measures as herein specified and/or as directed in the field by the Architect to avoid disturbing the strength of the natural subgrade in an approved manner shall be made during the course of the construction.
- B. Provide and operate pumps or other equipment as necessary, to keep excavation free from water at all times, until succeeding operations are begun.
- C. As original ground surface is worked and fill is added, daily provisions shall be made for drainage of surface water away from the exposed subgrade.
- D. No heavy equipment shall be allowed to travel over wet areas of the subgrade. Notify the Architect if trafficking by equipment not under control of this Section occurs.
- E. Properly compact layers of subgrade fill as soon as they are placed.
- F. As soon as subgrade or general fill is placed, compacted, and approved by the Soil Laboratory, place and compact the granular fill sub-grade material.

### **3.7 TEMPORARY SHEETING, SHORING & BRACING**

- A. The Contractor shall provide shoring systems adequately anchored and braced to resist earth and hydrostatic pressures at locations as needed to support excavations during construction. The sheeting/shoring systems shall be designed by a Massachusetts Professional Engineer.
- B. Shop drawings and calculations shall be submitted for review and approval prior to start of any work for temporary excavation support. All shop drawings, details & calculations submitted shall bear the Professional Engineer stamp of the Engineer responsible for the design.
- C. The General Contractor shall install, maintain and monitor (1 day before and each day excavation is open) 3 (minimum) settlement monitoring points on the building footing or foundation wall. Location of monitoring points to be determined by shoring design engineer.

- D. The Contractor shall locate required bracing to clear all permanent Work.
- E. Bracing which must be relocated shall be installed prior to the removal of original bracing.
- F. The Contractor shall remove shoring and bracing in stages to avoid disturbances to adjacent and underlying soils and damage to structures, pavements, facilities and utilities. The contractor shall repair or replace adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

### **3.8 ROUGH GRADING**

- A. Upon completion of the site clearing work for each operation, the area of operation shall be rough graded. All organic materials, unsuitable fill, debris, and other deleterious materials, shall be removed from areas to be filled or backfilled. Frozen material shall not be used in filling.
- B. Dispose of or supply all borrow of specified types, necessary to complete the rough grading to the required elevations.
- C. Bring all areas within the contract limit lines to the subgrade levels as shown on the plans.
- D. If field conditions cause yardage to change for any reason, dispose of or furnish all fill as required at no cost.
- E. The finished subgrade surface shall be protected from the action of the elements. Any settlement or washing out that may occur from that, or any other cause prior to the acceptance of the work shall be repaired, and grades, re-established to the required elevations and slopes.
- F. Newly graded areas shall be protected from the action of the elements. Any settlement or washing out that may occur from that, or any other cause prior to the acceptance of the work shall be repaired, and grades, re-established to the required elevations and slopes.
- G. Areas under pavements bearing on ground shall be graded to required levels using acceptable material for fill and be thoroughly compacted.
- H. During the performance of rough grading operations, the subgrade shall be examined critically and any areas discovered which, in the opinion of the Soils Laboratory, are soft and unstable, shall be excavated to such depths as may be necessary to insure satisfactory supporting properties. These areas of excavation shall be backfilled immediately and shall be brought back to the elevation of the surrounding area with approved fill material and in accordance with the earth fill construction procedure.

- I. Redress areas as required and/or directed before placing of pavements, walks, and slabs and/or granular fill in the above areas.

### **3.9 FILLING AND COMPACTION**

- A. After the clearing and stripping of topsoil and removal of debris and other deleterious material, the areas to receive fill shall be drained and/or pumped free of all standing water.
- B. Fill shall not be placed upon frozen subgrade within building limits or below pavements where raise in grade is less than 3 feet. Overnight frost, not more than 2 inches thick, shall be broken up by cleats or crawler or other acceptable means prior to placing fill.
- C. Fill may be placed upon frozen subgrade in landscaped areas or below pavement where raise in grade exceeds 3 feet provided that:
  1. All snow is removed.
  2. All free ice or water is removed first.
- D. The following are minimum procedures to be utilized in the placing and compaction of all fill. The final compaction methods shall be subject to the approval of the Soils Laboratory. Critical areas are defined as all fill below building limit lines and the upper most 12 inches of subgrade under parking lot, bank-run gravel under paving, and base course under paving. Less critical areas are those under landscaped areas and below 12 inches under the paved areas.
  1. Compaction Method: Hand operated vibratory plate or light roller (in confined areas only)  
  
Maximum Stone Size: 2"  
  
Maximum Loose Lift Thickness: Critical areas - 4", less critical areas - 6"  
Minimum # of Passes: Critical Areas – 4, less critical areas - 4
  2. Compaction Method: Hand operated vibratory drum rollers weighing at least 1000#, or light crawler tractor (in confined areas only)  
  
Maximum Stone Size: 4"  
  
Maximum Loose Lift Thickness: Critical Areas - 6", less critical areas - 8"  
Minimum # of Passes: Critical areas – 4, less critical areas - 4



3. Compaction Method: Loaded 10-wheel dump truck

Maximum Stone Size: 6"

Maximum Loose Lift Thickness: Critical Areas - 10", less critical areas - 10"

Minimum # of Passes: Critical areas – 4, less critical areas - 4

4. Compaction Method: Heavy crawler tractor (Cat D8 minimum)

Maximum Stone Size: 8"

Maximum Loose Lift Thickness: Critical areas - 12", less critical areas - 12"

Minimum # of Passes: Critical areas – 4, less critical areas - 2

5. Compaction Method: Light vibratory drum roller min. wt. @ drum: 3000#; min. dynamic force: 10,000#

Maximum Stone Size: 6"

Maximum Loose Lift Thickness: Critical areas - 12", less critical areas - 12"

Minimum # of Passes: Critical areas - 4, less critical areas - 2.

- E. The following compaction requirements shall apply, in each case expressed as percentage of maximum dry density achieved by laboratory ASTM Modified Proctor Method D1557:

|   |     |
|---|-----|
| Below Foundations   | 95% |
| Top 12" of subgrade underlying granular fill below pavement           | 95% |
| Below floor slabs, but above foundation                               | 95% |
| Deeper than 12" from top of subgrade underlying gravel below pavement | 95% |
| Landscaping areas   | 90% |

- F. The moisture content of placed material shall not deviate from the optimum by more than 2 percent. Moisture content of any material which displays pronounced deformation under construction equipment shall not exceed the optimum. Drying of wet soil shall be expedited by the use of plows, discs, harrows, or other approved methods. If additional water is required, it should be uniformly distributed through the use of approved water wagons and shall be thoroughly incorporated into the material by means of discs or other suitable mixing equipment. Care shall be taken to avoid trapping water within the fill.
- G. The fill and borrow areas should be maintained in a freely draining conditions at all times. Proper drainage shall be provided for any water or springs which may be encountered.
- H. Frozen fill shall not be placed nor shall any acceptable fill be placed on frozen or snow covered surface except as outlined in (D) above.
- I. All cut areas shall be rolled and compacted to produce a compaction equal to that of the filled areas. If soft, yielding material is encountered in cuts, or in fills as a result of trapping water, and cannot be satisfactorily stabilized by moisture control and compaction, the unstable material shall be excavated to the depth required by the Soils Laboratory. The excavation shall then be filled with suitable material and compacted in accordance with the requirements outlined above.

### **3.10 SUBGRADE PREPARATION**

- A. After the subgrade is compacted to the specified requirements, the subgrade shall be fine graded to within 1/10 of a foot of the required elevations. Proof roll the entire subgrade in the presence of the Soils Laboratory.
- B. Proof roll with vibratory drum roller 10,000 lbs. with minimum of two complete coverage in each direction.
- C. Any suspect areas revealed by proof rolling shall be investigated by backhoe excavation. Deficiencies shall be corrected as directed by the Soils Laboratory.

### **3.11 GRANULAR FILL**

- A. Immediately upon completion of subgrade under areas to be paved and after approval by Soils Laboratory, place, compact, and grade the granular fill as specified to within 1 inch of the required elevations as shown on the plans.
- B. At the time the site is ready for pavement base material, place additional granular fill as required to meet the elevations shown.

- C. Take precautions to protect granular fill during subsequent operations so as to keep it clean and free draining and segregated from other deleterious materials.

### **3.12 EXCAVATION**

- A. Unclassified excavation shall comprise and include the satisfactory excavation, removal, and disposal of all materials encountered within the lines and grades shown in the Drawings or limits specified herein, whichever is deeper, regardless of the nature of the materials, and shall be understood to include, but not be limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, railroad track and ties, cobblestones, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavation and replacement, if applicable, with structural fill material within the lines and grades shown in the Drawings or the limits specified herein, whichever is deeper, will be considered and bid as unclassified and shall be included in the Contractor's lump sum (i.e., shall not be paid for using Unit Prices).
- B. After exhaustion of the rock allowances noted in the Unit Price Section, the contractor shall be paid for excavated rocks that are larger than 1 cubic yard in trenches and larger than 3 cubic yards on open excavations using rock excavation unit rates. Rock excavated from trenches shall be stockpiled separately from rock from open excavations.
- C. Excavate properly to provide sufficient work space to permit the placing, inspection, and completion of the work embraced in the completion of the Project. Excavations shall be made to elevations and dimensions indicated on the drawings, and shall include the removal of unusable earth and debris. All pumping, drainage, bailing, and shoring where such is required, shall be included.
- D. All space beneath foundations, resulting from unauthorized excavations or from slides or cave-ins shall be refilled with approved concrete and foundations shall be laid at the excavated level as directed, or other methods acceptable to the Soils Laboratory.
- E. After completion and approval of the subgrade within the building area, excavate for footings and foundations carrying all excavations so that all bearing area will be either or virgin soil or on controlled compacted fill.
- F. Excavated materials not required or not suitable for backfilling and rough grading, and debris, shall be removed from the site at no additional cost to the Owner.

### **3.13 UNAUTHORIZED EXCAVATION**

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.

1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

### **3.14 BACKFILLING**

- A. Backfill as soon as permanent work has been completed and walls have attained sufficient set and strength.
- B. Except where otherwise specified, backfilling shall be done with granular fill and done promptly so as to protect the foundation from frost. Place backfill in layers as noted. Compact before placing succeeding layer. When sheeting, bracing, or shoring is removed, fill voids.
- C. Exercise extreme care in backfilling against newly placed walls. Walls with fill on one side shall be properly supported laterally, either with the designed structure or by temporary means. Walls with fill on both sides shall have fill placed in alternate layers on each side of the wall. Place no more than one (1) foot at a time, compacted each list as herein specified.

### **3.15 EXCAVATION AND BACKFILLING FOR UTILITIES**

- A. Excavate and backfill for all underground utilities and structures.
- B. Utilities shall not be laid directly on ledge or boulders or remains of old foundation or structure. This material shall be removed to a minimum of 6 inches below the utilities and backfilled and compacted as hereinafter specified.
- C. In general, the width of trenches shall be kept to a minimum and in the case of piping shall not exceed the sum of the pipe o.d. plus 2' - 0" to at least 12 inches above the pipe. Trench walls may be cut back from 12 inches above the pipe to subgrade.
- D. Excavation shall be carried to 6 inches below utility or structure and to the required line or grade. Machine excavation will be permitted. Immediately upon excavation of trench in the case of piping or excavation for manholes or other structures, place and compact 6 inches of 3/4" inch processed stone as herein specified in paragraph 2.06 at the proper line and grade, digging bell holes to insure bearing throughout the pipe barrel in the case of piping.
- E. Backfilling within the area of the utility work shall be carried to the lines and levels required for the grades shown on the drawings and as specified. Backfilling shall not be started until conditions have been inspected and approved by the Architect, nor any fill placed until structural members involved have sufficient strength to withstand the pressure to be imposed.

- F. Fill material shall be as detailed on the drawings, placed in the dry horizontal layers and approved of each layer shall be obtained from the Soils Laboratory before proceeding with the next. Each layer shall be compacted to 95% of maximum dry density and at a water content equal to optimum water content plus-or-minus 2%. The maximum dry density and optimum water content shall be determined by the Soils Laboratory.
- G. Backfill trenches only after pipe has been inspected, tested, and locations of pipes and appurtenances have been recorded. Backfill by hand around pipe and for a depth of 2 feet above the pipe and tamp firmly in lifts not exceeding 6 inches in thickness, taking care not to disturb the pipe. Compact the remainder of the backfill, in maximum 9-inch layers, thoroughly with a rammer of suitable weight, or approved mechanical tampers to a minimum relative density of 95%. Trenches shall not be left open overnight.
- H. Backfill material for utility structure shall be placed symmetrically on all sides, in 9-inch layers. Each layer shall be compacted with mechanical or hand tampers to a minimum relative density of 95%. Excavated areas for structures shall not be left open overnight.
- I. With prior approval of the Architect, the water line may be partially backfilled leaving all joints exposed prior to testing. As the entire is backfilled furnish and install plastic tracer line labeled "Water main" approximately 18" below finished grade.

**3.16 GRAVEL BASE COURSE FOR PAVEMENTS**

- A. Furnish, place, compact, and fine grade the gravel base for all pavement, to the thicknesses shown on the plans and to the satisfaction of the Soils Laboratory.
- B. Finished grading of base course shall be evenly graded, sloped to drain, and within 1/10 foot tolerance of required final grade.
- C. Gravel base material shall conform to gradation requirements of Geotechnical report shall be approved by the Soils laboratory at the process plant or pit.

**3.17 BASE FOR SLABS ON GRADE**

- A. Furnish, place, compact, and fine grade the crushed stone base for all slabs on grade to the thickness shown on the plans.

**3.18 LOCATION OF POROUS FILL (CRUSHED STONE)**

- A. At the slab on ground level - a 6" minimum layer between the structural fill and the vapor retarder which is located directly under the interior slabs on grade as indicated on the Structural Drawings.
- B. At bottom of footing in cut locations – a 6" minimum layer beneath the bottom of footing elevation.

### 3.19 FIELD QUALITY CONTROL

- A. Testing Agency: Allow the Owner's testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
  - 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method).
    - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM C 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
    - b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.
  - 2. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
  - 3. Field testing of structural fill will consist of grain size analysis of gravel fill, Modified Optimum Density (AASHTO T-180) and field density tests at the rate of one (1) per 200 cubic yards of fill or at the discretion of the inspector.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or allow drying, or removing and replacing soil to the depth required, re-compacting and retesting until required density is obtained. All retesting costs are the responsibility of the Contractor.
- C. Testing Laboratory's presence does not include supervision or direction of the actual work by the Contractor, his employees, subcontractors or agents. Neither the presence of the Testing Laboratory, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
- D. Testing equipment will be provided by and testing performed by the Testing Laboratory, except as otherwise provided by Contract. Upon request by Architect, the Contractor shall provide such auxiliary personnel and services as needed to accomplish testing work and to repair damage caused thereby to permanent work.
- E. All fill materials delivered to the project site shall be tested for gradation before use. Additional test shall be performed when in the Geotechnical Engineer's opinion the material being delivered to the site has changed in gradation.

### **3.20 PROTECTION**

- A. Protecting Graded Areas: The contractor is cautioned that the onsite soils are high in fines and will be susceptible to disturbance when wet and will be frost susceptible.
- B. Protect newly graded areas from traffic, softening, freezing, and erosion. Keep free of trash and debris.
- C. Work area shall be protected from surface runoff flowing from areas upslope of the site. The contractor shall divert such runoff so as it does not interfere with earthwork operations.
- D. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by the Architect; reshape and re-compact at optimum moisture content to the required density.
- E. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### **3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS**

- A. Disposal: Remove waste material, including trash, and debris, and legally dispose of it off Owner's property. Surplus satisfactory soil and unsatisfactory soil shall be legally disposed of off Owner's property.
- B. Refer to Division 32 for disposal of topsoil.

END OF SECTION

**SECTION 31 23 19  
DEWATERING**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Each and every Contractor, Subcontractor and/or supplier providing goods or services referenced in or related to this Division shall also be bound by the Documents identified in Section 01010, Paragraph 1.1A, entitled Related Documents.

**1.2 SUMMARY**

- A. This Section includes Construction Dewatering.
- B. The following related work is specified under the designated Sections:
1. Section 220000 – PLUMBING
  2. Section 260000 – ELECTRICAL
  3. Section 312000 – EARTH MOVING
  4. Section 312500 – EROSION AND SEDIMENTATION
  5. Section 321216 – ASPHALT PAVING
  6. Section 330000 – SITE UTILITIES

**1.3 PERFORMANCE REQUIREMENTS**

- A. Dewatering Performance: Design, provide, test, operate, monitor, and maintain a dewatering system of sufficient scope, size, and capacity to control ground-water flow into excavations and permit construction to proceed on dry, stable subgrades.
1. Work includes removing dewatering system when no longer needed.
  2. Maintain dewatering operations to ensure erosion is controlled, stability of excavations and constructed slopes is maintained, and flooding of excavation and damage to structures is prevented.
  3. Prevent surface water from entering excavations by grading, dikes, or other means.
  4. Completely protect adjacent properties from siltation caused by outfall operations.



#### **1.4 SUBMITTALS**

- A. Shop Drawings: For dewatering system, show arrangement, locations, and details of wells and well points; locations of headers and discharge lines; and means of discharge and disposal of water.
  - 1. Include a written report outlining control procedures to be adopted if dewatering problems arise.
  - 2. Include Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.
- B. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by dewatering operations.
- D. Field Test Reports: Before starting excavation, submit test results and computations demonstrating that dewatering system is capable of meeting performance requirements.

#### **1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced installer to assume engineering responsibility and perform dewatering who has specialized in installing dewatering systems similar to those required for this Project and with a record of successful in-service performance.
- B. Regulatory Requirements: Comply with water disposal requirements of the City of Newton and the Commonwealth of Massachusetts agencies.

#### **1.6 PROJECT CONDITIONS**

- A. Project Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of the geotechnical engineer and represent interpretations of the subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
  - 1. Make additional test borings and conduct other exploratory operations as necessary.

- B. Survey adjacent structures and improvements, employing a qualified professional engineer or surveyor, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.
  - 1. During dewatering, resurvey benchmarks weekly, maintaining an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 PREPARATION**

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
  - 1. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding site and surrounding area.
  - 2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

**3.2 DEWATERING**

- A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls. Maintain site drainage at all times.

- B. Before excavation below ground-water level, place system into operation to lower water to specified levels and then operate it continuously until drains, sewers, and structures have been constructed and fill materials have been placed, or until dewatering is no longer required.
- C. Provide an adequate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Install sufficient dewatering equipment to drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
  - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
- D. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
  - 1. Maintain piezometric water level a minimum of 24 inches (600 MM) below surface of excavation.
- E. Dispose of water removed from excavations in a manner to avoid endangering public health, property, and portions of work under construction or completed. Dispose of water in a manner to avoid inconvenience to others. Provide sumps, sedimentation tanks, temporary sedimentation basins, and other flow-control devices as required by authorities having jurisdiction. Prevent erosion or siltation of adjacent areas and watercourses. Refer to Section 312500.
- F. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on a continuous basis if any part of system becomes inadequate or fails. If dewatering requirements are not satisfied due to inadequacy or failure of dewatering system, restore damaged structures and foundation soils at no additional expense.
  - 1. Remove dewatering system from Project site on completion of Dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches (900 mm) below overlying construction.
- G. Damages: Promptly repair damages to adjacent facilities caused by dewatering operations.

### **3.3 OBSERVATION WELLS**

- A. Provide, take measurements, and maintain at least the minimum number of observation wells or piezometers indicated and additional observation wells as may be required by authorities having jurisdiction.
- B. Observe and record daily elevation of ground water and piezometric water levels in observation wells.
- C. Repair or replace, within 24 hours, observation wells that become inactive, damaged, or destroyed. Suspend construction activities in areas where observation wells are not functioning properly until reliable observations can be made. Add or remove water from observation-well risers to demonstrate that observation wells are functioning properly.
  - 1. Fill observation wells, remove piezometers, and fill holes when dewatering is completed.

END OF SECTION

**SECTION 31 25 00**  
**EROSION AND SEDIMENTATION CONTROL**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Attention is directed to the Contract and General conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including, but not limited to, the following:
  - 1. The work to be performed is shown on the Drawings listed on the contract from. The work shall be performed in accordance with the City of Newton Specification, Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Latest Edition. Said documents are by reference made a part of the contract.
  - 2. Furnish and Install all slope protection, sedimentation and erosion control measures as necessary to retain all erosion and sediments within the construction area, as shown on the Drawings and/or as specified herein, including, but not limited to:
    - a. Provide and maintain wattle and erosion control silt fence for control of soil runoff on exposed slopes, drainage structures and temporary stockpiles.
    - b. Seeding annual ryegrass, installing erosion control blankets, or temporary mulch as a temporary cover on all exposed slopes and stockpiled topsoil.
    - c. Cleaning adjacent roadway surfaces of all accumulated sediment and debris as required or at a minimum of once per week.
    - d. Erosion Control Blankets (ECB) on all key identified slopes.
    - e. Temporary seeding and lawn stabilization of disturbed areas.
    - f. Dust control.
    - g. Provide and maintain Sediment Control Bags at all existing or new catch basins.

B. The following Related Work is specified under the designated Sections:

1. Section 024100 – DEMOLITION
2. Section 311000 – SITE PREPARATION
3. Section 312000 – EARTH MOVING
4. Section 321216 – ASPHALT PAVING
5. Section 321313 – CONCRETE PAVING
6. Section 321600 – CURBS
7. Section 321723 – PAVEMENT MARKING
8. Section 323000 – SITE IMPROVEMENTS
9. Section 329200 – TURF & GRASSES
10. Section 330000 – SITE UTILITIES

### **1.3 QUALITY ASSURANCE**

- A. Material Standards and Standards of Workmanship: Equal to the Commonwealth of Massachusetts Guidelines for Soil Erosion and Sediment Control and Local City Requirements.
- B. Requirements specified and noted on drawings are minimum. Provide additional measures as required by the local, State or Federal authorities as a result of Contractor's specific scheduling and Work sequencing, or weather conditions at no additional cost to the Owner.
- C. Qualifications: Engaged firm shall be able to demonstrate experience in the installation of the erosion and sedimentation controls described in the Contract Documents.

### **1.4 SUBMITTALS**

- A. Product data for the following:
  1. Silt Fence
  2. Erosion control blankets.
  3. Soil stabilizers.
  4. Sediment Control Bags.
  5. Fertilizers, seed.
  6. Limestone.
  7. Chemical preservatives and controls – also confirm that each of the materials proposed to be applied are permitted within the Commonwealth of Massachusetts and the City of Newton.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Seed, Fertilizer and Lime: Deliver in original sealed, labeled, and undamaged containers, showing weighs, analysis, and name of manufacturer.
- B. Protect materials from deterioration during delivery and while stored at site.

### **1.6 COORDINATION AND SCHEDULING**

- A. General: Sow lawn seed and install all stabilization measures as soon as possible in accordance with the Contractor's schedule.
- B. Weather Limitations: Proceed with lawn development only when existing and forecast weather conditions are suitable for work.

### **1.7 MAINTENANCE**

- A. Begin maintenance of stabilized areas immediately after each area is stabilized and continue until project is accepted.
- B. Maintain and establish all disturbed areas by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
  - 1. Replant bare areas.
  - 2. Add new mulch and tackifier in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.

### **1.8 JOB CONDITIONS**

- A. Existing Conditions: The contractor shall examine all work that the work of this Section is contingent upon, and report any deficiencies to the Architect. Commencement of the work will be construed to mean complete acceptance by the Contractor of the preparatory work of others. No adjustment will be made for discrepancies brought to the Architect's attention after work has begun.

B. Protection of Adjacent Lands:

1. The Contractor shall be totally responsible for protection of any lands or properties as may be subject to any effect or by-product of his demolition/construction effort. Special care shall be taken to avoid erosion of fill or cut slopes onto adjacent properties or downstream siltation of diversion of existing surface drainage. Any damage is to be corrected immediately.
2. Erosions control measures in the locations shown and as detailed and described in the Contract Documents shall be considered minimum requirements and the Contractor shall take whatever other erosion and sedimentation controls steps necessary to accommodate his particular construction procedures.

C. Schedule Procedure:

1. Erosion control construction shall be done prior to the commencement of demolition, site preparation or earthwork operations. The initial method outlined herein is intended to route all practicable surface water from the excavation area into erosion control facilities. The Contractor shall install any additional protective measures as may be required to control siltation from the site.
2. The following sequence of construction shall be followed: Revisions shall be only with the approval of the Architect and the responsible municipal governing agency.
  - a. Place sedimentation control measures along slopes, at catch basins and across swales and outfalls as shown on the Drawings, and where directed by the Architect.
  - b. Proceed with construction of the remaining items of work in accordance with the approved project sequence and schedule. The contractor shall be responsible for maintaining the integrity of all sediment and erosion control measures for the duration of the Contract.
  - c. Clean and maintain all sedimentation control components to achieve the intended purpose of both temporary and permanent erosion and sediment control facilities.

## **PART 2 - PRODUCTS**

### **2.1 SEED**

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerance.
1. Seed Mixture: 50% Annual Ryegrass; clean with a minimum of 0.50% noxious weed seed; minimum 97% pure with a germination rate minimum of 80%.



2. If seeding occurs after September 15, substitute winter rye for annual rye grass.
- B. Straw Mulch: Provide air-dry, clean, mildew-and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- C. Fiber Mulch: Biodegradable dye-wood cellulose-fiber mulch, nontoxic, free of plant growth or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth-or germination-inhibitors.

## **2.2 EROSION-CONTROL MATERIALS**

- A. Compost Filter Sock
  1. Compost filter socks shall consist of compost consisting of 25%-100% organic matter with a pH of 5.0-8.5, a moisture content less than 60% and 99% passing a 2" sieve and 30% to 50% passing a 3/8" sieve inside of a biodegradable sock/netting. Compost filter socks shall measure at least twelve (12) inches in diameter.
  2. Stakes for filter socks shall be one of the following materials. Lengths shall be approximately two feet (2').
    - a. Wood stakes of sound hardwood, one inch by one inch (1" x 1") in size.
    - b. Steel reinforcing bars of at least No. 4 size.
- B. Erosion Control Blanket: C125BN coconut fiber erosion control blanket (100% biodegradable) as manufactured by North American Green or approved Equal. Include biodegradable stakes.
- C. Temporary Mulch: Straw hydromulch or other approved product.
- D. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb. Per sq. yd. (0.5 kg per sq. m) minimum, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

## **2.3 SILTATION FENCE**

- A. Silt fence shall consist of the following elements:
  1. Fabric for siltation fence shall be a minimum width of 3 feet and conforming to the following criteria:

MINIMUM ACCEPTABLE

| <u>Fabric Properties</u>                    | <u>Value</u> | <u>Test Method</u> |
|---|--------------|--------------------|
| Grab Tensile Strength (lbs)                 | 124          | ASTM D 4632        |
| Grab Tensile Elongation (%)                 | 15           | ASTM D 4632        |
| Mullen Burst Strength (psi)                 | 300          | ASTM D 3786        |
| Puncture Strength (lbs)                     | 65           | ASTM D 4833        |
| Flow Rate (gal/min/sf)                      | 10           | ASTM D 4491        |
| Apparent Opening Size (sieve)               | 30           | ASTM D 4751        |
| Ultraviolet Stability (% strength retained) | 70           | ASTM D 4355        |

2. Acceptable fabric materials include “Mirafi Envirofence” by TenCate Mirafi, “Style 2130” by Amoco Fabrics Co., and “LS125-Super Grade” by ACF Environmental, or as approved by the Engineer.
3. Silt fence posts shall be wood or metal. Wood posts shall be a minimum of 1¼ inch by 1¼ inch by 5 feet long hardwood stakes commonly used to support siltation fabric. Metal posts shall be a minimum of 1 inch diameter and 5 feet long. Posts shall be spaced at a maximum distance of 8 feet on center.
4. Furnish and install suitable nylon cord to secure abutting silt fence posts.

**2.4 CRUSHED STONE: CONFORM TO MHD, SECTION M2.01.1, GRADATION 2”.**

**PART 3 - EXECUTION**

**3.1 PRECONSTRUCTION MEETING**

- A. Prior to the start of any construction activities on the site, a preconstruction conference shall be held to establish supervisory and inspection procedures for sediment and erosion control measures. This meeting shall be attended by the Contractor, the Architect, the Local Sediment and Erosion Control Officer, and the Owner.
- B. Submit detailed sequenced construction schedule for the Architect’s review and approval. Do not proceed until this schedule is approved.

### **3.2 CONSTRUCTION ENTRANCE**

- A. Install construction entrances to each project work area and staging area. Location and number of entrances to be modified based on Contractor's specific sequencing of work and as approved by the Architect. Maintain each entrance by regrading and providing additional stone as required to maintain a clean and open surface.
1. Dimensions: 50' length minimum (typical), 6" depth of crushed stone. Refer to Contract Drawings.
  2. Adjacent pavements are to be kept clean of construction generated sediment and debris. Sweeping shall occur once per week at a minimum or more frequently if so required.

### **3.3 MAINTENANCE**

- A. Maintain basins and Erosion control devices by restaking and replacing as required. Remove buildup of silt as necessary or as directed by the Architect. Maintain operations until all lawn/planted areas are stabilized and all paving is completed.

### **3.4 TEMPORARY SEEDING**

- A. Seed all exposed slopes and stockpiled topsoil with winter or annual ryegrass at a rate of two (2) pounds/1,000 sq. feet of area. Seeding shall be done immediately after rough grading operations are complete and maintained until finish grading and seeding have begun.

### **3.5 HYDROMULCHING/HYDROSEEDING**

- A. Hydroseeding: Mix specified seed, fertilizer, and maximum 10% of fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
1. Mix slurry with nonasphaltic tackifier.
  2. Apply slurry uniformly to all area to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lb. Per are (5.5 kg per 100 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1200 lb. Per acre (11 kg per 100 sq. m).

### **3.6 TEMPORARY EROSION CONTROL FABRIC OR MULCH**

- A. Temporary Erosion Control Fabric or Mulch: Immediately upon formation of rough grades, install on all key identified slopes as per manufacturer's recommendations or slopes steeper than one foot vertical to three feet horizontal or any areas and drainage

swales which receive concentrated run-off water and areas that are susceptible to erosion as required by the Architect. Overlap joint of erosion control blankets one foot and secure as recommended by the manufacturer. Maintain until permanent vegetative cover is established.

### **3.7 CLEAN UP**

- A. Upon stabilization of all disturbed areas and the completing of construction activity, remove all erosion control devices including stone construction entrances and restore surrounding areas to acceptable conditions.

END OF SECTION

**SECTION 32 12 16  
ASPHALT PAVING**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Attention is directed to the Contract and General conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

**1.2 DESCRIPTION OF WORK**

- A. The work to be performed is shown on the Drawings listed on the contract form. The work shall be performed in accordance with the City of Newton D.P.W. Specifications, Latest Edition and the Commonwealth of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Latest Edition. Said documents are by reference made a part of the contract.
- B. The Work to be performed under this Section shall include furnishing all labor, materials and equipment required to do all the Bituminous Concrete Paving and related work as shown on the Drawings or herein specified. The Work shall further include all appurtenant items not specifically shown or itemized but which are implied or required to complete the Work in accordance with the reasonable intent of the Contract Documents.
- C. The principal work of this Section includes, but may not be limited to the following:
  - 1. New Bituminous Concrete Paving for Walks, Parking Areas, and other areas as shown.
  - 2. Paving to consist of a two (2) course hot placed and compacted pavement of mineral aggregate, mineral filler, and bituminous material, to the various depths and cross sections shown on the documents.
  - 3. Fine grading of the gravel base course.

### **1.3 RELATED WORK**

- A. Carefully examine all of the Contract Documents for requirements that affect the work of this Section. Other specifications that directly relate to the work of this section include, but are not limited to, the following:
1. Section 312000 – EARTH MOVING
  2. Section 321313 – CONCRETE PAVING
  3. Section 321600 – CURBS
  4. Section 329200 – TURF & GRASSES
  5. Section 330000 – SITE UTILITIES

### **1.4 QUALITY ASSURANCE**

- A. The following Specifications and all related items and methods shall meet Commonwealth of Massachusetts Department of Public Works Construction Standards and Materials Specifications, latest Edition. Method of payment part of each Section is deleted and shall not be included.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Asphalt Paving and Materials
1. All materials shall meet the requirements of the Commonwealth of Massachusetts Highway Department for Highways and Bridges, Latest Edition, Standard Specifications for Type I-1 Bituminous Concrete Paving, and the materials selected shall be of the highest quality. Prior to starting work, submit job mix formula for review and approval.
  2. Bituminous prime coat shall be medium curing Type MC-D or MC-1 conforming to the Commonwealth of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Latest Edition. Asphalt cement shall be of a typical penetration grade for the local area. All bituminous material shall meet the minimum requirements of AASHO specifications.
  3. Bituminous concrete aggregates and fine aggregates shall conform to MHD Section M3.11 as amended.

4. Bituminous concrete shall meet the following requirements when tested by the Marshall method. The requirements are based on the bituminous concrete being compacted with 50 blows and tested at 140 degrees F.

| Physical Test | Surface Course | Binder Course | Asphalt Base |
|---------------|----------------|---------------|--------------|
| Stability     | 1000 PSI       | 1000 PSI      | 800 PSI      |
| Flow 1/100"   | 6 - 18         | 6 - 18        | 6 - 20       |
| Total Voids   | 2 - 5          | 3 - 6         | 3 - 8        |

5. Asphalt cement content to be determined by three point Marshall curve. The amount of asphalt cement shall be selected from the maximum density obtained and within the above minimum requirements.

### **PART 3 - EXECUTION**

#### **3.1 PAVEMENT FOUNDATION CONDITIONS**

- A. Subgrade materials and preparation are specified in Section 312000. Gravel base material, thickness, and compaction is detailed on the Drawings. Fine grading is specified herein.

#### **3.2 ESTABLISHMENT OF GRADES**

- A. Establish grade stakes from the Contract Drawings Site Grading Plan. The grade stakes shall be set to desired section and elevation and due allowances shall be made for existing improvements, proper drainage and adjoining property rights.

#### **3.3 PROTECTION OF WORK BY OTHERS**

- A. Protect all work previously installed such as manholes, catch basins, sewer cleanouts, lighting posts, bases, curbs, sidewalks, etc. Repair any damage to this work caused by work of this Section.

#### **3.4 PAVEMENT TRIMMING**

- A. Only sawcutting (without overcuts) shall be allowed as a means of creating the final (permanent) edge between existing and new hot-mix asphalt. All overcuts shall be filled with bituminous joint sealer. The standard cutback for all permanent pavement patches shall be 24" beyond the original pavement cuts made to perform the Contractor's work.

### **3.5 PAVEMENT APPLICATION**

- A. The gravel base course shall be fine graded in accordance with the Drawings and the maximum allowable deviation shall be 1/2 inch in ten (10) feet. Spread additional screening into any area showing segregation and roll into the surface until all voids in the base course have been completely filled. Rolling of the entire base shall be performed in the presence of the Soils Laboratory.
- B. The bituminous prime coat shall be applied to the base course at the rate of 0.05 gallons per square yard. The base course shall be relatively dry at the time the primer is applied. The prime coat shall be allowed to cure for a minimum of twenty-four (24) hours.
- C. Bituminous concrete shall be installed to the minimum thickness as specified. The compacted thickness shall be equal to or greater than the thickness specified. No skin patching will be accepted. Compaction of the bituminous concrete shall be equal to 97% of that obtained in the Laboratory. Bituminous concrete shall be rolled with a ten-ton roller as soon after placing as is practical.
- D. Provide a slope for drainage as indicated on the Drawings. Slope to catch basins as provided.
- E. The surface of the finished pavement shall be free of roller depressions. When tested with water, the surface shall not contain any irregularities which will impede water flow.
- F. Bituminous concrete paving shall abut concrete curbs and walls making a smooth, even, clean joint as indicated on the Drawings.

### **3.6 FIELD QUALITY CONTROL**

- A. As directed by the Architect, the Owner will furnish the services of a testing laboratory to perform compaction and thickness testing. All testing is to be performed in accordance with ASTM or AASHTO recommended procedures.

END OF SECTION



**SECTION 32 13 13  
CONCRETE PAVING**

**PART 1 - GENERAL**

**1.1 GENERAL PROVISIONS**

- A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. The Work to be performed under this Section shall include furnishing all labor, materials and equipment required to do all the Portland Cement Concrete Site Work and related work as shown on the Drawings or herein specified. The Work shall further include all appurtenant items not specifically shown or itemized but which are implied or required to complete the Work in accordance with the reasonable intent of the Contract Documents.
- B. The principal work of this Section includes, but may not be limited to, the following:
1. Reinforced Concrete Pads
  2. Concrete Walkways and Stoops
  3. Joint Treatments
  4. Reinforcement
  5. Surface Finish
  6. Curing

**1.3 RELATED WORK**

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other Specifications which directly relate to the work of this Section include, but are not limited to, the following:
1. Section 033000 – CAST-IN-PLACE CONCRETE
  2. Section 312000 – EARTH MOVING
  3. Section 329200 – TURF & GRASSES

**1.4 SUBMITTALS**

- A. Submit product data under provisions of the General Conditions.

- B. Submit manufacturer's instructions under provisions of the General Conditions
- C. Product Data: Submit product data for the following materials and items.
  - 1. Reinforcement
  - 2. Forming Accessories
  - 3. Admixtures
  - 4. Patching compounds
  - 5. Sealants (including colors)
  - 6. Joint fillers
  - 7. Shop Drawing Reinforcement: Submit detailed shop drawings for fabrication, bending and placement of concrete reinforcement. Elevations of walls shall include form tie placement.
  - 8. Shop Drawing Jointing: Submit detailed layout drawing for joint locations and layout.
  - 9. Show bar schedules, stirrup spacing, diagrams of bent bars and arrangement of reinforcement including bar overlap.
  - 10. Include special reinforcement required for opening through concrete structures.
  - 11. Plastic slip dowel system
  - 12. Laboratory Test Reports: Submit concrete materials test reports and mix design reports certifying that each material or item complies with or exceeds the specified requirements.

## **1.5 SAMPLES**

- A. Plastic Slip Dowel System

## **1.6 QUALITY ASSURANCE**

- A. The following Specifications and all related items and methods shall meet The Commonwealth of Massachusetts Department of Public Works Construction Standards and Materials Specifications, Latest Edition (MDPW). Method of payment part of each Section is deleted and shall not be included.
- B. Installer Qualifications
  - 1. An experienced installer who has completed pavement work similar in material, design and extent to that indicated for this project and whose work has resulted in construction with record of successful in-service performance.
- C. Manufacturer Qualifications
  - 1. Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

- a. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

D. Testing Agency Qualifications

1. An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated.

E. Source Limitations

1. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

F. ACI Publications

1. Comply with ACI 301, "Specifications for Structural Concrete," unless modified by the requirements of the Contract Documents.

G. Concrete Testing Services

1. Engage a qualified independent testing agency to perform material evaluation test and to design concrete mixes.

- H. Walks constructed for use by persons with accessibility challenges shall conform to the applicable portions of the Americans with Disability Act Accessibility Guidelines (ADA), Massachusetts Architectural Access Board (MAAB) and the Massachusetts State Building Code.

## **PART 2 - PRODUCTS**

### **2.1 FORMS**

A. Form Materials

1. Plywood, metal, metal-framed plywood or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surface.
2. Use flexible or curved forms for curves of a radius 100 feet or less.

B. Form-Release Agent

1. Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces. Conform to all State and local requirements for levels of toxicity.

## 2.2 STEEL REINFORCMENT

### A. Epoxy-Coated Welded Wire Fabric

1. ASTM A 884/A 884M, Class A, plain steel. Flat sheets required. No rolls.

### B. Reinforced Bars

1. ASTM A 615/A 615M, Grade 60, deformed.

### C. Steel Bar Mats

1. ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

### D. Joint Dowel Bars

1. Galvanized smooth steel dowels, ASTM A 615/A 615M, Grade 60. Cut dowels true to length with ends square and free of burrs. Provide polypropylene plastic slip dowel sleeves system. System shall be similar to "Speed Dowel" by Aztec Concrete Accessories, or approved equal.

### E. Tie Bars

1. ASTM A 615/A, Grade 60, deformed.

### F. Hook Bolts

1. ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

### G. Bar Supports

1. Bolters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows.
  - a. Equip wire bar supports with sand plates or horizontal runners where base materials will not support chair legs.
  - b. For epoxy-coated reinforcement, use epoxy or other dielectric-polymer coated wire bar supports.

H. Epoxy Repair Coating

1. Liquid two-part epoxy repair coating, compatible with epoxy coating on reinforcement.

**2.3 CONCRETE MATERIAL**

- A. Use the same brand and type of cementitious material from the same manufacturer throughout the project. Bath mixing at the site is not acceptable.
- B. Compressive Strength: Minimum 4,000 psi at 28 days.
- C. Portland Cement: ASTM C 150, Type I or II.
- D. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as per MPDW M2.02.02,  $\frac{3}{4}$  inch aggregate.
  1. Do not use fine or coarse aggregates containing substances that cause spalling.
- E. Water: ASTM C 94

**2.4 ADMIXTURES**

- A. Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260, 5-6 percent.
- C. Water-Reducing Admixture: ASTM C 494, Type A.
- D. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C 494, Type E.
- F. Water Reducing and Retarding Admixture: ASTM C 494, Type D.

**2.5 CURING MATERIALS**

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard dry.
- B. Moisture-Retaining Cover: White polyethylene film or white burlap polyethylene sheet, ASTM C171; or resin-based, clear emulsion liquid dissipating cure which will not discolor the concrete, conforming to ASTM C309 Type I or ID, Class A & B and AASHTO M-148.

## 2.6 RELATED MATERIALS

- A. Expansion and Isolation Joint Filler Strips: ASTM D 1751, asphalt saturated, cellular fibers, as manufactured by Sealtight, W.R. Meadows, or approved equal.
  - 1. Thickness: ½ inch.
  - 2. Depth: To match full section of concrete pavement.
- B. Removable Vinyl Joint Cap Strips: Compatible with filler strips width, as manufactured by Vinylex Corp. or approved equal. Provide in length equal to lengths of filler strips.
- C. Joint Sealer: Compatible with filler strips, two component polyurethane elastomeric type complying with FS-TT-S-00227, self leveling designed for pedestrian and vehicular traffic, as manufactured by Sika, Pecora, or approved equal. Include primer and backing rods as required.
  - 1. Type: Class II, non-load bearing, for bonding freshly mixed to hardened concrete.
  - 2. Type: Class I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
  - 3. Type: Class IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.7 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
  - 1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
  - 1. Compressive Strength (28 Days): 4,000 pounds per square inch.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
  - 3. Slump Limit: 3 inches.
  - 4. Sacks of Cement (minimum): 7 sacks per cubic yard.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

## 2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94, and MDPW, Section M4.

## **2.9 SEALING MATERIALS**

- A. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
  - 1. Available Products:
    - a. L&M Construction Chemicals, Inc.; Lumiseal Plus.
    - b. Meadows, W.R. Inc.; CS-309/30.
    - c. Metalcrete Industries; Seal N Kure 30.
- B. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A, specifically manufactured for use with colored concrete.
- C. Clear Acrylic Sealer: Manufacturer's standard waterborne, membrane-forming, medium-gloss, acrylic copolymer emulsion solution, specifically manufactured for colored concrete, containing not less than 15 percent solids by volume, non-yellowing, and UV resistant.
- D. Slip-Resistant Additive: Manufacturer's standard finely graded aggregate or polymer additive, designed to be added to clear acrylic sealer, to result in a slip-resistant surface.
- E. Polyethylene Film: ASTM D 4397, 1 mil thick, clear.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Proof-roll prepared surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and sub grade is ready to receive pavement. Do not install concrete over saturated, muddy or frozen base.
- B. Remove loose material from compacted base surface immediately before placing concrete.

### **3.2 EDGE FORMS AND SCREED CONSTRUCTION**

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement and curbs to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement. At points where change of grades is more than 2% introduce approved vertical curve. No abrupt changes in grade will be accepted.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

- C. Curb forms to be true to horizontal and vertical alignment. Forms to be true to radiuses specified.

### **3.3 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
  - 1. Apply epoxy repair coating to uncoated or damaged surfaces of epoxy-coated reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lap splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

### **3.4 JOINTS**

- A. General: Construct construction, expansion, score joints, and tool edging true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
  - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Expansion Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlet, structures, walks, other fixed objects, and where indicated. Approval required prior to pour.
  - 1. Locate expansion joints at intervals of 30 feet maximum, unless otherwise indicated
  - 2. Extend joint fillers full width and depth of joint.
  - 3. Install removable vinyl cap strips and set top of cap strip flush with finished concrete surface.
  - 4. Furnish joint fillers in on-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.



5. Protect top edge of joint filler during concrete placement with metal cap after concrete has been placed on both sides of joint.
  6. Install dowel bars and support assemblies at joints where and as indicated.
- C. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
  2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
  3. Provide tie bars at sides of pavement strips where indicated.
  4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- D. Score Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness as follows:
1. Grooved Joints: Form contraction joint after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks (tool wings) on concrete surfaces. Maximum spacing of 3'-0" in any direction. Areas of concrete sidewalk replacement shall be patterned to match existing pavement. Joints shall be straight or true to radius shown – poor workmanship is just cause for rejection of pavement.
    - a. Radius: ¼ inch.
  2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- E. Edging: Tool edges of pavement, gutters, curbs and joints in concrete after initial floating with an edging tool to following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surface.
1. Radius: ¼ inch.

- F. Rub all exposed vertical faces of curbs to eliminate blemishes, pockmarks, honeycombing, and all other defects. Plastering is not permitted.

### **3.5 CONCRETE PLACEMENT**

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work. Protect adjacent work from damage, splatter, and all other concrete operations.
- B. Remove snow, ice, or frost from sub base surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten sub base to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
  - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

- I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
  - 2. Do not use frozen materials or materials containing ice or snow.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, reinforcement steel, and sub grade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

### **3.6 CONCRETE FINISHING**

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power driven floats, or by hand floating if area is small or inaccessible to poser units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture (standard). Provide cleanly finished fine textured broom finish on all colored concrete pavements including varying directions of the brooming.
  - 2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic (handicap access ramps).

### 3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with SSHB, Section 476, and ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturers written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, or a combination of these as follows:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof.

### 3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
  - 1. Elevation:  $\frac{1}{4}$  inch.
  - 2. Thickness: Plus  $\frac{3}{8}$  inch, minus  $\frac{1}{4}$  inch.
  - 3. Surface: Gap below 10-foot long, unlevelled straightedge not to exceed  $\frac{1}{4}$  inch.
  - 4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
  - 5. Vertical Alignment of Tie Bars and Dowels:  $\frac{1}{4}$  inch.
  - 6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel  $\frac{1}{4}$  inch per 12 inches.
  - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel  $\frac{1}{4}$  inch per 12 inches.
  - 8. Joint Spacing: 3 inches.
  - 9. Contraction Joint Depth: Plus  $\frac{1}{4}$  inch, no minus.
  - 10. Joint Width: Plus  $\frac{1}{8}$  inch, no minus.

- B. Typical cross slope of pavement is 1.5% unless otherwise indicated. In no case will water be allowed to stand or puddle on any finished pavement.

### **3.9 SEALANTS INSTALLATION**

- A. Install joint sealants in all expansion joints in accordance with the manufacturer's installation instructions. Clean and prime joints. Remove dirt and loose coatings.
- B. Apply sealant in continuous beads, without open joints, voids, or air pockets. Hand tool and finish all joints.
- C. Confine materials to joint areas with masking tape or other precautions. Insure joint sealing is cleanly executed with no override onto adjacent pavement.
- D. Remove excess compound promptly as work progresses and clean adjoining surfaces. Protect until full cured.
- E. In rough surfaces of joints of uneven widths, hold joint sealant well back into joints.

### **3.10 FIELD QUALITY CONTROL**

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
  1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C172, except modified for slump to comply with ASTM C 94.
  2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
  3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
  4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
  5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.

6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. Yd., but less than 25 cu. Yd., plus one set for each additional 50 cu. yd. One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required
  7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  8. When total quantity of a given class of concrete is less than 50 cu. yd., Architect may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.
  9. When strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
  10. Strength level of concrete will be considered satisfactory if average of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28 day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing agency shall make additional tests for the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

### **3.11 REPAIR AND PROTECTION**

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with Portland cement concrete bonded to pavement with epoxy adhesive.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

**SECTION 32 16 00  
CURBS**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Attention is directed to the CONTRACT and GENERAL CONDITIONS and all Sections within DIVISION 1 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.

**1.2 DESCRIPTION OF WORK**

- A. The Work to be performed under this Section shall include furnishing all labor, materials and equipment required to do all the Curbs and related work as shown on the Drawings or herein specified. The Work shall further include all appurtenant items not specifically shown or itemized but which are implied or required to complete the Work in accordance with the reasonable intent of the Contract Documents.

- B. The principal work of this Section includes, but may not be limited to, the following:

- 1. Vertical Granite Curbing

**1.3 RELATED WORK**

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other Specifications which directly relate to the Work of this Section include, but are not limited to, the following:

- 1. Section 312000 – EARTH MOVING
- 2. Section 321313 – CONCRETE PAVING
- 3. Section 329200 – TURF & GRASSES
- 4. Section 330000 – SITE UTILITIES

**1.4 CODES, ORDINANCES, AND PERMITS**

- A. Give all requisite notices and file all requisite plans relating to this work with the proper authorities, secure all permits for this work, and pay all fees for same.
- B. Perform all work in accordance with all applicable local, state, and federal codes, statutes, or regulations.



## **1.5 SHOP DRAWINGS AND MATERIAL SCHEDULES**

- A. Submit shop drawings for the following materials and equipment:
  - 1. Vertical Granite Curbing

## **PART 2 - PRODUCTS**

### **2.1 VERTICAL GRANITE CURB**

- A. Type VA4 to be used wherever Vertical Granite Curbing is called for on plans. Types are according to the Massachusetts Highway Department Standard Specifications for Highways and Bridges, Latest Edition.
- B. All granite curb and edging shall be basically light gray in color, free from seams and other structural imperfections or flaws which would impair its structural integrity, and of a smooth splitting appearance. Natural color variation characteristics of the deposit from which the curbing is obtained will be permitted.
- C. Whenever curbing is sawed, all surfaces that are to be exposed shall be thoroughly cleaned and any iron rust or iron particles shall be removed by sand blasting or other approved methods satisfactory to the Architect. Any saw mark in excess of 1/8 inch shall be removed.
- D. Dimensions of curbing to be:

|                          |                           |
|--------------------------|---------------------------|
| Minimum Length:          | 6 feet                    |
| Width of Top:            | 6 inches                  |
| Depth:                   | 17" - 19"                 |
| Minimum width at bottom: | 4 inches (for 2/3 length) |

The end of all curved stones shall be cut on radial lines. Refer to MHD Section M 9.04.1.

- E. Granite Curb Inlets if required shall conform to MHD Section M 9.04.5 and to the dimensions shown on the plans.

## **PART 3 - EXECUTION**

### **3.1 LAYOUT AND EXECUTION**

- A. All curbs shall be true to line and grade and shall be laid out in the field with suitable offset stakes and top elevation clearly marked on appropriately spaced stakes.

Newton Commonwealth Golf Course  
Maintenance Facilities Improvements and Renovations  
Newton, MA

- B. Hold the curb elevations shown on the Grading Plan. Set all top of curb in the field to be 6" above the finish paving grade immediately in front of the curb. Top of curb to be 6" above the overlay in areas indicating on overlay over existing paving.
  
- C. Curbs are to be set parallel to all buildings and structures. Finish face of all Vertical Granite Curb is to be vertical and plumb.
  
- D. After excavation to the grade specified above prepare the trench bottom as follows:
  - 1. Place 6" of compacted crushed stone in the bottom of the trench for setting and leveling of all Vertical Granite Curb.
  - 2. Pour 6" of Class "C" cement on both sides of the Vertical Granite Curb.
  - 3. The curb shall be set at the line and grade required as shown on the plans unless otherwise directed. Curb shall be fitted together as closely as possible.
  - 4. The joints between curbs (both front and back) shall be carefully filled with cement mortar and neatly pointed on the top and front exposed portions. After pointing, the curbstones shall be satisfactorily cleaned of all excess mortar that may have been forced out of the joints.

END OF SECTION

**SECTION 32 17 23  
PAVEMENT MARKING**

**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Include GENERAL CONDITIONS and SUPPLEMENTARY CONDITIONS as part of this Section.
- B. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with trades affecting, or affected by, work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

**1.2 WORK INCLUDED**

- A. Provide all additional equipment and materials not otherwise specified, and do all work necessary for pavement marking, as indicated on the Drawings including but not limited to parking space striping, painted parking islands, fire lane markings, handicap parking symbols, loading areas, stop lines, painted crosswalks, and painted lettering.

**1.3 RELATED WORK UNDER OTHER SECTIONS**

- A. Carefully examine all of the Contract Documents for requirements which affect the work of this Section. Other Specifications which directly relate to the work of this Section include, but are not limited to, the following:
  - 1. Section 321216 – ASPHALT PAVING

**1.4 REFERENCES**

- A. Work shall conform to codes and standards of the following:
  - 1. Massachusetts Highway Department Standard Specifications for Highways and Bridges (MHD Specifications), Latest Edition.

**1.5 LAYOUT OF WORK**

- A. The Contractor shall furnish to the Architect for approval a schedule of pavement marking operations in accordance with MHD Specifications Section 860.61.

## **1.6 TRAFFIC CONTROL**

- A. Suitable warning signs shall be placed near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions.
- B. Place traffic cones along newly painted lines to control traffic and prevent damage to newly painted surfaces. Remove when paint has dried fully.
- C. Painting equipment shall be marked with large warning signs indicating slow moving painting equipment in operation.

## **PART 2 - PRODUCTS**

### **2.1 PAVEMENT STRIPING**

- A. Materials for pavement markings shall conform to MHD Specifications M7.01.03 (for White Thermoplastic ReflectORIZED Pavement Markings) and M7.1.04 (for Yellow Thermoplastic ReflectORIZED Pavement Markings)
- B. Paint shall be in sealed containers that plainly show the designated name, formula or specification number, batch number, color, date of manufacture, manufacturer's name, formulation number and directions, all of which shall be plainly legible at time of use.
- C. Paint shall be homogeneous, easily mixed to smooth consistency, and shall show no hard settlement or other objectionable characteristics during a storage period of six months.
- D. Paint color for handicap parking symbol, parking stall stripes, stop lines and other traffic related items shall be white traffic paint.

### **2.2 MARKING EQUIPMENT**

- A. Machines, tools and equipment used in the application of pavement markings shall conform to MHD Specifications Section 860.60 and shall be approved and maintained in satisfactory operating condition.
- B. Push-type machines of a type commonly used for application of paint to pavement surfaces shall be acceptable for marking roadway and parking areas. Applicator machine shall have the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Hand-operated spray guns shall be provided for use in areas where push-type machines cannot be used.

## **PART 3 - EXECUTION**

### **3.1 SURFACE PREPARATION**

- A. New pavement surfaces shall be allowed to cure for a period of not less than 48 hours before application of marking materials.
- B. Dust, dirt, and other granular surface deposits shall be removed by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods, as required. Rubber deposits, surface laitance, existing paint markings, and other coatings adhering to the pavement shall be completely removed using scrapers, wire brushes, sandblasting, approved chemicals, or mechanical abrasion, as directed.

### **3.2 PAVEMENT MARKING**

- A. Marking materials shall be applied to clean, dry surfaces in accordance with the requirements of MHD Specifications Section 860.62.
- B. Paint shall be applied pneumatically with approved equipment.
- C. Pavement marking materials shall be applied evenly to the pavement surface to be coated at a rate specified in MHD Specifications Section 860.62.
- D. Guidelines and templates shall be employed as necessary to control paint application. Special precautions shall be taken in marking numbers, letters, and symbols.
- E. Edges of markings shall be sharply outlined.
- F. Maximum drying time requirements of the paint manufacturer shall be enforced to prevent undue softening of bitumen, and pickup, displacement or discoloration by vehicle tires.
- G. If markings require more drying time than stated by the paint manufacturer, painting operations shall be discontinued until cause of the slow drying is determined and corrected.

### **3.3 PROTECTION OF MARKINGS**

- A. Markings shall remain protected in accordance with MHD Specifications Section 860.63.

END OF SECTION

**SECTION 32 30 00**  
**SITE IMPROVEMENTS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction," 1997 Edition, the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Providing and installing all site improvements shown on the Drawings and as specified herein, including:
1. Traffic Signage and Posts
  2. Steel Bollards

**1.3 RELATED WORK DESCRIBED ELSEWHERE**

- A. Carefully examine all of the Contract Document for requirements which affect the work of this Section. Other specifications which directly relate to the work of this Section include, but are not limited to, the following:
1. Section 099113 – EXTERIOR PAINTING
  2. Section 033000 – CAST-IN-PLACE CONCRETE
  3. Section 312000 – EARTH MOVING
  4. Section 321216 – ASPHALT PAVING
  5. Section 321313 – CONCRETE PAVING
  6. Section 321600 – CURBS
  7. Section 329200 – TURF & GRASSES

**1.4 SUBMITTALS**

- A. Shop Drawings: Contractor shall provide fully dimensioned shop drawings and manufacturer's technical literature for all improvements and confirm fabrication, reinforcing, and anchoring systems for approval.

## **PART 2 - PRODUCTS**

### **2.1 TRAFFIC SIGNAGE**

- A. 3/32" thick sign face - sheet aluminum signs in conformance with MHD Standard Specifications Section 828.42 Type A.
- B. Graphic image, text, and sign to conform to State Statute and project requirements (see drawings for schedule of graphics).
  - 1. Posts: Schedule 40, 2 1/2" tubular steel pipe, galvanized, and painted including fabricated dome cap.

### **2.2 METAL BOLLARDS:** Schedule 40 galvanized seamless pipe including concrete core and schedule 40 galvanized steel dome welded to pipe and ground smooth. Install as per detail.

- A. Reflective tape, 3M, Reflexite, or approved equal.
- B. Prime and paint. Colors to be approved. See Division 9.

### **2.3 CONCRETE:** Sections 033000.

## **PART 3 - EXECUTION**

### **3.1 JOB CONDITIONS**

- A. Confirm completion of pavements and other improvements are properly sequenced prior to installation of specified improvements.

### **3.2 TRAFFIC SIGNAGE**

- A. Install signs and posts at each designated location.
- B. Install signage plates and fabricated steel post/bollard assembly where and as detailed at handicap parking areas.
- C. Signs to be installed level and plumb, at a constant vertical alignment.

### **3.3 BOLLARDS:**

- A. Fabricate and finish bollards as detailed. Install bollards where and as detailed. Hold bollards at a constant alignment.

- B. Install collapsible bollards in concrete footings in accordance with manufacturer recommendations. Minimum depth 42" below finish grade. Hold top of footing 3" below bottom of adjacent bituminous concrete.

**3.4 PROTECTION/CLEAN UP**

- A. Protect: until acceptance of the project. Replace or refinish the surfaces if damaged prior to acceptance.
- B. Clean up all debris from installation procedures.

END OF SECTION



**SECTION 32 32 23**  
**SEGMENTAL RETAINING WALLS**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

**1.2 DESCRIPTION OF WORK**

- A. Work Included: Providing and installing all site improvements shown on the Drawings and as specified herein, including:
1. Segmental retaining walls with soil reinforcement
  2. Free-standing modular walls
  3. Capstone

**1.3 RELATED WORK DESCRIBED ELSEWHERE**

- A. Carefully examine all of the Contract Document for requirements which affect the work of this Section. Other specifications which directly relate to the work of this Section include, but are not limited to, the following:
1. Section 00 27 00 – UNIT PRICES
  2. Section 312000 – EARTH MOVING
  3. Section 311000 – SITE PREPARATION
  4. Section 330000 – SITE UTILITIES

**1.4 DEFINITIONS**

- A. SSHB: "Standard Specifications for Highways and Bridges", Commonwealth of Massachusetts, Massachusetts Highway Department, 1988 edition, including all supplements.

**1.5 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide segmental retaining walls capable of withstanding the effects of loads due to soil pressures resulting from grades indicated.

Segmental Retaining Walls

1. Design retaining walls according to NCMA's "Design Manual for Segmental Retaining Walls". Note location of adjacent chain link fence – modify design of wall and geogrids as required to permit full depth concrete fence foundations.

Design the retaining walls with the understanding that the generator and transformer and their pads will be above the wall. Show bearing capabilities of wall.

## **1.6 SUBMITTALS**

- A. Shop Drawings: Contractor shall provide fully dimensioned shop drawings and manufacturer's technical literature for all types of segmental retaining walls and other manufactured products specified.
- B. Provide shop drawings of all walls, prepared and sealed by a Massachusetts Structural Engineer responsible for their preparation. The information provided shall include design loadings and structural analysis. For walls over four feet in height, the Structural Engineer of record shall perform a global stability analysis utilizing the site soil properties provided in the Geotechnical Report included in the Project Manual.
- C. Provide detailed drawings indicating layout and elevations of wall, specifying "steps" in wall elevations consistent with project grading requirements. Steps shall be designed with a consistent spacing and shall be limited to one course in height unless otherwise approved.
- D. Samples for Verification: Sets for each color, finish, and pattern of unit required. Include 5 or more samples; in each set showing the full range of variations expected.
- E. Qualification Data: Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- F. Preconstruction Test Reports: Indicate and interpret test results for compliance with performance requirements.
- G. Product Test Reports: Indicate compliance of retaining wall units and soil reinforcement with requirements based on comprehensive testing of current products.
  1. Include test data verifying properties used as basis of structural design.
  2. Include test data required by "Source Quality Control" Paragraph 2.4 for each roll of soil reinforcement.
- H. Research/Evaluation Reports: Evidence of system's compliance with building code in effect for Project from a model code organization acceptable to authorities having jurisdiction.

## 1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed segmental retaining walls similar in material, design and extent to that indicated for Project that has resulted in construction with a record of successful in service performance.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the Commonwealth of Massachusetts and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of systems that are similar to those indicated for this Project in material, design and extent.
- C. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated without delaying the Work, as documented according to ASTM E 548.
- D. Mockups: Before installing segmental retaining walls, construct sample wall panels to verify selections made under sample submittals and to demonstrate aesthetic effects and qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for completed Work.
  - 1. Locate mockups as directed by Architect and Project Manager.
  - 2. Build mockups for each type of segmental retaining wall in sizes approximately 96 inches long by 36 inches high above finished grade at front of wall.
    - a. Include typical base and cap or finished top construction.
    - b. Include backfill to typical finished grades at both sides of wall.
    - c. Include 36 inch return at 1 end of mockup with typical corner construction.
  - 3. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
    - a. Approval of mockups does not constitute approval of deviations from Construct Documents contained in mockups, unless such deviations are specifically approved by Architect in writing.
    - b. Store and handle retaining wall units and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.
    - c. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

- d. Store and handle geotextiles according to ASTM D 4873.

## **1.8 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials to Project Site in an undamaged condition.
- B. Store and handle retaining wall units and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping or other causes.
- C. Store accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- D. Store and handle geotextiles according to ASTM D 4873.

## **PART 2 - PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Basis of Design Product of Segmental Retaining block shall be Versa-lok 4 unit Mosaic panel (weathered).
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Retaining Wall Units:
    - a. Licensees of Redi-Rock Corp.
    - b. Licensees of Allan Block Corp.
    - c. Licensees of Unilock
    - d. Licensees of Amastone Co.
    - e. Licensees of Anchor Wall Systems, Inc.
    - f. Licensees of ICD Corp.
    - g. Licensees of Keystone Retaining Wall Systems, Inc.
    - h. Licensees of Kiltie Corp.; Versa-Lock Retaining Wall Systems Division.
    - i. Licensees of Mesa Retaining Wall Systems.

- j. Licensees of Reinforced Earth Co., (The).
  - k. Licensees of Rockwood Retaining Wall Systems.
2. Soil Reinforcement:
- a. Amoco Fabrics and Fibers Co.
  - b. Nicolon Corp.; Nicolon/Mirafi Group.
  - c. Strata Systems, Inc.
  - d. Tensar Earth Technologies, Inc.

## **2.2 RETAINING WALL UNITS**

- A. Concrete Units: High strength, regular weight concrete units, designed for use in segmental retaining walls, complying with ASTM C 1372, except with net area compressive strength of 3000 psi for average of 3 units and 2500 psi for individual unit, maximum water absorption of 8 percent, and variation in height limited to 1/8 inch.
- B. Colors: Provide units that result in colors of exposed wall surfaces complying with the following requirements.
  - 1. Provide Architect's selections from manufacturer's full range of colors for materials and products of type indicated.
- C. Surface Texture: Provide units with machine split faces and smooth, as cast beds.
- D. Shapes: Provide units matching basic shapes and dimensions indicated by referencing manufacturer's pattern designation. Depth to height ratio of 2:1 minimum.
  - 1. Exposed Face: Flat face with rough split texture.
  - 2. Batter: Provide units that offset from the course below to provide 1-1/2 inch per foot (1:8) batter.
- E. Special Units: Provide corner units, end units, cap units and other special shapes as necessary to produce retaining walls of dimensions and profiles indicated and to provide indicated textures on exposed surfaces.

## 2.3 INSTALLATION MATERIALS

- A. Pins: Product supplied by retaining wall unit manufacturer for use with units provided, made from non degrading polymer reinforced with glass fibers.
- B. Cap adhesive: Product supplied or recommended by retaining wall unit manufacturer for adhering cap units to units below.
- C. Base: Comply with requirements of Section 310000, Earthwork, for granular base material.
- D. Drainage Fill: Washed gravel or washed crushed stone complying with ASTM D 448 for Size No. 57 and Section M.2.01.6, 1/4" crushed stone.
- E. Filter Fabric: Nonwoven pervious geotextile manufactured from polyester, nylon, or polypropylene fibers, as follows:
  - 1. Apparent Opening Size: No. 1000 per ASTM D 4751.
  - 2. Permeability: 150 gpm/sq. ft. per ASTM D 4491.
  - 3. Grab Strength: 100 lbf per ASTM D 4632.
- F. Drainage Pipe: Refer to Section 330000, Site Utilities.
- G. Soil Reinforcement: A geotextile or geogrid, specifically manufactured for use as soil reinforcement, and with necessary properties for completed segmental retaining walls to comply with performance requirements.
- H. Concrete: Section 321313, "Concrete Paving".
- I. Drain Vents/ Rodent Screens. Provide metal drain wall screens at all drainage weeps and rodent screens where drain lines daylight at ends of walls. Color of metal drain wall screens to match segmental retaining wall block.

## 2.4 SOURCE QUALITY CONTROL

- A. Test and inspect each roll of soil reinforcement at the factory for minimum average roll values for geosynthetic index property tests including the following:
  - 1. Weight.
  - 2. Roll size.
  - 3. Grab or single rib strength.

4. Aperture opening.
5. Rib or yarn size.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine areas to receive segmental retaining walls and conditions under which walls will be installed, with Installer present, for compliance with requirements for excavation tolerances, condition of subgrades, and other conditions affecting performance of retaining walls.
  1. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### **3.2 RETAINING WALL INSTALLATION**

- A. General: Place units according to manufacturer's written instructions. Lay units in running bond, overlapping half units of course below.
  1. Form corners and ends by using special units.
  2. Do not use units with chips, cracks, voids, discolorations, and other defects that might be visible in finished work.
  3. Mix units from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
  4. Cut unit with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible.
- B. Leveling Base: Place and compact base material to thickness indicated and with not less than 95 percent of maximum dry density according to ASTM D 698.
- C. Leveling Course: Place concrete over base course to thickness indicated, compact and screed to a smooth, level surface.
- D. First Course: Place first course of retaining wall units on leveling base/course for full length of wall. Place units in firm contact with each other, properly aligned and level.
  1. Tamp units into leveling base at necessary to bring tops of units into a level plane.
  2. Place and compact fill, either drainage fill or soil fill as indicated, to top of first course.

Place fill without disturbing alignment of units. Fill voids between and within units with drainage fill.

- E. Subsequent Courses: Sweep excess fill from tops of course below. Place units in firm contact, properly aligned, and directly on course below.
  - 1. For units with lugs designed to fit into holes in units of adjacent course, lay units so lugs are accurately aligned with holes and bedding surfaces are firmly seated on beds of units below.
  - 2. For units with lips at front of units, slide units as far forward as possible for firm contact with lips of units below.
  - 3. For units with pins, carefully align holes in units above with holes below and insert pins according to manufacturer's written instructions.
  - 4. Place and compact fill as each course is laid. Place fills on both sides of wall at same time, where both sides are indicated to be filled.
  - 5. Fill voids between and within units with drainage fill.
- F. Cap Units: Place cap units and secure with cap adhesive according to manufacturer's written instructions.

### **3.3 FILL PLACEMENT**

- A. General: Comply with requirements Division 31, Section "Earthwork" and retaining wall unit manufacturer's written instructions.
- B. Place, spread, and compact fill in uniform lifts for full width and length of embankment as wall is laid. Begin at back of wall and place and spread fill toward embankment.
  - 1. Use only hand-operated compaction equipment within 36 inches of wall.
  - 2. Compact drainage fill to not less than 95 percent maximum dry density according to ASTM D 698.
  - 3. Compact reinforced soil fill to not less than 95 percent maximum dry density according to ASTM D 698.



- C. Place a layer of drainage fill at least 12 inches deep behind the wall to within 12 inches of finished grade.
  - 1. Wrap drainage pipe with filter fabric and place in drainage fill as indicated, sloped  $\frac{1}{4}$  inch per foot to drain.
  - 2. Place surface finish material over top edge of drainage fill layer as shown on Drawings.
  - 3. At shoreline installations only, install a geosynthetic filter fabric behind the drainage fill.
  
- D. Place soil reinforcement in horizontal joints of retaining wall where indicated and according to soil reinforcement manufacturer's written instructions. Embed reinforcement a minimum of 8 inches into retaining wall and stretch tight over compacted backfill. Anchor soil reinforcement before placing fill on it.
  - 1. Use additional soil reinforcement at corners and curved walls to provide continuous reinforcement and to comply with manufacturer's written instructions.
  - 2. Place geotextiles with sewn seams oriented with seams perpendicular to retaining walls. Overlap of the reinforcement in the design strength direction shall not be permitted.
  - 3. Do not dump fill material directly from trucks onto geotextile.
  - 4. Before compacting, place sufficient depth of fill over reinforcement to produce compacted depth of 4 inches for wheeled vehicles or 6 inches for tracked vehicles.
  - 5. Do not turn vehicles on fill until first layer of fill is compacted and second layer is placed over each soil reinforcement layer.

### **3.4 CONSTRUCTION TOLERANCES**

- A. Variation from Level: For bed joint lines along walls, do not exceed  $\frac{1}{4}$  inch in 10 feet or 1 inch in 40 feet or more.
- B. Variation from Indicated Batter: For slope of face of wall, do not vary from indicated slope by more than  $\frac{1}{4}$  inch in 10 feet.
- C. Variation in Plan Position: For ends and faces of walls in relation to property lines, buildings, and other objects, do not vary from plan dimensions by more than 1 inch or from depicted plan relationship (scaled dimensions) by more than 3 inches.

- D. Variation in Linear Wall Line: For walls indicated as straight, do not exceed  $\frac{1}{4}$  inch in 10 feet or 1 inch in 40 feet or more from a straight line.

### **3.5 FIELD QUALITY CONTROL**

- A. Comply with requirements of Division 31, Section "Earth Moving" for in place soil density testing.
1. In each compacted backfill layer, perform at least 1 field in place density test for each 100 feet or less of retaining wall length, but no fewer than 2 tests along a wall face.
  2. Perform additional testing if required by Project Manager or Architect.

### **3.6 ADJUSTING AND CLEANING**

- A. Remove and replace segmental retaining walls of the following description:
1. Broken, chipped, stained, or otherwise damaged units. Units may be repaired if methods and results are approved by Architect.
  2. Segmental retaining walls not matching approved samples and mockups.
  3. Segmental retaining walls not complying with other requirements indicated.
  4. Cracks in units longer than  $\frac{1}{2}$ ".
- B. Replace in a manner which results in segmental retaining wall's matching approved samples and mockups, complying with other requirements, and showing no evidence of replacement, at no additional cost to the Owner.

### **3.7 PROTECTION/CLEAN UP**

- A. Protect: until acceptance of the project. Replace or refinish the surfaces if damaged prior to acceptance.
- B. Clean up all debris from installation procedures.

END OF SECTION

**SECTION 33 00 00**  
**SITE UTILITIES**

**PART 1 - GENERAL**

**1.1 GENERAL**

- A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Drawings on which this Contract is based are listed in Section 00860. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

**1.2 SUMMARY**

- A. This Section includes the following:
  - 1. All labor, materials, and operations in connection with the installation of the Site Utilities Work.
  - 2. The principal work of this Section includes, but is not necessarily limited to the following:
    - a. Sanitary Sewers Off Site and On Site
    - b. Storm Drainage Systems
    - c. Excavation, Bedding, and Backfill of Fire Service Piping, Valves, Hydrants
    - d. Catch Basins and Manholes including Frames and Covers, Drainage control structures.
    - e. Installation of Precast Concrete Oil-Water Separator as detailed on Plumbing Drawings and furnished by the Plumbing Contractor
- B. The following related work is specified under the designated Sections:
  - 1. Section 210000 – FIRE PROTECTION
  - 2. Section 220000 – PLUMBING
  - 3. Section 260000 – ELECTRICAL
  - 4. Section 312000 – EARTH MOVING
  - 5. Section 312319 – DEWATERING
  - 6. Section 312500 – EROSION AND SEDIMENTATION
  - 7. Section 321216 – ASPHALT PAVING
  - 8. Section 321313 – CONCRETE PAVING
  - 9. Section 329200 – TURF & GRASSES

### **1.3 REFERENCE STANDARDS, SPECIFICATIONS, AND CODES**

- A. The following are hereby made a part of this SECTION by reference thereto:
1. All work installed under this SECTION shall comply with all Local, State, County and Federal Codes, Laws, Statutes, and Authorities having jurisdiction. Include any and all permit, connection, and/or inspection fees in the bid. Where the Contract Documents indicate more stringent requirements than the above Codes and Ordinances, the Contract Documents shall take precedence.
  2. Give all requisite notices and file all requisite plans relating to this work with the proper Authorities, secure all permits for this work, and pay all fees for same.
  3. All Site Utilities related materials and methods shall conform to the Commonwealth of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Latest Edition..

### **1.4 SUBMITTALS**

- A. Submit for approval Shop Drawings for the following:
1. Precast Concrete Structures
  2. Piping of all description including Valves and Hydrants
  3. Frames and Covers

### **1.5 RECORD DRAWINGS**

- A. Maintain on the site at all times one (1) set of black or blue line on white Drawings which shall at all times be accurate, clear and complete, showing the actual location of all piping and structures as installed in colored pencil.
- B. The Contractor shall, as part of the application for substantial completion, provide the Owner a set of "As-Built" drawings for the scope of work provided under this section. "As-Built" drawings shall be prepared and endorsed by a Massachusetts Registered Professional Engineer or Land Surveyor and shall bear the seal of such professional. Drawings shall depict, in relationship to the design plan, the "As-Built" condition of all the utility systems including but not limited to: Drainage, Sewer, Subsurface Sewage Disposal System, Electric, CATV, Telephone, Alarm, Data, Water and Underground Tanks. "As-Built" shall identify the location, elevations, pipe size, pipe material of all site utilities related to grade components.
- C. At project close out provide the services of an outside firm who shall run an underground video camera, locating all sanitary and storm drainage system lines including depth, preparing a video, and identifying and correcting any problem areas. Turn over 4 copies

of the video and written report to the Owner. Videos are required for the underground sanitary and storm drainage systems including subsurface infiltration trenches.

## **1.6 CONTRACT DOCUMENTS**

- A. It is the intent of these Specifications and Drawings to call for finished work, tested, and ready for operation. Any apparatus, appliance, materials, or work not shown on the Drawings but mentioned in the Specifications, or vice-versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, and installed.
- B. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, conduits, and piping. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions or invert elevations are approximate only. If directed by the Architect, make reasonable modifications in the layout as needed to prevent conflict with other work or for proper execution of work.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL**

- A. Material and equipment for installation under this Section of the Specifications shall be new, unused, free of defects, and the best quality of a manufacturer of established reputation. Any defective or damaged material shall be immediately removed from the Site.
- B. Each piece of pipe, fitting, valve, etc., delivered under this Section of the Specifications shall have indelibly cast or marked thereon the manufacturer's name, trademark, pressure rating, and the date of manufacture.
- C. Specifications for materials included herein are intended for the purpose of establishing minimum quality requirements, and all materials are subject to approval by the Architect.

### **2.2 PIPING**

- A. All piping installed for this job shall be marked with manufacturer's data indicating type, size, etc. Refer to Drawings for various pipe materials to be used on this project.

### 2.3 DETECTABLE UNDERGROUND WARNING TAPE

- A. Detectable warning tape shall be installed 12" directly above all buried utilities. Detectable warning tape shall consist of a nominal 4.5 mil (0.0045") overall thickness and 6" wide, with a solid aluminum foil core. The imprinted warning message is "Buried, or Encased" to prevent rub-off, and is impervious to acids, alkalis and other destructive elements found in soil. The imprint is as such that it allows for total reflectivity. A tape must be visibly seen before it can be read. The tape shall meet the testing requirements of ASTM D-882, Method A.
- B. Legend/Color & Imprint:
1. Tape shall read "CAUTION BURIED \_\_\_\_\_ LINE BELOW" with respective utility type indicated .
  2. Tape color coding:
    - a. Electric – Red
    - b. Gas – Yellow
    - c. Water – Blue
    - d. Sewer – Green
    - e. Fiber Optic/Telephone – Orange
    - f. Storm Drain - Green

### 2.4 MANHOLE AND PRECAST CONCRETE STRUCTURE

- A. Manholes and precast concrete structures shall be constructed as shown on Drawings. Conform accurately to indicated dimensions.
1. Precast concrete manhole barrel, base, and cone sections shall conform to ASTM C-478 and shall be furnished complete with integral cast aluminum polymer coated steel steps. Sections shall be assembled with Kentseal #2 gaskets, or equal.
  2. Brick for constructing channels and adjustments to grade shall be waterstruck sewer brick, Grade 'A' concrete brick conforming to ASTM C-55, or precast concrete grade rings mortared in place.
  3. Cement mortar for parging and for joining brick shall be made of one (1) part portland cement and two (2) parts sand mixed to the proper consistency. Add approximately twenty (20) pounds of hydrated lime for each sack of cement.
  4. Precast concrete structures shall be as manufactured by A. Rotondo & Sons, Inc. or equal by Scituate Concrete pipe or Shea precast. Structures shall conform to the form and dimensions shown, be reinforced with ASTM A-615-22 Grade 60 reinforcing steel having a minimum 1" cover, and constructed of 5,000 PSI concrete. All field joints shall be sealed with rubber gasket and shall be grouted with hydraulic

cement for watertightness. Design loading for all structures shall meet H-20 wheel loading design criteria.

## **2.5 CONCRETE**

- A. Conform to the Concrete Section of the specification for 4,000 PSI 6% air entrained concrete for all concrete structures for the work of this section. Including reinforcing steel where detailed.

## **2.6 FRAMES, COVERS, AND STEPS**

- A. Cast iron manholes, frames, and covers, shall be of the form, dimensions, and manufacture shown on the Contract Drawings. Manhole extensions shall be neatly and accurately brought to dimensions of the base of the frame. Casting shall be of tough gray iron, free from cracks, holes, and cold shuts. All castings shall be made accurately to dimensions and shall be machined to provide even bearing surfaces. Covers must fit the frames in any position and, if found to rattle under traffic, shall be replaced. Filling to obtain tight covers will not be permitted. No plugging, burning-in, or filling will be allowed. All castings shall be carefully coated inside and out with coal tar pitch varnish of approved quality.
- B. Castings shall be as detailed on drawings or castings that appear on the Massachusetts Highway Department approval list for manhole frame & cover castings. Castings shall be by LeBaron Foundry, Neenah Foundry, or Campbell Foundry.

## **2.7 SAND BORROW**

- A. Sand borrow meeting the gradation requirements of MassDOT M1.04.0 Type b shall be used as backfill around all water and natural gas piping.

## **2.8 CONTROLLED DENSITY FILL**

- A. Controlled Density Fill shall be installed in lieu of gravel in utility trench backfills with the public right-of-way as required by the City of Newton.
- B. Controlled Density Fill (CDF) material is a flowable, self consolidating, rigid setting, low density material that can substitute for compacted gravel in backfills, fills and structural fills.
- C. All ingredients shall comply with the following:

1. Portland Cement: AASHTO M 85
  2. Fly Ash: AASHTO M 295 Class F
  3. Sand: M4.02.02
  4. Air Entraining Admixtures: M4.02.05
- D. Controlled Density Fill shall meet the material requirements of MassDOT M4.08.0 Type 2E (Flowable (Excavatable)) with the following requirements:
1. Compressive Strength at 28 Days: 30-80 pounds per square inch (psi)
  2. Compressive Strength at 90 Days: 100 pounds per square inch (psi) maximum
  3. Slump: 10-12 inches

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- A. Furnish the services of a Registered Land Surveyor for layout of Site Utility Systems.
1. Leaching trenches and manholes shall be established with offsets and grade. Establish line and grade for all piping. Provide additional control along the pipe runs by use of lasers. Grade stakes and batter boards are not acceptable except as may be used in conjunction with lasers.
- B. Verify inverts and locations of all existing utilities prior to installation of any work. Transmit above information to the Architect who shall make any alterations to the Contract Drawings as required by the existing conditions. Proceed with construction only after written permission from the Architect. If any work is installed without prior written notice of the Architect, and said work requires alteration due to existing conditions, said alterations shall be made by the Contractor at his expense.
- C. Protect all pipe lines, sewers, drains, poles, wiring and the like that interfere in any way with the work whether or not they are specifically shown on the Drawings. Notify the proper Authorities that items are protected, supported and/or relocated as necessary to adjust them to the new work.

#### **3.2 PROTECTION, SHORING AND PUMPING**

- A. Protect open excavations with fencing, warning lights and/or other suitable safeguards and as may be additionally required by the Authorities having jurisdiction.
- B. Protect bottom of excavation from frost. Do not place new work on frozen ground. Shore and brace excavation and provide sheet piling, if necessary, to prevent cave-ins and



to conform to Local, State, and Federal Safety Regulations. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.

- C. Provide all necessary pumps, well points and pumping facilities, including attendants, to keep all excavation free from water from whatever source at all times when work is in progress and when necessary for protection and integrity of the work in place. Trenches shall be kept water-free during jointing and for sufficient time thereafter to allow the jointing material to become fully set and completely resistant to water penetration. Pump discharge to be in such a manner that it does not flood, interfere or damage any other area of work and meets with approval of Conservation Commission.

### **3.3 INSTALLATION OF PIPE**

- A. Trenches shall be opened only to such extent as approved by the Architect and the total lengths of open trench shall be as short as practical at all times. Immediately upon opening of trench, pipe bedding shall be placed, compacted, and dressed as specified.
- B. Carefully examine each pipe length before laying, and do not lay defective or damaged pipe. Lay pipe lines to grades and alignment indicated. Provide proper facilities for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable.
- C. Pipe laying shall proceed upgrade with spigot ends of bell-and-spigot pipe, and tongue ends of tongue-and-groove pipe pointing in direction of flow.
- D. Execute installation of flexible joints by placing gaskets and jointing materials in accordance with recommendation of particular manufacturer in regard to use of lubricants, cements, adhesives and other special installation requirements. Surfaces to receive lubricants, cements or adhesives shall be clean and dry. Affix gaskets and jointing materials to pipe not more than twenty-four (24) hours prior to installation of pipe and protect from sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials so damaged shall be removed and replaced. Pipe shall be aligned with previously installed pipe and joint pulled together. If, while making joint, gasket or jointing material becomes loose and can be seen through exterior joint recess when joint is pulled up to within 1 inch of closure, pipe shall be removed and joint remade.

### **3.4 GRADE TOLERANCE – SEWER PIPING**

- A. Grade tolerance of the flow line of sewer pipe shall not exceed  $\pm 0.05$  feet. In addition, in any twenty-five-foot (25') length, the total variation (plus or minus) from flow line grade shall no exceed the following:

1. One-quarter of an inch (0.25") in four inch (4") or smaller pipe.
2. Three-quarters of an inch (0.75") in six- through twelve-inch (6"-12") pipe.
3. One inch (1") in fifteen- through thirty-six-inch (15"-36") pipe.

### **3.5 GRADE TOLERANCE – STORM DRAIN**

- A. The elevation of the pipe invert for storm drain pipe shall not deviate from the design elevation by more than plus or minus two percent ( $\pm 2.0\%$ ) of the pipe size concern, or one inch (1"), whichever is greater. The rate of deviation from grade or returning to grade shall be limited to one-sixteenth of an inch (1/16") per foot (1') of pipe.

### **3.6 ANCHORAGE AND THRUST BLOCKING**

- A. All plugs, caps, tees, and bends on water and fire services deflecting 11-1/2 degrees or more and at other locations where there will be an unbalanced thrust in the line shall be provided with a concrete thrust block or anchorages to prevent movement. Concrete thrust blocks shall be in accordance with the details on the plans. The excavation shall be carried out by hand at such locations to provide a good bearing against undisturbed soil within a short distance from the fitting. The use of joint harnesses in place of anchorage and thrust blocks shall be subject to the approval of the Architect both as to location and to details of the harness. Harnesses shall utilize galvanized rods, nuts and bolts.
- B. Where bends turn down and the resulting thrust will be upward, provision to restrain the thrust shall be made either with concrete anchorages, joint harnesses, or a combination of both.
- C. Insofar as possible, thrust blocking and anchorages shall be so placed that the pipe and fitting joints will be accessible for repair. Concrete from thrust blocks shall conform to the requirements of CONCRETE Section of the Specification for 4,000 PSI, 6% air entrained concrete.

### **3.7 CATCH BASINS, MANHOLES, AND OVERFLOW STRUCTURES**

- A. Catch basins and manholes shall be built accurately to dimensions. Brickwork shall be laid by skilled workmen. Inverts shall have a cross section of the sewers which are connected, and changes in size, grade or lines shall be made gradually and evenly.
- B. The top of the brickwork shall be brought to the dimensions of the flange of the manhole frame. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by frost. Particular care shall be taken that no water rises on the masonry

until the mortar is thoroughly set and any brick masonry damaged in this manner shall be removed upon the order of the Contractor.

- C. All pipes or casting to be embedded in brickwork shall be accurately set, and if so required, headers shall be laid around the casting so embedded.
- D. Cement plaster for plastering exterior of brick or block walls shall be 1:2 cement and sand mortar.
- E. The outside of brickwork on all manholes shall be plastered with 3/4" thick coat of Portland cement mortar mixed in the proportions of one (1) part cement to two (2) parts of sand. Plaster shall be troweled to a smooth hard finish, and no backfill shall be placed until mortar has thoroughly hardened.
- F. After the plaster has hardened, exterior walls of sanitary manholes shall be painted with two (2) coats of Bitumastic 300M, as manufactured by the Carboline Company, or approved equal. All work shall be in accordance with the manufacturer's instructions.
- G. Upon completion, all debris shall be removed from manholes.
- H. The entire work of constructing manholes shall be carried on in a manner to insure watertight work, and any leaks in manholes shall be caulked and repaired, or the entire work shall be removed and rebuilt. Attention is particularly called to the necessity of keeping the water below all parts of the brick or concrete foundation and walls until the cement has obtained adequate set.

### **3.8 TESTS**

- A. Provide all labor, materials, and equipment for performing all test as herein specified or required by Local Authorities.

- B. Sanitary and storm sewers shall be tested as follows:
1. If any inspection of the completed sewer or any part thereof shown any manholes, pipes or joints which allow the infiltration of water in a noticeable stream or jet, the defective work shall be replaced or repaired as directed.
  2. After the sewers have been laid and otherwise completed, infiltration or exfiltration test shall be made to demonstrate that the line will satisfactorily meet the conditions prevailing in place with leakage not in excess of 375 gallons/day per inch of diameter per mile of pipe.
  3. Rate of infiltration shall be determined by means of V-notch weirs or pipe spigot in an approved manner and at such times and locations as may be directed by the Architect during the progress of the work. Provide and install weir plates or other materials required and at such time and locations as may be directed by the Architect.
  4. Perform an air test as per manufacturer's recommendation and report result to Architect and the City of Newton.
  5. All joints shall be inspected and inspection of line and grade shall be made with mirrors and lights. Alignment for both line and grade shall be true with full circles visible at manholes.

END OF SECTION

**APPENDIX A**  
**GEOTECHNICAL REPORTS**



August 27, 2020

Mr. Daniel P. Bradford, AIA  
Raymond Design Associates, Inc.  
60 Ledgewood Place  
Rockland, MA 02370  
Phone: 781-421-3480  
E-mail: dbradford@rda-design.com

Subject: **Geotechnical Engineering Report  
Proposed New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458  
PSI Project No.: 04461007**

Dear Mr. Bradford:

Thank you for choosing Professional Service Industries, Inc. (PSI), an Intertek company, as your consultant for the above referenced project. PSI is pleased to submit this report presenting the results of the geotechnical engineering studies regarding the proposed Metal Storage Building Addition at the Newton Commonwealth Golf Course in Newton, Massachusetts. Our services were conducted in accordance with PSI's Proposal No. 0446-299017 (Rev. 1) dated April 28, 2020.

PSI recommends that the geotechnical engineer and/or their representative be present during earthwork operations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be held responsible for interpretations and field quality control observations made by others.

Should there be any questions regarding this report, please do not hesitate to call our office at (781) 821-2355. PSI would be pleased to continue providing geotechnical services throughout design and construction of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,  
**Professional Service Industries, Inc.**

A handwritten signature in black ink that reads "Brianna Hansen".

Brianna Hansen  
Project Manager

A handwritten signature in black ink that reads "Stephen M. Simonette".

Stephen M. Simonette, P.E.  
Principal Consultant

## GEOTECHNICAL ENGINEERING REPORT

For the Proposed

**New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458**

*Brianna Hansen*

Brianna Hansen  
Project Manager

Prepared for

**Raymond Design Associates, Inc.  
60 Ledgewood Place  
Rockland, MA 02370**



Prepared by

**Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021  
Telephone: (781) 821-2355  
Fax: (781) 821-6276**

*Stephen M. Simonette* 08/27/20  
Stephen M. Simonette, P.E.  
Principal Consultant

**PSI PROJECT NO. 04461007**

**August 27, 2020**

# TABLE OF CONTENTS

**1.0 PROJECT INFORMATION ..... 1**

1.1 PROJECT AUTHORIZATION ..... 1

1.2 PROJECT DESCRIPTION ..... 1

1.3 SITE DESCRIPTION ..... 2

1.4 EXPLORATION PROGRAM ..... 2

**2.0 SITE AND SUBSURFACE CONDITIONS ..... 3**

2.1 SUBSURFACE CONDITIONS ..... 3

    2.1.1 *Local Geology* ..... 3

    2.1.2 *Soil Test Borings* ..... 4

2.2 GROUNDWATER CONDITIONS ..... 5

2.3 SOIL LABORATORY TESTING ..... 5

    2.3.1 *Laboratory Results* ..... 5

    2.3.2 *Reuse of Excavated Soil* ..... 6

**3.0 RECOMMENDATIONS ..... 6**

3.1 GENERAL ..... 6

3.2 FOUNDATIONS ..... 7

3.3 CONCRETE SLAB ..... 8

3.4 SEISMIC CONSIDERATIONS ..... 10

3.5 LATERAL EARTH PRESSURE RECOMMENDATIONS ..... 10

3.6 RETAINING WALL BACKFILL RECOMMENDATIONS ..... 12

**4.0 CONSTRUCTION CONSIDERATIONS ..... 13**

4.1 EARTHWORK ..... 13

4.2 CONSTRUCTION DEWATERING ..... 14

4.3 MATERIALS ..... 15

**5.0 GEOTECHNICAL RISK ..... 16**

**6.0 REPORT LIMITATIONS ..... 16**

## FIGURES

FIGURE 1: USGS SITE LOCATION PLAN

FIGURE 2: BORING LOCATION PLAN

FIGURE 3: SURFICIAL GEOLOGY

## APPENDIX A

BORING LOGS

SOIL PROFILES

MATERIAL TEST REPORTS

SITE IMAGES





# 1.0 PROJECT INFORMATION

## 1.1 PROJECT AUTHORIZATION

Authorization to proceed with this project was provided by Mr. Daniel P. Bradford with Raymond Design Associates, Inc. by signing the Acceptance of Proposal on August 4, 2020 included with PSI's Proposal No. 0446-299017 (Rev. 1).

## 1.2 PROJECT DESCRIPTION

Project information provided to PSI includes:

- New Work Site Plan: A1.0 (dated 8/1/19)
- New Work Floor Plans: A1.1 (dated 8/1/19)
- New Work Reflective Ceiling Plans: A1.2 (dated 8/1/19)
- New Work Floor Plans: A1.3 (dated 8/1/19)
- Exterior Elevations: A2.0 (dated 8/1/19)
- Demolition Floor Plans: AD.1 (dated 8/1/19)
- Existing Site Plan: Ex1.0 (dated 8/1/19)

The project consists of the construction of a new, high-bay roof, pre-engineered metal building addition adjacent to and abutting the north side of the existing maintenance building; a chemical storage pad, a solids separator/recycled water treatment system and wash down pad north of the addition; and 500-gallon and 1,000-gallon fuel tanks/pumps south of the existing maintenance building.

The new addition will be a 2-story, pre-engineered metal structure having a footprint area of approximately 3,000 square feet. A below-grade basement level is not planned. New retaining walls are planned adjacent to the west side of the area planned for the aforementioned chemical storage/water treatment/washdown bay systems and adjacent to the west side of the fuel pump pads.

The new addition floor level will be similar to that of the northern side of the existing maintenance building. From the provided plans, we estimate the existing floor slab level is at an elevation near EL 100 feet. The west wall of the new addition will include a concrete retaining wall approximately 7 feet in height. The retaining wall will extend northwest with the aforementioned chemical storage/water treatment/washdown bay systems situated east of the wall. Ground surfaces extending west from the top of the new wall will be sloped uphill to the west to meet the existing EL 114 feet contour.

Anticipated structural loads for the new building addition were not provided. Therefore, this report is based on column loads not exceeding 150-kips, uplift load not exceeding 15-kips, wall loads not exceeding 3-klf, and slab loads not exceeding 150-psf. The new addition will be cut into the existing slope on the west side; therefore, grading cut excavations of about 4½ to 6½ feet are anticipated to attain the finished subgrade elevation for the new addition.



Should any of the information identified herein be incorrect or should supplemental information become available, PSI must be notified and have the opportunity to reassess conditions and amend the report where necessary.

The objective of our services summarized herein was to provide subsurface information and geotechnical engineering recommendations to members of the design team for use in designing foundations for the proposed building addition.

### 1.3 SITE DESCRIPTION

The referenced site (42° 20' 35.00" N, 71° 10' 09.00" W) is located at the Newton Commonwealth Golf Course at the site of the maintenance building at 58 Undine Road in Brighton, Massachusetts, as shown in *Figure 1, USGS Site Location Plan*. The property is along the town boundary limits between Newton and Brighton (neighborhood of Boston).

The site of the new addition is north of the existing maintenance building and includes bituminous concrete pavement (cart storage area) which slopes gradually downhill to the north and steeply sloping wooded terrain which ascends uphill to the west. Information contained on Google Earth indicates existing surface grades within this area to be approximately EL 95 to 114 feet, NAVD. The slope height is estimated to be approximately 12 to 18 feet and the inclination is estimated to be approximately 1H:1V. There is golf course turf grass at the top of the slope, which slopes downhill to the west. Bedrock outcroppings were clearly visible at the surface on the west side of the slope.

The existing maintenance building structure is of masonry wall construction with a concrete slab-on-grade and a roof eave height of approximately 16 feet. Exposed exterior CMU walls of the structure exhibit cracking.

### 1.4 EXPLORATION PROGRAM

PSI conducted a geotechnical exploration program at the site in conformance with generally accepted geotechnical engineering practices to provide subsurface information about the site. This information was utilized to develop geotechnical engineering recommendations for members of the design team for use on this project.

The subsurface exploration program consisted of the performance of Standard Penetration Test (SPT) borings to assess the depth and characteristics of the underlying material. PSI marked out the exploration locations using the provided Site Plan and notified Dig Safe System, Inc. for public utility clearance prior to drilling. The exploration locations were also scanned by a private utility location service, Ground Penetrating Radar Systems LLC, prior to performing the explorations at the site.

Soil X Corporation of Leominster, MA drilled four soil test borings on August 14, 2020 at the approximate locations shown in *Figure 2, Boring Location Plan*. The borings were drilled near or within the proposed building footprint. Due to the steeply sloped terrain along the west side of the proposed addition and the fenced in cart storage area, the borings were located as close to the



proposed building addition footprint as feasible. A PSI representative observed the exploration activities for this project, retrieved soil samples for classification and testing, and prepared the attached Soil Test Boring Logs.

The borings were advanced by flush joint casing using a Geoprobe 7822DT drill rig equipped with a DH103 automatic hammer to depths of approximately 6½ to 14½ feet below the existing ground surfaces (bgs), where the borings encountered refusal.

Standard Penetration Test (SPT) and split spoon samples were retrieved at approximately 2-foot intervals to depths of approximately 7 to 12 feet bgs and at approximately 5-foot intervals thereafter. The number of hammer blows required to drive the sampler into the soil in 6-inch increments is recorded on the Soil Test Boring Logs attached in the Appendix for reference. The sum of the hammer blows for the second and third interval provides the Standard Penetration Resistance (N) and is a measure of soil strength. Five soil samples retrieved from the borings were selected for laboratory testing to assist in classifying the material. The remaining samples will be stored in our laboratory and disposed of after 6 months.

PSI classified the soil strata shown in the Soil Test Boring Logs based upon its interpretation of the subsurface conditions encountered at the boring locations. The stratifications shown on the Soil Test Boring Logs represent the conditions only at the actual boring locations and variations will occur and should be expected at other locations. It is also possible that there could be thin layers of material lying between the sampling intervals that are not described on the logs and which might not become known until construction. Likewise, the depth to each soil stratum is approximate and may be more gradual or different in the field.

## **2.0 SITE AND SUBSURFACE CONDITIONS**

### **2.1 SUBSURFACE CONDITIONS**

#### **2.1.1 LOCAL GEOLOGY**

Based on the “Plate 5 Surficial Geologic Map of the Newton Quadrangle, Massachusetts” compiled by C.M. Brankman in 2004, the surficial geology of the project site is glacio-fluvial deposits, which consists of primarily sand and gravel with cobbles, as shown in *Figure 3, Surficial Geology*. The subsurface conditions encountered at this site generally fits the geologic description.

Based on the “Bedrock Geologic Map of Massachusetts,” compiled by Zen, E-an, Goldsmith, Richard, Ratcliffe, N.M., Robinson, Peter, Stanley, R.S., Hatch, N.L., Shride, A.F., Weed, E.G.A., and Wones, D.R. in 1983, the bedrock geology generally consists of Roxbury Conglomerate, which consists of conglomerate, sandstone, siltstone, argillite, and melaphyre. Refusal was encountered at depths ranging from approximately 6½ to 14½ feet bgs, however, the material was not cored for classification.



## **2.1.2 SOIL TEST BORINGS**

The subsurface conditions encountered at the specific boring locations for the proposed building addition are presented as individual soil profiles and descriptions on the Soil Test Boring Logs in the Appendix. The stratification presented is based on a visual assessment of the recovered soil samples and the interpretation of field logs by a PSI representative. The Standard Penetration Test values (N-values), which are shown on the Soil Test Boring Logs, have been empirically correlated with various soil properties and are indicative of the relative density of cohesionless soils and the consistency of cohesive soils.

A brief description of the soils encountered at the site is presented in this section. Details are shown in the Soil Test Boring Logs.

**BITUMINOUS CONCRETE** – Approximately 3 inches of surficial Bituminous Concrete pavement was encountered at Borings B-1 and B-4. Note that the actual thickness of bituminous concrete may vary within the site and may be greater or lesser. The contractor should determine the depth of bituminous concrete pavement to quantify bituminous concrete depths for removal purposes.

**TOPSOIL** – At Borings B-2 and B-3, approximately 7 to 8 inches of surficial Topsoil was encountered. Note that the actual amount of topsoil may vary widely between boring locations. The contractor should determine the depth of topsoil to quantify topsoil depths for removal purposes.

**FILL** – Approximately 1 to 9½ feet of material classified as Fill was encountered below the surficial topsoil at Borings B-2 and B-3. The Fill material is most likely the result of original site development (possibly site grading). The general material description is brown, fine to coarse sand, trace silt, with little to some gravel. At Boring B-3, pieces of bituminous concrete and trace fibrous roots were present in the recovered samples, indicating the material to be Fill, and casing refusal was encountered at a depth of 9½ feet bgs. Standard Penetration Test (SPT) N-values ranged from 7 blows per foot (bpf) to 50 or more blows for 1 to 5 inches of sampler penetration, indicating loose to very dense relative densities. In miscellaneous fill, the N-values can be erratic, reflecting the variable composition of the fill material. The presence of obstruction and/or cobbles within fill can result in locally high N-values, even in a very loose soil. Other obstructions may be present in a miscellaneous uncontrolled fill and may not be readily detectable with exploratory drill rig methods.

**SILTY SUBSOIL** – An approximately 2½ to 4-foot thick subsoil layer of Silty Sand to Sandy Silt soils were encountered immediately below the surficial bituminous concrete at Borings B-1 and B-4 and below the fill material at Boring B-2. The general material description at Borings B-1 and B-4 is brown/orange, fine to medium sand, trace coarse sand, some silt, with little to some gravel and trace fibrous roots. The general material description at Boring B-2 is brown/orange, silt, some fine to medium sand, trace coarse sand, with trace to little gravel. The SPT N-values ranged from 7 to 44 bpf, indicating loose to dense relative densities and medium stiff to stiff consistencies.



SAND AND GRAVEL – At Borings B-1, B-2 and B-4, Sand and Gravel soils were encountered below the Silty Sand to Sandy Silt soils and extended to depths of approximately 6½ to 14½ feet bgs, where Borings B-1 and B-2 encountered refusal. The general material description is brown, fine to coarse sand, trace silt, with little to some gravel. The SPT N-values ranged from 26 bpf to 50 or more blows for 1 to 5 inches of sampler penetration, indicating medium dense to very dense relative densities, although the majority of the N-values were in the very dense relative density range.

SANDY SILT – Below the Sand and Gravel soils at Boring B-4, Sandy Silt soils were encountered, beginning at a depth of approximately 10 feet bgs and extending to a depth of approximately 12 feet bgs, where the boring encountered refusal. The general material description is brown, silt, some fine to medium sand, trace coarse sand, with little gravel. The SPT N-value was 50 or more blows for 1 to 5 inches of sampler penetration, indicating a hard consistency.

REFUSAL – Casing refusal was encountered at each boring location at depths ranging from approximately 6½ to 14½ feet bgs, which is interpreted to be bedrock. However, the material was not cored for classification.

## **2.2 GROUNDWATER CONDITIONS**

At the time of the borings (August 2020), groundwater infiltrating the borehole was not encountered during drilling and sampling operations. For safety purposes, all the borings were backfilled upon completion of drilling and sampling.

The observations represent the groundwater condition (or absence of) at the time of measurement and may not be indicative of other times. The level of groundwater below the ground surface fluctuates based on conditions such as season, temperature, and amount of precipitation that might be different from the time when the observations were made. Therefore, the groundwater levels can be higher or lower during construction and during the life of the structure. This fact must be taken into consideration when developing earthwork procedures.

## **2.3 SOIL LABORATORY TESTING**

### **2.3.1 LABORATORY RESULTS**

PSI tested soil samples for moisture content and gradation to assist in classifying the material and determining the percent fines (percent passing the Number 200 sieve). The material test reports for the samples are in the Appendix of this report and results are summarized in the following table.



| Boring No. | Sample No. | Sample Depth (feet) | USCS Classification <sup>1</sup>              | Moisture Content (%) | Fines Content (%) |
|------------|------------|---------------------|---|----------------------|-------------------|
| B-2        | S2         | 2'-4'               | Sandy Silt (ML)                               | 18.4                 | 50                |
| B-3        | S3         | 5'-7'               | Well-Graded Sand with Silt and Gravel (SW-SM) | 2.0                  | 9.7               |
| B-4        | S1         | 1.5'-2.5'           | Silty Sand with Gravel (SM)                   | 2.1                  | 24                |
| B-4        | S3         | 5'-7'               | Well-Graded Sand with Silt and Gravel (SW-SM) | 0.8                  | 8.6               |
| B-4        | S5         | 10'-12'             | Sandy Silt (ML)                               | 3.1                  | 56                |

<sup>1</sup>For USCS Soil Classification definitions, refer to the Soil Classification Chart in the APPENDIX

### **2.3.2 REUSE OF EXCAVATED SOIL**

Based on the results of the laboratory testing, PSI anticipates that the excavated Sand and Gravel natural soil may meet the specific gradation requirements for Granular or Structural Fill. This material will be acceptable for reuse provided that the material continues to meet the project specifications and can be compacted to the required degree of compaction.

PSI anticipates that the excavated Silty Sand to Sandy Silt soils will not meet the gradation requirements for Granular or Structural Fill and might also be difficult to reuse as common compacted borrow because of the silt content. The high silt content makes the material sensitive to disturbance when wet and difficult, if not, impossible to recompact without drying the soil. As a result, the material must be dried, which might be difficult to accomplish during the fall, winter, and spring seasons of the year.

The Fill material meets the gradation requirements for Granular or Structural Fill, however, pieces of bituminous concrete were observed within some soil samples, which might eliminate reusing the material. If there are any contamination concerns within the materials excavated, the suitability for reuse should be addressed by a qualified environmental consultant. Specific environmental studies were not part of our scope of services. PSI's branch which provides environmental consultation could be engaged for further studies during site development and construction.

## **3.0 RECOMMENDATIONS**

### **3.1 GENERAL**

The following geotechnical design recommendations have been developed for the proposed building addition based on the previously described project information and subsurface conditions encountered at this site. If there are any changes in the project criteria, PSI should review the changes to determine if modifications to these recommendations are necessary.

Along the western side of the new addition, the provided topographic contour information indicates existing grades ranging from approximately EL 104 to EL 106 feet. To attain the finished subgrade elevation for the new addition, cut excavations of about 4½ to 6½ feet are anticipated.



Borings B-2 and B-3, performed near the west side of the addition, encountered casing refusal conditions at estimated elevations of approximately EL 105½ and EL 104½ feet, which is above the design finished floor level. Borings B-1 and B-2 encountered refusal conditions at approximately EL 85½ and EL 85 feet. Therefore, the refusal depths (bedrock) appear to slope downward to the east. At the west wall of the new addition, refusal/bedrock conditions are anticipated to be close to (area of southwest corner) and at (area approaching and at the northwest corner) the finished floor level. Difficult excavation in bedrock should be anticipated in the building area and where lay-back excavation of the existing slope is required.

Based on our borings, conventional footing foundations and a grade-supported floor slab should be suitable for support of the planned addition, retaining wall, and concrete pads for new appurtenances. Additional recommendations are presented in the following sections.

### 3.2 FOUNDATIONS

Exterior footings should be placed at least 4 feet below the lowest adjacent exterior finished grade for frost protection and interior footings should be placed at the nominal depth below the floor slab as required by the Building Code.

Conventional footing foundations bearing in approved natural soils and new, properly compacted, Structural Fill may be proportioned using a maximum allowable net bearing pressure of 2 tsf (4,000 psf). These pressures are acceptable if the minimum foundation width is 3 feet. For widths less than 3 feet, the design pressure recommended above should be reduced by a factor of B/3, where B is the actual footing width. For this pressure, settlements should be within tolerable limits of 1-inch total and ½-inch differential over 20 feet.

At the anticipated minimum bearing levels required for frost protection, we anticipate that native soils will be present at a majority of the building area and that rock will be present approaching the west side of the structure. For control of potentially excessive differential settlement where footings bear on dissimilar materials, we recommend rock be removed to a depth of 12 inches below the design bearing levels and replaced with compacted Structural Fill (please see Section 4.3 of this report for material gradation recommendations). The Structural Fill should be in contact with the rock below the entire footprint of the excavation. In the event that the rock is too hard to be removed, foundations bearing on rock should be designed for 2.5 tsf and additional top and bottom longitudinal reinforcement is recommended for continuous footings, extending a minimum of 5 feet in each direction longitudinally from the soil-rock transition point. Wall footings that transition from soil to rock should have a transition zone extending 8 feet along both the soil and adjacent rock surface. The transition zone material should be Structural Fill extending at least 6 inches beyond the edges of the wall footing. Footings on rock sloped greater than 1 vertical to 6 horizontal should be pinned to the rock.

PSI recommends that wall footings have a minimum width of 18 inches and that column footings have a minimum width of 24 inches, regardless of the actual bearing pressure. Wall footings should be provided with continuous longitudinal steel reinforcement as determined by the structural engineer, for greater bending strength so they can span across small areas of loose or soft soils that may go undetected during construction.



Footings for the chemical storage pad, solids separator/recycled water treatment system, and wash down pad north of the addition, and the 500-gallon and 1,000-gallon fuel tanks/pumps south of the existing maintenance building may be proportioned based on a maximum allowable net bearing pressure of 4 tsf. These foundations should bear entirely on rock or approved soils. Where footings within the pad footprints consist primarily but not completely of rock, we recommend the soils be overexcavated to the rock and replaced with lean concrete. Such conditions can be further assessed and additional recommendations provided by PSI based on actual conditions encountered.

All foundation bearing materials consisting of soil should be proof-compacted to densify these materials as a result of the excavation process or if loose in their natural state. Densifying the soil below the footing grade is important to provide relatively uniform compact conditions and to test for potentially weak areas. The contractor must take care when compacting so that the silty soil does not become disturbed and weakened, especially if moist. The contractor must also adjust the procedure accordingly.

After excavating and compacting the foundation soils, the contractor may elect (means and methods) to place a 4 to 6-inch layer of ¾-inch angular crushed stone over the footing subgrade to provide a firm working surface, reduce the possibility of disturbing the footing subgrade, and to provide a drainage layer to remove water that might accumulate due to groundwater or precipitation. Footings bearing on new, properly placed and compacted Structural Fill do not require a stone layer below the footing. These requirements should also be placed in the contract documents so that the work becomes part of the contract price.

Footing reinforcement and concrete should be placed as soon as practical following completion of excavation to final grade and proof-compacting the footing subgrade. Once the footing concrete is placed, the foundations should be backfilled with Structural Fill as soon as the concrete has cured to an acceptable degree to allow backfilling. The backfill serves to protect the footing as a component of overturning resistance and prevents accumulation of water around the foundations which can soften and weaken the bearing soils. The ground surface near the completed foundations should be sloped to drain away from the foundations throughout construction to avoid accumulation of moisture in the subgrade soils.

The foundation subgrade should be observed by the geotechnical engineer of record or a representative prior to formwork to document that the foundation materials are consistent with this report.

### **3.3 CONCRETE SLAB**

Subsurface soil conditions are suitable for supporting a slab-on-grade for the building after excavating or filling to the base course subgrade layer and proof-rolling the footprint to tighten the subgrade soil. Fill required to raise the site to the slab base course grade should be compacted Structural or Granular Fill.





The slab subgrade should be proof-rolled to verify that the soil is firm prior to constructing the slab base course layer. A vibratory drum compactor (5-ton minimum weight at the drum) should be used, making at least 5 passes over the subgrade at the bottom of the excavation. Weak or soft soil should be replaced with compacted Structural or Granular Fill.

To reduce the possibility of capillary rise of groundwater and moisture into the floor slab, PSI recommends that the concrete floor slabs be constructed over a 4-inch thick layer of compacted, freely draining base course material such as the ¾-inch angular Crushed Stone or a 6-inch thick layer of Dense Graded Crushed Stone, both as specified herein. Base course soil material must be compacted to at least 95% of the maximum dry density determined in accordance with ASTM D1557. Crushed Stone must be tamped into firm interlock so that it is firm and stable.

PSI recommends that a continuous vapor retarder of at least 10-mil thick, or as specified by the structural engineer, be installed between the slab and the base course to reduce migration of moisture.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction,  $k$  value, of 150 pounds per cubic inch (pci) may be used in the grade slab design based on values typically obtained from 1 ft. x 1ft. plate load tests. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

$$\text{Modulus of Subgrade Reaction, } k_s = \left(\frac{k}{B}\right) \text{ for cohesive soil and}$$
$$k_s = k \left(\frac{B+1}{2B}\right)^2 \text{ for cohesionless soil}$$

where:  $k_s$  = coefficient of vertical subgrade reaction for loaded area  
 $k$  = coefficient of vertical subgrade reaction for 1x1 square foot area  
 $B$  = width of area loaded, in feet

Cosmetic cracking of slabs-on-grade is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the following listed precautions should be closely followed for construction of all slabs-on-grade:

- PSI recommends installing construction joints between the floor slab and the walls and columns to account for differential settlement between the footings and slab. Concrete slabs should be jointed according to the American Concrete Institute (ACI) requirements, or other suitable code.
- All backfill in areas supporting slabs should be moisture conditioned and compacted. Backfill in all interior and exterior water and utility line trenches should be carefully compacted to match adjacent soils.
- Exterior slabs should be isolated from the building. These slabs should be constructed to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.



### 3.4 SEISMIC CONSIDERATIONS

Subsurface conditions beginning at the surface of the site within the building addition footprint consist of loose to very dense Fill material underlain by medium stiff to stiff Sandy Silt soils and medium dense to dense Silty Sand soils, then medium dense to very dense Sand and Gravel soils underlain by hard Sandy Silt soils to the depths explored. At each boring, refusal was encountered at depths ranging from approximately 6½ to 14½ feet bgs, which is interpreted as bedrock.

Therefore, it is PSI’s opinion that the site should be classified as Site Class C as defined in the Building Code and using the available information, if necessary, for design. Seismic values based on Site Class C are presented in the following table.

| 2015 International Building Code and Massachusetts Amendments | Reference         | Equation       | Value |
|---|-------------------|----------------|-------|
| <b>City – Boston, MA</b>                                      |                   |                |       |
| Site Class Definition   | 1613.3.2          | C              |       |
| Earthquake Design Factors (short)                             | Table 1604.11     | $S_s$          | 0.217 |
| Earthquake Design Factors (1 -sec)                            | Table 1604.11     | $S_1$          | 0.069 |
| Site Coefficient - $F_a$                                      | Table 1613.3.3(1) | $F_a$          | 1.2   |
| Site Coefficient - $F_v$                                      | Table 1613.3.3(2) | $F_v$          | 1.7   |
| Max EQ spectral response - $S_{MS}$                           | Eq 16-37          | $F_a * S_s$    | 0.260 |
| Max EQ spectral response - $S_{M1}$                           | Eq 16-38          | $F_v * S_1$    | 0.117 |
| Design spectral response acceleration - $S_{DS}$              | Eq 16-39          | $2/3 * S_{MS}$ | 0.173 |
| Design spectral response acceleration - $S_{D1}$              | Eq 16-40          | $2/3 * S_{M1}$ | 0.078 |

The subsurface conditions to the depth explored at the site were also assessed for its liquefaction potential using the guidance provided in the 2015 International Building Code. It is PSI’s opinion that the site is not susceptible to liquefaction to the depths explored.

### 3.5 LATERAL EARTH PRESSURE RECOMMENDATIONS

The west wall of the proposed building addition will include a concrete retaining wall approximately 7 feet in height. Additionally, new retaining walls are planned adjacent to the west side of the area planned for the aforementioned chemical storage/water treatment/washdown bay systems and adjacent to the west side of the fuel pump pads.

Lateral earth pressure is developed from the soils present within a wedge formed by the vertical wall and an imaginary line extending up and away from the bottom of the wall at an approximate angle from the horizontal of  $45 + \frac{1}{2}\phi$ , where  $\phi$  is the angle of internal friction for existing soils adjacent to the wall backfill zone. The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K.



The site retaining walls must be designed to resist both the superimposed effect of the total static lateral earth pressure and seismic forces. A site retaining wall designed to permit a limited amount of outward rotation should be designed using the “active” lateral earth pressure ( $K_a$ ). Seismic forces should be applied as stated in the latest addition of the Building Code.

Recommended parameters for use in wall designs are presented as follows:

### Recommended Parameters for use in Retaining Wall Design

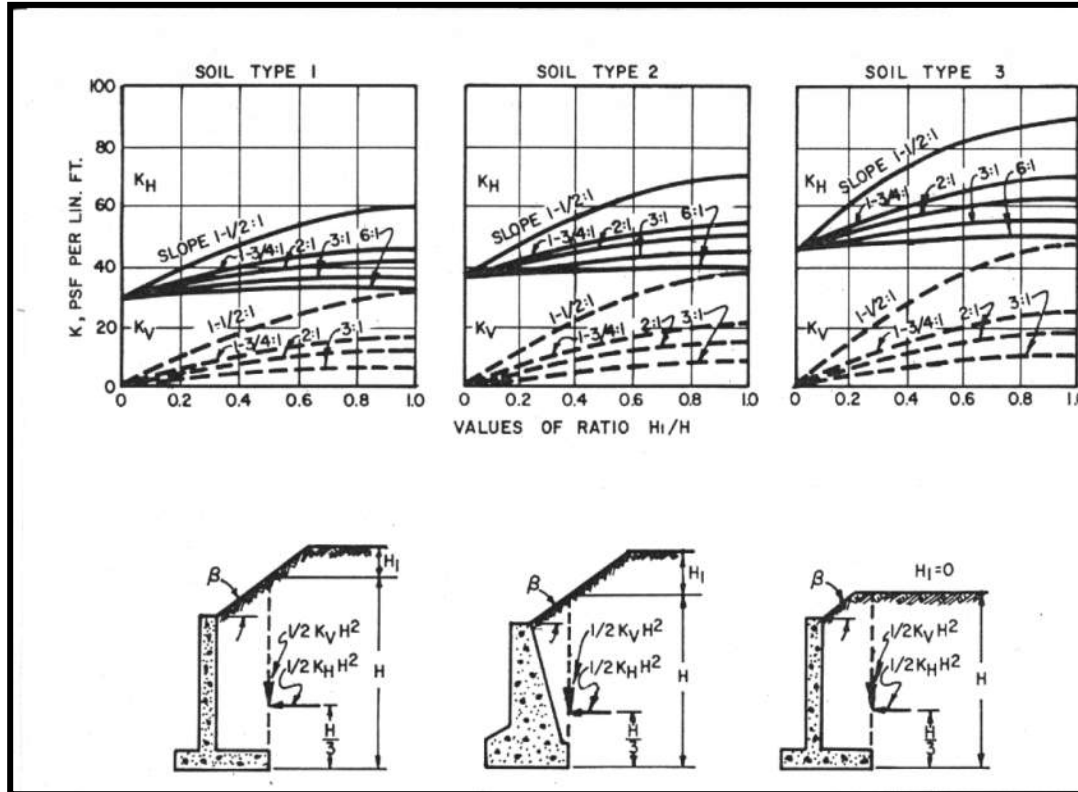
| Material Type           | Drained Friction Angle ( $\Phi'$ ), degrees | Total Density $\gamma$ (pcf) | Earth Pressure Coefficient ** |                  |                   |
|-------------------------|---|------------------------------|-------------------------------|------------------|-------------------|
|                         |   |                              | At-Rest ( $K_o$ )             | Active ( $K_a$ ) | Passive ( $K_p$ ) |
| On-Site Soils           | 30  | 120                          | 0.50                          | 0.33             | 1.50              |
| Wall Drainage Aggregate | 35  | 110                          | 0.43                          | 0.27             | 2.46              |
| Granular Backfill       | 33  | 125                          | 0.46                          | 0.29             | 2.26              |

*\*\* Earth pressure coefficients valid for level and drained backfill conditions. These values may be used for design only if the aggregate backfill extends back from the wall certain distances. These are a horizontal distance approximately equal to or greater than the total height of the wall at the surface, and at least one-foot beyond the heel of the wall footing. A Factor of Safety of 1.5 has been applied to passive pressure coefficients.*

The pressure coefficients presented above assume level slope conditions behind the wall. However, the designs of below-grade building walls and site retaining walls should consider the effects of geometry and loading conditions.

The following charts have been included from NAVFAC 7.02 concerning inclined slopes extending above retaining wall structures. Depending on the geometry of the site, the lateral loading on the wall should be modified according to these charts. Although the charts include a Soil Type 3 which consists of fine-grained soils, that soil type is never recommended for new construction. That chart is intended for evaluating existing conditions that include that soil type.





Soil Type 1 – Clean Sand and Gravel, GW, GP, SW, SP  
 Soil Type 2 – Dirty Sand and Gravel of Restricted Permeability, GM, GM-GP, SM-SP, SM  
 Soil Type 3 – Stiff Residual Silts and Clays, Silty Fine Sands, Clayey Sands and Gravels: CL, ML, CH, MH, SM, SC, GC

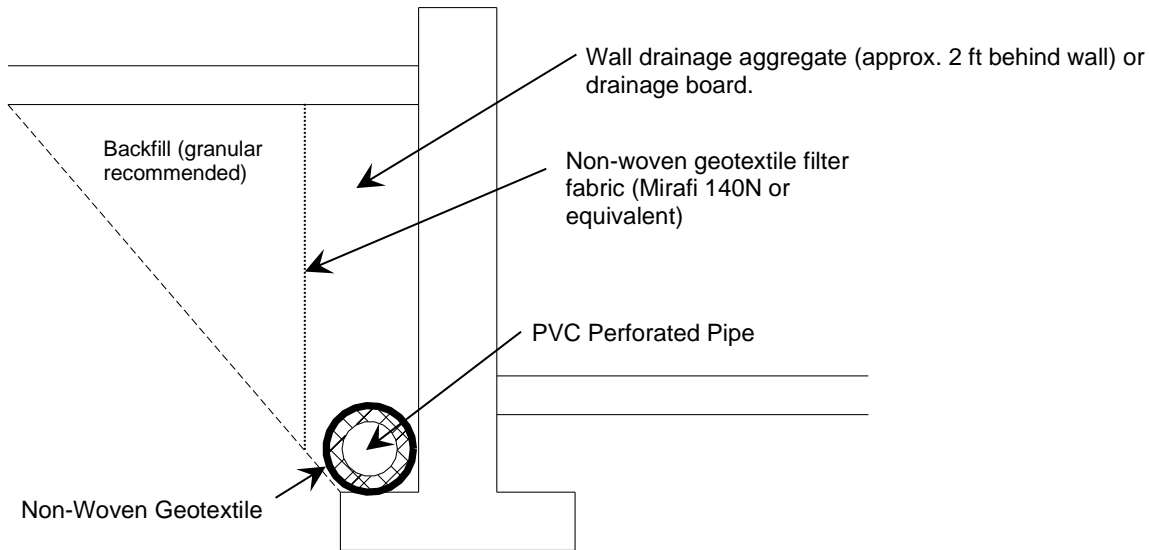
The values presented above were calculated based on positive foundation drainage being provided to prevent the buildup of hydrostatic pressure. An “equivalent fluid” pressure can be obtained from the above table values by multiplying the appropriate K-factor times the total unit weight of the soil. This applies to unsaturated conditions only. If a saturated “equivalent fluid” pressure is needed, the effective unit weight (total unit weight minus unit weight of water) should be multiplied times the appropriate K-factor and the unit weight of water added to that resultant. However, PSI does not recommend that the walls be designed with a hydrostatic load and PSI does recommend that drainage should be provided to relieve the pressure.

### 3.6 RETAINING WALL BACKFILL RECOMMENDATIONS

The backfill materials should be placed in lifts that do not exceed 4 to 6-inches loose. The lift thickness may need to be reduced to thinner lifts immediately behind the walls to achieve the desired compaction without overstressing the wall with the compaction process. The backfill materials should be compacted to at least 95% of the Modified Proctor maximum dry density (ASTM D1557). If granular materials do not exhibit a well-defined moisture-density relationship curve per ASTM D1557, they should be compacted to at least 70% relative density per ASTM D4253/4254.



Backfill that is placed within 5 feet of the walls, should be placed in thinner lifts with hand compaction equipment to achieve the specified density. Heavy compactors and grading equipment should not be allowed to operate within these limits during the backfilling of the retaining wall to reduce the developing of excessive temporary or long-term lateral soil pressures from the installation process. PSI recommends that a representative of the geotechnical engineer be present to monitor the below grade wall excavation, construction, and backfilling processes. Care should be exercised during the backfilling operation to prevent overstressing and damaging the wall. A typical wall cross-section is as follows:



The placement of a limited amount of granular material behind a site retaining wall does not appreciably change the coefficient of lateral earth pressure acting on that wall. The lateral earth pressure acting on a retaining structure is a function of the weight of the soil that exists above the theoretical plane projecting up from the heel of the wall footing (the back of the footing at the base of the wall). The soil above this plane is held in place by two forces, the strength of the soil itself and the lateral resistance of the wall. Therefore, a thin layer of granular material behind the wall (such as a vertical drain on the back of the wall) is of little consequence on the soil forces acting on the wall; however, it will have significant consequences for wall drainage and, therefore, hydrostatic pressures.

## 4.0 CONSTRUCTION CONSIDERATIONS

### 4.1 EARTHWORK

In the preceding sections, PSI has outlined several recommendations for earthwork. There are additional recommendations provided herein which should be incorporated into the structural design and Contract Documents.



1. Following initial demolition (removal of existing pavements, concrete, utilities to be abandoned/relocated) and removal of all surficial vegetation, topsoil, root mat, shrubbery, and trees (including root systems and root balls) at the design finished subgrades in planned cut areas and prior to placement of new fill (if needed), the exposed subgrades should be proof-rolled using a minimum 10-ton, smooth-drum roller. Proof-rolling should be performed in the presence of a representative of PSI. Subgrade materials exhibiting yielding and/or rutting conditions should be scarified, aerated, and re-compacted, removed and replaced, or stabilized in place through addition of geo-grid and/or coarse aggregate.
2. Soil compaction criteria requires compaction of at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 at plus/minus 2% of the optimum moisture content. Lifts must be controlled so that they do not exceed 6 inches in confined areas and 12 inches in open areas where larger compactors can be utilized. Use hand-operated equipment within 10 feet behind retaining walls and do not over-compact the backfill material. All fill placed within and below the structure must be compacted in accordance with ASTM D1557.
3. All excavations shall be stabilized by cutting back the side slopes or using shoring and bracing as required by 29 CFR 1926 Subpart P, Excavations. Plans and specifications should refer to this requirement so that contractors are aware of their responsibility.
4. Drainage must not be directed onto adjacent property either during construction or as part of the design grading, especially if this would affect groundwater and / or moisture conditions on the adjacent parcel.
5. Proof-compact the foundation soil at each footing excavation to verify that the material is firm and compact. If the material is silty, a 4 to 6-inch thick layer of ¾-inch crushed stone material should be placed over the foundation subgrade and tamped into tight interlock.

## 4.2 CONSTRUCTION DEWATERING

Groundwater was not observed within the borings during the field exploration program at the site. Therefore, excavations are not expected to encounter groundwater.

Should groundwater or wet conditions be encountered, it is PSI's opinion that dewatering can be handled by pumping from the bottom of the excavation. If dewatering is necessary, the contractor is solely responsible for designing all dewatering systems and maintaining a groundwater level that is at least 24 inches below the bottom of the excavation so that the bottom of the excavation remains firm and dry to allow placing and compacting of fill.

The contractor is responsible for maintaining a dewatered and firm subgrade condition and is solely responsible for selecting the method of groundwater control, designing, and maintaining the system. PSI recommends that this requirement be stated in the project specifications.



### 4.3 MATERIALS

PSI recommends that the following material gradations and names be used for consistency on the drawings and in the earthwork specifications. All material must be well graded between the limits shown herein and be capable of being compacted to the required degree of density. The material shall have sufficient fines so that it does not shove and remains stable.

PSI also recommends that the specifications not allow the use of recycled material such as reprocessed building demolition material. Material having more than 30 percent retained on the ¾-inch sieve may be difficult to test for compaction. Therefore, PSI recommends that the material selected also be satisfactory for compaction testing purposes.

#### Common Borrow

Friable, natural soil containing no gravel greater than 2/3 loose lift thickness and free of trash, snow, ice, organics, roots, and tree stumps and no more than 35 percent passing the No. 200 sieve. Common borrow can be used as general site backfill provided it can be compacted and stabilized for the intended purpose.

#### Structural Fill (recommended for over-excavation backfill below footing grade):

Natural or processed materials meeting the following grading ranges.

| Sieve Size | Percent Finer |
|------------|---------------|
| 3-inches   | 100           |
| ½-inches   | 50 - 100      |
| No. 4      | 30 - 85       |
| No. 10     | 20 - 75       |
| No. 40     | 5 - 35        |
| No. 200    | 0-10          |

#### Granular Fill (recommended for general site fill and backfill above footing grade):

Natural or processed materials meeting the following grading ranges.

| Sieve Size | Percent Finer |
|------------|---------------|
| 2-inches   | 100           |
| No. 10     | 30 - 95       |
| No. 40     | 10 - 70       |
| No. 200    | 0 - 15        |



Dense Graded Crushed Stone (recommended as the granular base for floor slabs):

Dense graded crushed rock meeting the following grading ranges.

| Sieve Size | Percent Finer |
|------------|---------------|
| 2-inch     | 100           |
| 1½-inch    | 70 - 100      |
| ¾-inches   | 50 - 85       |
| No. 4      | 30 - 55       |
| No. 50     | 8 - 24        |
| No. 200    | 3 - 10        |

Crushed Stone:

The crushed stone should meet the requirements for material M2.01.4 (¾-inch gradation) stated in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

## 5.0 GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. Site exploration identifies actual subsurface conditions only at those points where samples are taken.

A geotechnical report is based on conditions that existed at the time of the subsurface exploration. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

## 6.0 REPORT LIMITATIONS

PSI's professional services have been performed and our findings presented in accordance with generally accepted geotechnical engineering principles and practices. PSI is not responsible for the conclusions, opinions, or recommendations made by others based on this data. No other warranties are implied or expressed. As stated previously, our recommendations are made based on the limited information available.





The scope of explorations was intended to assess soil conditions within the influence of the proposed foundations. The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. If subsoil variations become evident during this project, a re-assessment of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature, or location of the proposed structure.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our Client.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminate in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Site conditions are outside of PSI's control, and mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible of the occurrence or recurrence of mold amplification.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.



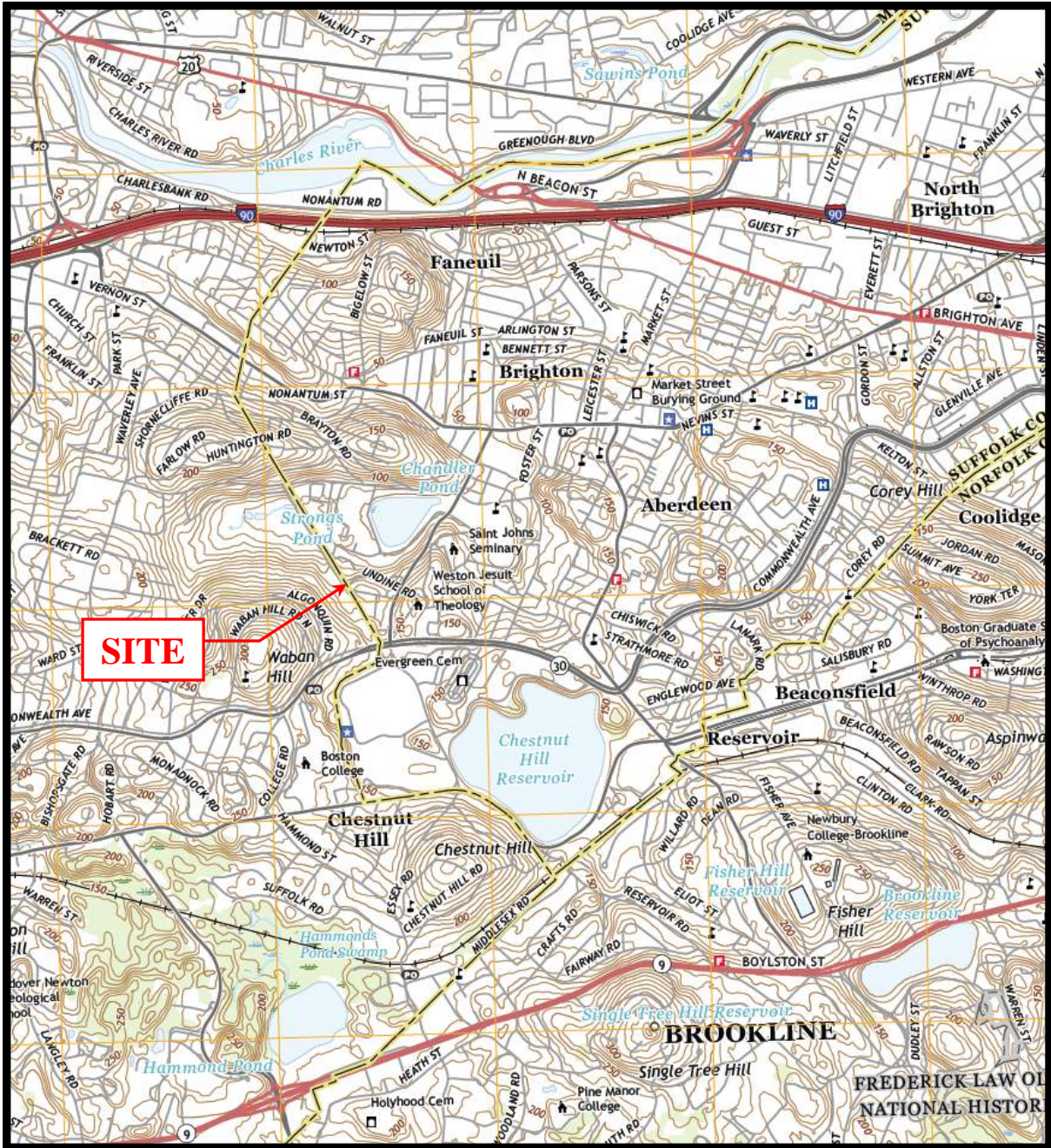
# FIGURES

**Figure 1: USGS Site Location Plan**

**Figure 2: Boring Location Plan**

**Figure 3: Surficial Geology**




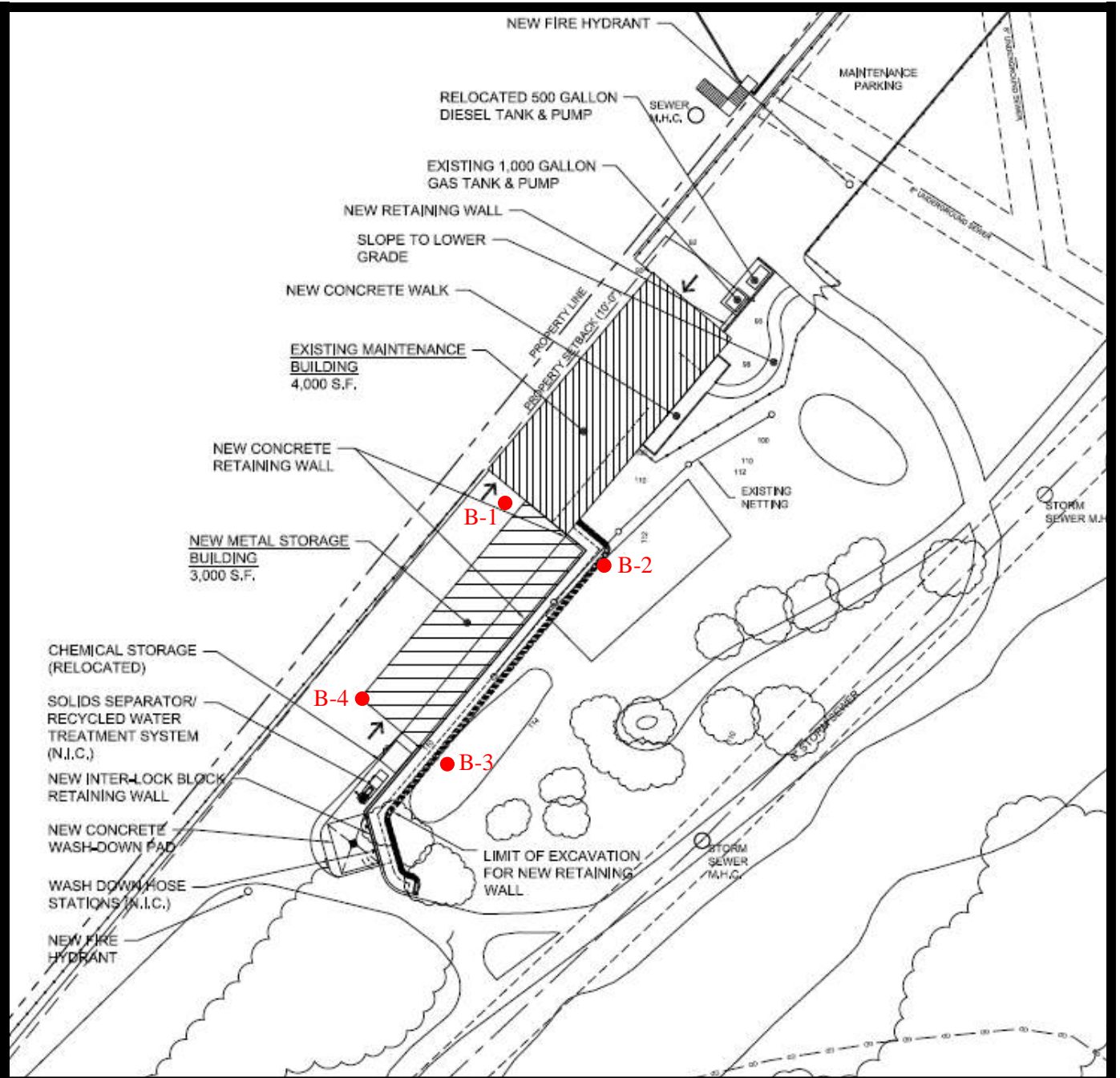


REFERENCE: U.S.G.S. "NEWTON, MA" 7.5' QUADRANGLE MAP  
 ISSUED: 2018

**FIGURE 1: USGS SITE LOCATION PLAN**

**PROJECT NAME:**  
 Proposed New Metal Storage Building Addition  
 Newton Commonwealth Golf Course  
 212 Kenrick Street, Newton, MA 02458

|   |                        |             |              |
|---|------------------------|-------------|--------------|
|  | <b>PSI Project No.</b> | <b>Date</b> | <b>Scale</b> |
|   | 04461007               | August 2020 | N.T.S.       |



● Boring Location

- Base Plan is New Work Site Plan: A1.0 (dated 8/1/19) provided by Client.
- Borings were located in the field by PSI. Locations are approximate.
- Borings drilled on August 14, 2020 by Soil X Corp. of Leominster, MA.

**FIGURE 2: BORING LOCATION PLAN**

**PSI Project No.**

**Date**

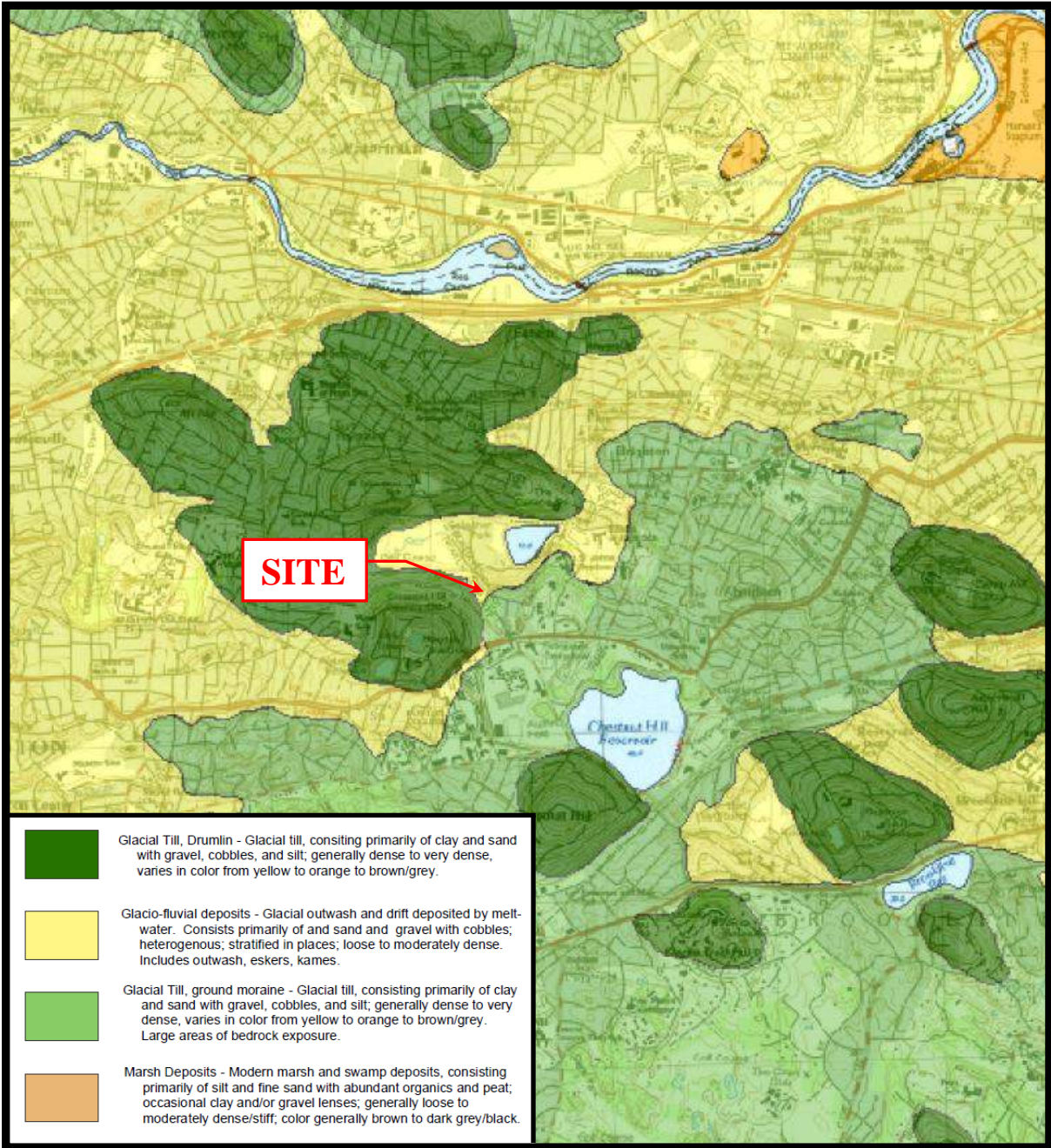
**PROJECT:**

Proposed New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458

04461007

August 2020





**REFERENCE:** "Plate 5 Surficial Geologic Map of the Newton Quadrangle, Massachusetts"  
Compiled by C.M. Brankman - 2004

**FIGURE 3: SURFICIAL GEOLOGY**

**PROJECT NAME:**

Proposed New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458



**PSI Project No.**

04461007

**Date**

August 2020

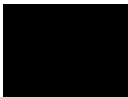
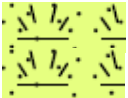



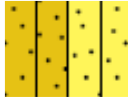
**Scale**

N.T.S.

# APPENDIX

## Boring Logs

### Legend for Graphic Log

|   |                                 |
|---|---------------------------------|
|    | <b>Bituminous Concrete</b>      |
|    | <b>Topsoil</b>                  |
|   | <b>Fill</b>                     |
|  | <b>Silty Sand to Sandy Silt</b> |
|  | <b>Sand and Gravel</b>          |
|  | <b>Sandy Silt</b>               |







DATE STARTED: 8/14/20 DRILL COMPANY: Soil X Corp.  
 DATE COMPLETED: 8/14/20 DRILLER: Don Leger LOGGED BY: Intertek-PSI  
 COMPLETION DEPTH: 14.5 ft DRILL RIG: Geoprobe 7822DT  
 BENCHMARK: N/A DRILLING METHOD: Flush Joint Casing  
 ELEVATION: 100 ft SAMPLING METHOD: SS  
 LATITUDE: HAMMER TYPE: Automatic  
 LONGITUDE: EFFICIENCY: N/A  
 STATION: N/A OFFSET: N/A REVIEWED BY: Brianna Hansen

# BORING B-1

Water  Dry  
  


BORING LOCATION: \_\_\_\_\_

REMARKS: Ground elevation based on information contained on provided Site Plans (dated 8/1/19) and information contained on Google Earth

| Elevation (feet) | Depth (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION  | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|---|-------------|------------|-------------------|---|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |   |             |            |                   | Approximately 3" of bituminous concrete   |                     |                           |             |               |                    |
|                  |              |    |             | 1          | 10                | Medium dense, brown/orange, fine to medium sand, trace coarse sand, some silt, little gravel, trace fibrous roots ( <b>Loamy eolian deposit</b> ) |                     | 6-7-9-24<br>N=16          | ⊙           |               |                    |
|                  |              |    |             | 2          | 15                | Very dense, brown, fine to coarse sand, trace silt, little to some gravel ( <b>Sandy basal till</b> )   |                     | 28-56-63/4"               |             |               |                    |
| 95               | 5            |   |             | 3          | 6                 | Very dense, brown, fine to coarse sand, trace silt, little to some gravel ( <b>Sandy basal till</b> )   |                     | 103-50/1"                 |             |               | >>⊙                |
| 90               | 10           |  |             | 4          | 16                | Very dense, brown, fine to coarse sand, trace silt, some gravel ( <b>Sandy basal till</b> )   |                     | 42-46-69-44<br>N=115      |             |               | >>⊙                |
|                  |              |   |             |            |                   | Refusal encountered at ~ 14.5 feet bgs  |                     |                           |             |               |                    |



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 480 Neponset Street, Suite 9C  
 Canton, MA 02021  
 Telephone: (781) 821-2355

PROJECT NO.: 04461007  
 PROJECT: Newton Commonwealth Golf Course  
 LOCATION: 212 Kenrick Street  
 Newton, MA 02458


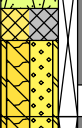
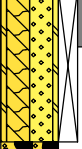

DATE STARTED: 8/14/20 DRILL COMPANY: Soil X Corp.  
 DATE COMPLETED: 8/14/20 DRILLER: Don Leger LOGGED BY: Intertek-PSI  
 COMPLETION DEPTH: 6.5 ft DRILL RIG: Geoprobe 7822DT  
 BENCHMARK: N/A DRILLING METHOD: Flush Joint Casing  
 ELEVATION: 112 ft SAMPLING METHOD: SS  
 LATITUDE: HAMMER TYPE: Automatic  
 LONGITUDE: EFFICIENCY: N/A  
 STATION: N/A OFFSET: N/A REVIEWED BY: Brianna Hansen

# BORING B-2

Water  Dry  
  


BORING LOCATION: \_\_\_\_\_

REMARKS: Ground elevation based on information contained on provided Site Plans (dated 8/1/19) and information contained on Google Earth

| Elevation (feet) | Depth (feet) | Graphic Log  | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION  | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|--|-------------|------------|-------------------|---|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |   |             |            |                   | Approximately 7" of topsoil   |                     |                           |             |               |                    |
| 110              | 1            |   |             | 1          | 19                | Loose, dark brown, fine to coarse sand, trace silt, little gravel   |                     | 1-3-4-5<br>N=7            |             |               |                    |
|                  | 2            |   |             | 2          | 9                 | Medium stiff, brown/orange, silt, some fine to medium sand, trace coarse sand, trace to little gravel ( <b>Loamy eolian deposit</b> )<br>Stiff, brown/orange, silt, some fine to medium sand, trace coarse sand ( <b>Loamy eolian deposit</b> ) |                     | 4-6-4-4<br>N=10           | 18          |               | -200 = 50%         |
| 5                | 3            |  |             | 3          | 10                | Very dense, brown, fine to coarse sand, trace silt, some gravel ( <b>Sandy basal till</b> )   |                     | 25-60/5"                  |             |               | >>⊕                |
|                  |              |  |             |            |                   | Refusal encountered at ~6.5 feet bgs  |                     |                           |             |               |                    |



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PROJECT NO.: 04461007  
 PROJECT: Newton Commonwealth Golf Course  
 LOCATION: 212 Kenrick Street  
 Newton, MA 02458




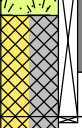
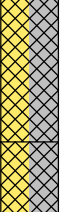
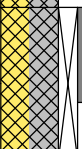
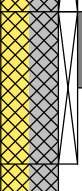

**DATE STARTED:** 8/14/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 8/14/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 9.5 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 114 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING B-3

**Water**    Dry

**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Site Plans (dated 8/1/19) and information contained on Google Earth

| Elevation (feet) | Depth (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION   | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|---|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |    |             |            |                   | Approximately 8" of topsoil  |                     |                           |             |               |                    |
|                  |              |    |             | 1          | 17                | Medium dense, dark brown, fine to coarse sand, trace to little silt, little gravel (Fill)                              |                     | 2-5-7-10<br>N=12          |             |               |                    |
|                  |              |    |             | 2          | 0                 | Very dense, no recovery  |                     | 50/1"                     |             |               |                    |
| 110              |              |   |             | 3          | 15                | Dense, dark brown, fine to coarse sand, trace silt, some gravel, trace fibrous roots, trace bituminous concrete (Fill) |                     | 15-20-20-32<br>N=40       | 2 X         |               | -200 = 9.7%        |
|                  |              |  |             | 4          | 12                | Dense, dark brown, fine to coarse sand, trace silt, little to some gravel, little bituminous concrete (Fill)           |                     | 26-18-12-8<br>N=30        |             |               |                    |
| 105              |              |  |             | 5          | 0                 | Very dense, no recovery<br>Refusal encountered at ~9.5 feet bgs  |                     | 50/1"                     |             |               |                    |



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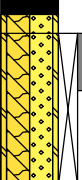



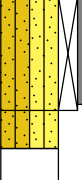
**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

**DATE STARTED:** 8/14/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 8/14/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 12.0 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 97 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING B-4

**Water**    Dry

**BORING LOCATION:**  
 REMARKS: Ground elevation based on information contained on provided Site Plans (dated 8/1/19) and information contained on Google Earth

| Elevation (feet) | Depth, (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION   | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|---------------|---|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |               |   |             |            |                   | Approximately 3" of bituminous concrete  |                     |                           |             |               |                    |
| 95               |               |    |             | 1          | 9                 | Dense, brown/orange, fine to medium sand, trace coarse sand, some silt, little to some gravel, trace fibrous roots ( <b>Loamy eolian deposit</b> ) |                     | 12-13-31-30<br>N=44       | 2 X         |               | ⊙ -200 = 24%       |
| 5                |               |    |             | 2          | 14                | Very dense, brown, fine to coarse sand, trace silt, some gravel ( <b>Sandy basal till</b> )  |                     | 32-37-48-44<br>N=85       |             |               | >>⊙                |
| 90               |               |   |             | 3          | 12                | Dense, brown, fine to coarse sand, trace silt, some gravel ( <b>Sandy basal till</b> )   |                     | 43-21-21-23<br>N=42       | 1 X         |               | ⊙ -200 = 8.6%      |
| 85               |               |  |             | 4          | 8                 | Medium dense, brown, fine to coarse sand and gravel, trace silt ( <b>Sandy basal till</b> )  |                     | 9-10-16-20<br>N=26        |             |               | ⊙                  |
|                  |               |  |             | 5          | 17                | Hard, brown, silt, some fine to medium sand, trace coarse sand, little gravel ( <b>Sandy basal till</b> )  |                     | 35-64-80/5.5"             | 3 X         |               | ⊙ -200 = 56%       |
|                  |               |   |             |            |                   | Refusal encountered at ~12 feet bgs  |                     |                           |             |               |                    |



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 480 Neponset Street, Suite 9C  
 Canton, MA 02021  
 Telephone: (781) 821-2355

**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

# FIELD CLASSIFICATION SYSTEM FOR SOIL EXPLORATION

## COHESIONLESS SOILS

(Silt, Sand, Gravel and Combinations)

### Density

|              |                           |
|--------------|---------------------------|
| Very Loose   | 4 blows per foot or less  |
| Loose        | 5 - 10 blows per foot     |
| Medium Dense | 11 - 30 blows per foot    |
| Dense        | 31 - 50 blows per foot    |
| Very Dense   | 51 blows per foot or more |

### Relative Properties

| Descriptive Term | Percent |
|------------------|---------|
| Trace            | 1 - 10  |
| Little           | 11 - 20 |
| Some             | 21 - 35 |
| And              | 36 - 50 |

### Particle Size Identification

|          |   |
|----------|---|
| Boulders | 8 inch diameter or more                               |
| Cobbles  | 3 - 8 inch diameter                                   |
| Gravel   | Coarse 1 - 3 inches                                   |
|          | Medium 1/2 - 1 inch                                   |
|          | Fine 1/4 - 1/2 inch                                   |
| Sand     | Coarse 0.6 mm - 1/4 inch<br>(diameter of pencil lead) |
|          | Medium 0.2 mm - 0.6 mm<br>(diameter of broom straw)   |
|          | Fine 0.05 mm - 0.2 mm<br>(diameter of human hair)     |
| Silt     | 0.002 mm - 0.05 mm<br>(cannot see particles)          |

## COHESIVE SOILS

(Clay, Silt and Combinations)

### Consistency

|             |                           |
|-------------|---------------------------|
| Very soft   | 2 blows per foot or less  |
| Soft        | 3 - 4 blows per foot      |
| Medim Stiff | 5 - 8 blows per foot      |
| Stiff       | 9 - 15 blows per foot     |
| Very Stiff  | 16 - 30 blows per foot    |
| Hard        | 31 blows per foot or more |

### Plasticity

| Degree of Plasticity | Plasticity Index |
|----------------------|------------------|
| None to slight       | 0 - 4            |
| Slight               | 5 - 7            |
| Medium               | 8 - 22           |
| High to very high    | over 22          |

### CLASSIFICATION ON LOGS ARE MADE BY VISUAL EXAMINATION OF SAMPLES.

**Standard Penetration Test** Driving a 2.0" O.D., 1 3/8" I.D., sampler a distance of 2.0 feet into undisturbed soil with a 140 pound hammer free falling a distance of 30 inches. The number of hammer blows required to drive the sampler into the soil in 6-inch increments is recorded. The sum of the hammer blows for the second and third interval provides the Standard Penetration Resistance (N) and is a measure of soil strength. The reader is referenced to ASTM D1586.

**Strata Changes** Boundaries between soil layers are considered approximate based upon observed changes during the drilling operations or noted changes within representative samples.

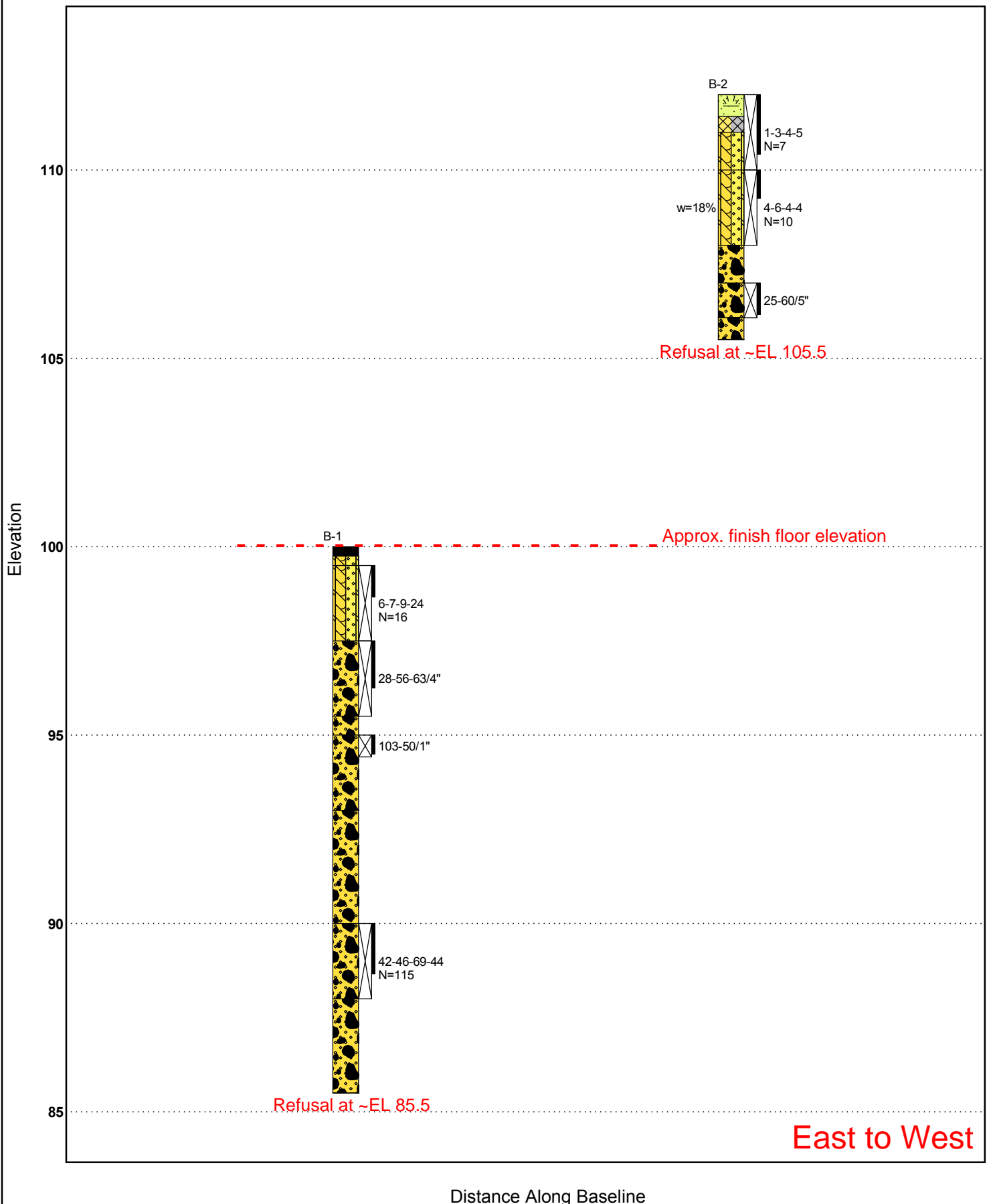
**Groundwater** Observations were made to determine either the depth or elevation of water at the times indicated on the Soil Exploration Logs. The water so encountered may be groundwater or perched water. The depth or elevations indicated for water may fluctuate due to seasonal changes or other unknown factors.



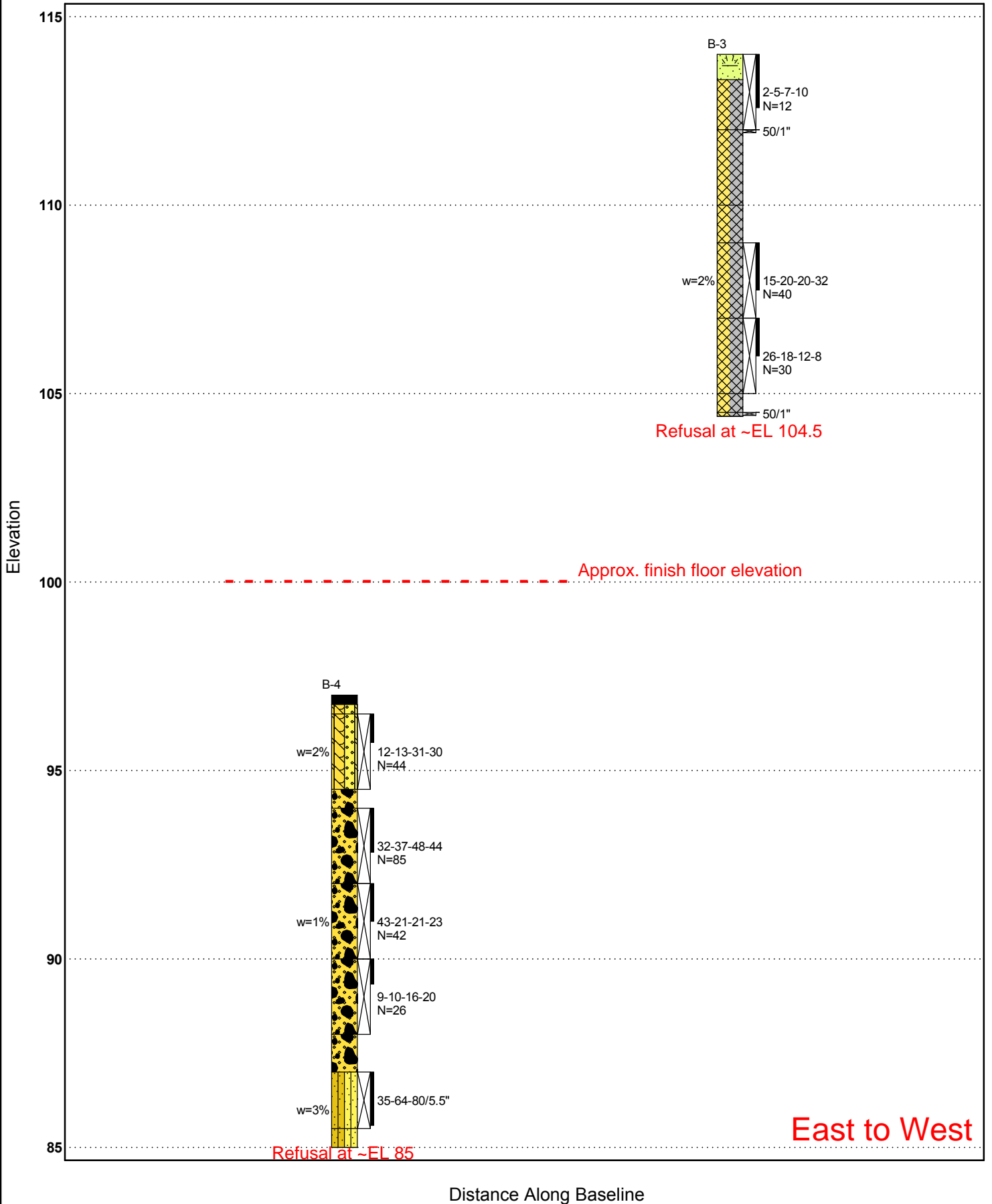
## Soil Profiles



# Profile



# Profile



## Material Test Reports









Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S1**

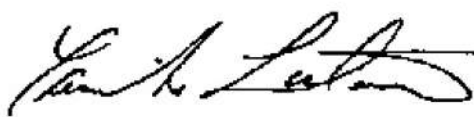
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, **CC:**  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S1  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-2 (2'-4')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 18.4        |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A





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480 Neponset Street, Suite 9C  
Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S2**

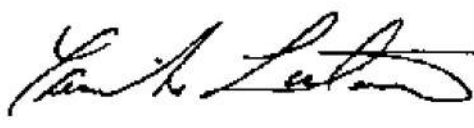
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S2  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-3 (5'-7')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 2.0         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A





Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S3**

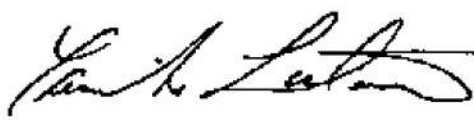
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S3  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-4 (0.5'-2.5')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 2.1         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A





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Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S4**

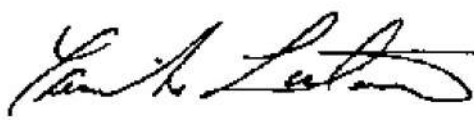
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S4  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-4 (5'-7')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 0.8         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A







Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S5**

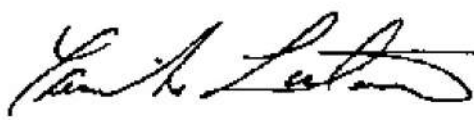
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S5  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-4 (10'-12')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 3.1         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A

## Site Images









November 19, 2020

Mr. Daniel P. Bradford, AIA  
Raymond Design Associates, Inc.  
60 Ledgewood Place  
Rockland, MA 02370  
E-mail: dbradford@rda-design.com

Subject: **Geotechnical Engineering Report  
Proposed New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458  
PSI Project No.: 04461007 (Rev. 1)**

Dear Mr. Bradford:

Thank you for choosing Professional Service Industries, Inc. (PSI), an Intertek company, as your consultant for the above referenced project. PSI is pleased to submit this report presenting the results of the geotechnical engineering studies regarding the proposed Metal Storage Building Addition at the Newton Commonwealth Golf Course in Newton, Massachusetts. Our services were conducted in accordance with PSI's Proposal No. 0446-299017 (Rev. 1) dated April 28, 2020 and PSI's Proposal No. 0446-321683 (Rev. 2) dated October 1, 2020.

PSI recommends that the geotechnical engineer and/or their representative be present during earthwork operations to observe the field conditions with respect to the design assumptions and specifications. PSI will not be held responsible for interpretations and field quality control observations made by others.

Should there be any questions regarding this report, please do not hesitate to call our office at (781) 821-2355. PSI would be pleased to continue providing geotechnical services throughout design and construction of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,  
**Professional Service Industries, Inc.**

A handwritten signature in black ink that reads "Brianna Hansen".

Brianna Hansen  
Project Manager

A handwritten signature in black ink that reads "Stephen M. Simonette".

Stephen M. Simonette, P.E.  
Principal Consultant

## GEOTECHNICAL ENGINEERING REPORT

For the Proposed

**New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458**

*Brianna Hansen*

Brianna Hansen  
Project Manager

Prepared for

**Raymond Design Associates, Inc.  
60 Ledgewood Place  
Rockland, MA 02370**

Prepared by

**Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021  
Telephone: (781) 821-2355  
Fax: (781) 821-6276**



*Stephen M. Simonette* 11/19/20  
Stephen M. Simonette, P.E.  
Principal Consultant

**PSI PROJECT NO. 04461007  
REV. 1**

**November 19, 2020**

# TABLE OF CONTENTS

|  |           |
|--|-----------|
| <b>1.0 PROJECT INFORMATION .....</b>             | <b>1</b>  |
| 1.1 PROJECT AUTHORIZATION .....                  | 1         |
| 1.2 PROJECT DESCRIPTION .....                    | 1         |
| 1.3 SITE DESCRIPTION .....                       | 2         |
| 1.4 EXPLORATION PROGRAMS .....                   | 2         |
| <b>2.0 SITE AND SUBSURFACE CONDITIONS.....</b>   | <b>3</b>  |
| 2.1 SUBSURFACE CONDITIONS .....                  | 3         |
| 2.1.1 <i>Local Geology</i> .....                 | 3         |
| 2.1.2 <i>Soil Test Borings</i> .....             | 4         |
| 2.1.3 <i>Depth of Explorations</i> .....         | 5         |
| 2.2 GROUNDWATER CONDITIONS.....                  | 5         |
| 2.3 SOIL LABORATORY TESTING .....                | 6         |
| 2.3.1 <i>Laboratory Results</i> .....            | 6         |
| 2.3.2 <i>Reuse of Excavated Soil</i> .....       | 6         |
| <b>3.0 RECOMMENDATIONS .....</b>                 | <b>7</b>  |
| 3.1 GENERAL .....                                | 7         |
| 3.2 FOUNDATIONS .....                            | 7         |
| 3.3 CONCRETE SLAB .....                          | 9         |
| 3.4 SEISMIC CONSIDERATIONS .....                 | 10        |
| 3.5 LATERAL EARTH PRESSURE RECOMMENDATIONS.....  | 11        |
| 3.6 RETAINING WALL BACKFILL RECOMMENDATIONS..... | 12        |
| <b>4.0 CONSTRUCTION CONSIDERATIONS.....</b>      | <b>13</b> |
| 4.1 EARTHWORK .....                              | 13        |
| 4.2 CONSTRUCTION DEWATERING .....                | 14        |
| 4.3 MATERIALS.....                               | 15        |
| <b>5.0 GEOTECHNICAL RISK.....</b>                | <b>16</b> |
| <b>6.0 REPORT LIMITATIONS.....</b>               | <b>16</b> |

## FIGURES

FIGURE 1: USGS SITE LOCATION PLAN

FIGURE 2: BORING LOCATION PLAN

FIGURE 3: SURFICIAL GEOLOGY

## APPENDIX A

BORING LOGS

PROBE LOGS

SOIL PROFILES

MATERIAL TEST REPORTS

SITE IMAGES



# 1.0 PROJECT INFORMATION

## 1.1 PROJECT AUTHORIZATION

Authorization to proceed with this project was provided by Mr. Daniel P. Bradford with Raymond Design Associates, Inc. by signing the Acceptance of Proposal on August 4, 2020 included with PSI's Proposal No. 0446-299017 (Rev. 1) and the Acceptance of Proposal on October 10, 2020 included with PSI's Proposal No. 0446-321683 (Rev. 2).

## 1.2 PROJECT DESCRIPTION

Project information provided to PSI includes:

- New Work Site Plan: A1.0 (dated 8/1/19)
- New Work Floor Plans: A1.1 (dated 8/1/19)
- New Work Reflective Ceiling Plans: A1.2 (dated 8/1/19)
- New Work Floor Plans: A1.3 (dated 8/1/19)
- Exterior Elevations: A2.0 (dated 8/1/19)
- Demolition Floor Plans: AD.1 (dated 8/1/19)
- Existing Site Plan: Ex1.0 (dated 8/1/19)
- Existing Conditions Plan (dated 9/7/20)

The project consists of the construction of a new, high-bay roof, pre-engineered metal building addition adjacent to and abutting the north side of the existing maintenance building; a chemical storage pad, a solids separator/recycled water treatment system and wash down pad north of the addition; and 500-gallon and 1,000-gallon fuel tanks/pumps south of the existing maintenance building.

The new addition will be a 2-story, pre-engineered metal structure having a footprint area of approximately 3,000 square feet. A below-grade basement level is not planned. New retaining walls are planned adjacent to the west side of the area planned for the aforementioned chemical storage/water treatment/washdown bay systems and adjacent to the west side of the fuel pump pads.

The new addition floor level will be similar to that of the northern side of the existing maintenance building. From the provided plans, we estimate the existing floor slab level is at an elevation near EL 100 feet. The west wall of the new addition will include a concrete retaining wall approximately 7 feet in height. The retaining wall will extend northwest with the aforementioned chemical storage/water treatment/washdown bay systems situated east of the wall. Ground surfaces extending west from the top of the new wall will be sloped uphill to the west to meet the existing EL 114 feet contour.

Anticipated structural loads for the new building addition were not provided. Therefore, this report is based on column loads not exceeding 150-kips, uplift load not exceeding 15-kips, wall loads not exceeding 3-klf, and slab loads not exceeding 150-psf. The new addition will be cut into the existing slope on the west side; therefore, grading cut excavations of about 4½ to 6½ feet are anticipated to attain the finished subgrade elevation for the new addition.





Should any of the information identified herein be incorrect or should supplemental information become available, PSI must be notified and have the opportunity to reassess conditions and amend the report where necessary.

The objective of our services summarized herein was to provide subsurface information and geotechnical engineering recommendations to members of the design team for use in designing foundations for the proposed building addition.

### 1.3 SITE DESCRIPTION

The referenced site (42° 20' 35.00" N, 71° 10' 09.00" W) is located at the Newton Commonwealth Golf Course at the site of the maintenance building at 58 Undine Road in Brighton, Massachusetts, as shown in *Figure 1, USGS Site Location Plan*. The property is along the town boundary limits between Newton and Brighton (neighborhood of Boston).

The site of the new addition is north of the existing maintenance building and includes bituminous concrete pavement (cart storage area) which slopes gradually downhill to the north and steeply sloping wooded terrain which ascends uphill to the west. Information contained on Google Earth indicates existing surface grades within this area to be approximately EL 95 to 114 feet, NAVD. The slope height is estimated to be approximately 12 to 18 feet and the inclination is estimated to be approximately 1H:1V. There is golf course turf grass at the top of the slope, which slopes downhill to the west. Bedrock outcroppings were clearly visible at the surface on the west side of the slope.

The existing maintenance building structure is of masonry wall construction with a concrete slab-on-grade and a roof eave height of approximately 16 feet. Exposed exterior CMU walls of the structure exhibit cracking.

### 1.4 EXPLORATION PROGRAMS

PSI conducted two geotechnical exploration programs at the site in conformance with generally accepted geotechnical engineering practices to provide subsurface information about the site. This information was utilized to develop geotechnical engineering recommendations for members of the design team for use on this project.

The subsurface exploration programs consisted of the performance of Standard Penetration Test (SPT) borings to assess the depth and characteristics of the underlying material. PSI marked out the exploration locations using the provided Site Plan and notified Dig Safe System, Inc. for public utility clearance prior to drilling. The exploration locations for the first exploration program were also scanned by a private utility location service, Ground Penetrating Radar Systems LLC, prior to performing the explorations at the site.

Soil X Corporation of Leominster, MA drilled four soil test borings on August 14, 2020 (Borings B-1 through B-4) and two soil test borings and five probes on November 9, 2020 (Borings B-3A and B-5 and Probes P1 through P-5) at the approximate locations shown in *Figure 2, Boring Location Plan*.



The borings were drilled near or within the proposed building footprint. Due to the steeply sloped terrain along the west side of the proposed addition and the fenced in cart storage area, the exploration locations were located as close to the proposed building addition footprint as feasible. The probes were drilled on the lowest portions of the existing slope (slope inclination too steep for on-slope probes and borings). A PSI representative observed the exploration activities for this project, retrieved soil samples for classification and testing, and prepared the attached Soil Test Boring Logs.

The borings were advanced by flush joint casing using a Geoprobe 7822DT drill rig equipped with a DH103 automatic hammer to depths of approximately 6½ to 14½ feet below the existing ground surfaces (bgs), where the borings encountered refusal. The probes were advanced by macrocore to depths of approximately 2½ to 8 feet bgs, where the borings encountered refusal.

Standard Penetration Test (SPT) and split spoon samples were retrieved at approximately 2-foot intervals to depths of approximately 7 to 12 feet bgs and at approximately 5-foot intervals thereafter. The number of hammer blows required to drive the sampler into the soil in 6-inch increments is recorded on the Soil Test Boring Logs attached in the Appendix for reference. The sum of the hammer blows for the second and third interval provides the Standard Penetration Resistance (N) and is a measure of soil strength. Five soil samples retrieved from the borings were selected for laboratory testing to assist in classifying the material. The remaining samples will be stored in our laboratory and disposed of after 6 months.

PSI classified the soil strata shown in the Soil Test Boring Logs based upon its interpretation of the subsurface conditions encountered at the boring locations. The stratifications shown on the Soil Test Boring Logs represent the conditions only at the actual boring locations and variations will occur and should be expected at other locations. It is also possible that there could be thin layers of material lying between the sampling intervals that are not described on the logs and which might not become known until construction. Likewise, the depth to each soil stratum is approximate and may be more gradual or different in the field.

## **2.0 SITE AND SUBSURFACE CONDITIONS**

### **2.1 SUBSURFACE CONDITIONS**

#### **2.1.1 LOCAL GEOLOGY**

Based on the “Plate 5 Surficial Geologic Map of the Newton Quadrangle, Massachusetts” compiled by C.M. Brankman in 2004, the surficial geology of the project site is glacio-fluvial deposits, which consists of primarily sand and gravel with cobbles, as shown in *Figure 3, Surficial Geology*. The subsurface conditions encountered at this site generally fits the geologic description.

Based on the “Bedrock Geologic Map of Massachusetts,” compiled by Zen, E-an, Goldsmith, Richard, Ratcliffe, N.M., Robinson, Peter, Stanley, R.S., Hatch, N.L., Shride, A.F., Weed, E.G.A., and Wones, D.R. in 1983, the bedrock geology generally consists of Roxbury Conglomerate, which consists of conglomerate, sandstone, siltstone, argillite, and melaphyre.



Apparent bedrock was encountered at depths ranging from approximately 2½ to 14½ feet bgs. The bedrock encountered within Boring B-5 was cored for classification.

### **2.1.2 SOIL TEST BORINGS**

The subsurface conditions encountered at the specific boring locations for the proposed building addition are presented as individual soil profiles and descriptions on the Soil Test Boring Logs in the Appendix. The stratification presented is based on a visual assessment of the recovered soil samples and the interpretation of field logs by a PSI representative. The Standard Penetration Test values (N-values), which are shown on the Soil Test Boring Logs, have been empirically correlated with various soil properties and are indicative of the relative density of cohesionless soils and the consistency of cohesive soils.

A brief description of the soils encountered at the site is presented in this section. Details are shown in the Soil Test Boring Logs.

**BITUMINOUS CONCRETE** – Approximately 3 inches of surficial Bituminous Concrete pavement was encountered at Borings B-1 and B-4. Note that the actual thickness of bituminous concrete may vary within the site and may be greater or lesser. The contractor should determine the depth of bituminous concrete pavement to quantify bituminous concrete depths for removal purposes.

**TOPSOIL** – At Borings B-2, B-3, B-3A, and B-5, approximately 7 to 10 inches of surficial Topsoil was encountered. Note that the actual amount of topsoil may vary widely between boring locations. The contractor should determine the depth of topsoil to quantify topsoil depths for removal purposes.

**FILL** – Approximately 1 to 9½ feet of material classified as Fill was encountered below the surficial topsoil at Borings B-2, B-3, B-3A, and B-5. The Fill material is most likely the result of original site development (possibly site grading). The general material description is brown, fine to coarse sand, trace silt, with little to some gravel. At Borings B-3, B-3A, and B-5, pieces of bituminous concrete, brick, concrete, and trace fibrous roots were present in the recovered samples, indicating the material to be Fill, and casing refusal was encountered at a depth of 9½ feet bgs. Standard Penetration Test (SPT) N-values ranged from 4 blows per foot (bpf) to 50 or more blows for 1 to 5 inches of sampler penetration, indicating very loose to very dense relative densities. In miscellaneous fill, the N-values can be erratic, reflecting the variable composition of the fill material. The presence of obstruction and/or cobbles within fill can result in locally high N-values, even in a very loose soil. Other obstructions may be present in a miscellaneous uncontrolled fill and may not be readily detectable with exploratory drill rig methods.

**SILTY SUBSOIL** – An approximately 2½ to 4-foot thick subsoil layer of Silty Sand to Sandy Silt soils were encountered immediately below the surficial bituminous concrete at Borings B-1 and B-4 and below the fill material at Boring B-2. At Boring B-5, the silty subsoil layer was encountered at approximately 8½ feet bgs. The general material description at Borings B-1, B-4, and B-5 is brown/orange, fine to medium sand, trace coarse sand, some silt, with little to some gravel and trace fibrous roots. The general material description at Boring B-2 is brown/orange, silt, some fine to medium sand, trace coarse sand, with trace to little gravel. The SPT N-values ranged from 7 to 44 bpf, indicating loose to dense relative densities and medium stiff to stiff consistencies.



**SAND AND GRAVEL** – At Borings B-1, B-2 and B-4, Sand and Gravel soils were encountered below the Silty Sand to Sandy Silt soils and extended to depths of approximately 6½ to 14½ feet bgs, where Borings B-1 and B-2 encountered refusal. The general material description is brown, fine to coarse sand, trace silt, with little to some gravel. The SPT N-values ranged from 26 bpf to 50 or more blows for 1 to 5 inches of sampler penetration, indicating medium dense to very dense relative densities, although the majority of the N-values were in the very dense relative density range.

**SANDY SILT** – Below the Sand and Gravel soils at Boring B-4, Sandy Silt soils were encountered, beginning at a depth of approximately 10 feet bgs and extending to a depth of approximately 12 feet bgs, where the boring encountered refusal. The general material description is brown, silt, some fine to medium sand, trace coarse sand, with little gravel. The SPT N-value was 50 or more blows for 1 to 5 inches of sampler penetration, indicating a hard consistency.

**REFUSAL** – Casing refusal was encountered at each boring location at depths ranging from approximately 6½ to 14½ feet bgs, which is interpreted to be bedrock. Macrocore refusal was encountered at each probe location. Refusal depths ranged from approximately 2½ to 8 feet bgs. At Boring B-5, rock cores were obtained (5 feet total) and the refusal material is classified as sandstone conglomerate bedrock. The sampled rock exhibited an RQD value of approximately 23 percent. Refer to the Soil Test Boring Log in the Appendix of this report for a graphical interpretation.

### **2.1.3 DEPTH OF EXPLORATIONS**

The following table provides the approximate depth of refusal for each exploration.

| <b>Location</b> | <b>Approx. Refusal Depth</b> | <b>Approx. Refusal Elevation</b> |
|-----------------|------------------------------|----------------------------------|
| Boring B-1      | 14½ feet bgs                 | EL 84.1                          |
| Boring B-2      | 6½ feet bgs                  | EL 105.8                         |
| Boring B-3      | 9½ feet bgs                  | EL 102.8                         |
| Boring B-3A     | 9½ feet bgs                  | EL 102.8                         |
| Boring B-4      | 12 feet bgs                  | EL 84.6                          |
| Boring B-5      | 9½ feet bgs                  | EL 103                           |
| Probe P-1       | 4 feet bgs                   | EL 95                            |
| Probe P-2       | 9 feet bgs                   | EL 91                            |
| Probe P-3       | 3 feet bgs                   | EL 98                            |
| Probe P-4       | 2½ feet bgs                  | EL 99.5                          |
| Probe P-5       | 8 feet bgs                   | EL 102.5                         |

## **2.2 GROUNDWATER CONDITIONS**

At the time of the borings (August and November 2020), groundwater infiltrating the borehole was not encountered during drilling and sampling operations. For safety purposes, all the borings were backfilled upon completion of drilling and sampling.



The observations represent the groundwater condition (or absence of) at the time of measurement and may not be indicative of other times. The level of groundwater below the ground surface fluctuates based on conditions such as season, temperature, and amount of precipitation that might be different from the time when the observations were made. Therefore, the groundwater levels can be higher or lower during construction and during the life of the structure. This fact must be taken into consideration when developing earthwork procedures.

## 2.3 SOIL LABORATORY TESTING

### 2.3.1 LABORATORY RESULTS

PSI tested soil samples for moisture content and gradation to assist in classifying the material and determining the percent fines (percent passing the Number 200 sieve). The material test reports for the samples are in the Appendix of this report and results are summarized in the following table.

| Boring No. | Sample No. | Sample Depth (feet) | USCS Classification <sup>1</sup>              | Moisture Content (%) | Fines Content (%) |
|------------|------------|---------------------|---|----------------------|-------------------|
| B-2        | S2         | 2'-4'               | Sandy Silt (ML)                               | 18.4                 | 50                |
| B-3        | S3         | 5'-7'               | Well-Graded Sand with Silt and Gravel (SW-SM) | 2.0                  | 9.7               |
| B-4        | S1         | 1.5'-2.5'           | Silty Sand with Gravel (SM)                   | 2.1                  | 24                |
| B-4        | S3         | 5'-7'               | Well-Graded Sand with Silt and Gravel (SW-SM) | 0.8                  | 8.6               |
| B-4        | S5         | 10'-12'             | Sandy Silt (ML)                               | 3.1                  | 56                |

<sup>1</sup>For USCS Soil Classification definitions, refer to the Soil Classification Chart in the APPENDIX

### 2.3.2 REUSE OF EXCAVATED SOIL

Based on the results of the laboratory testing, PSI anticipates that the excavated Sand and Gravel natural soil may meet the specific gradation requirements for Granular or Structural Fill. This material will be acceptable for reuse provided that the material continues to meet the project specifications and can be compacted to the required degree of compaction.

PSI anticipates that the excavated Silty Sand to Sandy Silt soils will not meet the gradation requirements for Granular or Structural Fill and might also be difficult to reuse as common compacted borrow because of the silt content. The high silt content makes the material sensitive to disturbance when wet and difficult, if not, impossible to recompact without drying the soil. As a result, the material must be dried, which might be difficult to accomplish during the fall, winter, and spring seasons of the year.

The Fill material meets the gradation requirements for Granular or Structural Fill, however, pieces of bituminous concrete were observed within some soil samples, which might eliminate reusing the material. If there are any contamination concerns within the materials excavated, the suitability for reuse should be addressed by a qualified environmental consultant. Specific environmental studies were not part of our scope of services. PSI's branch which provides environmental consultation could be engaged for further studies during site development and construction.



## 3.0 RECOMMENDATIONS

### 3.1 GENERAL

The following geotechnical design recommendations have been developed for the proposed building addition based on the previously described project information and subsurface conditions encountered at this site. If there are any changes in the project criteria, PSI should review the changes to determine if modifications to these recommendations are necessary.

Along the western side of the new addition, the provided topographic contour information indicates existing grades ranging from approximately EL 104 to EL 106 feet. To attain the finished subgrade elevation for the new addition, cut excavations of about 5½ to 7½ feet are anticipated.

Borings B-2, B-3, B-3A, and B-5, performed near the west side of the addition, encountered casing refusal conditions at estimated elevations ranging from approximately EL 102.8 to EL 105.8 feet, which is above the design finished floor level. Borings B-1 and B-2 encountered refusal conditions at approximately EL 84.1 and EL 84.6 feet. Therefore, the refusal depths (bedrock) appear to slope downward to the east. The probes, performed on the lowest portions of the existing steep slope, encountered refusal conditions at estimated elevations ranging from approximately EL 91 to EL 102.5. Therefore, the refusal depths (bedrock) appear to also slope downward to the north. At the west wall of the new addition, refusal/bedrock conditions are anticipated to be close to (area of southwest corner) and at (area approaching and at the northwest corner) the finished floor level. Difficult excavation in bedrock should be anticipated in the building area and where lay-back excavation of the existing slope is required. While the RQD value of the cored rock is relatively low (~23%), relatively hard conditions should be anticipated, requiring special hammer and ripper equipment.

Based on our borings, conventional footing foundations and a grade-supported floor slab should be suitable for support of the planned addition, retaining wall, and concrete pads for new appurtenances. Additional recommendations are presented in the following sections.

### 3.2 FOUNDATIONS

Exterior footings should be placed at least 4 feet below the lowest adjacent exterior finished grade for frost protection and interior footings should be placed at the nominal depth below the floor slab as required by the Building Code.

Conventional footing foundations bearing in approved natural soils and new, properly compacted, Structural Fill may be proportioned using a maximum allowable net bearing pressure of 2 tsf (4,000 psf). These pressures are acceptable if the minimum foundation width is 3 feet. For widths less than 3 feet, the design pressure recommended above should be reduced by a factor of B/3, where B is the actual footing width. For this pressure, settlements should be within tolerable limits of 1-inch total and ½-inch differential over 20 feet.



At the anticipated minimum bearing levels required for frost protection, we anticipate that native soils will be present at a majority of the building area and that rock will be present approaching the west side of the structure. For control of potentially excessive differential settlement where footings bear on dissimilar materials, we recommend rock be removed to a depth of 12 inches below the design bearing levels and replaced with compacted Structural Fill (please see Section 4.3 of this report for material gradation recommendations). The Structural Fill should be in contact with the rock below the entire footprint of the excavation. In the event that the rock is too hard to be removed, foundations bearing on rock should be designed for 2.5 tsf and additional top and bottom longitudinal reinforcement is recommended for continuous footings, extending a minimum of 5 feet in each direction longitudinally from the soil-rock transition point. Wall footings that transition from soil to rock should have a transition zone extending 8 feet along both the soil and adjacent rock surface. The transition zone material should be Structural Fill extending at least 6 inches beyond the edges of the wall footing.

If the rock cannot be removed down to design grade and the rock is solid, then the footings can be pinned to the rock by drilling and epoxying reinforcing. Footings on rock sloped greater than 1 vertical to 6 horizontal should be pinned to the rock.

PSI recommends that wall footings have a minimum width of 18 inches and that column footings have a minimum width of 24 inches, regardless of the actual bearing pressure. Wall footings should be provided with continuous longitudinal steel reinforcement as determined by the structural engineer, for greater bending strength so they can span across small areas of loose or soft soils that may go undetected during construction.

Footings for the chemical storage pad, solids separator/recycled water treatment system, and wash down pad north of the addition, and the 500-gallon and 1,000-gallon fuel tanks/pumps south of the existing maintenance building may be proportioned based on a maximum allowable net bearing pressure of 4 tsf. These foundations should bear entirely on rock or approved soils. Where footings within the pad footprints consist primarily but not completely of rock, we recommend the soils be overexcavated to the rock and replaced with lean concrete. Such conditions can be further assessed and additional recommendations provided by PSI based on actual conditions encountered.

All foundation bearing materials consisting of soil should be proof-compacted to densify these materials as a result of the excavation process or if loose in their natural state. Densifying the soil below the footing grade is important to provide relatively uniform compact conditions and to test for potentially weak areas. The contractor must take care when compacting so that the silty soil does not become disturbed and weakened, especially if moist. The contractor must also adjust the procedure accordingly.

After excavating and compacting the foundation soils, the contractor may elect (means and methods) to place a 4 to 6-inch layer of  $\frac{3}{4}$ -inch angular crushed stone over the footing subgrade to provide a firm working surface, reduce the possibility of disturbing the footing subgrade, and to provide a drainage layer to remove water that might accumulate due to groundwater or precipitation. Footings bearing on new, properly placed and compacted Structural Fill do not require a stone layer below the footing. These requirements should also be placed in the contract documents so that the work becomes part of the contract price.



Footing reinforcement and concrete should be placed as soon as practical following completion of excavation to final grade and proof-compacting the footing subgrade. Once the footing concrete is placed, the foundations should be backfilled with Structural Fill as soon as the concrete has cured to an acceptable degree to allow backfilling. The backfill serves to protect the footing as a component of overturning resistance and prevents accumulation of water around the foundations which can soften and weaken the bearing soils. The ground surface near the completed foundations should be sloped to drain away from the foundations throughout construction to avoid accumulation of moisture in the subgrade soils.

The foundation subgrade should be observed by the geotechnical engineer of record or a representative prior to formwork to document that the foundation materials are consistent with this report.

### 3.3 CONCRETE SLAB

Subsurface soil conditions are suitable for supporting a slab-on-grade for the building after excavating or filling to the base course subgrade layer and proof-rolling the footprint to tighten the subgrade soil. Fill required to raise the site to the slab base course grade should be compacted Structural or Granular Fill.

The slab subgrade should be proof-rolled to verify that the soil is firm prior to constructing the slab base course layer. A vibratory drum compactor (5-ton minimum weight at the drum) should be used, making at least 5 passes over the subgrade at the bottom of the excavation. Weak or soft soil should be replaced with compacted Structural or Granular Fill.

To reduce the possibility of capillary rise of groundwater and moisture into the floor slab, PSI recommends that the concrete floor slabs be constructed over a 4-inch thick layer of compacted, freely draining base course material such as the ¾-inch angular Crushed Stone or a 6-inch thick layer of Dense Graded Crushed Stone, both as specified herein. Base course soil material must be compacted to at least 95% of the maximum dry density determined in accordance with ASTM D1557. Crushed Stone must be tamped into firm interlock so that it is firm and stable.

PSI recommends that a continuous vapor retarder of at least 10-mil thick, or as specified by the structural engineer, be installed between the slab and the base course to reduce migration of moisture.

For subgrade prepared as recommended and properly compacted fill, a modulus of subgrade reaction,  $k$  value, of 150 pounds per cubic inch (pci) may be used in the grade slab design based on values typically obtained from 1 ft. x 1ft. plate load tests. However, depending on how the slab load is applied, the value will have to be geometrically modified. The value should be adjusted for larger areas using the following expression for cohesive and cohesionless soil:

Modulus of Subgrade Reaction,  $k_s = \left(\frac{k}{B}\right)$  for cohesive soil and  $k_s = k \left(\frac{B+1}{2B}\right)^2$  for cohesionless soil

where:  $k_s$  = coefficient of vertical subgrade reaction for loaded area  
 $k$  = coefficient of vertical subgrade reaction for 1x1 square foot area  
 $B$  = width of area loaded, in feet





Cosmetic cracking of slabs-on-grade is normal and should be expected. Cracking can occur not only as a result of heaving or compression of the underlying soil, but also as a result of concrete curing stresses. To reduce the potential for cracking, the following listed precautions should be closely followed for construction of all slabs-on-grade:

- PSI recommends installing construction joints between the floor slab and the walls and columns to account for differential settlement between the footings and slab. Concrete slabs should be jointed according to the American Concrete Institute (ACI) requirements, or other suitable code.
- All backfill in areas supporting slabs should be moisture conditioned and compacted. Backfill in all interior and exterior water and utility line trenches should be carefully compacted to match adjacent soils.
- Exterior slabs should be isolated from the building. These slabs should be constructed to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

### 3.4 SEISMIC CONSIDERATIONS

Subsurface conditions beginning at the surface of the site within the building addition footprint consist of loose to very dense Fill material underlain by medium stiff to stiff Sandy Silt soils and medium dense to dense Silty Sand soils, then medium dense to very dense Sand and Gravel soils underlain by hard Sandy Silt soils to the depths explored. At each boring, refusal was encountered at depths ranging from approximately 6½ to 14½ feet bgs, which is interpreted as bedrock.

Therefore, it is PSI's opinion that the site should be classified as Site Class C as defined in the Building Code and using the available information, if necessary, for design. Seismic values based on Site Class C are presented in the following table.

| 2015 International Building Code and Massachusetts Amendments | Reference         | Equation       | Value |
|---|-------------------|----------------|-------|
| <b>City – Boston, MA</b>                                      |                   |                |       |
| Site Class Definition   | 1613.3.2          | C              |       |
| Earthquake Design Factors (short)                             | Table 1604.11     | $S_s$          | 0.217 |
| Earthquake Design Factors (1 -sec)                            | Table 1604.11     | $S_1$          | 0.069 |
| Site Coefficient - $F_a$                                      | Table 1613.3.3(1) | $F_a$          | 1.2   |
| Site Coefficient - $F_v$                                      | Table 1613.3.3(2) | $F_v$          | 1.7   |
| Max EQ spectral response - $S_{MS}$                           | Eq 16-37          | $F_a * S_s$    | 0.260 |
| Max EQ spectral response - $S_{M1}$                           | Eq 16-38          | $F_v * S_1$    | 0.117 |
| Design spectral response acceleration - $S_{DS}$              | Eq 16-39          | $2/3 * S_{MS}$ | 0.173 |
| Design spectral response acceleration - $S_{D1}$              | Eq 16-40          | $2/3 * S_{M1}$ | 0.078 |



The subsurface conditions to the depth explored at the site were also assessed for its liquefaction potential using the guidance provided in the 2015 International Building Code. It is PSI's opinion that the site is not susceptible to liquefaction to the depths explored.

### 3.5 LATERAL EARTH PRESSURE RECOMMENDATIONS

The west wall of the proposed building addition will include a concrete retaining wall approximately 7 feet in height. Additionally, new retaining walls are planned adjacent to the west side of the area planned for the aforementioned chemical storage/water treatment/washdown bay systems and adjacent to the west side of the fuel pump pads.

Lateral earth pressure is developed from the soils present within a wedge formed by the vertical wall and an imaginary line extending up and away from the bottom of the wall at an approximate angle from the horizontal of  $45 + \frac{1}{2}\phi$ , where  $\phi$  is the angle of internal friction for existing soils adjacent to the wall backfill zone. The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K.

The site retaining walls must be designed to resist both the superimposed effect of the total static lateral earth pressure and seismic forces. A site retaining wall designed to permit a limited amount of outward rotation should be designed using the "active" lateral earth pressure ( $K_a$ ). Seismic forces should be applied as stated in the latest addition of the Building Code.

Recommended parameters for use in wall designs are presented as follows:

#### Recommended Parameters for use in Retaining Wall Design

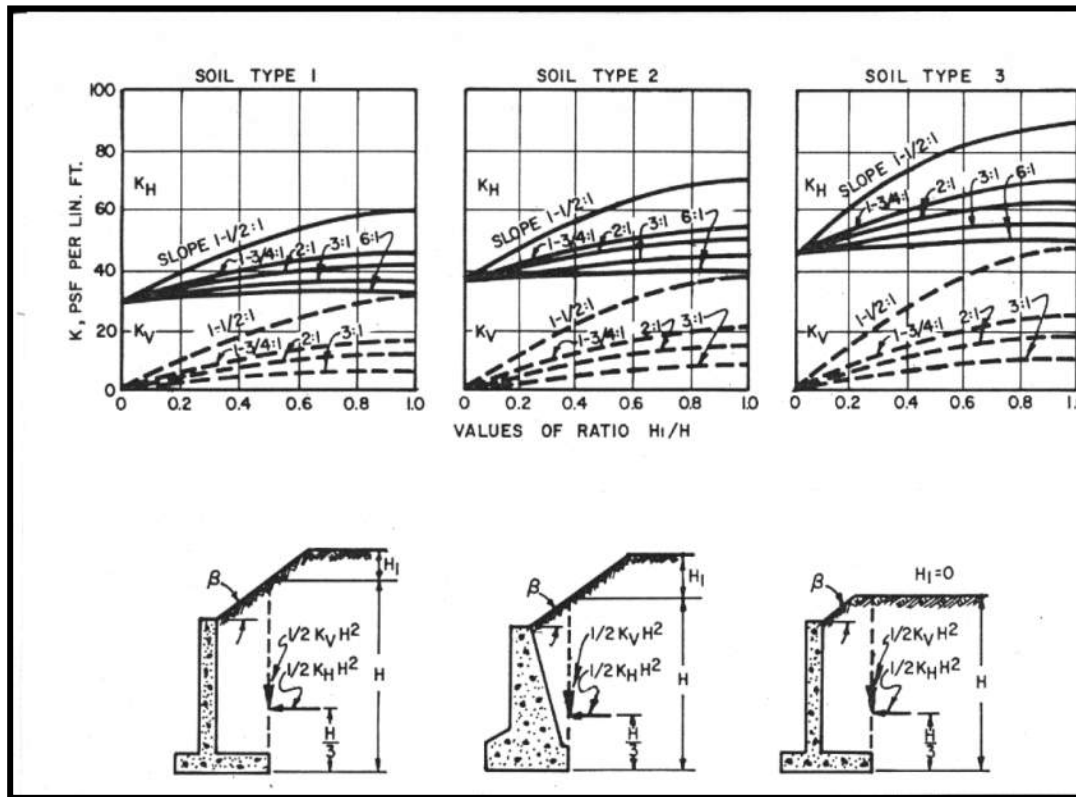
| Material Type           | Drained Friction Angle ( $\Phi'$ ), degrees | Total Density $\gamma$ (pcf) | Earth Pressure Coefficient ** |                  |                   |
|-------------------------|---|------------------------------|-------------------------------|------------------|-------------------|
|                         |   |                              | At-Rest ( $K_o$ )             | Active ( $K_a$ ) | Passive ( $K_p$ ) |
| On-Site Soils           | 30  | 120                          | 0.50                          | 0.33             | 1.50              |
| Wall Drainage Aggregate | 35  | 110                          | 0.43                          | 0.27             | 2.46              |
| Granular Backfill       | 33  | 125                          | 0.46                          | 0.29             | 2.26              |

*\*\* Earth pressure coefficients valid for level and drained backfill conditions. These values may be used for design only if the aggregate backfill extends back from the wall certain distances. These are a horizontal distance approximately equal to or greater than the total height of the wall at the surface, and at least one-foot beyond the heel of the wall footing. A Factor of Safety of 1.5 has been applied to passive pressure coefficients.*

The pressure coefficients presented above assume level slope conditions behind the wall. However, the designs of below-grade building walls and site retaining walls should consider the effects of geometry and loading conditions.

The following charts have been included from NAVFAC 7.02 concerning inclined slopes extending above retaining wall structures. Depending on the geometry of the site, the lateral loading on the wall should be modified according to these charts. Although the charts include a Soil Type 3 which consists of fine-grained soils, that soil type is never recommended for new construction. That chart is intended for evaluating existing conditions that include that soil type.





Soil Type 1 – Clean Sand and Gravel, GW, GP, SW, SP

Soil Type 2 – Dirty Sand and Gravel of Restricted Permeability, GM, GM-GP, SM-SP, SM

Soil Type 3 – Stiff Residual Silts and Clays, Silty Fine Sands, Clayey Sands and Gravels: CL, ML, CH, MH, SM, SC, GC

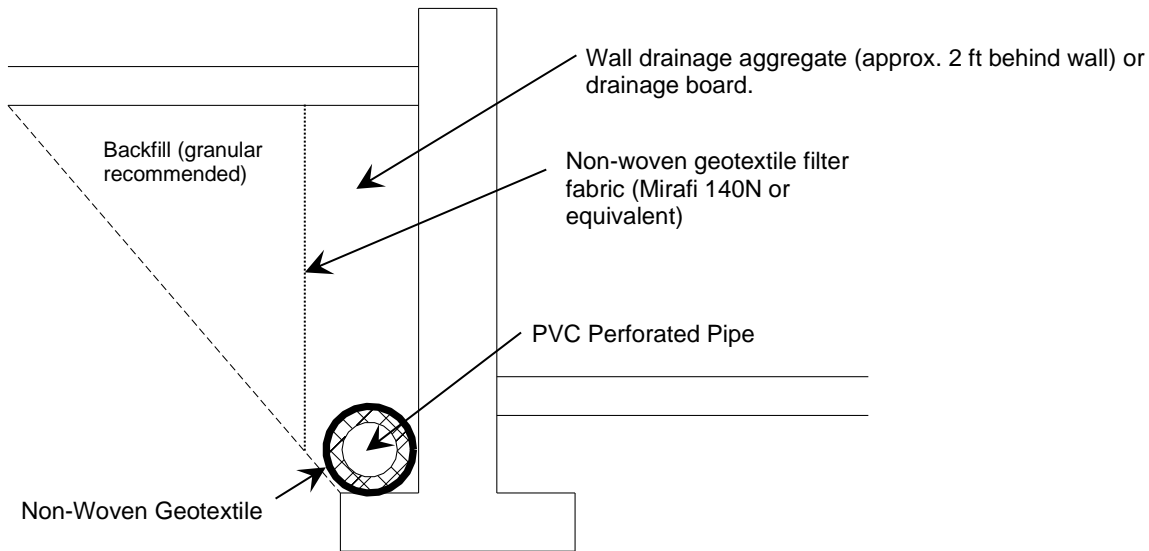
The values presented above were calculated based on positive foundation drainage being provided to prevent the buildup of hydrostatic pressure. An “equivalent fluid” pressure can be obtained from the above table values by multiplying the appropriate K-factor times the total unit weight of the soil. This applies to unsaturated conditions only. If a saturated “equivalent fluid” pressure is needed, the effective unit weight (total unit weight minus unit weight of water) should be multiplied times the appropriate K-factor and the unit weight of water added to that resultant. However, PSI does not recommend that the walls be designed with a hydrostatic load and PSI does recommend that drainage should be provided to relieve the pressure.

### 3.6 RETAINING WALL BACKFILL RECOMMENDATIONS

The backfill materials should be placed in lifts that do not exceed 4 to 6-inches loose. The lift thickness may need to be reduced to thinner lifts immediately behind the walls to achieve the desired compaction without overstressing the wall with the compaction process. The backfill materials should be compacted to at least 95% of the Modified Proctor maximum dry density (ASTM D1557). If granular materials do not exhibit a well-defined moisture-density relationship curve per ASTM D1557, they should be compacted to at least 70% relative density per ASTM D4253/4254.



Backfill that is placed within 5 feet of the walls, should be placed in thinner lifts with hand compaction equipment to achieve the specified density. Heavy compactors and grading equipment should not be allowed to operate within these limits during the backfilling of the retaining wall to reduce the developing of excessive temporary or long-term lateral soil pressures from the installation process. PSI recommends that a representative of the geotechnical engineer be present to monitor the below grade wall excavation, construction, and backfilling processes. Care should be exercised during the backfilling operation to prevent overstressing and damaging the wall. A typical wall cross-section is as follows:



The placement of a limited amount of granular material behind a site retaining wall does not appreciably change the coefficient of lateral earth pressure acting on that wall. The lateral earth pressure acting on a retaining structure is a function of the weight of the soil that exists above the theoretical plane projecting up from the heel of the wall footing (the back of the footing at the base of the wall). The soil above this plane is held in place by two forces, the strength of the soil itself and the lateral resistance of the wall. Therefore, a thin layer of granular material behind the wall (such as a vertical drain on the back of the wall) is of little consequence on the soil forces acting on the wall; however, it will have significant consequences for wall drainage and, therefore, hydrostatic pressures.

## 4.0 CONSTRUCTION CONSIDERATIONS

### 4.1 EARTHWORK

In the preceding sections, PSI has outlined several recommendations for earthwork. There are additional recommendations provided herein which should be incorporated into the structural design and Contract Documents.



1. Following initial demolition (removal of existing pavements, concrete, utilities to be abandoned/relocated) and removal of all surficial vegetation, topsoil, root mat, shrubbery, and trees (including root systems and root balls) at the design finished subgrades in planned cut areas and prior to placement of new fill (if needed), the exposed subgrades should be proof-rolled using a minimum 10-ton, smooth-drum roller. Proof-rolling should be performed in the presence of a representative of PSI. Subgrade materials exhibiting yielding and/or rutting conditions should be scarified, aerated, and re-compacted, removed and replaced, or stabilized in place through addition of geo-grid and/or coarse aggregate.
2. Soil compaction criteria requires compaction of at least 95 percent of the maximum dry density determined in accordance with ASTM D1557 at plus/minus 2% of the optimum moisture content. Lifts must be controlled so that they do not exceed 6 inches in confined areas and 12 inches in open areas where larger compactors can be utilized. Use hand-operated equipment within 10 feet behind retaining walls and do not over-compact the backfill material. All fill placed within and below the structure must be compacted in accordance with ASTM D1557.
3. All excavations shall be stabilized by cutting back the side slopes or using shoring and bracing as required by 29 CFR 1926 Subpart P, Excavations. Plans and specifications should refer to this requirement so that contractors are aware of their responsibility.
4. Drainage must not be directed onto adjacent property either during construction or as part of the design grading, especially if this would affect groundwater and / or moisture conditions on the adjacent parcel.
5. Proof-compact the foundation soil at each footing excavation to verify that the material is firm and compact. If the material is silty, a 4 to 6-inch thick layer of ¾-inch crushed stone material should be placed over the foundation subgrade and tamped into tight interlock.

## 4.2 CONSTRUCTION DEWATERING

Groundwater was not observed within the borings during the field exploration program at the site. Therefore, excavations are not expected to encounter groundwater.

Should groundwater or wet conditions be encountered, it is PSI's opinion that dewatering can be handled by pumping from the bottom of the excavation. If dewatering is necessary, the contractor is solely responsible for designing all dewatering systems and maintaining a groundwater level that is at least 24 inches below the bottom of the excavation so that the bottom of the excavation remains firm and dry to allow placing and compacting of fill.

The contractor is responsible for maintaining a dewatered and firm subgrade condition and is solely responsible for selecting the method of groundwater control, designing, and maintaining the system. PSI recommends that this requirement be stated in the project specifications.



### 4.3 MATERIALS

PSI recommends that the following material gradations and names be used for consistency on the drawings and in the earthwork specifications. All material must be well graded between the limits shown herein and be capable of being compacted to the required degree of density. The material shall have sufficient fines so that it does not shove and remains stable.

PSI also recommends that the specifications not allow the use of recycled material such as reprocessed building demolition material. Material having more than 30 percent retained on the ¾-inch sieve may be difficult to test for compaction. Therefore, PSI recommends that the material selected also be satisfactory for compaction testing purposes.

#### Common Borrow

Friable, natural soil containing no gravel greater than 2/3 loose lift thickness and free of trash, snow, ice, organics, roots, and tree stumps and no more than 35 percent passing the No. 200 sieve. Common borrow can be used as general site backfill provided it can be compacted and stabilized for the intended purpose.

#### Structural Fill (recommended for over-excavation backfill below footing grade):

Natural or processed materials meeting the following grading ranges.

| Sieve Size | Percent Finer |
|------------|---------------|
| 3-inches   | 100           |
| ½-inches   | 50 - 100      |
| No. 4      | 30 - 85       |
| No. 10     | 20 - 75       |
| No. 40     | 5 - 35        |
| No. 200    | 0-10          |

#### Granular Fill (recommended for general site fill and backfill above footing grade):

Natural or processed materials meeting the following grading ranges.

| Sieve Size | Percent Finer |
|------------|---------------|
| 2-inches   | 100           |
| No. 10     | 30 - 95       |
| No. 40     | 10 - 70       |
| No. 200    | 0 - 15        |



Dense Graded Crushed Stone (recommended as the granular base for floor slabs):

Dense graded crushed rock meeting the following grading ranges.

| Sieve Size | Percent Finer |
|------------|---------------|
| 2-inch     | 100           |
| 1½-inch    | 70 - 100      |
| ¾-inches   | 50 - 85       |
| No. 4      | 30 - 55       |
| No. 50     | 8 - 24        |
| No. 200    | 3 - 10        |

Crushed Stone:

The crushed stone should meet the requirements for material M2.01.4 (¾-inch gradation) stated in the Massachusetts Highway Department Standard Specifications for Highways and Bridges.

## 5.0 GEOTECHNICAL RISK

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. Site exploration identifies actual subsurface conditions only at those points where samples are taken.

A geotechnical report is based on conditions that existed at the time of the subsurface exploration. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitute PSI's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and PSI's experience in working with these conditions.

## 6.0 REPORT LIMITATIONS

PSI's professional services have been performed and our findings presented in accordance with generally accepted geotechnical engineering principles and practices. PSI is not responsible for the conclusions, opinions, or recommendations made by others based on this data. No other warranties are implied or expressed. As stated previously, our recommendations are made based on the limited information available.



The scope of explorations was intended to assess soil conditions within the influence of the proposed foundations. The analyses and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. If subsoil variations become evident during this project, a re-assessment of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered. The applicability of the report should also be reviewed in the event significant changes occur in the design, nature, or location of the proposed structure.

The scope of our services does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our Client.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminate in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Site conditions are outside of PSI's control, and mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible of the occurrence or recurrence of mold amplification.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.





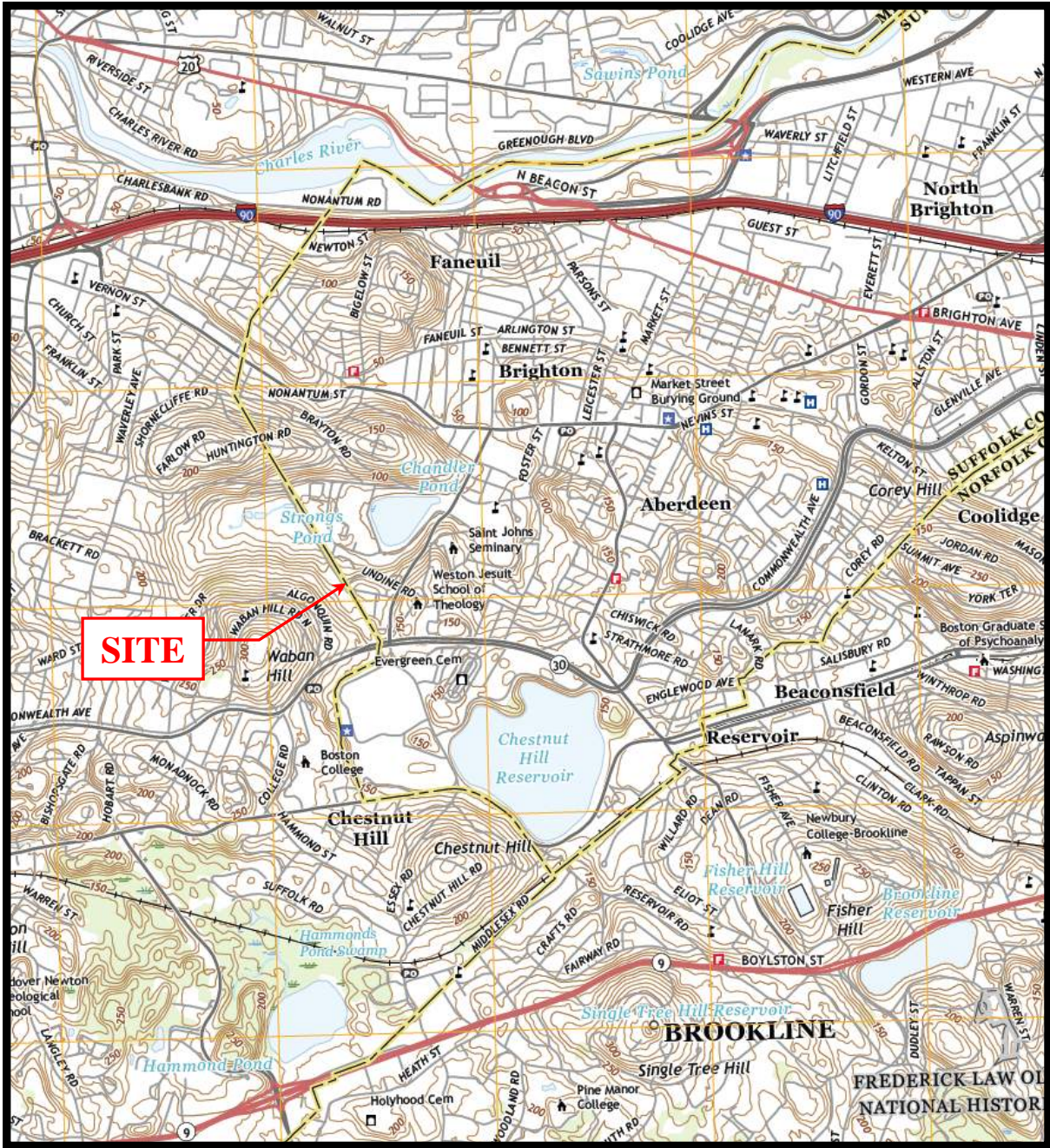
# FIGURES

**Figure 1: USGS Site Location Plan**

**Figure 2: Boring Location Plan**

**Figure 3: Surficial Geology**




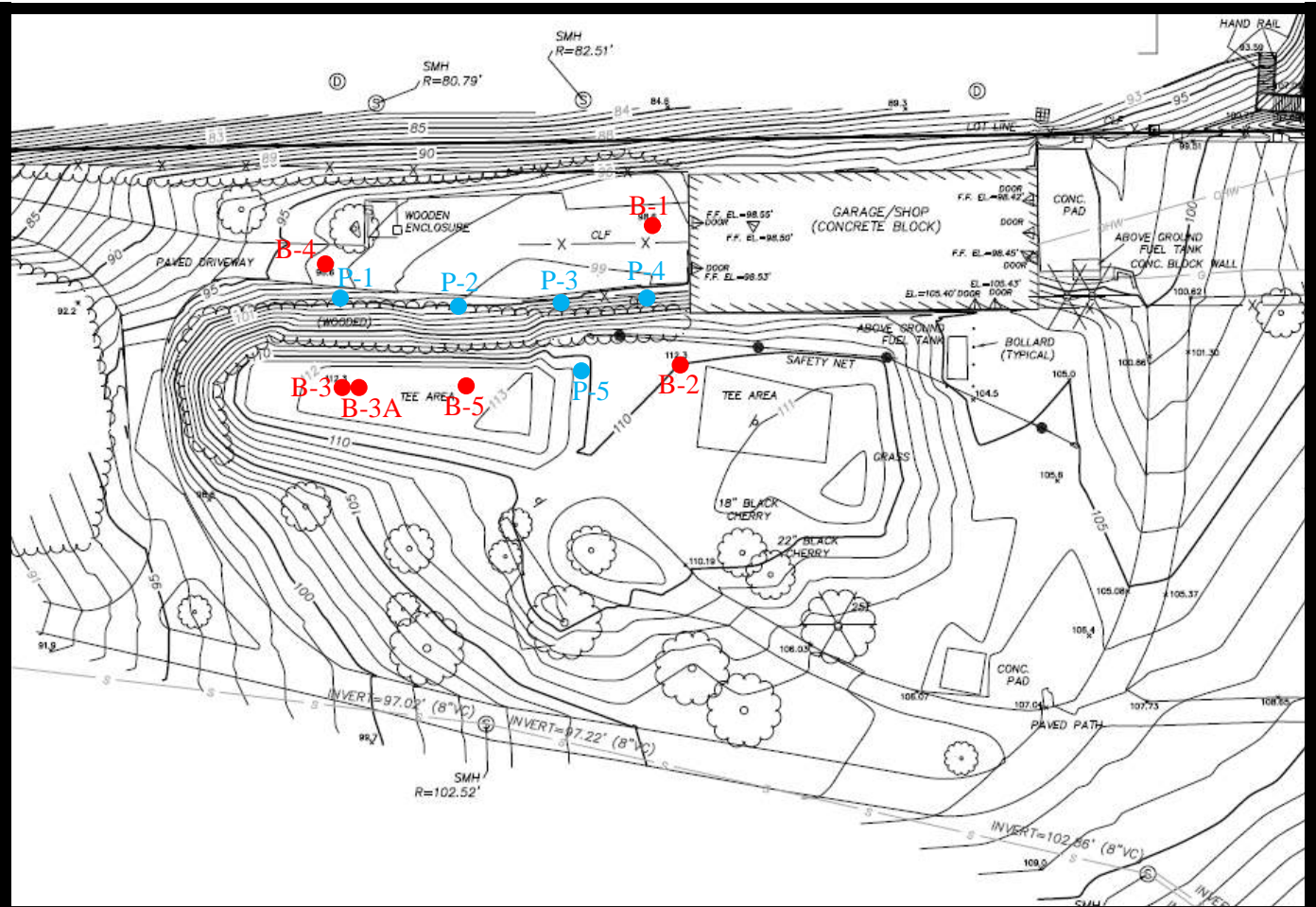


REFERENCE: U.S.G.S. "NEWTON, MA" 7.5' QUADRANGLE MAP  
 ISSUED: 2018

**FIGURE 1: USGS SITE LOCATION PLAN**

**PROJECT NAME:**  
 Proposed New Metal Storage Building Addition  
 Newton Commonwealth Golf Course  
 212 Kenrick Street, Newton, MA 02458

|   |                        |               |              |
|---|------------------------|---------------|--------------|
|  | <b>PSI Project No.</b> | <b>Date</b>   | <b>Scale</b> |
|   | 04461007<br>(Rev. 1)   | November 2020 | N.T.S.       |

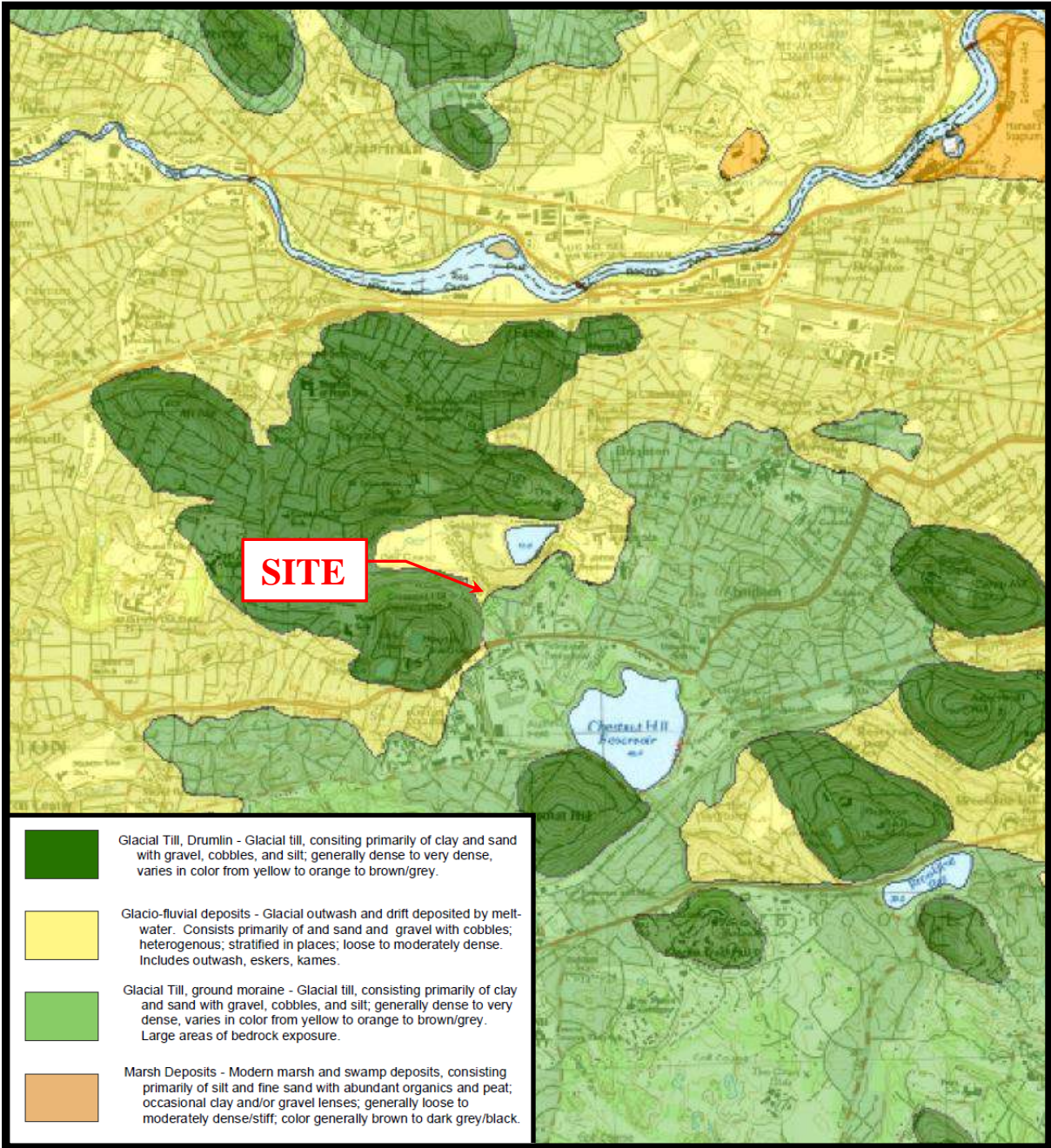


● Boring Location

● Probe Location

- Base Plan is Existing Conditions Plan (dated 9/7/20) provided by Client.
- Borings were located in the field by PSI. Locations are approximate.
- Borings/Probes drilled on August 14, 2020 and November 9, 2020 by Soil X Corp. of Leominster, MA.

| FIGURE 2: BORING LOCATION PLAN   | PSI Project No.      | Date             |  |
|--|----------------------|------------------|--|
| <b>PROJECT:</b><br>Proposed New Metal Storage Building Addition<br>Newton Commonwealth Golf Course<br>212 Kenrick Street, Newton, MA 02458 | 04461007<br>(Rev. 1) | November<br>2020 |  |



**REFERENCE:** "Plate 5 Surficial Geologic Map of the Newton Quadrangle, Massachusetts"  
Compiled by C.M. Brankman - 2004

**FIGURE 3: SURFICIAL GEOLOGY**

**PROJECT NAME:**

Proposed New Metal Storage Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458



**PSI Project No.**

04461007  
(Rev. 1)

**Date**

November  
2020

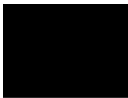
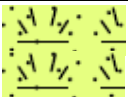





**Scale**

N.T.S.

# APPENDIX

## Boring Logs

### Legend for Graphic Log

|   |                                 |
|---|---------------------------------|
|    | <b>Bituminous Concrete</b>      |
|    | <b>Topsoil</b>                  |
|   | <b>Fill</b>                     |
|  | <b>Silty Sand to Sandy Silt</b> |
|  | <b>Sand and Gravel</b>          |
|  | <b>Sandy Silt</b>               |
|  | <b>Bedrock</b>                  |



**DATE STARTED:** 8/14/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 8/14/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 14.5 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 98.6 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen  
**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

# BORING B-1

**Water**    Dry

**BORING LOCATION:**

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION   | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |             |             |            |                   | Approximately 3" of bituminous concrete  |                     |                           |             |               |                    |
|                  | 1            |             |             | 1          | 10                | Medium dense, brown/orange, fine to medium sand, trace coarse sand, some silt, little gravel, trace fibrous roots<br><b>(Loamy eolian deposit)</b> |                     | 6-7-9-24<br>N=16          |             |               |                    |
| 95               | 2            |             |             | 2          | 15                | Very dense, brown, fine to coarse sand, trace silt, little to some gravel<br><b>(Sandy basal till)</b>   |                     | 28-56-63/4"               |             |               |                    |
| 5                | 3            |             |             | 3          | 6                 | Very dense, brown, fine to coarse sand, trace silt, little to some gravel<br><b>(Sandy basal till)</b>   |                     | 103-50/1"                 |             |               | >>⊙                |
| 10               | 4            |             |             | 4          | 16                | Very dense, brown, fine to coarse sand, trace silt, some gravel<br><b>(Sandy basal till)</b>   |                     | 42-46-69-44<br>N=115      |             |               | >>⊙                |
| 85               |              |             |             |            |                   | Refusal encountered at ~ 14.5 feet bgs   |                     |                           |             |               |                    |

STANDARD PENETRATION TEST DATA

N in blows/ft ⊙

X Moisture      ⊠ PL  
                          ⊕ LL

Moisture, %

0 25 50

STRENGTH, tsf

▲ Qu      \* Qp

0 2.0 4.0




Professional Service Industries, Inc.  
 480 Neponset Street, Suite 9C  
 Canton, MA 02021  
 Telephone: (781) 821-2355

**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458






**DATE STARTED:** 8/14/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 8/14/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 6.5 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 112.3 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING B-2

**Water**  Dry  
  


**BORING LOCATION:** \_\_\_\_\_

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

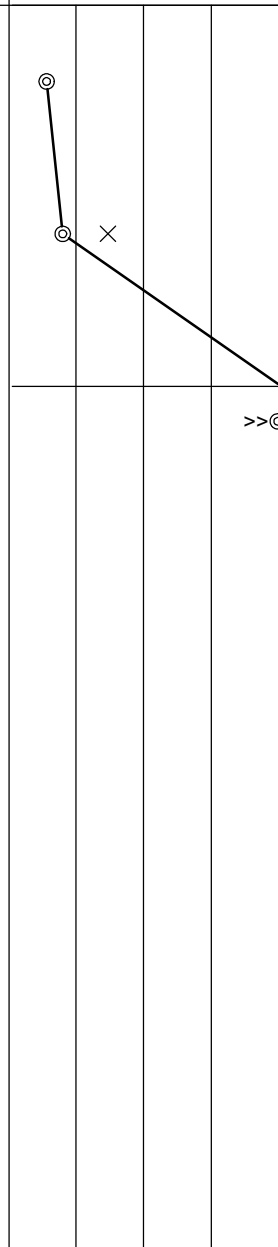
| Elevation (feet) | Depth (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION  | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|---|-------------|------------|-------------------|---|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |  |             |            |                   | Approximately 7" of topsoil   |                     |                           |             |               |                    |
|                  |              |  |             | 1          | 19                | Loose, dark brown, fine to coarse sand, trace silt, little gravel ( <b>Fill</b> )   |                     | 1-3-4-5<br>N=7            |             |               |                    |
|                  |              |  |             |            |                   | Medium stiff, brown/orange, silt, some fine to medium sand, trace coarse sand, trace to little gravel ( <b>Loamy eolian deposit</b> ) |                     |                           |             |               |                    |
| 110              |              |  |             | 2          | 9                 | Stiff, brown/orange, silt, some fine to medium sand, trace coarse sand ( <b>Loamy eolian deposit</b> )                                |                     | 4-6-4-4<br>N=10           | 18          |               | -200 = 50%         |
|                  |              |  |             | 3          | 10                | Very dense, brown, fine to coarse sand, trace silt, some gravel ( <b>Sandy basal till</b> )   |                     | 25-60/5"                  |             |               | >>⊕                |
|                  |              |   |             |            |                   | <b>Refusal encountered at ~6.5 feet bgs</b>   |                     |                           |             |               |                    |

STANDARD PENETRATION TEST DATA  
N in blows/ft ⊕

× Moisture      ⊕ PL  
                          ⊕ LL

STRENGTH, tsf

▲ Qu      \* Qp



Professional Service Industries, Inc.  
 480 Neponset Street, Suite 9C  
 Canton, MA 02021  
 Telephone: (781) 821-2355

**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458


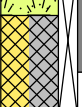
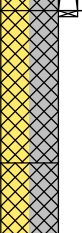
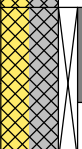
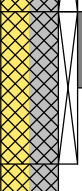
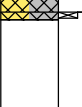
**DATE STARTED:** 8/14/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 8/14/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 9.5 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 112.3 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING B-3

**Water**  Dry  
  


**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

| Elevation (feet) | Depth (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION   | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|---|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |    |             |            |                   | Approximately 8" of topsoil  |                     |                           |             |               |                    |
|                  |              |    |             | 1          | 17                | Medium dense, dark brown, fine to coarse sand, trace to little silt, little gravel (Fill)                              |                     | 2-5-7-10<br>N=12          |             |               |                    |
| 110              |              |    |             | 2          | 0                 | Very dense, no recovery  |                     | 50/1"                     |             |               |                    |
| 5                |              |   |             | 3          | 15                | Dense, dark brown, fine to coarse sand, trace silt, some gravel, trace fibrous roots, trace bituminous concrete (Fill) |                     | 15-20-20-32<br>N=40       | 2 X         |               | -200 = 9.7%        |
| 105              |              |  |             | 4          | 12                | Dense, dark brown, fine to coarse sand, trace silt, little to some gravel, little bituminous concrete (Fill)           |                     | 26-18-12-8<br>N=30        |             |               |                    |
|                  |              |  |             | 5          | 0                 | Very dense, no recovery<br>Refusal encountered at ~9.5 feet bgs  |                     | 50/1"                     |             |               |                    |




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**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458








**DATE STARTED:** 11/9/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 11/9/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 9.5 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 112.3 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

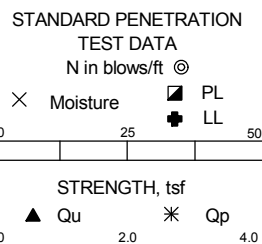
# BORING B-3A

**Water**    Dry

**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

| Elevation (feet) | Depth (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION   | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|--------------|---|-------------|------------|-------------------|--|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |              |  |             |            |                   | Approximately 9" of topsoil  |                     |                           |             |               |                    |
|                  |              |  |             | 1          | 15                | Very loose, dark brown, fine to coarse sand, trace to little silt, trace gravel (Fill)       | 2-2-2-3             | N=4                       | ⊙           |               |                    |
| 110              |              |  |             | 2          | 11                | Medium dense, dark brown, fine to coarse sand, trace silt, little gravel, trace brick (Fill) | 7-17-12-10          | N=29                      | ⊙           |               |                    |
| 5                |              |  |             | 3          | 16                | Very dense, dark brown/gray, fine to coarse sand, trace silt, some gravel (Fill)             | 23-39-30-20         | N=69                      |             |               | >>⊙                |
| 105              |              |  |             | 4          | 13                | Medium dense, dark brown/gray, fine to coarse sand, trace silt, little to some gravel (Fill) | 27-22-7-12          | N=29                      | ⊙           |               |                    |
|                  |              |   |             |            |                   | <b>Refusal encountered at ~9.5 feet bgs</b>  |                     |                           |             |               |                    |



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**LOCATION:** 212 Kenrick Street  
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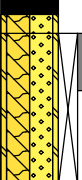



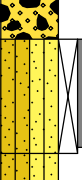
**DATE STARTED:** 8/14/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 8/14/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 12.0 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 96.6 ft **SAMPLING METHOD:** SS  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING B-4

**Water**    Dry

**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

| Elevation (feet) | Depth, (feet) | Graphic Log   | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION  | USCS Classification | SPT Blows per 6-inch (SS) | Moisture, % | STRENGTH, tsf | Additional Remarks |
|------------------|---------------|---|-------------|------------|-------------------|---|---------------------|---------------------------|-------------|---------------|--------------------|
| 0                |               |   |             |            |                   | Approximately 3" of bituminous concrete   |                     |                           |             |               |                    |
| 95               |               |    |             | 1          | 9                 | Dense, brown/orange, fine to medium sand, trace coarse sand, some silt, little to some gravel, trace fibrous roots<br><b>(Loamy eolian deposit)</b> |                     | 12-13-31-30<br>N=44       | 2 X         |               | ⊙ -200 = 24%       |
|                  |               |    |             | 2          | 14                | Very dense, brown, fine to coarse sand, trace silt, some gravel<br><b>(Sandy basal till)</b>  |                     | 32-37-48-44<br>N=85       |             |               | >>⊙                |
| 5                |               |   |             | 3          | 12                | Dense, brown, fine to coarse sand, trace silt, some gravel<br><b>(Sandy basal till)</b>   |                     | 43-21-21-23<br>N=42       | 1 X         |               | ⊙ -200 = 8.6%      |
| 90               |               |  |             | 4          | 8                 | Medium dense, brown, fine to coarse sand and gravel, trace silt<br><b>(Sandy basal till)</b>  |                     | 9-10-16-20<br>N=26        |             |               | ⊙                  |
| 10               |               |  |             | 5          | 17                | Hard, brown, silt, some fine to medium sand, trace coarse sand, little gravel   |                     | 35-64-80/5.5"             | 3 X         |               | ⊙ -200 = 56%       |
| 85               |               |   |             |            |                   | <b>Refusal encountered at ~12 feet bgs</b>  |                     |                           |             |               |                    |

**STANDARD PENETRATION TEST DATA**  
 N in blows/ft ⊙  
 X Moisture    ⊠ PL  
                   ⊕ LL  
 0                    25                    50  
**STRENGTH, tsf**  
 ▲ Qu                    \* Qp  
 0                    2.0                    4.0






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**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

**DATE STARTED:** 11/9/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 11/9/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 14.5 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Flush Joint Casing  
**ELEVATION:** 112.5 ft **SAMPLING METHOD:** SS-in Core  
**LATITUDE:** **HAMMER TYPE:** Automatic  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING B-5

**Water:**    Dry

**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION   | USCS Classification | SPT Blows per 6-inch (SS) RQD & Recovery % (NX) | Moisture, % | STANDARD PENETRATION TEST DATA<br>N in blows/ft ©<br>X Moisture PL<br>LL<br>STRENGTH, tsf<br>▲ Qu * Qp | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|--|---------------------|---|-------------|--|--------------------|
| 0                |              |             |             |            |                   | Approximately 10" of topsoil   |                     |   |             |  |                    |
|                  |              |             |             | 1          | 20                | Loose, dark brown, fine to coarse sand, trace silt, trace gravel, trace brick (Fill)   | 2-2-5-6             | N=7   |             |  |                    |
| 110              |              |             |             | 2          | 18                | Dense, dark brown, fine to coarse sand, trace silt, little gravel, trace brick, trace concrete (Fill)  | 12-23-15-13         | N=38  |             |  |                    |
| 5                |              |             |             | 3          | 16                | Dense, dark brown, fine to coarse sand, trace silt, little gravel, trace bituminous concrete (Fill)  | 55-31-17-17         | N=48  |             |  |                    |
| 105              |              |             |             | 4          | 13                | Medium dense, dark brown, fine to coarse sand, trace silt, little to some gravel, trace bituminous concrete (Fill)                                       | 21-11-8-16          | N=19  |             |  |                    |
|                  |              |             |             |            |                   | Medium dense, brown/orange, fine to medium sand, trace coarse sand, some silt, trace gravel, trace fibrous roots (Loamy eolian deposit)                  |                     |   |             |  |                    |
|                  |              |             |             |            |                   | Refusal encountered at ~9.5 feet bgs   |                     |   |             |  |                    |
|                  |              |             |             |            |                   | 5-foot rock core obtained  |                     |   |             |  |                    |
| 100              |              |             |             | 5          | 60                | BEDROCK - Light gray-brown, SANDSTONE CONGLOMERATE, fine grained, thin to medium bedded, massive to broken, weathered to slightly weathered, medium hard |                     | RQD=23<br>Rec=100%                              |             |  |                    |



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**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

## GENERAL NOTES

### SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

### DRILLING AND SAMPLING SYMBOLS

|  |   |
|--|---|
| SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.           | ☒ SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted. |
| HSA: Hollow Stem Auger - typically 3 1/4" or 4 1/4" I.D. openings, except where noted. | ■ ST: Shelby Tube - 3" O.D., except where noted.              |
| M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry                 | ▮ RC: Rock Core   |
| R.C.: Diamond Bit Core Sampler   | ⬇ TC: Texas Cone  |
| H.A.: Hand Auger   | ☞ BS: Bulk Sample   |
| P.A.: Power Auger - Handheld motorized auger   | ☑ PM: Pressuremeter   |
|  | CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings  |

### SOIL PROPERTY SYMBOLS

|   |
|---|
| N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon. |
| N <sub>60</sub> : A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)  |
| Q <sub>u</sub> : Unconfined compressive strength, TSF   |
| Q <sub>p</sub> : Pocket penetrometer value, unconfined compressive strength, TSF                                  |
| w%: Moisture/water content, %   |
| LL: Liquid Limit, %   |
| PL: Plastic Limit, %  |
| PI: Plasticity Index = (LL-PL), %   |
| DD: Dry unit weight, pcf  |
| ▼, ▼, ▼ Apparent groundwater level at time noted  |

### RELATIVE DENSITY OF COARSE-GRAINED SOILS

| <u>Relative Density</u> | <u>N - Blows/foot</u> |
|-------------------------|-----------------------|
| Very Loose              | 0 - 4                 |
| Loose                   | 4 - 10                |
| Medium Dense            | 10 - 30               |
| Dense                   | 30 - 50               |
| Very Dense              | 50 - 80               |
| Extremely Dense         | 80+                   |

### ANGULARITY OF COARSE-GRAINED PARTICLES

| <u>Description</u> | <u>Criteria</u>  |
|--------------------|--|
| Angular:           | Particles have sharp edges and relatively plane sides with unpolished surfaces |
| Subangular:        | Particles are similar to angular description, but have rounded edges           |
| Subrounded:        | Particles have nearly plane sides, but have well-rounded corners and edges     |
| Rounded:           | Particles have smoothly curved sides and no edges                              |

### GRAIN-SIZE TERMINOLOGY

| <u>Component</u>       | <u>Size Range</u>                      |
|------------------------|--|
| Boulders:              | Over 300 mm (>12 in.)                  |
| Cobbles:               | 75 mm to 300 mm (3 in. to 12 in.)      |
| Coarse-Grained Gravel: | 19 mm to 75 mm (¾ in. to 3 in.)        |
| Fine-Grained Gravel:   | 4.75 mm to 19 mm (No.4 to ¾ in.)       |
| Coarse-Grained Sand:   | 2 mm to 4.75 mm (No.10 to No.4)        |
| Medium-Grained Sand:   | 0.42 mm to 2 mm (No.40 to No.10)       |
| Fine-Grained Sand:     | 0.075 mm to 0.42 mm (No. 200 to No.40) |
| Silt:                  | 0.005 mm to 0.075 mm                   |
| Clay:                  | <0.005 mm                              |

### PARTICLE SHAPE

| <u>Description</u> | <u>Criteria</u>                                     |
|--------------------|---|
| Flat:              | Particles with width/thickness ratio > 3            |
| Elongated:         | Particles with length/width ratio > 3               |
| Flat & Elongated:  | Particles meet criteria for both flat and elongated |

### RELATIVE PROPORTIONS OF FINES

| <u>Descriptive Term</u> | <u>% Dry Weight</u> |
|-------------------------|---------------------|
| Trace:                  | < 5%                |
| With:                   | 5% to 12%           |
| Modifier:               | >12%                |

## GENERAL NOTES

(Continued)

### CONSISTENCY OF FINE-GRAINED SOILS

| <u>Q<sub>u</sub> - TSF</u> | <u>N - Blows/foot</u> | <u>Consistency</u>  |
|----------------------------|-----------------------|---------------------|
| 0 - 0.25                   | 0 - 2                 | Very Soft           |
| 0.25 - 0.50                | 2 - 4                 | Soft                |
| 0.50 - 1.00                | 4 - 8                 | Firm (Medium Stiff) |
| 1.00 - 2.00                | 8 - 15                | Stiff               |
| 2.00 - 4.00                | 15 - 30               | Very Stiff          |
| 4.00 - 8.00                | 30 - 50               | Hard                |
| 8.00+                      | 50+                   | Very Hard           |

### MOISTURE CONDITION DESCRIPTION

| <u>Description</u> | <u>Criteria</u>                                       |
|--------------------|---|
| Dry:               | Absence of moisture, dusty, dry to the touch          |
| Moist:             | Damp but no visible water                             |
| Wet:               | Visible free water, usually soil is below water table |

### RELATIVE PROPORTIONS OF SAND AND GRAVEL

| <u>Descriptive Term</u> | <u>% Dry Weight</u> |
|-------------------------|---------------------|
| Trace:                  | < 15%               |
| With:                   | 15% to 30%          |
| Modifier:               | >30%                |

### STRUCTURE DESCRIPTION

| <u>Description</u> | <u>Criteria</u>   | <u>Description</u> | <u>Criteria</u>   |
|--------------------|---|--------------------|---|
| Stratified:        | Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick  | Blocky:            | Cohesive soil that can be broken down into small angular lumps which resist further breakdown |
| Laminated:         | Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick | Lensed:            | Inclusion of small pockets of different soils   |
| Fissured:          | Breaks along definite planes of fracture with little resistance to fracturing             | Layer:             | Inclusion greater than 3 inches thick (75 mm)   |
| Slickensided:      | Fracture planes appear polished or glossy, sometimes striated                             | Seam:              | Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample                |
|                    |   | Parting:           | Inclusion less than 1/8-inch (3 mm) thick   |

### SCALE OF RELATIVE ROCK HARDNESS

| <u>Q<sub>u</sub> - TSF</u> | <u>Consistency</u> |
|----------------------------|--------------------|
| 2.5 - 10                   | Extremely Soft     |
| 10 - 50                    | Very Soft          |
| 50 - 250                   | Soft               |
| 250 - 525                  | Medium Hard        |
| 525 - 1,050                | Moderately Hard    |
| 1,050 - 2,600              | Hard               |
| >2,600                     | Very Hard          |

### ROCK BEDDING THICKNESSES

| <u>Description</u> | <u>Criteria</u>                       |
|--------------------|---------------------------------------|
| Very Thick Bedded  | Greater than 3-foot (>1.0 m)          |
| Thick Bedded       | 1-foot to 3-foot (0.3 m to 1.0 m)     |
| Medium Bedded      | 4-inch to 1-foot (0.1 m to 0.3 m)     |
| Thin Bedded        | 1¼-inch to 4-inch (30 mm to 100 mm)   |
| Very Thin Bedded   | ½-inch to 1¼-inch (10 mm to 30 mm)    |
| Thickly Laminated  | 1/8-inch to ½-inch (3 mm to 10 mm)    |
| Thinly Laminated   | 1/8-inch or less "paper thin" (<3 mm) |

### ROCK VOIDS

| <u>Voids</u> | <u>Void Diameter</u>            |
|--------------|---------------------------------|
| Pit          | <6 mm (<0.25 in)                |
| Vug          | 6 mm to 50 mm (0.25 in to 2 in) |
| Cavity       | 50 mm to 600 mm (2 in to 24 in) |
| Cave         | >600 mm (>24 in)                |

### GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

| <u>Component</u>    | <u>Size Range</u>  |
|---------------------|--------------------|
| Very Coarse Grained | >4.76 mm           |
| Coarse Grained      | 2.0 mm - 4.76 mm   |
| Medium Grained      | 0.42 mm - 2.0 mm   |
| Fine Grained        | 0.075 mm - 0.42 mm |
| Very Fine Grained   | <0.075 mm          |

### ROCK QUALITY DESCRIPTION



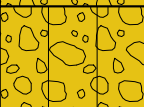
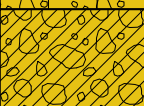
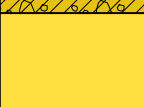

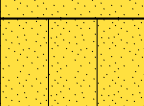
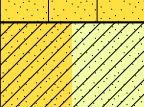

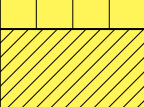



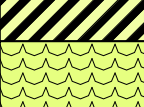
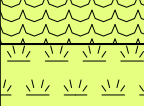
| <u>Rock Mass Description</u> | <u>RQD Value</u> |
|------------------------------|------------------|
| Excellent                    | 90 - 100         |
| Good                         | 75 - 90          |
| Fair                         | 50 - 75          |
| Poor                         | 25 - 50          |
| Very Poor                    | Less than 25     |

### DEGREE OF WEATHERING

|                     |   |
|---------------------|---|
| Slightly Weathered: | Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.                          |
| Weathered:          | Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.                |
| Highly Weathered:   | Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife. |

# SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

| MAJOR DIVISIONS   |   |  | SYMBOLS   |   | TYPICAL DESCRIPTIONS  |   |
|---|---|--|---|---|---|---|
|   |   |  | GRAPH   | LETTER  |   |   |
| COARSE GRAINED SOILS<br><br>MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE | GRAVEL AND GRAVELLY SOILS<br><br>(LITTLE OR NO FINES)                               | CLEAN GRAVELS  |    | <b>GW</b>   | WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES                     |   |
|   |   |  |    | <b>GP</b>   | POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES                   |   |
|   |   | GRAVELS WITH FINES   |    | <b>GM</b>   | SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES  |   |
|   | MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE                            | (APPRECIABLE AMOUNT OF FINES)  |    | <b>GC</b>   | CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES                                       |   |
|   |   | SAND AND SANDY SOILS<br><br>(LITTLE OR NO FINES)                                       | CLEAN SANDS   |    | <b>SW</b>   | WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES   |
|   |   |  |   |    | <b>SP</b>   | POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES  |
|   | MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE                             | SANDS WITH FINES   | (APPRECIABLE AMOUNT OF FINES)   |    | <b>SM</b>   | SILTY SANDS, SAND - SILT MIXTURES   |
|   |   |  |   |   | <b>SC</b>   | CLAYEY SANDS, SAND - CLAY MIXTURES  |
|   |   | FINE GRAINED SOILS<br><br>MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE | SILTS AND CLAYS<br><br>LIQUID LIMIT LESS THAN 50                                    |   |  | <b>ML</b>   |
|   |   |  |   |  | <b>CL</b>   | INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS |
|   |  |  |   | <b>OL</b>   | ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY                             |   |
| SILTS AND CLAYS<br><br>LIQUID LIMIT GREATER THAN 50                                     |   |  |  | <b>MH</b>   | INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS                 |   |
|   |   |  |  | <b>CH</b>   | INORGANIC CLAYS OF HIGH PLASTICITY  |   |
|   |   |  |  | <b>OH</b>   | ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS                           |   |
|   | HIGHLY ORGANIC SOILS  |  |  | <b>PT</b>   | PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS                                 |   |

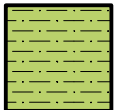
# Graphic Symbols for Materials and Rock Deposits



**CONCRETE**  
Portland Cement Concrete



**BITUMINOUS CONCRETE**



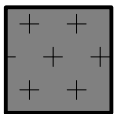
**CLAYSTONE**



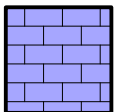
**COAL**  
Coal, Anthracite Coal



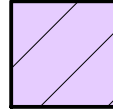
**CONGLOMERATE/BRECCIA**  
Conglomerate, Breccia



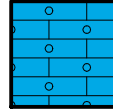
**IGNEOUS ROCK**  
Anorthosite, Basalt, Metabasalt, Diabase (Gabbro), Gabbro, Granite/Granodionite, Homfels, Pegmatite, Rhyolite/Metarhyolite



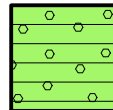
**LIMESTONE**  
Limestone, Dolomite



**METAMORPHIC ROCK**  
Amphibolite, Gneiss, Marble, Phyllite, Quartzite, Schist, Serpentinite, Slate



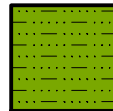
**CHERT**



**SANDSTONE**  
Sandstone, Orthoquartzite (Sandstone)



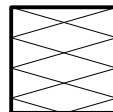
**SHALE**



**SILTSTONE**



**NO RECOVERY**



**VOID**

## Probe Logs







**DATE STARTED:** 11/9/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 11/9/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 9.0 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Macrocore  
**ELEVATION:** 100 ft **SAMPLING METHOD:**  
**LATITUDE:** **HAMMER TYPE:**  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING P-2

Water

BORING LOCATION:

| Elevation (feet) | Depth (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION                     | USCS Classification | Moisture, %                             | STANDARD PENETRATION TEST DATA<br>N in blows/ft © | Additional Remarks |
|------------------|--------------|-------------|-------------|------------|-------------------|--|---------------------|---|---|--------------------|
| 0                |              |             |             |            |                   |  |                     | X Moisture      □ PL<br>+ LL            |   |                    |
| 95               | 5            |             |             |            |                   | Macrocore refusal encountered at ~9' bgs |                     | STRENGTH, tsf<br>▲ Qu              * Qp |   |                    |



Professional Service Industries, Inc.  
 480 Neponset Street, Suite 9C  
 Canton, MA 02021  
 Telephone: (781) 821-2355

**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

**DATE STARTED:** 11/9/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 11/9/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 3.0 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Macrocore  
**ELEVATION:** 101 ft **SAMPLING METHOD:**  
**LATITUDE:** **HAMMER TYPE:**  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen  
**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

# BORING P-3

Water

**BORING LOCATION:**

| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION                     | USCS Classification | Moisture, % | STANDARD PENETRATION TEST DATA<br>N in blows/ft ©  | Additional Remarks |
|------------------|---------------|-------------|-------------|------------|-------------------|--|---------------------|-------------|--|--------------------|
|                  |               |             |             |            |                   |  |                     |             | X Moisture      □ PL<br>+ LL<br>0                      25                      50                      |                    |
|                  |               |             |             |            |                   |  |                     |             | STRENGTH, tsf<br>▲ Qu                      * Qp<br>0                      2.0                      4.0 |                    |
| 0                |               |             |             |            |                   |  |                     |             |  |                    |
| 100              |               |             |             |            |                   | Macrocore refusal encountered at ~3' bgs |                     |             |  |                    |



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 Canton, MA 02021  
 Telephone: (781) 821-2355

**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

**DATE STARTED:** 11/9/20      **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 11/9/20      **DRILLER:** Don Leger      **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 2.5 ft      **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A      **DRILLING METHOD:** Macrocore  
**ELEVATION:** 102 ft      **SAMPLING METHOD:**  
**LATITUDE:**  
**LONGITUDE:**      **HAMMER TYPE:**  
**EFFICIENCY:** N/A  
**STATION:** N/A      **OFFSET:** N/A      **REVIEWED BY:** Brianna Hansen

# BORING P-4

Water



**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION                       | USCS Classification | Moisture, % | STANDARD PENETRATION TEST DATA<br>N in blows/ft ©  |  |  |  | Additional Remarks |
|------------------|---------------|-------------|-------------|------------|-------------------|--|---------------------|-------------|--|--|--|--|--------------------|
|                  |               |             |             |            |                   |  |                     |             | <input type="checkbox"/> Moisture <input type="checkbox"/> PL<br><input type="checkbox"/> LL |  |  |  |                    |
|                  |               |             |             |            |                   |  |                     |             | STRENGTH, tsf  |  |  |  |                    |
|                  |               |             |             |            |                   |  |                     |             | <input type="checkbox"/> Qu <input type="checkbox"/> Qp                                      |  |  |  |                    |
| 0                |               |             |             |            |                   |  |                     |             |  |  |  |  |                    |
| 100              |               |             |             |            |                   | Macrocore refusal encountered at ~2.5' bgs |                     |             |  |  |  |  |                    |



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 Canton, MA 02021  
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**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

**DATE STARTED:** 11/9/20 **DRILL COMPANY:** Soil X Corp.  
**DATE COMPLETED:** 11/9/20 **DRILLER:** Don Leger **LOGGED BY:** Intertek-PSI  
**COMPLETION DEPTH:** 8.0 ft **DRILL RIG:** Geoprobe 7822DT  
**BENCHMARK:** N/A **DRILLING METHOD:** Macrocore  
**ELEVATION:** 110.5 ft **SAMPLING METHOD:**  
**LATITUDE:** **HAMMER TYPE:**  
**LONGITUDE:** **EFFICIENCY:** N/A  
**STATION:** N/A **OFFSET:** N/A **REVIEWED BY:** Brianna Hansen

# BORING P-5

Water

**BORING LOCATION:**

**REMARKS:** Ground elevation based on information contained on provided Existing Conditions Plan (dated 9/7/20)

| Elevation (feet) | Depth, (feet) | Graphic Log | Sample Type | Sample No. | Recovery (inches) | MATERIAL DESCRIPTION                     | USCS Classification | STANDARD PENETRATION TEST DATA |               |   |    | Additional Remarks |  |
|------------------|---------------|-------------|-------------|------------|-------------------|--|---------------------|--------------------------------|---------------|---|----|--------------------|--|
|                  |               |             |             |            |                   |  |                     | N in blows/ft ©                |               |   |    |                    |  |
|                  |               |             |             |            |                   |  |                     | Moisture, %                    | STRENGTH, tsf |   |    |                    |  |
|                  |               |             |             |            |                   |  |                     | ×                              | Moisture      | ■ | PL |                    |  |
|                  |               |             |             |            |                   |  |                     | +                              | LL            |   |    |                    |  |
|                  |               |             |             |            |                   |  |                     | ▲                              | Qu            | * | Qp |                    |  |
| 110              | 0             |             |             |            |                   | Macrocore refusal encountered at ~8' bgs |                     |                                |               |   |    |                    |  |



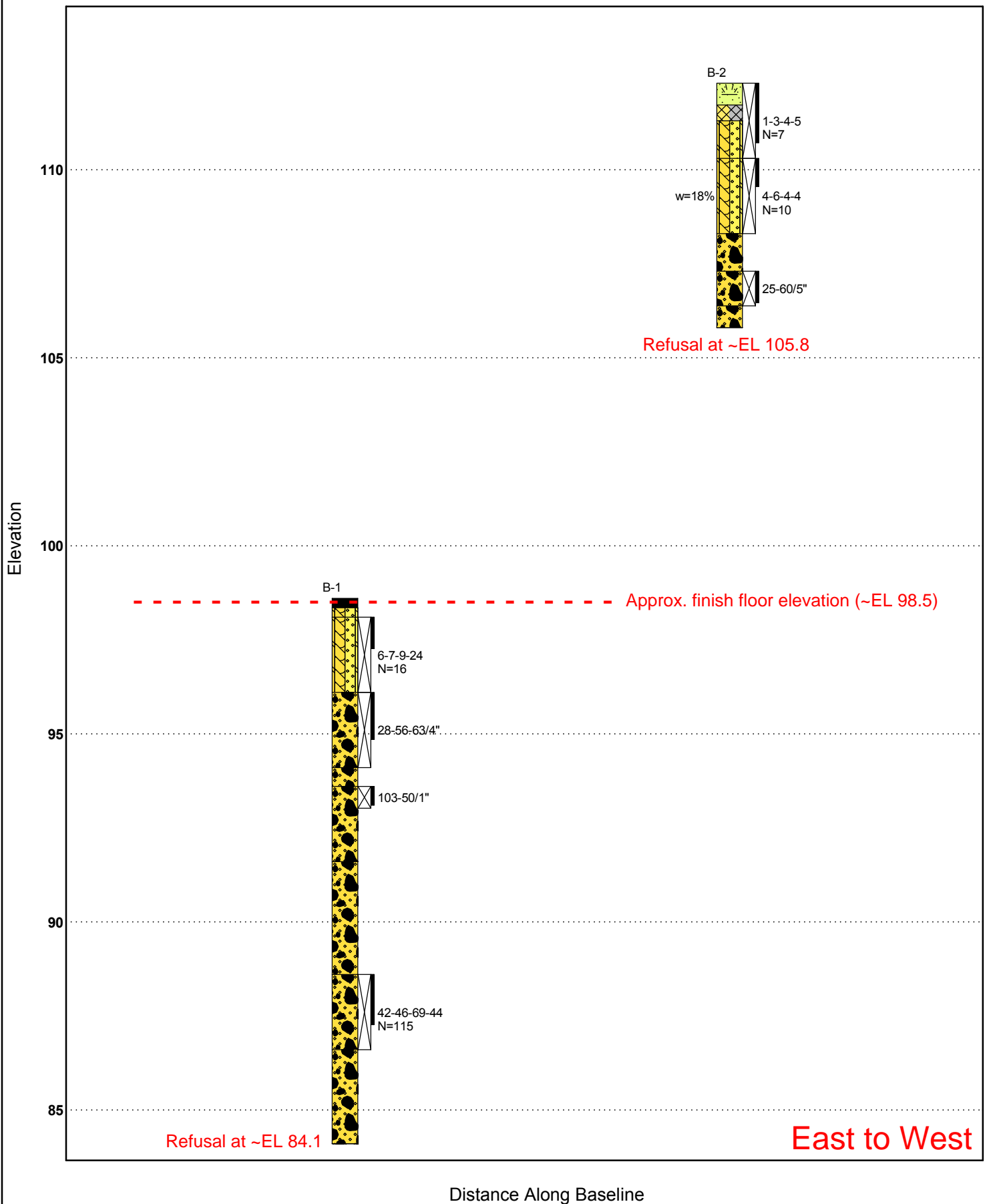
Professional Service Industries, Inc.  
 480 Neponset Street, Suite 9C  
 Canton, MA 02021  
 Telephone: (781) 821-2355

**PROJECT NO.:** 04461007  
**PROJECT:** Newton Commonwealth Golf Course  
**LOCATION:** 212 Kenrick Street  
 Newton, MA 02458

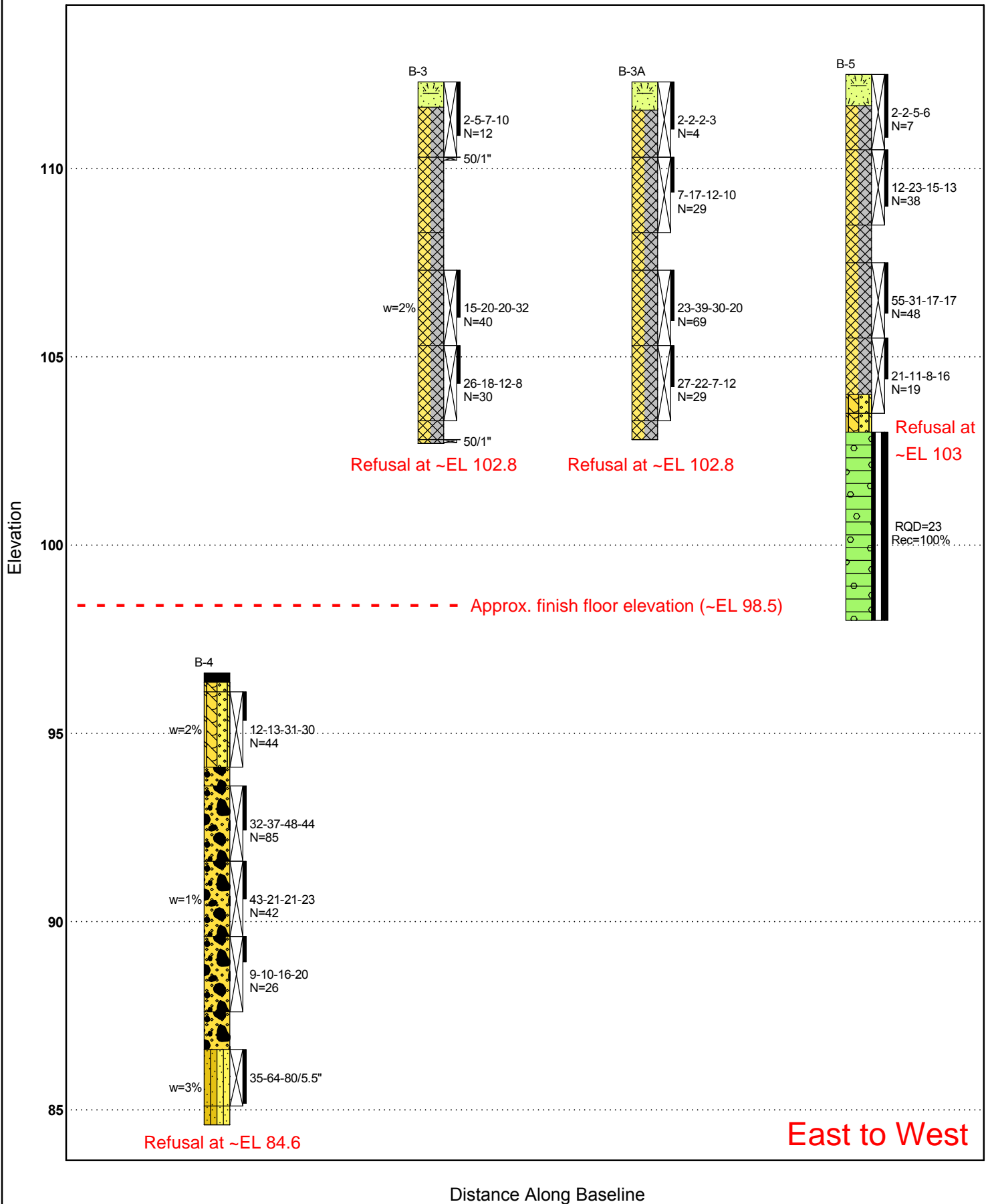
## Soil Profiles



# Profile

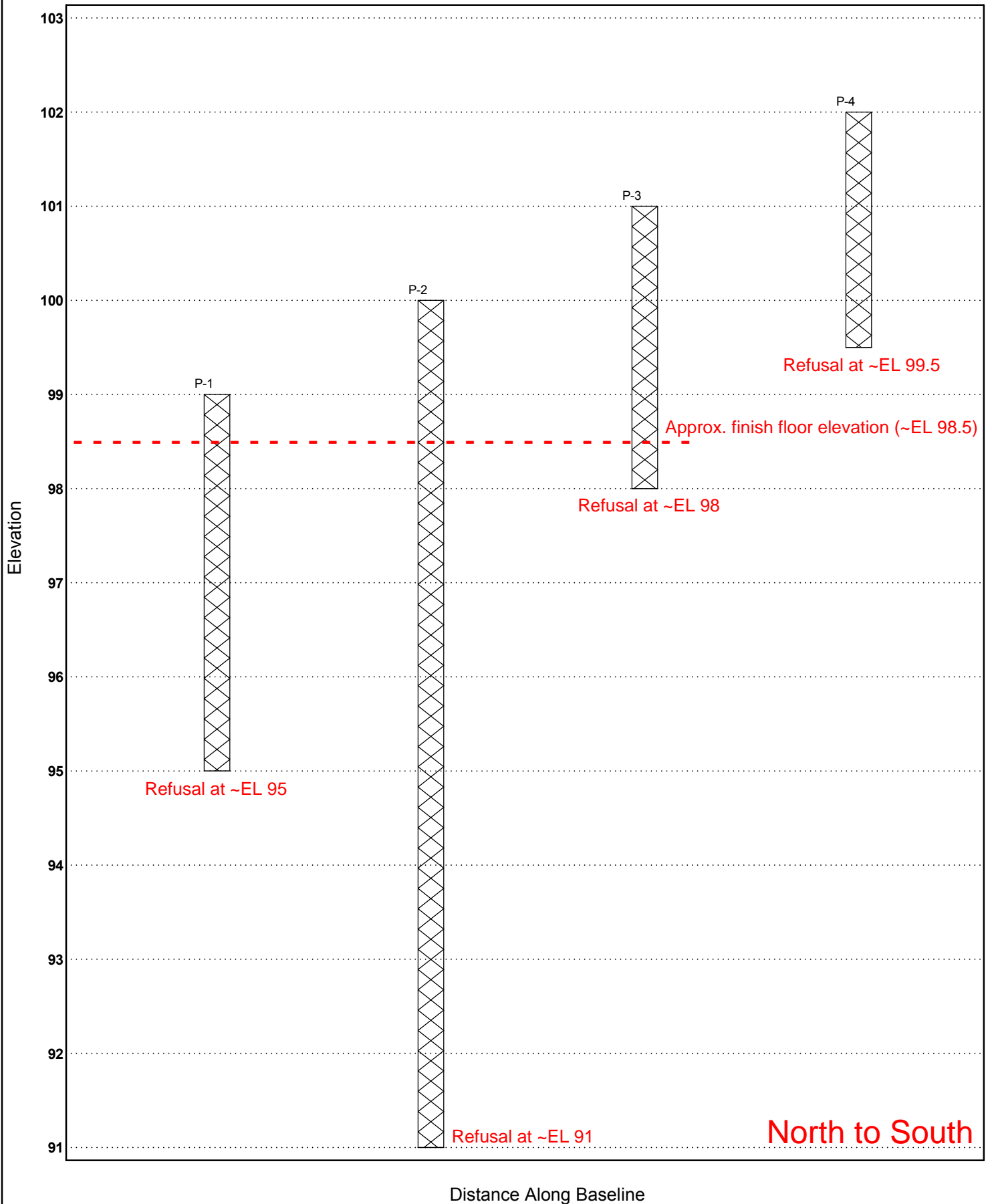


# Profile





# Profile



## Material Test Reports







Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S1**

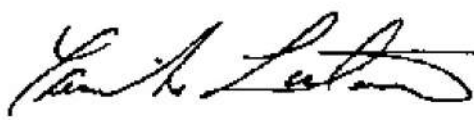
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S1  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-2 (2'-4')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 18.4        |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A





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Canton, MA 02021

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Fax: (781) 821-6276

**Report No: MAT:04461007-1-S2**

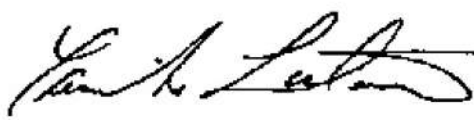
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S2  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-3 (5'-7')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 2.0         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A





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Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S3**

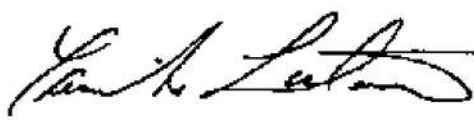
**Issue No: 1**

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# Material Test Report

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INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S3  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-4 (0.5'-2.5')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 2.1         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A







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Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S4**

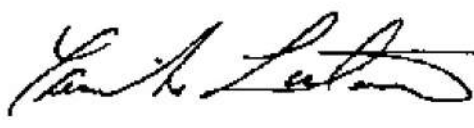
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S4  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-4 (5'-7')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 0.8         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A





Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021

Phone: (781) 821-2355  
Fax: (781) 821-6276

**Report No: MAT:04461007-1-S5**

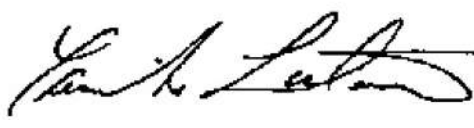
**Issue No: 1**

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# Material Test Report

**Client:** RAYMOND DESIGN ASSOCIATES, CC:  
INC  
60 LEDGEWOOD PLACE  
ROCKLAND, MA 02370

**Project:** NEWTON COMMONWEALTH GOLF  
COURS  
NEWTON, MA



Approved Signatory: Yannick Lastennet (Department Manager)  
Date of Issue: 8/26/2020

## Sample Details

**Sample ID:** 04461007-1-S5  
**Client Sample ID:**  
**Date Sampled:** 08/14/20  
**Sampled By:** PSI  
**Specification:** No Spec. Sieve  
**Supplier:**  
**Source:** On-Site  
**Material:**  
**Sampling Method:** Soil Boring Split Spoon Sample  
**General Location:** B-4 (10'-12')

## Other Test Results

| Description       | Method      | Result      | Limits |
|-------------------|-------------|-------------|--------|
| Water content (%) | ASTM D 2216 | 3.1         |        |
| Method            |             | B           |        |
| Tested By         |             | Gary Brooks |        |
| Date Tested       |             | 8/19/2020   |        |

## Comments

N/A

## Site Images









July 7, 2022

Mr. Jefferey R. Yost  
Raymond Design Associates  
60 Ledgewood Place  
Rockland, MA 02370  
E-mail: jyost@rda-design.com

Subject: **Subsurface Conditions Report  
Fire Service & Drainage Lines for the Maintenance Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street, Newton, MA 02458  
PSI Project No.: 04461161**

Dear Mr. Yost:

Thank you for choosing Professional Service Industries, Inc. (PSI), an Intertek company, as your consultant for the above referenced project. PSI is pleased to submit this report presenting the results of the subsurface conditions regarding the proposed fire service and drainage lines for the Newton Commonwealth Golf Course in Newton, Massachusetts. PSI previously prepared a geotechnical engineering report for the proposed Maintenance Building Addition (PSI Project No.: 04461007) dated August 27, 2020 with Revision 1 dated November 19, 2020. PSI performed a supplementary probe exploration program as outlined in this report. Our services were conducted in accordance with PSI's Proposal No. 0446- 367335 (Rev. 1) dated March 1, 2022.

Should there be any questions regarding this report, please do not hesitate to call our office at (781) 821-2355. PSI would be pleased to continue providing geotechnical services throughout design and construction of the project, and we look forward to working with you and your organization on this and future projects.

Respectfully submitted,  
**Professional Service Industries, Inc.**

A handwritten signature in cursive script that reads "Brianna Hansen".

Brianna Hansen  
Project Manager

A handwritten signature in cursive script that reads "Karl Suter".

Karl Suter, P.E.  
Chief Engineer



## SUBSURFACE CONDITIONS REPORT

For the Proposed

**Fire Service and Drainage Lines for the  
Maintenance Building Addition  
Newton Commonwealth Golf Course  
212 Kenrick Street  
Newton, MA 02458**

*Brianna Hansen*

Brianna Hansen  
Project Manager

Prepared for

**Raymond Design Associates  
60 Ledgewood Place  
Rockland, MA 02370**



Prepared by

**Professional Service Industries, Inc.  
480 Neponset Street, Suite 9C  
Canton, MA 02021  
Telephone: (781) 821-2355  
Fax: (781) 821-6276**

Karl Suter, P.E.  
Chief Engineer

**PSI PROJECT NO. 04461161**

**July 7, 2022**

# TABLE OF CONTENTS

|   |          |
|---|----------|
| <b>1.0 PROJECT INFORMATION</b> .....            | <b>1</b> |
| 1.1 PROJECT AUTHORIZATION .....                 | 1        |
| 1.2 PROJECT DESCRIPTION .....                   | 1        |
| 1.3 SITE DESCRIPTION .....                      | 1        |
| 1.4 EXPLORATION PROGRAM.....                    | 2        |
| <b>2.0 SITE AND SUBSURFACE CONDITIONS</b> ..... | <b>2</b> |
| 2.1 SUBSURFACE CONDITIONS .....                 | 2        |
| 2.1.1 <i>Local Geology</i> .....                | 2        |
| 2.1.2 <i>Probes</i> .....                       | 2        |
| 2.2 GROUNDWATER CONDITIONS.....                 | 3        |
| <b>3.0 REPORT LIMITATIONS</b> .....             | <b>3</b> |

## FIGURES

FIGURE 1: USGS SITE LOCATION PLAN

FIGURE 2: PROBE LOCATION PLAN

FIGURE 3: SURFICIAL GEOLOGY



# 1.0 PROJECT INFORMATION

## 1.1 PROJECT AUTHORIZATION

Authorization to proceed with this project was provided by Mr. Jefferey Yost by signing the Proposal Authorization on June 14, 2022 included with PSI's Proposal No. 0446-367335 (Rev. 1).

## 1.2 PROJECT DESCRIPTION

Project information provided to PSI included the following:

- Newton Commonwealth Golf Course Maintenance Facilities Improvements & Renovations Drawings C0.1, C0.2, C0.3, C1.0, C1.1, C2.1, and C3.1 (dated September 15, 2021)

The project consists of the excavation, bedding, and backfill of the fire service connection and piping and drainage service lines for the new maintenance building addition.

Should any of the information identified herein be incorrect or should supplemental information become available, PSI must be notified and have the opportunity to reassess conditions and amend the report where necessary.

The objective of our services summarized herein was to provide subsurface information to members of the design team for use in designing the service lines.

## 1.3 SITE DESCRIPTION

The referenced site (42° 20' 35.00" N, 71° 10' 09.00" W) is located at 212 Kenrick Street in Newton, Massachusetts, as shown in *Figure 1, USGS Site Location Plan*.

The site consists of an existing maintenance building with associated pavement areas adjacent to the golf course. On the southern side of the existing maintenance building, the site within the paved area is gradually sloping downhill from the street to the north with information contained on the Site Utility Plan (C2.1) indicating existing surface grades of approximately EL. 115 to 98.5 feet. On the northern side of the existing maintenance building, the site within the paved area is gradually sloping downhill to the north towards the parking lot with existing grades of approximately EL. 98.5 to 71 feet. Additionally, there is wooded terrain which ascends uphill to the west. The site within the paved parking lot north of the existing maintenance building is gradually sloping downhill to the north with existing grades of approximately EL. 71 to 60 feet.



## 1.4 EXPLORATION PROGRAM

PSI conducted a geotechnical exploration program at the site in conformance with generally accepted geotechnical engineering practices to provide subsurface information about the site.

The subsurface exploration program consisted of the performance of eighteen probes to assess the anticipated presence of bedrock material within the project area. PSI marked out the exploration locations using the provided Site Utility Plan (C2.1) and notified Dig Safe System, Inc. for public utility clearance prior to drilling. The exploration locations were also scanned by a private utility locating service, Ground Penetrating Radar Systems LLC, prior to performing the explorations at the site.

Soil X Corporation of Leominster, MA drilled eighteen probes on July 6, 2022 at the approximate locations shown in *Figure 2, Probe Location Plan*. The probes were drilled as close as feasible to where the proposed fire service and drainage lines will be installed. Due to possible underground utilities, some of the probe locations were shifted.

A PSI representative observed the exploration activities for this project. The probes were advanced by augering using a truck-mounted drill rig to depths of approximately 6 feet below the existing ground surfaces (bgs), which was the planned probe termination depth. The subsurface conditions in this report represent the conditions only at the actual probe locations and variations will occur and should be expected at other locations.

## 2.0 SITE AND SUBSURFACE CONDITIONS

### 2.1 SUBSURFACE CONDITIONS

#### 2.1.1 LOCAL GEOLOGY

Based on the “Plate 5 Surficial Geologic Map of the Newton Quadrangle, Massachusetts” compiled by C.M. Brankman in 2004, the surficial geology of the project site is glacio-fluvial deposits, which consists of primarily sand and gravel with cobbles, as shown in *Figure 3, Surficial Geology*. The subsurface conditions encountered at this site generally fits the geologic description.

Based on the “Bedrock Geologic Map of Massachusetts,” compiled by Zen, E-an, Goldsmith, Richard, Ratcliffe, N.M., Robinson, Peter, Stanley, R.S., Hatch, N.L., Shride, A.F., Weed, E.G.A., and Wones, D.R. in 1983, the bedrock geology generally consists of Roxbury Conglomerate, which consists of conglomerate, sandstone, siltstone, argillite, and melaphyre. Bedrock, however, was not encountered to the depths explored at this site.

#### 2.1.2 PROBES

The probes were drilled along the proposed fire service and drainage lines to depths of approximately 6 feet bgs, which was the planned probe termination depth.



Approximately 2½ to 5 inches of surficial Bituminous Concrete pavement was encountered at the probe locations. Note that the thickness of pavement measured in boreholes has a precision of no better than ½ inch and the actual thickness of bituminous concrete may vary within the site and may be greater or lesser. The contractor should determine the depth of bituminous concrete pavement to quantify depths for removal purposes.

During drilling operations, the subsurface material consisted primarily of fine to coarse sand and gravel based on the auger cuttings and appeared to contain cobbles, however, the auger was able to drill through the material. Refusal material was not encountered at the exploration locations. The fire service and drainage lines will be placed approximately 4 feet bgs, therefore, bedrock excavation is not expected to be necessary.

## **2.2 GROUNDWATER CONDITIONS**

At the time of the probes (July 2022), groundwater was not encountered to the depths explored during drilling operations. For safety purposes, all of the probe holes were backfilled when the drilling had been completed.

The observations represent the groundwater condition at the time of measurement and may not be indicative of other times. The level of groundwater below the ground surface fluctuates based on conditions such as season, temperature, and amount of precipitation that might be different from the time when the observations were made. Therefore, the groundwater levels can be higher or lower during construction and during the life of the structure. This fact must be taken into consideration when developing earthwork procedures.

## **3.0 REPORT LIMITATIONS**

PSI's professional services have been performed and our findings presented in accordance with generally accepted geotechnical engineering principles and practices. PSI is not responsible for the conclusions, opinions, or recommendations made by others based on this data. No other warranties are implied or expressed. The scope of explorations was intended to assess the soil conditions. No engineering analyses and recommendations were submitted in this report.

The scope of our services for this report does not include any environmental assessment or investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studied. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our Client.

PSI did not provide any service to investigate or detect the presence of moisture, mold or other biological contaminate in or around any structure, or any service that was designed or intended to prevent or lower the risk of the occurrence of the amplification of the same. Mold is ubiquitous to the environment with mold amplification occurring when building materials are impacted by moisture. Site conditions are outside of PSI's control, and mold amplification will likely occur, or continue to occur, in the presence of moisture. As such, PSI cannot and shall not be held responsible of the occurrence or recurrence of mold amplification.



# FIGURES

**Figure 1: USGS Site Location Plan**

**Figure 2: Probe Location Plan**

**Figure 3: Surficial Geology**



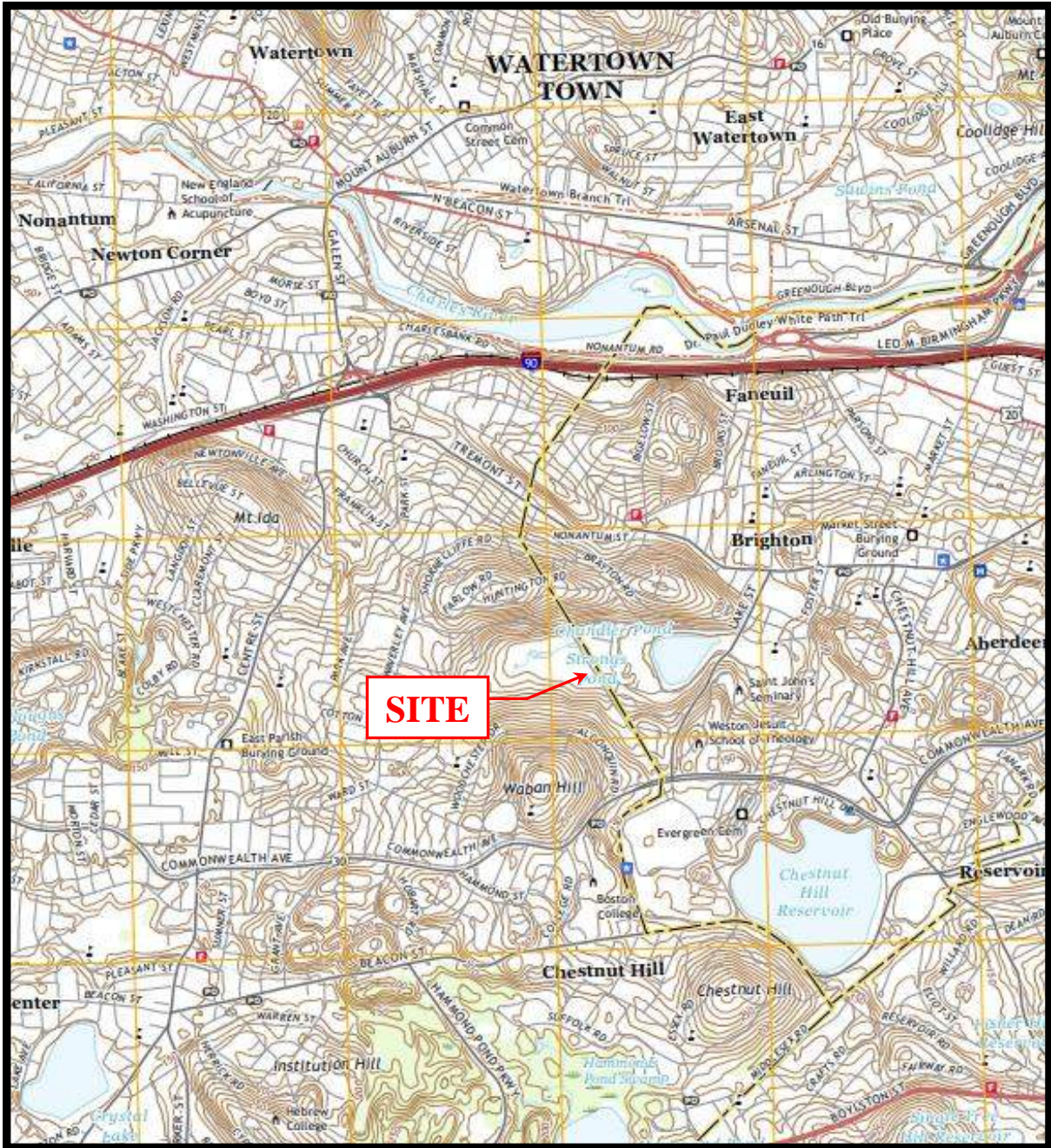
# FIGURES

**Figure 1: USGS Site Location Plan**

**Figure 2: Probe Location Plan**

**Figure 3: Surficial Geology**





REFERENCE: U.S.G.S. "NEWTON, MA" 7.5' QUADRANGLE MAP  
ISSUED: 2021

**FIGURE 1: USGS SITE LOCATION PLAN**

**PROJECT NAME:**  
Fire Service & Drainage Lines for Newton Golf  
Course Maintenance Building Addition  
212 Kenrick Street, Newton, MA 02458



PSI Project  
No.

04461161

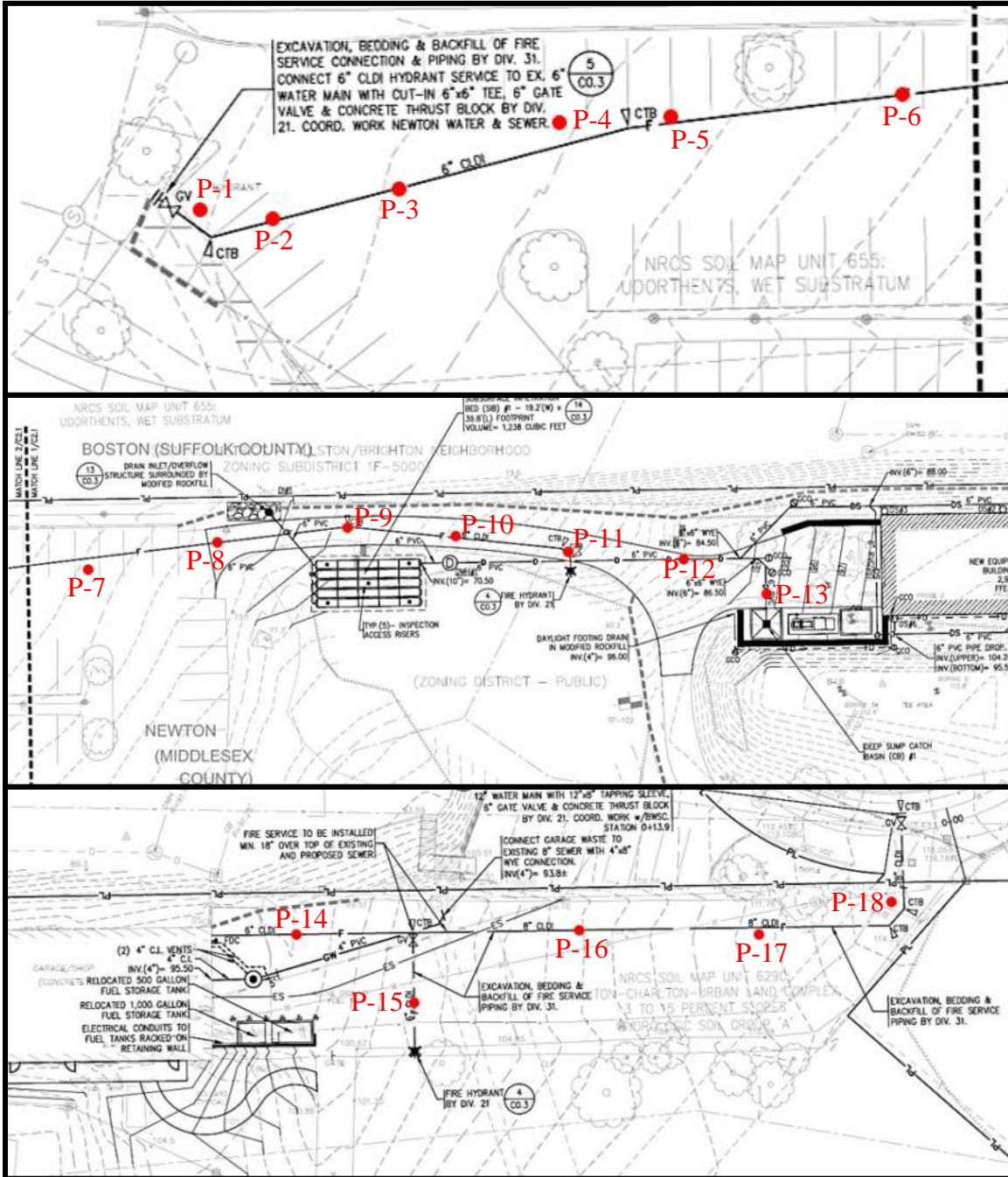
Date

July 2022

Scale


N.T.S.

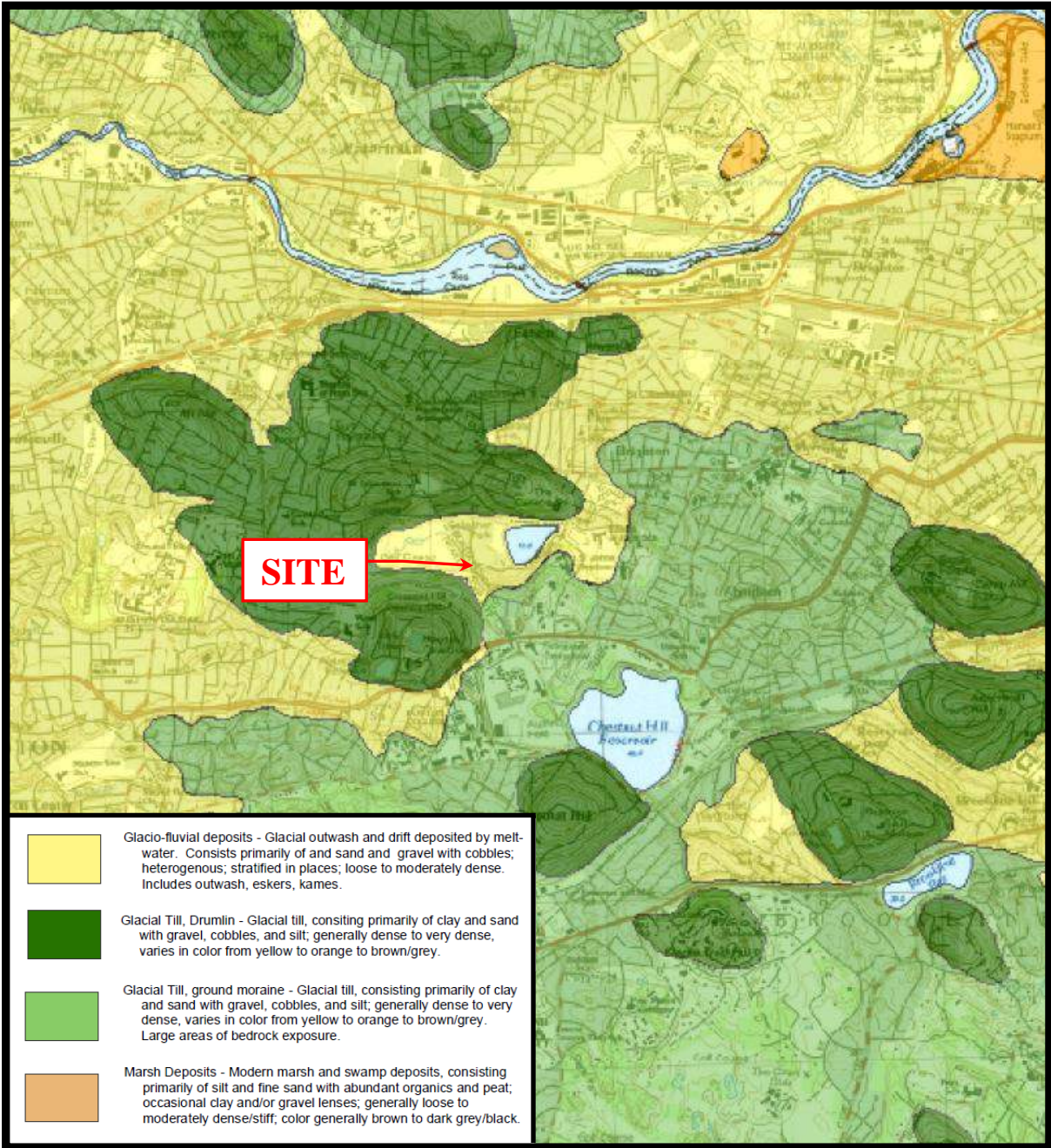




● Probe Location

- Base Plan is Site Utility Plan (dated 9/15/21) provided by the Client.
- Probes were located in the field by PSI. Locations are approximate.
- Probes were drilled on July 6, 2022 by Soil X Corp. of Leominster, MA.

| FIGURE 2: PROBE LOCATION PLAN   | PSI Project No. | Date      |  |
|---|-----------------|-----------|---|
| <p><b>PROJECT:</b></p> <p>Fire Service &amp; Drainage Lines for Newton Golf Course Maintenance Building Addition<br/>212 Kenrick Street, Newton, MA 02458</p> | 04461161        | July 2022 |   |



**REFERENCE:** "Plate 5 Surficial Geologic Map of the Newton Quadrangle, Massachusetts"  
Compiled by C.M. Brankman - 2004

**FIGURE 3: SURFICIAL GEOLOGY**

**PROJECT NAME:**

Fire Service & Drainage Lines for Newton Golf Course Maintenance Building Addition  
212 Kenrick Street, Newton, MA 02458



| PSI Project No. | Date      | Scale  |
|-----------------|-----------|--------|
| 04461161        | July 2022 | N.T.S. |