

SECTION 00 01 10

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ASTRICK * DENOTES FILED SUB-BID

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DRAWINGS

SECTION 00 86 00
LIST OF DRAWINGS

DRAWING NUMBER	TITLE
	COVER SHEET

ARCHITECTURAL

PH1.0 ALTERNATES AND SITE PHASING PLAN
A0.1 EXISTING CONDITIONS PHOTOS
A1.0 BUILDING PLANS, ELEVATIONS AND TYPICAL ENLARGED APARTMENT PLANS
A1.1 TYPICAL SECTIONS AND ELEVATIONS
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A2.0 BASE BID & ADD ALTERNATE 1-4 SITE PLAN, TYPICAL ADD ALTERNATE 1-4 BUILDING PLAN
A2.1 ADD ALTERNATE 1-4 TYPICAL APARTMENT PLAN, SECTIONS AND ELEVATIONS

MECHANICAL

M0.01 MECHANICAL ABBREVIATIONS, NOTES, SYMBOLS AND SCHEDULES
M1.00 MECHANICAL DEMOLITION PLANS - BUILDING B-2
M2.00 MECHANICAL FLOOR PLANS - BUILDING B-2
M3.00 MECHANICAL FLOOR PANS - BUILDING A1-A6, B1

ELECTRICAL

E0.00 ELECTRICAL SITE PLAN, ABBREVIATIONS, NOTES, DETAILS AND SYMBOLS
E1.00 ELECTRICAL DEMOLITION PLANS
E2.00 ELECTRICAL POWER NEW WORK PLANS
E3.00 ELECTRICAL SCHEDULES, DETAIL AND DIAGRAMS

All Drawings Printed Full Size 30" x 42".
Cover Sheet PH1.0, A0.1 and A2.0 to be printed in color.

SECTION 01 01 10

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 all start dates and completion dates of each phase to allow the next phase to start, 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 building occupants and to enhance the safety of the users, operations of the Contractor are to be separated from those of the residents 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, resident occupancy 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 drawing **PH1.0 Alternates and Site Phasing Plan** for dates associated with the following Phases of Work.

B. Any deliveries to the Contractor's staging areas shall be limited to morning deliveries between 7:30 AM and 12:00PM or by approval of the Owner.

C. Project Timetable

1. **Phase 1 Electrical Service** – Phased work areas (**Building C and Site**) will be made available to the Contractor on the following sequence. Each phase shall be completed prior to the commencement of the next phase.
 - Phase 1: May1, 2025 through May 30, 2025
2. **Phase 2, 3 & 4 Installation of New HVAC Heat Pumps in Resident Units** - Phased work areas (**Building B-2**) will be made available to the Contractor on the following sequence. Each phase shall be completed prior to the commencement of the next phase. There is a week between each phase for resident move out and move in of the units, typical all phases.
 - Phase 2: June 2, 2025 through July 2, 2025
 - Phase 3: July 21, 2025 through August 29, 2025
 - Phase 4: September 8, 2025 through October 17, 2025
3. **Phase 5 & 6 New HVAC Convector Replacement in Resident Units** - Phased work areas (**Building A-3**) will be made available to the Contractor on the following sequence. Each phase shall be completed prior to the commencement of the next phase. There is a week between each phase for resident move out and move in of the units, typical all phases.
 - Phase 5: October 27, 2025 through December 5, 2025
 - Phase 6: December 15 through January 23, 2026
4. **Phase 7 & 8 New HVAC Convector Replacement in Resident Units** - Phased work areas (**Building A-6**) will be made available to the Contractor on the following sequence. Each phase shall be completed prior to the commencement of the next phase. There is a week between each phase for resident move out and move in of the units, typical all phases.
 - Phase 7: February 2, 2026 through March 13, 2026
 - Phase 8: March 23, 2026 through May 1, 2026
5. **Phase 9 & 10 New HVAC Convector Replacement in Resident Units** - Phase work areas (**Building A-4**) will be made available to the Contractor on the following sequence. Each phase shall be completed prior to the commencement of the next phase. There is a week between each phase for resident move out and move in of the units, typical all phases.
 - Phase 9: May 11, 2026 through June 19, 2026
 - Phase 10: June 29, 2026 through August 7, 2026
6. **Phase 11 & 12 New HVAC Convector Replacement in Resident Units** - Phase work areas (**Building A-1**) will be made available to the Contractor on the following sequence. Each phase shall be completed prior to the commencement of the next phase. There is a week between each phase for resident move out and move in of the units, typical all phases.
 - Phase 11: August 17, 2025 through September 25, 2026
 - Phase 12: October 5 through November 13, 2026
7. **Start Dates Contingent on Prior Progress** – Start dates for those phases of the Work which do not begin upon Contractor's receipt of the Notice to Proceed are

predicted on the Contractor having maintained adequate progress or achieved Substantial Completion in prior phases. Should the Contractor fail, in opinion of the Architect / Owner, to maintain adequate progress in prior phases, or fail to achieve Substantial Completion of prior phases within their Contract Time, there shall not be just cause for a time extension on subsequent phases. The Contract Times for such subsequent phases shall remain the same as stated in the contract documents.

1.04 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 operations will limit Contractor access to Owner-occupied areas of the building and site. 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.

1.05 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 resident occupancy.
- 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 resident unit space for whatever portion of the 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.

1.06 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, 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 two-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.

1.07 Separation of Uses

- A. Before beginning any phase of the Work, provide 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.

1.08 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 residents 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 installation of boiler room connections, temporary fire alarm addressable panels, temporary handsets and the like.
 - 5. During all phases, the Owner will have need to receive deliveries of school supplies and kitchen supplies.
 - 6. During all phases, the building residents will require access to the existing building and site.

END OF SECTION

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" 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 **NHA – Horace Mann Apartments & Model Building – HVAC / Electrical Upgrades**

1.03 CONTRACT DESCRIPTION

Existing Condition Drawings: Existing Conditions drawing are provide under **Appendix B** for reference and coordination.

Model Building: In general, and without limiting the scope of this contract, the work consists of:

- A. Demolition of existing heating hot water system including piping throughout the existing crawlspace, heating hot water risers around the exterior walls, and convectors throughout the building. There are convectors in each apartment – one each in the living room, bedroom, bathroom and kitchen and two convectors serving the hallway/stairs in each 4 apartment module.
- B. Installation of new electric heaters and heat pumps where the convectors were located. Run new power wiring from existing load center in each apartment to new heaters and heat pumps. Provide new wall mounted thermostats and wiring back to heaters and heat pumps.
- C. New conduit and conductors from the main electrical service in the community room, trenched below grade to the B2 building. Stub up into a new panelboard located on the exterior of the building. Provide new feeders from the new exterior panelboard to existing panelboards in each of the stairway, routed through the crawlspace. The existing panelboards in the stairways shall be converted to a slice box and connect to existing feeders serving the existing load centers in each apartment.

Apartments: In general, and without limiting the scope of this contract, the work consists of:

- A. Demolition of existing heating hot water convectors throughout the building. There are convectors in each apartment – one each in the living room, bedroom, bathroom and kitchen and two convectors serving the hallway/stairs in each apartment module.
- B. Existing building materials that the demolition and installation of new convectors and electrical scope requires. This includes the associated GWB walls and ceilings, blocking, insulation, CMU block, , flooring (wood and tile), piping, and any associated caulking and adhesives.

Schedule:

- A. The schedule as described in The Invitation to Bid of these specifications has a Submittal - Procurement period to occur **December 16, 2024 through April 15, 2025**. On-site mobilization will begin in **May 1,**

2025 through November 13, 2026. For Final Substantial Completion and Occupancy by November 13, 2026. There will be phased Partial Substantial Completion for each Building, tied to the Phasing Substantial Completion date for each building.

1.04 GENERAL SCOPE OF WORK

- A. The work to be done consists of Renovations of the existing **NHA – Horace Mann Apartments & Model Building – HVAC / Electrical Upgrades** shown and specified on the contract drawings and project manual entitled:

**NHA – Horace Mann Apartments & Model Building –
HVAC / Electrical Upgrades
682-690 Watertown Street, Newton, MA 02460**

- 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 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 01 14 00
WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Site access restrictions.
- B. Coordination of work with City Agencies and Building Owner
- 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/Prime 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, MA** 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 building 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 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.
 - 5. **Facility** access: The existing building site and building is occupied by residence.

6. The General Contractor is required to coordinate with the Owner's Project Manager prior to scheduling Work.
7. 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.
8. Town 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.
9. 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 building's cafeteria / kitchen for eating or any building 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.

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 building 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.
- 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

Section 01 23 00

ALTERNATES

PART 1

1.0 INSTRUCTIONS AND PROVISIONS

1.1 Each Bidder shall be held fully responsible for examining the scope of the alternates generally defined herein and for recognizing any modifications to the Work caused by any alternate whether or not the particular trade Section is mentioned therein.

1.2 All Sections of the Work that are affected by the alternates will be considered Work to be performed by the **General Contractor and Filed Sub-Bid Contractors**.

1.3 General Bidders shall enter a single amount in the appropriate space provided in the Bid Form, which total amount shall consist of the amount for all work to be performed by the **General Contractor**.

1.4 The Work of the various Subcontractors and trades to be performed under alternates shall be in strict accordance with the requirements of the particular trade Section of the Specifications.

PART 2

2.0 BASE BID – ELECTRICAL SERVICE AND NEW HEAT PUMPS

Phase 1 - Site Work Community Building / Boiler Room Electrical Service

Phase 2, 3, & 4 – Model Building – B-2 : 682-690 Water Street

2.0.1 Base Bid: Provide all new heat pump systems and associated work in the existing building, as indicated on the Drawings.

2.1 ALTERNATE NO. 1 – NEW HVAC CONVECTOR REPLACEMENT

Phase 5 & 6 – Building A-3 : 674-676 Watertown Streets

2.1.1 Alternate number 1: Provide all new convectors and associated work in the existing building, as indicated on the Drawings.

2.2 ALTERNATE NO. 2 – NEW HVAC CONVECTOR REPLACEMENT

Phase 7 & 8 – Building A-6 : 33-35 Walker Street

2.2.1 Alternate number 2: Provide all new convectors and associated work in the existing building, as indicated on the Drawings.

2.3 ALTERNATE NO. 3 – NEW HVAC CONVECTOR REPLACEMENT

Phase 9 & 10 – Building A-4 : 15-17 Walker Street

2.3.1 Alternate number 3: Provide all new convectors and associated work in the existing building, as indicated on the Drawings.

2.4 ALTERNATE NO. 4 – NEW HVAC CONVECTOR REPLACEMENT

Phase 11 & 12 – Building A-1 : 21-23 Walker Street

2.4.1 Alternate number 4: Provide all new convectors and associated work in the existing building, as indicated on the Drawings.

End of Section 01 23 00

ALTERNATES

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.

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.
- C. 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.

D. 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.

E. 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

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 project for **Final Substantially Completion** must be completed by **November 13, 2026**. **There will be phased Partial Substantial Completion for each Building, tied to the Phasing Substantial Completion date for each building.**
 - 2. **The execution of work shall be tied into the specific areas on the CPM schedule. Final cleaning of the interior spaces shall be identified and coordinated with the Owner in preparation of Owner's 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 Senior Center will continue to be operated during the course of construction, by the **City of Newton** 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 building 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 Owner's 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 cleanup 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. Wetlands protection.
 - g. Potentially difficult areas of work.
 - h. Project coordination.
 - i. Construction-waste management and recycling procedures.
 - j. Sustainability product requirements and procedures.
 - k. Security and housekeeping procedures.
 - l. Construction schedules.
 - m. Work beyond Contract Limit.
 - n. Procedures for testing and inspection.
 - o. Procedures for maintaining record documents.
 - p. Requirements for equipment start-up.
 - q. 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
 - l. 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.

01 33 24 END OF ELECTRONIC SUBMITTAL PROCEDURES

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

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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, or impede trucking delivery or moving of materials at the site, or prevent adequate drainage of the site or adjoining areas.

1.08 WINTER CONSTRUCTION / CONDITIONS

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. The project will extend through the winter months for year 2025 and 2026; the contractor is responsible to provide temporary heat to resident units under construction. No propane or natural gas fueled heat equipment is allowed within the building. Contractor to provide temporary electric heat based on Global Industrial Portable Electric Space Heater, 120V, 1500W, Model WB653579. Winter conditions are considered from October 1 through April 30 for temporary heat. Maintain a minimum of 55 degrees at all times. Provide a thermostat with in each unit to verify minimum temperature requirements.

B. Refer to SECTION 01 50 00 - TEMPORARY FACILITIES, for additional requirements applicable to
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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 **Fire Department** to accommodate the day to day occupancy. Construction is expected to commence during

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the Construction Period Phasing Description while the building is occupied and be completed while the 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 Department**
- 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) custodian from **City of Newton** and one (1) Owner's Project Representative.

1.14 CUSTODIAL HOURS

A. A custodian is required to be onsite for all Contractor work hours per **City of Newton** policy. Direct payments for extended hours will be made to the **City of Newton** for overtime and weekend custodian hours. The Contractor shall reimburse the **City of Newton** for extended hours required by the Owner's Project Representative.

1.15 OVERTIME RATES

- A. Extended hours and weekend rates for custodians and project representative:
 - 1. Custodian rate for additional hours is \$49.00 per hour per custodian.

1.16 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

1.17 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.

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Any person violating this provision of the contract will be removed from the site.

1.18 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.

1.19 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.

1.20 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 3/4" 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

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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 facility. Playgrounds and landscaped areas should be protected from damage from construction activities.

1.21 PARKING, STORAGE AND DELIVERY OF MATERIALS

A. *Onsite storage and parking is limited. Refer to Site Logistics plan. Contractor to work with **City of Newton** to coordinate use of dumpsters and deliveries to site.*

1.22 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.

1.23 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.

1.24 PERMITS AND REGULATIONS

A. Permit and Inspectional fee are waived. The project is Tax- Exempt. An tax identification number will be issued to the Awarded contractor.

1.25 NOT USED

1.26 NOT USED

01 35 00 END OF SPECIAL PROJECT PROCEDURES

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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. Hazardous ACM abatement shall be performed by the Owner's Abatement Contractor in coordination with this project. The general contractor, sub-contractors and filed sub-bid contractors shall coordinate with the Owner's abatement contractor in performance of work, phasing requirements and alternates described.**
- C. Refer to Appendix A of the specifications for Hazardous Materials Report and Material testing. Appendix A shall be in part references in coordination of the project's scope of work.**
- D. 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.
- E. 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 41 19 Selective Demolition
- B. Section 02 83 33 Demolition of Material Bearing Lead Paint
- C. Section 04 01 20 Masonry
- D. Section 06 10 00 Rough Carpentry
- 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 Owner's 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 Owner's 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 if 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 maybe found inside the building. The Owner's Abatement 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.
- A. 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 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 areas below and adjacent to the work being performed.** Final cleaning to all interior spaces shall include but not limited to broom, then vacuum with hepa filtered vacuums all surfaces (including but not limited to floors, sills, all horizontal and vertical surfaces, shelves, trays, ledges and ceilings) and complete wipe down for a clean dust / debris free space.
- 1.04 Requirements
- 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 as shown on the Table of Contents with in this Project Manual
- 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 24.
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: New ceilings are to be 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 or required to be removed and reinstalled to execute the work. 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 Architect's and Owner'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. **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.
 - G. 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 18 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 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 gypsum deck, floor, wall and ceiling surfaces resulting from alteration work and those shown to be filled to match adjacent undisturbed surfaces.
- H. Removed or Abandoned Utilities: Cap, valve, plug or bypass to make a complete and working installation.
- I. Landscaping and Lawns: Protect existing lawns and plantings to remain.
- J. Installing Acoustical Ceilings:
 - 1. After completing Work above plaster ceilings, install new suspended acoustical ceilings as detailed. 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.
- K. Existing Pipe and Duct covering and Existing Sprayed-on Fireproofing: Restore to their original undamaged conditions.
- L. 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 ² or SM	square meter
m ³ or CM	cubic meter
mm	Millimeter
Mths	Months

REFERENCES AND DEFINITIONS

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
CLG	Ceiling
CLKG	Caulking
CLOS	Closet

REFERENCES AND DEFINITIONS

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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
EJ	Expansion Joint
EL	Elevation
ELEC	Electrical
ELEV	Elevator

REFERENCES AND DEFINITIONS

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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
FURR	Furring
FUT	Future
GA	Guage
GALV	Galvanized
GC	General Contractor

REFERENCES AND DEFINITIONS

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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
LT	Light
LTG	Lighting
MAT	Entrance Mats, Entrance Grate
MATL	Material
MAX	Maximum
MB	Marker Board

REFERENCES AND DEFINITIONS

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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
PNL	Panel, Paneling
POL	Polished
PPT	Porcelain Paver Tile
PPTB	Porcelain Paver Tile Base
PR	Pair
PRFB	Prefabricated
PRTBD	Particle Board

REFERENCES AND DEFINITIONS

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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
SCRF	Static Control Resilient Flooring
SECT	Section
SEG	Segment
SF	Square Foot
SH	Shelf
SHT	Sheet
SHR	Shower
SHVT	Seamless Sheet Vinyl
SIM	Similar
SLH	Slotted Horizontal
SLV	Slotted Vertical

REFERENCES AND DEFINITIONS

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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
TRK	Track
TS	Tube Steel
TV	Television
TW	Top of Wall
TYP	Typical
TZ	Terrazo
UC	Undercut
UL	Underwriters Laboratory
UNO	Unless Noted Otherwise

REFERENCES AND DEFINITIONS

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

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

REFERENCES AND DEFINITIONS

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/dfel/> 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

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

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 900 19th Street N.W., Suite 300 Washington, DC 20006 www.aluminum.com
ABAA	Air Barrier Association of America 1600 Boston-Providence Highway Walpole, MA 02081 www.airbarrier.org
AAMA	American Architectural Manufacturer's Association 1827 Walden Office Sq., Suite 104 Schaumburg, IL 60173-4268 www.aamanet.org
AASHTO	American Assoc. of State Highway & Transportation Officials 444 N. Capitol Street NW, Suite 249 Washington, DC 20001 www.aashto.org
ACI	American Concrete Institute, International 38800 Country Club Drive, Farmington Hills, Michigan 48331 www.aci-int.org
ACPA	American Concrete Pipe Association 222 West Las Colinas Boulevard, Suite 641, Irving TX www.concrete-pipe.org
ADC	Air Diffusion Council 104 S. Michigan Ave, Suite 1500, Chicago, IL 60603 www.flexibleduct.org
AFPA	American Forest & Paper Association (Formerly NFPA National Forest Products Association) 1111 19 th St. N.W., Suite 800, Washington, DC 20036 www.afandpa.org
AGA	American Gas Association Inc. 1515 Wilson Blvd. Arlington, VA 22209-2469 www.agagas.com
AGAI	American Galvanizers Association Inc. 12200 E. Liff Ave, Suite 204, Aurora, CO 80014-1252 www.galvanizeit.org
AIA	American Institute of Architects 1735 New York Avenue, N.W., Washington, DC 20006-5292 www.aia.org
AISC	American Institute of Steel Construction 1 E. Wacker Dr., Suite 3100, Chicago, IL 60601-2001 www.aisc.org
AMCA	Air Movement and Control Association 30 W. University Drive, Arlington Heights, IL 60004-1893 www.amca.org
ANSI	American National Standards Institute 11 W. 42 nd Street, 13 Floor, New York, NY 10036 www.ansi.org
APA	APA - The Engineered Wood Association (formerly APA - American Plywood Association) P.O. Box 11700, Tacoma, WA 98411-0070 www.apawood.org
ARI	Air-Conditioning and Refrigeration Institute

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	4301 N. Fairfax Dr., Suite 425, Arlington, VA 22203 www.ari.org
ASCA	Architectural Spray Coaters Association 230 West Wells Street, Suite 311, Milwaukee WI 53203 www.aecinfo.com
ASCE	American Society of Civil Engineers 1015 15 th St. N.W., Washington, DC 20005 www.asce.org
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers 1791 Tullie Circle NE, Atlanta GA.30329 www.ashrae.org
ASME	American Society of Mechanical Engineers 345 East 47th Street, New York, NY 10017-2392 www.asme.org
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive, West Conshohocken, PA 19428 www.astm.org
AWI	Architectural Woodwork Institute 1952 Isaac Newton Square W., Reston, VA 20190 www.awinet.org
AWPA	American Wood Preservers' Association P.O. Box 286, Woodstock, MD 21163-0286 www.awpa.com
AWPI	American Wood Preservers' Institution 1945 Old Gallows Rd., Suite 150, Vienna, VA 22182 www.oas.org
AWS	American Welding Society 550 LeJeune Road, N.W., Miami, FL 33126 www.aws.org
BHMA	Builders Hardware Manufacturers Association, Inc. 355 Lexington Ave., 17 Floor New York, NY 10017 www.buildershardware.com
CDA	Copper Development Association 260 Madison Ave., 16 th Floor, New York, NY 10016 www.copper.org
CISCA	Ceilings & Interior Systems Construction Association 579 W. North Ave., Suite 301, Elmhurst, IL 60126 www.cisca.org
CRI	Carpet and Rug Institute 310 Holiday Ave, Dalton, GA 30720 ww.carpet-rug.com
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road, Schaumburg, IL 60173-4758 www.crsi.org
DHI	Door and Hardware Institute 14170 Newbrook Dr., Chantilly, VA 22021-2223 www.dhi.org
FM	Factory Mutual Engineering & Research Corp. 1151 Boston-Providence Turnpike Norwood, MA 02062 www.fmglobal.com
FSC	Forest Stewardship Council (United States Chapter) 1155 30th Street NW, Suite 300, Washington, DC 20007

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	www.c-f-c.com
GA	Gypsum Association 810 First Street, N.E., Suite 510 Washington, DC 20002 www.gypsum.org
GANA	Glass Association of North America 2945 S.W. Wanamaker Dr., Suite A, Topeka, KS 66612-5321 www.glass.org
GICC	Glazing Industry Code Committee 3310 Harrison St., Topeka, KS 66611-2279 www.glazingcodes.net
IGCC	Insulating Glass Certification Council 3933 US Route 11, PO Box 2040, Cortland, NY 13045 www.igcc.org
LSGA	Laminators Safety Glass Association 3310 Harrison Street, Topeka KS 66611-2279 www.glass.org
MCAA	Mason Contractors Association of America 1910 S. Highland Ave. Suite 101, Lombard, IL 60148 www.masoncontractors.org
MFMA	Maple Flooring Manufacturers Association 60 Revere Drive, Suite 500, Northbrook, IL 60062 www.maplefloor.org
MIL	Military Specifications and Standards Naval Publications and Forms Center 5801 Tabor Avenue, Philadelphia, PA 19120 www.milspec.com
NAAMM	National Association of Architectural Metal Manufacturers 8 South Michigan Avenue, Suite 1000, Chicago, IL 60603 www.naamm.org
NCMA	National Concrete Masonry Association 2302 Horse Pen Road, Herndon, VA 20171-3499 www.ncma.org
NEBB	National Environmental Balancing Bureau 8575 Government Circle, Gaithersburg, MD 20877-4121 www.nebb.org
NEMA	National Electrical Manufacturers' Association 1300 N. 17 th St., Suite 1846, Rosslyn, VA 22209 www.nema.org
NFPA	National Fire Protection Association 1 Battery March Park, PO Box 9101, Quincy, MA 02269 www.nfpa.org
NFSHSA	National Federation of State High School Associations PO Box 20626, Kansas City MO. 64195 www.nfhs.org
NRCA	National Roofing Contractors Association O'Hare International Center 10255 W. Higgins Road, Suite 600, Rosemont, IL 60018-5607 www.nrca.net
PCA	Portland Cement Association 5420 Old Orchard Road, Skokie, IL 60077-1083 www.cement.org
PEI	Porcelain Enamel Institute 4004 Hillsboro Pike, Suite 224B, Nashville, TN 37215 www.porcelainenamel.com

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PS	Product Standard U. S. Department of Commerce www.omg.org
SDI	Steel Deck Institute P.O. Box 25, Fox River Grove, IL 60021-0025 www.sdi.org
SDI	Steel Door Institute 30200 Detroit Road, Cleveland, OH 44145-1967 www.steeldoor.org
SGCC	Safety Glass Certification Council RMS, P.O. Box 9 Henderson Harbor, NY 13651 www.sgcc.org
SIGMA	Sealed Insulating Glass Manufacturers Association 401 N. Michigan Ave., Suite 2400, Chicago, IL 60611 www.glasschange.com
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association 4201 Lafayette Center Dr., Chantilly, VA 22022-1209 www.smacnapa.org
SSMA	Steel Stud Manufacturer's Association 8 South Michigan Avenue, Chicago IL 60603 www.ssma.com
SSPC	The Society for Protective Coatings 40 24 th Street, 6 th Floor, Pittsburgh PA 15222-4623 www.sspc.org
SWRI	Sealant, Waterproofing & Restoration Institute 2841 Main Street, Suite 585, Kansas City, MO 64108 www.swrionline.org
TCNA	Tile Council of North America, Inc. 100 Clemson Research Blvd., Anderson, SC 29625 www.tileusa.com <i>(formerly TCA, Tile Council of America)</i>
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road, Northbrook, IL 60602 www.ul.com
USGBC	United States Green Building Council 1800 Massachusetts Avenue NW, Suite 300 Washington DC 20036 www.usgbc.org
WDMA	Window & Door Manufacturers Association <i>(formerly National Wood Window & Door Association, NWWDA)</i> 205 E. Touhy Avenue, Suite G-54, Des Plaines, IL 60018 www.nwwda.org

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

REFERENCES AND DEFINITIONS

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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 30 0 Administrative Requirements
- B. Section 01 45 00 Quality Control

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. Weather Protection
- C. Temporary Power
- D. Hoisting Equipment and Machinery
- E. Staging
- F. Maintenance of Access
- G. Dust Control
- H. Noise Control
- I. Cleaning During Construction
- J. Sanitary Facilities
- K. 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 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 Town 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 facility 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 Owner.
- 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, a thermostatically controlled heater, with full height partitions in close proximity to the Contractor's office. 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 facility 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.

NHA – Horace Mann Apartments & Model Building
HVAC / Electrical Upgrades

- 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 Owner 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.
- 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 24 Electronic Submittal Procedures, 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, mechanical, 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.
 - 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. 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 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.
- F. **Final cleaning to all interior spaces shall include but not limited to broom, then vacuum with hepa filtered vacuums all surfaces (including but not limited to floors, sills, all horizontal and vertical surfaces, shelves, trays, ledges and ceilings) and complete wipe down for a clean dust / debris free space.**

1.03 RECORD DRAWINGS

- A. Record as-built 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 contractors 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 / Town** 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 in 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 week prior to the time of turning over this contract to the Town for Use and Occupancy or Final Acceptance, the general contractor shall secure and deliver to the Town via the Architect two complete, indexed files containing approved operating and maintenance manuals, shop drawings, closeout documents, 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 Town 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 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 / As-builts on AutoCAD and PDF (Three hard copies 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 (3 record hard copies and one electronic copy).**
 - 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 and letter of completeness.**
 - m) **Final accounting of schedule of values and changes to the contract.**
 - n) **Statement of Wage Compliance**
 - o) **Contractor warranty / service contact information of all trades**
 - p) **All contents of electronic closeout documents to be PDF BOOKMARKED!!!!**

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. Cutting and patching of in-place work
- F. Cleaning.
- G. Protecting installed work.

1.2 RELATED REQUIREMENTS

- A. Division 00 and Division 01

1.3 EXAMINATION OF AND ACCEPTANCE OF EXISTING CONDITIONS

- A. The General Contractor, its subcontractors 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.

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.

EXECUTION

- D. Survey Reference Points.
 - 1. Contractor 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, as required 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 70 00 – Contract Closeout.

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.

EXECUTION

- 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 will park vehicles on the inside slab. If necessary to complete their scope of work, drop cloths will be placed under vehicles at all times.
 - 3. No pipe cutting machine will be used on the inside floor slabs.
 - 4. Steel will 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.

EXECUTION

- 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.
 - 1. Such exposures include, but are not limited to the following:
 - a. Excessive static or dynamic loading.
 - b. Excessive internal or external pressures.
 - c. Excessive weathering.
 - d. Excessively high or low temperatures or humidity.
 - e. Air contamination or pollution.
 - f. Water or ice.
 - g. Chemicals or solvents.
 - h. Heavy traffic, soiling, staining and corrosion.
 - i. Rodent and insect infestation.
 - j. Unusual wear or other misuse.
 - k. Contact between incompatible materials.
 - l. 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. 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 CUTTING AND PATCHING OF IN-PLACE WORK
- A. Scope: General Contractor shall coordinate with the Owner's Abatement Contractor in GWB walls for coordination and quality of all cutting work. Cutting and patching of the Work includes, but is not limited to:
 - 1. All cutting, altering, and fitting in GWB wall shall be done by the Owner's abatement contractor as necessary for the Work to comply with the Contract Documents.

EXECUTION

- a. Make all products and their components of the Work fit together properly.
 - b. Fully integrate all patching, to present the visual appearance of an entire, completed, and unified project in compliance with the Contract Documents.
 2. Provide openings in elements of the Work that are non-GWB, and the patching of same, for penetrations required by all trades, including but not limited to mechanical, plumbing and electrical work.
 - a. Individual filed sub-trades are responsible for designated types of coring and drilling penetrations in non-GWB assemblies for piping, conduit, ducts and other penetrations.
 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.
 6. Remove samples of in-place construction as specified for testing.
- 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 structure.
- C. Exposed elements: Employ appropriate tradesperson to perform cutting and patching for weather exposed and moisture resistant elements, and sight exposed surfaces that are non-GWB
- 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.
- 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 safety of the building when occupied.
- G. General requirements of cutting and patching:
1. Submit written proposals to perform cutting and patching 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. Aesthetic and visual qualities of exposed-to-view elements.

EXECUTION

- d. Work of Owner or work performed under separate Contract.
2. Cutting: Cut in-place construction using methods least likely to damage elements of as-built construction.
3. Coring and Drilling of holes incidental to work of individual sections shall be performed by the trade requiring the penetration, except as follows. The General Contractor is responsible for performing the following:
 - a. Coring and Drilling of holes greater than 8 inches in diameter in concrete decks and slabs.
 - b. Core drilling in exterior wall and roof surfaces leading to, or from, the outside of the Building.
 - c. 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.
4. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break; for assemblies, refinish entire unit.

1.9 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 wind blown debris.
 2. Filed Sub-bid Subcontractors are responsible for clean-up and removal of their own rubbish, debris, shipping materials and waste materials through-out the term of their work.
 - a. Filed Sub-bid Subcontractors are responsible to comply with requirements of the City of Boston and the requirement herein.
 3. General Contractor shall furnish dumpsters and provide general site cleaning services, except as explicitly specified otherwise under individual Sections of the Specifications.
- 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. 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.
 3. Do not dispose of wastes into streams or waterways.
 4. Comply with requirements of authorities having jurisdiction including, without limitation, requirements related to fire prevention, rodents, pests, vermin, waste storage, waste trucking, waste removal, waste disposal, street cleaning, truck tire cleaning, and other requirements.
- D. Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.

EXECUTION

- E. Maintain project in accordance with all local, Commonwealth of Massachusetts, and Federal Regulatory Requirements.
- F. Store volatile wastes in covered metal containers, and remove from premises daily.
- G. Prevent accumulation of wastes which create hazardous conditions.
- H. Provide adequate ventilation during use of volatile or noxious substances.
 - 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.
- I. Use only those materials which will not create hazards to health or property and which will not damage surfaces.
- J. Use only those cleaning materials and methods recommended by manufacturer of surface material to be cleaned.
- K. 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.
- L. Provide on-site containers (dumpsters) for collection and containment of, waste materials, debris and rubbish.
- M. General Contractor 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.
- N. 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.
- O. Handle material in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.
- P. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not damage surrounding surfaces.

1.10 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 Contractors operations, the Contractor 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.

EXECUTION

1.11 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
 - 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.

EXECUTION

- 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. Carpet: Vacuum clean carpet and remove all spots and stains.
- I. Hardware: Clean and polish finished hardware, remove marks, stains, scratches and blemishes.
- J. Tile: Clean and polish floor and wall tile, remove grout film and excess grout.
- K. Woodwork: Dust and clean architectural millwork, and finish woodwork items, remove all stains, spots, and foreign matter using methods and cleaning agents which will not harm the various finishes.
- L. Site: Sweep exterior paved surfaces broom clean; rake clean unpaved surfaces.
- M. 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.

1.12 PROTECTING INSTALLED WORK

- A. Protect all built, and in-place Work. In addition to requirements specified elsewhere, the Contractor shall protect all installed work from subsequent damage or deterioration from construction activities, and atmospheric damage until Owner's Substantial Completion and occupancy precludes the need for protection activities. No attempt is made in this Section to list all elements requiring protection or to describe how each element will be protected. It is the responsibility of the Contractor to determine for itself the scope and nature of protection required.
 - 1. Protection of some products/building elements may be required to remain in place for a large portion duration of the project. As such, materials should be installed to provide adequate protection throughout the full extent of construction activities. Repair or reinstall protection throughout the duration of construction as required.
- B. Finish Products: Some finishes may need to be physically isolated from construction operations by means of protective barriers and coverings.
 - 1. General: 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.
 - 2. Doors, door frames and hardware: Protect from damage due to traffic and construction operations.

EXECUTION

3. Floor and Finished Surfaces Protection: Protect against construction traffic, rolling loads, static loads, damage from material movement and storage, or similar causes of damage.
 4. Walls: Protect from impact, dents, marks, water damage, and similar damage.
 5. Glass: Protect from damage including etching and staining. Keep glass clean.
 6. Protect products sensitive to water damage from becoming wet.
 7. Protect products sensitive to ultra-violet exposure and atmospheric exposure by limiting exposure to within limits recommended by respective product manufacturer.
 8. Protect products from biological growth, molds and mildew.
 9. Protect products from rodents and other animals, birds and insect damage.
- C. Roofing and waterproofing systems: Protect and isolate from traffic and construction operations. Protect from chemicals. Work and traffic directly upon roofing and waterproofing is prohibited, provide temporary walkways and platforms.
- D. General Protection from chemicals:
1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners selected for Project unless chemicals being used will not damage adjacent surfaces. Use covering materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. Do not apply liquid masking agent to painted or porous surfaces. When no longer needed, promptly remove masking to prevent adhesive staining.
 2. Do not clean surfaces during winds of sufficient force to spread cleaning solutions to unprotected surfaces.
 3. Neutralize and collect alkaline and acid wastes and dispose of off-site.
 4. Dispose of runoff from chemical operations by legal means and in a manner that prevents soil erosion, undermining of paving and foundations, damage to landscaping, and water penetration into building interiors.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Examination of as built conditions and acceptance of conditions.
- B. **All cutting, penetrations, fastening and anchoring in to GWB construction / assemblies shall be done by the Owner's Abatement Contractor. The General Contractor, subcontractors and filed sub-bid contractor shall coordinate locations with the Owner's abatement contractor on locations of cutting, penetrations, fastening and anchors into GWB assemblies / construction.**
- C. **All cutting and patching of non-GWB assemblies / construction shall be by the GC, subcontractors and filed sub-bid contractors for their portion of work.**
- D. Administrative and procedural requirements for cutting and patching, including attendant excavation and backfill as required to complete the Work. Construction Manager 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. **PATCHING OF FLOORS / WALLS DUE TO CUTTING OF OPENINGS IS THE RESPONSIBILITY OF THE FILED SUB-BID CONTRACTOR / Sub CONTRACTOR CUTTING HOLE. SLEEVES WILL BE INCORPORATED BY THE LISTED TRADE AS DESCRIBED BELOW. CUTTING OF DECK(FLOOR AND ROOF) IS THE RESPONSIBILITY OF THE TRADE INSTALLING MATERIAL WHICH FILLS AND/OR COVERS THE HOLE UP TO 16"X16". CUTTING OF HOLES LARGER THAN 16"X16" ARE BY GENERAL CONTRACTOR.**
 - 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 Trade Contract trades are responsible for designated types of coring and drilling penetrations for piping, conduit, ducts and other penetrations as defined in this Section. Note that it is the intention and expectation that **ALL** floor openings will require coring by the appropriate Filed Sub-Bid Contractor. Openings will be reinforced by 05 50 00 METAL FABRICATIONS per the details on the structural drawings.

Wall penetrations in concrete walls may be sleeved or cored at the discretion of the Trade Contractor. Sleeves provided by and

location coordinated by Trade Contractor, installed by 03 30 00 CAST IN PLACE CONCRETE.

Wall penetrations in Masonry and Drywall Partitions **SHALL** be sleeved prior to erection of wall. Sleeves provided by and location coordinated by Filed Sub-Bid Contractor, installed by 04 01 20 MASONRY, and if not on associated piping shall be secured to the metal studs by the Filed Sub-Bid Contractor responsible for the penetration.

- 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 Trade Contractors are responsible for coring and sleeving up to and including 16 inches in diameter. All cutting of openings greater than this dimension require the permission of the Architect.
 - 2) The General Contractor is responsible for all cutting, coring and patching 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.

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.
- Should conditions of Work or the schedule indicate a change of products from original installation, Contractor shall submit a request for substitution in accordance with project requirements.

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, Contractor shall oversee and ensure Filed Sub-Bid Contractor(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 barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - 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.

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 any direction.

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 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 01 15. 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. **All removal of convectors, cutting, penetrations and anchoring into GWB assemblies / construction shall be performed by the Owner's abatement Contractor in coordination with the project. The GC and all trades shall coordinate with the Owner's abatement contractor on all location affected with GWB construction / assemblies.**
 2. 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.
 3. Careful removal and storage of items designated on the Drawings to be reused or re-installed.
 4. 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.
 - d. Coordination of Subcontractors demolition with the disconnecting, cutting, capping and rerouting of utilities.
- 1.04 Related Section
- A. Section 01 35 43 Environmental Procedures
 - B. Section 02 83 33 Demolition of Material Bearing Lead Paint
 - C. Section 04 01 20 Masonry
 - D. Section 06 10 00 Rough Carpentry
 - E. Section 23 00 00 Heating Ventilation and Air Conditioning
 - F. Section 26 00 01 Electrical
- 1.05 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 by administrative and facility staff operation. The staff will coordinate occupancy with the contractors construction activities.
- 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 General and Supplementary 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. Lead based paint for the era of this building is assumed to be present on this project. The issuance of this section is to set requirements and proper procedures if lead based paint is encountered during the scope of work of this project. Given the age of the building, it shall be assumed that lead paint exists throughout.
- 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 contractor shall be responsible for the removal, site protection and disposal of paint containing lead I area where to paint is to be provided. See section 09 90 00 Painting.
 - C. 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.
 - D. 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.
 - E. 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.
 - F. 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
- B. Section 04 01 20 Masonry
- C. Section 06 10 00 Rough Carpentry
- D. Section 09 90 00 Painting
- E. Section 23 00 00 Heating Ventilation and Air Conditioning
- F. Section 26 00 00 Electrical

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

Demolition of Materials Bearing Lead Paint
02 83 33 - 2

**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/m³.

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 plane by means of mechanical fasteners and/or adhesives. The sheeting will extend out from the building for the remainder of the 20 foot 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 04 01 20

MASONRY

PART 1 - GENERAL

1.01 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.

1.02 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:

1.03 Refer to the drawings for specific work notes.

A. Infill of masonry wall where access by other trades is required, i.e. HVAC, and access.

B. Infill masonry and concrete openings with masonry, material to match adjacent.

C. Provide new openings in existing masonry walls where new work is occurring

D. Firestopping of masonry partitions to adjacent surfaces.

E. Installation of steel loose lintels supplied by section 05 50 00

F. All staging, scaffolding and hoisting for the work of this Section.

G. Field Mock-Ups in place as designated by Architect

1.04 Related Sections

A. Section 02 84 00 Demolition of Materials Bearing Lead Paint

B. Section 06 10 00 Rough Carpentry

C. Section 07 84 00 Firestopping

D. Section 07 92 00 Joint Sealants

E. Section 23 00 00 HVAC – Ductwork, piping and access doors

F. Section 26 00 00 Electrical

1.05 Submittals

A. Submit for approval in accordance with the requirements of Section 01 33 24 ELECTRONIC SUBMITAL PROCEDURES, the following:

1. Manufacturers brochures and product data for all manufactured and purchased

products.

B. Actual color samples of:

1. Caulking
2. Mortar Mix (All samples to be washed prior to submission)
3. Brick Samples proposed for Repair to install through wall flashings. 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.
4. Metal Flashing

1.06 Sample Panels (Each Mortar Type)

- A. Construct at the site, mock-up panels as requested by the Architect for face brick and 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.

1.07 Test Panels

- A. Before full scale application, review manufacturer's product data sheets to determine the suitability of each product for the specific surfaces. Apply each restoration cleaner and paint stripper to test panels to determine dilution rates, dwell times, number of applications, compatibility, effectiveness, application procedures, effects of pressure rinsing, and desired results.
- B. Apply restoration cleaners and paint strippers to test panels in accordance with manufacturer's instruction. Allow 48 hours or until test panels are thoroughly dry, before evaluating final appearance and results. Do not begin full scale application until test panels are inspected and approved by the Architect.
1. Size: Minimum 4 feet by 4 feet each.
 2. Locations: As determined by the Architect.
 3. Restoration Cleaners: Number of test panels as required to completely test each restoration cleaner with each type of substrate and with each type of material or stain to be cleaned.
 4. Paint Strippers: Number of test panels as required to completely test each paint stripper with each type of substrate and with each type of coating or paint to be stripped.
- C. Test all cleaning effluents generated by the restoration cleaning and paint stripping of the test panels to determine any hazardous characteristics. Comply with applicable federal, state, and local environmental regulations regarding testing, handling, treatment, containment, collection, transport, disposal, and discharge of hazardous wastes.
- D. Retain and protect approved test panels in undisturbed condition during the work of this section, as a standard for judging the restoration cleaning work.

1.08 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. Pre-Application Meeting: Convene a pre-application meeting two (2) weeks before the start of exterior masonry restoration cleaning. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, applicator and ProSoCo representative. Review environmental regulations, test panel procedures, protection of surrounding areas and non-masonry surfaces, surface preparation, application and coordination with other work.
- C. 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.
- D. Product Data: Provide manufacturer's product data sheets on all products to be used for the work.
- E. 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.
- F. 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.
- G. 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.
- H. Surface Preparation: Describe surface preparation to be completed before application of restoration cleaners and paint strippers.
- I. Application: Describe application procedures of restoration cleaners and paint strippers.
- 1.09 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. Project/Site Conditions: Do not install 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.

1.11 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.

1.12 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.

2.04 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. See firestopping specification for requirements.

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:

- A. Brick Veneer Anchors and Ties: Pos-I-Tie by Heckmann Building Products, Chicago, IL or equal with the following characteristics:

- B. Veneer Anchors: 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 3/4 inch diameter washer under flanged head sealing surface penetration at anchor.
1. Screws for Brick Veneer to Steel Studs: Heckmann Self-Drilling Screw.
 2. Screws for Brick Veneer to Concrete, CMU, Wood or Brick: Heckmann Tapcon.
 3. Screws for Brick Veneer to Structural Steel: Heckmann Drill-It.
 - a. Ties: 3/16 inch diameter, triangular shape, hot-dip galvanized wire ties, ASTM A 641 or ASTM A 82 with 1.30 ounces per square foot zinc coating conforming to ASTM A 153, Class B-3. Length as required for not less than 75% embedment in mortar joints.
 - b. At stack bond areas and where heights of brick of other than running or flemish bond exceed 8 inches shall be Vee wall ties, 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.
 - c. In general, ties are to be spaced at 1'-4" horizontally and 1'-4" vertically. The minimum quantity is one (1) per two (2) square feet.
 - d. Ties for new block walls to existing walls shall be continuous channels AHB 360 C with slots for #363 Gripstay Anchors.
 4. Composite and Single Wythe Types: Longitudinal reinforcement shall be standard, ladur, as manufactured by AA Wire Products, Hohmann and Barnard, Inc., or "Fur-O-Wall", fabricated of cold-drawn, mild-galvanized 9-gauge steel wire conforming to ASTM A-82, with two (2) deformed longitudinal rods welded at 16 inch intervals in the same place to a continuous perpendicular cross rod.
 5. Widths: Except as otherwise noted on the Drawings, all longitudinal reinforcement shall be of such width as to place the longitudinal rods within 1 inch of each face of wall or partitions.
 6. Joint Reinforcing Placement for Masonry Units: Reinforcing shall be placed at all masonry unit walls. In general, place reinforcing every 16 inch on centers laid continuous. Use 6 inch laps for continuity. Provide preformed corners and "tee" pieces at all intersections and corners.

2.07 Mortar Materials

- A. Mortar type shall be ASTM Type N with 1:1:6 proportions and consist of the following.
- B. Cement: Shall be an American Portland Cement, conforming to ASTM C-150, Type II for concrete masonry units as approved by the Architect
- C. Air Entraining Admixtures: For grout fill shall conform to C-260
- D. Lime: Shall be plastic hydrate, conforming to ASTM C-207, Type S (Only)
- E. 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.

- F. 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.
- G. Integral waterproofing for exterior mortar mixes: Master Builders Omicron Mortarproofing, Sonneborn Hydrocide, Pardee Dycrete, or equal.
- H. Water: Shall be potable and free from injurious contaminants

2.09 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.
 - 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".
 - 3. 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.

5 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.

6 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.

2.08 Thru-Wall Flashing

- A. Thru-wall flashing shall be accomplished:
 1. One piece bent 22 gauge stainless steel sheet through-wall flashing with crimped drip edge to facilitate counter flashing by Roofing Contractor. Fastened with stainless steel fasteners Stainless Steel Type 302 or 304 to unit masonry backup wall in continuous bed of sealant and membrane flashing.
 2. Fully Adhered Membrane Flashing Fully Adhered Membrane Flashing : CCW-705 Air Barrier self-adhered sheet membrane by Carlisle Coatings and Waterproofing or Henry Company, Inc. or W.R. Grace & Co. or approved equal.
 3. 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.

2.11. 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.
 1. Hohmann & Barnard, Inc., Model QV "Quadro-Vent",
 2. Heckman Building Products; product "#85, Cell Vent".
 3. Wire Bond Inc., Model 3601 "Cell Vent".

2.12 Cavity Wall Mortar Netting

- 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. Mortar netting: High Density Polyethylene (HDPE) course geotextile fabric having a 90 percent open weave mesh, with stepped topped edging, shaped in a manner to catch and hold mortar droppings and preventing blockage of weep hole vents, nominal 1 inch thick by 5 feet long by 10 inches high.
 1. Hohmann & Barnard, Inc. product "Mortar Net".
 2. Mortar Net USA, Ltd., Highland IN., product "Mortar Net".
 3. Wire Bond, Inc., Charlotte, NC, product "Mortar Net Green".

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 Restoration Cleaners

- A. Manufacturers:

1. SafRestorer Masonry Cleaner
 2. Sure Klean Restoration Cleaner
 3. 600 Detergent Mason Cleaner
- B. Restoration Cleaner: "Sure Klean Restoration Cleaner" 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.
1. Form: Clear liquid
 2. Color: Light Amber
 3. pH: 1.2
 4. Specific Gravity: 1.05
 5. Flash Point: None
- 2.15 Epoxy Repair Gel
- A. Epoxy: Sikadur Injection Gel
 - B. Epoxy: Simpson Strong Tie ETIPAC10KT
 - C. Epoxy: Silpro CIE 100

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. Refer to paragraphs on repointing.
 - 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 reinforced masonry units shall possess a strength of Type N 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.
 - P. Use of all materials shall be in strict accordance with manufacturer's recommendations.
 - Q. Window / Door / Misc Material Protection
 - 1. Protect window frames using polyethylene secured by duct tape. Do not use masking tape.
 - 2. When applying stripper around protected frames, carefully brush apply to avoid contacting the protected frame surfaces.
 - 3. Any accidental spill, drip, or splash must be cleaned off protected frames immediately to ensure that stripper does not contact frame surfaces.
 - 4. Do not remove window frame protection until all stripping and rinsing is complete. If protection comes loose, it must be secured before work can proceed.
 - R. Application
 - 1. Test each surface and/or material to be treated to insure compatibility and desired water repellency results. The surface to be treated must be clean and free of all foreign matter and dry as possible to insure penetration of the water repellent.
 - 2. Apply material as supplied do not dilute or alter material as packaged. Preferred method of application is with low pressure, airless diaphragm-type spray equipment or with a heavily saturated roller or brush. Equipment can be cleaned with commercial solvents.
 - 3. Apply sealer in a "wet on wet" application. In the case of extremely dense surfaces, it may be necessary to restrict the amount of material applied to one saturating application to prevent surface darkening.
 - 4. Apply sealer in a flooding application from the bottom up with sufficient material applied to produce a 6 to 8 inch rundown below the contact point of the spray pattern with the masonry surface. Allow the first application to penetrate the surface (approximately three to five minutes) and reapply in the same saturating matter. 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. Applied sufficient material to thoroughly saturate the surface, making sure to brush out heavy runs or drips that do not penetrate.
- 3.09 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 51 00

MISCELLANEOUS METAL FABRICATIONS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

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.

- 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.

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 in executing the contract summary

- A. Furnish and install:
1. Hot Dipped Galvanized steel loose lintel steel angles in masonry openings
- B. Perform post-erection touch-up of shop prime coat, using the same material as shop-prime coating.

1.3 RELATED REQUIREMENTS

- A. Section 04 01 20 00 - MASONRY: Building in of anchors into masonry walls.
- B. Section 09 91 00 - PAINTING: Applied finish coatings other than those specified herein.

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. ASTM A 283 - Carbon Steel Plates, Shapes, and Bars.
 2. ASTM A 307 - Carbon Steel Externally Threaded Standard Fasteners.
 3. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
 4. ASTM A 53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
 5. ASTM A 167 - Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 6. ASTM A 276 –Stainless and Heat- Resisting Steel Bars and Shapes.
 7. AISC - Code of Standard Practice for Steel Buildings and Bridges.
 8. AISC - Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.
 9. AISI - Referenced standards.

10. AWS - Standard Code for Arc and Gas Welding in Building Construction.
11. NAAMM, applicable publications.
12. AA – Aluminum Association.
13. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
14. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
15. OSHA 1910.27 – Fixed Ladders.

1.5 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – Electronic Submittal Procedures
 1. Literature: Manufacturer's complete product data and specifications for all prefabricated items, shop primer paints, liquid zinc coating, and hydraulic cements, to be furnished hereunder.
 2. Shop drawings:
 - a. Include large scale details of stairs, landings, railings, and guards bearing registration stamp of a Professional Structural Engineer registered in Commonwealth of Massachusetts.
 - b. 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. Provide calculations for loading and stresses for metal stairs, landings, railings and guards bearing the Professional Structural Engineer's seal. Show how design load requirements and other performance requirements as required by the 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments have been satisfied.
 4. Quality standards 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.
 - a. Accepted sample will be used to establish the quality standard for handrail and guardrail fabrication and workmanship.

1.6 WARRANTY

- A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 2 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
 1. Defects in materials and workmanship.
 2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear.

3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.

B. Manufacturer shall be notified immediately of defective products, and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

1.7 QUALITY ASSURANCE

A. Engineering: 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 requirements specified in this section and as required by the 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments.

1. Prepare Shop Drawings for stairs, handrails, and handrail brackets under direct supervision of a same Engineer experienced in design of this work.

1.8 COORDINATION

A. 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.

1.9 DELIVERY, STORAGE AND HANDLING

A. All materials under this Section shall be carefully prepared for delivery, and handled and stored 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. 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. Steel shapes, plates and bars: ASTM Designation A 36.
2. Steel pipe: ASTM A53, grade A, seamless pipe, black finish unless otherwise noted.
3. Structural steel tubing, square and rectangular shapes; ASTM A500, Grade B.
4. Steel bars and bar-size shapes: ASTM A306, grade 65, or ASTM A36.
5. Stainless steel: ASTM A 167, non-magnetic corrosion resistant chromium-nickel steel, Type 302 or 304 (18-8 Alloy) polished to a N° 4, brushed finish to all exposed to view surfaces, except where specified otherwise.

- B. Recycled content of Ferrous Metals: Use maximum available percentage of recycled steel. Steel incorporated into the work shall contain not less than 30 percent of recycled steel.
- C. 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.
- D. Provide all fasteners and attachments of the same material and finish as the metal to which it is applied unless otherwise noted. Provide all fasteners and attachments for work specified herein and as indicated on the Drawings.
- 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.

2.2 ACCESSORIES

- A. 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. Master Builders, Cleveland, OH (BASF)., product "Masterflow 713".
 - d. Sika Corporation, Lyndhurst, NJ., product "SikaGrout 212".
 - e. ChemMasters, Madison, OH., product "Conset".
 - f. Allied Building Products Corp. product "Sonogrout 10K".
- B. Metal paste filler: 2 component epoxy, high strength, structural adhesive putty:
 - 1. Abatron, Inc. Gilberts IL, product: "Ferrobond-P".
 - 2. Dynatron/Bondo Corp., Atlanta, GA, product: "Bondo Plastic Filler".
 - 3. 3M Bondo Lightweight Body Filler PN0262, St. Paul, MN
- C. Primer for non-galvanized steel surfaces, modified alkyd rust-inhibitive, high solids primer, equal to the following:
 - 1. Rust-Oleum: 1069 Heavy Duty Rust Inhibitive Red Primer.
 - 2. Sherwin Williams: Kem Flash Primer HS, Red Oxide E61R706.
 - 3. Tnemec: 10-99 Red Primer.
 - 4. California Paints: Prime Line® Primer.
- D. Wall brackets (typical): Provide stainless steel wall mounts equal to The Wagner Companies, Milwaukee, WI, Model No. 1806AN; Steel Supply, L.P. #3-RS ; Architectural Iron Designs, Inc., # 3419

2.3 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.
 - 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

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.
- D. Grind all edges of bars and plates completely free from nicks and machine marks, prior to shop priming.
- E. Weld all permanent connections, make all welds in a continuous manner; tack-weld only where specifically indicated on the Drawings. Grind all exposed-to-view welds completely smooth and flush to the surface plane of the base metals.

- 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 screws, bolts, or other anchorage items, at each connection point.
 - 2. Draw up all threaded connections tightly, after buttering them with pipe joint compound, to exclude water.
- G. Carefully coordinate the installation of metal fabrications with the work of trades 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.
- H. Fit and assemble metal fabrications in largest practical sections for delivery to site, ready for installation.

2.5 SHOP APPLIED COATINGS

- A. 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 film thickness of primer shall be not less than 2.4 mils per coat.
- C. Hot-Dip Galvanizing:
 - 1. Provide coating for iron and steel fabrications applied by the hot-dip process. 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.
 - a. Wherever possible, perform galvanizing after assembly of items.
 - b. Galvanized items shall be straightened to remove all warpage and distortion caused by the galvanization process.
 - c. 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.
 - d. Touch-up of galvanized surfaces with aerosol spray, silver paint, bright paint, brite paint, or aluminum paints is not acceptable.
 - 2. 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.

- a. VOC limit: not more than 250 g/L.
- D. 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.
1. Touch-up finishes shall be fully compatible with, and exactly match shop applied finish, color, texture and sheen.

PART 3 - EXECUTION

3.1 ERECTION

- A. 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, and leave in perfect condition. Grind all exposed to view welds smooth to the touch.
- B. Construct and install stairs in strict accordance with the details, the approved shop drawings, and requirements of all codes, laws, and ordinances bearing on the work.
 1. Pipe rails set in exposed concrete surfaces shall be grouted with expanding grout. Hole to receive pipe shall be formed with galvanized sheet metal sleeve and provide at least 1/2 inch clearance around entire perimeter. Hold expanding grout back 1/2 inch from finish surface and fill void with Portland cement grout to match color and texture of adjacent surface.

3.2 FIELD WELDING

- A. Field weld components indicated on Shop Drawings in accordance with AWS D1.1.
- 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. Touch-up all welded areas using the same coatings as specified under the Article titled Shop Applied Finishes.

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.

3.4 TOUCH-UP

- A. Touch-up all scratches, abrasions, and other surface damaged on shop-primed or painted metals, using the same coatings as specified under shop applied finishes, herein above.

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 openings and other temporary items, including railings, ladders and similar items required under the applicable Sections of Division 1.
 - B. Fire retardant treated Wood furring & blocking.
 - C. Fire retardant treated wood blocking and nailers not specified under other Sections.
 - D. Pressure treated wood blocking and nailers in contact with concrete slabs / construction and masonry construction.
 - E. Rough hardware, including bolts, screws, spikes, nails, and clips, as required to install rough carpentry work.
 - F. Fire retardant treated plywood backer panels for mounting of electrical panelboards, telephone/data backboards, HVAC and fire control equipment and other equipment.
 - G. Installation of any items specified elsewhere to be installed under this Section and those items under other Sections where installation is not specified.
 - H. Any other miscellaneous items of carpentry or fastening or installing of same.
 - I. 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. APA - applicable grades and specifications.
 - 2. APA PRB-108 Performance Standards and Policies for Structural-Use Panels..
 - 3. ANSI A250.11 (formerly SDI 105) - Recommended Erection Instructions for Steel Doors and Frames.
 - 4. ASTM D 3201 - Test Method for Hygroscopic Properties of Fire-

Retardant Wood.

5. AWPA Standards and references for preservative treated wood including Standards UC1, UC2, UC3A, UC3B, UC4A, and P5
6. AWPA Standard UCFA – Fire Protection as Required by Codes Above Ground Interior Construction.
7. AWPA Standard UCFB – Fire Protection as Required by Codes Above Ground Exterior Construction.
8. AWPA M4 – Care Of Preservative Treated Wood Products.
9. FSC (Forest Stewardship Council): “FSC Certification Program”.
10. NER-643: ACQ Preserve[®] and ACQ Preserve Plus[®] Wood Preservative Treatment, ICBO Evaluation Service.
11. MIL L-1914OE - Lumber and Plywood, Fire Retardant Treated.
12. SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
13. SPIB Grading Rules, current edition.
14. UL - Building Materials Directory
15. US. Department of Commerce Voluntary Product Standard PS1 for Construction and Industrial Plywood.
16. US. Department of Commerce Voluntary Product Standard PS2 for Wood-Based Structural-Use Panels.
17. US. Department of Commerce Voluntary Product Standard PS-20 - American Softwood Lumber Standard.
18. U.S. Department of Commerce Simplified Practice Recommendation R-16, for sizes and use classifications of lumber
19. American Lumber Standards Committee, National Lumber Grades Authority for Canadian Lumber, and applicable grading rules and standards of the various lumber associations whose species are being used for grades specified.

1.05 Related Sections:

- A. Section 02 41 19 Selective Demolition

1.06 Quality Assurance

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
1. All lumber shall:
 - a. Be new, dressed four sides (S4S), clear and free from warping and other defects.
 - b. Have a moisture content not exceeding 19 percent when delivered to the project.
 - c. Be in accordance with the grading rules of the lumber manufacturer's association under whose jurisdiction the lumber is produced and bear the mark of grade and mill identification.

2. Plywood: Conform to the requirements of Product Standard PS-1, and bear applicable APA grade trademarks.
 - a. Plywood for electrical boards treated for retardance, meet Class I or a flame spread rating of 25 or less and bear U.L. label "Classified FRS".

1.07 Submittals

- A. Submit the following in accordance with Section 01 33 24.
 1. Product Data: Manufacturer's product data sheets, specifications, performance data, physical properties and installation instructions for products specified herein.
 - a. Include certification of data indicating Volatile Organic Compound (VOC) content of all adhesives. Submit MSDS highlighting VOC limits.

PART 2 - PRODUCTS

A. BOARD AND SHEET MATERIALS

1. Lumber for blocking, nailers and curbs as indicated or required: Hem-Fir, Douglas Fir, Eastern Spruce, Eastern Hemlock, or Southern Pine, surfaced dried stud or utility grade. Wood members shall be of sizes indicated on the Drawings or of the same size as the members being braced.
 - a. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
2. Plywood and sheet products:
 - a. Marine grade plywood: EWA MARINE A-A EXT, fir veneer marine grade plywood, with plugged cores and sanded faces .
 - b. For electric panel board mountings and similar uses: APA graded B-D INT, Group 2 species, touch-sanded, fire-retardant treated, 3/4 inch thick, except as otherwise indicated on the Drawings.
 - c. For unspecified interior concealed from view locations: APA graded C-D PLUGGED INT, Group 2 species, thickness as indicated on the Drawings.

B. WOODTREATMENTS

1. Treated wood products shall be produced by a single treatment plant, fully licensed by the chemical manufacturers, and conforming to the requirements specified herein.
 - a. Toxicity and Environmental Quality:
 - (1) Products containing chromium will not be permitted.
 - (2) Products containing arsenic will not be permitted.

- (3) Fire-retardant-treated wood products shall be free of halogens, sulfates, ammonium phosphate and formaldehyde.
 - b. Dye wood or otherwise color code all treated wood at treatment plant to clearly distinguish the different treatments in the field.
 - c. Kiln dry all treated lumber and plywood to the following maximum moisture content after treatment.
 - (1) Lumber: 19 percent.
 - (2) Plywood 15 percent.
 - (3) Discard pieces with defects which might impair quality of work.
 - d. Quality marks: Each piece of lumber and plywood shall be permanently affixed with a quality mark, containing the following information:
 - (1) Identification of the inspection agency.
 - (2) Standard to which material was treated.
 - (3) Identification of the treating plant.
 - (4) Fire retardant treated wood shall include: stamp signifying a FR-S rating
 - (5) Preservative treated wood shall include: Retention and end use for which product is suitable.
2. Fire retardant treated wood. Designated as “FRTW”
 - a. Chemical Manufacturer: Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include:
 - (1) Hickson Corporation, product, “Dricon”.
 - (2) Osmose, Inc., Griffin GA., product “FirePro”.
 - (3) Hoover Treated Wood Products, Inc., product “PyroGuard”.
 - (4) Viance, LLC., Charlotte, NC, product: “D-Blaze FRT”.
 - b. Fire retardant treated wood shall comply with the following requirements:
 - (1) All fire-retardant lumber and plywood must have an Underwriters Laboratories stamp signifying a FR-S rating certifying a 25 or less flame spread and smoke developed value, when tested in accordance to ASTM E-84, or UBC Standard No. 42-1.
 - (2) Corrosion rates: Less than one mil per year for carbon steel, galvanized steel, aluminum, copper and red brass in contact with the fire retardant treated wood when tested in accordance with Federal Specification MIL-L-19140E Paragraph 4.6.5.2.
 - (3) The fire retardant treated wood must have an equilibrium moisture content of not more than 25 percent when tested in accordance with ASTM D 3201 procedures at 95 percent relative humidity and 80 degrees Fahrenheit.
 - (4) Fire retardant chemical: Registered for use as a wood

preservative by the U.S. Environmental Protection Agency.

- (5) Testing: Fire performance and strength properties for both lumber and plywood, of the fire retardant treated wood shall be recognized by issuance of a ICC Evaluation Service Report. Fire retardant chemical must not damage the middle lammella of the wood structure when exposed to 170 degrees Fahrenheit and 90 percent relative humidity for 23 days.

3. Pressure preservative treated wood. Designated as “PT”

- a. Chemical Manufacturer: Subject to compliance with the requirements specified herein, Products which may be incorporated in the work include:
 - (1) Osmose, Inc., Griffin GA., product “NatureWood”.
 - (2) Universal Forest Products, Inc., Grand Rapids MI., product “ProWood ACQ”.
 - (3) Viance, LLC., Charlotte, NC., product “Preserve”
- b. Treatment: Ammoniacal Copper Quaternary Compound (ACQ), arsenic-free and chromium-free chemical “ACQ Preservative” in accordance with AWPA Standards. Apply the preservative in a closed cylinder by pressure process in accordance with AWPA Standard C15.
 - (1) Minimum preservative retention for floor plates, framing, lumber and plywood above ground use: 0.25 pounds per cubic foot (4.0 kg/m^3) of ACQ chemical, in accordance with AWPA UC1, UC2, UC3A, and UC3B, or NER-643 as appropriate.
 - (2) Minimum preservative retention for framing, lumber and plywood in contact with water, ground, concrete and masonry: 0.40 pounds per cubic foot (6.4 kg/m^3) of ACQ chemical, in accordance with AWPA UC4A, UC4B, UC4C, or NER-643 as appropriate.
 - (3) Minimum preservative retention for lumber and plywood in permanent wood foundations: 0.60 pounds per cubic foot (9.6 kg/m^3) of ACQ chemical, in accordance with AWPA UC4B, or NER-643.
- c. Fixation of Chemical: Treated wood shall not be shipped from treatment plant until fixation of the preservative has occurred in the wood.

C. Accessories

1. Adhesives:

- a. Adhesive for lamination and fabrication of wood and plywood items: Exterior adhesives containing no urea formaldehydes, having a VOC limit of 70 g/L.
- b. Adhesive for subfloors and underlayment: High strength, waterproof and non-freezing adhesive complying with AFG-01 “Frozen Lumber Test” and ASTM 3498, and having a VOC limit of 50 g/L.

2. Nails (interior and exterior): Galvanized common nails, of size and type to suit application and as required by state and local building codes.
3. Screws:
 - a. Screws for interior applications: Flat head electroplated-galvanized wood screws of the appropriate sizes.
 - b. Screws for exterior applications:
 - (1) For ACQ pressure preservative treated wood: Flat head type 304 or 316 stainless steel only, wood screws, of the appropriate sizes. Aluminum, galvanized steel, and coated metal fasteners are prohibited.
 - (2) For general application (non-pressure preservative treated wood): Flat head hard aluminum, or stainless steel, wood screws, of the appropriate sizes.

PART 3 - EXECUTION

3.01 General

A. PREPARATION

1. All materials shall be inspected before use, with all checked, split and otherwise deficient stock rejected, or used only for miscellaneous blocking, furring or other incidental use. The Contractor shall be responsible for replacing all lumber which, due to warpage, twist, splitting, or checking, results in unsatisfactory work. Such replacement shall be required at any time, whether before or after application of finish material under other Sections.
2. Verify exact locations of toilet accessories, door stops and similar items with Architect prior to installation of blocking for accessories.

B. INSTALLATION - GENERAL

1. 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.
2. 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.
3. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
4. 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 spacing, of

fasteners specified herein.

5. Install blocking, 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.

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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

- 1.2 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.
- 1.3 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.
- 1.4 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. Furnish and install the following architectural woodwork items:
1. Standing and running wood trim to match
 2. Window sills and aprons to match existing
- 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.

1.5 RELATED SECTIONS

- A. Section 06 10 00 - ROUGH CARPENTRY: Concealed wood blocking and nailers.
- B. Division 23 - HVAC
- C. Division 26 - ELECTRICAL: Electrical connections for lighting.

1.6 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.

1.7 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.

1.8 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).

1.9 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.

1.10 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.

1.11 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.

1.12 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, No. 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 C-C PLUGGED EXT.

2.2 WOODVENEERS

- A. Veneered panels for transparent finish: The face veneer for transparent finishes shall be minimum 1/28 inch thick on doors, shelves, panels and other exposed surfaces meeting AWI Premium Grade Standards (installed). Each exposed face shall be of tight smooth veneer with joints parallel to vertical edges with no sharp contrasts.
 - 1. Wood Species: Plain Sliced, Grade A.

2.3 FABRICATION - GENERAL

- A. Do not fabricate materials until all specified submittals have been submitted to, and approved by, the Architect.
- B. 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.
- C. 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.
- D. Fit corners and joints hairline, secure with concealed fasteners.
- E. 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.
- F. Make all joints tight, and form to conceal shrinkage. Glue all miters having a dimension of 4 inches or more from heel to point.
- G. Provide closure trims with ample allowance for field cutting and fitting. Provide additional trim as required for scribing and site cutting.
- H. Finished work shall be free from visible adhesive and pencil marks.

2.4 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 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.

3.5 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.

3.6 CLEANING

- A. Comply with requirements of Section 01 52 40 DEMOLITION AND CONSTRUCTION WASTE MANAGEMENT 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.

3.7 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

Provincetown High School
HVAC and Accessibility Upgrades
Provincetown, Massachusetts

Section 07 21 31

CLOSED CELL SPRAYED FOAM INSULATION

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. The work of this Section consists of Resin-isocyanate (polyurethane) sprayed-in-place closed cell foam insulation system insulation where shown on the Drawings, as specified herein, and as required for a complete and proper installation.
- B. Furnish and install the following:
 - 1. Foamed-in-place insulation in masonry cavities behind masonry veneer.

1.3 RELATED REQUIREMENTS

- A. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements relating to recycling goals, waste management program and reporting.
- B. Section 04 01 20 - MASONRY: Masonry cavity walls.
- C. Section 07 92 00 - JOINT SEALANTS: Requirements for joint sealant and backing materials.
- D. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Ductwork and piping insulation.

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 C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - 2. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. ASTM C1029 - Standard Specification for Spray-Applied Rigid Cellular Polyurethane Thermal Insulation.

4. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
5. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
6. ASTM D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
7. ASTM D1621 – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
8. ASTM D1622 – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
9. ASTM D1623 – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
10. ASTM D1876 - Standard Test Method for Peel Resistance of Adhesives (T-Peel Test).
11. ASTM D1938 - Standard Test Method for Tear-Propagation Resistance (Trousers Tear) of Plastic Film and Thin Sheeting by a Single-Tear Method.
12. ASTM 1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
13. ASTM D2126 – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
14. ASTM D2842 – Standard Test Method for Water Absorption of Rigid Cellular Plastics.
15. ASTM D5116 - Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
16. ASTM D6226 - Standard Test Method for Open Cell Content of Rigid Cellular Plastics.
17. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
18. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials.
19. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C.
20. ASTM E154//E154M - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
21. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
22. ASTM E1186 - Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems.
23. ASTM E2832 – Standard Test Method for Measuring the Coefficient of Retroreflected Luminance of Pavement Markings in a Standard Condition of Continuous Wetting (RL-2).
24. ASTM E2179 - Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound Transmission Through Concrete Floors.

25. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
26. UL - Building Products Directory.
27. CAN/ULC-S705.1-01 Standard for Thermal Insulation - Medium Density Closed Cell Spray Applied Rigid Polyurethane Foam – Material Specification.
28. CAN/ULC-S705.2-05 Standard for Thermal Insulation - Medium Density Closed Cell Spray Applied Rigid Polyurethane Foam – Application.
29. All applicable federal, state and municipal codes, laws and regulations for thermal insulation and vapor barriers.

B. Definitions:

1. The term “AVB” referenced herein refers to “Air and Vapor Barrier” system.
2. The term “ccSPF” referenced herein refers to “Closed Cell Spray Polyurethane Foam” insulation.
3. 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.
4. “HFC”: refers to regulated (prohibited) Hydrofluorocarbon organic compounds which are designated as having high Global Warming Potential (GWP).
5. Prescriptive Thermal Barrier: Pursuant to IBC and IRC, minimum ½ inch thick gypsum wallboard (specified under Section 09 29 00).
6. Equivalent Thermal Barrier: Pursuant to IBC and IRC, independently tested assembly to limit temperature rise to 15 minutes. Equivalent thermal barriers may include:
 - a. Spray-applied cementitious materials.
 - b. Spray-applied cellulose materials.
 - c. Portland cement plaster.
 - d. Other approved various proprietary materials.
7. Applied Intumescent non-prescriptive thermal barrier (Alternative Assembly): Pursuant to IBC and IRC, independently tested Alternative Assembly, which has been specifically approved on the basis of large-scale fire testing representing the actual end-use configuration as identified in ECC-ES Evaluation Report, and approved by local authorities having jurisdiction.
 - a. Alternative assemblies tested under AC 377; Appendix X is not an acceptable Alternative Assembly.

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 specified under related specifications:

1. Installer of the Work of this Section is required to attend pre-installation conference specified under Section 04 20 00 – UNIT MASONRY.

2. Installer of the Work of this Section is required to attend pre-installation conference specified under Section 07 27 13 - MODIFIED BITUMINOUS SHEET AIR BARRIERS.
- C. Sequencing: Do not install sprayed insulation until all pipes, ducts, conduits, and other such items which are to be concealed by insulation installation, have been permanently installed, inspected and approved.

1.6 SUBMITTALS

- A. Information and Review Submittals: Submit the following under provisions of Section 01 33 24 – Electronic SUBMITTAL PROCEDURES:
1. Product Data: Provide data on material characteristics, performance criteria, and limitations.
 - a. Submit letter from primary materials manufacturer indicating approval of products not manufactured by primary manufacturer.
 - b. Include statement that materials are compatible with adjacent materials proposed for use.
 2. Manufacturer's certifications:
 - a. Provide an Evaluation Report as the manufacturer's documentation confirming material has been evaluated and conforms to the requirements of the ASTM E2832 Standard for Air Barrier Materials.
 - b. Certification from an independent testing laboratory that insulation meets fire hazard classification requirements.
 3. Shop Drawings: Developed for specific project conditions including mock-up, submittal of manufacturer's standard details are prohibited.
 4. Samples: Submit clearly labeled samples, 3 by 4 inch (75 mm by 100 mm) minimum size of each material specified.
 5. Manufacturers installation instructions: indicate preparation, installation requirements and techniques, product storage and handling criteria, and limitations of the material.
 6. Qualification Submittals.
- 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.

1.7 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 sprayed foam insulation.
- C. Qualifications:

1. Installer/Applicator: Minimum of 3 years documented experience demonstrating previously successful work of the type specified herein, and a licensed applicator by product manufacturer.
 - a. Provide proof of manufacturer's certification upon request.
 - D. Certifications:
 1. Fire Hazard Classification: Maximum flame spread/smoke developed rating of 25/450, tested to ASTM E84.
 - E. 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 2 site visits are required.
- 1.8 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 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
 - 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.
- 1.9 SITE CONDITIONS
- A. Maintain temperature and humidity recommended by the materials manufacturer for 24 hours before, during, and 48 hours after installation of sprayed foam insulation.
 - B. Field Conditions: Do not install spray foam insulation in snow, rain, fog, or mist. Do not install air barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.
 1. To avoid overspray, product should not be applied when conditions are windy.

1.10 WARRANTY

A. Special Warranty:

1. Warrant work of this section against defects or deficiencies for a period of two years from the date work is certified as substantially performed in accordance with general condition of the contract.
2. Promptly correct, at own expense, defects or deficiencies which become apparent within the warranty period.

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. BASF Polyurethane Foam Enterprises, LLC, Minneapolis, MN, product "WALLTITE LWP".
2. Carlisle Spray Foam Insulation (formerly Bayer Material Science LLC), Cartersville, GA, product "SealTite Pro One Zero (HFO)".
3. Henry Company, Inc., Huntington Park, CA, product "Permax Spray System 2.0 HFO Series".
4. Huntsman Building Solutions, The Woodlands TX., product "Heatlok HFO Pro".
5. Johns Manville Insulation Systems, Denver CO., product "Corbond IV".
6. NCFI Polyurethanes, Inc., Mount Airy, NC., product "11-033 InsulStar 1.7" spray foam insulation.
7. Victory Polymers, Houston, TX., product: "VPC-HFO."

2.2 DESCRIPTION

A. General Description: Plastic resin and catalyst, cold setting low-density, closed-cell foam, two component system.

B. Regulatory Requirements

1. Regulatory Requirements:
 - a. Pursuant to Commonwealth of Massachusetts 310 CMR 7.76, ccSPF used for this project is prohibited from having HFC blowing agents used in manufacture of rigid extruded insulation, including HFC-134a, HFC-245fa, and blends thereof; blends of HFC365mfc with at least 4 percent HFC-245fa, and commercial blends of HFC-365mfc with 7 to 13 percent HFC-227ea and the remainder HFC-365mfc; Formacel TI.

2.3 PERFORMANCE/DESIGN CRITERIA

A. General:

1. Air permeability: Not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) (0.02 L/sm @ 75 Pa.) when tested according to ASTM E2178.
2. All penetrations of the sprayed foam insulation, and paths of air infiltration/exfiltration shall be made airtight.

- B. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds.
- C. Outgassing/Reactivity or Toxicity/Hazardous Materials:
 - 1. Formaldehyde: Products containing urea-formaldehyde will not be permitted.
 - 2. Chlorofluorocarbons (CFCs)/HCFCs: Products and equipment requiring or using CFCs or HCFCs during the manufacturing process will not be permitted.
- D. Performance criteria: Material shall meet requirements of ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density - Material - Specification. CCMC Evaluation Report or reports from accredited testing laboratory shall be made available upon request.
 - 1. Long Term Thermal Resistance (LTTR): 7.0 per inch minimum, when tested in accordance with ASTM C518.
 - 2. Closed cell content: 90 percent minimum when tested in accordance with ASTM D6226
 - 3. Density: Minimum 2.0 pounds per cubic foot minimum when tested in accordance with ASTM D1622.
 - 4. Compressive Strength: 36 pounds per square inch minimum when tested in accordance with ASTM D1621.
 - 5. Dimensional Stability: 12 percent change in volume maximum at 158°F. and 95 percent relative humidity when tested in accordance with ASTM D2126.
 - 6. Water Absorption: 0.88 percent when tested in accordance with ASTM D2842.
 - 7. Air Leakage (for 4 inches of material): ASTM E283; 0.01 L/s/m² @ Pa maximum.
 - 8. Sound Transmission Class (STC): ASTM E2179; STC 36 minimum.
 - 9. Bacterial or Fungal Growth: Zero rating when tested in accordance with ASTM G21.
 - 10. Flame Spread and Smoke Developed Rating: Flame Spread <25, Smoke Developed <450 when tested in accordance with ASTM E84.

2.4 EQUIPMENT

- A. Equipment for spraying foam shall be manufactured specifically for the application of polyurethane foam. The equipment shall be airless, capable of maintaining a 1:1 volume ratio and have primary and hose heaters (300 feet of material hose maximum allowable to meet mix pressure requirements.) Acceptable application guns shall include but are not limited to Gusmer GX-7, D Gun, GAP Pro, Fusion, Probler and other direct impingement type mixing guns with low output tips in the 15 pound per minute range or as recommended by the manufacturer.
- B. Equipment settings are to be recorded on the Daily Work Record

2.5 ACCESSORIES

- A. Prime substrate when required by spray polyurethane manufacturer or the membrane manufacturer. The type of primer and the installation of the primer shall follow the requirements of the manufacturer for the surface conditions.
- B. Membrane at Transitions in Substrate and Connections to Adjacent Elements, as acceptable to the spray polyurethane foam air barrier manufacturer:

1. Acceptable Manufacturers: Subject to compliance with the requirements specified herein and approval with specified foam air barrier (for compatibility), manufacturers offering similar products include the following:
 - a. Carlisle Coatings and Waterproofing, Inc., Wylie, TX., (“Carlisle”).
 - b. GCP Applied Technologies Inc., Cambridge MA., (“GCPAT”).
 - c. Henry Company, El Segundo CA., (“Henry”).
 2. Sheet membrane: Prefabricated composite sheet 0.9 mm (36 mils) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (4 mils) of cross-laminated, high-density polyethylene film to provide a minimum 1 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
 - a. Performance Requirements:
 - b. Water Vapor Transmission: ASTM E96, Method B - 2.9 ng/m²sPa (0.05 perms) maximum.
 - c. Water Absorption: ASTM D570 - Max. 0.1% by weight.
 - d. Puncture Resistance: ASTM E154 - 178 N (40 lbs.).
 - e. Tear Resistance:
 - 1) Initiation: ASTM D1004 - min. 58 N (7.0 lbs.) M.D.
 - 2) Propagation: ASTM D1938 - min. 40 N (4.0 lbs.) M.D.
 - f. Lap Adhesion at -4 degrees C (25 degrees F): ASTM D 1876 - 880 N/m (5.0 lbs./in.) of width.
 - g. Low Temperature Flexibility: ASTM D1970 - Unaffected to -43 degrees C (-45 degrees F).
 - h. Tensile Strength: ASTM D412, Die C Modified, Min. 2.7 MPa (400 psi).
 - i. Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412 - Die C - Min. 200%.
 3. Surface conditioner, liquid membrane tape, crack filler, mastics, and accessories as recommended by the sheet membrane manufacturer and comply with the following:
 - a. Description: Latex-based, water-dispersible liquid for substrate preparation.
 - 1) Flash Point: No flash to boiling point.
 - 2) Solvent Type: Water.
 - 3) VOC Content: Not to exceed 350 g/l.
 - 4) Application Temperature: -4 degrees C (25 degrees F) and above.
 - 5) Freeze/Thaw Stability: 5 cycles min.
 - 6) Freezing point (as packaged): -20 degrees C (-5 degrees F).
 - b. Termination Mastic: Rubberized asphalt-based mastic with 200 g/l max. VOC Content.
 - c. Primer: Rubber-based primer in solvent with 680 g/l max. VOC content.
- C. Counterflashing for Masonry Through-Wall Flashing: One of the following and as acceptable to the spray polyurethane foam air barrier manufacturer:
1. CCW-705 TWF by Carlisle Coatings and Waterproofing.
 2. Perm-A-Barrier Flashing by GCPAT.
 3. Blueskin TWF by Henry.

4. Poly-Wall Crack Guard by Protective Coatings Technology, Inc.
5. ExoAir TWF by Tremco, Inc.
6. Detail Strip by W. R. Meadows, Inc.

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. All application surfaces must be free of oil, grease, dust and debris. Surface must be dried prior to application of spray foam. Excess humidity may cause poor adhesion and result in product failure.
 2. Report in writing defects in substrates which may adversely affect the performance of the foam insulation.
 3. Beginning of installation means acceptance of existing substrate and project conditions.
- B. Evaluation and Assessment: Examine joints before sealing to ensure configurations, surfaces and widths are suitable for foam sealant.

3.2 PREPARATION

- A. Protection of In-situ Conditions: During the operation of work of this Section, protect existing finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all existing materials which are soiled or otherwise damaged by Work of this Section, to match original profiles and finishes. Existing materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work to match existing.
- B. Surface Preparation: Surfaces to receive foam insulation shall be free of frost and loose or foreign matter which might impair adhesion of materials.
 1. Prepare surface by brushing, scrubbing, scraping, or grinding to remove loose mortar, dust, oil, grease, oxidation, mill scale and other contaminants which will affect adhesion and integrity of the foam insulation system. Wipe down metal surfaces to remove release agents or other no compatible coatings, using clean sponges or rags soaked in a solvent compatible with the foam insulation. Ensure surfaces are dry before proceeding.

3.3 APPLICATION – SPRAY FOAM

- A. Apply foam insulation in strict accordance with ULC S705.2, manufacturer's written instructions, and the following.
 1. Apply foam insulation only when surfaces and ambient temperature are within limits prescribed by the material manufacturer.
- B. Fill joints with foam sealant making allowances for post expansion of foam.
- C. Finish joints shall be free from air pockets and imbedded foreign materials. Cut back excess foam sealant after cutting flush with surrounding surfaces unless otherwise directed and/or detailed.

- D. Apply foam insulation to within the following tolerances: minus 1/4 inch thickness or plus 1/2 inch thickness indicated on the Drawings.
 - 1. Trim, as required, any excess thickness that would interfere with the application of cladding/covering system by other trades.
- E. Finished sprayed foam insulation shall be free of voids and imbedded foreign materials.
- F. Do not install spray polyurethane foam within 3 inches of heat emitting devices such as light fixtures and chimneys.
- G. Complete connections to other components and repair any gaps, holes or other damage using material which conforms to ULC S710.1 or ULC S711.1 and installed in accordance with ULC S710.2 or ULC S711.2 as applicable.
- H. Do not allow foam insulation to cover or mark adjacent surfaces. Use masking materials if necessary.
- I. Do not permit adjacent work to damage work of this section. Damage to work of this section caused by other sections shall be made good by this section at the expense of the section which caused the damage.

3.4 INTERFACE WITH OTHER WORK

- A. Coordinate the work of this Section installation of windows and door frames. Ensure air and vapor barrier transitions from windows and door frames is completed.

3.5 FIELD QUALITY CONTROL

- A. Field inspection will be performed under the provisions of Section 01 45 00 - QUALITY CONTROL.
 - 1. Manufacturer's Technical Representative Site Inspections: Arrange for site inspections by insulation manufacturer to observe field conditions, substrates, and to instruct installer in project-specific installation procedures. Technical Representative to verify conformance with the manufacturer's instructions.
 - a. If the inspections reveal any defects, promptly remove and replace defective work at no additional expense to the Owner.
- B. Non-Conforming Work: Remove and replace all non-conforming work.

3.6 CLEANING

- A. After completion of the work of this Section, remove equipment, and clean all wall, partition, and floor areas free from deposits of sprayed-foam and other materials installed under this Section.
- B. Clean work under provisions of Section 01 70 00 – EXECUTION.
 - 1. Remove over-spray and masking materials immediately after foam has cured to hard surface film.
 - 2. Clean and make good surfaces soiled or damaged by work of this section. Consult with section of work soiled before cleaning to ensure methods used will not damage the work.

- C. Waste Management:
1. Recycle or dispose of off-site waste materials and trash 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. Dispose of liquid waste in accordance with all applicable regulations. Consult all regulations (federal, provincial, state, local) or a qualified waste disposal firm when characterizing waste for disposal. Contact manufacturer for MSDS sheets for product information, and recommendations for proposal disposal. Utilize licensed waste disposal companies as may be required, the following phone numbers for national companies are provided for the Contractor's convenience only.
 - a. Safety Kleen, Plano TX., (telephone 800-669-5740).
 - b. Clean Harbors, Norwell MA., (telephone 800-422-8998).
 - c. Phillip Services Corporation (PSC), Houston TX., (telephone 800-726-1300).

3.7 PROTECTION

- A. Protect finished work under provisions of Section 01 50 00 - TEMPORARY FACILITIES AND CONTROLS.
- B. Protect spray foam insulation from ultraviolet light following installation on exterior surfaces, do not leave exposed to weather elements for a period greater than 30 calendar days.

End of Section

Section 07 42 14
INSULATED COMPOSITE PANEL

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

- 1. The Panels required are as manufactured by Mapes Architectural Panels, LLC, Lincoln, NE. Panels consist of metal skins laminated to stabilizer substrates with an insulating core material. Panels are designed to be glazed into a window system or curtain wall system.
- 2. Related Work
 - A. Section 07 92 00 Joint Sealants
 - 1. Panel manufacturer shall have a minimum of 25 years experience.
 - 2. Field measurements shall be taken prior to completion of manufacturing and cutting.
 - 3. Maximum deviation from vertical and horizontal alignment of installed panels is 1/8" (3mm) in 20' (6m) non-commutative.

1.03 – REFERENCES

- 1. American Society of Testing Materials (ASTM)
 - A. E330-84: Structural Performance of Exterior Windows, Curtain Walls and Doors under the influence of wind loads.
 - B. D1781-76: Climbing Drum Peel Test for Adhesives.
 - C. D3363-74: Method for Film Hardness by Pencil Test.
 - D. D2794-90: Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
 - E. D3359-90: Method for Measuring Adhesion by the tape test.

1.04 - SUBSTITUTIONS

- 1. The materials and products specified in this section establish a minimum standard of required function, design, appearance quality and warranty to be met by any proposed substitution.
- 2. Acceptable Manufactures
 - A. Mapes Architectural Panels
 - B. H & H Metals
 - C. Lenmark

1.05 - SUBMITTALS

1. Submittals shall be in conformance with section 01 . Included section number of Division and refer to CSI Division I, Section 01 33 24 - Shop Drawings, Product Data and Samples.
2. Samples:
 - A. Panel makeup - 2 samples - 10"x10"
 - B. Two samples of each color and finish texture - 3"x5"
3. Submission Drawings: Indicate thickness, dimension and components of parts. Detail glazing methods, framing and tolerances to accommodate thermal movement.
4. Affidavit certifying materials meet all requirements as specified.
5. 2 copies of manufacturers standard literature for specified material.

1.06 - DELIVERY, STORAGE AND HANDLING

1. Protect finish and edge in accordance with panel manufacturer's recommendations.
2. Store materials in accordance with panel manufacturer's recommendations.

PART 2 - PRODUCTS

2.01 - PANELS - LAMINATED

1. Laminated metal faced Mapes-R+ (8-Ply) panels as manufactured by Mapes Industries, Inc.
2. Acceptable alternatives: Panels having similar composite construction and finish providing manufacturer has a minimum of 10 years panel laminating experience and comparable published warranties.

2.02 - FINISH

1. Finishes
 - A. Exterior: - Custom Kynar
 - B. Interior: - Smooth Mill Aluminum
2. Custom Color as selected by architect.

2.03 - PANEL FABRICATION

1. Exterior Side: Smooth Aluminum, 0.032 thickness
2. Exterior Substrate: Tempered Hardboard
3. Exterior Core: Isocyanurate
4. Interior side: Smooth Mill Aluminum
5. Secondary Exterior Substrate: Tempered Hardboard
6. Interior Core: Isocyanurate
7. Interior Substrate: Tempered Hardboard
8. Tolerances - .8% of panels dimension length and width - (+/-) 1/16" thickness
9. Overall Panel Thickness - 4"
10. Glazing Leg Thickness - 1 "
11. R-Value - 28.91
12. U-Value - 0.03

2.04 - ACCESSORIES

1. Recommended for use as an infill panel component in window and curtain wall systems. Related material to complete installation as recommended by the manufacturer.

CLOSED CELL SPRAYED FOAM INSULATION

2. Seals against moisture intrusion as recommended by the manufacturer. Polyurethane and silicone based sealant with a 20 year life are recommended.

PART 3 - EXECUTION

3.01 - INSTALLATION

1. Panel surfaces shall be free from defects prior to installation.

3.02 - EXECUTION

1. Erect panels plumb, level and true.
2. Glaze panels securely and in accordance with approved shop drawings and manufacturers instructions to allow for necessary thermal movement and structural support.
3. Do not install panels that are observed to be defective including warped, bowed, dented, scratched and delaminating components.
4. Weatherseal all joints as required using methods and materials as previously specified.
5. Separate dissimilar metals using gasketed fasteners and blocking to eliminate the possibility of electrolytic reaction.

3.03 - ADJUSTING AND CLEANING

1. Remove masking film as soon as possible after installation. Masking intentionally left in place after panel installation will be the responsibility of the contractor.
2. Weep holes and drainage channels must be unobstructed and free from dirt and sealant.

End of Section

SECTION 07 84 00

FIRESTOPPING

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 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, existing penetration openings, plumbing, 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.
 - 3. The contractor shall assume a minimum of 100 holes / voids/ penetrations to be firesafed. Refer to Section 01 27 Unit Prices
 - 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 where required by applicable codes and as additionally required by authorities having jurisdiction at no additional cost to the Owner.
- 1.2 RELATED REQUIREMENTS
- A. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Heating, ventilating and air conditioning system penetrations through fire resistance rated construction.

- B. 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. 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.

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, 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.
- 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 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.
 - 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/UL1479.

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/UL1479.
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:
 - 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 CableCollar”.
 - 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. BioFireshield, 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. BioFireshield, 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 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.
- 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 5PCF.
2. Do not apply if ambient or substrate temperature is less than 35 degrees Fahrenheit during 24 hours after application.
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 QUALITYCONTROL

- 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 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 Firestopsealant.
 - 3. Intumescent firestopsealant.
 - 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 (firesafing).
 - 3. Intumescent firestop sealant with wrap strips.

- D. Multiple metal pipe and conduit penetrations through floors:
 - 1. Firestop mortar and wrapstrips.
 - 2. Intumescent firestop sealant over mineral fiber / ceramic wool non- combustible insulation (firesafing).

- 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 wrapstrips.
 - 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 (firesafing).
 - 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 wrapstrips.
 - 2. Intumescent firestop sealant over mineral fiber / ceramic wool non- combustible insulation (firesafing).
 - 3. Intumescent firestop sealant over mineral fiber / ceramic wool non- combustible insulation (fire safing) and Wrap strips.
 - 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 (firesafing).
- I. Combustible plastic pipe and conduit penetrations through floors:
1. Firestop mortar with wrapstrips.
 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 (firesafing).
 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 (firesafing).
- 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 (firesafing).
 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. Blank openings:
1. Firestop mortar.
 2. Silicone Firestop sealant over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- N. Fire rated joints:
1. Silicone Firestop sealant over backer rod or bond breaker.
- O. Construction joints at head of wall/floor assemblies:
1. Silicone Firestop sealant/mastic over mineral fiber / ceramic wool non-combustible insulation (firesafing).
 2. Elastomeric spray over mineral fiber / ceramic wool non-combustible insulation (fire safing).
- P. Smoke barrier sealant for dampers, fire door frames:

1. Silicone Firestopsealant.

Q. 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

1.1 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. Prepare sealant substrate surfaces.
- B. Furnish and install sealant and backing.

1.3 RELATED REQUIREMENTS

- A. Section 04 01 20 - MASONRY.
- B. Section 07 84 00 - FIRESTOPPING: Firestopping Sealants and related backing materials.
- C. Section 09 29 00 - GYPSUM BOARD: Installation of wall board construction and related sealants.

1.4 REFERENCES

- A. The standards referenced herein are included to establish recognized quality only. Equivalent quality and testing standards will be acceptable, subject to their timely submission, review and acceptance by the Architect.
- B. 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 C 717 - Terms Relating to Building Seals and Sealants.
 - 2. ASTM C 790 - Use of Latex Sealing Compounds
 - 3. ASTM C 804 - Use of Solvent-Release Type Sealants.
 - 4. ASTM C 834 - Latex Sealing Compounds.
 - 5. ASTM C 919 - Use of Sealants in Acoustical Applications.
 - 6. ASTM C 920 - Elastomeric Joint Sealants.
 - 7. ASTM C 962 - Use of Elastomeric Joint Sealants.

8. ASTM C 1193 - Guide for Use of Joint Sealants.
 9. ASTM D 1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
 10. FS TT-S-00227E - Sealing Compound: Elastomeric Type, Multi-Component.
 11. FS TT-S-00230C - Sealing Compound: Elastomeric Type, Single-Component
 12. FS TT-S-001543A - Sealing Compound, Silicone Rubber Base.
- C. The following reference materials are hereby made a part of this Section by reference thereto:
1. SWRI – Sealant and Caulking Guide Specification.

1.5 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, chemical and physical properties and installation instructions for each item furnished hereunder.
 2. Manufacturer's certification that the Products supplied meet or exceed specified requirements.
 3. Compatibility and adhesion test reports: Test reports from sealant manufacturer indicating that sealant proposed for use have been tested for compatibility and adhesion with actual samples of substrates to be used on this project. Include sealant manufacturer's interpretation of test results, and recommendations for primers and substrate preparation specific to this project
 4. Selection samples: Sample card indicating Manufacturer's full range of colors available for selection by Architect
 5. Verification samples: 12 inch long samples of sealant for verification of color, installed where directed by Architect.

1.6 QUALITY ASSURANCE

- A. Applicator specializing in applying the work of this Section with a minimum of 3 years documented experience approved by sealant manufacturer.
- B. Obtain joint sealers from a single manufacturer for each type specified. Conform to SWRI requirements for installation.

1.7 PRE-INSTALLATION CONFERENCE

1.8 DELIVERY, STORAGE AND HANDLING

- A. Each container and package must bear an unbroken seal, test number and label of the manufacturer upon delivery to the site. Failure to comply with these requirements shall be sufficient cause for rejection of the material in question, by the Architect and his requiring its removal from the site. New material conforming to said requirements, shall be promptly furnished at no additional cost to the Contract.

1.9 PROJECT CONDITIONS

- A. Do not install single component solvent curing sealant in enclosed building spaces.

- B. Environmental Requirements: Maintain temperature and humidity recommended by the sealant manufacturer during and 24 hours after installation. Do not proceed with installation of joint sealers under the following conditions:
 - 1. When ambient and substrate temperature conditions are below 40 degrees F.
 - 2. When joint substrates are wet due to rain, frost, condensation, or other causes.
- C. Do not proceed with installation of joint sealers until contaminants capable of interfering with their adhesion are removed from substrates.

1.10 WARRANTY

- A. Provide 5 year warranty. Warranty shall include coverage of installed sealant and accessories which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Specified Manufacturers and Products: To establish a standard of quality, design and function desired, Drawings and specifications have been based on the products specified under this section for each individual sealant type, for the applications scheduled at the end of Section, and as may be additionally identified on the Drawings.
- B. Acceptable Manufacturers: Subject to compliance with the requirements specified herein, manufacturers offering similar products include the following:
 - 1. Dow Corning Corporation, Midland, MI.
 - 2. General Electric Company (GE Silicones) Waterford, NY.
 - 3. Pecora Corporation, Harleysville, PA.
 - 4. Sika Corp, Lyndhurst, NJ.
 - 5. BASF Sonneborn Building Products Inc., Minneapolis, MN.
 - 6. Tremco, Beachwood, OH.
 - 7. United States Gypsum Company, Chicago, IL.
 - 8. Emseal Joint Systems Ltd., Westborough, MA.
 - 9. Williams Products Inc., Troy, MI.

2.2 SEALANT MATERIALS

- A. Joint Sealer Type AA (Acrylic acoustical): 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".
- B. 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 ± 12.5 percent, equal to one of the following:

1. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “Sonolac”.
 2. Tremco, Beachwood OH. product, “Tremflex 834”.
 3. Bostik; product, “Chem-Calk 600”.
 4. Pecora Corporation, Harleysville PA; product “ AC-20+”.
- C. Joint Sealer Type B (Butyl): Gun-grade modified butyl and polyisobutylene sealant, conforming to FS TT-S-001657, Type I, and ASTM C-834, with a movement capability of ± 10 percent or better and a Shore A hardness of 24 to 28, equal to one of the following:
1. Tremco, Beachwood OH; product, “Butyl Sealant”.
 2. Pecora Corporation, Harleysville PA; product “BC-158”.
 3. PTI 757 Butyl Sealant
- D. 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, Beachwood OH; product “Vulkem 202”.
 2. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “Sonomeric 2”.
 3. Pecora Corporation, Harleysville PA; product “Urexpan NR-300”.
- E. Joint Sealer Type HL1 (Horizontal-self-Leveling, 1-component): Pouring grade self-leveling modified urethane 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 ± 25 percent, equal to the following:
1. Sika Corp, Lyndhurst NJ; product, “Sikaflex 1CSL”.
 2. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “SL1”.
 3. Tremco, Beachwood OH; product “Vulkem 45”.
 4. Tremco, Beachwood OH; product, “Tremflex SL”.
- F. Joint Sealer Type HL2 (Horizontal-self-Leveling, 2-component): Pouring grade self-leveling multi-component urethane sealant, conforming to FS TT-S-000227E, Type I, Class A, and ASTM C 920, with a minimum movement capability of ± 25 percent, equal to the following:
1. Sika Corp, Lyndhurst NJ; product, “Sikaflex 2CSL”.
 2. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “SL2”.
 3. Tremco, Beachwood OH; product “Vulkem 245/255”.
 4. Tremco, Beachwood OH; product, “THC-900 / THC-901”.
- G. Joint Sealer Type HT (Horizontal-Trowel): Trowel grade multi-component modified urethane sealant, conforming to FS TT-S-000227E, Type I, Class A, and ASTM C 920, with a minimum movement capability of ± 25 percent, equal to the following:
1. Pecora Corporation, Harleysville PA; product, “Dynatred”.
 2. Sika Corp, Lyndhurst NJ; product, “Sikaflex 2CTG”.
 3. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “SL2 (slope grade)”.

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4. Tremco, Beachwood OH; product, “THC-901”.
- 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 ± 25 percent, equal to the following:
1. Pecora Corporation, Harleysville PA; product “Dynatrol I”.
 2. Sika Corp., Lyndhurst NJ; product, “Sikaflex”.
 3. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “Sonolastic NP1”.
 4. Tremco, Beachwood OH; product “Vulkem 116”, or “Dymonic”.
- I. Joint Sealer Type P2 (Polyurethane, Multi-component): Low modulus type, Multi-component non-sagging gun-grade polyurethane sealant, conforming to FS TT-S-000227E, Type II, Class A, and ASTM C 920, Type M, Class 25, Grade NS, use NT,M, A and O with a minimum movement capability of ± 50 percent, equal to the following:
1. Tremco, Beachwood OH; product “Dymeric 240 / Dymeric 240FC”.
 2. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “Sonolastic NP2”.
 3. Pecora Corporation, Harleysville PA; product “Dynatrol II”.
 4. Sika Corp, Lyndhurst NJ; product, “Sikaflex 2CNS”.
- J. 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 ± 50 percent, equal to the following:
1. Dow Corning Corporation, Midland MI; product, “791”.
 2. General Electric Company (GE Silicones) Waterford NY; product, “Silpruf”.
 3. Pecora Corporation, Harleysville PA; product, “895”.
 4. Sika Corp, Lyndhurst NJ; product, “Sika Sil-C 995”.
 5. BASF Sonneborn Building Products Inc., Minneapolis MN; product, “Sonolastic - OmniSeal”.
 6. Tremco, Beachwood OH; product, “Spectrem 2”.
- K. 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:
1. Dow Corning Corporation, Midland MI; product, “790”.
 2. General Electric Company (GE Silicones) Waterford NY; product, “SilPruf LM”.
 3. Sika Corp, Lyndhurst NJ; product, “Sika Sil-C 990”.
 4. Tremco, Beachwood OH; product, “Spectrem 1”.
- L. Joint Sealer Type SM (Silicone, Mildew-resistant): USDA approved one component acetoxy silicone rubber, mildew resistant, acceptable to local health officials, conforming to U.S. Food and Drug Administration regulation 21 CFR 177.2600, FS

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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 ± 25 percent, and a Shore A hardness of 20, equal to the following:

1. Dow Corning Corporation, Midland MI; product, "786".
2. General Electric Company, Waterford NY; product, "Sanitary 1700".
3. BASF Sonneborn Building Products Inc., Minneapolis MN; product, "Sonolastic - OmniPlus".
4. Tremco, Beachwood OH; product, "Tremsil 200".
5. Pecora Corporation, Harleysville PA; product "898".

M. Joint Sealer Type SF (Silicone, Food contact): one component silicone rubber, acceptable to local health officials, conforming to U.S. Food and Drug Administration regulation 21 CFR 175.105 and 175.300, FS TT-S-001543A, Type Non-Sag, Class A, and ASTM C 920, Type NS, Class 25, Use NT, G, O and A with a minimum movement capability of ± 25 percent, and a Shore A minimum hardness of 20, equal to the following:

1. Dow Corning Corporation, Midland MI; product, "732".
2. General Electric Company, Waterford NY; product, "Series SCS1000".
3. Silco Sil-Bond RTV 4500 Food Contact Safe HS

2.3 ACCESSORIES

- A. Compressible joint bead back-up: Compressible closed cell polyethylene, extruded polyolefin or polyurethane foam rod complying with ASTM C 1330, Type C, 1/3 greater in diameter than width of joint. Shape and size of compressible back-up shall be as recommended by manufacturer for the specific condition used. Provide one of the following, or equal.
1. Chargar Corp. Hamden, CT., product "Green Rod".
 2. Industrial Thermo Polymers Ltd., Brampton, Ontario, CN, product "ITP Standard Backer Rod".
 3. BASF Sonneborn Building Products Inc., Minneapolis, MN, product "Sonolastic Closed Cell Backer Rod".
 4. W.R. Meadows Inc., Hampshire, IL, product "Sealtight Kool-Rod".
- B. 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.
- C. 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.
- D. Lead strip joint protectors: Soft lead protection strip as manufactured by Weathercap, Inc., Slidell LA (504) 649-4000.
1. At joints between units in same plane: Weathercap "Type A" Flat Cap".
 2. At joints between units at inside right angles: Weathercap "Type B" Cove cap.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General:
 - 1. Weather conditions must be dry and of the temperature, as recommended by sealant manufacturer, during application operations.
 - 2. Surface receiving work of this section must be absolutely dry and dust free. All joints receiving sealant/caulking materials and primers shall be subject to the approval of the sealant manufacturer for proper use of specified materials.
- B. 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.
 - 1. Clean ferrous metals of all rust and coatings by wire brush, grinding or sandblasting. Remove oil, grease and protective coatings with cleaners recommended by sealant manufacturer.
- C. Prime joint substrates, as recommended in writing by joint-sealant manufacturer, as based on preconstruction joint-sealant-substrate tests or as based upon prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- D. Verify that joint backing and release tapes are compatible with sealant.
- E. Perform preparation in accordance with ASTM C 804 and C 790 for solvent and latex base solvents, respectively.

3.3 INSTALLATION

- A. 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.
 - 1. Set beads into joints continuously, by slightly stretching during placement, to permit compression against sides of joint, without surface wrinkles or buckles.
 - 2. Do not stretch back-up material into joints.
- B. Install bond breaker in joints where shown in the Drawings and wherever recommended by the sealant manufacturer to prevent bond of the sealant to surfaces where such bond might impair the Work.
- C. Apply masking tape or other precautions to prevent migration or spillage of materials onto adjoining surfaces.

- D. Apply urethane sealant and latex caulking materials into joints in accordance with manufacturer's instructions, using mechanical or power caulking gun equipped with nozzle of appropriate size, with sufficient pressure to completely fill the joints.
 - 1. 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.
 - 2. Maintain the outer edge of the sealant and caulking materials, where side faces of joints are in the same plane, back 1/8-inch from the faces.
 - 3. Apply sealant in continuous beads without open joints, voids or air pockets so as to provide a watertight and airtight seal for the entire joint length.
 - 4. After placement of the sealant and caulking materials, concave-tool the surfaces to uniform density, using a water-wet tool. Do not use detergents or soapy water for the tooling operations.
 - 5. Remove the temporary masking tape immediately after tooling, and before the sealant or caulking material has taken initial set.
- E. Take care not to block-off weep tubes or any through wall opening constructed to allow weeping of accumulated water.

3.4 INSTALLATION PRE-FORMED FOAM SEALANTS

- A. General: The joint configuration and the joint surfaces shall be as detailed in the Drawings and in accordance with the current material Tech Data available from the Manufacturer. Field measurements of the depth and width of the joint shall be supplied to manufacturer before material is ordered.
- B. Joint sealer/expansion joint material to be installed in strict accordance with the manufacturer's instructions.
 - 1. Installed each length of sealant immediately after removing protective wrapping, taking care not to pull or stretch material.
 - 2. Install in manner to provide seal continuity at ends, turns and intersections of joints.
 - 3. Provide additional wet seal joints where required by manufacturer.
- C. Remove all strip-off waste materials and excess foam sealant from site immediately upon completion of work.

3.5 CLEANING

- A. Clean all surfaces of adjacent surfaces which have been marked or soiled by the work of this Section, removing all excess sealant and caulking materials with solvents which will not damage the surfaces in any way.

3.6 PROTECTION

- A. During the operation of sealant work, 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.

3.7 SCHEDULE

- A. General: Seal joints indicated and all interior and exterior joints, seams, and intersections between dissimilar materials.

B. Sealant Colors:

1. Colors for Sealant Types “P2” and “HL2”: Match colors furnished by the Architect, or match other building materials as directed. Should such custom colors not be available from the approved manufacturer, except at additional charge, provide all such colors at no change in Contract Sum.
2. Colors for Sealant Types “BP2”, P1”, “HL1”, “HT”, “SC”, “SE”, and “SM”: As selected by the Architect from manufacturer’s standard colors.
3. Color for Sealant Types “AA” and “AP”: White.
4. In concealed installation, and in partially or fully exposed installation where so approved by the Architect, standard gray or black sealant may be used.

C. Exterior joints (Listed by primary building material abutting sealant joints):

1. Concrete:

Joint Condition	Sealant Type
a. Concrete to concrete, vertical control joints:	P2
b. Concrete to concrete vertical expansion joints greater than 2 inch width:	FC
c. Concrete foundation walls to abutting concrete, and other non-bituminous pavements, steps, platforms, and ends of ramp, (horizontal joints):	HL2
d. Concrete slabs on grade to abutting non-bituminous pavements (horizontal joints, including pedestrian traffic surfaces):	HL2
e. Concrete to concrete saw cut and tooled control and isolation joints in horizontal surfaces including pedestrian traffic surfaces:	HL1
f. Concrete and non-bituminous sloped (5% to 12%) pavement ramps (horizontal joint) at abutting concrete or masonry foundation walls:	HT
g. Concrete to all items which penetrate exterior concrete walls, including, but not necessarily limited to, door frames, louver frames, pipes, vents, and similar items:	P1
h. Concrete to curbing joints will NOT be caulked.	

2. Exterior Masonry:

Joint Condition	Sealant Type
a. Masonry to masonry, expansion and control joints:	P2
b. Masonry to masonry, expansion joints greater than 2 inch width:	FC
c. Masonry to abutting masonry, or concrete:	P2
d. Masonry to abutting non-porous materials (painted metals, anodized aluminum, mill finished aluminum, PVC, glass, and similar materials):	P1
e. Masonry to all items which penetrate exterior masonry walls, including, but not necessarily limited to, door frames, louver frames, pipes, vents, and similar items:	P1

f. Masonry to metal: P1

D. Interior joints (Listed by primary building material abutting sealant joints):

1. Interior Concrete:

Joint Condition	Sealant Type
a. Concrete to concrete, vertical joints:	SC
b. Concrete to concrete: horizontal walkable surfaces:	HL2
c. Concrete and non-bituminous pavement ramps (5 to 12 Percent) horizontal joints at abutting vertical concrete or masonry surfaces:	HT
d. Concrete to all items which penetrate exterior concrete walls, including, but not necessarily limited to, door frames, louver frames, pipes, vents, and similar items:	SC

2. Interior Masonry:

* Includes interior side of exterior masonry walls.

Joint Condition	Sealant Type
a. Masonry to masonry control joints*:	P2
b. Masonry* to gypsum liner panels and gypsum veneer plaster	SC
c. Masonry to all items which penetrate masonry walls*, including, but not necessarily limited to, storefront framing, window frames, door frames, louver frames, and similar items:	SC
d. Masonry to all pipes, conduit and vents which penetrate non-rated masonry walls*:	SC

3. Gypsum Board:

Joint Condition	Sealant Type
a. Gypsum board to metal or wood trim:	AP
b. Gypsum board to masonry:	SC
c. Gypsum board to interior door and window frames, penetrating conduits and piping, light-fixtures, electrical cover plates, building specialty items, ductwork, grilles, supply diffusers, faucets, piping, escutcheon plates and similar items:	AP
d. Plumbing fixtures NOT to be caulked:	SM

4. Architectural millwork and casework

Joint Condition	Sealant Type
a. Casework to abutting materials, kitchens, toilet rooms and similar "wet spaces":	SM
b. Casework to abutting surfaces (except in "wet" spaces):	AP
c. Countertops to abutting wall surfaces and to abutting casework:	SM
d. Countertops to plumbing fixtures and fittings:	SM

5. Tile:

<u>Joint Condition</u>	<u>Sealant Type</u>
a. Tile to tile, horizontal pedestrian traffic joints:	SM
b. Tile to tile, ALL interior corners of tile walls and wainscoats will be caulked:	HL2
c. All tile to door frame or wood trim joints will be caulked	SM
d. All control joints in tile will be caulked.	SM

6. Interior Wood:

<u>Joint Condition</u>	<u>Sealant Type</u>
a. Wood to wood (natural or stained finishes)	SC
b. Wood to wood (painted opaque finishes)	AP
c. Wood to metal	SC
d. Wood base to wall surfaces	SC

End of Section

Section 08 31 01
ACCESS DOORS AND PANELS

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.

- A. Examine all Drawings and all other Sections of the Specifications for requirements therein affecting the work of this Section.

1.2 The Drawings on which this Contract is based are listed in Section 00 01 15. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.

1.3 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 – MASONRY: Installation of access panels into masonry assemblies.
 2. Section 09 29 00 - GYPSUM BOARD: Installation of access panels into drywall assemblies.

1.4 RELATED REQUIREMENTS

- A. Section 04 01 20 – MASONRY: Installation of access panels into masonry assemblies.
- B. Section 09 29 00 - GYPSUM BOARD: Installation of access panels into drywall assemblies.
- C. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Furnishing access panels required for heating/cooling systems.
- D. Division 26 - ELECTRICAL: Furnishing access panels required for electrical systems.

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 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.

1.6 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.

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 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 (typical): 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.
- B. For non-rated gypsum board walls and ceilings (public areas): Recessed door type meeting the following requirements
- 1. Manufacturer's types:
 - a. Acudor DW-5058 series.
 - b. Karp:
 - 1) Walls: Karp RDW series.
 - 2) Ceilings: Karp KATR series.
 - c. Nystrom RW series.
 - d. Williams WB-DW series.
 - 2. Frame type: 16 gage galvanized bonderized steel frame, with 22 gage galvanized steel drywall bead.
 - 3. Door: Recessed 16 gage galvanized bonderized steel door, with 22 gage galvanized steel drywall bead.
 - 4. Hinge: Concealed pivot rod hinge.
 - 5. Latch: Flush cam latch, (operated by Allen or Torx head screwdriver) with steel grommet welded to door.

2.5 FACTORY FINISHING

- A. Panel assemblies fabricated from stainless steel: N^o. 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 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. 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 / Plaster ceilings, soffits and walls where mechanical work has occurred.
 - 7. Patch and repair GWB / Plaster ceilings, soffits and walls.
 - 8. Provide GWB chase walls for the routing of new mechanical work.
 - 9. Provide GWB furred walls for the routing of new MEP & FP 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 08 31 00 - ACCESS DOORS AND PANELS: Shop primed access panels, occurring in partitions and walls.
- C. Section 09 91 00 - PAINTING: Applied finish coatings.
- D. Division 23 - HEATING, VENTILATING AND AIR CONDITIONING: Supply and return airregisters.
- E. 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 24 – ELECTRONIC 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. Gypsum board, (typical): UL fire resistance rated, ASTM C 1396 'Type X' board, 1/2 or 5/8 inch thick, 48 inch width, of lengths to minimize end joints, with tapered edges.(Above Ceilings)
1. Acceptable products include the following, or approved equal:
 - a. USG Sheetrock brand "Firecode Core".
 - b. National Gypsum Company, Gold Bond brand product "Fireshield Gypsum Board".
 - 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.
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).

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- 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, 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 1.
 2. At areas hidden from view, requiring a fire rating: Level 1.
 3. At concealed plenum spaces above ceilings attic spaces: Level 1.
 4. At non-occupied spaces (i.e. attics): Level 1.
 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, lobbies, vestibules 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

- 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

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.

1.2 SUMMARY

- A. The work of this Section consists of tiling where shown on the Drawings, as specified herein, and as required for a complete and proper installation. Work includes, all labor, materials, transportation, protection, apparatus, tools, equipment, incidentals, warranty, and items necessary for tiling Work detailed on Drawings and as specified herein.
- B. Furnish and install the following:
 - 1. Interior floor and wall tile Repair / replacement
- C. Install the following furnished under the designated Sections:
 - 1. Install access panels into tiled walls as specified under Section 08 31 00 - ACCESS DOORS AND PANELS.
- D. Perform drilling and cutting in tile surfaces, as required 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 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.

1.4 RELATED REQUIREMENTS

- A. Section 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction recycling.
- B. Section 02 41 19 - SELECTIVE DEMOLITION: Additional demolition requirements that is required and included as Work of this Filed Sub-bid Contractor.

TILING

- C. Section 04 20 00 - UNIT MASONRY: Concrete masonry unit substrate.
- D. Section 07 92 00 - JOINT SEALANTS: Backer rod and sealant at control joints.

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. 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 A108.4 - Installation of Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
 4. ANSI A108.5 - Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex Portland Cement Mortar.
 5. ANSI A108.6 - Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy.
 6. ANSI A108.9 - Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout.
 7. ANSI A108.10 - Installation of Grout in Tilework.
 8. ANSI A108.11 - Interior Installation of Cementitious Backer Units.
 9. ANSI A118.1 - Dry-Set Portland Cement Mortar.
 10. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile Setting and Grouting Epoxy and Water-Cleanable Tile Setting Epoxy Adhesive.
 11. ANSI A118.4 - Latex-Portland Cement Mortar.
 12. ANSI A118.6 - Ceramic Tile Grouts.
 13. ANSI A118.7 – Polymer Modified Cement Grouts
 14. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.
 15. ANSI A118.9 - Cementitious Backer Units.
 16. ANSI A118.10 - Waterproofing.
 17. ANSI A137.1 - Specifications for Ceramic Tile.
 18. ANSI A10.20 - Safety Requirements for Ceramic Tile, Terrazzo and Marble Work.
 19. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
 20. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 21. ASTM C109 – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens).
 22. ASTM C144 – Standard Specification for Aggregate for Masonry Mortar.
 23. ASTM C150 - Standard Specification for Portland Cement.

24. ASTM C256 (Withdrawn Standard) – Method of Test for Flexural Strength of Magnesium Oxychloride Cements (Using Simple Bar with Two-Point or Single-Point Loading).
 25. ASTM C321 (Withdrawn Standard) – Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
 26. ASTM C413 - Standard Test Method for Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes.
 27. ASTM C502 – Standard Test Method for Wedging of Flat, Rectangular Ceramic Wall and Floor Tile.
 28. ASTM C579 - Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes.
 29. ASTM C627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.
 30. ASTM C658 (Withdrawn Standard) - Standard Specification for Chemical-Resistant Resin Grouts for Brick or Tile.
 31. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
 32. ASTM C1026 - Standard Test Method for Measuring the Resistance of Ceramic and Glass Tile to Freeze-Thaw Cycling.
 33. ASTM C1027 – Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile.
 34. ASTM C1178 – Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
 35. ASTM C1278 – Standard Specification for Fiber-Reinforced Gypsum Panel.
 36. ASTM C1288 – Standard Specification for Fiber-Cement Interior Substrate Sheets.
 37. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units.
 38. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
 39. ASTM D751 – Standard Test Methods for Coated Fabrics.
 40. ASTM D2103 – Standard Specification for Polyethylene Film and Sheeting.
 41. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Inclusionary References: The following reference materials are hereby made a part of this Section by reference thereto:
1. TCNA (formerly TCA) - Handbook for Ceramic Tile Installation, latest edition.
- C. Definitions: For the purposes of these specifications the following terms are defined:
1. Wet Areas: Rooms/spaces which has plumbing fixtures, sinks, toilets, or floor drains. Wet areas additionally include rooms/spaces which are exposed to weather.
 2. Dry Areas: Rooms/spaces which have no plumbing, sinks, toilets, or floor drains.
 3. Tile having dimension of 15 inches or longer on one side, or weighing greater than 5 pounds.

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1.6 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. 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 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.
- B. Pre-installation meetings:
1. At least two weeks prior to commencing the work of this Section, conduct a pre-installation conference at the Project site. Coordinate time of meeting to occur prior to installation of work under the related sections named below.
 - a. Required attendees: Owner's Representative, Architect, General Contractor, Tile Installer's Project Superintendent, Tile setting materials manufacturer's technical representative and representatives for installers of related work specified under the following Sections:
 - 1) Section 04 20 00 - Unit Masonry/
 - 2) Section 07 92 00 - Joint Sealants.
 - 3) Section 09 22 16 - Non-Structural Metal Framing.
 - b. Agenda:
 - 1) Scheduling of tiling operations.
 - 2) Review of setting methods and materials required.
 - 3) Review of staging and material storage locations.
 - 4) Coordination of work by other trades.
 - 5) Protection of completed tile work.
- C. Sequencing:
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.
 2. Sequence tile installation with adjoining and related work to minimize damage and soiling during construction.
 - a. Before proceeding with installation work, inspect all project conditions and all work of other trades to ensure 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.
- D. Scheduling: 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 24 – Electronic SUBMITTAL PROCEDURES:
1. Product Data: 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.
 - b. Materials list: List of products proposed to be provided under this Section, submitted in accordance with Section 01 33 00 - SUBMITTAL REQUIREMENTS.
 2. Shop Drawings: 1/4 inch scale elevations and plans of tile patterns.
 3. Selection Samples:
 - a. Manufacturer's sample boards for each type and color group of tile specified, and grout colors, for selections by the Architect.
 4. Verification Samples:
 - a. Mount tile and apply grout on Size of sample appropriate to size of tile, but not less than 24 by 24 inches, 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.
 - c. Stone threshold, 12 inch long samples in shaped profile.
 5. Source Quality Control Submittals:
 - a. Grade Certificates: Manufacturer's Master Grade Certificates submitted prior to shipment of tile to project.
- C. Maintenance Material Submittals: Clearly label and package extra materials securely to prevent damage.
1. Extra Stock Materials: 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.

1.8 QUALITY ASSURANCE

- A. General: Notify the Architect where conflicts apply between referenced standards and existing materials, and existing methods of construction.
1. Conform to ANSI/TCNA A 137.1 and TCNA Handbook for Ceramic Tile Installation.
 2. 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.
- B. Sole Source: Obtain installation 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.

D. Examination of Site and Documents

1. The 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 will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Subcontractor's failure to familiarize themselves with the contractor 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.
2. Pre-Bid Conference: Bidders are strongly encouraged to attend the Pre-Bid conference; refer to ADVERTISEMENT FOR BIDS for time and date.

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 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.
3. Deliver and store tile setting materials in original, sealed, containers showing manufacturer's identification, year of production, new 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.
2. Store and protect containers above floor level, keep dry until ready for use.
3. 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 SITE CONDITIONS

A. 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.

- B. 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.

1.11 WARRANTY

- A. **Manufacturer Warranty:** The manufacturer of installation systems, adhesives, grouts and mortars shall provide a comprehensive non pro-rated written five (5) year warrantee 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 TCNA 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.
- B. **Special Warranty:** Provide 2 year, non pro-rated warranty which shall include provisions 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.

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. Porcelain tile:
 - a. Crossville Ceramics, Crossville, TN.
 - b. Porcelanosa USA, Boston, MA
 - c. Emil America, Dulles, VA.
 - d. Florim USA, Clarksville, TN.
 - e. Marazzi USA, Sunnyvale, TX.
 - f. Dal-Tile Corp., Dallas TX.
 - 2. Mortars, adhesives and grouts:
 - a. Ardex Americas, Aliquippa, PA.
 - b. Bostik Corp. (Hydroment), Middleton, MA.
 - c. C-Cure Chemical Company, Inc., Houston, TX.
 - d. Custom Building Products, Inc., Seal Beach, CA.
 - e. Laticrete International, Inc., Bethany, CT.
 - f. MAPEI Americas USA, Deerfield Beach, FL.
 - g. TEK Special Construction Brands, Inc. (division of HB Fuller), Arlington Heights, IL.
 - 3. Cementitious tile backer board ("Cement board"):

- a. Custom Building Products, Inc., Seal Beach, CA.
 - b. Fin Pan, Inc., Hamilton, OH.
 - c. Unifix, Inc., division of National Gypsum Company, Charlotte, NC.
 - d. United States Gypsum Company, Chicago, IL.
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. Wall tile: To establish a standard of quality, provide matching tile where penetrations occur

2.3 SETTING MATERIALS

- A. Thin-Set Mortar: Polymer-modified Portland cement dry-set mortar, complying with the bond strength requirements of ANSI A118.4.
1. Acceptable products are limited to:
 - a. Mapei product: "Ultralite Mortar".
 - b. Laticrete product: "Multimax Lite".
 - c. Custom Building product: " MegaLite Ultimate Crack Prevention Large Format Tile Mortar".
- B. Rendering Mortar: Pre-blended, polymer-modified Portland cement rendering mortar.
1. Acceptable products include the following or approved equal:
 - a. Laticrete product: "MVIS Lite Wall Float".
 - b. Mapei product: "Modified Mortar Bed".
 - c. Custom Building product: "SpeedSlope".
- C. High-bond strength mortar for porcelain tile: complying the requirements of ANSI A118.4.
1. Acceptable products include the following or approved equal:
 - a. Ardex Americas product: "Ardex S28".
 - b. Mapei product: "Grani-Rapid".
 - c. Laticrete product: "254 Platinum".
 - d. Custom Building product: "Porcelain Tile Mortar".

2.4 GROUTING MATERIALS

- A. Epoxy grout: Multi-component epoxy grout, non-pigmented, with colored highlight filler, stain resistant, and water cleanable, conforming to ANSI 118.3
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 in compliance with ANSI A118.3 test methods:
 - a. Compressive Strength: greater than 3500 psi (24,131 kPa).

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- b. Quarry Tile Shear Bond Strength: 1000 psi (24,131 kPa) min.
- 2. Acceptable products:
 - a. Ardex Americas: No equal product.
 - b. Mapei product: “Kerapoxy CQ”.
 - c. Laticrete product: “SpectraLOCK PRO” grout.
 - d. Custom Building product: “CEG-Lite 100% Solids Commercial Epoxy Grout”.

2.5 ACCESSORIES

- A. Cleavage membrane: ASTM D226 Number 15 asphalt saturated felt or ASTM D2103, polyethylene film, 4 mil thick.
- B. 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.
 - 2. Corner guard / corner edge trim: Stainless steel, having #4 polish finish, in full height (floor to ceiling) as required for tile thickness with a perforated anchoring leg.
 - a. Type 1: Tile Column Enclosure corners: Schlüter, product: “Quadec-k”.
 - b. Type 2: Schlüter, product: “ECK”, radius 5/8 inch.
 - c. Type 3: Schlüter, product: “Rondec”.
 - 3. 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”.
 - 4. Floor to wall transition trim in Toilet Rooms: Schlüter, product: “Dilek-AHKA”, in clear anodized finish.
 - 5. Trim at new entry 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.
 - 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.

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 existing finishes against undue soilage and damage by the exercise of reasonable care and precautions. Clean, or repair all existing materials which are soiled or otherwise damaged by Work of this Section, to match original profiles and finishes. Existing materials and finishes which cannot be cleaned, or repaired shall be removed and replaced with new work to match existing.
- 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 structural 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.
- F. Upon receipt of tile, check tile for demonstratable warpage and other product defects. Advise Architect in advance of installation if specified maximum tile lippage tolerance cannot be maintained due to tile warpage.

3.3 INSTALLATION - GENERAL REQUIREMENTS

- A. Installation Standards: 2016 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation and The American National Standard Specifications for the Installation of Ceramic Tile, 2017 edition (ANSI A108-A118-A136.1), is hereby made a part of this specification. All work of this Section shall be installed in accordance with the requirements contained in referenced 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 as required to provide coverage indicated, except for tiles exceeding 144 square inches which require a complete back application of mortar (100% coverage).
- C. Crack Suppression:
 - 1. Locate sealant filled movement joints including control, contraction and isolation joints where indicated on required and approved shop drawing submittal. Construct joints in accordance with TCNA joint design guideline EJ171 and as specified in Article entitled "INSTALLATION OF CONTROL JOINTS."
 - 2. Dry-Areas (as defined herein): Install anti-fracture membrane over existing cracks and non-movement joints in substrate materials, prior to tile/stone installation.
 - 3. Wet-Areas (as defined herein): Install waterproofing systems over all substrate materials (100 percent coverage) prior to tile/stone installation.
- D. Tile Patterns and types: Tile patterns are shown on the Drawings, if more information is required, obtain the necessary information from the Architect. Do not interrupt tile pattern around openings.
- E. 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.
 - 4. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated.
 - 5. Do not align joints of base units and lowest course of tile, offset joints by one-half of unit width.
 - 6. Soft Joints: Provide 3/8 inch sealant joint where floor tile terminates at non-tiled vertical surfaces (walls, planters and similar built-in place elements).
- F. Tile Lippage: Maximum 1/32 inch; remove and replace tiles exceeding this requirement.

3.4 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.

3.5 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.

3.6 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 07900 - JOINT SEALERS.

3.7 FLOORING INSTALLATION – TCNA NUMBER F122 MODIFIED WITH EPOXY GROUT

- A. Description: Thin-set tile installation with waterproofing membrane, at “wet areas” with fabric reinforcing at changes in plane.
- 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:
 - 1) Waterproofing membrane at ‘wet’ and all toilet rooms over suspended slab.
 - 2) Anti-fracture membrane at all ‘dry’ rooms and slabs-on-grade.
 - b. Bonding coat: Latex modified portland cement (ANSI A118.4).
 - 2. Grout materials: epoxy grout (ANSI A118.3).
- C. At ‘wet’ rooms and toilet rooms over suspended slabs: Install liquid applied waterproofing membrane with reinforcing over entire tile substrate area in strict compliance with manufacturer’s written instructions. (TCNA F125-Full).
- D. At ‘dry’ rooms and toilet rooms at slabs-on-grade: Install anti-fracture membrane over existing cracks and joints in substrate materials.
- E. Install latex/portland cement mortar bed over cured anti-fracture membrane to a nominal thickness of 3/32 inch.
- F. 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 W244E WITH THIN-SET

- A. General: Install in accordance with ANSI A108.5, TCNA installation method number W244E, 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.

3.9 WALL TILE INSTALLATION - TCNA NUMBER W211 WITH THIN-SET OVER MASONRY SUBSTRATE

- A. General: Install in accordance with ANSI A108.5, TCNA installation method number W211, 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. Rendering Mortar: Pre-mixed latex modified rendering mortar.
 - b. Thin-Set Bond coat: Latex modified portland cement (ANSI A118.4).
 2. Grout materials: Acrylic modified Portland cement grout (ANSI A118.6).
- B. Install latex modified Portland cement rendering mortar to a thickness of 3/8 inch to 3/4 inch. Install with a flatness tolerance of 1/8 inch variance in 10 feet.
- C. Install over cured rendering mortar, a latex modified Portland cement mortar bond coat to thickness recommended by manufacturer
- D. 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 INSTALLATION – METAL EDGE AND TRANSITION STRIPS

- A. General: Install in accordance with ANSI A108.5, TCNA installation method number F113, and as additionally specified herein below. Apply materials in strict accordance with the written instructions and recommendations of setting materials manufacturer.
- B. Grouting: Install in accordance with installation requirements of abutting tile.

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. 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 with heavy red-rosin paper or kraft paper.

End of Section

Section 09 64 29

WOOD STRIP AND PLANK FLOORING – PATCH AND REPAIR

PART 1 - GENERAL

1.1 SUMMARY

- A. Furnish and install:
 - 1. Patch, repair and finish wood flooring where mechanical and electrical work penetrations has occurred

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 06 10 00 – ROUGH CARPENTRY
- C. Section 06 20 00 - ARCHITETURAL WOODWORK
- D. Division 23 – HVAC
- E. Division 26 - ELECTRICAL

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.
 - 1. ASTM E 84 - Surface Burning Characteristics of Building Materials.
 - 2. FS MM-L-736 - Lumber; Hardwood.
 - 3. WSFI - Recommendations for the Correct Preparation, Finishing, and Testing of Concrete Subfloor Surfaces to Receive Wood Flooring.
 - 4. 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 – ELECRONIS SUBMITTAL PROCEDURES
 - 1. Literature: Manufacturer's product data sheets, specifications, performance data for each type of wood flooring materials, with

manufacturer's installation instructions and recommended maintenance procedures.

3. Installation instructions: Submit manufacturer's MFMA instructions, indicating special procedures, and perimeter conditions requiring special attention.
4. Manufacturer's warranties: Wood flooring and finish system manufacturers' standard written guarantees covering defects in materials and workmanship, clearly defining the terms included in the coverage.
5. Shop drawings: Indicate floor joint pattern and termination details.
6. Verification samples:
 - a. Strip flooring: At least six (6) 12-inch long pieces of specified specie, grade, and size of flooring, indicating complete range of color variation which may be expected for the project.

B. Submit the following under provisions of Section 01 78 00 - CLOSEOUT SUBMITTALS:

1. Maintenance data: Include maintenance procedures, recommended maintenance materials, a suggested schedule for cleaning, stripping, and re-finishing, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE

- A. Manufacturer: Companies specializing in manufacturing the products specified in this Section, each with minimum 5 years documented experience.
- B. Installer specializing in applying the work of this Section with a minimum of 5 years documented experience of the type of flooring system specified.
- C. Each board of flooring shall bear grade stamp on underside identifying Grading authority, manufacturer's identification, wood species and grade.
- D. Perform work in accordance with MFMA.

1.6 REGULATORY REQUIREMENTS

- A. Conform to applicable codes for Class 1 flame spread rating of finished floor surface when tested in accordance with ASTM E 84. Provide certificate of compliance from authority having jurisdiction.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver wood flooring a minimum of 7 days prior to installation to allow materials moisture content to stabilize to ambient conditions. Do not deliver wood until all concrete, masonry, plaster and other wet work is complete and dry, and ambient air at installation space has moisture content stabilized.
- B. Protect wood flooring from excessive moisture in shipment and handling;

store all materials in an elevated, protected, and dry location.

1.8 PROJECT CONDITIONS

- A. Maintain ambient temperature between 55 and 80 degrees Fahrenheit, with a relative humidity of between 35 and 50 percent for 48 hours prior to delivery and storage of the flooring materials at the area; maintain such conditions throughout the installation and finishing period, and thereafter until Owner's Final Acceptance or Owner's occupancy.

1.9 SEQUENCING AND SCHEDULING

- A. Sequence work to ensure wood flooring is not delivered until building is enclosed, sufficient heat is provided, and proper humidity conditions can be maintained.
- B. Install wood flooring after interior wet work is complete and fully cured, and ambient air at installation space has a moisture content stabilized.

1.10 WARRANTY

- A. Provide 2 year warranty. Warranty shall include coverage for all costs to repair or replace flooring, which shrinks, warps, cracks, or otherwise deteriorates excessively, or which breaks its anchorage, or bond with substrate, or otherwise fails. Warranty shall cover failures due to materials or workmanship. The Installer is not responsible for failure due to excessive moisture penetration through concrete substrate or other similar causes for failure which are beyond the Work of this Section, except verification of acceptable substrates, specified herein.

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. Tarkett Wood, Johnson City, TN.
 - 2. Bruce Hardwood Floors Div. of Armstrong World Industries, Lancaster, PA.
 - 3. Junkers Hardwood, Inc., New York, NY.
 - 4. Boen Hardwood Flooring, Inc., Martinsville, VA.
 - 5. Aacer Flooring, LLC, Peshtigo, WI

2.2 FLOORING MATERIALS

- A. Wood strip flooring: Nominal 3/4 inch (25/32 inch) thick by 2-1/4 inches wide kiln-dried plain sawn white Oak, grade-marked, tongue and grooved and end-matched, and delivered to the project in bundles bearing the specified grade marking.

1. Grade: Standard grade.
2. Individual strip length: Random lengths, ranging from a minimum of 9 inches to a maximum of 102 inches. Proportion of board lengths shall be in accordance with specified MFMA grade.
 - a. Not more than 65 percent of flooring shall be under 42 inches.
 - b. Not more than 30 percent of flooring shall be under 18 inches.
 - c. Not more than 15 percent of flooring shall be under 15 inches.

2.3 FINISHING MATERIALS

- A. Sandpapers: Number 1-1/2 graduating to 1/2; followed by Numbers 0 and 00 for final sanding, except as otherwise recommended by the flooring manufacturer.
- B. Floor finish: Water base catalyzed urethane coating system, as manufactured by Basic Coatings, Des Moines IA., product "Street ShoeXL Commercial Wood Floor Finish".
 1. VOC: Catalyzed, not exceed 350 grams per liter.
 2. Solids content: 31 percent.
 3. Luster: Gloss finish, 80 units at 60 degrees on wood.

2.4 ACCESSORIES

- A. High density fiber board: Tempered hardboard, 1/4 inch thick.
- B. Vapor retarder: 6 mil thick black polyethylene sheeting and 2 inch wide waterproof sealing tape for joints.
- C. Plywood underlayment: CD-EXT-APA, 5/8-inch thick.
- D. Sleepers and shims: Softwood lumber, pressure treated for moisture protection, nominal 2 by 4 inch size.
- E. Protection paper: Waxed kraft paper. or red rosin paper.
- F. Fasteners:
 1. Fasteners for plywood underlayment: Power-actuated fasteners of appropriate size for the specific substrate.
 2. Fasteners for flooring: 7d or 8d cut nails or screw-type nails, or other fasteners as recommended by the flooring manufacturer, for blind-method installation over plywood underlayment.
- G. Filler for patching, smoothing and leveling subfloors and underlayment: Portland cement-based latex underlayment acceptable to flooring manufacturer, equal to the following:
 1. Ardex, Inc., products "Feather Flash" and "Ardex SD-P".

2. Quikrete Companies, product “Fast-Set Underlayment 1248”.
3. Silpro Masonry Systems Inc., product “Masco Latex Cement”

PART 3 - EXECUTION

3.2 EXAMINATION

- A. Verify that support framing is complete and satisfactory for plywood substrate installation.
- B. Verify that permanent heat, light, and ventilation is complete and operational prior to installation.
- C. Inspect all substrate surfaces and verify that they are in proper condition to receive the work of this Section.
 1. Verify that concrete substrate surfaces are smooth and flat to plus or minus 1/8 inch in 10 feet, free of scaling, oil, grease, dust, and foreign substance.
 2. Verify that wood subfloor is properly secured, is smooth and flat to plus or minus 1/8 inch in 10 feet, free of foreign substances.
- D. Verify that required flooring mounted utilities are in proper location.
- E. Beginning of installation means acceptance of existing substrate and site conditions.

3.3 PREPARATION

- A. Comply with flooring manufacturer's requirements for preparation of substrate to receive wood flooring.
- B. Remove sub-floor ridges and bumps. 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.
- C. Thoroughly vacuum clean all receiving surfaces before commencing installation work.
- D. Open bundles of flooring, and permit the pieces to properly acclimatize prior to installing same.

3.4 INSTALLATION - GENERAL

- A. Install in accordance with manufacturer's instructions.
- B. Lay flooring in patterns shown in the Drawings. Arrange strips with staggered end joints and end grain, matched, set joints flush and tight.
- C. Terminate flooring at centerline of door openings where adjacent floor finish is dissimilar. Provide divider strips.
- D. Expansion Space: Provide adequate expansion space at walls, columns or

other projections into the floor surface. Provide expansion space per the following:

1. In wood floor areas of less than 1,000 square feet, allow an expansion space equal to 1/16 inch per foot of width of installation.
2. In wood floor areas of greater than 1,000 square feet, allow an expansion space of 1-3/4 inch at walls and 1 inch at columns and other projections.

E. Install flooring tight to floor access covers.

3.5 INSTALLATION - NAILED

- A. Perform the installation in strict accordance with the referenced installation standards and specifications, and with additional requirements as specified herein.
- B. Lay specified polyethylene sheet vapor retarder in a continuous manner over all concrete receiving surfaces, lapping all joints at least 6 inches and continuously sealing the joints with specified tape to provide an unbroken vapor-retardant surface throughout. Spot glue in place. Extend the sheet up onto walls and other intersecting vertical surfaces, where base is to be installed, a distance of at least 3 inches.
- C. Place sleepers over subfloor surface 12 inches on center. Shim underside of sleepers to level line. Place sheathing paper, lap edges and ends 12 inches; staple in place.
- D. Blind-nail flooring in place through the tongue edges with specified fasteners spaced 10 to 12 inches apart, driving the fasteners at an approximate 45-degree angle.
- E. Install wood treads, risers, facings, and edgings, in accordance with the details on the Drawings, blind-nailing throughout.

3.6 SANDING AND FINISHING PREPARATION

- A. Mask off adjacent surfaces and take precautions to contain dust.
- B. Sand all flooring, facings, and edgings, after installation of flooring and adjacent work is completed. Use a power sander, taking precautions to contain dust, sand flooring in several complete passes, commencing with 1-1/2 graduating to 1/2; followed by Numbers 0 and 00 for final sanding. Leave floor finish with no evidence of sander marks.
- C. Thoroughly vacuum-clean all sanded surfaces and other finish surfaces within space, clean surfaces completely free from dust, and dry-mop with a tack cloth-clad mop.

3.7 FINISHING

- A. Apply the first coat of sealer immediately following completion of sanding.

- B. Apply two coats of sealer with recommended applicator at a rate of 500-700 square feet per gallon. Comply with application instructions.
 - 1. Screen lightly between coats. Vacuum and pick up dust with a water-dampened towel.
 - 2. Allow to dry overnight.
- C. Apply two coats of Floor Finish with recommended applicator at rate of 600-800 square feet per gallon. Comply with application instructions.
 - 1. Mix pre-measured catalyst with finish prior to application.
 - 2. It is not necessary to screen between coats unless more than six hours has elapsed since the application of the first coat of finish.
 - 3. Allow to dry overnight. The floor may be open to light traffic in 24 hours.
 - 4. When dry, the finish should present a uniform finish, free of visible laps.

3.8 FINISHING

- A. Prior to commencing application of finishing products, measure moisture content of flooring using moisture meter, and record results.
- B. Stain wood to color and tone to match architect's accepted sample, applying stain at approximately 100 square feet per gallon; allow stain to fully dry, verify with moisture meter.
- C. When stain has cured, apply one coat of Basic Coatings product "Hydroline sealer" as recommended by manufacturer. When that moisture content of wood is same as original prior to application, sand/buff coat with a used 120 grit screen.
- D. Vacuum up all dust and tack with a clean water dampened towel. Apply second coat of sealer and, repeat sanding and cleaning procedures.
- E. Permit sealer to dry overnight prior to finishing with catalyzed urethane. Re-sand and clean as required.
- F. Mix catalyst with urethane in strict adherence to manufacturers' instructions. Apply one coat of catalyzed urethane with a coverage rate as recommended by manufacturer. When manufacturer recommends first coat should be dry, check the moisture content of wood. When moisture content is same as original prior to application, sand with used 120 grit screen, clean and apply second coat. This should occur between 3 and 5 hours after first coat. If more than 5 hours has lapsed prior to starting the second coat of urethane, repeat sanding and cleaning procedures specified above and apply second coat.

3.9 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. Daily clean work areas by sweeping and disposing of scraps and sawdust.
- C. As work progresses, remove excess adhesive from floor, base and wall surfaces without damage.
- D. 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.
- E. Clean and polish floor surfaces in accordance with manufacturer's instructions.

3.10 PROTECTION

- A. Provide protection of completed flooring areas from construction traffic until Substantial Completion of the General Contract. Prohibit construction traffic for a minimum of 48 hours on completed areas of adhesive applied flooring.
- B. Cover the all wood floor surfaces, facings, and edgings, with heavyweight non-staining 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 91 00

PAINTING

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.

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. Interior wood trim and paneling.
 4. Exposed to view electrical conduit and raceways.
 5. Access panels and frames.
- 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.

PAINTING

1.3 RELATED REQUIREMENTS

- A. Section 01 52 40- CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL: Procedural and administrative requirements for construction and demolition recycling.
- B. Section 08 31 00 - ACCESS DOORS AND PANELS, and by trades requiring the same: Shop primed access panels, occurring in partitions and walls.
- C. Division 26 - ELECTRICAL: Prefinished items such as light fixtures, switch gear, electrical distribution cabinets and similar surfaces and materials.
- D. Respective sections: Factory-finishing of food service, mechanical, plumbing, fire protection and electrical equipment.

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/ASTM D 16 - Definitions of Terms Relating to Paint, Varnish, Lacquer, and Related Products.
 - 2. ASTM D 2016 - Test Method for Moisture Content of Wood.
 - 3. All applicable federal, state and municipal codes, laws and regulations for flammability and smoke generation of interior finishes.

1.5 DEFINITIONS

- A. "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.
- B. Sheen: Specular gloss readings in accordance with ASTM D52
 - 1. Flat: less than 5 (measured at 85 degrees)
 - 2. Eggshell: 5 – 20 (measured at 60 degrees)
 - 3. Satin: 15-35 (measured at 60 degrees)
 - 4. Low Luster: 25 – 35 (measured at 60 degrees)
 - 5. Semi-Gloss: 30 -65 (measured at 60 degrees)
 - 6. Gloss: 65 or more (measured at 60 degrees)

1.6 SUBMITTALS

- A. Submit the following under provisions of Section 01 33 24 – Electronic SUBMITTAL PROCEDURES:
 - 1. Literature:
 - 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. 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:
 - 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:
 - a. Flat Paints and Coatings: VOC not more than 50 g/L.
 - b. Non-Flat Paints and Coatings: VOC not more than 150 g/L.
 - c. Anti-Corrosive Coatings: VOC not more than 250 g/L.
 - d. Clear wood finishes:
 - 1) Varnishes: VOC not more than 350 g/L.
 - 2) Lacquer: VOC not more than 550 g/L
 - e. Floor coatings: VOC not more than 100 g/L
 - f. Sealers:
 - 1) Waterproofing sealers: VOC not more than 250 g/L.
 - 2) Sanding sealers: VOC not more than 275 g/L.
 - 3) All other sealers: VOC not more than 200 g/L.
 - g. Stains: VOC not more than 250 g/L.
 - 2. 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.
 - 3. 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).
 - 4. 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.
 - 5. Restricted Components: Paints used on this Project shall not contain any of the following:

- 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 45 00 - QUALITY CONTROL 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 coatings used for shop-primed items and items which have been prime-coated under the work of other trades.
- B. 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.
- C. 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.

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, 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".
- 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 C 834, paintable within 24 hours after application, with a minimum movement capability of ± 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".
 - c. DAP Inc., Baltimore MD., product "T.S.P. Substitute Heavy Duty Cleaner".

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 painters 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.
 - 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.

PAINTING

3.3 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.

3.4 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.

3.5 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.

3.6 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.
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 limeproof, when used in coatings to be applied on masonry, concrete, plaster, and gypsum board surfaces.

3.7 PAINTING SCHEDULE FOR INTERIOR SURFACES AND MATERIALS

- A. Interior CONCRETE MASONRY walls and partitions:
1. One coat block filler:
 - a. California: "Mason-Cote 100% Acrylic Latex Block Filler", N°. 3751.
 - b. Glidden Professional: Concrete Coatings Block Filler Interior/Exterior N°. 3010.
 - c. Moore: "Latex Block Filler" N°. M88
 - d. Pittsburgh: "Speedhide Interior Masonry Latex Block Filler", 6-7 Series
 - e. Sherwin-Williams: "ProMar Int. Ext Block Filler" B25-W25.
 2. Two coats semi-gloss paint:
 - a. California: "Fres-Coat 100% Acrylic Latex Semi-Gloss", N°. 563XX.
 - b. Glidden Professional: Ultra-Hide 250 Semi-Gloss No 1406.
 - c. Moore: "EcoSpec Interior Latex Semi-Gloss" N°. 224.
 - d. Pittsburgh: "Speedhide Interior Low Odor Latex Semi-Gloss Enamel", N°. UC 80023.
 - e. Sherwin-Williams: Harmony Interior Low Odor Latex Semi-Gloss B10 Series
- B. Interior GYPSUM BOARD (drywall) partitions and STAGE flooring:
1. One coat latex primer.
 - a. California: "Prime Touch Primer Sealer", N°s. 545.
 - b. Glidden Professional: PVA Wall Primer Sealer N°. 1030.
 - c. Moore: "Fresh Start All Purpose Primer", No. 046.
 - d. Pittsburgh: "Speedhide Interior Quick Drying Latex Sealer", 6-2 Series.
 - e. Sherwin-Williams: "ProMar 200 Zero VOC Interior Latex Primer", B28w2600 Series.
 2. Two coats latex flat paint:
 - a. California: "CalPro2000 Series Acrylic Flat", N°. 556.
 - b. Glidden Professional: Ultra-Hide 250 Flat N° 1200.

- c. Moore: "Waterborne Ceiling Paint", 508 Series.
 - d. Pittsburgh: "Speedhide Latex Interior Flat Wall Paint", 6-70 Series
 - e. Sherwin-Williams: "ProMar 200 Int. Latex Flat Wall Paint Series".
- C. Interior GYPSUM BOARD (drywall) partitions, and ceilings, at toilet rooms, janitor's closets, food preparation and dishwashing areas for VOC compliant epoxy finish:
- 1. One coat of sealer,
 - a. California: "Prime Choice ASAP Primer", N°. 50300.
 - b. Glidden Professional: Gripper Primer N°. 3210.
 - c. Moore: "SuperSpec Primer", N°. 253.
 - d. Pittsburgh: "Speedhide Interior Quick Drying Latex Sealer", 6-2 Series.
 - e. Sherwin-Williams: "ProMar 200 Zero VOC Interior Latex Primer", B28w2600 Series.
 - f. Tnemec: PVA 51-792 Sealer.
 - 2. Two coats of semi-gloss Water Based Acrylic-Epoxy Coatings (3 mils DFT each coat).
 - a. California: No equivalent.
 - b. Devoe Coatings: Tru-Glaze-WB" 4418 Waterborne Acrylic Epoxy Coating.
 - c. Moore: "Industrial Acrylic Epoxy Enamel", N°s. P43/P44.
 - d. Pittsburgh: "Pitt-Glaze Water Based Acrylic Epoxy Enamels", 16 Series.
 - e. Sherwin-Williams: "Water Based Catalyzed Epoxy" B70/B60V15 Series.
 - f. Tnemec: "Tneme-Tufcoat", N°. 112.
- D. Interior GYPSUM BOARD (drywall) ceilings and underside of soffits:
- 1. One coat latex primer.
 - a. California: "Elements 100% Acrylic White Primer", N°. 74600.
 - b. Glidden Professional: Lifemaster No VOC Primer N°. 9116.
 - c. Moore: "Fresh Start All Purpose Primer", No. 046.
 - d. Pittsburgh: "Pure Performance Interior Latex Primer", N°. 9-900.
 - e. Sherwin-Williams: "Harmony Interior Latex Primer", B11W900 Series.
 - 2. Two coats flat paint:
 - a. California: "Elements Zero VOC Flat 100% Acrylic", N°. 733.
 - b. Glidden Professional: Lifemaster No VOC Flat N°. 9100.
 - c. Moore: "Waterborne Ceiling Paint", 508 Series.
 - d. Pittsburgh: "Pure Performance, Flat", 9-100 Series.
 - e. Sherwin-Williams: "Harmony Low Odor Interior Latex Flat", B5 Series.
- E. Interior MDF, new, unfinished, to receive painted (opaque) finish:
- 1. One coat acrylic primer-sealer (undercoater):
 - a. Glidden: Wall and Woodwork Primer Sealer, N° 1020.
 - b. Moore: "Alkyd Enamel Underbody", N°. 217.
 - c. Pittsburgh: "Speedhide Alkyd Interior Quick-Drying Enamel Undercoater", 6-6 Series.

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- d. Sherwin-Williams: "PrepRite Classic Latex Primer", B28W200 Series.
- 2. Two coats acrylic semi-gloss enamel:
 - a. California: "Fres-Coat Unite Semi-Gloss", N°. 563.
 - b. Glidden Professional: Ultra Hide 150 Semi-Gloss N°. 1416.
 - c. Moore: "Superspec Latex Semi Gloss", 276 Series.
 - d. Pittsburgh: "Speedhide Interior Semi-Gloss", 6-500 Series.
 - e. Sherwin-Williams: "ProClassic Waterborne", B31W20 Series.
- F. Interior METAL, FERROUS, 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 surfaces:
 - 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 100% Acrylic", 90-709/712 Series
 - e. Sherwin-Williams: "DTM Acrylic Primer Finish", B66 W1 Series.
 - 2. Two coats latex semi-gloss enamel:
 - a. California: "Rust-Stop DTM Primer/Finish", N°. 1061.
 - b. Devoe Coatings: Devflex 4216HP High Performance Waterborne Acrylic Semi-Gloss Enamel.
 - c. Moore: "Super Spec HP DTM Semi-Gloss Enamel", N°. P29.
 - d. Pittsburgh: "Pitt-Tech Plus High Performance, Semi -Gloss DTM Industrial Enamel", 90-1210 Series.
 - e. Sherwin-Williams: "Sher-Cryl HPA Semi-Gloss", B66 Series.
- G. 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. Devoe Coatings: Tru-Glaze-WB" 4030 Waterborne Epoxy Primer
 - d. Moore: "Superspec HP Epoxy Metal Primer", P33 Series.
 - e. Pittsburgh: "PPG All Weather DTR" 97 Series @ 5 mils DFT, 18 Month Recoat
 - f. 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. Glidden Professional: Devthane 359H DTM High Build Gloss Enamel @ 4.0-6.0 mils DFT.
 - d. Moore: "Superspec HP Aliphatic Urethane", P74 Series.
 - e. Pittsburgh: "Pitt-Thane Ultra" 95-800 Series @ 4 mils DFT.

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- f. Sherwin-Williams: "Acrolon 218 HS Acrylic Polyurethane" @ 3.0-6.0 mils DFT.
 - H. Interior metal, galvanized, (includes exposed ductwork):
 - 1. Touch-up with metal 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 100% Acrylic", 90-709/712 Series.
 - e. 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. Devoe Coatings: Devflex 4216HP High Performance Waterborne Acrylic Semi-Gloss Enamel.
 - c. Moore: "Super Spec HP DTM Semi-Gloss Enamel", N°. P29.
 - d. Pittsburgh: "Pitt-Tech Plus High Performance, Semi -Gloss DTM Industrial Enamel", 90-1210 Series.
 - e. Sherwin-Williams: "Sher-Cryl HPA Semi-Gloss", B66 Series.
 - I. Interior exposed METAL, PIPING: Same as specified for ferrous metal.
- 3.8 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. 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. ICI Paints: "Prep & Prime Odor-Less Interior Water-Based Primer-Sealer" LM 9116.
 - b. Moore: "EcoSpec Interior Latex Primer Sealer" 231.
 - c. Pittsburgh: "Pure Performance Interior Latex Primer".
 - d. Sherwin-Williams: "Harmony Interior Latex Primer" B11W900.
 - 2. Two coats latex semi-gloss paint:
 - a. ICI Paints: "Lifemaster 2000 Interior Semi-gloss" LM9200.
 - b. Moore: "EcoSpec Interior Latex Semi-gloss" N°. 224.
 - c. Pittsburgh: "Pure Performance Interior Semi-gloss", 9-500 Series.
 - d. Sherwin-Williams: "Harmony Interior Latex Semi-gloss" B10 Series.
 - D. Interior water piping system ('non-potable water', and 'potable water'), Non-insulated, insulated and wrapped piping to receive field painted semi-gloss finish, including all concealed locations for recycled water.

1. General: Comply with Massachusetts Regulation 248 CMR 10.00 and Section 23 00 00 - PLUMBING.
 2. Paint types:
 - a. At non insulated conditions: Same as specified for ferrous metal.
 - b. At insulated conditions: Apply one prime coat and two finish coats of a paint recommended by the approved paint manufacturer for application on the exposed wrapping material.
 3. Colors and patterns:
 - a. Potable water: (including hot water, cold water and return piping) Paint 3 inch wide bands of 'Green' at intervals of not more than 10 feet and at all points where piping penetrate through walls, floors and roofs.
 - 1) Includes cold water piping, hot water piping and hot water return piping.
 - b. Non-potable water: Paint 3 inch wide bands of 'Green' at intervals of not more than 10 feet and at all points where piping penetrate through walls, floors and roofs.
- 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.
- G. In compliance with the 2015 International Building Code with Massachusetts Building Code, Ninth Edition amendments 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 at intervals not to exceed 30'-0" 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: 1 inch minimum.
 - e. Color: Easily identifiable color, contrasting with background, acceptable to Owner.
 2. Apply stenciled lettering to the following types of partitions using wording specified:
 - a. Applied identification for 4 hour fire rated partitions shall read: "4 HOUR FIRE WALL – PROTECT ALL OPENINGS"

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- b. Applied identification for 3 hour fire rated partitions shall read: “3 HOUR FIRE WALL - PROTECT ALL OPENINGS”.
- c. Applied identification for 2 hour fire rated partitions shall read: “2 HOUR FIRE WALL - PROTECT ALL OPENINGS”.
- d. Applied identification for 1 hour fire rated partitions shall read: “1 HOUR FIRE WALL - PROTECT ALL OPENINGS”.
- e. Applied identification for Smoke barriers shall read: “1 HOUR SMOKE BARRIER - PROTECT ALL OPENINGS”.

Applied identification for Smoke partitions shall read: “SMOKE BARRIER PARTITION - PROTECT ALL OPENINGS

End of Section

SECTION 23 04 00

GENERAL CONDITIONS FOR MECHANICAL TRADES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to all Divisions 23 Sections.
- B. This section applies to all sections of Division 23, "Mechanical" of this project specification unless specified otherwise in the individual sections.
- C. The Drawings of other trades shall be examined for coordination and familiarity of work with other Contractors. Any duplication or omission of provisions in this project should be brought to the attention of the Owners prior to Bidding.
- D. Project phasing and alternates shall be part of all division 23 sections and as the HVAC Prime contractor all sections of the specifications.

1.2 DESCRIPTION

- A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division. Where conflicts exist between the drawings and the specifications or between this section of the specifications and other sections, the more stringent or higher cost option shall apply.
- C. Coordination with owner's contractors shall include, but not be limited to, coordination with the hazardous abatement contractor for ACM removal, demolition, and new scope of work.

1.3 INTENT

- A. It is the intent of the Specifications and Drawings to call for finished work, tested and ready for operation. Provide all parts necessary for the intended use, fully complete and operational, and installed in professional manner in accordance with the design intent.
- B. Any apparatus, appliance, material or work not shown on drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and ready for operation as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.

- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the Owner and Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section includes the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.

1.4 DEFINITIONS

- A. No Exceptions Taken – reviewed and determined to be in general conformance with contract documents.
- B. “Approved equal” mean any product which in the opinion of the Engineer is equal in quality, arrangement, appearance, and performance to the product specified.
- C. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
- D. “Finished” refers to all rooms and areas to be specified to receive architectural treatment as indicated on the drawings. All rooms and areas not covered, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- E. “Furnish” or “supply” shall mean purchase, deliver to, and off-load at the job site, ready to be installed including where appropriate all necessary interim storage and protection.
- F. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- G. “Install” shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- H. “Product” shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
- I. “Provide” shall mean furnish (or supply) and install as necessary.
- J. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- K. Remove: The term “remove” means “to disconnect from its present position, remove from the premises and to dispose of in a legal manner.”

- L. Special Warranties: The term “Special Warranties” are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.
- M. Standard Product Warranties: The term “Standard Product Warranties” are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- N. “Subcontractor” means specifically the subcontractor working under this Division. Other Contractors are specifically designated “Plumbing Subcontractor”, “General Contractor” and so on. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.
- O. Substitutions: Requests for changes in products, materials, equipment, and methods of construction proposed by the Contractor are considered requests for "substitutions."
- P. “Wiring” shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.

1.5 CONTRACT DOCUMENTS

- A. The two dimensional drawings govern the construction. They show the design intent and are part of the Contract Documents. BIM models are not part of contract documents. They are developed for convenience only.
- B. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect. (Do not scale the drawings)
- C. Work under each Section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; where space conditions appear inadequate, Owner and Engineer shall be notified before proceeding with installations.

1.6 DISCREPANCIES IN DOCUMENTS

- A. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, shall be included in the Contract price. The Owner and Engineer shall decide on the item and the manner in which the work shall be installed.
- B. Where Drawings or Specifications conflict or are unclear, submit clarification request in writing before Award of Contract. Otherwise, Architect's interpretation of Contract Documents shall be final, and no additional compensation shall be permitted due to discrepancies or un-clarities thus resolved.
- C. Where Drawings or Specifications do not coincide with manufacturers' recommendations or with applicable codes and standards, submit clarification request in form of an RFI before installation. Otherwise, make changes in installed work required for compliance with manufacturer instructions or codes and standards within Contract Price.
- D. Where insufficient information exists in the documents to precisely describe a certain component or subsystem, or the routing of a component or its coordination with other

building elements, where notification required by Paragraph (B) above has not been submitted, provide the specific component or subsystem with all parts necessary for the intended use, fully complete and operational, and installed in professional manner either concealed or exposed in accordance with the design intent.

- E. Where discrepancies exist between the mechanical, plumbing, fire protection, and electrical drawings in regards to what trade owns disconnects or starters, the discrepancy shall be brought to the Architect's attention in accordance with paragraph (B) above. If the scope is not resolved prior to the Award of Contract, Division 26 shall provide such items.

1.7 CODES AND STANDARDS

- A. Wherever Codes and/or Standards are mentioned in these Specifications, the latest applicable edition or revision of the local building or life safety code shall be followed.

- B. The following Standards shall be used where referenced by the following abbreviations:

AABC	Associated Air Balance Council
ACGIH	American Conference of Governmental Industrial Hygienists
ADC	Air Diffusion Council
AIA	American Institute of Architects
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
ARI	Air Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Plumbing Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society of Testing and Materials
AWS	American Welding Society
AWWA	American Water Works Association
CSA	Canadian Standards Association
CISPI	Cast Iron Soil Pipe Institute
EJMA	Expansion Joint Manufacturing Association
EPA	Environmental Protection Agency
FM	Factory Mutual
FSSC	Federal Specification
HIS	Hydraulic Institute Standards

IEEE	Institute of Electrical and Electronics Engineers
IRI	Industrial Risk Insurers
ISO	Insurance Services Office
MCAA	Mechanical Contractors Association of America
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NOFI	National Oil Fuel Institute
NSC	National Safety Council
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Administration
PDI	Plumbing and Drainage Institute
SBI	Steel Boiler Industry (Division of Hydronics Institute)
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
UL	Underwriters' Laboratories

- C. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.
- D. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.

1.8 PERMITS AND FEES

- A. Permits and fees are waived. Reinspection of any failed inspections are paid by the contractor / subcontractor. The project is tax exempt, owner to provide tax number when project is awarded

1.9 EQUIPMENT EQUIVALENTS AND SUBSTITUTIONS

- A. Certain manufacturers of material, apparatus or appliances are indicated in the drawings and specifications for this project. These items have been used as the basis of design, and as a convenience in fixing the minimum standard of quality, finish and design that is required. If the Contractors uses an "approved equal" alternative to the basis of design, and if the features of that alternative have an impact on other components of the Project, the Contractor shall include the necessary adjustments in those components, whether for architectural, structural, mechanical, electrical, fire protection, or any other elements, plus any adjustments for difference in performance.

- B. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for Architect and Engineer review.
- C. Where the Contractor proposes to use an item that is different from the basis of design in the Drawings and specifications, and that will require the redesign of the structure, partitions, foundations, piping, wiring or any other component of the mechanical, electrical, or architectural layout, the Contractor shall provide the necessary redesign of those components.
- D. Where the Contractor proposes to deviate (provide an equivalent or request for substitution) from the basis of design scheduled equipment or materials as hereinafter specified or shown on the drawings, they are required to submit a requested for substitution in writing. The Contractor shall state in their request whether it is a substitution, equivalent or a non approved equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.
- E. If an alternative or substitute item results in a difference in quantity and arrangement of structure, piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall furnish and install any such additional equipment required by the system, at no additional cost to the Owner including any costs added to other trades due to the equivalent change from the basis of design detailed in the drawings or included within the specifications.
- F. Equipment, material or devices submitted for review as a "substitution" shall meet the following requirements:
- G. Substitution Request Submittal: Requests for substitution will be considered if received in writing 14 days before the bid date. Requests received later than 14 days before the bid date may be considered or rejected at the discretion of the Engineer/Owner. Once the Contractor submits a complete request for substitution as determined by the engineer, the engineer reserves the right to request the time necessary to evaluate the request for substitution and review it with the Owner.
- H. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - 1. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
 - 2. Samples, where applicable or requested.
 - 3. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
 - 4. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
 - 5. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.

6. Cost information, including a proposal of the net change, if any in the Contract Sum.
7. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
8. Engineer's Action: Within one week of receipt of the request for substitution, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance of a product substitution will be in the form of an Addendum.
9. Other Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.
 - a. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
 - b. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 - c. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

1.10 SUBMITTAL PROCEDURES

- A. Provide Submittals in accordance with the requirements of Division 1 and as indicated in the following.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
 1. Allow ten business days for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 2. If an intermediate submittal is necessary, process the same as the initial submittal.

3. Allow ten business days for reprocessing each submittal.
 4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block. Submittals shall be arranged in order of specification sections.
1. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number, title and paragraph of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- F. Except for submittals for record, information or similar purposes, the Engineer will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.
- G. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

1.11 SHOP DRAWINGS

- A. Submit neatly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review all shop drawings to be incorporated in the Mechanical Contract.
- C. Provide shop drawings for all devices specified under equipment specifications for all systems. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, dimensions, identification of products and materials included, compliance with

specified standards, notation of coordination requirements, notation of dimensions established by field measurement and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures), of all shop drawings, catalog cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.

- D. When a submittal could involve more than one trade, e.g., valves, piping, etc., the submitted shall be separated by traded involved, ie. HVAC, plumbing, fire protection, etc.
- E. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- F. “No Exception Taken” rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings. Review of shop drawings shall not apply to quantity of material.
- G. After shop drawings have been reviewed, with no exceptions taken, no further changes will be allowed without the written consent of the Engineer.
- H. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- I. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the Engineer in writing at least five (5) working days prior to Bidding to allow for issuance of an Addendum.
- J. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.
- K. All submittals shall be made in electronic PDF format with searchable OCR (Optical Character Recognition) format. This excludes scanned and faxed materials.

1.12 COORDINATION DRAWINGS AND BIM MODEL

- A. Coordination drawings are required for all mechanical and electrical trades. The content and procedures described in Division 01 shall be followed, with the additional requirements specifically for the mechanical and electrical trades as described in this Section. If a BIM model is not used on this project, the below requirements shall be accomplished in CAD.
- B. Prepare coordination drawings accordance with Division 1, at 1 to 1 (full) scale prepared at $\frac{1}{4}'' = 1' - 0''$ detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. The Contractor shall indicate the proposed locations of piping, conduit, ductwork, equipment, and materials. Include the following:

- a. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - b. Equipment connections and support details.
 - c. Exterior wall and foundation penetrations.
 - d. Fire-rated wall and floor penetrations.
 - e. Sizes and locations of required concrete pads and bases.
- C. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
- D. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
- E. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.
- F. The Contractor and each subcontractor shall sign and date each coordination drawing prior to submission.
- G. Work shall not be performed until coordination drawings have been approved by the architect and engineer.
- H. Electronic copies of the MEP floor plans and/or BIM model are available to use as a basis for preparing coordination drawings and can be provided by the Engineer. If the Contractor elects to obtain the Engineers electronic files an Electronic Drawing File Release Form must be submitted. This form must be signed by the Contractor, Owner, and Architect. Upon receipt of a signed copy of the Electronic Drawing File Release Form, the Engineer will provide copies of the electronic files for the Contractor's use. A copy of the Electronic Drawing File Release Form is appended to the end of this specification section
- I. Review by Engineer of coordination drawings is limited to confirming that requirements for coordination and preparation of plans have been complied with by the Contractor and shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, Electrical and other related work.

1.13 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.
- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork, HVAC piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.

- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.
- E. The two dimensional drawings are diagrammatic. They indicate general arrangements of mechanical systems and other work, and are intended to convey sufficient information for skilled contractors and tradespeople to furnish and install complete systems. They are not intended to be absolutely precise; they are not intended to specify or to show every offset, fitting, and component. The purpose of the drawings is to indicate a systems concept, the main components of the systems, and the approximate geometrical relationships. Based on the systems concept, the main components, and the approximate geometrical relationships, provide all other components and materials to make the systems fully complete, coordinated with other systems and the structure and space available, and operational. Similarly, the drawings 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 in order to avoid interferences and to meet ceiling heights and other Architectural requirements. Establish and provide offsets, changes in direction, and exact routings to coordinate all systems. Where conflicts or potential conflicts exist and engineering guidance is desired, submit a "Request for Information" (RFI).
- F. Controls contractor shall coordinate and sequences of operation with all other trades as necessary to provide a complete and functioning system.

1.14 QUALITY CONTROL

- A. Service Support: The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.
- B. Modification of References: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.
- C. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled tradespeople, fitters, metal workers, welders, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- D. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- E. All labor for installation of mechanical systems shall be performed by experienced, skilled tradespeople under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, professional manner. The Engineer reserves the right to reject any work which, in their

opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.15 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner.
- B. The Engineer and the Owner shall be notified in writing of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.16 TEMPORARY UTILITIES

- A. General: Provide new materials and equipment; if acceptable to the Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. First Aid Supplies: Comply with governing regulations.
- D. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
- E. Utilities: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.
 - 1. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Engineer, and will not be accepted as a basis of claims for a Change Order.
- F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.
- G. Termination and Removal: Unless the Engineer requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete

or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

1.17 EQUIPMENT ACCESS

- A. Appliances, controls devices, heat exchangers and HVAC system components that utilize energy shall be accessible for inspection, service, repair and replacement without disabling the function of a fire-resistance-rated assembly or removing permanent construction, other appliances, venting systems or any other piping or ducts not connected to the *appliance* being inspected, serviced, repaired or replaced. A level working space not less than 30 inches deep and 30 inches wide (762 mm by 762 mm) shall be provided in front of the control side to service an *appliance*.

1.18 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workpeople and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.
- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by tradespeople or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.19 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer, a factory-trained service representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service representative shall supervise the initial operation of the equipment and instruct personnel responsible for operation and maintenance of the equipment. The service representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer.

1.20 CLEANING

- A. The Contractor shall thoroughly clean and flush all piping, ducts and equipment of all foreign substances, oils, burrs, solder, flux, etc., inside and out before being placed in operation.
- B. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.
- C. During the course of construction, all ducts and pipes shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- D. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work. Any oil or grease stains on floor areas caused by the Contractor shall be removed and floor areas left clean.
- E. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - 3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
 - 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
- F. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove and dispose of ALL waste materials, packaging material, skids etc. from the site and dispose of in a lawful manner in accordance with municipal, state and federal regulations.
- G. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

1.21 OPERATING AND MAINTENANCE

- A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, the contractor shall fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least seven (7) days notice to the Owner and the Engineer in advance of this period.

- B. The Contractor shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- C. The Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- D. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. The following equipment will require this inspection: pumps; air conditioning equipment, controls, air handling equipment, compressors, boilers etc. These letters shall be bound into the operating and maintenance books.
- E. Refer to individual trade Sections for any other particular requirements related to operating instructions.
- F. Demonstration shall be recorded on USB Flash drive turned over to the Owner. Video recording shall be done in a professional manner with quality video (1080p resolution) and clear audible sound.

1.22 OPERATING AND MAINTENANCE MANUALS

- A. Prepare operating and maintenance manuals in accordance with the requirements of Division 1 and as follows. The Contractor shall prepare up to six (6) copies of a complete maintenance and operating instructions manual, bound in booklet form. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty 3-ring vinyl-covered binders, with pocket folders for folded sheet information and designation partitions with identification tabs. Mark appropriate identification on front and spine of each binder.
- B. Manual shall include the following:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing and operating instructions including lubrication charts and schedules.
 - 5. Emergency and safety instructions.
 - 6. Spare parts list.
 - 7. Copies of warranties.
 - 8. Wiring diagrams.
 - 9. Recommended "turn around" cycles.
 - 10. Inspection procedures.
 - 11. Approved Shop Drawings and Product Data.
 - 12. Equipment Start-up Reports.
 - 13. Temperature control diagrams and written sequences of operations.
 - 14. Balance reports.
- C. Include in the manual, a tabulated equipment schedule for all equipment. Schedule shall include pertinent data such as: make, model number, serial number, voltage, normal

operating current, belt size, filter quantities and sizes, bearing number, etc. Schedule shall include maintenance to be done and frequency.

- D. Maintenance and instruction manuals shall be submitted to the Owner at the same time as the seven (7) day notice is given prior to the instruction period.

1.23 ACCEPTANCES

- A. The equipment, materials, quality, design and arrangement of all work installed under the Mechanical Sections shall be subject to the review of the Engineer.
- B. Within 30 days after the awarding of a Contract, the Mechanical Contractor shall submit to the Engineer, for review, a list of manufacturers of equipment proposed for the work under the Mechanical Sections. The intent to use the exact manufacturers and models specified does not relieve the Contractor of the responsibility of submitting such a list.
- C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the Owner and Engineer, in writing, within 30 days of award of the Contract. In such instances, equipment substitutions may be made pending acceptance by the Engineer or the Owner's representative.
- D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Mechanical Contractor shall verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.
- E. If material or equipment is installed before it is reviewed and/or approved, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.
- F. Failure on the part of the Engineer to reject shop drawings or to reject work in progress shall not be interpreted as acceptance of work not in conformance with the Drawings and/or Specifications. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.24 RECORD DRAWINGS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately. Give particular attention to concealed elements that would be difficult to measure and record at a later date. Items to be indicated include but are not limited to:
 - 1. Dimensional change
 - 2. Revision to drawing detail
 - 3. Location and depth of underground utility

4. Revision to pipe routing
 5. Revision to electrical circuitry
 6. Actual equipment location
 7. Duct size and routing
 8. Location of concealed internal utility
 9. Changes made by Change Order
 10. Details not on original Contract Drawing
 11. Information on concealed elements which would be difficult to identify or measure later
- C. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
- D. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
- E. Note related Change Order numbers where applicable.
- F. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.
- G. Final record documents shall be prepared in the latest electronic version and on USB Flash drive of all drawings and a clean set of reproducible paper copies shall be turned over to the Owner at the completion of the work.

1.25 WARRANTIES AND BONDS

- A. The following general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties are to be included:
1. General close-out requirements included in Division 1.
 2. Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions-2 through -50.
 3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the 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 Contractor.
- C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

1.26 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement.

The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.
- H. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.
- I. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.
 - 1. Refer to individual Sections of Divisions-2 through -50 for specific content requirements, and particular requirements for submittal of special warranties.
- J. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- K. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.27 GUARANTEES

- A. The Contractor shall guarantee all material and installation quality under these Specifications and the Contract for a period of two (2) year from the date of final acceptance by Owner. During this guarantee period, all defects developing through faulty equipment, materials or installation quality shall be corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineer's satisfaction.
- B. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided.

1.28 PROJECT CLOSE-OUT

- A. Submit specific warranties, quality bonds, maintenance agreements, final certifications and similar documents in accordance with Division 1.
- B. Deliver tools, spare parts, extra stock, and similar items.
- C. Complete start-up testing of systems, including measuring and documenting all required startup checklist requirements documented in installation and maintenance instructions by the equipment manufacturer, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- D. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- E. Field Observation Procedures: On receipt of a request for an Engineers Field Observation, the Engineer will advise the Contractor of unfulfilled requirements. The Engineer will advise the Contractor of construction that must be completed or corrected before the certificate will be issued. Contractor shall submit written response to each corrective item including specific photos prior to final Engineering inspection.
 1. The Engineer will repeat the Field Observation when requested and assured that the Work has been substantially completed.
 2. Results of the completed list of unfulfilled items will form the basis of requirements for final acceptance.

END OF SECTION

Electronic Drawing File Release Form

DELIVERY OF FILES FOR: _____
Project Name

In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Design Professional, the Client covenants and agrees that all such drawings and data are instruments of service of the Design Professional, who shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

The Client further agrees not to use these drawings and data, in whole or in part, for any purpose or project other than the project which is the subject of this Agreement. The Client agrees to waive all claims against the Design Professional resulting in any way from any unauthorized changes or reuse of the drawings and data for any other project by anyone other than the Design Professional.

In addition, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Design Professional harmless from any damage, liability or cost, including reasonable attorneys' fees and costs of defense, arising from any changes made by anyone other than the Design Professional or from any reuse of the drawings and data without the prior written consent of the Design Professional.

Under no circumstances shall transfer of the drawings and other instruments of service on electronic media for use by the Client be deemed a sale by the Design Professional, and the Design Professional makes no warranties, either express or implied, of merchantability and fitness for any particular purpose.

Client's Signature

Date

Company - Title

Architects' Signature

Date

Firm - Title

Owner's Signature

Date

Company - Title

SECTION 23 05 23

GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Applications.
- B. General requirements.
- C. Angle valves.
- D. Ball valves.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. Section 23 04 00 – General Conditions for Mechanical Trades

1.3 ABBREVIATIONS AND ACRONYMS

- A. CWP: Cold working pressure.
- B. SWP: Steam Working Pressure
- C. EPDM: Ethylene propylene copolymer rubber.
- D. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- E. NRS: Nonrising stem.
- F. OS&Y: Outside screw and yoke.
- G. PTFE: Polytetrafluoroethylene.
- H. RS: Rising stem.
- I. TFE: Tetrafluoroethylene.

1.4 REFERENCE STANDARDS (follow the most currently adopted amended version)

- A. API STD 594 - Check Valves: Flanged, Lug Wafer, and Butt-Welding.
- B. ASME B1.20.1 - Pipe Threads, General Purpose (Inch).
- C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250;.
- D. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard.

- E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves.
- F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- G. ASME B16.34 - Valves - Flanged, Threaded and Welding End.
- H. ASME B31.1 - Power Piping.
- I. ASME B31.9 - Building Services Piping.
- J. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Qualifications.
- K. ASTM A48/A48M - Standard Specification for Gray Iron Castings.
- L. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- M. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service.
- N. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures.
- O. ASTM A536 - Standard Specification for Ductile Iron Castings.
- P. ASTM A582/A582M - Standard Specification for Free-Machining Stainless Steel Bars;.
- Q. ASTM B61 - Standard Specification for Steam or Valve Bronze Castings.
- R. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings.
- S. AWWA C606 - Grooved and Shouldered Joints.
- T. MSS SP-45 - Bypass and Drain Connections.
- U. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service.
- V. MSS SP-78 - Cast Iron Plug Valves, Flanged and Threaded Ends.
- W. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves.
- X. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
- Y. MSS SP-108 - Resilient-Seated Cast Iron Eccentric Plug Valves.
- Z. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.5 SUBMITTALS

- A. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- C. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.

1.6 QUALITY ASSURANCE

- A. Manufacturer:
 - 1. Obtain valves for each valve type from single manufacturer.
 - 2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Welding Materials and Procedures: Conform to ASME BPVC-IX.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
 - 2. Protect valve parts exposed to piped medium against rust and corrosion.
 - 3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
 - 4. Adjust angle valves to the closed position to avoid clattering.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection and protect flanges and specialties from dirt.
 - a. Provide temporary inlet and outlet caps.
 - b. Maintain caps in place until installation.
 - 2. Store valves in shipping containers and maintain in place until installation.
 - a. Store valves indoors in dry environment.
 - b. Store valves off the ground in watertight enclosures when indoor storage is not an option.
- C. Exercise the following precautions for handling:
 - 1. Handle large valves with sling, modified to avoid damage to exposed parts.
 - 2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.1 GENERAL

- A. See Drawings for specific valve locations.
- B. Refer to Part 3 for applications.

- C. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

2.2 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Gear Actuator: Quarter-turn valves 8 NPS and larger.
 - 2. Handwheel: Valves other than quarter-turn types.
 - 3. Hand Lever: Quarter-turn valves 6 NPS and smaller except plug valves.
 - 4. Wrench: Plug valves with square heads.
- D. Valves in Insulated Piping: Provide 2 inch stem extensions and the following features:
 - 1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
 - 3. Pipe Flanges and Flanged Fittings 1/2 NPS through 24 NPS: ASME B16.5.
 - 4. Solder Joint Connections: ASME B16.18.
 - 5. Grooved End Connections: AWWA C606.
 - 6. Press End Connection: ASME B31 / ASTM F3226
- F. General ASME Compliance:
 - 1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
 - 2. Power Piping Valves: ASME B31.1.
 - 3. Building Services Piping Valves: ASME B31.9.
- G. Bronze Valves:
 - 1. Fabricate from dezincification resistant material.
 - 2. Copper alloys containing more than 15 percent zinc are not permitted.
- H. Valve Bypass and Drain Connections: MSS SP-45.
- I. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRONZE ANGLE VALVES

- A. Two Piece, Full Port, Standard Angle Valves nickel plated finish:
 - 1. Manufacturers:
 - a. Runtal or equal

2.4 BRONZE BALL VALVES

- A. Two Piece, Full Port, Bronze Ball Valves with Stainless-Steel Trim:
 - 1. Comply with MSS SP-110.

2. SWP Rating: 150 psig.
 3. CWP Rating: 600 psig.
 4. Body: Bronze.
 5. Ends: Sweat, Press, Threaded.
 6. Seats: PTFE.
 7. Stem: Bronze, brass or stainless steel
 8. Ball: Chrome plated brass or stainless steel, vented
 9. Manufacturers:
 - a. Apollo
 - b. Nibco
 - c. Watts
 - d. Bray International
- B. Three Piece, Full Port with Stainless Steel Trim:
1. Comply with MSS SP-110.
 2. SWP Rating: 150 psig.
 3. CWP Rating: 600 psig.
 4. Body: Bronze.
 5. Ends: Sweat, Press, Threaded.
 6. Seats: PTFE.
 7. Stem: Stainless steel.
 8. Ball: Stainless steel, vented.
 9. Manufacturers:
 - a. Apollo
 - b. Nibco
 - c. Watts
 - d. Bray International

PART 3 EXECUTION

3.1 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.2 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 VALVE APPLICATION

- A. Valves on hot water shall be as shown in the following tables. If valve applications are not indicated, use the following:
 1. Shutoff Service: Ball valve

2. Throttling Service: Globe or butterfly valves.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- C. Select valves with end connections as indicated in the tables. For applications not listed in the tables select valves, except wafer types, with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
 2. For Steel Piping, NPS 2 and Smaller: Threaded ends.
 3. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends.
 4. For Steel Piping, NPS 5 and Larger: Flanged ends.

HOT WATER SERVICE					
Maximum 250°F and 400 psig (1/2"-12")/250 psig (14"-24")					
Specialty	Application	Type	Size (inches)	Body/Seat, Body/Trim	Minimum Rating ^{1,2}
Ball Valve	Isolation (with locking handle) and Modulation	Full Port 3-pc.	1/2 - 2	Bronze/Teflon	Do not use
		Full Port 2 pc.	1/2 - 2	Bronze/Teflon	600 psig WOG
These are minimum ratings for ASTM A126, Class B and ASTM B-61 and 62. For higher pressures and temperatures, adjust these values to include static head plus 1.1 times pressure relief valve setting plus pump shutoff head pressure. For actual maximum allowable valve and strainer ratings, refer to "Pressure-Temperature Ratings - Non Shock" tables and "Adjusted Pressure Ratings" for copper tube, soldered end valves [and strainers]. SWP=Steam Working Pressure CWP=Cold Water Working Pressure WSP=Working Steam Pressure WOG=Water, Oil or Gas Class=ANSI Standard Use 1/8 inch dia for plate heat exchanger application. Coordinate connection type with piping system.					

3.4 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
- C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.
- D. Install check valves where necessary to maintain direction of flow as follows:
 1. Lift Check: Install with stem plumb and vertical.
 2. Swing Check: Install horizontal maintaining hinge pin level.

3. Orient plate-type, center-guided into horizontal or vertical position, between flanges.

END OF SECTION

SECTION 23 05 29

HANGERS AND SUPPORTS FOR HVAC PIPING, DUCTWORK AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe hangers and supports.
- B. Hanger rods.
- C. Formed steel channel.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.1 - Power Piping.
 - 2. ASME B31.5 - Refrigeration Piping.
 - 3. ASME B31.9 - Building Services Piping.
- B. ASTM International:
 - 1. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E814 - Standard Test Method for Fire Tests of Through Penetration Fire Stops.
 - 3. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 4. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.
- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.
- D. FM Global:
 - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- F. Intertek Testing Services (Warnock Hersey Listed):

1. WH - Certification Listings.

1.4 PERFORMANCE REQUIREMENTS

- A. Hangers and supports for mechanical ductwork, piping, and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

- A. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
- B. Manufacturer's Installation Instructions:
 - 1. Hangers and Supports: Submit special procedures and assembly of components.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum 3 years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Furnish five year manufacturer warranty for pipe hangers and supports.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. B-Line Systems, Inc.
 - 2. National Pipe Hanger Corporation
 - 3. Empire Industries, Inc.
 - 4. Globe Pipe Hanger Products Inc.
 - 5. Michigan Hanger Co.
 - 6. PHD Manufacturing, Inc.
- C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.
- D. Nonmetallic Coatings: Plastic coating, jacket, or liner.
- E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 FASTENER SYSTEMS

- A. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated or stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Manufacturers:
 - 1. B-Line Systems, Inc.; a division of Cooper Industries.
 - 2. Empire Industries, Inc.
 - 3. Hilti, Inc.
 - 4. ITW Ramset/Red Head.
 - 5. MKT Fastening, LLC.
 - 6. Powers Fasteners.

2.4 MISCELLANEOUS MATERIALS

- A. Hanger Rods: Mild steel threaded both ends, threaded on one end, or continuous threaded.

PART 3 EXECUTION

3.1 PIPE HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger and support requirements are specified in other Division 23 Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use padded hangers for piping that is subject to scratching.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system specific sections, install the following types:
 - 1. MSS Type 1 - Adjustable, Steel Clevis Hangers: For suspension of non-insulated or insulated stationary pipes, 2 inch to 30 inch size.
 - 2. MSS Type 2 - Yoke-Type Pipe Clamps: For suspension of 120 to 450 deg F pipes, 4 inch to 16 inch size, requiring up to 4 inches of insulation.
 - 3. MSS Type 3 - Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps: For suspension of pipes, 3/4 inch to 24 inch size, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. MSS Type 4 - Steel Pipe Clamps: For suspension of cold and hot pipes, 1/2 inch to 24 inch size, if little or no insulation is required.
 - 5. MSS Type 5 - Pipe Hangers: For suspension of pipes, 1/2 inch to 4 inch size, to allow off-center closure for hanger installation before pipe erection.
 - 6. MSS Type 12 - Extension Hinged or 2-Bolt Split Pipe Clamps: For suspension of non-insulated stationary pipes, 3/8 inch to 3 inch size.
 - 7. MSS Type 24 - U-Bolts: For support of heavy pipes, 1/2 inch to 30 inch.
 - 8. MSS Type 26 - Clips: For support of insulated pipes not subject to expansion or contraction.
 - 9. MSS Type 36 - Pipe Saddle Supports: For support of pipes, 4 inch to 36 inch size, with steel pipe base stanchion support and cast-iron floor flange.
 - 10. MSS Type 37 - Pipe Stanchion Saddles: For support of pipes, 4 inch to 36 inch size, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 - 11. MSS Type 38 - Adjustable, Pipe Saddle Supports: For stanchion-type support for pipes, 2-1/2 inch to 36 inch size, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
 - 12. MSS Type 41 - Single Pipe Rolls: For suspension of pipes, 1 inch to 30 inch size, from 2 rods if longitudinal movement caused by expansion and contraction might occur.
 - 13. MSS Type 43 - Adjustable Roller Hangers: For suspension of pipes, 2-1/2 inch to 20 inch size, from single rod if horizontal movement caused by expansion and contraction might occur.

14. MSS Type 44 - Complete Pipe Rolls: For support of pipes, 2 inch to 42 inch size, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 15. MSS Type 45 - Pipe Roll and Plate Units: For support of pipes, 2 inch to 24 inch, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 16. MSS Type 46 - Adjustable Pipe Roll and Base Units: For support of pipes, 2 inch to 30 inch size, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. MSS Type 13 - Steel Turnbuckles: For adjustment up to 6 inches for heavy loads.
 2. MSS Type 14 - Steel Clevises: For 120 to 450 deg F piping installations.
 3. MSS Type 15 - Swivel Turnbuckles: For use with MSS Type 11, split pipe rings.
 4. MSS Type 16 - Malleable-Iron Sockets: For attaching hanger rods to various types of building attachments.
 5. MSS Type 17 - Steel Weldless Eye Nuts: For 120 to 450 deg F piping installations.
- H. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. MSS Type 39 - Steel Pipe-Covering Protection Saddles: To fill interior voids with insulation that matches adjoining insulation.
 2. MSS Type 40 - Protection Shields: Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

3.2 PIPE HANGER AND SUPPORT INSTALLATION

- A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- C. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- D. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

- F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.
- G. Insulated Piping: Comply with the following:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 5. Pipes NPS 8 and Larger: Include wood inserts.
 6. Insert Material: Length at least as long as protective shield.
 7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
- H. Design hangers for pipe movement without disengagement of supported pipe.
- I. Provide clearance in hangers and from structure and other equipment for installation of insulation. Refer to Section 23 07 00 Provide supplemental angles, channels and formed steel supports to support piping, ductwork, equipment, etc. from building's structure. Piping, ductwork, equipment, etc. shall not be supported from the roof deck.

3.3 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.4 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4
10	18	22	3/4	7/8
12	19	23	3/4	7/8
14	22	25	7/8	1
16	23	27	7/8	1
18	25	28	1	1
20	27	30	1	1-1/4
24	28	32	1-1/4	1-1/4

END OF SECTION

SECTION 23 07 00

HVAC INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. HVAC piping insulation, jackets and accessories.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. Division 07 – Firestopping
- C. Division 09 - Finishes
- D. Section 23 2113 – Hydronic Piping

1.3 REFERENCES STANDARDS (follow the most currently adopted amended version)

- A. ASTM International:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 2. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
 - 3. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - 4. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
 - 5. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
 - 6. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
 - 7. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
 - 8. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

1.4 SUBMITTALS

- A. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- B. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.
- C. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

- A. Test pipe insulation for maximum flame spread index of 25 and maximum smoke developed index of not exceeding 50 in accordance with ASTM E84.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Factory fabricated fitting covers manufactured in accordance with ASTM C450.
- D. Duct insulation, Coverings, and Linings: Maximum 25/50 flame spread/smoke developed index, when tested in accordance with ASTM E84, using specimen procedures and mounting procedures of ASTM E 2231.
- E. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- F. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping. Store all insulation materials in a clean, dry environment.

1.7 FIELD CONDITIONS

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

2.2 MANUFACTURER

- A. Manufacturers for Flexible Glass Fiber (FGF), Pre-Molded Glass Fiber (PGF) and Rigid Glass Fiber (RGF) Insulation Products:
 - 1. Knauf Insulation
 - 2. Johns Manville Corporation
 - 3. Owens-Corning.
 - 4. Substitutions: Division 01.

- B. Manufacturers for Closed Cell Elastomeric (CCE) Insulation Products:
 - 1. Aeroflex. USA, Inc.
 - 2. Armacell, LLC (Interior- ArmaFlex, Exterior- ArmaTuff)
 - 3. K-Flex USA LLC
 - 4. Substitutions: Division 01.

2.3 PIPE INSULATION

- A. Pre-Molded Glass Fiber (PGF) Insulation:
 - 1. ASTM C547 and ASTM C795, rigid molded, noncombustible.
 - 2. 'K' ('Ksi') Value: ASTM C177, 0.24 at 75°F.
 - 3. Maximum Service Temperature: 850°F.
 - 4. Maximum Moisture Absorption: 0.2 percent by volume.
 - 5. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; self-sealing lap, moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches (ASJ-SSL).

- B. Closed Cell Elastomeric (CCE) Insulation:
 - 1. Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 3; use molded tubular material wherever possible.
 - 2. Minimum Service Temperature: Minus 40°F.
 - 3. Maximum Service Temperature: 220°F.
 - 4. Connection: Waterproof vapor barrier adhesive.

2.4 PIPE INSULATION JACKETS

- A. Polyvinyl-chloride (PVC): Plastic Pipe Jacket.
 - 1. Product Description: ASTM D1785, One piece molded type fitting covers and sheet material, off-white color.
 - 2. Thickness: 10 mil.
 - 3. Connections: Brush on welding adhesive.

- B. Aluminum (ALM): Self-Adhesive Waterproofing Jacket. Minimum 12 mil thick, vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; UV resistant, zero permeability with textured aluminum-foil facing, impact and tear resistant.

2.5 PIPE INSULATION ACCESSORIES

- A. Vapor Retarder Lap Adhesive: Compatible with insulation.

- B. Covering Adhesive Mastic: Compatible with insulation.

- C. Piping 1-1/2 inches diameter and smaller: Galvanized steel insulation protection shield. MSS SP-69, Type 40. Length: Based on pipe size and insulation thickness.
- D. Piping 2 inches diameter and larger: hydrous calcium silicate. Inserts length: not less than 6 inches long, matching thickness and contour of adjoining insulation.
- E. Closed Cell Elastomeric Insulation Pipe Hanger: Polyurethane insert with aluminum single piece construction with self-adhesive closure. Thickness to match pipe insulation.
- F. Valve insulation Wraps: White, noncombustible, conforming to ASTM E 84. Match insulation thickness to pipe size. Valve covers shall be easily removable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Protect insulation from exposure to moisture prior to and after installation. All insulation other than flexible elastomeric that becomes wet shall be replaced at no cost to the project.
- B. Verify piping surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - PIPING SYSTEMS

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Piping Exposed to View in Finished Spaces Provide with PVC Plastic pipe jacketing for additional protection. Locate insulation and cover seams in least visible locations.
- D. Piping Systems Conveying Fluids Below Ambient Temperature:
 - 1. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
 - 2. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 - 3. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor retarder adhesive or PVC fitting covers.
- E. For all hot piping conveying fluids, insulate flanges and unions at equipment.
- F. Glass fiber insulated pipes conveying fluids above ambient temperature.
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- G. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.
 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 3. Insert location: Between support shield and piping and under the finish jacket.
 4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- H. Insulation Terminating Points:
1. Condensate Piping: Insulate entire piping system and components to prevent condensation.
 2. Coil Branch Piping 1 inch and Smaller: Terminate hot water piping at union upstream of the coil control valve.
- I. Closed Cell Elastomeric Insulation:
1. Push insulation on to piping.
 2. Miter joints at elbows.
 3. Seal seams and butt joints with manufacturer's recommended adhesive.
 4. When application requires multiple layers, apply with joints staggered.
 5. Insulate fittings and valves with insulation of like material and thickness as adjacent pipe.
- J. Closed Cell Elastomeric Insulation Pipe Hanger:
1. Install insulated pipe hangers at support locations.
 2. Pipe clamps to be installed over insulation not directly to piping.

3.3 INSTALLATION - EQUIPMENT

- A. Factory Insulated Equipment: Do not insulate.
- B. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor retarder cement.
- C. Equipment Containing Fluids Below Ambient Temperature:
1. Insulate entire equipment surfaces.
 2. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.
 3. Furnish factory-applied or field-applied vapor retarder jackets. Secure factory-applied jackets with pressure sensitive adhesive self-sealing longitudinal laps and butt strips. Secure field-applied jackets with outward clinch expanding staples and seal staple penetrations with vapor retarder mastic.
 4. Finish insulation at supports, protrusions, and interruptions.
- D. Equipment Containing all Fluids Above Ambient Temperature:
1. Insulate flanges and unions with removable sections and jackets.
 2. Install insulation with factory-applied or field applied jackets, with or without vapor barrier. Finish with glass cloth and adhesive.
 3. Finish insulation at supports, protrusions, and interruptions.
- E. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation for easy removal and replacement without damage.

3.4 PIPE INSULATION SCHEDULE

- A. Provide insulation materials and thicknesses scheduled for each system type and pressure/temperature range. If more than one material is listed for a system, selection from materials listed is Division 23 option.
- B. Insulation for pre-insulated piping shall meet all specified requirements.

Cooling Coil Condensate Piping					
Insulation Type	Pipe Size (inch)	Indoor - Minimum Thickness (inch)	Outdoor - Minimum Thickness (inch)	Factory Applied Jacket	Field Applied Jacket
Closed Cell Elastomeric (CCE)	All Sizes	0.75	2.0	N/A	Indoor (CCE): N/A

Heating Hot Water Systems					
Insulation Type	Pipe Size (inch)	Indoor - Minimum Thickness (inch)	Outdoor - Minimum Thickness (inch)	Factory Applied Jacket	Field Applied Jacket
Pre-Molded Glass Fiber (PGF)	Less than 1 to 1.5	1.5	3.0	ASJ-SSL	Indoor: PVC for exposed piping finished space and mechanical rooms. Outdoor: ALM
	1.5 and Larger	2.0	4.0		

END OF SECTION

SECTION 23 21 13

HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Heating water piping.
- B. Coil condensate drain piping
- C. Pipe Concealment

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
 - 2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - 3. ASME B31.9 - Building Services Piping.
 - 4. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.
- B. ASTM International:
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
 - 3. ASTM B32 - Standard Specification for Solder Metal.
 - 4. ASTM B75 – Standard Specification for Seamless Copper Tube.
 - 5. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
 - 6. ASTM B584 - Standard Specification for Copper Alloy Sand Castings for General Applications.
 - 7. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- C. American Welding Society:
 - 1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
 - 2. AWS D1.1 - Structural Welding Code - Steel.

1.4 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, provide compatible system components and joints. Use non-conducting dielectric connections whenever jointing

dissimilar metals in open systems. Provide escutcheons at exposed pipe penetrations of ceilings and walls, and as indicated on drawings.

- B. Provide flanges, union, and couplings at locations requiring servicing. Use unions, flanges, and Grooved coupling couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.

1.5 SUBMITTALS

- A. Shop Drawings: Indicate layout of piping system, including equipment, critical dimensions, and sizes.
 - 1. Grooved joint couplings and fittings shall be shown on drawings and product submittals, and be specifically identified with the applicable Grooved coupling style or series number.
- B. Product Data:
 - 1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
- C. Test Reports: Indicate results of piping system pressure test.
- D. Welders' Certificates.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves equipment and accessories.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with ASME B31.9 code for installation of piping systems and ASME Section IX for welding materials and procedures.
- B. Perform Work in accordance with applicable authority for welding hanger and support attachments to building structure.
- C. To assure uniformity and compatibility of piping components in grooved piping systems, all grooved products utilized shall be supplied by a single manufacturer. Grooving tools shall be supplied by the same manufacturer as the grooved components.

1.8 QUALIFICATIONS

- A. Fabricator or Installer: Company specializing in performing Work of this section with minimum three years documented experience.
- B. Installers of Pressure-Sealed Joints: Installers shall be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A53/A53M., black steel with plain ends; welded and seamless, Grade B.
 - 1. Fittings: ASME B16.3, malleable iron or ASTM A234/A234M, forged steel welding type.
 - 2. Joints: Threaded for pipe 2 inch and smaller; welded for pipe 2-1/2 inches and larger.
 - 3. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- B. Steel Pipe, grooved joints: ASTM A53/A53M, black steel with grooved ends.
 - 1. Fittings: ASTM A536 ductile iron, or ASTM A53 forged steel or fabricated from carbon steel pipe, grooved ends designed to accept Grooved coupling standard or AGS "W" series couplings.
 - 2. Joints: Grooved mechanical couplings meeting ASTM F1476.
 - a. Housing Clamps: STM A536 ductile iron, enamel coated, compatible with steel piping sizes, rigid or flexible type.
 - 1) Rigid Type: 2 inch through 12 inch: "Installation ready" rigid coupling with offsetting, angle pattern bolt pads designed for direct 'stab' installation onto grooved end pipe without prior disassembly of the coupling, no torque requirement and Grade "EHP" EPDM gasket.
 - 2) Rigid Type: 14 inch through 24 inch: AGS grooves, wide housing key with flat bolt pads. Grade "E" EPDM FlushSeal® gasket.
 - 3) Flexible Type: 2 inch through 24" inch: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors for vibration isolation at equipment connections. Three (3) couplings, for each connector, shall be placed in close proximity to the source of vibration.
 - b. Grade "E" EPDM Gasket: Elastomer composition for operating temperature range from -30 degrees F to 230 degrees F.
 - c. Grade "EHP" EPDM Gasket: Elastomer composition for operating temperature range from -30 degrees F to 250 degrees F
 - d. Accessories: Steel bolts, nuts, and washers.

2.2 COPPER PIPE AND FITTINGS

- A. Drawn-Temper Copper Tubing, solder joints: ASTM B88, Type K, L, or M as specified in part 3 for application.
 - 1. Fittings:
 - a. ASME B16.22, solder wrought copper.
 - 2. Prohibited Tee Connections: Mechanically extracted collars with notched and dimpled branch tube (T-Drill) fittings are prohibited.
 - 3. Joints: Solder, lead free, ASTM B32, 95-5 tin-antimony, or tin and silver, with melting range 430 to 535 degrees F.
- B. Drawn-Temper Copper Tubing, press-seal joints: ASTM B88, Type L or M as specified in section 3 for application.
 - 1. Press Fittings: IAPMO PS 117, ANSI LC1002, NSF61-G
 - 2. Housing: Copper.
 - 3. O-Rings and Pipe Stops: EPDM.
 - 4. Tools: Manufacturer's special tools.
 - 5. Minimum 200-psig working-pressure rating at 250 deg F.

2.3 UNIONS AND FLANGES

- A. Unions for Pipe 2 inches and Smaller:
 - 1. Ferrous Piping: Class 150 malleable iron, threaded.
 - 2. Copper Piping: Class 150, bronze unions with soldered.
 - 3. Dielectric Connections:
 - a. Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.
 - b. Waterway fitting with zinc electroplated steel or ductile iron body, male thread, grooved, or plain end, water impervious isolation barrier.
- B. Flanges for Pipe 2-1/2 inches and Larger:
 - 1. Ferrous Piping:
 - a. Class 150 forged steel, slip-on flanges.
 - b. Grooved joint flange adapter, flat face, for direct connection to ANSI Class 125 and 150 flanges. For direct connection to ANSI Class 300 flanges
 - c. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
 - 2. Copper Piping:
 - a. Class 150, slip-on bronze flanges.
 - b. Grooved joint flange adapter, flat face, for direct connection to ANSI Class 125 and 150 flanges.
 - 3. Gaskets: 1/16 inch thick preformed neoprene gaskets.

2.4 PIPE CONCEALMENT

- A. Manufacturers
 - 1. Panduit or equal.
- B. PVC flush cover wiring duct and cover for condensate drain piping concealment shall be 3" x 3", white color.

PART 3 EXECUTION

3.1 PIPING APPLICATIONS

- A. Hot-water heating piping aboveground, 2-inch and smaller, shall be the following:
 - 1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 - 2. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and press-seal joints [where exposed and where installed above accessible ceilings only].
- B. Hot-water heating piping aboveground, 2-1/2 inch and larger shall be any of the following:
 - 1. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and soldered joints.
 - 2. Type L (Type B), drawn-temper copper tubing, wrought-copper fittings, and press-seal joints.
 - 3. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.
 - 4. Schedule 40 steel pipe, grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Condensate-Drain Piping: Type M, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 EXAMINATION

- A. Verify excavations are to required grade, dry, and not over-excavated.

3.3 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. Refer to Section 23 25 00.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install pipe hangers and supports in accordance with Section 23 05 29.

3.5 INSTALLATION - ABOVE GROUND PIPING SYSTEMS

- A. Install Work in accordance with Owner's guidelines.
- B. Route piping parallel to building structure and maintain gradient.

- C. Install piping to conserve building space, and not interfere with use of space.
- D. Install firestopping at fire rated construction perimeters and openings containing penetrating sleeves and piping.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Slope hydronic piping and arrange systems to drain at low points.
- G. Insulate piping and equipment; refer to Section 23 07 00.
- H. Provide access where new valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Install valves with stems upright or horizontal, not inverted.
- J. Insulate piping; refer to Section 23 07 00.

3.6 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
- D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
- E. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
- G. Grooved joint piping systems: Install in accordance with the manufacturer's guidelines and recommendations.
 - 1. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be supplied by the grooved coupling manufacturer. Grooved end shall be clean and free from indentations,

- projections and roll marks in the area from pipe end to groove for proper gasket sealing.
2. A factory trained field representative shall provide on-site training to contractor's field personnel in the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
 3. Use roll sets or cut groovers compatible with the pipe material and wall thickness per manufacturer's installation instructions.
- H. Press connections: Copper and copper alloy press connections shall be made in accordance with the manufacturer's installation instructions. 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(s) recommended by the manufacturer. Contractor shall be trained on the use and installation of the system by manufacturer's representative.

3.7 FIELD QUALITY CONTROL

- A. Comply with Division 1.
- B. Prepare hydronic piping according to ASME B31.9 and as follows:
1. Leave joints, including welds, uninsulated and exposed for examination during test.
 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
 3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- C. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping." Pressure test for press-seal fittings shall not exceed 85 psi. If there is a significant drop in pressure, the system shall be walked to check for un-pressed fittings. Should an un-pressed

- fitting be located, the pressure should be released from the system and the un-pressed fitting shall be pressed.
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- D. Test hydronic piping systems in accordance with ASME B31.9.
- E. HANGERS AND SUPPORTS
1. Comply with requirements in Division 23 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the requirements for maximum spacing of supports.

END OF SECTION

SECTION 23 21 14

HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Radiator valves.
- B. Air vents.
- C. Control Valves.
- D. Actuators.
- E. Thermostatic Angle Valves.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. Section 23 - Hydronic Piping.

1.3 REFERENCE STANDARDS (follow the most currently adopted amended version)

- A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- B. ASME B16.5 - Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Metric/Inch Standard.
- C. ASME B16.11 - Forged Fittings, Socket-welding and Threaded.
- D. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the installation of work of this section with size, location and installation of service utilities.
- B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

- A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.
- B. Certificates: Inspection certificates for pressure vessels from authority having jurisdiction.

- C. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- D. Maintenance Contract.
- E. Project Record Documents: Record actual locations of flow controls.
- F. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 RADIATOR VALVES

- A. Manufacturers:
 - 1. Armstrong International, Inc
 - 2. ITT Bell & Gossett
 - 3. Danfos
 - 4. Watts
- B. Angle or straight pattern, rising stem, inside screw globe valve for 125 psi working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lockshield key cap and set screw memory bonnet for balancing service.

2.2 AIR VENTS

- A. Manufacturers:
 - 1. Armstrong International, Inc.
 - 2. ITT Bell & Gossett
 - 3. Taco, Inc.
- B. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

2.3 CONTROL VALVES

- A. General: All automatic control valves shall be factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of the piping system in which the valve is being installed, and be suitable for the system flow conditions and close against the differential pressures involved. Valves shall be fully proportioning and provide near linear heat transfer control. The valves shall be quiet in operation and fail-safe open, closed, or in their last position. All valves shall operate in sequence with another valve when required by the sequence of operations. All control valves shall be sized by the control manufacturer, and shall be guaranteed to meet the heating loads, as specified.

- B. Sizing and application: Valves shall be globe, ball, angle, and/or butterfly, as required by the specific application. Modulating water valves shall be sized per manufacturer's recommendations for the given application.
 - 1. Liquid Control Valves (water and glycol)
 - a. Two-position service: Line size unless otherwise indicated.
 - b. Two-way modulating service (non-pressure independent): Pressure drop shall be equal to the pressure drop through heat exchanger (load), 50 percent of the pressure difference between supply and return pipe mains, or 5 psi whichever is greater. Minimum Cv shall be calculated at 10 percent of design flow, with a coincident pressure differential equal to the system design pump head.
 - c. Three-way modulating service: Pressure drop equal to the pressure drop through the coil exchanger (load), 5 psi maximum.
 - d. For pressure independent valves, select for a differential pressure range of 5 to 50 psig.
 - e. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - 1) Two-way: 150 percent of total system (pump) head.
 - 2) Three-way: 300 percent of pressure differential between ports A and B at design flow or 100 percent of total system (pump) head.

- C. Terminal Unit Control Valves:
 - 1. Bronze or brass body, bronze trim, two- or three-port as indicated, stainless steel ball union and threaded ends, 100 psi close-off rating.
 - 2. Rating: Class 125 for service at 862 kPa (125 psig) and 121 deg C (250 deg F) operating conditions.
 - 3. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.

2.4 ACTUATORS

- A. General: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action over the entire operating range. Provide proportional or two-position type as indicated in the sequence of operation, with current limiting circuitry or microprocessor overload protection.

- B. Manufacturers:
 - 1. Honeywell
 - 2. Johnson Controls
 - 3. Belimo
 - 4. Siemens

- C. Electronic Valve Actuators:
1. Modulating and two-position actuators shall be provided as required by the sequence of operations. Actuators shall provide the minimum torque required for proper valve close-off against the system pressure for the required application. The valve actuator shall be sized Based on valve manufacturer's recommendations for flow and pressure differential. All actuators shall fail in the last position unless specified with mechanical spring return in the sequence of operations. The spring return feature shall permit normally open or normally closed positions of the valves, as required. All direct shaft mount rotational actuators shall have external adjustable stops to limit the travel in either direction.
 2. Modulating Actuators shall accept 24 VAC or VDC and 120 VAC power supply and be UL listed. The control signal shall be 2-10 VDC or 4-20 mA and the actuator shall provide a clamp position feedback signal of 2-10 VDC. The feedback signal shall be independent of the input signal, and may be used to parallel other actuators and provide true position indication. The feedback signal of each valve actuator (except terminal valves) shall be wired back to a terminal strip in the control panel for trouble-shooting purposes.
 3. Two-position or open/closed actuators shall accept 24 or 120 VAC power supply and be UL listed. Butterfly isolation and other valves, as specified in the sequence of operations, shall be furnished with adjustable end switches to indicate open/closed position or be hard wired to start/stop the associated pump or heat exchanger.

2.5 THERMOSTATIC ANGLE VALVES

- A. Manufacturers:
1. Runtal or equal.
- B. Bronze or brass body, three-way standard straight angled valve, with valve mounted dial.
- C. Adjustable Temp Range 45-86 deg F with numbered scale.
- D. Rating: Rated for service at 145 psig and 250 deg F operating conditions

PART 3 EXECUTION

3.1 INSTALLATION – HYDRONIC PIPING SPECIALTIES

- A. Install specialties in accordance with manufacturer's instructions.
- B. Provide manual air vents at system high points and as indicated.
- C. Provide radiator valves on water inlet to terminal heating units such as radiation heaters.

3.2 MAINTENANCE

- A. Explain corrective actions to Owner's maintenance personnel in person.

END OF SECTION

SECTION 23 31 00

HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Sealants and gaskets.
- B. Single wall spiral round ducts.
- C. Ductwork Fabrication.

1.2 RELATED SECTIONS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 REFERENCES

- A. ASTM International:
 - 1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
 - 2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 3. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - 4. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - 5. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 - 6. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 7. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
 - 8. A1011/A1011M-07 Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
 - 9. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 10. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- B. National Fire Protection Association:
 - 1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
 - 2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
- C. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Fibrous Glass Duct Construction Standards.

2. SMACNA - HVAC Air Duct Leakage Test Manual.
3. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

- D. Underwriters Laboratories Inc.:
1. UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
- C. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission.

1.5 SUBMITTALS

- A. Product Data: Submit data for duct materials and duct connectors.
- B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A, NFPA 90B and NFPA 96 standards as applicable.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealant.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 (zinc coating of in conformance with ASTM A90/A90M).
- B. Aluminum Ducts: ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength. Mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.
- C. Fasteners: Rivets, bolts, or sheet metal screws.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 SEALANTS AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Water-Based Joint and Seam Sealant:
 - 1. General: Brush-on, water-resistant, mold and mildew resistant, indoor and outdoor use, compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. VOC: Maximum 75 g/L (less water).
 - 5. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
- C. Flanged Joint Sealant: Comply with ASTM C 920.
 - 1. General: Single-component, acid-curing, silicone, elastomeric.
 - 2. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- E. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.

2.3 SINGLE WALL SPIRAL ROUND DUCTS

- A. Manufacturers include, but are not limited to:
 - 1. McGill AirFlow Corporation
 - 2. Semco Incorporated
 - 3. Tangent Air Corp
 - 4. Spiral Mfg. Co., Inc.
- B. Product Description: UL 181, Class 1, round spiral lock seam duct constructed of galvanized steel.

1. Exposed ductwork shall be paintable galvanized steel with finish ready for field painting.

C. Construct ducts and fittings gauge per the latest edition of SMACNA.

2.4 DUCTWORK FABRICATION

- A. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards). Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide [airfoil] turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- F. Seal joints between duct sections and duct seams with welds, gaskets, mastic adhesives, mastic plus embedded fabric systems.
 1. Sealants, Mastics: Conform to UL 181A. Provide products bearing appropriate UL 181A markings.
 2. Do not provide sealing products not bearing UL approval markings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

- A. General:
 1. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
 2. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

3. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
4. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 8inch and smaller.
5. Install duct hangers and supports in accordance with Section 23 05 29.
6. Use double nuts and lock washers on threaded rod supports.
7. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
8. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.
9. Do not route ducts through transformer vaults or electrical equipment rooms and enclosures.
10. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

B. Flexible ductwork

1. Minimize kinks and sags
2. Flexible duct shall be located only where concealed and accessible.
3. Non-insulated flexible ductwork: Provide when the metal ductwork connected to is not insulated.
4. Elbow supports: Provide above flexible ductwork connections to ceiling diffusers. Use cable ties as indicated in the manufacturer's installation instructions.
5. Connections to rigid ductwork: Provide both a drawband and two layers of duct tape lapped approximately 25% at each connection of flexible ductwork to rigid ductwork. Drawbands shall be the non-metallic type listed and labeled in accordance with UL 181B. Duct tape shall be listed and labeled in accordance with UL 181B.

3.3 DUCT SEALING

A. Duct Seal Level Description

Seal Level	Sealing Requirements*
A	All transverse joints, longitudinal seams, and duct wall penetrations. Pressure sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A or UL0181B by an independent testing laboratory and the tape is used in accordance with that certification
B	All transverse joints, longitudinal seams. Pressure sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A or UL0181B by an independent testing laboratory and the tape is used in accordance with that certification.
<p>Notes:</p> <p>Longitudinal seams are joints oriented in the direction of flow. Transverse joints are connections of two duct sections oriented perpendicular to airflow. Duct wall penetrations are openings made by any screw fastener, pipe, rod, or wire. Spiral lock seams in a round duct need not be sealed. All other connections are considered transverse joints, including but not limited to spin-ins, taps, and other branch connections, access door frames and jambs, duct connections to equipment, etc.</p>	

B. Minimum Duct Seal Levels

Duct Type			
Duct Location	Intake / Supply		Exhaust
	2-in. or less (1)	Greater than 2-in. (1)	
Conditioned Space	C	B	B
Notes: Duct design static pressure classification Includes indirectly conditioned spaces such as return air plenums			

3.4 SCHEDULES

A. Ductwork Material Schedule:

AIR SYSTEM	MATERIAL
General Exhaust	Galvanized Steel, Aluminum
Outside Air Intake	Galvanized Steel

END OF SECTION

SECTION 23 37 00

AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Louvers.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.
- B. Division 09: Painting
- C. Section 23 04 00 – General Conditions for Mechanical Trades

1.3 REFERENCE STANDARDS (follow the most currently adopted amended version)

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating
- B. AMCA 540 – Debris Impact Resistance
- C. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers.
- D. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets.
- E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
- G. SMACNA (ASMM) - Architectural Sheet Metal Manual. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible.

1.4 SUBMITTALS

- A. Test Reports: Rating of air outlet and inlet performance.
- B. Manufacturer's Certificate: Certify products meet or exceed specified requirements

1.5 QUALITY ASSURANCE

- A. Test and rate louver performance in accordance with AMCA 500-L.
- B. AMCA 540 – Debris Impact Resistance. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2015.
- C. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2015.

- D. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- E. Maintain two copies of each document on site.

1.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum one week prior to commencing work of this section.

1.7 WARRANTY

- A. Furnish one year manufacturer warranty for air outlets and inlets.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. The following list of manufacturers applies to all air terminal units unless otherwise noted in sections below.
 - 1. Sunvent Industries or equal.

2.2 LOUVERS

- A. Type: Blades on 30-degree slope, heavy channel frame, square mesh screen over exhaust and intake, Aluminum hexagon pest screen with 1/4" holes on 9/32" staggered centers, 1/2" water stop at highest point of the sloped bottom.
- B. Fabrication: 28 gage, galvanized steel welded assembly, with factory prime coat finish.
- C. Color: To be selected by Architect from manufacturer's available custom colors. Custom color shall match new insulated panels.
- D. Mounting: Furnish with interior flat flange for installation.

EXECUTION

2.3 EXAMINATION

- A. Division 1 - Administrative Requirements: Coordination and project conditions.
- B. Verify inlet and outlet locations. Verify wall systems are ready for installation.

2.4 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

2.5 INTERFACE WITH OTHER PRODUCTS

- A. Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

END OF SECTION

SECTION 23 81 43

UNITARY AIR-SOURCE HEAT PUMPS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Unitary air-source heat pumps.

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 DEFINITIONS

- A. Coefficient of Performance (COP), heat pump, heating - Ratio of rate of heat delivered to rate of energy input, in consistent units, for complete heat pump system, including compressor and, if applicable, auxiliary heat, under designated operating conditions.
- B. Energy Efficiency Ratio (EER) - Ratio of net cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.
- C. Heating Seasonal Performance Factor (HSPF) - Total heating output of heat pump during its normal annual usage period for heating (in Btu) divided by total electric energy input during the same period.
- D. Seasonal Energy Efficiency Ratio (SEER) - Total cooling output of an air conditioner during its normal annual usage period for cooling (in Btu) divided by total electric energy input during the same period (in Wh).

1.4 SUBMITTALS

- A. Section 01 33 24 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data indicating:
1. Cooling and heating capacities.
 2. Dimensions.
 3. Rough-in connections and connection requirements.
 4. Controls.
 5. Accessories.
 6. Installation, operation and service clearances.
 7. Indicate unit shipping, installation and operating weights.
 8. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or maximum circuit ampacity.
- C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include start-up instructions.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, and maintenance and repair data.

1.6 QUALITY ASSURANCE

- A. The HVAC system shall be manufactured in facilities registered to follow the International Standard Organization (ISO) ISO 9001 - Quality
- B. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration.
- C. Comply with ASHRAE Standard 90.1, Energy Standard for Buildings except for Low-Rise Residential Buildings for cooling and heating performance requirements when tested in accordance with AHRI //210/240//AHRI 390// and UL 1995.
- D. Comply with Fed Spec A-A-50502//Type I, having factory assembled refrigerant circuit or circuits (Packaged Unit), Class 1, "Department of Energy" (DOE) covered products (units with cooling capacity up to 65000 Btu/hr).

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.
- B. Accept heat pump units on site in factory packaging. Inspect for damage.
- C. Protect heat pump units from damage by providing temporary covers until construction is complete in adjacent space.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.9 WARRANTY

- A. Full One-Year Warranty: For the period of one year from the date of certification by a factory-certified technician, the Manufacturer shall replace any part of the unit which fails due to a defect in materials or workmanship. During this full one-year warranty, the Manufacturer shall provide, on-site, free of charge, all labor and related service costs to replace the defective part. If located in an area where the Manufacturer does not have a certified technician, the Manufacturer shall ship a replacement unit and arrange to pick up the defective unit at the Manufacturer's cost.
- B. Full Ten-Year Warranty on Compressor: For the period of ten years from the date of certification by a factory-certified technician, the Manufacturer shall replace the compressor should it fail due to a defect in materials or workmanship. During this full ten-year warranty, the Manufacturer shall provide, on-site, free of charge, all labor and related service costs to replace the defective compressor. If located in an area where the Manufacturer does not have a certified technician, the Manufacturer shall ship a replacement unit and arrange to pick up the defective unit at the Manufacturer's cost.

PART 2 PRODUCTS

2.1 UNITARY HEAT PUMP UNITS

- A. Manufacturers:
 - 1. Ephoca or approved equal. Approved equal must meet performance and physical requirements set forth in Specification 23 81 43.
- B. Product Description: Packaged, self-contained, factory assembled, pre-wired unit, consisting of cabinet, compressor, condensing coil, evaporator fan, evaporator coil, outside air connection, electric auxiliary heating coil, air filters, and controls; fully charged with refrigerant and filled with oil.
- C. Assembly: Horizontal flow air delivery, draw-through configuration.
- D. Compressor: Inverter-driven twin rotary, automatic thermal overload protection, modulating capacity between 35% and 110%
- E. Refrigerant: R32
- F. Outdoor fan:
 - 1. Variable speed EC.
 - 2. Static pressure up to 0.70 in.WG for external ducting.
 - 3. Statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - 4. Electrically protected fan motor.
 - 5. Metal grille for fan protection.
 - 6. Horizontal discharge fan blow.
- G. Indoor Fans:
 - 1. Tangential fan with variable speed EC motor.
 - 2. Statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 - 3. Three (3) fan speeds: Low, Mid, and High.
 - 4. Selectable Auto fan setting to adjust fan speed based on the difference between the controller set-point and space temperature.
 - 5. Capable of preventing the fan from operating when the temperature is satisfied in heating mode.
- H. Outdoor Coil:
 - 1. The outdoor coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
 - 2. Factory-applied corrosion-resistant finish for coil fins.
 - 3. Factory pressure tested coils.
- I. Filter:
 - 1. Return air shall be filtered by means of a MERV3 washable air filter.
 - 2. The filter shall be on the sides of the unit.
 - 3. The filter construction shall include a Fungicide agent.
- J. Drainage:
 - 1. The unit shall be equipped with an integral insulated drain pan.
 - 2. The drain pan shall have a heating element.

3. Provide connection to piped condensate drain system to a code-approved location.
- K. Electrical:
1. The unit shall be available to be powered by 208-230V/single-phase, 60 Hz. and shall be able to operate satisfactorily within the 187 to 251 Voltage range.
 2. Indoor unit electric circuits shall be electronically protected using fuses.
- L. Electric-Resistance Heating Coil:
1. The electric-resistance heating element shall work in tandem with the heat pump, when the heat pumps output is insufficient to heat the room.
 2. The unit shall be available with 1,800-watt supplemental electric-resistance heating element with a contactor and high-temperature-limit switch.
- M. Cabinet:
1. The cabinet shall be fabricated of 18-gauge galvanized steel
 2. The cabinet shall be finished in RAL 9003.
 3. The cabinet shall have removable access panels.
 4. Dimensions: 39.7" W x 21.9" H x 6.5" D + 2" external fan
- N. Controls:
1. Integrated onboard controller that shall be capable of displaying settings and values, controlling the unit and programming parameters.
 2. Integrated onboard controller with the following features:
 - a. Touch Sensor Capacitive buttons.
 - b. Dimmable backlit display with night mode.
 - c. Modes: Auto, Cool, Heat, Dry, Fan.
 - d. Automatic Change over (Heat/Cool) with a dead band.
 - e. Temperature set point adjustment
 - f. Restricted temperature ranges for heating and cooling
 - g. Fan speed control includes: low, med, high and auto.
 - h. Temperature settings in Fahrenheit and Celsius.
 - i. Sleep mode.
 - j. Keypad lock.
 - k. Displays error codes.

2.2 ACCESSORIES:

- A. Wall sleeves
1. From the unit to the exterior louvers.
- B. Exterior louvers:
1. Exterior louvers for supply and exhaust air.
 2. Louvers must meet the required free area and pressure drop as specified by the manufacturer.
- C. Interior grilles and diffusers
1. Interior grilles and diffusers are required for supply and return air.
 2. Grilles and diffusers must meet the required free area and pressure drop as specified by the manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify wall openings have been properly prepared before beginning installation.
- C. Verify piping rough-in is at correct location.
- D. Verify electrical rough-in is at correct location.
- E. Prepare conditions using the methods recommended by the manufacturer for achieving the best result for the operation under the project conditions.

3.2 INSTALLATION

- A. Install accessories furnished loose for field mounting.
- B. Install electrical devices furnished loose for field mounting.
- C. Install control wiring between unit control panel and field mounted control devices.
- D. Coordinate installation of vent sleeves in finished wall assembly; seal and weatherproof.
- E. Coordinate installation of louvers that are in compliance with manufacturers' specifications for pressure drop and free area.
- F. Install in accordance with manufacturer's instructions, approved submittals and in proper relationship with adjacent construction including the following:
 - 1. Drain connections to drainage system.
 - 2. Electrical connections per NFPA 70.
- G. Clearance tolerances per Manufacturer's Written Instructions:
 - 1. Clearance at the exterior of the unit for unobstructed airflow around the vents.
 - 2. Clearance at the interior of the unit for unobstructed airflow around the vents.
 - 3. Clearance at the interior of the unit for maintenance purposes.
 - 4. Minimum vertical and horizontal clearance between unit and walls.
- H. Install units according to the manufacturer's written instructions.
- I. Connect units to wiring systems and to ground as indicated and instructed by the manufacturer. All electrical work shall comply with Division 26 Sections.

3.3 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units.
- B. Install new throwaway filters in units after Substantial Completion.

3.4 DEMONSTRATION

- A. Demonstrate unit operation and maintenance.

- B. Provide instruction to personnel in the operation and maintenance of the unit.

3.5 PROTECTION OF FINISHED WORK

- A. Protect finished surfaces of cabinets with protective covers during remainder of construction.

END OF SECTION

SECTION 23 82 00

HEATING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electric Panel Radiators
- B. Hydronic Panel Radiators
- C. Hydronic Convectors

1.2 RELATED REQUIREMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 SUBMITTALS

- A. Shop Drawings: Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations. Indicate schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers.
- B. Product Data: Submit coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions. Submit mechanical and electrical service locations, capacities and accessories or optional items.
- C. Manufacturer's Installation Instructions: Submit assembly, support details, and connection requirements.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access to valves.
- B. Operation and Maintenance Data: Submit manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Accept units on site in factory packing. Inspect for damage. Store under roof.
- B. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 ELECTRIC PANEL RADIATOR

- A. Manufacturers:
 - 1. Runtal or equal
- B. Assembly: UL listed and labeled, with terminal control box cover, splice box, and controls.
- C. Element: Enclosed tube, aluminum finned element of coiled resistance wire centered in tubes and embedded in refractory material or Exposed helical coil of nickel-chrome resistance wire with refractory support bushings.
- D. Controls: Manual reset thermal cut-out, wall mount thermostat.
- E. Finish: Factory applied baked enamel of color as selected.

2.2 HYDRONIC PANEL RADIATOR

- A. Manufacturers:
 - 1. Runtal or equal
- B. The wall mounted heating panel radiation shall be of one-piece all-welded steel construction, consisting of flattened water tubes welded to headers at each end. Finned models to have steel corrugated fins welded to the rear side of the water tubes to increase the convective output of the unit. Fins shall start within 1" of the headers, and shall be spot-welded three times per tube, factory air pressure tested at 74 psi maximum.
- C. Finish: Factory applied baked enamel of color as selected.

2.3 HYDRONIC CONVECTORS

- A. Manufacturers:
 - 1. Vulcan
 - 2. Trane
 - 3. McQuay
 - 4. Modine
- B. Heating Elements: Seamless copper tubing mechanically expanded into evenly spaced aluminum fins and cast iron headers, steel side plates and supports, factory air pressure tested at 100 psi under water, with means of adjusting pitch of element.
- C. Cabinet 0.0598 inch thick steel front and top, 0.0478 inch steel back and ends; exposed corners rounded; easily secured removable front panels, adequately braced and reinforced for stiffness.
- D. Finish: Factory applied baked enamel of color as selected.
- E. Access Doors: For otherwise inaccessible valves, furnish factory-made permanently hinged access doors, 6 x 7 inch minimum size, integral with cabinet.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify wall construction is ready for installation.
- B. For recessed units, verify recess dimensions are correct size.

3.2 INSTALLATION

- A. Protect to prevent damage.
- B. Install level.
- C. Provide control wiring to wall mounted thermostat, concealed.
- D. Install equipment exposed to finished areas after walls and ceilings are finished and painted. Avoid damage.
- E. Provide control wiring to thermostatic valve, concealed.

3.3 CLEANING

- A. After construction is completed, including painting, clean exposed surfaces of units.

END OF SECTION

SECTION 26 00 01
ELECTRICAL FILED SUB-BID
(Filed Sub-Bid Required)

PART 1 – GENERAL

1.01 GENERAL

- A. All of the Contract Documents, including General and Supplementary Conditions, Bidding Documents, Contract Forms, Conditions of the Contract, and all sections of Division 01 – General Requirements, shall be part of this Section unless specifically excluded.
- B. Examine all Drawings and all Sections of the Specifications for the requirements and provisions affecting the work of this Section.

1.02 FILED SUB-BIDS

- A. Sub-Bids shall be submitted for the Work of this Section in accordance with the provisions of M.G.L. c.149 §§44A-J. The time and place for submission of Sub-Bids are set forth in the Advertisement. The procedures and requirements for submitting Sub-Bids are set forth in the Instructions to Bidders.
- B. The Work of this section is shown on Drawings:
 - 1. E0.00 - ELECTRICAL SITE PLAN, ABBREVIATIONS, NOTES, DETAILS, AND SYMBOLS
 - 2. E1.00 - ELECTRICAL DEMOLITION PLANS
 - 3. E2.00 - ELECTRICAL POWER NEW WORK PLANS
 - 4. E3.00 - ELECTRICAL SCHEDULES, DETAILS, AND DIAGRAMS
 - 5. E3.01 - ELECTRICAL PANEL SCHEDULES
 - 6. PH1.0 - ALTERNATES AND SITE PHASING PLAN
- C. The Work of this Filed Sub-Bid includes the following Sections in their entirety:
 - 1. Section 26 04 00 - General Conditions for Electrical
 - 2. Section 26 05 01 - Electrical Demolition
 - 3. Section 26 05 19 - Electrical Power Conductors and Cables
 - 4. Section 26 05 26 - Grounding and Bonding for Electrical Systems
 - 5. Section 26 05 29 - Hangers and Supports for Electrical Systems
 - 6. Section 26 05 33 - Raceway and Boxes for Electrical Systems
 - 7. Section 26 05 53 - Identification for Electrical Systems
 - 8. Section 26 24 16 - Panelboards

1.03 SCOPE OF WORK

- A. The scope of work consists of the installation of all materials to be furnished under Division 26 and without limiting the generality thereof, consists of furnishing all labor, materials, equipment, plant, transportation, rigging, staging up to roof, appurtenances, and services necessary and/or incidental to properly complete all work as shown on the Mechanical drawings, as described in the Specifications, or as reasonably inferred from

either, in the opinion of the Architect. Coordination with Owner's contractors including but not limited to the Hazardous abatement contractor for ACM removal and demolition and new scope of work. Add hoisting, scaffolding, and rigging.

1.04 RELATED WORK SPECIFIED ELSEWHERE

- A. The following related work or materials shall be provided under the designated Sections and coordinated by the Contractor:
 - 1. Cutting and Patching including openings in concrete masonry floors, walls and roof: General Conditions

1.05 SUBMITTALS

- A. Attention is directed to Specification Section 01 33 24 Electronic Submittal Procedures and Section 26 04 00 General Conditions for Electrical Trades

1.06 RECORD DRAWINGS

- A. Refer to Specification Division 1 – Closeout Procedures for the Record Drawing requirements for this section.
- B. The marked up As Built Drawings required to be maintained under this section are of E-Series Drawings.
- C. Availability of marked up As-Built drawings shall be a prerequisite to scheduling final inspection of this contract and said drawings and original contract documents will be used in checking completion of the work.
- D. Non-availability of marked up As-Built drawings or inaccuracies therein may be grounds for cancellation and postponement of any scheduled final inspection by the Architect until the discrepancy has been corrected.

1.07 TEMPORARY UTILITIES

- A. Attention is directed to Section 01 50 00 – Temporary Facilities and Controls.

1.08 OPERATING AND MAINTENANCE MANUALS

- A. Refer to Section under Division 1 – Closeout Procedures for the Operating and Maintenance Manual requirements for this Contract.
- B. The Electrical subcontractor shall provide the Contractor two (2) sets of operating and maintenance instructions of all mechanical and electrical equipment furnished and installed under this section.
- C. The Contractor shall collect the operating instructions, bind them into two complete sets and deliver them to the Architect who will check for completeness and deliver them to the Owner.
- D. Delivery of the operating and maintenance manuals shall be a condition precedent to final payment.

1.09 INSTRUCTION OF OWNER'S PERSONNEL

- A. Refer to Section under Division 1 – Closeout Procedures for the Instruction of Owner's Personnel requirements for this Contract.
- B. The Electrical subcontractor shall instruct the Owner's personnel, at the site, in the use and maintenance of equipment installed under this section.
- C. Submission to the Architect of a certificate of compliance to this requirement, signed by the Contractor and the Owner's Representative shall be a condition precedent to final payment.

1.10 GUARANTEE AND SERVICE

- A. Notwithstanding any other requirements of this contract, the Electrical subcontractor shall guarantee the performance of the installation and equipment included in this Section for two (2) year workmanship and material warranty from the date of Substantial Completion as defined in the General Conditions. Should any defects in materials or workmanship appear during this period, they shall be corrected or replaced by the Electrical subcontractor to the satisfaction of the Architect, and at no expense to the Owner.

END OF SECTION

SECTION 26 04 00

GENERAL CONDITIONS FOR ELECTRICAL TRADES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. The Drawings of other trades Architectural, Structural, Landscape, Civil, and Mechanical shall be examined for coordination and familiarity of work with other Contractors. Any duplication or omission of provisions in this project should be brought to the attention of the Owners prior to Bidding.
- C. The drawings of equipment suppliers shall be examined for coordination and familiarity of work with Owner's equipment suppliers.

1.2 DESCRIPTION

- A. The General Conditions and Supplementary General Conditions are a part of this Division and are to be considered a part of this Contract.
- B. Where items of the General Conditions and Supplementary General Conditions are repeated in other Sections of the Specifications, it is merely intended to qualify or to call particular attention to them. It is not intended that any other parts of the General Conditions and Supplementary General Conditions shall be assumed to be omitted if not repeated therein. This Section applies equally and specifically to all Contractors supplying labor and/or equipment and/or materials as required under each Section of this Division. Where conflicts exist between the drawings and the specifications or between this section of the specifications and other sections, the more stringent or higher cost option shall apply.
- C. It is the intent of this Section of the Specifications to establish a standard of quality and performance characteristics for basic materials and installation methods used in building electrical systems. Coordination with Owner's contractors including but not limited to the Hazardous abatement contractor for ACM removal and demolition and new scope of work.
- D. Project phasing and alternates shall be part of all division 23 sections and as the HVAC Prime contractor all sections of the specifications.
- E. Provide all scaffolding, hoisting and rigging.

1.3 INTENT

- A. This contract is for all labor, materials and equipment required for installation. The system shall be complete and finished in all respects, tested and ready for operation. Work shall include calibration of equipment with factory settings. All materials, equipment and apparatus shall be new and of first class quality.

- B. Any apparatus, appliance, material or work not shown on 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 as determined by good trade practice even if not particularly specified, shall be furnished, delivered and installed under their respective Divisions without any additional expense to the Owner.
- C. Minor details not usually shown or specified but necessary for proper installation and operation shall be included in the work as though they were hereinafter shown or specified.
- D. Work under each Section shall include giving written notice to the Owner and Engineer of any materials or apparatus believed inadequate or unsuitable; in violation of laws, ordinances, rules or regulations of authorities having jurisdiction; and any necessary items of work omitted. In the absence of such written notice, it is mutually agreed that work under each Section has included the cost of all required items for the accepted, satisfactory functioning of the entire system without extra compensation.
- E. Location of all existing systems and equipment shown on floor plans is based on the best available information. The Contractor shall verify all dimensions and locations of existing systems and equipment in the field and adjust as necessary.
- F. Certain items of existing equipment may be indicated for removal or relocation. Items noted for removal shall be disconnected and turned over to the Owner or disposed of by the Contractor if the Owner so requests. If instructed to dispose of items, the Contractor shall remove the items from the premises and dispose of them in a safe, legal and responsible manner and location. Items noted for relocation are intended for reuse in another location as designated on the Drawings. It shall be the responsibility of the Contractor to remove the material from its present location, store the material in a safe place and reinstall the material in its new location. Questions regarding the suitability of the material or equipment shall be brought to the attention of the Owner and Engineer in writing.
- G. Wherever a particular piece of equipment, device or material is specifically indicated on the Drawings by model number, type, series or other means, that specification shall take precedence over equipment or materials specified herein. For example: If a particular switch is specified on the Drawings, its specification takes precedence over switch specified herein.

1.4 DEFINITIONS

- A. Word “Subcontractor” means specifically the subcontractor working under this Division. Other Contractors are specifically designated “Plumbing Subcontractor”, “General Contractor” and so on. Note: Take care to ascertain limits of responsibility for connecting equipment which requires connections by two or more trades.
- B. Word “install” shall mean set in place complete with all mounting facilities and connections as necessary ready for normal use or service.
- C. Words “furnish” or “supply” shall mean purchase, deliver to, and off-load at the job site, all ready to be installed including where appropriate all necessary interim storage and protection.

- D. Word “provide” shall mean furnish (or supply) and install as necessary.
- E. Word “finished” refers to all rooms and areas scheduled to be painted in Room Finish Schedule on the drawings. All rooms and areas not covered in Schedule, including underground tunnels and areas above ceilings shall be considered not finished, unless otherwise noted.
- F. No Exceptions Taken – reviewed and determined to be in general conformance with contract documents.
- G. Words “approved equal” mean any product which in the opinion of the Engineer is equal in quality, arrangement, appearance, and performance to the product specified.
- H. Word “wiring” shall mean cable assembly, raceway, conductors, fittings and any other necessary accessories to make a complete wiring system.
- I. Word “product” shall mean any item of equipment, material, fixture, apparatus, appliance or accessory installed under this Division.
- J. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions."
- K. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, other paragraphs or schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
- L. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
- M. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in General and Supplementary Conditions.
- N. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- O. Remove: The term “remove” means “to disconnect from its present position, remove from the premises and to dispose of in a legal manner.”
- P. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- Q. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.5 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of systems and work included in the Contract. Consult the Architectural Drawings and Details for exact location of fixtures and equipment; where same are not definitely located, obtain this information from the Architect. (Do not scale the drawings)
- B. Work under each Section shall closely follow Drawings in layout of work; check Drawings of other Divisions to verify spaces in which work will be installed. Maintain maximum headroom; where space conditions appear inadequate, Owner and Engineer shall be notified before proceeding with installations.
- C. The Owner may, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades and/or for proper execution of the work.
- D. Where variances occur between the Drawings and Specifications or within either of the Documents, the item or arrangement of better quality, higher rating, or higher value shall be included in the Contract price. The Owner and Engineer shall decide on the item and the manner in which the work shall be installed.

1.6 SURVEYS AND MEASUREMENTS

- A. Before submitting his Bid, the Contractors shall visit the site and become thoroughly familiar with all existing conditions under which his work will be installed. This Contract includes all modifications of existing systems required for the installation of new equipment. This Contract includes all necessary offsets, transitions and modifications required to install all new equipment in existing spaces. All new and existing equipment and systems shall be fully operational under this Contract before the job is considered complete. The Contractors shall be held responsible for any assumptions he makes, any omissions or errors he makes as a result of his failure to become fully familiar with the existing conditions at the site and the Contract Documents.
- B. The Contractor shall base all measurements, both horizontal and vertical, from established bench marks. All work shall agree with these established lines and levels. Verify all measurements at the site and check the correctness of same as related to the work.
- C. Should the Contractor discover any discrepancies between actual measurements and those indicated which prevent following good practice or which interfere with the intent of the Drawings and Specifications, the Engineer will be notified and work will not proceed until instructions from the Engineer are received.

1.7 CODES AND STANDARDS

- A. Reference Standard Compliance
 - 1. Where equipment or materials are specified to conform to industry and technical society reference standards of the organizations such as American National Standards Institute (ANSI), American Society for Testing and Materials (ASTM), National Electrical Manufacturers Association (NEMA), and Underwriters Laboratories Inc. (UL), submit proof of such compliance. The

label or listing by the specified organization will be acceptable evidence of compliance.

2. Independent Testing Organization Certificate: In lieu of the label or listing, indicated above submit a certificate from an independent testing organization, competent to perform testing, and approved by the engineer. The certificate shall state that the item has been tested in accordance with the specified organization's test methods and that the item complies with the specified organization's reference standard.

- B. All materials furnished and all work installed shall comply with the rules and recommendations of the NFPA, the requirements of the local utility companies, the recommendations of the fire insurance rating organization having jurisdiction and the requirements of all Governmental departments having jurisdiction.
- C. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and Drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether shown on Drawings and/or specified or not.

1.8 PERMITS AND FEES

- A. Permits and fees are waived. Reinspection of any failed inspections are paid by the contractor / subcontractor. The project is tax exempt, owner to provide tax number when project is awarded.

1.9 EQUIPMENT EQUIVALENTS AND SUBSTITUTIONS

- A. Certain manufacturers of material, apparatus or appliances are indicated in the drawings and specifications for this project. These items have been used as the basis of design, and as a convenience in fixing the minimum standard of workmanship, finish and design that is required. If the Contractor uses an "approved equal" alternative to the basis of design, and if the features of that alternative have an impact on other components of the Project, the Contractor shall include the necessary adjustments in those components, whether for architectural, structural, mechanical, electrical, fire protection, or any other elements, plus any adjustments for difference in performance.
- B. Where one name only is used and is followed by the words "or approved equal", the Contractor must use the item named or he is required to apply for a substitution. Where one name only is used, the Contractor must use that item named.
- C. Where no specific make of material, apparatus or appliance is mentioned, any first-class product made by a reputable manufacturer may be submitted for Architect and Engineer review.
- D. Where the Contractor proposes to use an item that is different from the basis of design in the Drawings and specifications, and that will require the redesign of the structure, partitions, foundations, piping, wiring or any other component of the mechanical, electrical, or architectural layout, the Contractor shall provide the necessary redesign of those components.

- E. Where the Contractor proposes to deviate (provide an equivalent or request for substitution) from the basis of design scheduled equipment or materials as hereinafter specified or shown on the drawings, they are required to submit a requested for substitution in writing. The Contractor shall state in their request whether it is a substitution, equivalent or a non approved equivalent to that specified and the amount of credit or extra cost involved. A copy of said request shall be included in the Base Bid with manufacturer's equipment cuts. The Base Bid shall be based on using the materials and equipment as specified with no exceptions.
- F. If an alternative or substitute item results in a difference in quantity and arrangement of piping, ductwork, valves, pumps, insulation, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Contractor shall furnish and install any such additional equipment required by the system, at no additional cost to the Owner including any costs added to other trades due to the equivalent change from the basis of design detailed in the drawings or included within the specifications.
- G. Equipment, material or devices submitted for review as an "equivalent" shall meet the following requirements:
1. The equivalent shall have the same construction features such as, but not limited to:
 - a. Material thickness, gauge, weight, density, etc.
 - b. Welded, riveted, bolted, etc., construction
 - c. Finish, undercoating, corrosion protection
 2. The equivalent shall perform with the same or better operating efficiency.
 3. The equivalent shall be locally represented by the manufacturer for service, parts and technical information.
 4. The equivalent shall bear the same labels of performance certification as is applicable to the specified item, such as UL or NEMA labels.
- H. Equipment, material or devices submitted for review as a "substitution" shall meet the following requirements:
1. Substitution Request Submittal: Requests for substitution will be considered if received in writing 14 days before the bid date. Requests received later than 14 days before the bid date may be considered or rejected at the discretion of the Engineer/Owner. Once the Contractor submits a complete request for substitution as determined by the engineer, the engineer reserves the right to request the time necessary to evaluate the request for substitution and review it with the Owner.
 2. Submit three (3) copies of each request for substitution for consideration.
 3. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
 - a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
 - b. Samples, where applicable or requested.
 - c. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.

- d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
- e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
- f. Cost information, including a proposal of the net change, if any in the Contract Sum.
- g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
- h. Engineer's Action: Within one week of receipt of the request for substitution, the Engineer will notify the Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name. Acceptance of a product substitution will be in the form of an Addendum.
- i. Other Conditions: The Contractor's substitution request will be received and considered by the Engineer when one or more of the following conditions are satisfied, as determined by the Engineer; otherwise requests will be returned without action except to record noncompliance with these requirements.
 - 1) The request is directly related to an "or equal" clause or similar language in the Contract Documents.
 - 2) The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
 - 3) A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Engineer for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.

1.10 SUBMITTAL PROCEDURES

- A. Provide Submittals in accordance with the requirements of Division 1 and as indicated in the following.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination. The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for resubmittals.
1. Allow two weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Engineer will promptly advise the Contractor when a submittal being processed must be delayed for coordination.
 2. If an intermediate submittal is necessary, process the same as the initial submittal.
 3. Allow two weeks for reprocessing each submittal.
 4. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.
- D. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
1. Include the following information on the label for processing and recording action taken.
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Number and title of appropriate Specification Section.
 - i. Drawing number and detail references, as appropriate.
- E. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Engineer using a transmittal form. Submittals received from sources other than the Contractor will be returned without action. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.
- F. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer will review each submittal, mark to indicate action taken, and return promptly. Compliance with specified characteristics is the Contractor's responsibility.

- G. Action Stamp: The Engineer will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, to indicate the action taken.

1.11 SHOP DRAWINGS

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. The Contractor shall submit for review detailed shop drawings of all equipment and material specified in each section and coordinated ductwork layouts. No material or equipment may be delivered to the job site or installed until the Contractor has received shop drawings for the particular material or equipment which have been properly reviewed. Shop drawings shall be submitted within 60 days after award of Contract before any material or equipment is purchased. The Contractor shall submit for review copies of all shop drawings to be incorporated in the Electrical Contract. Refer to the General Conditions and Supplementary General Conditions for the quantity of copies required for submission. Where quantities are not specified, provide seven (7) copies for review.
- C. Provide shop drawings for all devices specified under equipment specifications for all systems including fire alarm, switchgear, clock, lighting, etc., or where called for elsewhere in the Specifications, or where scheduled on the drawings, or where called out on the drawings. Shop drawings shall include manufacturers' names, catalog numbers, cuts, diagrams, dimensions, identification of products and materials included, compliance with specified standards, notation of coordination requirements, notation of dimensions established by field measurement and other such descriptive data as may be required to identify and accept the equipment. A complete list in each category (example: all fixtures) of all shop drawings, performance cuts, material lists, etc., shall be submitted to the Engineer at one time. No consideration will be given to a partial shop drawing submittal.
- D. Submittals shall be marked with the trade involved, i.e., Electrical, HVAC, Plumbing, Fire Protection, etc. when the submittal could involve more than one trade.
- E. Where multiple quantities or types of equipment are being submitted, provide a cover sheet (with a list of contents) on the submittal identifying the equipment or material being submitted.
- F. Failure to submit shop drawings in ample time for review shall not entitle the Contractor to an extension of Contract time. No claim for extension by reason of such default will be allowed, nor shall the Contractor be entitled to purchase, furnish and/or install equipment which has not been reviewed by the Engineer.
- G. The Contractor shall furnish all necessary templates, patterns, etc., for installation work and for the purpose of making adjoining work conform; furnish setting plans and shop details to other trades as required.
- H. Acceptance rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are reviewed, review does not

mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the Contract Drawings and Specifications. Verify available space prior to submitting shop drawings.

- I. Acceptance of shop drawings shall not apply to quantity nor relieve Contractor of his responsibility to comply with intent of Drawings and Specifications.
- J. Acceptance of shop drawings is final and no further changes will be allowed without the written consent of the Engineer.
- K. Acceptance of shop drawings does not relieve the Contractor from submitting, coordinating and implementing schedules, forms, worksheets and similar as required for owner/operator input and approval as specified herein and required for proper system operation.
- L. Shop drawing submittal sheets which may show items that are not being furnished shall have those items crossed off to clearly indicate which items will be furnished.
- M. Bidders shall not rely on any verbal clarification of the Drawings and/or Specifications. Any questions shall be referred to the Engineer in writing at least five (5) working days prior to Bidding to allow for issuance of an Addendum.
- N. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

1.12 COORDINATION DRAWINGS

- A. Prepare coordination drawings in accordance with Division 01 Section "PROJECT COORDINATION," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of light fixtures, panelboards, conduits, cabinets, etc. Include the following:
 - 2. Clearances for installing and maintaining insulation.
 - 3. Clearances for servicing and maintaining equipment, including NEC requirements and space for equipment disassembly required for periodic maintenance.
 - 4. Equipment connections and support details.
 - 5. Exterior wall and foundation penetrations.
 - 6. Fire-rated wall and floor penetrations.
 - 7. Sizes and locations of required concrete pads and bases.
- B. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
- C. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

- D. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items.
- E. Electronic copies of the MEP floor plans are available to use as a basis for preparing coordination drawings and can be provided by the Engineer. If the Contractor elects to obtain the Engineers electronic files an Electronic File Release Form must be submitted with payment. This form must be signed by the Contractor, Owner, and Architect. Upon receipt of a signed copy of the Electronic File Release Form, and payment, the Engineer will provide copies of the electronic files for the Contractor's use. A copy of the Electronic File Release Form is appended to the end of this specification section

1.13 COORDINATION WITH OTHER DIVISIONS

- A. All work shall be carried out in conjunction with other trades and full cooperation shall be given in order that all work may proceed with a minimum of delay and interference. Particular emphasis is placed on timely installation of major apparatus and furnishing other Contractors, especially the Contractor or Construction Manager, with information as to openings, chases, sleeves, bases, inserts, equipment locations, panels, etc., required by other trades.
- B. The Contractors are required to examine all of the Project Drawings and mutually arrange work so as to avoid interference with the work of other trades. In general, ductwork, heating, condenser, chilled water piping, sprinkler piping and drainage lines take precedence over water, gas and electrical conduits. The Engineer shall make final decisions regarding the arrangement of work which cannot be agreed upon by the Contractors.
- C. Where the work of the Contractor will be installed in close proximity to or will interfere with work of other trades, the Contractors will cooperate in working out space conditions to make a satisfactory adjustment.
- D. If the work under a Section is installed before coordinating with other Divisions or Sections or so as to cause interference with work of other Sections, the necessary changes to correct the condition shall be made by the Contractor causing the interference without extra charge to the Owner.
- E. Where work is installed prior to preparation and approval of the Coordination Drawings or in conflict with the approved Coordination drawings and if so directed in other Sections, the Contractor indicated shall prepare composite working drawings and sections clearly showing how the work is to be installed in relation to the work of other trades, at no extra charge to the Owner.

1.14 WORKMANSHIP

- A. Service Support: The equipment items shall be supported by service organizations which are reasonably convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

- B. Modification of References: In each of the publications referred to herein, consider the advisory provisions to be mandatory, as though the word, "shall" had been substituted for "should" wherever it appears.
- C. The Contractor shall furnish the services of an experienced superintendent who shall be constantly in charge of the installation of the work together with all skilled workmen, journeymen, electricians, helpers and laborers required to unload, transfer, erect, connect, adjust, start, operate and test each system.
- D. Unless otherwise specifically indicated on the Drawings or Specifications, all equipment and materials shall be installed with the acceptance of the Engineer and in accordance with the recommendations of the manufacturer. This includes the performance of such tests as the manufacturer recommends.
- E. All labor for installation of electrical systems shall be performed by experienced, skilled tradesmen under the supervision of a licensed journeyman foreman. All work shall be of a quality consistent with good trade practice and shall be installed in a neat, workmanlike manner. The Engineer reserves the right to reject any work which, in his opinion, has been installed in a substandard, dangerous or unserviceable manner. The Contractor shall replace said work in a satisfactory manner at no extra cost to the Owner.

1.15 SHUTDOWNS

- A. When installation of a new system requires the temporary shutdown of an existing operating system, the connection of the new system shall be performed at such time as designated by the Owner.
- B. The Engineer and the Owner shall be notified in writing of the estimated duration of the shutdown period at least ten (10) days in advance of the date the work is to be performed.
- C. Work shall be arranged for continuous performance whenever possible. The Contractor shall provide all necessary labor, including overtime if required, to assure that existing operating services will be shut down only during the time actually required to make necessary connections.

1.16 TEMPORARY UTILITIES

- A. General: Provide new materials and equipment; if acceptable to the Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- C. First Aid Supplies: Comply with governing regulations.
- D. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable,

UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

- E. Provide temporary lighting in all areas, throughout construction activities.
 - 1. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Engineer, and will not be accepted as a basis of claims for a Change Order.
 - 2. Temporary Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload protected disconnects, automatic ground-fault interrupters, and main distribution switch gear.
 - a. Except where overhead service must be used, install electric power service underground.
 - b. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
 - 3. Temporary Telephones: Provide temporary telephone service for all personnel engaged in construction activities, throughout the construction period.
- F. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.
- G. Termination and Removal: Unless the Engineer requires that it be maintained longer, remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.

1.17 PROJECT PHASING

- A. Work under each Section shall include all necessary temporary connections, equipment, conduit, wiring, fire alarm equipment and testing, lighting and emergency lighting, fire stopping, connection of necessary mechanical equipment, labor, and material as necessary to accommodate the phasing of Construction as developed by the General Contractor or Construction Manager and approved by the Owner. All existing systems that pass-thru an area of the building or are required to be maintained in a phased fashion during construction shall remain operational during all phases of construction. No extra compensation shall be granted the Contractor for work required to maintain existing systems operational or to accommodate the construction phasing of the project.

1.18 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Work under each Section shall include protecting the work and material of all other Sections from damage by work or workmen and shall include making good all damage thus caused.
- B. The Contractor shall be responsible for work and equipment until the facility has been accepted by the Owner. Protect work against theft, injury or damage and carefully store material and equipment received on site which is not immediately installed. Close open ends of work with temporary covers or plugs during construction to prevent entry of foreign material.
- C. Work under each Section includes receiving, unloading, uncrating, storing, protecting, setting in place and completely connecting equipment supplied under each Section. Work under each Section shall also include exercising special care in handling and protecting equipment and fixtures, and shall include the cost of replacing any of the equipment and fixtures which are missing or damaged.
- D. Equipment and material stored on the job site shall be protected from the weather, vehicles, dirt and/or damage by workmen or machinery. Insure that all electrical or absorbent equipment or material is protected from moisture during storage.

1.19 ADJUSTING AND TESTING

- A. After all the equipment and accessories to be furnished are in place, they shall be put in final adjustment and subjected to such operating tests so as to assure the Engineer that they are in proper adjustment and in satisfactory, permanent operating condition.
- B. Where requested by the Engineer or specified in the contract documents, a factory-trained service representative shall inspect the installation and assist in the initial startup and adjustment to the equipment. The period of these services shall be for such time as necessary to secure proper installation and adjustments. After the equipment is placed in permanent operation, the service representative shall supervise the initial operation of the equipment and instruct the personnel responsible for operation and maintenance of the equipment. The service representative shall notify the Contractor in writing that the equipment was installed according to manufacturer's recommendations and is operating as intended by the manufacturer. Factory start-up reports shall be included in the operation and maintenance manuals under the appropriate equipment section.

1.20 CLEANING

- A. The Contractor shall thoroughly clean all equipment of all foreign substances, oils, dust, dirt, etc., inside and out before final acceptance by the Engineer.
- B. If any part of a system should be stopped or damaged by any foreign matter after being placed in operation, the system shall be disconnected, cleaned and reconnected wherever necessary to locate and/or remove obstructions. Any work damaged in the course of removing obstructions shall be repaired or replaced when the system is reconnected at no additional cost to the Owner.

- C. During the course of construction, all conduits shall be capped in an acceptable manner to insure adequate protection against the entrance of foreign matter.
- D. Upon completion of all work under the Contract, the Contractor shall remove from the premises all rubbish, debris and excess materials left over from his work.
- E. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
 - 1. Remove labels that are not permanent labels.
 - 2. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
 - 3. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces and panelboard interiors.
 - 4. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
- F. Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove and dispose of ALL waste materials, packaging material, skids etc. from the site and dispose of in a lawful manner in accordance with municipal, state and federal regulations.
- G. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.

1.21 OPERATING AND MAINTENANCE

- A. Upon completion of all work and tests, the Contractor shall furnish the necessary skilled labor and helpers for operating his system and equipment for a period specified under each applicable Section of this Division. During this period, he shall fully instruct the Owner or the Owner's representative in the operation, adjustment and maintenance of all equipment furnished. The Contractor shall give at least seven (7) day notice to the Owner and the Engineer in advance of this period.
- B. The Contractor shall include the maintenance schedule for the principal items of equipment furnished under this Division.
- C. The Contractor shall physically demonstrate procedures for all routine maintenance of all equipment furnished under each respective Section to assure accessibility to all devices.
- D. An authorized manufacturer's representative shall attest in writing that the equipment has been properly installed prior to startup of any major equipment. At a minimum, the following equipment will require this inspection: emergency generator, fire alarm system, nurse call system, paging systems, etc. These letters will be bound into the operating and maintenance books.

- E. Refer to individual trade Sections for any other particular requirements related to operating instructions.
- F. Demonstration shall be recorded on CD Rom with two (2) discs turned over to the Owner.

1.22 OPERATING AND MAINTENANCE MANUALS

- A. Prepare operating and maintenance manuals in accordance with the requirements of Division 1 and as follows. The Contractor shall prepare six (6) copies of a complete maintenance and operating instructions manual, bound in booklet form. Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual heavy-duty, 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder.
- B. Manual shall include the following:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and 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. Emergency instructions.
 - 6. Spare parts list.
 - 7. Copies of warranties.
 - 8. Wiring diagrams.
 - 9. Recommended "turn around" cycles.
 - 10. Inspection procedures.
 - 11. Shop Drawings and Product Data.
 - 12. Equipment start-up reports.
- C. Include in the manual, a tabulated equipment schedule for all equipment. Schedule shall include pertinent data such as: make, model number, serial number, voltage, normal operating current, belt size, filter quantities and sizes, bearing number, etc. Schedule shall include maintenance to be done and frequency.
- D. Maintenance and instruction manuals shall be submitted to the Owner at the same time as the seven (7) day notice is given prior to the instruction period.

1.23 ACCEPTANCES

- A. The equipment, materials, workmanship, design and arrangement of all work installed under the Electrical Sections shall be subject to the review of the Engineer.

- B. Within 30 days after the awarding of a Contract, the Electrical Contractor shall submit to the Engineer, for review, a list of manufacturers of equipment proposed for the work under the Electrical Sections. The intent to use the exact makes specified does not relieve the Contractor of the responsibility of submitting such a list.
- C. If extensive or unacceptable delivery time is expected on a particular item of equipment specified, the Contractor shall notify the Owner and Engineer, in writing, within 30 days of the awarding of the Contract. In such instances, deviations may be made pending acceptance by the Engineer or the Owner's representative.
- D. Where any specific material, process or method of construction or manufactured article is specified by reference to the catalog number of a manufacturer, the Specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the Drawings. In all cases, the Electrical Contractor shall verify the duty specified with the specific characteristics of the equipment offered for review. Equipment characteristics are to be used as mandatory requirements where the Contractor proposes to use an acceptable equivalent.
- E. If material or equipment is installed before it is reviewed and/or approved, the Contractor shall be liable for its removal and replacement at no extra charge to the Owner if, in the opinion of the Engineer, the material or equipment does not meet the intent of, or standard of quality implied by, the Drawings and Specifications.
- F. Failure on the part of the Engineer to reject shop drawings or to reject work in progress shall not be interpreted as acceptance of work not in conformance with the Drawings and/or Specifications. Work not in conformance with the Drawings and/or Specifications shall be corrected whenever it is discovered.

1.24 RECORD DRAWINGS

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - 1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
 - 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
 - 3. Note related Change Order numbers where applicable.
 - 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

5. Final record documents shall be prepared in the latest AutoCad and/or Revit version and digital media for all drawings and a clean set of reproducible paper copies shall be turned over to the Owner at the completion of the work.

1.25 WARRANTIES AND BONDS

- A. The following general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties are to be included:
 1. General close-out requirements included in Section "Project Close-out."
 2. Specific requirements for warranties for the Work and products and installation that are specified to be warranted, are included in the individual Sections of Divisions 02 through [50].
 3. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the 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 Contractor.
- C. Separate Prime Contracts: Each prime Contractor is responsible for warranties related to its own Contract.

1.26 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, right and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
- E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

- F. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.
- H. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within fifteen days of completion of that designated portion of the Work.
- I. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Engineer for approval prior to final execution.
 - 1. Refer to individual Sections of Divisions 2 through [16][50] for specific content requirements, and particular requirements for submittal of special warranties.
- J. Form of Submittal: At Final Completion compile two copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- K. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2" by 11" paper.
 - 1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address and telephone number of the installer.
 - 2. Identify each binder on the front and the spine with the typed or printed title "WARRANTIES AND BONDS," the Project title or name, and the name of the Contractor.
 - 3. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

1.27 GUARANTEES

- A. The Contractor shall guarantee all material and workmanship under these Specifications and the Contract for a period of two (2) years from the date of final acceptance by Owner. During this guarantee period, all defects developing through faulty equipment, materials or workmanship shall be corrected or replaced immediately by this Contractor without expense to the Owner. Such repairs or replacements shall be made to the Engineers satisfaction.

- B. Contractor shall provide name, address, and phone number of all contractors and subcontractors and associated equipment they provided

1.28 PROJECT CLOSE-OUT

- A. Contractor shall submit annual maintenance proposal to the Architect/Engineer for review and approval as part of the close out documents.
- B. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- C. Deliver tools, spare parts, extra stock, and similar items.
- D. Complete start-up testing of systems, and instruction of the Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- E. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- F. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
 - 1. The Engineer will repeat inspection when requested and assured that the Work has been substantially completed.
 - 2. Results of the completed inspection will form the basis of requirements for final acceptance.

END OF SECTION

Electronic File Release Form

DELIVERY OF ELECTRONIC FILES FOR: _____
Project Name

In accepting and utilizing any drawings or other data on any form of electronic media generated and provided by the Design Professional, the Client covenants and agrees that all such drawings and data are instruments of service of the Design Professional, who shall be deemed the author of the drawings and data, and shall retain all common law, statutory law and other rights, including copyrights.

The Client further agrees not to use these drawings and data, in whole or in part, for any purpose or project other than the project which is the subject of this Agreement. The Client agrees to waive all claims against the Design Professional resulting in any way from any unauthorized changes or reuse of the drawings and data for any other project by anyone other than the Design Professional.

In addition, the Client agrees, to the fullest extent permitted by law, to indemnify and hold the Design Professional harmless from any damage, liability or cost, including reasonable attorneys' fees and costs of defense, arising from any changes made by anyone other than the Design Professional or from any reuse of the drawings and data without the prior written consent of the Design Professional.

Under no circumstances shall transfer of the drawings and other instruments of service on electronic media for use by the Client be deemed a sale by the Design Professional, and the Design Professional makes no warranties, either express or implied, of merchantability and fitness for any particular purpose.

_____ Client's Signature	_____ Date
_____ Company - Title	
_____ Architects' Signature	_____ Date
_____ Firm - Title	
_____ Owner's Signature	_____ Date
_____ Company - Title	

SECTION 26 05 01

ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Prior to beginning work, test the existing systems as appropriate and document all deficiencies affecting the work under this contract to the architect and owner. Provide a cost proposal for recommended solutions. Do not proceed with the corrective work until authorized by the owner or their appointed representatives.
- B. Electrical demolition.

1.2 RELATED REQUIREMENTS

- A. Division 01 – General Requirements / Supplementary Conditions paragraph.
- B. Section 01 33 24 - Electronic Submittal Procedures
- C. Section 26 00 01 – Electrical Filed Sub-bid.
- D. Section 26 04 00 – General Conditions for Electrical Trades.

1.3 SUBMITTALS

- A. Division 01 – General Requirements/Supplementary Conditions Paragraph.
- B. Section 26 04 00 – General Conditions for Electrical Trades.
- C. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. It is the Contractor's responsibility to modify the existing systems in a phased fashion and be maintained outside of the phased area of work. Maintain operation of the existing systems during phased demolition. Devices are to be removed back to the next device outside of the area of work. Extend circuits with wiring to match existing as required to

maintain continuity of circuits upstream and downstream of the work affected by demolition. Protect existing devices during construction. Take devices off-line if necessary, coordinate bypassing and reactivation of the devices with the Owner.

- B. Demolition is to be performed in a selective, phased fashion and performed to maintain existing systems in areas remaining operational. It is the contractor's responsibility to coordinate disruption of systems or circuits and to investigate all circuiting and devices scheduled for removal. Provide temporary measures to maintain existing systems and circuits as required. Refer to phasing plans and coordinate all phasing work with the CM/GC and Owner.
- C. Verify field measurements and circuiting arrangements are as shown on Drawings.
- D. Verify that abandoned wiring and equipment serve only abandoned facilities.
- E. Demolition drawings are based on limited field observation and existing record documents where available.
- F. Report discrepancies to Architect/Engineer before disturbing existing installation.
- G. Beginning of demolition means installer accepts existing conditions.
- H. Contractor shall modify existing circuits, when existing devices are removed, as required to maintain circuit continuity.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company and the Owner.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Phased Construction: Provide temporary equipment, wiring, conduit, labor and materials as required to maintain operation of existing systems during all phases of construction.
- E. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 72 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 2. PCB- and DEHP-containing lighting ballasts.
 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
 - C. Remove abandoned wiring to source of supply.
 - D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
 - E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
 - F. Disconnect and remove abandoned panelboards and distribution equipment.
 - G. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
 - H. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
 - I. Repair adjacent construction and finishes damaged during demolition and extension work.
 - J. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
 - K. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

- A. Division 01 - General Requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 05 19

ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Nonmetallic-sheathed cable.
- C. Underground feeder and branch-circuit cable.
- D. Service entrance cable.
- E. Metal-clad cable.
- F. Wiring connectors.
- G. Electrical tape.
- H. Heat shrink tubing.
- I. Wire pulling lubricant.
- J. Cable ties.

1.2 RELATED REQUIREMENTS

- A. Division 01 – General Requirements / Supplementary Conditions paragraph.
- B. Section 01 33 24 - Electronic Submittal Procedures
- C. Division 07 – Thermal and Moisture Protection.
- D. Section 26 00 01 – Electrical Filed Sub-bid.
- E. Section 26 04 00 – General Conditions for Electrical Trades.
- F. Section 26 05 01 – Electrical Demolition : Disconnection, removal, and/or extension of existing electrical conductors and cables.
- G. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- H. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

I. Division 31 - Trenching: Excavating, bedding, and backfilling.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate the installation of direct burial cable with other trades to avoid conflicts with piping or other potential conflicts.
3. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
4. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

A. See Division 01 – General Requirements.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.

D. Manufactured Wiring System Shop Drawings: Provide plan views indicating proposed system layout with components identified; indicate branch circuit connections.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Division 01 – General Requirements.
2. Extra Manufactured Wiring System Cable Assemblies: One of each configuration, 6 foot lengths.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted, unless noted otherwise.
- D. Service entrance cable is not permitted, unless noted otherwise.
- E. Armored cable is not permitted.
- F. Metal-clad cable is permitted as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet.
 - b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
 - 1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.
 - 2. In addition to other applicable restrictions, may not be used:
 - a. Life Safety or Critical Power.
 - b. Homeruns from first device, such as lighting fixture, MEP equipment, wiring device to panelboards.
 - c. Where not approved for use by the authority having jurisdiction.
 - d. Where exposed to view.

- e. Where exposed to damage.
- f. For damp, wet, or corrosive locations.
- g. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.
- h. For patient care areas requiring redundant grounding, unless using HCFC Type cable.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide conductors and cables with lead content less than 300 parts per million.
- D. Provide new conductors and cables manufactured not more than one year prior to installation.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- F. Comply with NEMA WC 70.
- G. Comply with FS A-A-59544 where applicable.
- H. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- I. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- J. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- K. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
- L. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- M. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- N. Conductor Material:
 - 1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, or ASTM B8 unless otherwise indicated.
 - 2. Tinned Copper Conductors: Comply with ASTM B33.
 - 3. Aluminum Conductors: Not Permitted.
- O. Minimum Conductor Size:

ELECTRICAL POWER CONDUCTORS AND CABLES

1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 100 feet 10 AWG minimum, and sized for voltage drop.
 - 2) 20 A, 120 V circuits longer than 165 feet 8 AWG minimum, and sized for voltage drop.
 2. Control Circuits: 14 AWG.
- P. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- Q. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 3. Color Code:
 - a. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - b. Equipment Ground, All Systems: Green.
 - c. Isolated Ground, All Systems: Green with yellow stripe.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.
 - e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
 - f. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Manufacturers:
1. Copper Building Wire:
 - a. Cerro Wire LLC.
 - b. Southwire Company
 - c. General Cable Technologies
 - d. Substitutions: See Section 01 - Product Requirements.
 2. Aluminum Building Wire (only where specifically indicated):
 - a. Encore Wire Corporation
 - b. Southwire Company
 - c. Stabiloy, a brand of General Cable Technologies Corporation
 - d. Substitutions: See Section 01 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Conductor Stranding:
1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.

- b. Size 8 AWG and Larger: Stranded.
- 2. Control Circuits: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 - a. Installed Underground: Type XHHW-2.
 - 2. Aluminum Building Wire (only where specifically indicated): Type XHHW-2.

2.4 NONMETALLIC-SHEATHED CABLE

- A. Manufacturers:
 - 1. Cerro Wire LLC
 - 2. Encore Wire Corporation
 - 3. Southwire Company⁴. General Cable Technologies.
 - 4. Substitutions: See Section 01 - Product Requirements.
- B. Description: NFPA 70, Type NM multiple-conductor cable listed and labeled as complying with UL 719, Type NM-B.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.

2.5 UNDERGROUND FEEDER AND BRANCH-CIRCUIT CABLE

- A. Manufacturers:
 - 1. Cerro Wire LLC.
 - 2. Encore Wire Corporation.
 - 3. Southwire Company.
 - 4. General Cable Technologies.
 - 5. Substitutions: See Section 01 - Product Requirements.
- B. Description: Single conductor insulated wire.
- C. Provide equipment grounding conductor unless otherwise indicated.
- D. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- E. Insulation Voltage Rating: 600 V.
- F. Insulation: Type XHHW-2.

2.6 METAL-CLAD CABLE

- A. Manufacturers:
 - 1. AFC Cable Systems Inc.
 - 2. Encore Wire Corporation
 - 3. Southwire Company
 - 4. General Cable Technologies
 - 5. Substitutions: See Section 01 - Product Requirements.
- B. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- C. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- D. Insulation Voltage Rating: 600 V.
- E. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- F. Provide oversized neutral conductors where indicated or required.
- G. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- H. Grounding: Full-size integral equipment grounding conductor.
 - 1. Provide additional isolated/insulated grounding conductor where indicated or required.
- I. Armor: Steel, interlocked tape.
- J. Provide PVC jacket applied over cable armor where indicated or required for environment of installed location.

2.7 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper conductors 10 AWG and smaller: Install insulated spring wire connectors with plastic caps
 - 2. Copper Conductors Size 8 AWG: Install solderless pressure connectors with insulating covers
 - 3. Copper Conductors Size 6 AWG and larger: Install pressure connectors or split bolt connectors.
- D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
 4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
 5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
 6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
 7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
1. Manufacturers:
 - a. 3M
 - b. Ideal Industries, Inc.
 - c. NSI Industries LLC.
 - d. IlSCO
 - e. Erico
 - f. Substitutions: See Division 01 – General Requirements.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO
 - c. Thomas & Betts Corporation
 - d. Substitutions: See Division 01 – General Requirements.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
1. Manufacturers:
 - a. Burndy LLC.
 - b. IlSCO
 - c. Thomas & Betts Corporation
 - d. Erico
 - e. Substitutions: See Division 01 – General Requirements.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
1. Manufacturers:
 - a. Burndy LLC.

- b. IlSCO
- c. Thomas & Betts Corporation
- d. Substitutions: See Division 01 – General Requirements.

2.8 WIRING ACCESSORIES

- A. Electrical Tape:
 - 1. Manufacturers:
 - a. 3M
 - b. Plymouth Rubber Europa
 - c. Substitutions: See Division 01 – General Requirements.
 - 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F .
 - 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
 - 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
 - 1. Manufacturers:
 - a. 3M
 - b. Burndy LLC.
 - c. Thomas & Betts Corporation
 - d. Substitutions: See Division 01 – General Requirements.
- C. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
 - 1. Manufacturers:
 - a. 3M
 - b. American Polywater Corporation
 - c. Ideal Industries, Inc.
 - d. Substitutions: See Division 01 – General Requirements.
- D. Cable Ties: Material and tensile strength rating suitable for application.
 - 1. Manufacturers:
 - a. Burndy LLC.
 - b. Substitutions: See Section 01 - Product Requirements.
 - 2. Provide plenum rated cable ties.

PART 3 - EXECUTION

3.1 EXISTING WORK

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.
- E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.2 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as shown on the drawings.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.3 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.4 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated and routing is not shown, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are shown as separate, combining them together in a single raceway is not permitted. Where combining branch circuit in a single raceway is indicated:
 - a. Dedicated neutral conductors are considered current-carrying conductors.

- b. Increase size of conductors as required accounting for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
- 7. Common Neutrals: Not allowed.

- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install nonmetallic-sheathed cable (Type NM-B) in accordance with NECA 121.
- E. Install metal-clad cable (Type MC) in accordance with NECA 120.
- F. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
 - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.
- I. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
 - c. Do not use direct-bearing set-screw type fittings for cables with aluminum armor.
 - d. Secure at maximum interval of 5 ft.
 - e. Install parallel and perpendicular to building lines.
 - f. Bundle cables in common routes back to panelboards.
 - g. Secure from structure using suitable J-hooks or plenum rated cable ties.
- J. Install conductors with a minimum of 12 inches of slack at each outlet.
- K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.

- L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- N. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Do not remove conductor strands to facilitate insertion into connector.
 - 3. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
 - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
 - 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
 - 3. Wet Locations: Use heat shrink tubing.
- P. Insulate ends of spare conductors using vinyl insulating electrical tape.
- Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- R. Identify conductors and cables in accordance with Section 26 0553.
- S. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07.

- T. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

- U. Mineral Insulated Cable Installation:
 - 1. The wiring and cable shall be installed according to the manufacturers' recommendations, the instructions in the installation and specifications manual and the requirements of the UL Fire Resistance Directory listing.
 - 2. Provide brass glands, termination kits and fittings from the same manufacturer as the cable. Provide brass plates for entrance fittings to ferrous enclosures per the manufacturer's recommendations.

3.5 FIELD QUALITY CONTROL

- A. See Division 01 – General Requirements.

- B. Inspect and test in accordance with NETA ATS, except Section 4.

- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
 - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground rod electrodes.
- E. Ground plate electrodes.
- F. Ground enhancement material.

1.2 RELATED REQUIREMENTS

- A. Division 01 – General Requirements / Supplementary Conditions paragraph.
- B. Section 01 33 24 - Electronic Submittal Procedures.
- C. Division 03– Concrete.
- D. Division 09 - Finishes.
- E. Section 26 00 01 – Electrical Filed Sub-bid.
- F. Section 26 04 00 – General Conditions for Electrical Trades.
- G. Section 26 05 19 - Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- H. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify exact locations of underground metal water service pipe entrances to building.
 - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
 - 3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.4 SUBMITTALS

- A. See Division 01 – General Requirements.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Shop Drawings.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Field quality control test reports.
- F. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.

- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
 - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:
 - 1. Provide grounding electrode system for each separate building or structure.
 - 2. Provide equipment grounding conductor routed with supply conductors.
 - 3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
 - 4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.
- G. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 - 7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
 - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
 - b. Metal gas piping.
 - c. Metal process piping.
 - 8. Provide bonding for interior metal air ducts.
 - 9. Provide bonding for metal building frame.

10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.
11. Provide bonding and equipment grounding for pools and fountains and associated equipment in accordance with NFPA 70.
12. Provide redundant grounding and bonding for patient care areas of health care facilities in accordance with NFPA 70 and NFPA 99.

2.2 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0519:
 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
 2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gage of specified conductors.
- C. Connectors for Grounding and Bonding:
 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
 - a. Exceptions:
 - 1) Use mechanical connectors for connections to electrodes at ground access wells.
 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
 - a. Exceptions:
 - 1) Use exothermic welded connections for connections to metal building frame.
 4. Manufacturers - Mechanical and Compression Connectors:
 - a. Advanced Lightning Technology (ALT)
 - b. Burndy LLC.
 - c. Harger Lightning & Grounding
 - d. Thomas & Betts Corporation
 - e. Substitutions: See Division 01 - General Requirements.
 5. Manufacturers - Exothermic Welded Connections:
 - a. Burndy LLC.
 - b. Cadweld, a brand of Erico International Corporation
 - c. ThermOweld, a brand of Continental Industries, Inc. Substitutions: See Division 01 - General Requirements.

- D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 2. Size: As indicated.
 3. Holes for Connections: As indicated or as required for connections to be made.
 4. Manufacturers:
 - a. Advanced Lightning Technology (ALT)
 - b. Erico International Corporation
 - c. Harger Lightning & Grounding
 - d. ThermOweld, a brand of Continental Industries, Inc.
 - e. Substitutions: See Division 01 - General Requirements.
- E. Ground Rod Electrodes:
1. Comply with NEMA GR 1.
 2. Material: Copper-bonded (copper-clad) steel.
 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.
 4. Where rod lengths of greater than 10 feet are indicated or otherwise required, sectionalized ground rods may be used.
 5. Manufacturers:
 - a. Advanced Lightning Technology (ALT)
 - b. Erico International Corporation
 - c. Galvan Industries, Inc.
 - d. Harger Lightning & Grounding
 - e. Substitutions: See Division 01 - General Requirements.
- F. Ground Plate Electrodes:
1. Material: Copper.
 2. Size: 24 by 24 by 1/4 inches, unless otherwise indicated.
 3. Manufacturers:
 - a. Advanced Lightning Technology (ALT)
 - b. Erico International Corporation
 - c. Harger Lightning & Grounding
 - d. ThermOweld, subsidiary of Continental Industries
 - e. Substitutions: See Division 01 - General Requirements.
- G. Ground Enhancement Material:
1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.
 2. Resistivity: Not more than 20 ohm-cm in final installed form.
 3. Manufacturers:
 - a. Erico International Corporation
 - b. Harger Lightning & Grounding
 - c. ThermOweld, subsidiary of Continental Industries
 - d. Substitutions: See Division 01 - General Requirements.
- H. Oxide Inhibiting Compound: Comply with Section 26 0519.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as shown on the drawings.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

- A. Remove paint, rust, mill oils, surface contaminants at connection points.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches deep in accordance with NFPA 70 or provide ground plates.
 - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
 - 2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Ground Plate Electrodes: Unless otherwise indicated, install ground plate electrodes at a depth of not less than 30 inches.
- E. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- F. Install in accordance with IEEE 142.
- G. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

- H. Install grounding and bonding conductors concealed from view.
- I. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- J. Install continuous grounding using underground cold water system, driven rods and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.
- K. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.
- L. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.
- M. Permanently attach equipment and grounding conductors prior to energizing equipment.
- N. Common Ground Bonding with Lightning Protection System: Bond electric power system, grounding electrode system directly to lightning protection system earth connection at closest point to electric service grounding electrode. Use bonding conductor sized the same as system grounding conductor and install in conduit.
- O. Identify grounding and bonding system components in accordance with Section 26 0553.

3.4 FIELD QUALITY CONTROL

- A. See Division 01 - General Requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment components for electrical equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

- A. Division 01 – General Requirements / Supplementary Conditions paragraph.
- B. Section 01 33 24 - Electronic Submittal Procedures.
- C. Section 26 00 01 – Electrical Filed Sub-bid.
- D. Section 26 04 00 – General Conditions for Electrical Trades.
- E. Section 26 05 33 – Raceway and Boxes for Electrical Systems: Additional support and attachment requirements for conduits.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. See Division 01: General Requirements.
- B. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components being installed.
 - 2. Coordinate the work with other trades and provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.
- C. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Division 03.

1.4 SUBMITTALS

- A. See Division 01 – General Requirements.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, post-installed concrete, and masonry anchors.

- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Installer's Qualifications: Include evidence of compliance with specified requirements.
- E. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.5 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with latest adopted version of applicable building code, including any addendum or supplements.
- C. Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.
- D. Installer Qualifications for Field-Welding: As specified in Section 260400 General Requirements for Electrical Trades.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 - PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
 - 6. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

- a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, fiberglass or approved equivalent unless otherwise indicated.
 - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
1. Conduit Straps: One-hole or two-hole type; zinc plated steel.
 2. Conduit Clamps: Bolted type unless otherwise indicated.
 3. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation
 - b. Erico International Corporation
 - c. O-Z/Gedney, a brand of Emerson Industrial Automation
 - d. Thomas & Betts Corporation
 - e. Substitutions: See Division 01 - General Requirements.
- C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation
 - b. Erico International Corporation
 - c. O-Z/Gedney, a brand of Emerson IndustrialAutomation
 - d. Thomas & Betts Corporation
 - e. Substitutions: See Division 01 - General Requirements.
- D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
1. Comply with MFMA-4.
 2. Channel Material:
 - a. Indoor Dry Locations: Use galvanized steel.
 - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
 3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
 4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
 5. Manufacturers:
 - a. Cooper B-Line, a division of Eaton Corporation
 - b. Thomas & Betts Corporation
 - c. Unistrut, a brand of Atkore International Inc.
 - d. Substitutions: See Division 01- General Requirements.
 - e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
- E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch diameter.
 - b. Busway Supports: 1/2 inch diameter.
 - c. Single Conduit up to 1 inch trade size: 1/4 inch diameter.
 - d. Single Conduit larger than 1 inch trade size: 3/8 inch diameter.

- e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
 - f. Outlet Boxes: 1/4 inch diameter.
 - g. Luminaires: 1/4 inch diameter.
- F. Anchors and Fasteners:
- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Hollow Masonry: Use toggle bolts.
 - 5. Hollow Stud Walls: Use toggle bolts.
 - 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
 - 7. Sheet Metal: Use sheet metal screws.
 - 8. Wood: Use wood screws.
 - 9. Plastic and lead anchors are not permitted.
 - 10. Powder-actuated fasteners may be used with:
 - a. Permission by Architect.
 - b. Permission by Structural Engineer.
 - c. Use only threaded studs; do not use pins.
 - 11. Hammer-driven anchors and fasteners are permitted as follows:
 - a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction (when specified).
 - b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction (when specified).
 - 12. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch minimum base metal thickness.
 - d. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
 - 13. Manufacturers - Mechanical Anchors:
 - a. Hilti, Inc.
 - b. ITW Red Head, a division of Illinois Tool Works, Inc.
 - c. Powers Fasteners, Inc.
 - d. Simpson Strong-Tie Company Inc.
 - e. Substitutions: See Division 01 - General Requirements.
 - 14. Manufacturers - Powder-Actuated Fastening Systems:
 - a. Hilti, Inc.
 - b. ITW Ramset, a division of Illinois Tool Works, Inc. Powers Fasteners, Inc.
 - c. Simpson Strong-Tie Company Inc.
 - d. Substitutions: See Division 01 - General Requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.

- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated, do not provide support from roof deck.
- F. Do not penetrate, notch, or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Division 03.
 - 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Conduit Support and Attachment: Also comply with Section 26 05 33.
- I. Box Support and Attachment: Also comply with Section 26 05 33.
- J. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- K. Secure fasteners according to manufacturer's recommended torque settings.
- L. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

- A. Division 01 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Conduit Applications
 - 2. General Requirements
 - 3. Galvanized steel rigid metal conduit (RMC).
 - 4. Electrical metallic tubing (EMT).
 - 5. Rigid polyvinyl chloride (PVC) conduit.
 - 6. Wireway
 - 7. Boxes
 - 8. Accessories.

- B. Related Sections:
 - 1. Section 26 00 01 – Electrical Filed Sub-bid.
 - 2. Section 26 04 00 – General Conditions for Electrical Trades.
 - 3. Section 26 05 19 – Electrical Power Conductors and Cables.
 - 4. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
 - 5. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 6. Section 26 05 53 - Identification for Electrical Systems.

1.2 DESIGN REQUIREMENTS

- A. Minimum Raceway Size: 3/4 inch unless otherwise specified.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
 - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.4 SUBMITTALS

- A. See Division 01 – General Requirements.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for all conduits and fittings outlined in Part 2.
- C. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Shop Drawings:
 - 1. Indicate proposed arrangement for conduits to be installed within or under structural concrete slabs, where permitted.
 - 2. Include proposed locations of roof penetrations and proposed methods for sealing.
- E. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs (where permitted), and conduits 2 inch trade size and larger.
- F. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- G. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
- H. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Division 01 – General Requirements.
 - 2. Keys for Lockable Enclosures: Two of each different key.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. See Division 01 – General Requirements
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.
- D. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

1.7 COORDINATION

- A. See Division 01 – General Requirements
- B. Coordinate installation of outlet boxes for equipment connected under Section 260503.
- C. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.
- D. Electrical contractor is responsible to fully coordinate with the site and concrete contractors and all other trades when routing conduit underslab. Routing of conduit underslab may be acceptable, provided spacing of conduits is adequate for proper backfilling of area surrounding conduits. Adequate spacing shall mean using factory made conduit spacers that allow for a minimum of 3-inches for backfilling with sand or 3 times the pipe diameter for backfilling with a structural fill. Proposed conduit routing, installation and methods and backfilling procedures shall be submitted to the Engineer for review prior to installation.

PART 2 - PRODUCTS

2.1 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.
- C. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications listed below. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
 - 1. Underground:
 - a. Under Slab on Grade: Use schedule 40 rigid PVC conduit with galvanized steel rigid metal conduit sweeps. Provide cast metal boxes or nonmetallic handhole. Applications limited to:

- 1) Panelboard feeders
- b. Exterior, Within Trench: Use schedule 40 rigid PVC conduit with galvanized steel rigid metal conduit sweeps. Provide cast metal boxes or nonmetallic handhole.
- c. Exterior, Concrete Encased: Use Type EB rigid PVC conduit. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
2. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT) or MC cable (where allowed).
3. Interior - Damp or Wet Locations - Provide:
 - a. Rigid steel conduit
 - b. Electrical metallic tubing (EMT) with compression fittings
 - c. Schedule 40 PVC conduit
 - d. Provide cast metal or nonmetallic outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.
4. Exposed, Interior dry locations: Use electrical metallic tubing (EMT)
5. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit.
6. Exposed, Exterior: Use galvanized steel rigid metal conduit
7. Connections to Vibrating Equipment:
 - a. Dry Locations: Use flexible metal conduit or MC Cable.
 - b. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
 - c. Maximum Length: 6 feet unless otherwise indicated.
 - d. Vibrating equipment includes, but is not limited to:
 - 1) Motors.
 - 2) Pumps.
 - 3) Fans.

2.2 GENERAL REQUIREMENTS

- A. Fittings for Grounding and Bonding: Also comply with Section 260526.
- B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Minimum Conduit Size, Unless Otherwise Indicated:
 1. Branch Circuits: 3/4 inch trade size.
 2. Branch Circuit Homeruns: 3/4 inch trade size.
 3. Control Circuits: 1/2 inch trade size.
 4. Underground, Interior: 1 inch trade size.
 5. Underground, Exterior: 1 inch trade size.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:
 1. Allied Tube and Conduit.
 2. Western Tube and Conduit.
 3. Wheatland Tube Company.

4. Substitutions: See Division 01 – General Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc.
 - b. O-Z/Gedney.
 - c. Thomas & Betts Corporation.
 - d. Substitutions: See Division 01 – General Requirements
 2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Hazardous (Classified) Locations: Use fittings listed and labeled as complying with UL 1203 for the classification of the installed location.
 4. Material: Use steel or malleable iron.
 5. Do not use die cast zinc fittings.
 6. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:
1. Allied Tube and Conduit.
 2. Western Tube and Conduit.
 3. Wheatland Tube Company.
 4. Substitutions: See Division 01 – General Requirements
- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
1. Manufacturers:
 - a. Bridgeport Fittings Inc
 - b. O-Z/Gedney, a brand of Emerson Industrial Automation
 - c. Thomas & Betts Corporation
 - d. Substitutions: See Division 01 – General Requirements
 2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 3. Material: Use steel.
 4. Connectors and Couplings: Use compression (damp or wet location) or set-screw type elsewhere

2.5 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Manufacturers:
1. Cantex Inc
 2. Carlon, a brand of Thomas & Betts Corporation
 3. JM Eagle
 4. Substitutions: See Division 01 – General Requirements

- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- C. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.6 WIREWAY

- A. Manufacturers:
 - 1. Carlon Electrical Products.
 - 2. Thomas & Betts Corp.
 - 3. Hoffman.
 - 4. Substitutions: See Division 01 – General Requirements
- B. Product Description: Indoor dry: General purpose. Outdoor wet: Raintight.
- C. Knockouts: Manufacturer's standard.
- D. Cover: Hinged cover with full gaskets.

2.7 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
 - 1. Manufacturers:
 - a. Cooper Crouse-Hinds, a division of Eaton Corporation
 - b. Hubbell Incorporated; Bell Products
 - c. Hubbell Incorporated; RACO Products
 - d. Leviton
 - e. O-Z/Gedney, a brand of Emerson Industrial Automation
 - f. Thomas & Betts Corporation
 - g. Substitutions: See Division 01 – General Requirements
 - 2. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

3. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 4. Use cast iron boxes or cast aluminum boxes with threaded hubs where exposed galvanized steel rigid metal conduit is used.
 5. Use cast aluminum boxes with threaded hubs where aluminum rigid metal conduit is used.
 6. Use nonmetallic boxes where exposed rigid PVC conduit is used.
 7. Use suitable concrete type boxes where flush-mounted in concrete.
 8. Use suitable masonry type boxes where flush-mounted in masonry walls.
 9. Use raised covers suitable for the type of wall construction and device configuration where required.
 10. Use shallow boxes where required by the type of wall construction.
 11. Do not use "through-wall" boxes designed for access from both sides of wall.
 12. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 13. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 14. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C.
 15. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 16. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
 17. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep trade size.
 - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep trade size.
- C. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
 2. Size: As indicated on drawings.
 3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches.
 4. Provide logo on cover to indicate type of service.
 5. Applications:
 - a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 15 load rating.
 - b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77, Tier 22 load rating.
 - c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
 6. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
 - a. Manufacturers:
 - 1) Hubbell Incorporated; Quazite Products
 - 2) NewBasis

- 3) MacLean Highline
- 4) Substitutions: See Division 01 – General Requirements
- b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

2.8 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- E. Mechanical Sleeve Seals
 - 1. Manufacturers:
 - a. Thunderline Link-Seal, Inc.
 - b. NMP Corporation.
 - c. PSI Link-Seal.
 - 2. Substitutions: See Division 01 – General Requirements
 - 3. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
 - 4. Use: Provide for all penetrations through foundation walls.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. See Division 01 – General Requirements.
- B. Verify outlet locations and routing and termination locations of raceway prior to rough-in.
- C. Verify that field measurements are as shown on drawings.
- D. Verify that mounting surfaces are ready to receive conduits.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

- B. Remove concealed abandoned raceway to its source.
- C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.
- D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations or as specified.
- F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 260526.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 260529.
- C. Identify raceway and boxes in accordance with Section 260553.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.
- E. Install products in accordance with manufacturer's instructions.
- F. Perform work in accordance with NECA 1 (general workmanship).
- G. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated and routing is not shown, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - e. Interior finished spaces.
 - 5. Conduits installed underslab or embedded in concrete (see section 2.1 where applicable) may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
 - 6. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 7. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 8. Arrange conduit to provide no more than 150 feet between pull points.
 - 9. Route conduits above water and drain piping where possible.
 - 10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.

11. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
 12. Maintain minimum clearance of 12 inches between conduits and surfaces exceeding 104 degrees F. This includes, but is not limited to:
 - a. Heaters.
 - b. Hot water piping.
 - c. Flues.
 13. Group parallel conduits in the same area together on a common rack.
- H. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
 4. Use conduit strap to support single surface-mounted conduit.
 5. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
 6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
 9. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
 10. Use of spring steel conduit clips for support of conduits is not permitted.
 11. Use of wire for support of conduits is not permitted.
- I. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs 6" above finished floor.
 7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
- J. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.

2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable mechanical sleeve seals where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Provide metal escutcheon plates for conduit penetrations exposed to public view.
10. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07 Section 07 8400.

K. Underground Installation:

1. Provide trenching and backfilling in accordance with Division 31.
2. Provide trenching and backfilling in accordance with Division 31.
3. Minimum Cover, Unless Otherwise Indicated or Required:
 - a. Underground, Exterior: 24 inches.
 - b. Under Slab on Grade:
 - 1) Minimum 12 inches to bottom of slab.
 - 2) Depth as required to allow conduit to penetrate perpendicular to slab
4. Provide underground warning tape (exterior below grade) in accordance with Section 260553 along entire conduit length except where concrete-encased.

L. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Division 03 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

M. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

N. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.

2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
 3. Where conduits penetrate coolers or freezers.
- O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- P. Provide grounding and bonding in accordance with Section 260526.
- Q. Identify conduits in accordance with Section 260553.
- R. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
- S. Surface Raceway: Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings.

3.4 INSTALLATION – BOXES

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Install gang box with plaster ring for single device outlets.
- I. Box Locations:
1. Locate boxes to be accessible. Provide access panels in accordance with Division 08 as required where approved by the Architect.
 2. Unless dimensioned, box locations indicated are approximate.
 3. Locate boxes as required for devices installed under other sections or by others.
 4. Locate boxes so that wall plates do not span different building finishes.
 5. Locate boxes so that wall plates do not cross masonry joints.

6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
 8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
 9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260534.
- J. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 260529.
 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
 4. Install stamped steel bridges to fasten flush mounting outlet box between studs.
 5. Install adjustable steel channel fasteners for hung ceiling outlet box.
- K. Install boxes plumb and level.
- L. Install boxes as required to preserve insulation integrity.
- M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- O. Underground Boxes/Enclosures:
1. Install enclosure on gravel base, minimum 6 inches deep.
 2. Flush-mount enclosures located in concrete or paved areas.
 3. Mount enclosures located in landscaped areas with top at 1 inch above finished grade.
 4. Provide cast-in-place concrete collar constructed in accordance with Division 03, minimum 10 inches wide by 12 inches deep, around enclosures that are not located in concrete areas.
 5. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

- P. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Division 07.
- R. Close unused box openings.
- S. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- T. Provide grounding and bonding in accordance with Section 260526.
- U. Identify boxes in accordance with Section 260553.

3.5 INTERFACE WITH OTHER PRODUCTS

- A. Locate outlet boxes to allow luminaires positioned as indicated on reflected ceiling plan.
- B. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.6 ADJUSTING

- A. See Division 01 – General Requirements Adjust flush-mounting outlets to make front flush with finished wall material.
- B. Install knockout closures in unused openings in boxes.

3.7 CLEANING

- A. See Division 01 – General Requirements
- B. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.
- C. Clean exposed surfaces and restore finish.

3.8 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Underground warning tape.
- F. Floor marking tape.
- G. Warning signs and labels.

1.2 RELATED REQUIREMENTS (follow the most currently adopted amended version)

- A. Division 01 – General Requirements / Supplementary Conditions paragraph.
- B. Section 01 33 24 - Electronic Submittal Procedures.
- C. Division 09 - Finishes.
- D. Section 26 00 01 – Electrical Filed Sub-bid.
- E. Section 26 04 00 – General Conditions for Electrical Trades.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.4 SUBMITTALS

- A. See Division 01- General Requirements

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation and installation of product.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. See Division 01 – General Requirements
- B. Accept identification products on site in original containers. Inspect for damage.
- C. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- D. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.7 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature and humidity is lower than recommended by manufacturer.

PART 2 - PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain - that are not already identified - in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify panel name.
 - 2) Identify ampere rating.
 - 3) Identify voltage and phase.
 - 4) Identify power source and circuit number. Include location when not within sight of equipment.
 - 5) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.

- 6) Use typewritten circuit directory to identify load(s) served for panelboards with a door, including spares and spaces
 - b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
 - 3) Identify load(s) served. Include location when not within sight of equipment.
2. Service Equipment:
 - a. Use identification nameplate to identify each service disconnecting means.
 - b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
4. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
5. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
10. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
 - a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches wide, painted in accordance with Division 09.
11. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70
12. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
 - a. Minimum Size: 3.5 by 5 inches.
 - b. Legend: Include orange header that reads "WARNING", followed by the word message "Arc Flash and Shock Hazard; Appropriate PPE Required; Do not operate controls or open covers without appropriate personal protection equipment; Failure to comply may result in injury or death; Refer to NFPA 70E for minimum PPE requirements" or approved equivalent.

- c. Service Equipment: Include the following information in accordance with NFPA 70.
 - 1) Nominal system voltage.
 - 2) Available fault current.
 - 3) Clearing time of service overcurrent protective device(s).
 - 4) Date label applied.
 13. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
 14. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 15. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
 16. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 - a. At each source and load connection.
 - b. Within boxes when more than one circuit is present.
 - c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
 - d. In cable tray, at maximum intervals of 20 feet.
 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
 5. Use underground warning tape to identify direct buried cables.
- D. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
 2. Use voltage markers or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
 - a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
 - 1) Color Code:

- a) Emergency Power System: Red.
 - (1) Life Safety Branch: YELLOW.
 - (2) Critical Branch: RED.
 - (3) Equipment Branch: GREEN.
 - b) Fire Alarm System: Red.
 - 2) Field-Painting: Comply with Division 09.
 - 3) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 5. Use underground warning tape to identify underground raceways.
 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Manufacturers:
 - a. Brimar Industries, Inc.
 - b. Kolbi Pipe Marker Co.
 - c. Seton Identification Products
 - d. Substitutions: Division 01 - General Requirements.
2. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
 - a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:
 - a. Brady Corporation
 - b. Brother International Corporation
 - c. Panduit Corp.
 - d. Substitutions: Division 01 - General Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.

- a. Use only for indoor locations.
 3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.
- C. Format for Equipment Identification:
1. Minimum Size: 1 inch by 2.5 inches.
 2. Legend:
 - a. System designation where applicable:
 - 1) Emergency Power System: Identify with text "EMERGENCY".
 - 2) Life Safety Branch: Identify with text "LIFE SAFETY"
 - 3) Critical Branch: Identify with text "CRITICAL"
 - 4) Equipment Branch: Identify with text "EQUIPMENT"
 - 5) Fire Alarm System: Identify with text "FIRE ALARM".
 - b. Equipment designation or other approved description.
 - c. Other information as indicated.
 3. Text: All capitalized unless otherwise indicated.
 4. Minimum Text Height:
 - a. System Designation: 1 inch.
 - b. Equipment Designation: 1/2 inch.
 - c. Other Information: 1/4 inch.
 - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
 5. Color:
 - a. Normal Power System: White text on black background.
 - b. Emergency Power System: White text on red background.
 - 1) Life Safety Branch: White text on YELLOW background.
 - 2) Critical Branch: White text on RED background.
 - 3) Equipment Branch: White text on GREEN background.
 - c. Fire Alarm System: White text on red background.

2.3 WIRE AND CABLE MARKERS

- A. Manufacturers:
1. Brady Corporation
 2. HellermannTyton
 3. Panduit Corp.
 4. Substitutions: Division 01 - General Requirements.
- B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
1. Do not use self-adhesive type markers.
- C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- D. Legend: Power source and circuit number or other designation indicated.
- E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
1. Do not use handwritten text.

- F. Minimum Text Height: 1/8 inch.
- G. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

- A. Manufacturers:
 - 1. Brady Corporation
 - 2. Brimar Industries, Inc.
 - 3. Seton Identification Products
 - 4. Substitutions: Division 01 - General Requirements.
- B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- D. Minimum Size:
 - 1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
 - 2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
 - 4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.
- E. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
 - a. Emergency Power System: Text "EMERGENCY".
 - b. Other Systems: Type of service.
- F. Color: Black text on orange background unless otherwise indicated.

2.5 UNDERGROUND WARNING TAPE

- A. Manufacturers:
 - 1. Brady Corporation
 - 2. Brimar Industries, Inc.
 - 3. Seton Identification Products
 - 4. Substitutions: Division 01 - General Requirements.
- B. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.
- C. Legend: Type of service, continuously repeated over full length of tape.
- D. Color:
 - 1. Tape for Buried Power Lines: Black text on red background.
 - 2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

2.6 WARNING SIGNS AND LABELS

- A. Manufacturers:
 - 1. Brimar Industries, Inc.
 - 2. Clarion Safety Systems, LLC.
 - 3. Seton Identification Products
 - 4. Substitutions: Division 01 - General Requirements.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
 - 1. Materials:
 - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
 - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
 - 2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
 - 3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - a. Do not use labels designed to be completed using handwritten text.
 - b. Provide polyester overlamine to protect handwritten text.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Elevated Equipment: Legible from the floor or working platform.
 - 4. Branch Devices: Adjacent to device.
 - 5. Interior Components: Legible from the point of access.
 - 6. Conduits: Legible from the floor.
 - 7. Boxes: Outside face of cover.
 - 8. Conductors and Cables: Legible from the point of access.
 - 9. Devices: Outside face of cover.

- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
 - 1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 12 inches below finished grade.
- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 FIELD QUALITY CONTROL

- A. See Division 01 - General Requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General panelboards
- B. Power distribution panelboards.
- C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

- A. Division 01 – General Requirements / Supplementary Conditions paragraph.
- B. Section 01 33 24 - Electronic Submittal Procedures.
- C. Section 26 00 01 – Electrical Filed Sub-bid.
- D. Section 26 04 00 – General Conditions for Electrical Trades.
- E. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- F. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- G. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
 - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.4 SUBMITTALS

- A. See Division 01 – General Requirements.

- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
 - 1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
 - 1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
 - 2. Include wiring diagrams showing all factory and field connections.
 - 3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
 - 4. Include documentation of listed series ratings upon request.
- D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.
- E. Field Quality Control Test Reports.
- F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.
- I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Division 01 - Product Requirements, for additional provisions.
 - 2. Panelboard Keys: Two of each different key.
 - 3. See Section 262813 for requirements for spare fuses and spare fuse cabinets.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. ABB/GE.
- B. Eaton Corporation.
- C. Schneider Electric; Square D Products.
- D. Siemens Industry, Inc.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet.
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
 - 2. Listed series ratings are acceptable, except where not permitted by motor contribution according to NFPA 70.

3. Label equipment utilizing series ratings as required by NFPA 70.
- D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 1.
 2. Outdoor Locations: Type 3R.
 - a. Furnish thermostatically controlled electric heaters sized to prevent condensation under expected weather conditions at Project site. Furnish control power transformer and terminals for separate connection of heater power circuit.
 - b.
 3. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - b. Increase gutter space as required where sub-feed lugs, feed-through lugs, gutter taps, or oversized lugs are provided.
 - c. Provide removable end walls for NEMA Type 1 enclosures.
 - d. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
 4. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
 5. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

- K. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided, list and label panelboards as a complete assembly including surge protective device.
- L. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- M. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- N. Load centers are not acceptable.
- O. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Feed-through lugs.
 - 2. Sub-feed lugs.

2.3 POWER DISTRIBUTION PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase and Neutral Bus Material: Tin plated copper.
 - 2. Ground Bus Material: Copper.
 - 3. Terminations: 75°C.
- D. Circuit Breakers:
 - 1. Provide bolt-on type. .
 - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
 - 3. Provide electronic trip circuit breakers where indicated.
- E. Circuit breakers rated 1200 amps and above shall have Long time, Short time, Instantaneous and Ground fault protection (LSI) functions. These functions shall similar to those functions found on a Square D PowerPact circuit breaker. Circuit breaker shall have energy reduction maintenance setting (ERMS) system. Provide the following;
 - 1. Energy Reduction Maintenance Setting Switch (ERMS)
 - a. For the circuit breakers above 1200 amps, provide a maintenance OFF ON selector switch on the compartment door to switch the circuit breaker instantaneous tripping characteristics to an alternate setting temporarily during maintenance activity.
 - b. Provide a lock feature for the ERMS switch so that it may be locked in either the OFF or ON maintenance mode position.
 - c. Provide a blue LED indicating light to indicate trip unit is in the ERMS mode.

- F. Enclosures:
1. Provide surface-mounted enclosures unless otherwise indicated.
 2. Fronts: Provide trims to cover access to load terminals, wiring gutters, and other live parts, with exposed access to overcurrent protective device handles.
 3. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 4. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 5. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
 - 2) 14,000 rms symmetrical amperes at 480 VAC.
 - b. Series Rated Systems: Provide circuit breakers listed in combination with upstream devices to provide interrupting rating not less than the short circuit current rating indicated.
 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Provide compression lugs where indicated.
 - c. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 225 amperes and larger.
 - b. Provide interchangeable trip units where indicated.
 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 6. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
 - c. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Combination type listed as complying with UL 1699.
 - d. 100 Percent Rated Circuit Breakers: Listed for application within the panelboard where installed at 100 percent of the continuous current rating.
 - e. Current Limiting Circuit Breakers: Without using fusible elements, designed to limit the let-through energy to a value less than the energy of

a one-half cycle wave of the symmetrical prospective current when operating within its current limiting range.

7. Provide listed switching duty rated circuit breakers with SWD marking for all branch circuits serving fluorescent lighting.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.

2.5 SOURCE QUALITY CONTROL

- A. See Division 01 – General Requirements.
- B. Factory test panelboards according to NEMA PB 1.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required supports in accordance with Section 260529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- I. Provide minimum of six spare 1 inch trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.

1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.
 2. Terminate branch circuit isolated grounding conductors on isolated/insulated ground bus only. Do not terminate on solidly bonded equipment ground bus.
- K. Install all field-installed branch devices, components, and accessories.
- L. Energy Reduction Maintenance Switch:
1. Installation of ERMS maintenance lockable selector switch and blue indicating light onto compartment door of the circuit breaker. Installation of the IO module and the IFE module in accordance with manufactures recommendations.
 - a. Set point for the ERMS instantaneous is based on manufactures recommendations. For Square D Power Pact circuit breaker (Basis of design) the default programmed setting to the instantaneous (li) set point is $2 \times I_n$.
- M. Install a permanent label indicating the panelboard where the power supply to the panel originates.
- N. Set field-adjustable circuit breaker tripping function settings as indicated.
- O. Provide filler plates to cover unused spaces in panelboards.
- P. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
1. Emergency and night lighting circuits.
 2. Fire detection and alarm circuits.
 3. Communications equipment circuits.
 4. Intrusion detection and access control system circuits.
 5. Video surveillance system circuits.
- Q. Identify panelboards in accordance with Section 260553.

3.3 FIELD QUALITY CONTROL

- A. See Division 01 - General Requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 800 amperes. Tests listed as optional are not required.
1. Perform insulation-resistance tests on all control wiring with respect to ground.
 2. Test functions of the trip unit by means of secondary injection.
- D. Test GFCI circuit breakers to verify proper operation.
- E. Test AFCI circuit breakers to verify proper operation.

- F. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.
- G. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

- A. See Division 01 – General Requirements.
- B. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- C. Adjust alignment of panelboard fronts.
- D. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

- A. See Division 01 – General Requirements.
- B. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- C. Repair scratched or marred exterior surfaces to match original factory finish.

3.6 PROTECTION

- A. Protect installed panelboards from subsequent construction operations.

END OF SECTION

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. 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 321313 – CONCRETE PAVING
 3. Section 329000 – TURF & GRASSES

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: site utility lines and structures, walks, pavements, lawns, fields and plantings.
 2. Compacted structural fill where indicated on the Drawings or where required below building areas.
 3. Processed aggregate for pavements and other improvements.
 4. Crushed Stone and porous fill for pavements,
 5. General fill for establishing project sub-grades under paved areas and where shown on the Drawings.
 6. 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.
 7. Utility bedding material for site utilities.
 8. Securing trenching permit
 9. Protecting existing buildings, utilities, roads, pavements, lawns, plantings and other improvements from damage due to construction.
 10. Excavation & Backfill within the building for all underground Plumbing, subsoil drainage, conduits, and the like.
 11. 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 23 04 00 - General Conditions for Mechanical Trades
 2. Section 26 00 00 – Electrical
 3. Section 31 10 00 – Site Preparation
 4. Section 31 25 00 – Erosion and Sedimentation Controls
 5. Section 32 13 13 – Concrete Paving
 6. Section 32 92 00 – Turf & Grasses

- 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. 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.
- H. 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.
- I. Subbase Course: Layer placed between the subgrade and base course for pavement or other site improvements.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- K. 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.
- L. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- M. SSHB: “Standard Specifications for Highways and Bridges”, Commonwealth of Massachusetts, Massachusetts Highway Department, 1988 edition, including all supplements to date.
- N. 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.
- D. 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
- E. 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.
- F. 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.

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 ± 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 ± 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
3/4 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 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 displayed 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 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 Contractor is to submit an Erosion Control Plan in accordance with the site work to be performed. 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,
 - 3. 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 311000 – SITE PREPARATION
 - 2. Section 312000 – EARTH MOVING
 - 3. Section 321313 – CONCRETE PAVING
 - 4. Section 3292 19- SEEDING FOR LAWN AREAS

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 mulch 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 runoff 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 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 312000 – EARTH MOVING
 2. 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

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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.

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- 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

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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, ¾ 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.

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- 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.

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- 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.

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- 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 power 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.

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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.
- 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.

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- 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 92 19
SEEDING FOR LAWN AREAS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Section 32 91 01 -Soil Preparation for Lawn Establishment

1.2 DESCRIPTION OF WORK

- A. Provide all materials, equipment, and labor necessary to complete the work as indicated on the drawings or as specified herein.
- B. The principal work of this section includes, but may not be limited to, the following:
 - 1. Application of seed
 - 2. Application of weed control
 - 3. Maintenance of seeded areas
 - 4. Acceptance of seeding
- C. In general, seeded areas shall, at a minimum, include all areas of site within project limit lines that have been disturbed or are barren unless otherwise noted on the plans. Overseeding of established lawn areas, if required on plans, shall also extend to the limit of disturbance (LOD), unless otherwise noted with a different seed mix, refer to Plans.

1.3 QUALITY ASSURANCE

- A. Subcontract seeding work to a firm specializing in such work unless Contractor is fully experienced and qualified.
- B. Selected installer/ contractor shall employ a person certified by ASBA in the construction of natural grass athletic fields CFB-N. The contractor shall employ and maintain for the term of the contract an ASBA certified natural turf field builder on staff to ensure quality control in all aspects of a project conducted under this solicitation. Failure of the bidder to meet this requirement in its response will be deemed non-responsive. Credentials shall be submitted prior to beginning any work.
- C. Each seed bag or container shall display a label which identifies the contents as a true representation of the seed mix and percentages required by specification. No seed shall be applied to a site until display labels are submitted to the Owner's representative and has determined the mixture meets all requirements.
- D. Do not make substitutions without written approval. If specified seed mixes are not available, obtain approval for substitution from the Owner's representative.

1.4 SUBMITTALS

- A. Certifications and/or blue tag labels of proposed seed mixtures stating common and

scientific names of grasses, percentages by weight, and percentages of purity and germination.

- B. Product information for all proposed weed control chemicals.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect all products from weather or other damaging or deteriorating conditions.
- B. Seed mixes which have been damaged or have deteriorated in transit or storage are not acceptable.
- C. Seeding Schedule: Prepare a proposed seeding schedule. Schedule dates for each type of landscape work during normal seasons for such work.
 - 1. Seeding:
 - March 15 - June 30
 - August 15 - October 15
- D. Correlate with specified maintenance periods to provide maintenance to date of acceptance. Once the schedule is accepted, dates shall be revised and submitted in writing for reasons of delay.

1.6 WARRANTY

- A. Warranty seeding until final acceptance of grass stand. Final acceptance is defined in Part 3 of this specification.

1.7 MAINTENANCE

- A. Maintenance of seeding to be performed by the installer to ensure plant survival and to eliminate undesirable species includes:
 - 1. Watering
 - 2. Mowing
 - 3. Regrading and replanting eroded areas
 - 4. Seeding or patching sparse or bare areas
 - 5. Debris removal
 - 6. Replacement of damaged or dead material
 - 7. Additional fertilizations
 - 8. Additional weed control
- B. Maintain seeded areas immediately after placement until seed areas are accepted as outlined in Part 3 of this specification.

PART 2 - PRODUCTS

2.1 MULCH

- A. Hydro mulch: Shall be a Bonded Fiber Matrix Hydraulically applied erosion system, consisting of long strand, virgin wood fibers (90% by weight), bound together by a pre-blended, high-strength polysaccharide polymer adhesive (10% by weight). The virgin wood fibers shall be thermo-mechanically defibrated from clean whole wood chips, containing a minimum of 25% of the fibers averaging 10 mm long, with a minimum of 50% or more retained on a #24 mesh screen. The organic binders shall be a high

viscosity. Fiber shall not be produced from recycled material such as sawdust, paper or cardboard.

- B. The bonded fiber matrix shall be of such character that it will disperse uniformly into a slurry when mixed with water. The slurry, when hydraulically applied to the ground, shall form an absorptive mat of mulch. No materials which inhibit growth or germination shall be present in the mixture.

2.2 SEED

- A. General: Pure, live, fresh seed from commercial sources meeting and labeled in accordance with State and Federal laws, rules and regulations. All seed to have minimum germination rate of 90%.
 - 1. Seed mix for all athletic field lawn areas with the limit of disturbance not otherwise noted to receive seed shall conform to the following grass types and percentages:
 - a. 25% Improved Perennial Rye
 - 25% Creeping Red Fescue
 - 18.5% Turf Type Tall Fescue
 - 5% Ky Bluegrass 98/85
 - 1% Red top
 - .5% Colonial Bentgrass
 - 1) Turfgrass Water Conservation Alliance or
 - 2) Alliance for Low Input Sustainable Turf 'A List'
- Sowing Rate: 5 to 7 pounds per 1,000 sq. ft.
Overseed Sowing Rate: 2 to 3 pounds for 1,000 sq. ft.

2.3 WEED CONTROL

- A. Pre-emergent weed control for Loam and Seed Areas shall be Tenacity or approved equal. Deliver in manufacturer's fully identified containers and apply according to manufacturer's directions.
- B. Contractor shall notify Owners Project Manager 4 days prior to anticipated application, time, and type of pre-emergent weed control.

2.4 WATER

- A. Clean, fresh potable water free of salt and other impurities injurious to vegetation. Site irrigation may be used.

2.5 JUTE MESH

- A. Jute mesh shall be uniform, open, plain weave of undyed and unbleached single jute yarn, a minimum of four (4) feet in width plus or minus one (1) inch. There shall be 78 warp ends per width and 41 weft ends per yard. Weight shall average 1.22 pounds per linear yard, plus or minus 5%. Staples for Erosion Control Materials: 9 gauge staples shall be used with jute mesh: 11 gauge with woven paper.

PART 3 - EXECUTION

3.1 GENERAL

- A. Seeded areas shall, at a minimum, include all areas of site within project limit lines that have been disturbed or are barren unless otherwise noted on the plans.

- B. Any seeded areas that are rutted or eroded due to construction, weather or otherwise damaged shall be the responsibility of the contractor to correct.
- C. Multi-phased projects may have different seeding times based on each phase. It is the contractor's responsibility to follow the specifications herein for each phase of construction.

3.2 APPLICATION OF SEED

- A. Seeding operations shall not occur until the seed bed has been approved per Specification 32 91 01, Section 3.3, A.
- B. The approved seed mixture shall be applied at a rate indicated in Section 2.2, herein, by means of a seeder device capable of penetrating ground to depth of 1". Seeder machine shall be equipped with disc-type penetrating action and seeder tubes which plant seeds. Seeder shall be similar to Jacobson Model 524-100, 548100 or equal.
- C. Distribute seed over area in two separate passes, each one perpendicular to the other (north-south, east-west orientation). Each pass shall be in a linear progression, and shall conform to the field direction that permits the longest straight line application procedure.
- D. Hydro mulch shall be applied to seeded areas after seeding has occurred on athletic fields.
- E. Hydroseeding will be permitted only with permission of Owner's Representative. All requests shall be in writing with detailed and itemized procedure to be followed.
- F. Broadcast seeding will be permitted only with permission of Owner's Representative. All requests shall be in writing with detailed and itemized procedure to be followed.

3.3 APPLICATION OF FERTILIZER

- A. Complete fertilizer in granular form shall be applied per Specification 32 91 01 – Soil Preparation for Lawn Establishment.

3.4 APPLYING JUTE MESH

- A. Jute mesh shall be applied to any slopes 4:1 or steeper.
- B. Apply jute mesh loosely but smoothly to fit the contour of the finished grade, parallel to and in same direction as the flow of water. The up-slope end of each separate strip or piece of jute mesh shall be buried in a six (6) inch minimum vertical anchor slot or junction slot with the soil tamped firmly against the mesh. Where more than one width of material is required, edges shall overlap a minimum of twelve (12) inches, and the up-slope section of mesh will be on top. Down-hill ends of the jute mesh shall be folded under approximately four (4) inches and stapled in place. Staples will be inserted through the mesh along edges, overlaps, and in the center of all jute mesh strips at intervals not greater than three (3) feet. All anchor slots, junction slots, check slots, and terminal folds shall have five (5) staples spaced not more than nine (9) inches on center across widths.
- C. On seeded banks, jute shall be applied immediately after seeding.

3.5 ACCEPTANCE OF SEEDING FOR GENERAL LAWN AREAS

- A. PROVISIONAL APPROVAL FOR GENERAL LAWN AREAS

1. Provisional approval shall be considered after a minimum of ONE full growing season per the seeding schedule, Section 1.5, C, herein. In order for provisional approval to be granted, the Contractor shall request in writing to the Owner's Representative that he/she is ready to have the seeded areas reviewed. The following requirements shall be met.
2. Provisional approval will not occur until after one full growing season. The seeded areas must be well established, exhibiting a vigorous growing condition and devoid of bare spots greater than 1 square foot.
3. It will be the contractor's responsibility to maintain seeded areas from the time of seed installation until the date of Final Acceptance. See Section 1.7, herein for maintenance requirements.
4. Provisional approval will not be granted until contractor has obtained, in writing, a statement from the landscape architect indicating that grass is satisfactory under the terms of the provisional approval.

Following are some examples of delays in provisional approval of seeded areas:

Improper grading:

- a. -Low or high spots on flat or fairly level areas
- b. -Improper drainage
- c. -Washed out or rilled areas
- d. -Exposed debris or other deleterious matter
- e. -Compacted soils

Turf Grass Conditions

- f. -Poor or thin stands of lawn
- g. -Improper fertilization application
- h. -Persistent weeds established in turf areas

3.6 FINAL ACCEPTANCE FOR GENERAL LAWN AREAS

- A. In order for final acceptance to be granted, the Contractor shall request in writing to the Owner's Representative that he/she is ready to have the seeded areas reviewed and the following requirements shall be met.
 1. All seeded areas have been maintained by the Contractor for not less than ONE growing season from the time provisional approval is granted. Growing season shall be defined as follows:
 - a. If provisional approval is received during April, May, June or July, next growing season shall end on October 15.
 - 1) If provisional approval is received during September, October, November or December, next growing season shall end on June 1.
 2. Inspection will be made by the Owner's Representative and the Landscape Architect. Grass areas not demonstrating satisfactory stands as outlined above, (except if damaged by vandalism) as determined, by the L.A. shall be renovated, re-seeded, and maintained meeting all requirements as specified herein. Maintenance period shall extend to the end of the next growing season, see Section 3.5, B,1 herein.
 3. After all necessary corrective work has been completed, the Landscape Architect will submit in writing recommending to the Owner's Representative that Final Acceptance shall be granted.
 4. One application of turf maintenance fertilizer shall be applied before final

acceptance of seeded areas can be granted.

5. Decision of Owner's Representative as to the necessity to replace grass areas or repair any defects in workmanship, or cause of any destruction or loss, impairment or failure to flourish, shall be conclusive and binding upon Contractor. Replacements shall be the same as specified. All replacements shall be planted as specified herein at Contractor's expense.
6. "Vandalism", as noted above, is intended to mean any acts, whether intentional or accidental, by other persons, which clearly result in damage, and which may reasonably be considered to be beyond the Contractor's reasonable control, as determined by the Owner's representative.

3.7 MAINTENANCE FOR GENERAL LAWN AREAS

- A. Contractor is responsible for maintaining lawn areas for the growing seasons as outlined in 3.5, A and B herein.
- B. Maintain grassed areas by watering, mowing, fertilizing, weeding, debris removal and trimming.
- C. The Contractor shall mow all established seeded areas. No mowing shall remove more than one-third of the grass blade length. Heavy mowing, resulting in grass on the surface shall be "doubled mowed" or the contractor shall remove grass on surface. The grass shall be mown to a height of two and one half to three inches (2-2.5" for athletic fields and 2.5-3" for general lawns).
- D. The Contractor shall keep all seeded areas watered and in good condition, reseeding if and when necessary to meet the requirements specified herein.
- E. Watering of seeded areas.
 1. During this period, water grass as necessary to maintain an adequate supply of moisture within the root zone. An adequate supply of moisture is the equivalent of two (2) inches of absorbed water per week that is delivered at weekly intervals in the form of natural rain or is augmented by watering by the contractor.
- F. Repair areas damaged by erosion or construction activities by regrading, rolling and replanting.
- G. Reseed small, sparse grass areas. When sparse areas exceed 20 percent of planted area, reseed and hydro mulch.

END SECTION 32 92 19

APPENDIX A

ASBESTOS ABATEMENT SPECIFICATION AND REPORT

SECTION 02 08 00
ASBESTOS ABATEMENT

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

- A. The General Provisions of the contract, including General and Supplementary Conditions and applicable provisions of Division 1 - General Requirements, apply to the work specified within this Section.
- B. Examine all conditions as they exist at the Project prior to submitting a bid for the work of this Section.
- C. All provisions of this Section relating to the health and safety of workers and the general public, as well as protection of the environment, are minimum standards. The General Contractor and the Asbestos Contractor are responsible for determining whether any additional and/or more stringent protective measures are required by any legal requirements or prudent, conservative work practices and implementing such measures if deemed necessary. Nothing in this Section shall be deemed to relieve the General Contractor and the Asbestos Contractor from any liability with respect to any such legal requirements or requirement of prudent, conservative practice.
- D. All work-site preparations and practices will be conducted in accordance with all Federal, Massachusetts, and appropriate City and other local regulations, standards, and codes pertaining to worker health protection, protection of the public health and the environment, including current US Environmental Protection Agency (EPA), Department of Labor Occupational Safety and Health Administration (OSHA), US Department of Transportation (DOT), Massachusetts Department of Labor Standards (DLS), Massachusetts Department of Environmental Protection (DEP), local and all other Federal, Commonwealth of Massachusetts and local regulations pertaining to asbestos removal, its transportation, and disposal.
- E. The Consultant will render certain technical services during the Work, including the services described at 454 CMR, without limitation. 28.00 and described within this Section. All services performed by such Representative shall be considered advisory to and for the sole and exclusive benefit of the Owner. The Asbestos Contractor acknowledges that the Consultant is an independent contractor of the Owner and agrees that no act or omission by such Consultant and no communication by said "Consultant" shall be deemed in any manner to alter or modify the terms of this Contract or to waive any provision hereof, or to bind Owner unless specifically agreed upon by Owner in a signed written instrument.
- F. Prior to the use of any design, device, material, method of operation, or process covered by letters patent or copyright, the right for such use shall be secured by a suitable legal agreement with the patentee or Owner of the letters patent or copyright. No arrangement involving letters patent or copyright is acceptable if subsequent payment for permanent use following completion of the work is required or implied. The Contractor shall be responsible for any liability on the part of the Consultant which may result from violations by the Contractor.
- G. The Owner has retained Atlas Technical Consultants as the Environmental Consultant for the purpose of Project Management during Asbestos Abatement.
- H. For the purpose of this Section, "*Consultant*" shall refer to Atlas, who will act as designated, authorized representatives of the Owner for the purpose of inspecting, monitoring, and testing.

1.02 SUMMARY OF WORK

The following is the Scope of Work, at a minimum, required to be performed associated with the asbestos removal and renovation of the heating units at the Newton Housing Authority – Horace Mann Development, located at 682-690 Watertown St., Newton, Massachusetts, under the base bid.

All Asbestos Abatement work under this Section shall be performed by a contractor holding a current Massachusetts DLS Asbestos Contractor's license. The Contractor shall furnish all labor, worker training, materials, equipment, and services for the complete and proper removal and disposal of asbestos-containing materials.

In consideration that MassDEP regulations do not address working in multiple tenant units concurrently, the following materials are required to be removed with traditional methods in a negative pressure full containment work area. The Contractor can elect to have a Licensed Massachusetts Asbestos Designer prepare a Non-Traditional Work Plan, which would relieve the need for full containment and final clearance air sampling. Please note that Contractor is responsible for any cost incurred by the Non-Traditional Work Plan preparation and MassDEP fees.

- A. Removal and disposal of all specified asbestos-containing materials (ACM) and specified non-ACM materials as identified herein. This shall include all asbestos-containing joint compound, gypsum wallboard, and pipe thread sealant associated with the heating units, and specified non-ACM where necessary to access asbestos. The Contractor is responsible for any demolition necessary to access asbestos containing materials (e.g., pipe gypsum wallboard, etc.).
- B. Work area preparations, including required pre-cleaning, installation of critical barriers and polyethylene sheeting, construction of decontamination facilities, work area enclosures, sealing, isolation, and other activities as directed by the Owner or Consultant.
- C. Installation and operation of HEPA filtration units sufficient to achieve a minimum of four air changes per hour in each containment, and according to the provisions set forth in this Section.
- D. Protection of non-ACM materials and equipment inside of work areas with two layers of 6-mil polyethylene sheeting.
- E. Removal and disposal of all asbestos-containing joint compound, gypsum wallboard, and pipe thread selant associated with the heating units will be completed in accordance with Section 3.02.
- F. Furnishing of all labor, materials, equipment, and services required for all work included under the provisions of this Section.
- G. Compliance with all applicable federal, state, and local regulations, as well as all provisions set forth within this Section and facility requirements.
- H. Decontamination and clean up following removal activities in each designated work area. Clean up to include all visible debris from all surfaces present in the work areas.
- I. Performance of any other work or activities required by this Section, applicable regulations, or as necessary to perform a complete job to the satisfaction of the Owner and Consultant.

- J. Provide temporary electrical wiring and services as required for asbestos removal according to the Provisions set forth in this Section.
- K. Perform all selective demolition as needed to access any asbestos-containing materials and to ensure that no other suspect or hidden ACM remain in the Facility prior to renovation. The Contractor will perform all selective demolition as needed to the satisfaction of the Consultant at any locations and items requested by the Consultant during the Project.

Base Bid: The following is the approximate location and quantities of known asbestos-containing materials to be removed, under the Base Bid, in accordance with the provisions set forth in this Section.

Table 1 – Summary of Identified Asbestos-Containing Materials
Horace Mann
682-690 Watertown Street
Fitchburg, Massachusetts

Location	Material	Estimated Quantity ¹
Building B-2 “Model Building”		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total
Conduit/ Anchors / Thermostat / Electrical Panel Attachments – Interior Tenant Units	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 7 sq ft/ Unit, 84 sq ft Total

Location	Material	Estimated Quantity ¹
Building C “Community Building”		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total
Conduit/ Anchors / Thermostat / Electrical Panel Attachments – Interior Tenant Units	Tan Gypsum Wallboard & Tan Joint Compound ²	12 Apartment Units, 7 sq ft/ Unit, 84 sq ft Total

¹ The Newton Housing Authority Horace Mann Apartments includes eight (8) Buildings with twelve (12) Apartment Units each for a total of seventy-two (72) apartments and a community center. The Heating units will be replaced in four (4) areas in each apartment unit and two (2) Stairwell Units in full negative pressure containments. Approximately six (6) conduit attachments and one (1) thermostat attachment for a total of 7 sq ft of asbestos-containing Joint Compound and associated Gypsum Wall Board shall be removed utilizing spot abatement work for the attachments.

² Installation of all attachment components associated with the heating replacement project shall be installed by the abatement contractor utilizing HEPA-shrouded drilling/cutting procedures.

Add Alternates: The following is the approximate location and quantities of known asbestos-containing materials to be removed, each as a separate Add Alternate, in accordance with the provisions set forth in this Section.

Location	Material	Estimated Quantity ¹
Add Alternate #1 Building A-3		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total

¹ The Newton Housing Authority Horace Mann Apartments includes eight (8) Buildings with twelve (12) Apartment Units each for a total of seventy-two (72) apartments and a community center. The Heating units will be replaced in four (4) areas in each apartment unit and two (2) Stairwell Units in full negative pressure containments.

Location	Material	Estimated Quantity ¹
Add Alternate #2 Building A-6		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total

¹ The Newton Housing Authority Horace Mann Apartments includes eight (8) Buildings with twelve (12) Apartment Units each for a total of seventy-two (72) apartments and a community center. The Heating units will be replaced in four (4) areas in each apartment unit and two (2) Stairwell Units in full negative pressure containments.

Location	Material	Estimated Quantity ¹
Add Alternate #2 Building A-6		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total

¹ The Newton Housing Authority Horace Mann Apartments includes eight (8) Buildings with twelve (12) Apartment Units each for a total of seventy-two (72) apartments and a community center. The Heating units will be replaced in four (4) areas in each apartment unit and two (2) Stairwell Units in full negative pressure containments.

Location	Material	Estimated Quantity ¹
Add Alternate #3 Building A-4		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total

¹ The Newton Housing Authority Horace Mann Apartments includes eight (8) Buildings with twelve (12) Apartment Units each for a total of seventy-two (72) apartments and a community center. The Heating units will be replaced in four (4) areas in each apartment unit and two (2) Stairwell Units in full negative pressure containments.

Location	Material	Estimated Quantity ¹
Add Alternate #4 Building A-1		
Bedroom	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 6 sq ft/ Unit 72 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Living Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 10 sq ft/ Unit 120 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Dining Room	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Kitchen	Tan Gypsum Wallboard & Tan Joint Compound	12 Apartment Units, 5 sq ft/ Unit 60 sq ft Total
	Brown Pipe Thread Sealant (Interior Heating Unit)	12 Apartment Units. 2 In ft – 6 Fittings 24 In ft Total
Stairwells	Brown Pipe Thread Sealant (Interior Heating Unit)	2 Units. 2 In ft – 6 Fittings 4 In ft Total

¹ The Newton Housing Authority Horace Mann Apartments includes eight (8) Buildings with twelve (12) Apartment Units each for a total of seventy-two (72) apartments and a community center. The Heating units will be replaced in four (4) areas in each apartment unit and two (2) Stairwell Units in full negative pressure containments.

1.03 SEQUENCE OF WORK

The following is a typical sequence of work that Contractor shall adhere to during the asbestos abatement project. Consultant may authorize deviations from this typical sequence based upon the specific conditions encountered during the Project.

1. Contractor shall post all required signage.
2. Contractor shall secure area from unauthorized access.
3. Owner/Contractor will remove all movable objects from the work area.
4. Contractor shall pre-clean the work area and cover all immovable objects and objects not removed from the work area with two (2) layers of six (6)-mil polyethylene sheeting, sealed airtight with duct tape. Contractor shall install critical barriers at all points of access required by regulations.
5. Contractor shall seal all rooms that do not contain ACM with two layers of six-mil polyethylene sheeting sealed airtight with duct tape.
6. Contractor shall install HEPA filtration units sufficient to achieve a minimum of four (4) air changes per hour. All units shall exhaust to the outside of the building through windows.
7. Contractor shall prepare the specified Work Areas for total isolation/ containment or Glovebag removal and perform removal of all identified ACM as described in this Section. Preparation shall include two (2) layers of six (6)-mil polyethylene sheeting, sealed with duct tape, on all floors and ceilings (if applicable) and non-impervious surfaces, including all interior walls.
8. Contractor shall construct decontamination unit and any other construction needed to complete the work area to the satisfaction of Consultant.
9. A Mass DLS certified Project Monitor shall inspect and approve all work area preparations before permitting Contractor to begin removal work.
10. Contractor shall construct demising barriers according to the Provisions set forth in this Section, as deemed necessary and at the direction of the Consultant if ceiling and wall voids are accessed during abatement activities.
11. Contractor shall remove and dispose of all asbestos-containing materials as required by these Sections.
12. Contractor shall decontaminate and clean up each work area upon completion of removal. Clean up of the work area will include the removal of all visible dust and debris from all surfaces in the work area.
13. A Mass DLS-certified Project Monitor shall perform a final visual inspection to assure that no visible debris exists in the work area. Contractor shall re-clean the work areas as needed until they pass a visual inspection by Consultant.

14. Contractor shall encapsulate all surfaces in the work area from which ACM was removed.
15. A Mass DLS-certified Project Monitor will perform final air clearance testing in each work area. According to 454 CMR 28.10, all the final clearance air sampling results are required to be less than or equal to the Mass DLS clearance criteria of 0.010 f/cc prior to teardown of containment barriers.
16. Contractor shall remove all work area barriers, equipment, polyethylene sheeting, etc., and clean any areas to the satisfaction of Consultant and Owner.

1.04 RELATED WORK SPECIFIED ELSEWHERE

- A. Related work specified elsewhere: Examine all Drawings and all other Sections of the Specifications for requirements of related sections affecting the work of this Section.
- B. The work of this section shall be performed as stated herein. In performing the work of this Section, the Contractor shall refer to other Divisions for additional procedures. The Contractor is responsible for the coordination of the work of this section with other related work.

1.05 ESTIMATES

- A. Section 1.02 represents a brief description of the estimated quantities of asbestos and asbestos-containing materials to be removed. This data is provided for informational purposes only and is based on the best information available at the time of specification preparation. Nothing in this section may be interpreted as limiting the scope of work otherwise required by this contract and related documents.
- B. The quantities and location of ACM and the extent of work included in this section are only best estimates, which are limited by the physical constraints imposed by occupancy of the building. Accordingly, minor variations of plus or minus 15% of the estimated quantities of ACM within the limits of containment for each abatement stage are considered as having no impact on the price of this contract.

1.06 COORDINATION AND PHASING OF WORK

- A. Contractor shall coordinate all work in this Section with all other work of this Project. Where additional regulatory requirements apply to the work in this Section, the Contractor shall ensure compliance with all requirements.
- B. Contractors work schedule must be coordinated with and acceptable to the General Contractor and approved by the Owner. Contractor shall work continuously and diligently in each work area on the days and during the hours indicated on their work schedule
- C. Contractor shall cooperate fully with other Contractors at the Facility.
- D. Contractor shall subdivide work areas and/or otherwise provide additional containments where and when necessary to accomplish asbestos abatement in accordance with the project phasing, as determined by the General Contractor, and as specified by the Owner.

1.07 SUBMITTALS

- A. Pre-Construction Meeting

The Contractor shall meet with the Owner and the Consultant for a Pre-Construction meeting prior to commencing work on the Project. The meeting shall be at the Facility or the offices of the Owner at a mutually convenient time and date. At the meeting, the Contractor shall be represented by authorized representatives and the field supervisor, who shall run the Project on a daily basis, and who shall present evidence that all requirements for initiation of the work have been met. The minimum agenda for the meeting shall be:

1. Review of "Pre-Job Submittals."
2. Channels of communication.
3. Construction schedule, including sequence of critical work.
4. Designation of responsible personnel.
5. Procedures for safety, security, quality control, housekeeping, and related matters.
6. Use of premises, facilities, and utilities.

B. Pre-Job Submittals

The Contractor is required to provide one copy of the following Pre-Job Submittals at the Pre-construction Conference:

1. Copies of all notifications, permits, applications, personnel licenses, asbestos contractor license, and like documents required by Federal, State, or local regulations obtained or submitted in proper fashion,
2. List of employees to be used on this Project.
3. Copies of medical records as required by OSHA or a notarized statement by examining medical doctor that such examinations took place and when for each employee to be used on Project,
4. Record of successful respiratory fit test performed by a Competent person (as defined by OSHA) within the previous 6 months, as required elsewhere in the documents for each employee to be used on this Project,
5. Certificate of Insurance,
6. Proposed respiratory program for employees throughout all phases of the job, including make, model, and NIOSH approval numbers of respirators to be used,
7. Written description of all procedures, methods, or equipment to be utilized by the Contractor that differ from the Contract Sections, including manufacturers Sections on any equipment not specified for use by the Contract Sections,
8. Proposed electrical safeguards to be implemented, including but not limited to location of transformers, GFCI outlets, lighting, etc., necessary to safely perform the job, including a description of an electrical hazards safety plan for common practices in the work area,
9. A list of all equipment to be used on site, by make and model, including negative pressure equipment, HEPA vacuums, Water Atomizing Devices, etc.,
10. Chain of Command of responsibility at work site including supervisors, foreman, and competent person, their names, resumes, and certificates of training,

11. Proposed Emergency plan and route of egress from work areas in case of fire or injury, including the name and phone number of nearest medical assistance center,
12. Contractor's testing lab, AIHA PAT proficiency, and Certification in the State where work site is located,
13. Schedule of values breaking down the work in sufficient detail so as to serve as the basis for payment, with disposal costs listed as a separate item.

C. Post-Construction Submittals

The Contractor is required to submit the following to the Consultant within thirty days after completion of the Project:

1. Manifests and waste receipts acknowledging disposal of all waste material from the Project showing delivery date, quantity, and appropriate signature of landfill's authorized representative,
2. A copy of the entry-exit logbook required elsewhere in these Sections,
3. All personnel monitoring results as required by OSHA and elsewhere in these Sections,
4. Copy of licenses, medical, and fit tests of all workers and supervisors who performed work on the Project,
5. All notifications as required elsewhere in these Sections.

1.08 REFERENCE STANDARDS, REGULATIONS, AND CODES

A. All work shall be performed strictly according to the Sections contained herein and with the regulations cited in this Article. The Contractor undertaking asbestos abatement work and persons in their employ shall comply with and be bound to requirements of the following Federal, State, and Local standards, regulations, and codes. These standards and codes shall be by reference made part of this Section and shall be complied with. Whenever regulations are conflicting, the more stringent regulation will prevail.

1. US Department of Labor; Occupational Safety and Health Act of 1970. (Particular attention is drawn to the Asbestos Regulations: CFR Title 29, Part 1910, Sec. 1910.1001 and Part 1926, Sec. 1926.1101, and the Respirator Regulations; CFR Title 29, Part 1910, Sec. 1910.134 and the Hazard Communication Program, CFR Title 29, Part 1910.1200).
2. US Environmental Protection Agency, CFR, Title 40, Part 61, Subparts A and M, National Emission Standards for Hazardous Air Pollutants; Asbestos NESHAP Revision; Final Rule, Dated Tuesday, November 20, 1990.
3. US Environmental Protection Agency; TSCA Title II, Asbestos Hazard and Emergency Response Act (AHERA), 40 CFR Part 763 Subpart E - "Asbestos-Containing Materials in Schools" and also 40 CFR, Part 763, Subpart G - "Worker Protection Rule."
4. US Department of Transportation regulations, 49 CFR Parts 172 and 173.

5. All Commonwealth of Massachusetts laws, regulations, and standards, including the regulations 454 CMR 28.00 "The Removal, Containment or Encapsulation of Asbestos" and 310 CMR 7.15 "Asbestos," 18.00 and 19.00 and MGL Chapter 21E.
 6. Other Federal, State, and local statutes, ordinances, regulations, or rules pertaining to this Section and the work described herein, including the storage, transportation, and disposal of asbestos.
- B. All regulations by these and other governing agencies in their most recent version are applicable. These Sections refer to many requirements found in these references, but in no way intend to cite or reiterate all provisions therein or elsewhere. It is the Contractor's responsibility to know, understand, and abide by all such regulations and common practices. Other provisions contained in these references may, from time to time, during the execution of this contract, be enforced by the Owner at his own discretion.

1.09 REGULATORY SUBMITTALS

- A. The Contractor shall be responsible for securing all necessary permits for asbestos related work, including hauling, removal, and disposal, fire, and materials usage, or any other permits required to perform the specified work.
- B. The Contractor shall notify the following agencies in appropriate manner and place of impending work and shall provide evidence of notifications at the pre-construction conference:
 1. U.S. Environmental Protection Agency,
J. F. Kennedy Federal Building
Boston, Massachusetts 02203
(10 working days in advance)
 2. Massachusetts Department of Environmental Protection
Division of Air and Hazardous Materials
(10 working days in advance)
Send Notification to:

Commonwealth of Massachusetts
Asbestos Program
P.O. Box 120087
Boston, Massachusetts 02112-0087
 3. Massachusetts Department of Labor Standards
Asbestos Control Unit
(10 working days in advance)
 4. Newton Fire Department, Newton Health Department, and other state or city agencies as required by law or ordinance.

1.10 PROJECT CONDITIONS

- A. Take all measures and provide all material necessary for protecting fixed machinery, controls, instrumentation, equipment, and furniture from asbestos fiber, dust, debris, and from water damage.
- B. Working space and space available for storing materials is restricted within the confines of the Project and/or at locations to be designated by the Owner.

- C. Provide access and personal protective equipment, including full face piece powered air-purifying respirators, to the Consultants, who are licensed and certified, to visit the Work Areas to maintain and adjust building services.
- D. Schedule, the use of existing utilities with the Owner. No utility service, fire protection system, or communication system may be interrupted without prior approval of the Owner.
- E. Water, electric power, lighting, and other utilities, toilets, and other facilities, shall be provided by the Owner from existing sources where Contractor's use is not excessive and does not interfere with buildings normal use. Where existing utilities of the Facility are not adequate or cannot be used, the Contractor is responsible for providing alternative sources, the cost of which is to be included in bid price. The use of the Facility's utilities shall be coordinated through the Owner.
- F. Post and affix caution signs and labels as required by OSHA regulation, 29.CFR.1926.1101 (k) (1). Post safety signs outside the work project as may be required by the Owner. Obtain two copies of 29.CFR.1910.1001, 29.CFR.1926.1101, m 40.CFR.61, Subpart M, and Commonwealth of Massachusetts Regulations 454 CMR 28.00 and 310 CMR 7.00, and post one copy at the job site and retain one copy on file.
- G. Post at the job site or the entrance to each independent Work Area one copy of all Safety Data Sheets (SDS's) of all chemicals and other substances to be used on this contract. These sheets shall be made available to the Consultant for review.
- H. Storage of waste will not be permitted onsite. All materials and equipment are to be kept orderly in designated areas, free and clear of halls and doorways, and conformance with all regulations, codes, and in consideration of building usage.

1.11 RESPIRATORS AND PROTECTIVE CLOTHING

- A. Personal protection, in the form of disposable Tyvek suits and NIOSH approved respirators, are required for mechanics, contractor supervision, Consultant, and visitors at the work site during the set-up, removal, and cleaning operations. Contractor shall provide all this protective equipment for workers, Consultant, and authorized personnel to access this work site.
- B. Each worker shall be supplied with a minimum of two complete disposable uniforms every day. Removal workers shall not be limited to two uniforms, and the Contractor will be required to supply additional uniforms as is necessary. Under no circumstances will anyone entering the removal area be allowed to reuse a contaminated uniform.
- C. Work clothes shall consist of disposable full body suits, head covers, gloves, footwear, and eye protection.
- D. The Contractor shall supply workers, and supervisory personnel with NIOSH approved protective respirators and HEPA/filters. Appropriate respirator selection shall be determined by the daily personnel samples being taken and strictly follow the guidelines set forth in the OSHA respiratory program 29 CFR 1910.134 and the Massachusetts DLS Regulations 454 CMR 28.00. The respirators shall be sanitized and maintained according to the manufacturer's Sections. Appropriate respirators shall be selected using the information provided in OSHA Title 29 CFR Part 1910.1926 Final Rules. This determination has been made for this Project. PAPR's shall be supplied by the Contractor for all personnel associated with this work. Disposable respirators shall not be considered acceptable in any circumstance. The Contractor will maintain on site a sufficient supply of disposable HEPA/filters to allow workers and supervisory personnel to change contaminated filters at least three (3) times daily. The

Contractor is solely responsible for means and methods used and for compliance with applicable regulations.

- E. Respirators shall be individually assigned to removal workers for their exclusive use. All respiratory protection shall be provided to workers in accordance with the written submitted respiratory protection program, which includes all items in OSHA 29 CFR 1910.134 (b) (1-11). A copy of this program shall be kept at the work-site and shall be posted in the Clean Room of the Decontamination Unit.
- F. Workers must perform negative and positive pressure fit tests each time a respirator is put on, whenever the respirator design so permits. Powered air purifying respirators shall be tested for adequate flow as specified by the manufacturer.
- G. Workers shall be given a qualitative fit test in accordance with procedures detailed in the OSHA Lead Standard (29 CFR 1910.1025, Appendix D, Qualitative Fit Test Protocols) for all respirators to be used on this abatement project. An appropriately administered quantitative fit test may be substituted for the qualitative fit test.
- H. Upon leaving the active work area, pre-filters shall be discarded, cartridges removed, and respirators cleaned in disinfectant solution and clean water rinse. Clean respirators shall be stored in plastic bags when not in use. The Contractor shall inspect respirators daily for broken, missing, or damaged parts.
- I. Contractor shall provide daily personal sampling to check personal exposure levels for the purpose of establishing respiratory protection needs. Samples shall be taken for the duration of the work shift or for eight hours, whichever is less. Personal samples need not be taken every day after the first day if working conditions remain invariant but must be taken every time there is a change in the removal operation, either in terms of the location or the type of work. Sampling will be to determine eight-hour Time-Weighted-Averages (TWA). The Contractor is responsible for personal sampling as outlined in OSHA Standard 1926.1001. Personal air sampling personnel shall be proficient in the taking of air samples under NIOSH 7400 and must be supervised by an individual who has completed the training course NIOSH 582 or equivalent.
- K. Air sampling results shall be available at the job site in written form no more than twenty-four (24) hours after the completion of a sampling cycle. The document shall list each sample's result, sampling time and date, person monitored, flow rate, sample duration, microscope field area, number of fibers per field counted, cassette size, and analysts name and company. Air sample analysis results will be reported in fibers per cubic centimeter.

1.12 WATER AND ELECTRICAL SERVICE

- A. The Contractor shall provide temporary connections to existing building utilities and provide temporary facilities as required and necessary to carry out the work.
- B. The Contractor shall provide temporary connections to building water service and provide all lines necessary for distribution of water.
- C. Comply with applicable NEMA, NECA, and UL standards and governing regulations for materials and layout of temporary electrical service. All power connections and panel work is to be performed by a licensed electrician.
- D. The Contractor shall provide temporary service connections from power sources as required. All existing power service to the work area will be isolated and shut down for the duration of the Project. Contractor shall provide service (sub-panel) with a minimum of 100 amp, two-pole

circuit breaker, or fused disconnect. Sub-panel and disconnect shall be sized and equipped to accommodate all electrical equipment required for completion. Contractor's electricians will make all necessary connections to main power system.

- E. Provide I.D. warning signs at power outlets other than 110-120 volt power. Provide polarized outlets for plug-in type outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets.
- F. Provide all receptacle outlets equipped with ground fault circuit interrupters (GFCI) and reset button for plug-in connection of equipment.
- G. The Contractor must supply temporary lighting for all lighting requirements within contained areas. All existing lighting shall be isolated and shut down.

1.13 SPECIAL CONSIDERATIONS

A. Final Air Clearance Tests

- 1. All final air tests will be performed in accordance with Massachusetts Department of Labor Standards (DLS) regulations at 454 CMR 28.10(11), this Section, and other applicable Rulings (i.e., AHERA). The first set of final clearance air tests for each removal area will be paid for by Owner. In the event that these air tests do not pass the clearance criteria, any subsequent air tests that need to be performed shall be paid for by Contractor. All additional sampling costs will be automatically deducted from the contract price until the areas in question pass the final air clearance criteria of less than 0.010 fibers per cubic centimeter for PCM clearance testing or an average of 70 structures per square millimeter for TEM clearance testing. PCM clearance testing will be utilized for this Project.

B. Exceptions to Work Area Preparation Requirements

- 1. In accordance with 454 CMR 28.10(4)(8)(a), it will not be required to cover impervious surfaces of walls or floors with two (2) layers of polyethylene sheeting. Examples of such surfaces that may be considered to be impervious include concrete floors without any cracks or fissures and glazed walls, i.e., painted brick walls. (Note: Wooden surfaces and surfaces constructed of stone/cement are not considered impervious). If Contractor wishes to utilize this exception, Contractor shall be required to state on their DLS notification forms that they do not intend to use two (2) layer of polyethylene sheeting for these particular surfaces. If the DLS does not permit this exception, Contractor shall be required to use two (2) layers of polyethylene sheeting in full accordance with the work area preparation requirements of this Section, and will not be entitled to any additional monies of payment.

PART 2.0 - PRODUCTS

2.01 ASBESTOS ABATEMENT SUPPLIES

- A. Respirators: Respirators will be selected from those jointly approved by the National Institute for Occupational Safety and Health (NIOSH), US Department of Health and Human Services and the Mine Safety and Health Administration (MSHA), US Department of Labor.
- B. Surfactant (Amended Water): All water to be used for removal and wet wiping of asbestos-contaminated materials during clean-up operations shall be amended through the addition of a surfactant (a 50/50 mixture of polyoxyethylene ether and polyoxyethylene ester, or equivalent) mixed and supplied in accordance with manufacturer's instructions.
- C. Sealer: All surfaces from which asbestos-containing materials have been removed shall be sealed with a colored-asbestos sealer, mixed and applied in accordance with manufacturer's instructions. The proposed brand and product shall be submitted to the Consultant for approval.
- D. Polyethylene Sheeting: All polyethylene sheeting used on the Project shall be fire resistant, and shall meet and be approved as called for in local, Fire Prevention Codes
- E. Encapsulant: a bridging encapsulant such as Childer's Product Co., Chilcare CP215 bridging encasement/encapsulant; Barrier Systems Inc., Slaytex Asbestos Encasement System; CRSI/ISP Guardian Bridging encapsulant; IPC Serpiflex shield encapsulant; or equivalent shall be used. The proposed brand and product shall be submitted to the Consultant for approval.
- F. Plaster impregnated glass-fiber cloth.
- G. Mastic Remover - Sentinel 747, or approved equal

PART 3 - EXECUTION

3.01 GENERAL

A. Approvals and Inspection

1. All temporary facilities, work procedures, equipment, materials, services, and agreements must strictly adhere to and meet these contract Sections along with EPA, OSHA, NIOSH, regulations and recommendations as well as any other federal, state, and local regulations. Where there exists overlap of these regulations, the most stringent one applies. All work performed by the Contractor is further subject to approval of the Owner.
2. Modifications to these isolation and sealing methods, procedures, and design may be considered if all elements of proper and safe procedures to prevent contamination and exposure can be demonstrated. Written modifications to these Sections must be made to the Owner for review before they can be used for work on this Project.

B. HVAC Systems

1. All duct work, heating units and HVAC equipment shall be wrapped in two layers of six-mil polyethylene prior to any other work taking place, or excluded from work area boundaries by airtight polyethylene sheeting.

C. Barriers and Isolation Areas

1. The Contractor shall construct and maintain suitable critical barriers within the building to separate work areas from spaces occupied by the Owner. Critical barriers shall be of sufficient size and strength to prevent staff, residents, the public and others from entering the work areas. Critical barriers shall be constructed at all hallways, doorways, grille openings, or other open entrances to the work area. Critical barriers shall be constructed with PVC or plywood and 2 x 4 lumber, reinforcing it, and placed in the locations specified and designated by the Owner's Representative. Any seams in the critical barriers shall be sealed airtight with caulking or an approved equal method. These barriers shall be removed by the Contractor at the completion of construction work.
2. Warning signs shall be posted on all critical barriers at the commencement of the work area preparation, as required in 1926.1101 of the Occupational Safety and Health Standards Federal Register, Volume 51, Number 119, June 20, 1986. The signs shall display the proper legend in the lower panel, with letter sizes and styles of a visibility at least equal to that specified in OSHA Standard 1926.1101. (k)(1)(ii). The signs will read as follows:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATOR AND PROTECTIVE CLOTHING
REQUIRED IN THIS AREA

3. The signs shall be posted at the perimeters of asbestos removal, demolition or construction areas where the asbestos-containing material to be removed exists.

4. The Contractor shall maintain all temporary and critical barriers, facilities and controls as long as needed for the safe and proper completion of the work. Any breaches in the containment will be corrected at the beginning of each shift and as necessary during the workday. Work will not be allowed to commence until all control systems are in place and operable.
5. No barriers shall be removed until the work areas are thoroughly cleaned and all debris has been properly bagged and removed from work areas, and the air has passed final clearance tests, in accordance with provisions detailed herein.

3.02 ACM LOCATION PREPARATION AND REMOVAL METHOD

A. Preparation

1. Primary Barriers: Prior to construction of the asbestos removal area, all primary barriers shall be sealed with a minimum of one layer of six (6) mil plastic sheeting and duct tape. Primary barriers consist of all windows, vents, closed and locked doors, and openings to adjacent spaces from the work area. HVAC systems shall be sealed, where applicable, as described previously with two layers of 6 mil polyethylene sheeting.
2. Critical Barriers: Critical barriers consist of the boundaries of the work area including floors, walls, and any constructed barrier to restrict public access to the work area. Floors, if applicable, shall be sealed with a minimum of two layers of six (6) mil polyethylene sheeting. There shall be a minimum overlap of two feet (24") at the floor seams and the sheeting will run a minimum of two feet (24") up the walls.
3. The containment walls shall be constructed using a minimum of two layers of six mil. polyethylene sheeting after sealing the floors. This shall be done using a minimum of one layer of six mil. polyethylene sheeting. Overlaps between the walls and floors shall be interwoven.
4. The first floor layer shall be taped up the wall a minimum of two feet (24"). The first wall layer shall be sealed to the floor layer at the corner of the floor and wall. The second floor layer shall be sealed to the first wall layer at a minimum of a two foot (24") overlap. The second wall layer shall cover all overlaps and be sealed to the floor.
5. The enclosure shall be constructed so as to allow the removal of interior layers of plastic without damaging the exterior layer. The exterior layer shall stay intact for the duration of the project and be designated the critical barrier.

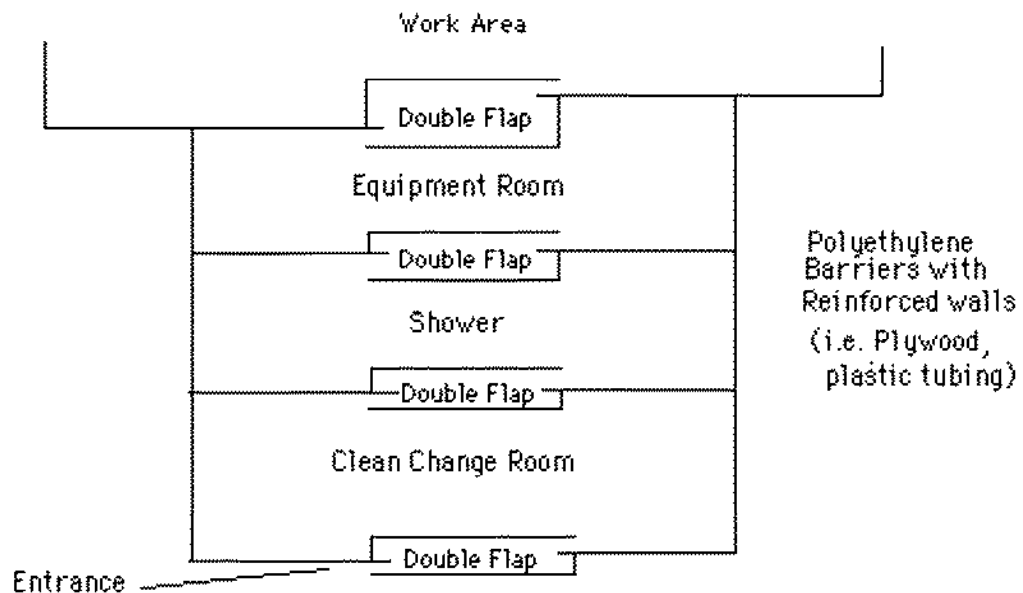
B. Decontamination Unit and Procedures

1. It is the Contractor's responsibility to provide decontamination chambers consisting of an Equipment Room, Shower, and Clean Room for personnel involved in asbestos removal. Each of the three rooms shall be of sufficient size to accommodate authorized personnel and related equipment. Each room shall be separate of other rooms by a double flap of 6-mil polyethylene sheeting acting as an airlock. This shall be designed to minimize fiber migration and air flow between the decontamination unit rooms. The rooms shall be framed with PVC or 2"x 4" lumber, masked, sealed and attached to the entry/exit ways of asbestos work areas. The three rooms together shall be referred to as the Decontamination Unit. A Decontamination Unit will be required for each separate containment area, if work is to be divided into sections.
2. The Equipment Room shall serve as a transfer room and an intermediate area between the work area and any decontamination procedures to occur in the shower room. This

room shall be vacuumed and washed whenever necessary in order to prevent asbestos dust and debris accumulations or when required by Consultant. The Equipment Room will also serve as an access area to the shower for personnel leaving the work area. Workers leaving the containment shall remove and dispose of disposable protective suits and wear only respirators into the Shower. At the end of each day, bags of asbestos waste and contaminated materials shall be removed after a thorough decontamination procedure as described in the contract Sections. Workers performing this operation will wear respirators and disposable full-body protective suits.

3. The Shower Room shall have a continuous supply of cold and hot water, and be suitably arranged for complete showering during decontamination. The Shower Room with curtained doorways will comprise an airlock between contaminated and clean areas. All materials being passed from the equipment room to the clean room must pass through the shower and be thoroughly decontaminated. The shower floor will not be allowed to sit at ground level, but must be elevated a minimum of six inches off of the floor with a suitable catch basin for drainage into a filtration system. The shower will be equipped with a sump pump and an in-line two stage filter. The first stage will efficiently filter fibers greater than twenty (20) microns in length and the second stage will filter bulk material and fibers greater than five (5) microns in length. Alternatively, shower water may be re-routed back into the work area to be bagged and disposed of as asbestos contaminated waste. The Contractor shall provide disposable towels and soap in the shower area.
4. The Clean Room shall store asbestos worker's clean protective clothing and clean respirator equipment. Contaminated clothing, respirators, tools, equipment, or other materials shall not be allowed into the Clean Room or beyond. The Clean Room will serve as an access for personnel entering the work area, and for the donning of respiratory protection and protective clothing. The Contractor shall provide space in the clean room for the worker's personal clothing. This may be in the form of hangers or lockers.

TYPICAL DECONTAMINATION UNIT



5. The above decontamination enclosure is called a "three-stage" decontamination enclosure and shall be the type constructed and used for this Project in specified areas.

A "two stage" unit resembles the "three-stage" unit in construction detail, but it is built without a shower section.

- C. HEPA Filtration: Adequate negative pressure shall be provided within the enclosure as specified below.
1. After the work area is totally isolated, and prior to commencement of work, the Consultant will perform a visual inspection of the work area. This will consist of checking the integrity of barriers including smoke testing the containment if deemed necessary by Consultant. This does not in any way relieve the Contractor's responsibilities to ensure the isolation of the work area. The volume of air within the contained work area shall be changed a minimum of four (4) times per hour. A pressure differential reading of -0.02 inches of water shall be maintained in the negative pressure work area relative to adjacent areas. Equipment used for producing a negative pressure work area shall have a filtering device that is at least 99.97% efficient at a 0.3 micron pore size. Filters meeting these standards are referred to as High Efficiency Particulate Air (HEPA) filters.
 2. The HEPA filtration units shall be equipped with the following:
 - a. Magnehelic gauge to monitor the unit's air pressure difference across the filters and be able to interpret magnehelic reading to cubic feet per minute (CFM).
 - b. An affixed label, clearly marked and conspicuous, showing the most recent installation date and hour reading of the primary internal HEPA
 - c. A clock to record the unit's operation time.
 - d. Automatic shut off for filter failure or absence.
 - e. Audible alarm for unit shutdown.
 - f. Amber flashing warning light for filter loading.
 - g. The unit must be equipped with a safety system, which prevents it from being operated with the HEPA filter in an improper orientation.
 - h. All flexible ducting, vent tubing, adapter plates and other equipment used for the passage of filtered air shall be undamaged, uncontaminated, and free of air leaks at all points.
 3. Pre-filters shall be changed frequently during the removal.
 4. Air movement will flow uninterrupted from outside the work area through the Decontamination Unit into the work area. There shall be no other openings for air to enter the containment unless approved by the Consultant in writing.
 5. HEPA filtration units shall be placed as far as possible from the air intake to the containment to prevent short-cycling of fresh air.
 6. This containment, along with the decontamination chamber, shall constitute the critical containment of the work area from the surrounding areas. All openings to this critical containment are to be sealed except where air must enter the work-site due to the use

of exhaust equipment. Unless approved by the Owner, air shall enter the critical containment only through the Decontamination Unit.

7. Modifications to these isolation and sealing methods, procedures, and design may be considered if all elements of proper and safe procedures to prevent contamination and exposure can be demonstrated. Written modifications to these Sections must be made to the Owner for review before they can be used for work on this Project.

D. ACM Removal

1. Asbestos removal will not begin until the Consultant has given authorization to proceed. This authorization will be given after the removal area has passed a visual inspection by the Consultant based on the criteria presented herein.
2. All asbestos-containing material must be soaked with amended water before removal. The material shall be sufficiently saturated to reduce fiber release so that the airborne fiber concentration does not exceed the established OSHA Permissible Exposure Limits, (PEL's). The amended water shall not be applied in amounts that will cause leakage or runoff of contaminated water from the removal area. Dry removal will not be permitted during this Project.
3. Asbestos-containing material shall be carefully removed and placed immediately into bags. Bags must be filled with water to the point where all asbestos is adequately wetted as defined by Federal Regulations 40 CFR 61 Subpart M. Asbestos will not be permitted to let fall or sit on the ground before being bagged.
4. Fine cleaning of residual asbestos-containing material shall consist of carefully scraping or brushing the material from surfaces. The recommended method for brushing a substrate after gross removal has taken place is to use a nylon brush. Wetting of the substrate shall also occur while this brushing is performed, since the chance of airborne fiber generation during fine cleaning still exists.
5. Water Atomizing Devices, commonly termed "mistifiers," shall be utilized by the Contractor during asbestos removal and fine cleaning phases to provide further dust control protection in the work area. The mistifiers shall be supplied with amended water and in operation continuously during these phases.
6. Asbestos waste must be double bagged before it is removed from the contained area. The inner bag will be HEPA vacuumed and showered before being placed in the outer bag. Vacuuming must take place in the Equipment Room of the Decontamination Unit. Washing must take place in the Shower Room of the Decontamination Unit. Bags will normally be removed at the end of each working day and transported from the job site.
7. Any materials considered contaminated by the Owner or the Owner's representative that cannot be double bagged shall be wetted and containerized in disposal drums. Oversized contaminated materials (e.g., plywood subfloor, hardwood floors) shall be wrapped airtight in two layers of 6-mil polyethylene sheeting.
8. All bags, containers or wrapped materials transported out of the work area shall be labeled with preprinted labels required by Federal EPA, OSHA and the Department of Transportation regulations. Any carts used to transport asbestos waste to the on-site holding dumpster should be HEPA vacuumed and wet wiped each day, and may be inspected by the Owner or Consultant every day.

9. Carts that are not made of an impermeable material shall be lined with a minimum of one layer of 6-mil polyethylene sheeting to be removed after each shift and disposed of as contaminated waste. The transport route and the transport of waste out of the work area shall be coordinated with the onsite Owner's representative.
10. The work area shall be cleaned of residual asbestos debris on a daily basis. The Decontamination Unit floor (top layer) shall be picked up and replaced on a daily basis, if required by Consultant.
11. Air testing will be performed continuously outside the enclosed area. If fiber concentrations exceed 0.010 fibers/cc or background levels, work shall stop and the Contractor shall perform clean-up activities in the affected areas and check the integrity of the critical barriers. Clean up activities shall include but not be limited to wet wiping and vacuuming surfaces with a HEPA equipped vacuum. Work may continue only after the source of contamination is identified, corrected and proper cleaning activities are implemented. Air testing will be performed by the Consultant on site in the affected areas. If the results of these air tests are not below 0.010 fibers/cc, the Contractor shall perform a thorough decontamination of the affected areas.
12. After brushing and scraping, surfaces shall be free of visible debris and fibers. A final wipe-down of the substrate with wet, lint-free rags shall take place in order to ensure proper cleaning. All surfaces including floors, walls, and ceilings shall also be HEPA vacuumed clean. All visible asbestos-containing material is to be removed by the Contractor before encapsulation procedures are allowed to begin. The Consultant will perform an inspection of the work area prior to giving approval to begin encapsulation of work area. Removal substrate must be clean and bare, and the entire work area must be free and clear of any suspect material for the Contractor to pass this visual inspection and begin encapsulation.
13. Where insulated substrates penetrate walls or other demising structures, remove asbestos through to the opposite side of the demising structure. After the removal of the asbestos materials at the demising structures, any resulting spaces or breeches shall be foamed or sealed airtight.

E. Removal of Critical Barriers

1. No critical barrier shall be taken down until the final visual inspection and final clearance air tests are found to be below 0.010 fibers/cc.
2. After a successful final visual inspection, encapsulation, and a successful final air test, Contractor shall perform post abatement take-down.
3. All encapsulated polyethylene sheeting used in the construction of the Decontamination Unit and Containment Area shall be bagged and disposed of as asbestos contaminated waste. Areas exposed during this process shall be examined for traces of suspect material. If any is found, it will be picked up by HEPA vacuuming and wet cleaning, and a coat of encapsulant be applied to the affected areas. Based on the amount of suspect material found, the Consultant may request the use of misters in the surrounding area. The Contractor will then implement the use of misters as a precautionary measure.

F. Encapsulation Procedures

1. The polyethylene barriers shall be cleaned of gross contamination before a lock-down sealant can be applied to the substrate. After the substrate has been cleaned and all polyethylene barriers of the work area are cleaned of all visible debris, the Contractor

shall request a visual inspection of the work area by the Consultant. Prior to the inspection of the work area, the Contractor shall remove the inside layer of the work area polyethylene sheeting, after cleaning, and dispose of it as contaminated waste. The work area will still have all primary barriers intact and one layer of polyethylene sheeting over floor, walls, and permanent structures within the work area during the inspection.

2. Workers performing lock-down must wear disposable protective clothing and respirators suitable for asbestos. The encapsulation process shall not be treated any differently from the removal process in this respect.
3. The lock-down material shall be applied with a low pressure (less than 500 p.s.i.), airless spray-type mechanism.
4. All surfaces in the work area will be encapsulated. A minimum of one coat of lock-down encapsulant will be applied to prevent the generation of airborne residual fibers. The lock-down encapsulant will be applied to both the substrate and the polyethylene sheeting serving as the containment barrier. During the encapsulation process, the Contractor shall decrease the negative pressure of the work area by shutting down some of the air filtration devices in the work area. If the lock-down material is being applied to irregular, grooved, or corrugated surfaces, it shall be administered from the opposing side, or at a right angle to the direction of the previous application. The encapsulant shall be left to dry before the commencement of final air testing. After final air clearance and inspection criteria have been met, the Contractor shall begin final take-down procedures.

3.03 DECONTAMINATION/WORK PROCEDURES

- A. In order to avoid possible exposure to dangerous levels of asbestos, and to prevent possible contamination of areas outside the demarcated work zone, work shall follow the guidelines listed below.
 1. At no time shall a worker entering the containment area go further than the Clean Room of the Decontamination Unit without a respirator and protective clothing.
 2. Before leaving the work area, the worker shall remove all gross contamination and debris from the coveralls. In practice this is carried out by one worker assisting another.
 3. All equipment used by the workers inside the demarcated work zone shall be either left in the Dirty Room of the Decontamination Unit or thoroughly decontaminated before being removed from the area. Extra work clothing (that in addition to the disposable garments supplied by the Contractor) shall be left in the Dirty Room of the Decontamination Unit until the completion of work in that area.
 4. All persons leaving the removal area must shower before leaving the containment.
 5. Under no circumstance shall workers or supervisory personnel be allowed to eat, drink, smoke, chew gum, or chew tobacco in the work area; to do so shall be grounds for the Consultant to stop all removal operations. Only in the case of life threatening emergency shall workers or supervisory personnel be allowed to remove their protective respirators while in the work area. In this situation, respirators are to be removed for as short a duration as possible.
 6. As with additional clothing, all footwear shall be left inside the work area until the completion of the job, then cleaned or discarded.

3.04 DISPOSAL OF ASBESTOS WASTE

- A. Waste removal procedure shall be done in accordance with all regulations as set forth by the agencies having authority to regulate.
- B. The Contractor shall provide proof that disposal sites for the waste materials have current and valid permits to dump asbestos waste at the time of the pre-construction meeting.
- C. Receipts shall be obtained by the Contractor from the dumping site(s), and submitted to the Owner upon request for final payment.
- D. Warning labels having permanent, waterproof print and adhesive shall be affixed to all bags, trucks, drums (lids and sides), and other containers used to store and/or transport asbestos-containing material. Labels must be conspicuous and legible and contain the following warning:

CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

- E. The Contractor shall be responsible for all necessary precautions to prevent pollution by spilling during the performance of services and shall assume full responsibility for all Contractor-caused spills, which shall be cleaned up at the Contractor's expense.
- F. Temporary storage of asbestos waste on-site must be approved by the Owner.
- G. Contractor is responsible for determining which ACM waste also contains excluded PCB Product so that it can be disposed of properly. Excluded PCB Product waste may be managed by any permitted asbestos waste management facility as long as they are made aware of the fact that material being sent to them contains PCBs up to the concentrations noted above and their permit allows them to accept materials with PCBs up to these levels. Facilities that can accept ACM can often accept these materials.

3.05 HOUSEKEEPING

- A. Throughout the work period, the Contractor shall maintain the building and site in a standard of cleanliness as specified throughout these Sections.
 - 1. Contaminated disposable clothing, respirator filters, and other debris shall be bagged and sealed at the end of each workday.
 - 2. All asbestos generated by either removal or repair, shall be bagged immediately and not allowed to be left exposed at the end of each workday.
 - 3. Respirators shall be thoroughly cleaned at the end of each workday and stored for the next day's use.
 - 4. The Contractor shall retain all stored items in an orderly arrangement allowing maximum access, not impeding traffic, and providing the required protection materials.
 - 5. The Contractor shall not allow the accumulation of scrap, debris, waste material, and other items not required for completion of the work.

6. The Contractor shall provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.
7. Daily, and more often if necessary, the Contractor shall inspect the work areas and adjoining spaces, and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.
8. The Contractor shall maintain the site in a neat and orderly condition at all times.

3.06 AIR MONITORING

- A. Background (pre-testing) air samples may be taken to represent conditions before the Contractor starts masking and sealing operations.
- B. During removal, area samples will be collected by the Consultant (Owner's Representative) outside major openings in the containment: in the clean room, at other critical points outside the work areas, just outside the clean room, inside the contained work sites, and at HEPA exhaust locations. Contractor shall be responsible for all OSHA personal sampling.
- C. Final clearance air samples will be collected inside the contained removal work area after all visual inspection criteria is met and the area is free and clear of any suspect material and debris. The insulation substrate, if any, must be clean and bare. The work area should be clear of any debris from inside the work area.
 1. Air will be agitated by means of a small leaf blower prior to the test, and kept agitated by means of a small electric fan. The results of all samples must be less than 0.010 fibers per cubic centimeter (f/cc) for PCM analysis or less than an average of 70 structures per square millimeter for TEM analysis to be in compliance with clearance criteria as described in this Section, Massachusetts Department of Labor Standards regulations. The first set of final clearance air tests for each removal area will be paid by the Owner. In the event that these air tests do not pass the clearance criteria, any subsequent air tests that need to be performed shall be paid for by the Contractor. If the Contractor fails to meet the criterion, the Contractor will be required to re-clean the designated work site and then the Consultant (Owner's Representative) to repeat the final air clearance testing. Cleaning and testing will be repeated until the specified criterion is met.

3.07 WORK REVIEW

- A. Consultant will review Contractor's work practices prior to the start of and during all asbestos related work and will report any Section violations to the Contractor. If the Contractor fails to correct deficiencies in a timely manner, the Owner will be notified in writing, and work may be stopped. The Consultant will review the containment structure and negative air conditions before work begins and after the Contractor Site Supervisor has given approval. Outside containment, airborne fiber concentrations must not exceed 0.010 fibers/cc or pre-abatement levels, whichever is greater. If concentrations exceed this level, then work must be stopped, conditions reviewed as to the probable cause, and then corrected. A description of procedures regarding fiber concentrations greater than 0.010 fibers/cc outside the containment can be found above.
- B. Consultant will keep a daily log of Contractor's work practices and will make these daily logs a part of the final project documents.

- C. In addition to various daily inspections of containment and work practices, Consultant will make three (3) mandatory inspections throughout the removal work. These inspections include: a pre-abatement visual inspection, a post-abatement visual inspection, and a post-teardown visual inspection.
- D. Each inspection must be requested by the Contractor and performed by Consultant, to the satisfaction of the Consultant, and be signed off by the Consultant, before work is to continue on to the next task in the phase. Failure on the part of the Contractor to obtain sign-off before proceeding is regarded as a serious violation of the contract and unacceptable.

END OF SECTION 02 82 00



10 State Street, Suite 100
Woburn, MA 01801
781.932.9400 | oneatlas.com

October 25, 2024

Mr. William H. Ferguson VIA
Co-Director of Sustainability
CITY of NEWTON
100 Walnut Street
Newton, MA 02460
857-404-4929

[Email: wferguson@newtonma.gov](mailto:wferguson@newtonma.gov)

**SUBJECT: Limited Asbestos-Containing Material Inspection Report
Newton Housing Authority- Horace Mann Campus
682-690 Watertown Street
Newton, Massachusetts 02460
Atlas Proposal No. 24-08542**

Dear Mr. Ferguson:

Atlas Technical Consultant (Atlas) was retained by the City of Newton to perform bulk sample testing for suspect asbestos-containing materials (ACM) at the Horace Mann Campus, located at 682-690 Watertown Street in Newton, Massachusetts. The inspection and bulk sampling was performed by Commonwealth of Massachusetts Department of Labor Standards (DLS) certified Asbestos Inspectors Mr. Sudesh M. Singh (License No.: AI000058) and Mr. Michael Ringuette (License No.: AI901024) on September 12, 2024 and October 19, 2024.

The purpose of the inspection was to determine if the existing building components contained asbestos prior to any disturbance by the upcoming heating replacement renovation project. Atlas understands that the surveyed area(s) will be undergoing renovations.

ASBESTOS-CONTAINING MATERIALS SURVEY

Atlas performed bulk sampling of building materials that will be impacted by the renovation work regarding the upcoming heating replacement renovation project. A total of eighty-seven (87) samples were collected with seventy-seven (77) analyzed for asbestos content. Representative bulk samples of each type of homogenous materials were collected. Sampling was performed to ensure compliance with the Asbestos Hazard Emergency Response Act (AHERA) criteria, as required by OSHA regulations, as well as the National Emission Standards for Hazardous Air Pollutants (NESHAP), and Commonwealth of Massachusetts Department of Environmental Protection (MADEP) standards (310 CMR 7.00: Air Pollution Control and 7.15: Asbestos) and DLS standards (454 CMR 28.00)

The samples were placed in labeled containers, which were sealed and submitted to the laboratory for analysis. Asbestos Identification Laboratory (AIL), located in Woburn, Massachusetts, analyzed the asbestos bulk samples using Polarized Light Microscopy with dispersion staining (PLM/DS) in general accordance with EPA Method 600/R-93/116. The visual estimation technique was used to quantify asbestos concentrations. AIL is fully accredited for bulk sample analysis under the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology. It is also licensed by the Massachusetts Department of Labor Standards (DLS) (License No.: AA000208).

PLM bulk sample analysis indicated that the following building materials identified and sampled by Atlas were found to contain asbestos:

- Gypsum Wallboard and Ceiling Board throughout units,
- Tan Joint Compound throughout units,

- Sealant associated with Pipe Threading associated with current heating units.

None of the other materials identified and collected by Atlas were found to contain asbestos.

Please refer to the attached *Bulk Sample Results of Polarized Light Microscopy Analysis Table* and *Asbestos Bulk Sample Laboratory Results* (Appendix I) for sample information and analytical results.

Please refer to the *Newton HA – 020800 Asbestos Abatement Specification* for estimated quantities of asbestos containing materials.

If any additional suspect asbestos containing materials are identified during renovation activities and are not of similar mode or frequency to the materials identified within this survey report, Atlas recommends that the material be treated as asbestos until its composition can be determined.

If you have any questions regarding the contents of this report, please call us at your convenience at 781-932-9400. Thank you for the opportunity to be of service and we look forward to working with you on future projects.

Respectfully submitted,

ATLAS TECHNICAL CONSULTANTS, LLC



Michael Ringuette
Assistant Project Manager
For Atlas Technical Consultants, LLC
Mobile: 781-301-1418
Email: michael.ringuette@oneatlas.com



Ricardo Nunes
Division Manager, Building Science
For Atlas Technical Consultants, LLC
Office: 781-404-1345
Email: ric.nunes@oneatlas.com

Attachments:

Bulk Sample Results Table
Appendix I – Asbestos Bulk Sample Laboratory Results

**BULK SAMPLE RESULTS TABLE
POLARIZED LIGHT MICROSCOPY ANALYSIS
682-690 WATERTOWN STREET – HORACE MANN CAMPUS
NEWTON, MASSACHUSETTS**

Batch	Sample Number	Material	Location	Result
123497	01A-C	Yellow Pipe Insulation	Crawlspace Building 15 & 17	NAD
123497	02A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawlspace Building 15 & 17	NAD
123497	03A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawlspace Building 15 & 17	NAD
123500	01A	Tan Gypsum Board	Induction Unit Unit 676B	2% Chrysotile
	01B			PS/NA
123500	02A-B	Multi Colored Sealant Associated with Pipe Threading	Induction Unit Unit 676B	NAD
123500	03A	Tan Joint Compound	Induction Unit Unit 676B	2% Chrysotile
	03B-E			PS/NA
123500	04A-C	Yellow Pipe Insulation	Induction Unit Unit 676B	PS/NA
123514	01A-C	Yellow Pipe Insulation	Crawl Space Building 686	NAD
123514	02A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawl Space Building 686	NAD
123514	03A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawl Space Building 686	NAD
123516	01A-C	Yellow Pipe Insulation	Crawlspace Building 674	NAD
123516	02A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawlspace Building 674	NAD
123516	03A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawlspace Building 674	NAD
123518	01A-C	Yellow Pipe Insulation	Crawlspace Buildings 4 & 6	NAD
123518	02A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawlspace Buildings 4 & 6	NAD
123518	03A-C	<2" Gray Pipe Fitting Insulation Hard Pack	Crawlspace Buildings 4 & 6	NAD
123520	01A-C	Yellow Pipe Insulation	682-692 Watertown St. Boiler Room	NAD
123530	02A-C	White Sealant Associated with Pipe Threading	682-692 Watertown St. Boiler Room	NAD

Batch	Sample Number	Material	Location	Result
123530	01A-B	Gray Gypsum Board	Induction Unit Unit 23C	NAD
123530	02A	Brown Sealant Associated with Pipe Threading	Induction Unit Unit 23C	2% Chrysotile
	02B			PS/NA
123530	03A	Tan Joint Compound	Induction Unit Unit 23C	3% Chrysotile
	03B-E			PS/NA
125173	01A-B	Gray Gypsum Wallboard	676 Watertown St., Unit B Kitchen Ceiling and Entry Ceiling	NAD
125173	02A-B	Tan Joint Compound	676 Watertown St., Unit B Kitchen Ceiling and Entry Ceiling	2% Chrysotile
125173	03A-B	12"X12" Tan Mottled Floor Tile	676 Watertown St., Unit B Kitchen	NAD
125173	04A-B	Brown Mastic Associated with 12"x12" Tan Mottled Floor Tile	676 Watertown St., Unit B Kitchen	NAD
125173	05A-B	Tan Cove Base Mastic	676 Watertown St., Unit B Kitchen	NAD
125173	06A-B	Ceramic Wall Tile Grout	676 Watertown St., Unit B Bathroom	NAD
125173	07A-B	Ceramic Wall Tile Mastic	676 Watertown St., Unit B Bathroom	NAD
125173	08A-B	Vapor Barrier under Wooden Flooring	676 Watertown St., Unit B Living Room	NAD

NAD – No Asbestos Detected

PS/NA – Positive Stop Not Analyzed

APPENDIX I

ASBESTOS BULK SAMPLE LABORATORY REPORTS



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123497

Project Information

*Newton Housing Authority Horace-Mann/682-690
Watertown St Crawlspace Building 15 & 17,
Newton MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Information provided by the customer can affect the validity of results. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. All customer information will be maintained in confidentiality. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.

Michael Manning
Owner/Director

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367628	Yellow Pipe Insulation		yellow	Fiberglass 90 Non-Fibrous 10	None Detected
01B 1367629	Yellow Pipe Insulation		yellow	Fiberglass 90 Non-Fibrous 10	None Detected
01C 1367630	Yellow Pipe Insulation		yellow	Fiberglass 90 Non-Fibrous 10	None Detected
02A 1367631	<2"0 Pipe Fitting Insulation	Hard Pack	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
02B 1367632	<2"0 Pipe Fitting Insulation	Hard Pack	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
02C 1367633	<2"0 Pipe Fitting Insulation	Hard Pack	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
03A 1367634	>2"0 Pipe Fitting Insulation	Hard Pack	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
03B 1367635	>2"0 Pipe Fitting Insulation	Hard Pack	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
03C 1367636	>2"0 Pipe Fitting Insulation	Hard Pack	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected

Sampled: September 12, 2024 Received: September 17, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by:

Mathew Chann

Batch: 123497



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123500

Project Information

*Newton H.A. - Horace Mann - Unit 676B - Induction
Unit,
Newton,
MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.

Michael Manning
Owner/Director

Newton H.A. - Horace Mann - Unit 676B - Induction
 Unit,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367652	Gypsum Board	Induction Unit	tan	Cellulose 3 Non-Fibrous 95	Detected Chrysotile 2
01B 1367653	Gypsum Board	Induction Unit			Not Analyzed
02A 1367654	Sealant Assoc. with Pipe Threading	Induction Unit	multi	Non-Fibrous 100	None Detected
02B 1367655	Sealant Assoc. with Pipe Threading	Induction Unit	multi	Non-Fibrous 100	None Detected
03A 1367656	Joint Compound	Induction Unit	tan	Non-Fibrous 98	Detected Chrysotile 2
03B 1367657	Joint Compound	Induction Unit			Not Analyzed
03C 1367658	Joint Compound	Induction Unit			Not Analyzed
03D 1367659	Joint Compound	Induction Unit			Not Analyzed
03E 1367660	Joint Compound	Induction Unit			Not Analyzed
04A 1367661	Yellow Pipe Insulation	Induction Unit	yellow	Fiberglass 90 Non-Fibrous 10	None Detected
04B 1367662	Yellow Pipe Insulation	Induction Unit	yellow	Fiberglass 90 Non-Fibrous 10	None Detected
04C 1367663	Yellow Pipe Insulation	Induction Unit	yellow	Fiberglass 90 Non-Fibrous 10	None Detected

Sampled: September 12, 2024 Received: September 17, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by:

David Thomas

Batch: 123500

Client: **ATLAS**
 Address: **10 STATE ST., SUITE 100, WOBURN, MA**
 Project Site & #: **NEWTON H.A. / HORACE MANN**
UNIT 676B INDUCTION UNIT
 Phone / email address:
NEWTON, MA

Contact: **D. THOMPSON, R. NUNES, SID M. SINGH**
 Relinquish by/date: **SID M. SINGH 9/14/24**
 Received by/date: **[Signature] 9/17/24**
 # of Samples Received: **2**

CHAIN OF CUSTODY

EPA/600/R-93/116

Page **1** of **3**

Asbestos Identification Lab

165 New Boston St.
 Suite 227
 Woburn, MA 01801
 (781)932-9600
 www.asbestosidentificationlab.com
 Date Sampled: **9/12/24**



BATCH# **123500**

Rev 06/16

Turnaround Time Sample Method

Less 3 Hrs Bulk
 Same Day Soil
 Next Day Wipe
 Two Day Point Count

Stop on 1st Positive? **Yes** / No

Notify Method: Mail E-Mail Verbal

Analyzed By: **Daniel Thomas**

Date: **9/17/24**

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Material / Location	Stereo Scope					Optical Properties							RI	Non-Asbestos Percentage (%)													
			% of Asbestos	Color	Homogeneity	Texture	Friable	Asbestos Minerals	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism		Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous							
1307652	01A	Material GYPSUM BOARD	0	T	Y	S	Y	Chrysotile	2	U	D	F	L	N	SSC	SSP													
		Amosite																											
		Cruciolite																											
		Tremolite																											
		Anthophyllite																											
		Actinolite																											
53	01B	Material INDUCTION UNIT						Chrysotile																					
		Amosite																											
		Cruciolite																											
		Tremolite																											
		Anthophyllite																											
		Actinolite																											
54	02A	Material SEALANT ASSOC WITH PIPE THREADING	0	M	N	S	N	Chrysotile																					
		Amosite																											
		Cruciolite																											
		Tremolite																											
		Anthophyllite																											
		Actinolite																											

DNA

100



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123514

Project Information

*Newton Housing Authority - Horace Mann - Crawl
Space - Building 686,
682-690 Watertown St.,
Newton,
MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.

Michael Manning
Owner/Director

Newton Housing Authority - Horace Mann - Crawl
 Space - Building 686,
 682-690 Watertown St.,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367820	Yellow Pipe Insulation	Crawl Space	yellow	Fiberglass 90 Non-Fibrous 10	None Detected
01B 1367821	Yellow Pipe Insulation	Crawl Space	yellow	Fiberglass 90 Non-Fibrous 10	None Detected
01C 1367822	Yellow Pipe Insulation	Crawl Space	yellow	Fiberglass 90 Non-Fibrous 10	None Detected
02A 1367823	<2" 0 Pipe Fitting Insulation Hard Pack	Crawl Space	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
02B 1367824	<2" 0 Pipe Fitting Insulation Hard Pack	Crawl Space	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
02C 1367825	<2" 0 Pipe Fitting Insulation Hard Pack	Crawl Space	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
03A 1367826	>2" 0 Pipe Fitting Insulation Hard Pack	Crawl Space	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
03B 1367827	>2" 0 Pipe Fitting Insulation Hard Pack	Crawl Space	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected
03C 1367828	>2" 0 Pipe Fitting Insulation Hard Pack	Crawl Space	gray	Fiberglass 60 Mineral Wool 20 Non-Fibrous 20	None Detected

Sampled: September 12, 2024 Received: September 17, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by:

Mathew Chann

Batch: 123514



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123516

Project Information

*Newton Housing Authority Horace-Mann / 682-690
Watertown St.,
Crawlspace Bldg 674,
Newton,
MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.

Michael Manning
Owner/Director

Newton Housing Authority Horace-Mann / 682-690
 Watertown St.,
 Crawlspace Bldg 674,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367833	Yellow Pipe Insulation	Crawlspace	yellow	Fiberglass 95 Non-Fibrous 5	None Detected
01B 1367834	Yellow Pipe Insulation	Crawlspace	yellow	Fiberglass 95 Non-Fibrous 5	None Detected
01C 1367835	Yellow Pipe Insulation	Crawlspace	yellow	Fiberglass 95 Non-Fibrous 5	None Detected
02A 1367836	<2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
02B 1367837	<2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
02C 1367838	<2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
03A 1367839	>2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
03B 1367840	>2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
03C 1367841	>2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected

Sampled: September 12, 2024 Received: September 16, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by:



Batch: 123516



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123518

Project Information

*Newton Housing Authority Horace-Mann / 682-690
Watertown St.,
Crawlspace Bldg 4&6,
Newton,
MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.

Michael Manning
Owner/Director

Newton Housing Authority Horace-Mann / 682-690
 Watertown St.,
 Crawlspace Bldg 4&6,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367842	Yellow Pipe Insulation	Crawlspace	yellow	Fiberglass 95 Non-Fibrous 5	None Detected
01B 1367843	Yellow Pipe Insulation	Crawlspace	yellow	Fiberglass 95 Non-Fibrous 5	None Detected
01C 1367844	Yellow Pipe Insulation	Crawlspace	yellow	Fiberglass 95 Non-Fibrous 5	None Detected
02A 1367845	<2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
02B 1367846	<2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
02C 1367847	<2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
03A 1367848	>2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
03B 1367849	>2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected
03C 1367850	>2" 0 Pipe Fitting Insulation Hard Pack	Crawlspace	gray	Fiberglass 50 Mineral Wool 15 Non-Fibrous 35	None Detected

Sampled: September 12, 2024 Received: September 16, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by:



Batch: 123518

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = _____	Stereo Scope					Asbestos Minerals	Optical Properties						RI		Non-Asbestos Percentage (%)						
		Material / Location	% of Asbestos	Color	Homogeneity	Texture	Friable		Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	=	L	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
45	02A	Material < 2" Ø PIPE FITTING INSULATION Location HARD PACK	0	GM	Y	TIE	Y	Chrysotile									5	15					
								Amosite															
								Crocidolite															
								Tremolite															35
								Anthophyllite															
								Actinolite															
46	02B	Material Location	0	GM	Y	TIE	Y	Chrysotile									5	15					
								Amosite															
								Crocidolite															
								Tremolite															35
								Anthophyllite															
								Actinolite															
47	02C	Material Location	0	GM	Y	TIE	Y	Chrysotile									5	15					
								Amosite															
								Crocidolite															
								Tremolite															35
								Anthophyllite															
								Actinolite															
48	03A	Material > 2" Ø PIPE FITTING INSULATION Location HARD PACK	0	GM	Y	TIE	Y	Chrysotile									5	15					
								Amosite															
								Crocidolite															
								Tremolite															35
								Anthophyllite															
								Actinolite															
49	03B	Material Location	0	GM	Y	TIE	Y	Chrysotile									5	15					
								Amosite															
								Crocidolite															
								Tremolite															35
								Anthophyllite															
								Actinolite															

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = _____	Stereo Scope				Asbestos Minerals	Optical Properties						RI		Non-Asbestos Percentage (%)								
		Material / Location	% of Asbestos	Color	Homogeneity	Texture		Friable	Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	=	-	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous	
50	03C	Material 72" Ø PIPE FITTING INSULATION Location HARD PACK CRAWLSPACE	0	GM	Y	PIE	Y	Chrysotile									5	5						
		Material					Chrysotile																	
		Location					Amosite																	
		Material					Crocidolite																	
		Location					Tremolite																	
		Material					Anthophyllite																	
		Location					Actinolite																	
		Material					Chrysotile																	
		Location					Amosite																	
		Material					Crocidolite																	
		Location					Tremolite																	
		Material					Anthophyllite																	
		Location					Actinolite																	



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123520

Project Information

*Newton Housing Authority Horace-Mann / 682-690
Watertown St.,
Boiler Room,
Newton,
MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

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- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.


Michael Manning
Owner/Director

Newton Housing Authority Horace-Mann / 682-690
 Watertown St.,
 Boiler Room,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367863	Yellow Pipe Insulation		tan	Fiberglass 95 Non-Fibrous 5	None Detected
01B 1367864	Yellow Pipe Insulation		tan	Fiberglass 95 Non-Fibrous 5	None Detected
01C 1367865	Yellow Pipe Insulation		tan	Fiberglass 95 Non-Fibrous 5	None Detected
02A 1367866	Sealant Assoc w/ Pipe Threading		white	Non-Fibrous 100	None Detected
02B 1367867	Sealant Assoc w/ Pipe Threading		white	Non-Fibrous 100	None Detected
02C 1367868	Sealant Assoc w/ Pipe Threading		white	Non-Fibrous 100	None Detected

Sampled: September 12, 2024 Received: September 17, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by: 

Batch: 123520



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 123530

Project Information

*Newton H.A. - Horace Mann - Unit 23C Induction Unit,
Newton,
MA*

*Method: BULK PLM ANALYSIS,
EPA/600/R-93/116*

Sid Singh
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Sid Singh,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

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- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Sid Singh for your business.

Michael Manning
Owner/Director

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1367956	Gypsum Board	Induction Unit	gray	Cellulose 5 Non-Fibrous 95	None Detected
01B 1367957	Gypsum Board	Induction Unit	gray	Cellulose 5 Non-Fibrous 95	None Detected
02A 1367958	Sealant Assoc. with Pipe Threading	Induction Unit	brown	Non-Fibrous 98	Detected Chrysotile 2
02B 1367959	Sealant Assoc. with Pipe Threading	Induction Unit			Not Analyzed
03A 1367960	Joint Compound	Induction Unit	tan	Non-Fibrous 97	Detected Chrysotile 3
03B 1367961	Joint Compound	Induction Unit			Not Analyzed
03C 1367962	Joint Compound	Induction Unit			Not Analyzed
03D 1367963	Joint Compound	Induction Unit			Not Analyzed
03E 1367964	Joint Compound	Induction Unit			Not Analyzed

Sampled: September 12, 2024 Received: September 17, 2024 Analyzed: September 17, 2024

Wednesday 18 September

Analyzed by:

Matthew Chann

Batch: 123530

Lab ID# (Lab Use Only)	Field ID/ (Client Reference)	Temp in Celcius = _____	Stereo Scope					Asbestos Minerals	Optical Properties						RI		Non-Asbestos Percentage (%)						
		Material / Location	% of Asbestos	Color	Homogeneity	Texture	Friable		Asbestos %	Morphology	Extinction	Sign of Elongation	Birefringence	Pleochroism	=	+	Fiberglass	Mineral Wool	Cellulose	Hair	Synthetic	Other	Non-Fibrous
1367964	03E	Material						Chrysotile															
		JOINT COMPOUND						Amosite															
		Location						Crocidolite															
		INDUCTION UNIT						Tremolite															
								Anthophyllite															
								Actinolite															
		Chrysotile																					
		Amosite																					
		Crocidolite																					
		Tremolite																					
		Anthophyllite																					
		Actinolite																					
		Chrysotile																					
		Amosite																					
		Crocidolite																					
		Tremolite																					
		Anthophyllite																					
		Actinolite																					

MA



Asbestos Identification Laboratory.

165 New Boston St., Ste 227
Woburn, MA 01801
781-932-9600

Web: www.asbestosidentificationlab.com Email:
mikemanning@asbestosidentificationlab.com



Batch: 125173

Project Information

676 Watertown St.,
Unit B,
Newton,
MA

Method: BULK PLM ANALYSIS,
EPA/600/R-93/116

Michael Ringuette
Atlas Technical Services, Woburn
10 State Street
Suite 100
Woburn, MA 01801

Dear Michael Ringuette,

Asbestos Identification Laboratory has completed the analysis of the samples from your office for the above referenced project. The Analysis Method is BULK PLM ANALYSIS, EPA/600/R-93/116. The information and analysis contained in this report have been generated using the EPA /600/R-93/116 Method for the Determination of Asbestos in Bulk Building Materials. Materials or products that contain more than 1% of any kind or combination of asbestos are considered an asbestos containing building material as determined by the EPA. This Polarized Light Microscope (PLM) technique may be performed either by visual estimation or point counting. Point counting provides a determination of the area percentage of asbestos in a sample. If the asbestos is estimated to be less than 10% by visual estimation of friable material, the determination may be repeated using the point counting technique. The results of the point counting supersede visual PLM results. Results in this report only relate to the items tested. This report may not be used by the customer to claim product endorsement by NVLAP or any other U.S. Government Agency.

Laboratory results represent the analysis of samples as submitted by the customer. Information regarding sample location, description, area, volume, etc., was provided by the customer. Information provided by the customer can affect the validity of results. Asbestos Identification Laboratory is not responsible for sample collection activities or analytical method limitations. Unless notified in writing to return samples, Asbestos Identification Laboratory discards customer samples after 30 days. Samples containing subsamples or layers will be analyzed separately when applicable. Reports are kept at Asbestos Identification Laboratory for three years. All customer information will be maintained in confidentiality. This report shall not be reproduced, except in full, without the written consent of Asbestos Identification Laboratory.

- NVLAP Lab Code: 200919-0
- Massachusetts Certification License: AA000208
- State of Connecticut, Department of Public Health Approved Environmental Laboratory Registration Number: PH-0142
- State of Maine, Department of Environmental Protection Asbestos Analytical Laboratory License Number: LB-0078(Bulk) LA-0087(Air)
- State of Rhode Island and Providence Plantations. Department of Health Certification: AAL-121
- State of Vermont, Department of Health Environmental Health License AL934461

Thank you Michael Ringuette for your business.

Michael Manning
Owner/Director

676 Watertown St.,
 Unit B,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
01A 1385432	Gypsum Wallboard	Kitchen Ceiling	gray	Cellulose 10 Non-Fibrous 90	None Detected
01B 1385433	Gypsum Wallboard	Entry Ceilbing	gray	Cellulose 10 Non-Fibrous 90	None Detected
02A 1385434	Joint Compound	Kitchen Ceiling	tan	Non-Fibrous 98	Detected Chrysotile 2
02B 1385435	Joint Compound	Entry Ceiling	tan	Non-Fibrous 98	Detected Chrysotile 2
03A 1385436	12x12 Tan Mottled Floor Tile	Unit B Kitchen	tan	Non-Fibrous 100	None Detected
03B 1385437	12x12 Tan Mottled Floor Tile	Unit B Kitchen	tan	Non-Fibrous 100	None Detected
04A 1385438	Brown Mastic Associated with 12x12 Tan Mottled Floor Tile	Unit B Kitchen	tan	Non-Fibrous 100	None Detected
04B 1385439	Brown Mastic Associated with 12x12 Tan Mottled Floor Tile	Unit B Kitchen	tan	Non-Fibrous 100	None Detected
05A 1385440	Tan Cove Base Mastic	Unit B Kitchen	tan	Non-Fibrous 100	None Detected
05B 1385441	Tan Cove Base Mastic	Unit B Kitchen	tan	Non-Fibrous 100	None Detected
06A 1385442	Ceramic Wall Tile Grout	Unit B Bathroom	gray	Non-Fibrous 100	None Detected
06B 1385443	Ceramic Wall Tile Grout	Unit B Bathroom	gray	Non-Fibrous 100	None Detected
07A 1385444	Ceramic Wall Tile Mastic	Unit B Bathroom	tan	Non-Fibrous 100	None Detected
07B 1385445	Ceramic Wall Tile Mastic	Unit B Bathroom	tan	Non-Fibrous 100	None Detected
08A 1385446	Vapor Barrier under Wooden Flooring	Unit B Living Room	black	Cellulose 80 Non-Fibrous 20	None Detected
08B 1385447	Vapor Barrier under Wooden Flooring	Unit B Living Room	black	Cellulose 80 Non-Fibrous 20	None Detected

Sampled: October 19, 2024 Received: October 21, 2024 Analyzed: October 21, 2024

Monday 21 October 2024

Analyzed by:



Batch: 125173

676 Watertown St.,
 Unit B,
 Newton,
 MA

FieldID LabID	Material	Location	Color	Non-Asbestos %	Asbestos %
09A 1385448	Black Adhesive on Foam ISO Board	Unit B Interior behind Heating Panel in Living Room	black	Non-Fibrous 100	None Detected
09B 1385449	Black Adhesive on Foam ISO Board	Unit B Interior behind Heating Panel in Living Room	black	Non-Fibrous 100	None Detected
10A 1385450	Gray Caulking on Glass Panel	Unit B Exterior	gray	Non-Fibrous 100	None Detected
10B 1385451	Gray Caulkiing on Glass Panel	Unit B Exterior	gray	Non-Fibrous 100	None Detected
11A 1385452	Fabric Coating on Waterproofing	Unit B Exterior	black	Cellulose 80 Non-Fibrous 20	None Detected
11B 1385453	Fabric Coating on Waterproofing	Unit B Exterior	black	Cellulose 80 Non-Fibrous 20	None Detected
12A 1385454	Black Waterproofing on CMU	Unit B Exterior	black	Non-Fibrous 100	None Detected
12B 1385455	Black Waterproofing on CMU	Unit B Exterior	black	Non-Fibrous 100	None Detected

Sampled: October 19, 2024 Received: October 21, 2024 Analyzed: October 21, 2024

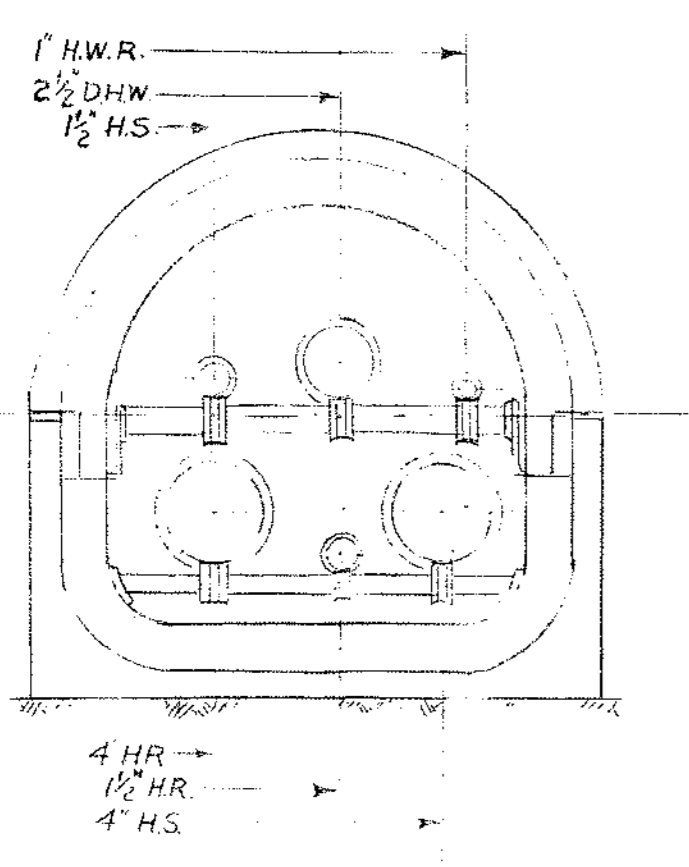
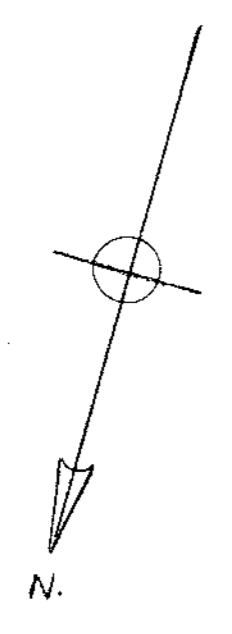
Monday 21 October 2024

Analyzed by:

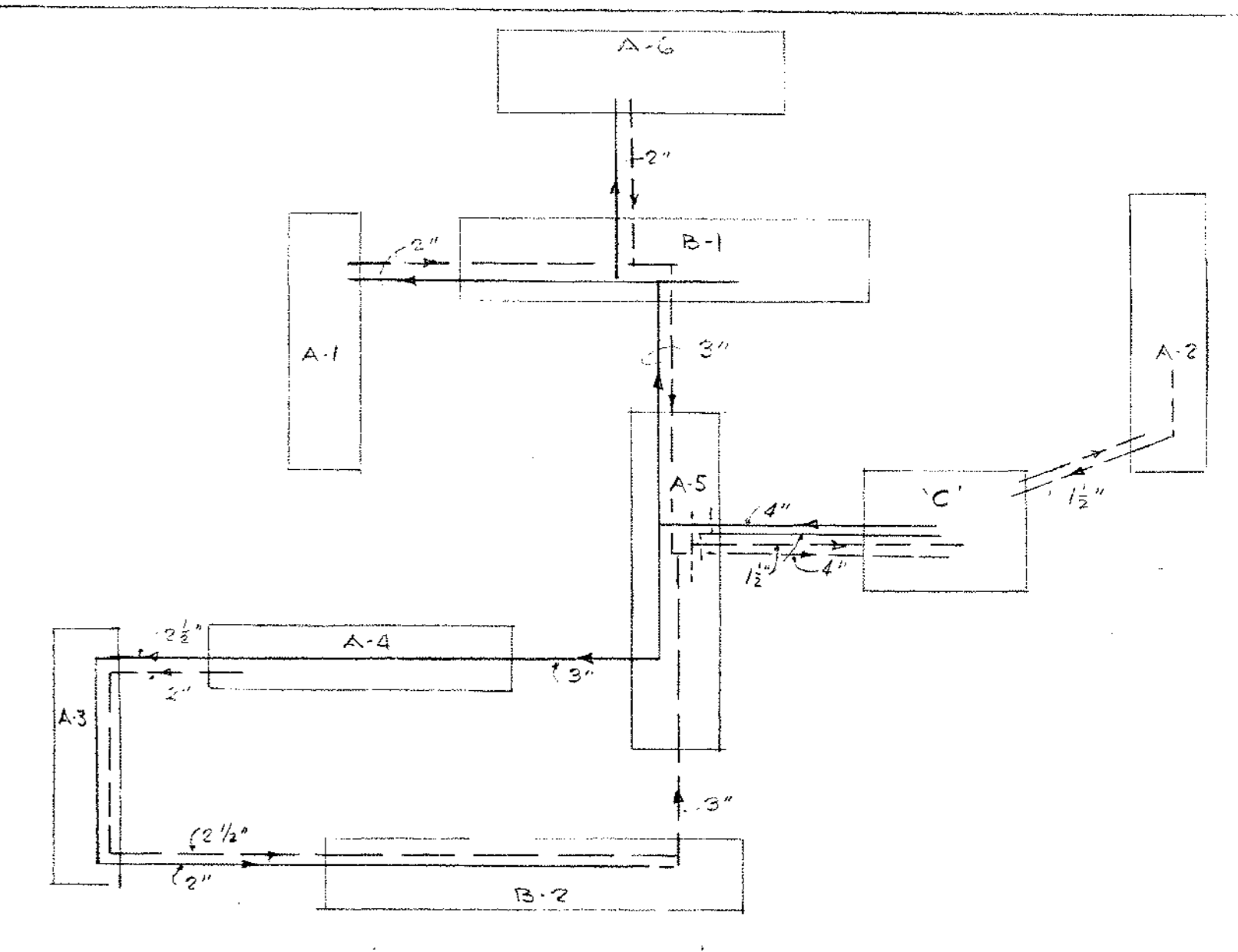


Batch: 125173

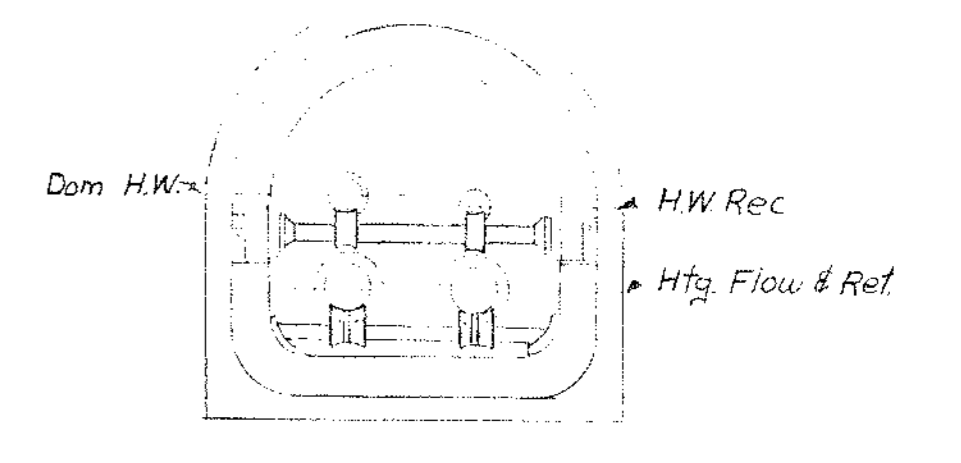
APPENDIX B
EXISTING DRAWINGS



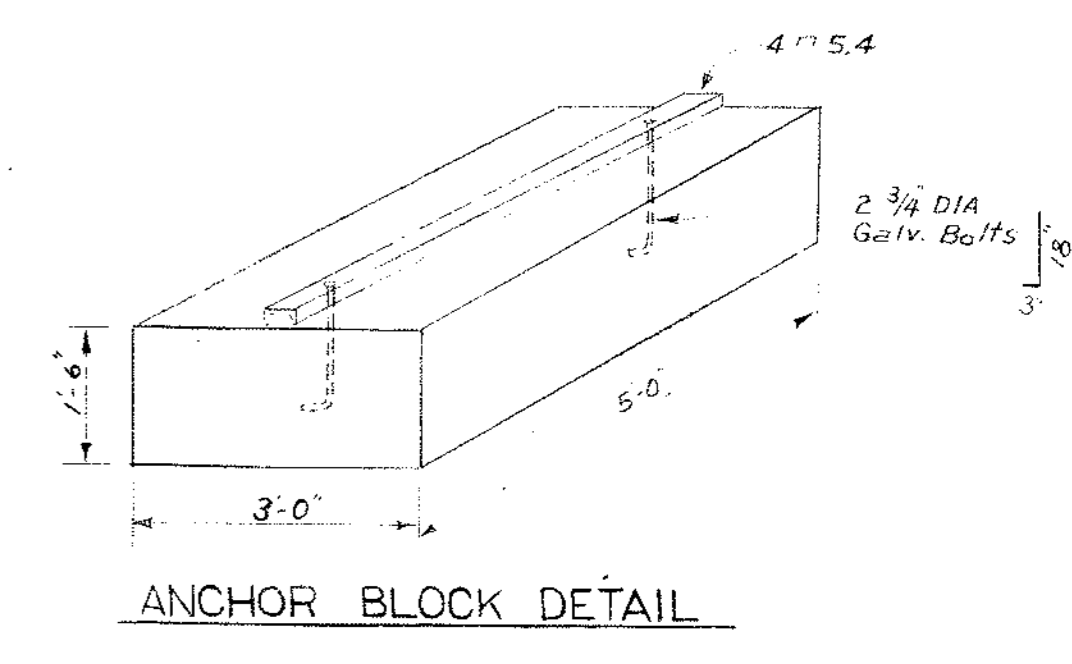
SECTION AT 24" CONDUIT



HEATING PIPING FLOW DIAGRAM
NO SCALE



TYPICAL SECTION THRU CONDUIT



ANCHOR BLOCK DETAIL

NOTE: Conduit sizes may vary. Final sizes to be by Conduit Mfg.

LEGEND

-S-	Sanitary Sewer
-W-	City Water
-O-	Storm Sewer
-H-	Heating & Domestic H.W. Conduit
-C-	Fuel Oil Lines
G.B.	Gate Box
S.M.H.	Sewer Man hole
H.S.	Heating Supply
H.R.	Heating Return
H.W.S.	Dom. Hot Water Supply
H.W.R.	Dom. Hot Water Return

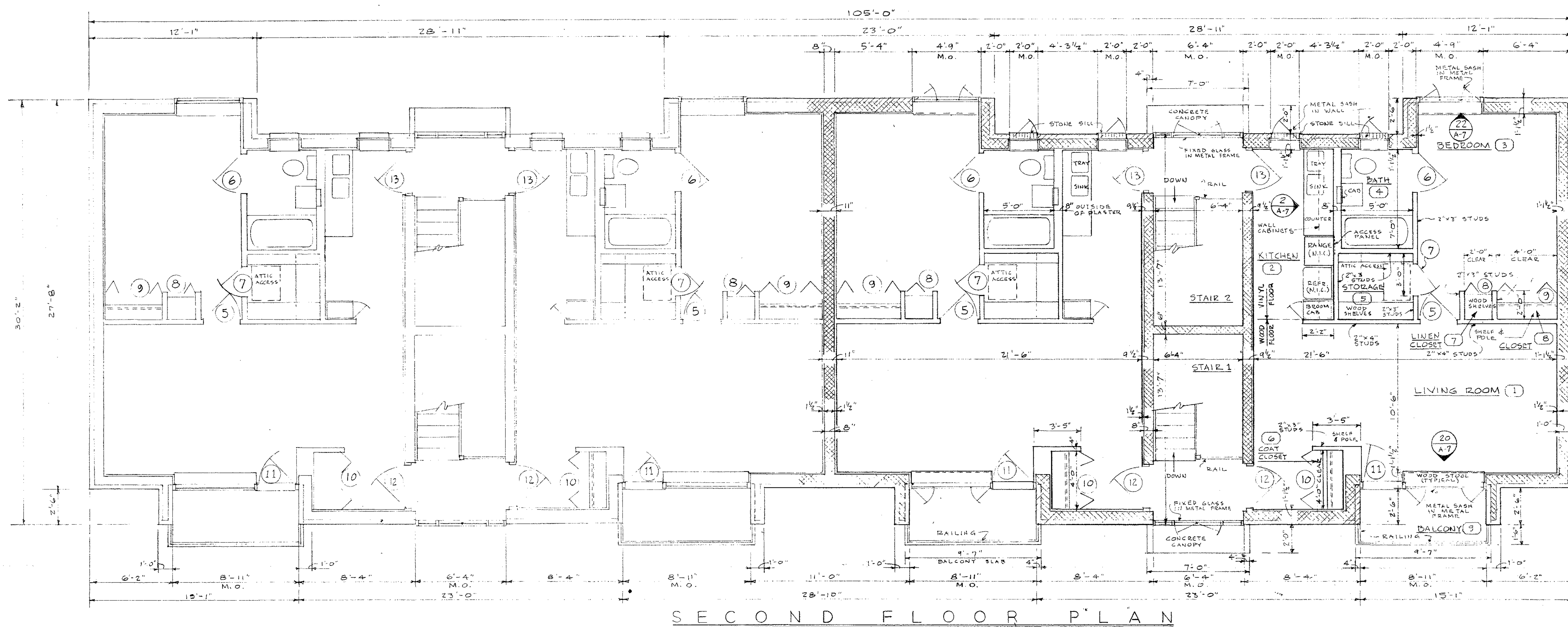
FEDERAL AIDED HOUSING FOR THE ELDERLY
MASS. PROJECT 36-3
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.

UTILITY PLAN

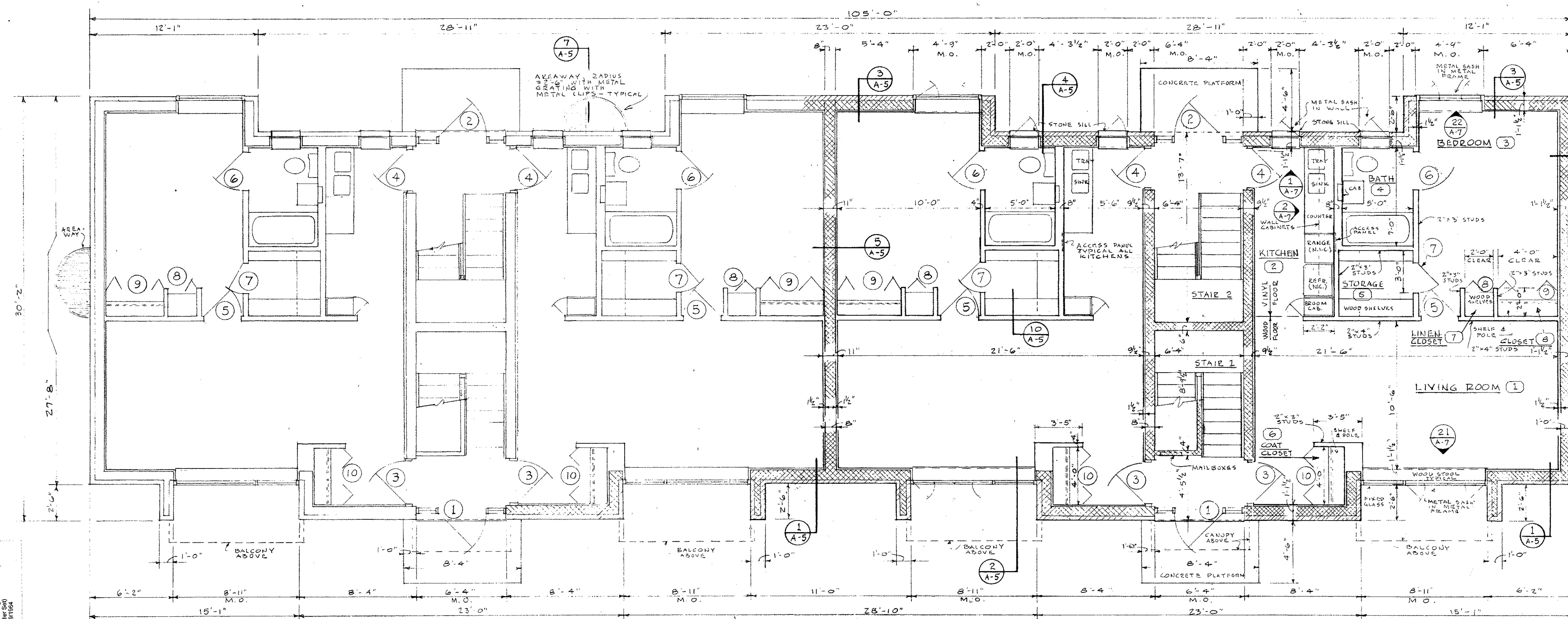
SCALE: 1" = 10'-0"
 OCT. 19, 1964

U-1

Project No. 62-0483337
 Federal Aid to the Elderly
 Newton, Mass.



SECOND FLOOR PLAN



FIRST FLOOR PLAN

ROOM FINISH SCHEDULE

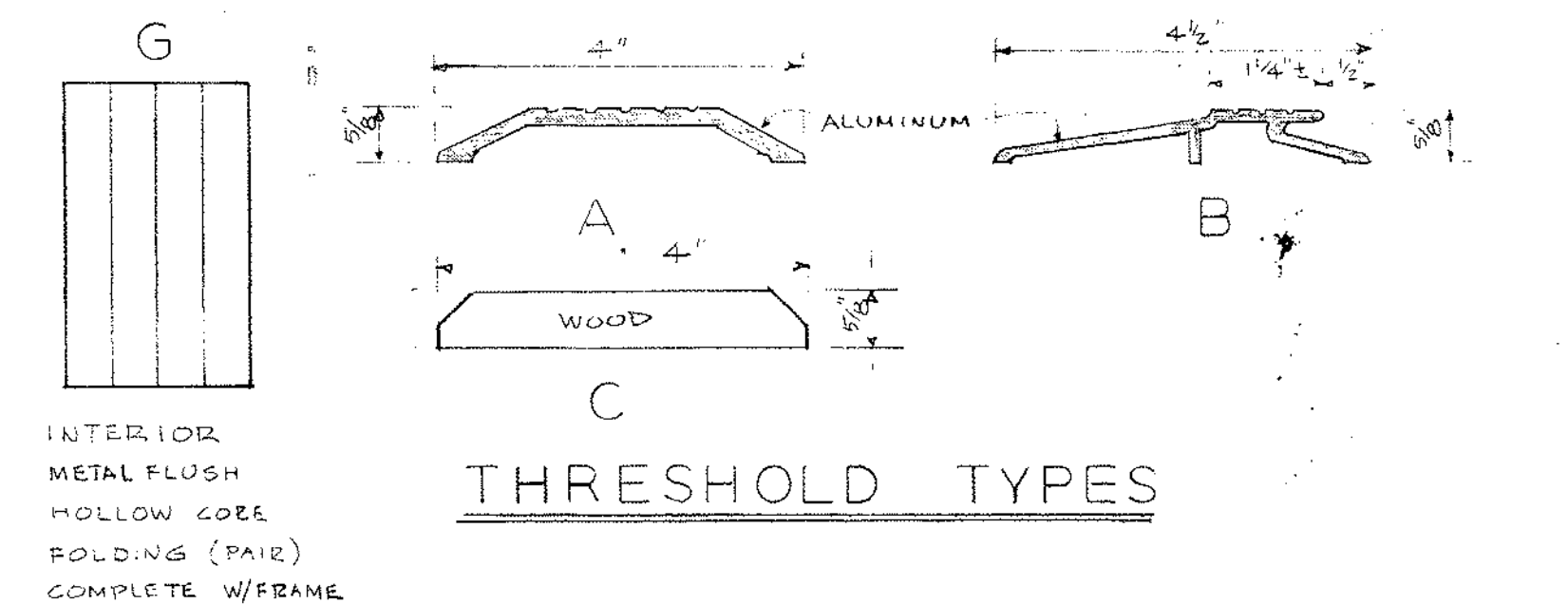
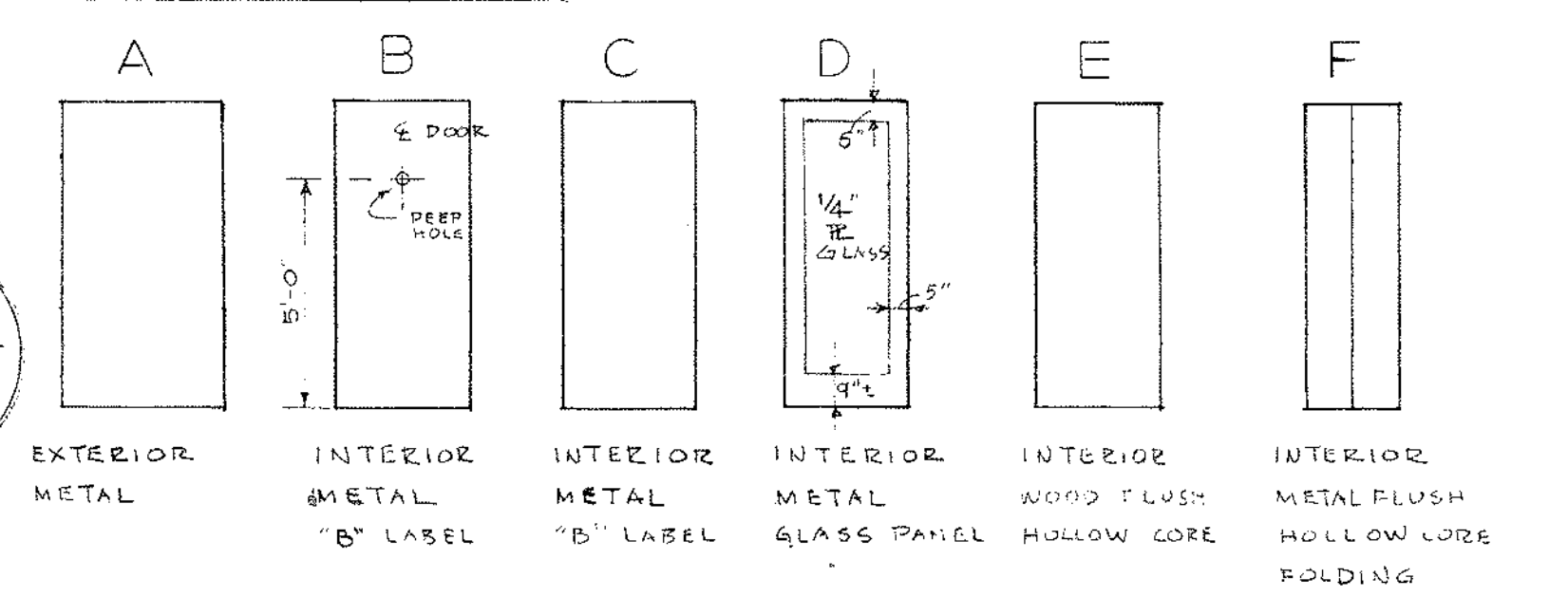
SPACE NO.	SPACE NAME	FLOOR	BASE	DADO	WALLS	CEILING	REMARKS
1	LIVING ROOM	WOOD	WOOD	NONE	PLASTER	PLASTER	
2	KITCHEN	VINYL ASBESTOS	VINYL ASBESTOS	NONE	PLASTER	PLASTER	CERAMIC TILE WALL AT COUNTER
3	BEDROOM	WOOD	WOOD	NONE	PLASTER	PLASTER	
4	BATH	CERAMIC TILE	CERAMIC TILE	NONE	PLASTER	PLASTER	CERAMIC TILE WALLS AT THREE SIDES OF TUB
5	STORAGE	WOOD	WOOD	NONE	PLASTER	PLASTER	
6	COAT CLOSET	WOOD	WOOD	NONE	PLASTER	PLASTER	
7	LINEN CLOSET	WOOD	WOOD	NONE	PLASTER	PLASTER	
8	CLOSET	WOOD	WOOD	NONE	PLASTER	PLASTER	
9	BALCONY	CONC.	NONE	NONE	BRICK	NONE	WOOD & METAL RAILING
-	STAIR 1	GRAND.	NONE	NONE	EXP. BL.	SEE REMARKS	PLAS. CIG AT 2ND FL.
-	STAIR 2	GRAND.	NONE	NONE	EXP. BL.	SEE REMARKS	PLAS. CIG AT 2ND FL.

DOOR SCHEDULE

DOOR NO.	DOOR TYPE	FRAME TYPE	DOOR WIDTH	DOOR HEIGHT	THICKNESS	CLOSER	THRESHOLD TYPE	REMARKS
1	A	C	3'-6"	7'-0"	1 3/4"	YES	A	
2	A	C	3'-6"	7'-0"	1 3/4"	YES	A	
3	B	P	3'-0"	7'-0"	1 3/4"	NONE	A	
4	C	P	3'-0"	7'-0"	1 3/4"	NONE	A	
5	E	R	2'-8"	6'-8"	1 3/8"	NONE	NONE	
6	E	R	2'-8"	6'-8"	1 3/8"	NONE	C	
7	E	R	2'-4"	6'-8"	1 3/8"	NONE	C	
8	F	BI-FOLD	2'-0"	6'-8"	1 3/8"	NONE	NONE	
9	G	BI-FOLD	4'-0"	6'-8"	1 3/8"	NONE	NONE	
10	G	BI-FOLD	4'-0"	6'-8"	1 3/8"	NONE	NONE	
11	D	B	2'-8"	6'-11 1/2"	1 3/4"	NONE	B	
12	B	P	3'-0"	6'-11 1/2"	1 3/4"	NONE	A	
13	C	P	3'-0"	6'-11 1/2"	1 3/4"	NONE	A	

NOTE: FOR DOOR FRAME TYPES SEE DWG. A-1

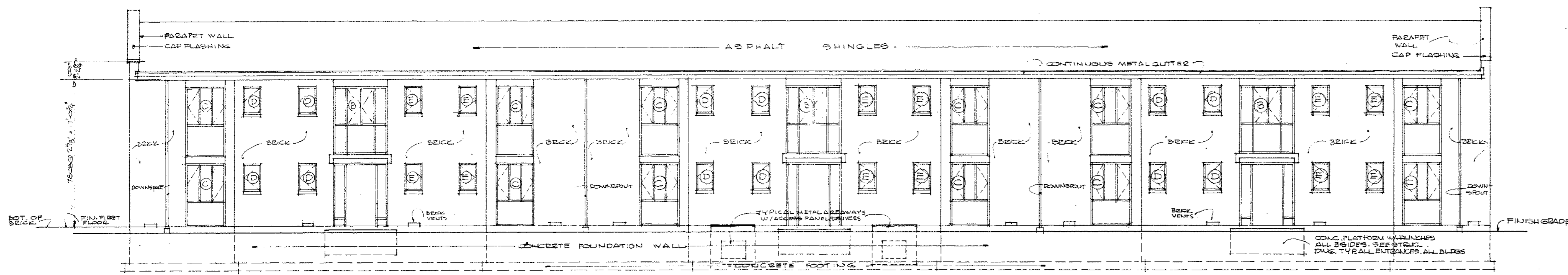
DOOR TYPES



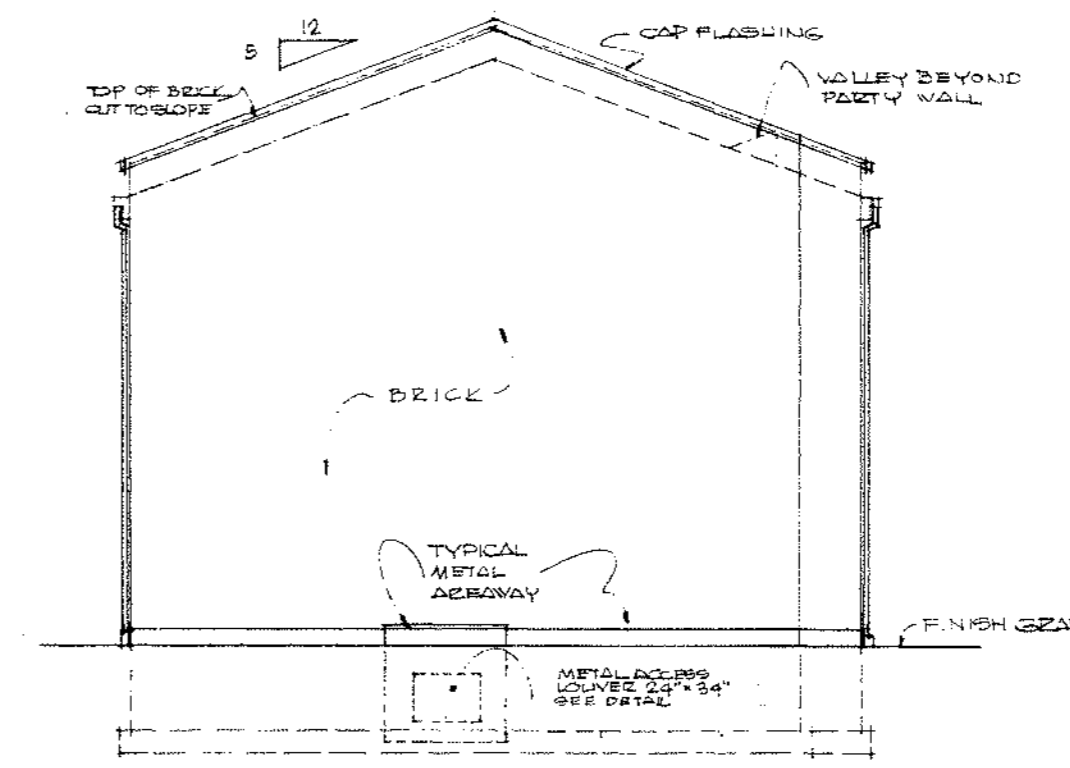
FEDERAL AIDED HOUSING FOR THE ELDERLY
 MASS. PROJECT 36-3
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.

WM. NELSON JACOBS
 ASSOCIATES, INC.
 ARCHITECTS - ENGINEERS
 819 STURGEON STREET
 FISHKILL, N.Y.

FIRST & SECOND FLOOR PLANS 8-UNIT DWELLING UNITS
 SCALE 1/8"=1'-0"
 OCT. 19, 1964

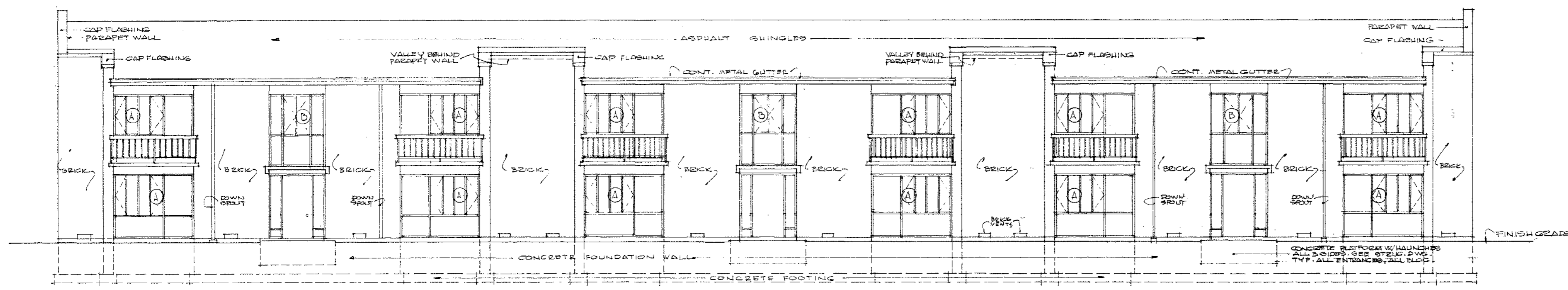


REAR ELEVATION - 12 UNIT BUILDING
SCALE - 1/8" = 1'-0"



LEFT ELEVATION - 12 UNIT BUILDING
SCALE - 1/8" = 1'-0"

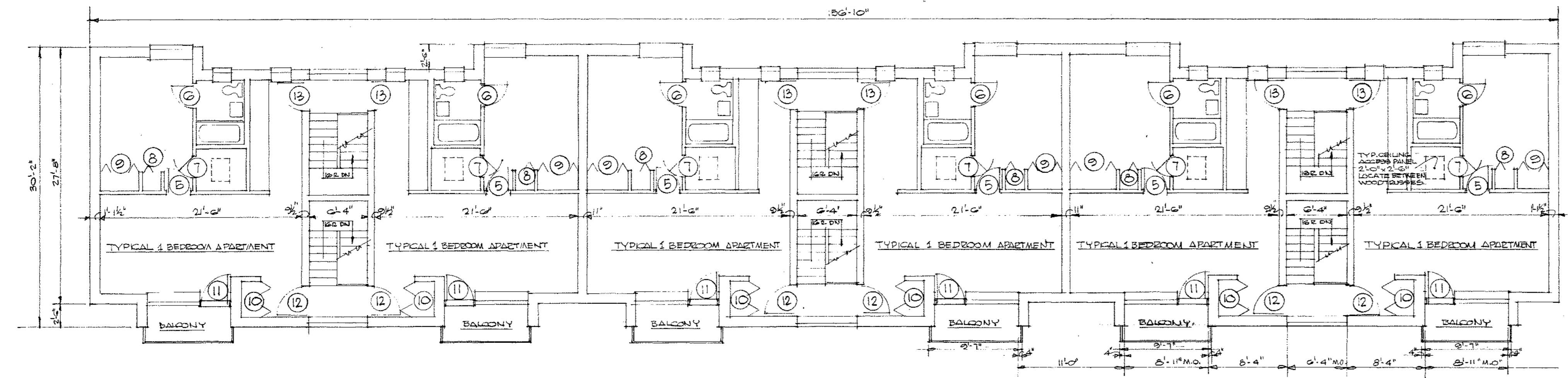
RIGHT ELEVATION - SIMILAR, BUT OPPOSITE HAND



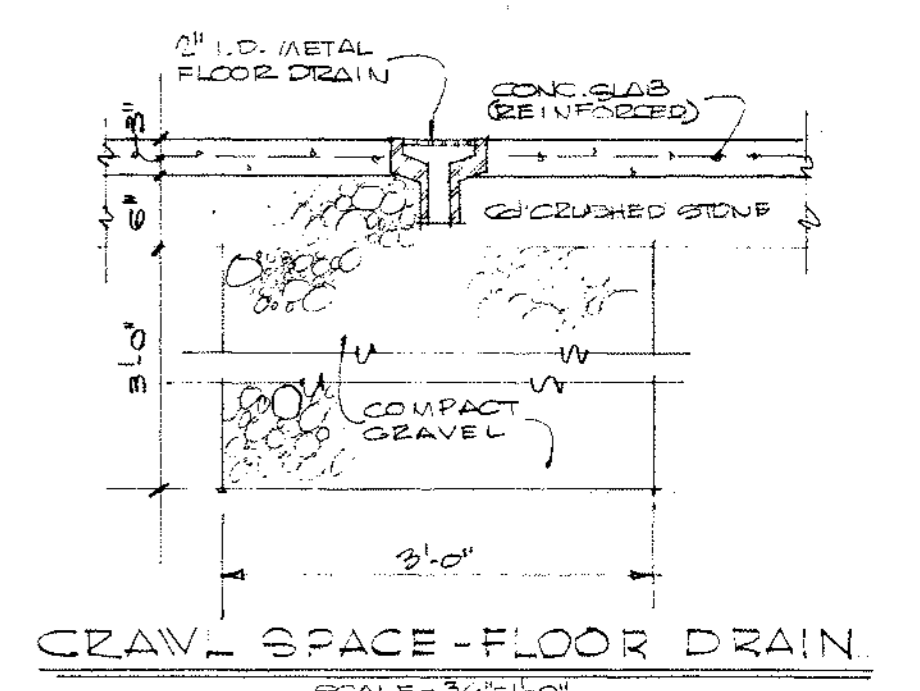
FRONT ELEVATION - 12 UNIT BUILDING
SCALE - 1/8" = 1'-0"

NOTE: FOR DETAILS OF ELEVATIONS SEE DWG A-3

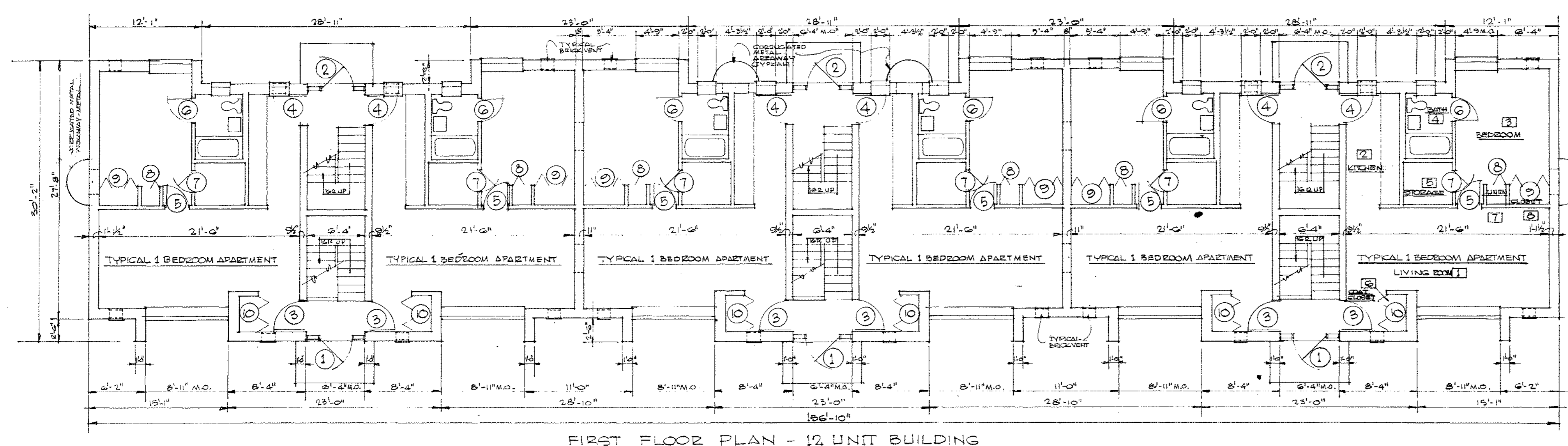
NOTE: FOR WINDOW SCHEDULES SEE DWG A-3



2ND FLOOR PLAN - 12 UNIT BUILDING
SCALE - 1/8" = 1'-0"



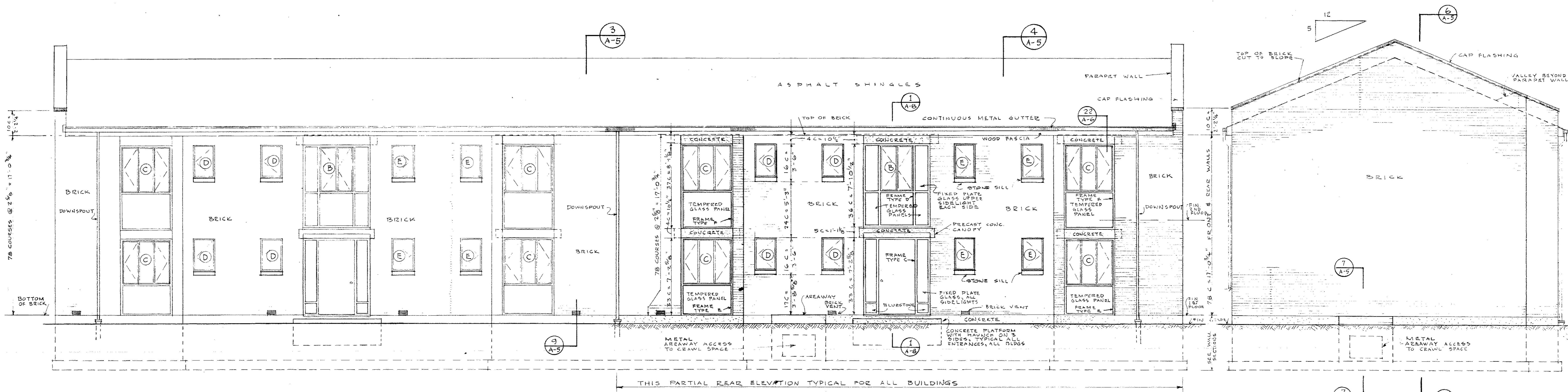
CRAWL SPACE - FLOOR DRAIN
SCALE - 3/4" = 1'-0"



FIRST FLOOR PLAN - 12 UNIT BUILDING
SCALE - 1/8" = 1'-0"

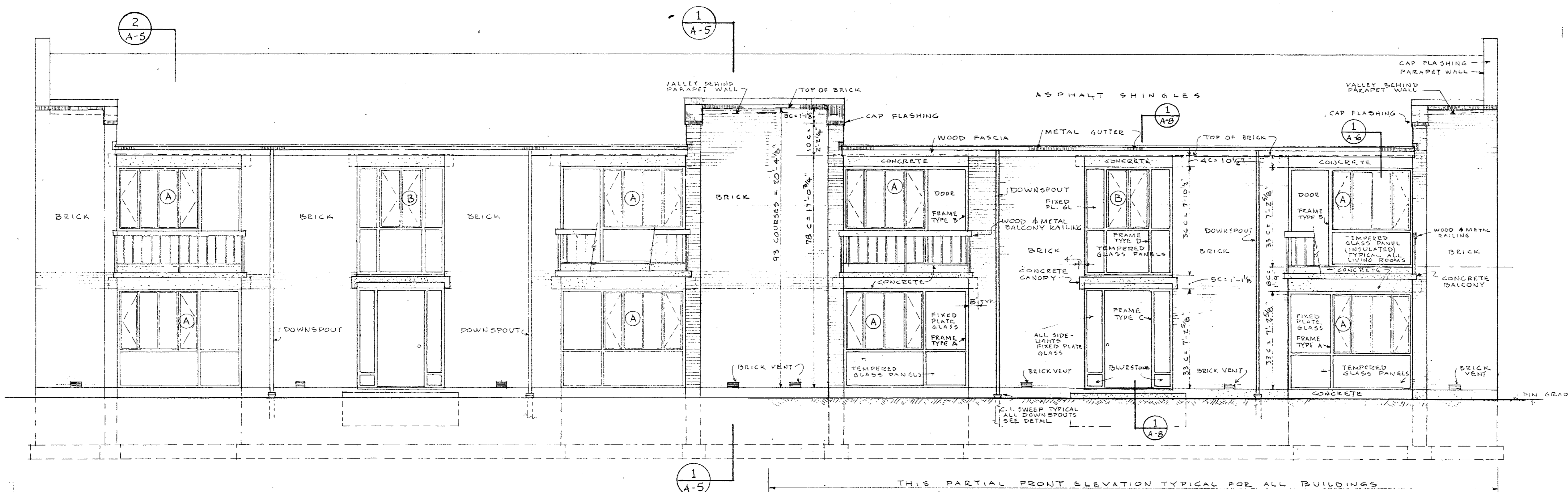
Handed Man (83) Housing for the Elderly 363
NEWTON, MASS.
OCT. 19, 1964

FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.	
FIRST & SECOND FLOOR PLANS ELEVATIONS - 12 UNIT DWELLING UNITS	SCALE: 1/8" = 1'-0" OCT. 19, 1964

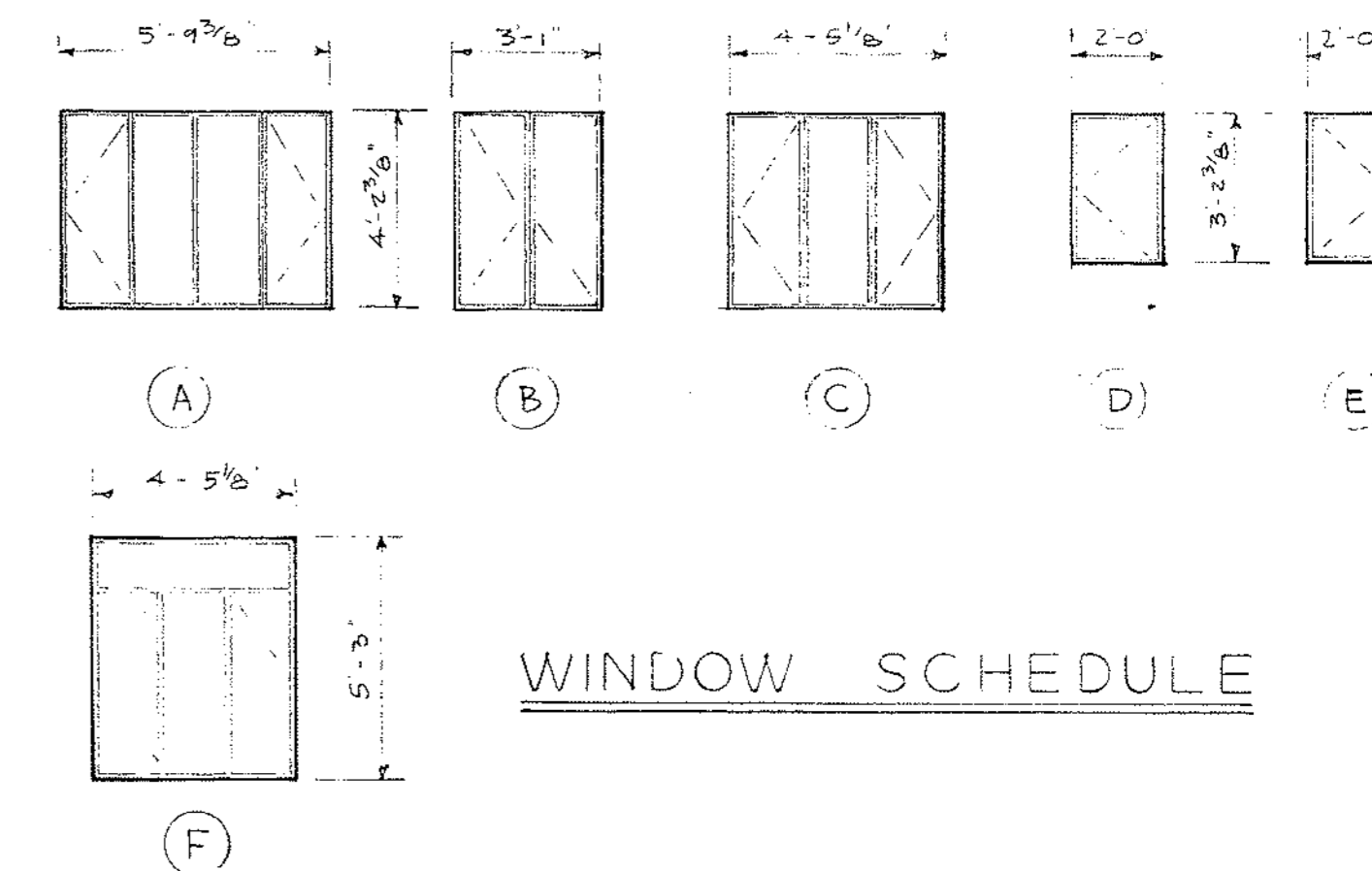


TYPICAL REAR ELEVATION 8 UNIT BUILDING

LEFT ELEVATION-ALL BUILDINGS
RIGHT ELEVATION SIMILAR EXCEPT OPPOSITE



TYPICAL FRONT ELEVATION 8 UNIT BUILDING



WINDOW SCHEDULE

Vertical Form (100) for the Elderly 363
 100-100-03374
 100-100-03374
 100-100-03374

FEDERAL AIDED HOUSING FOR THE ELDERLY
 MASS. PROJECT 363
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.

WM NELSON JACOBY
 ARCHITECTS, INC.
 100 WASHINGTON STREET
 NEWTON, MASSACHUSETTS

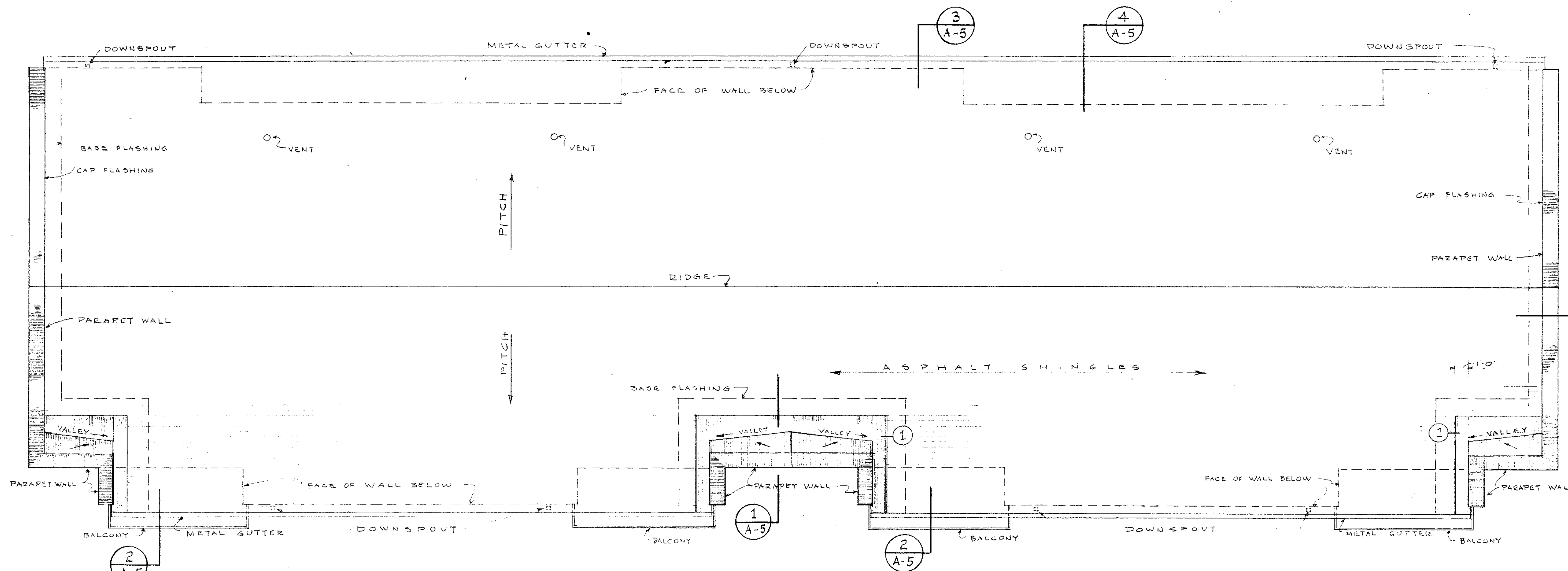
ELEVATIONS - 8 UNIT BLDGS

SCALE 1/4" = 1'-0"

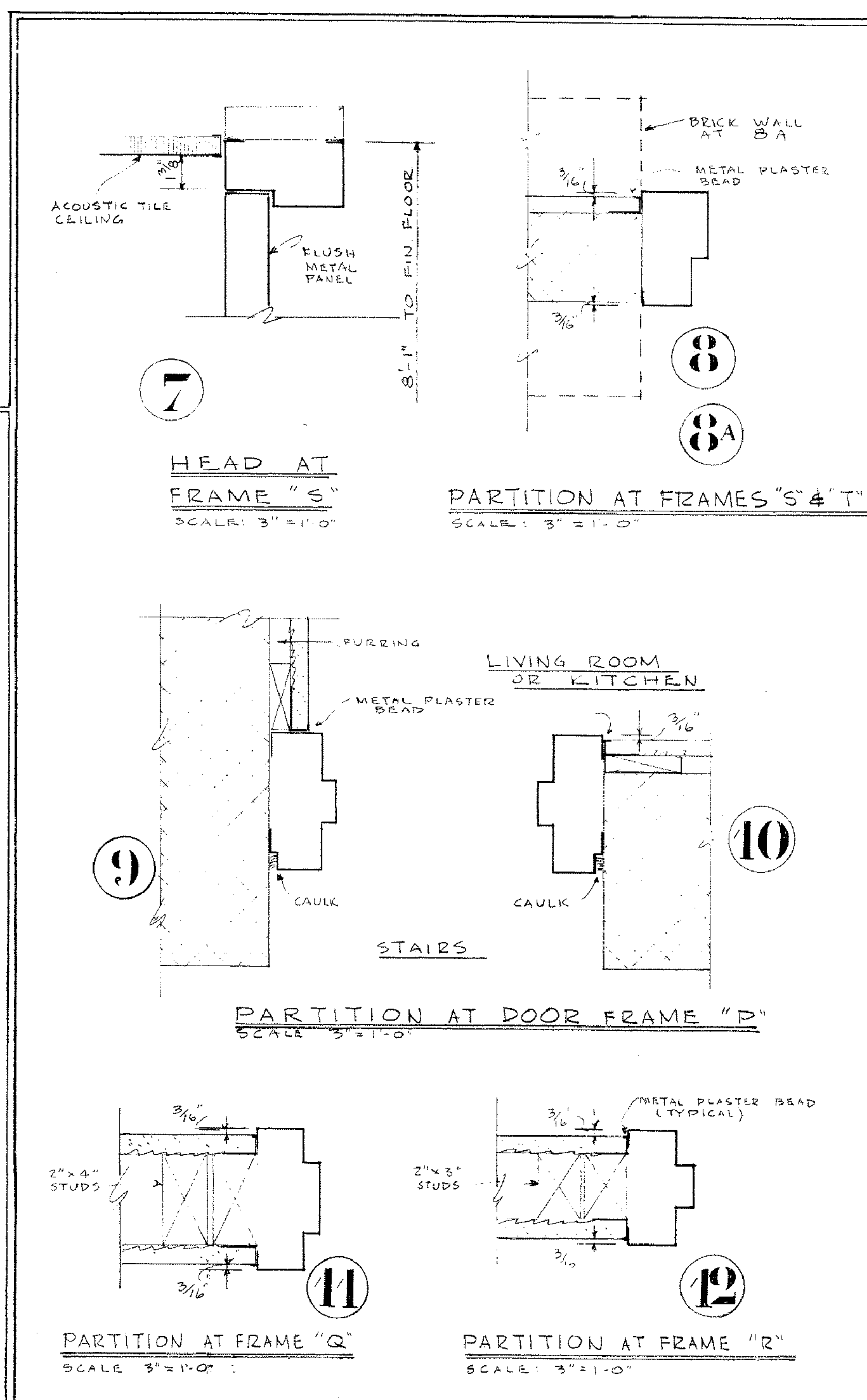
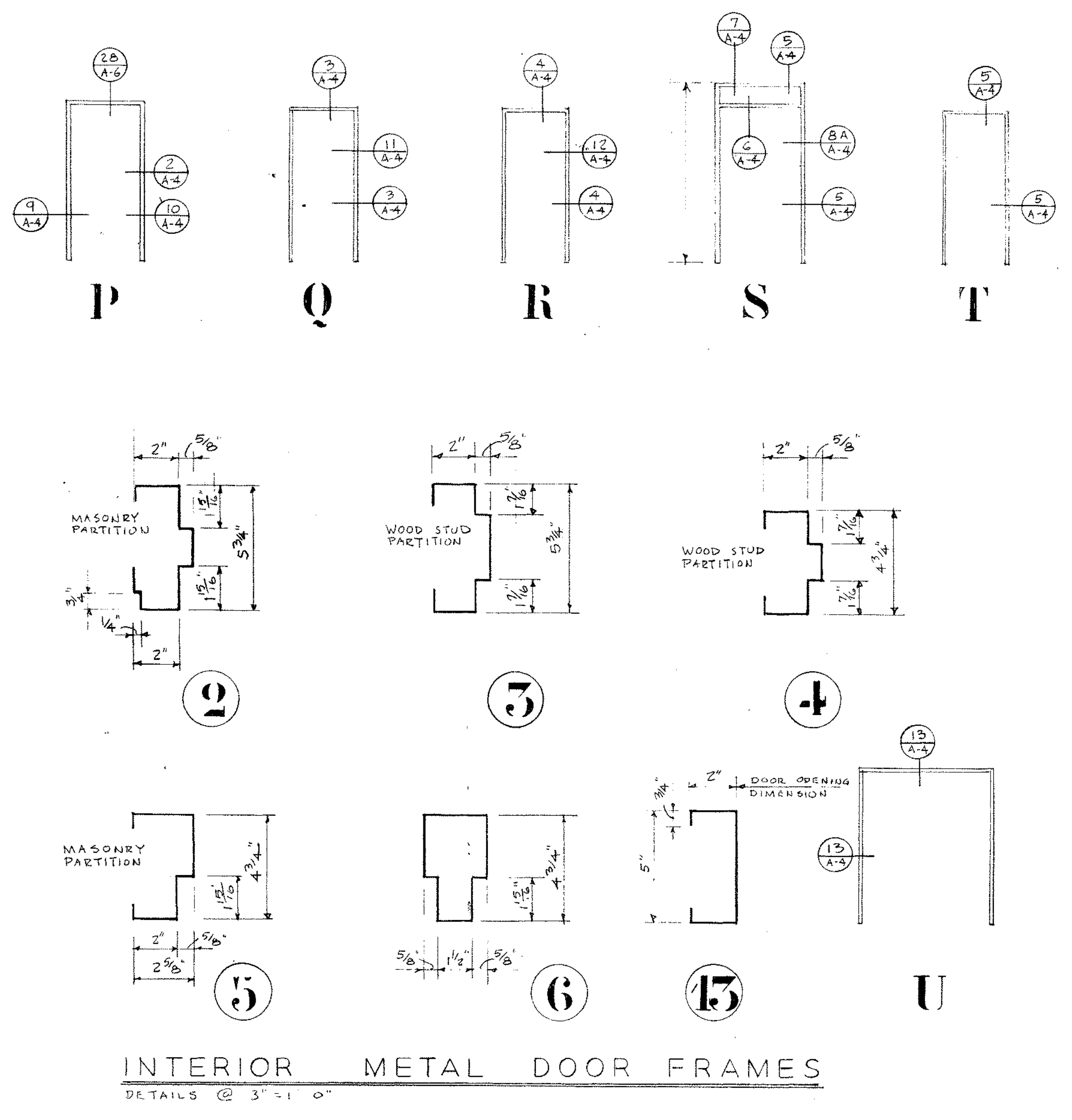
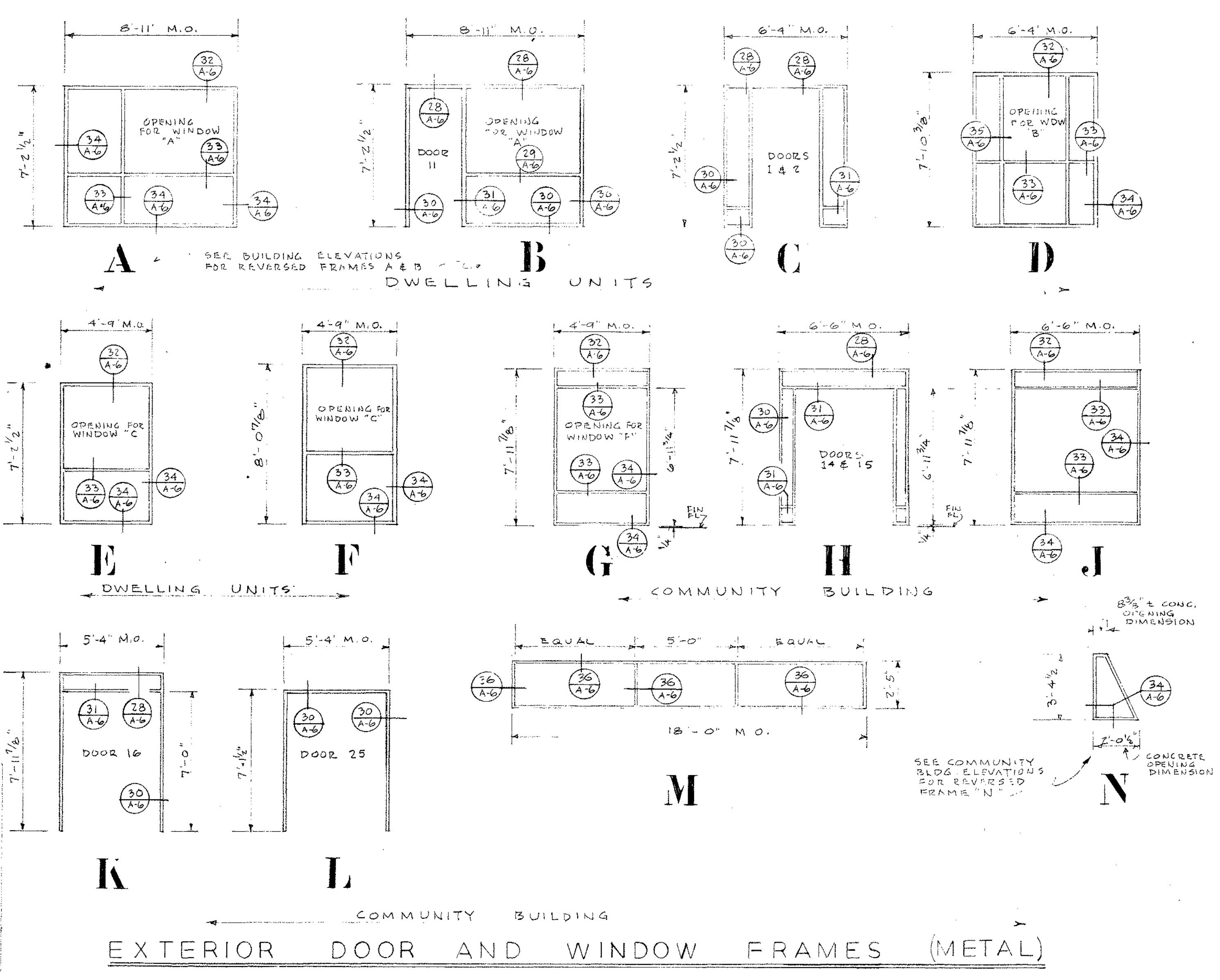
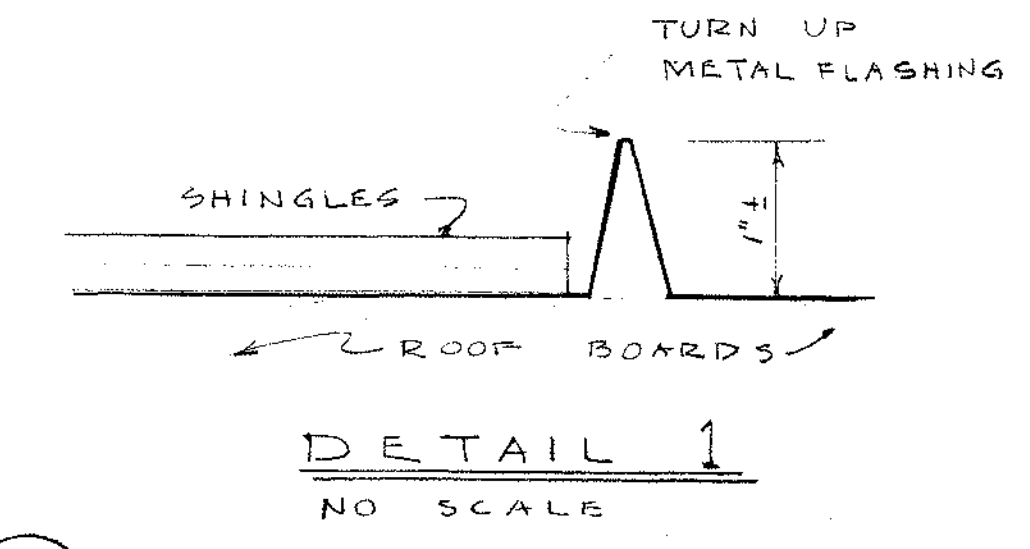
A-3

DWELLING UNITS

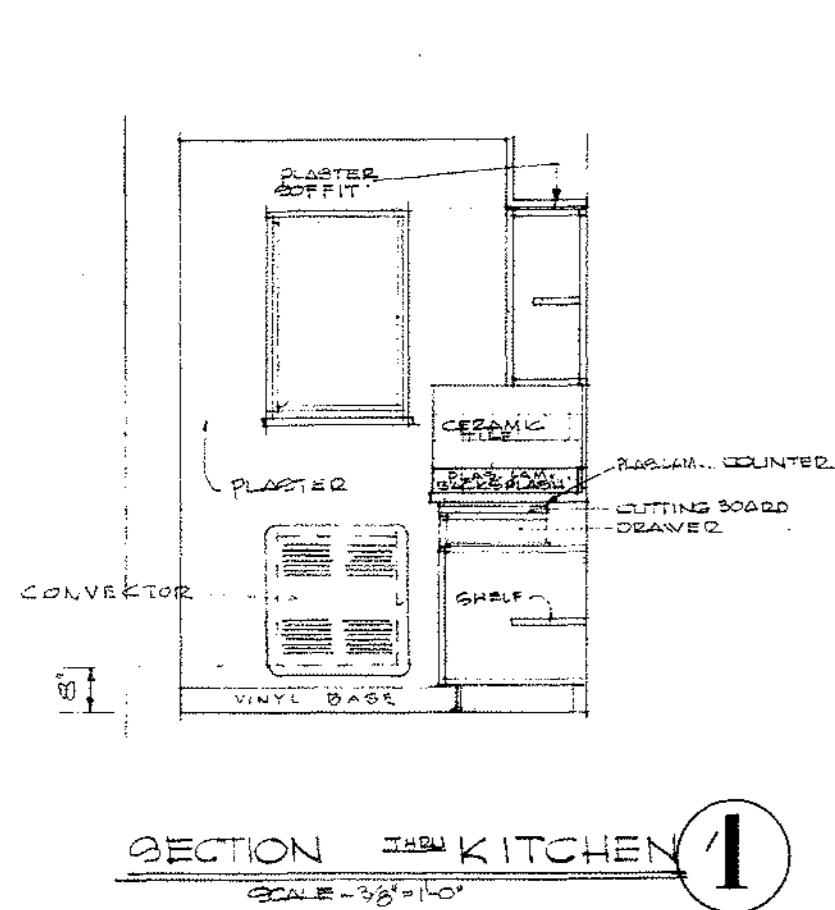
OCT. 19, 1964



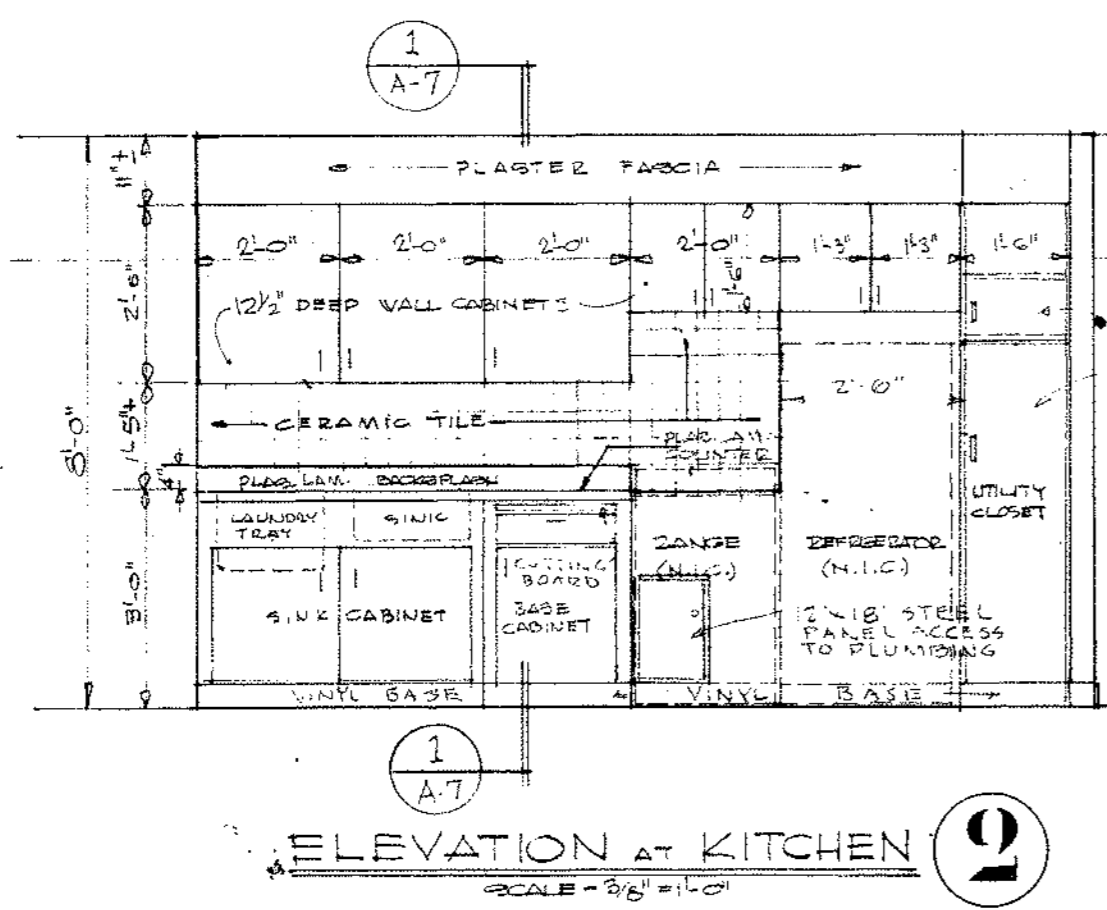
ROOF PLAN - TYPICAL 8-UNIT BUILDING
 SCALE 1/4" = 1'-0" NOTE: ROOF PLAN AT 12-UNIT BUILDINGS IS SIMILAR.



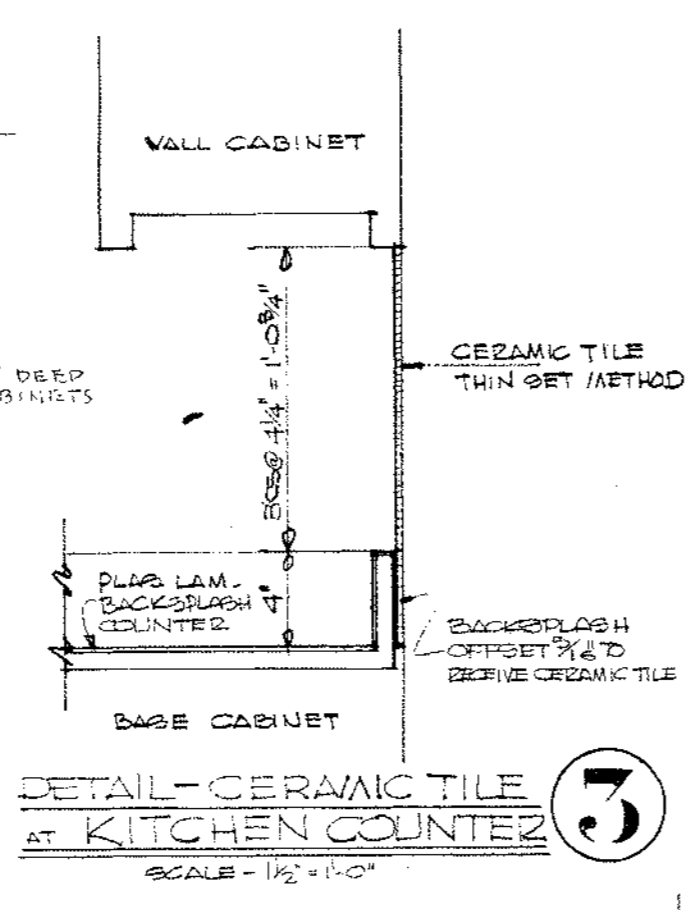
FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.	WM. NELSON JACOBS AND ASSOCIATES, INC. ARCHITECTS & ENGINEERS 212 STUART ST. BOSTON, MASSACHUSETTS
TYPICAL ROOF PLAN OF DWELLING UNITS & METAL DOOR & WINDOW FRAMES	SCALE 1/4" = 1'-0" OCT. 19, 1964



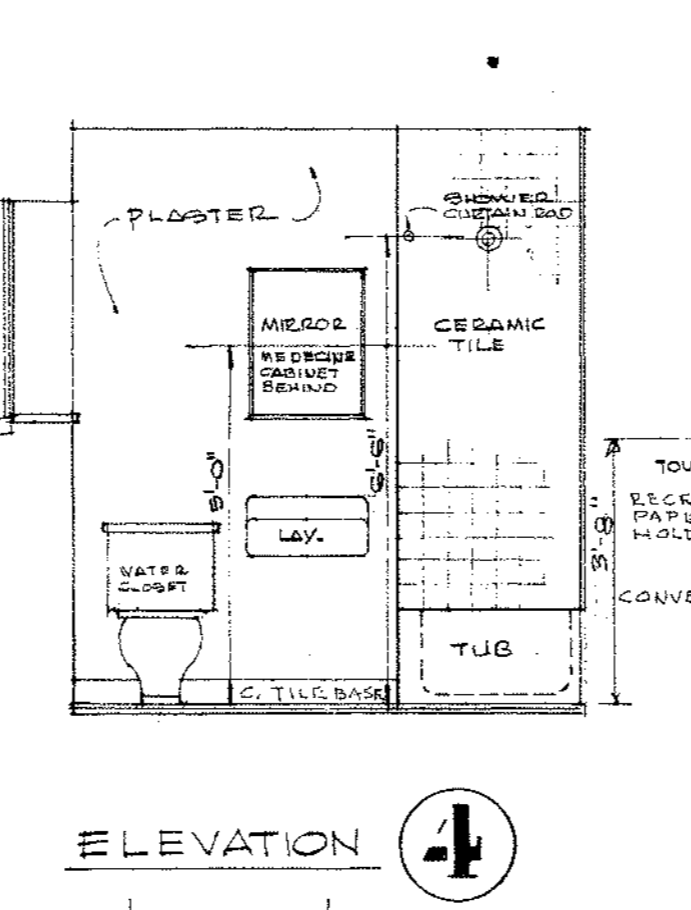
SECTION - MAIN KITCHEN 1
SCALE - 3/8" = 1'-0"



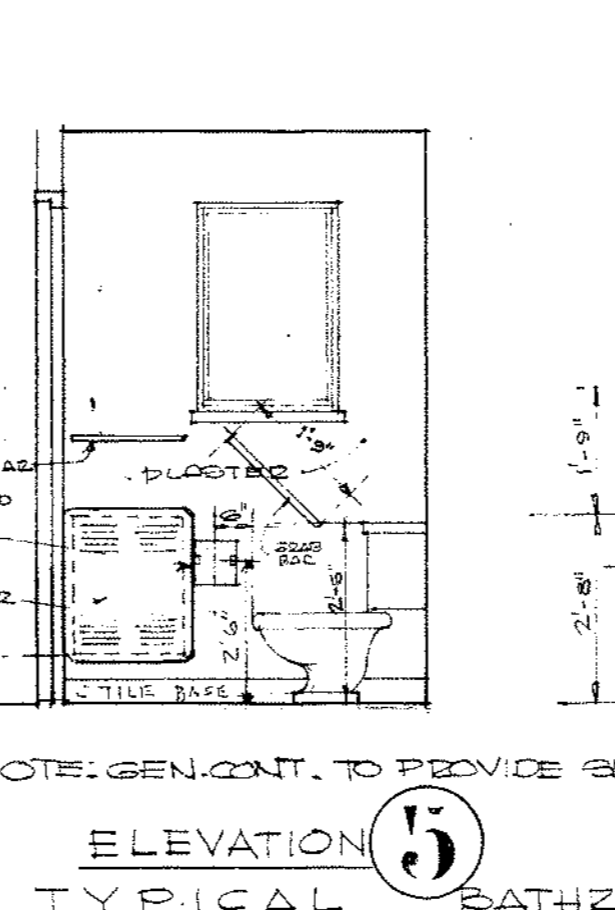
ELEVATION AT KITCHEN 2
SCALE - 3/8" = 1'-0"



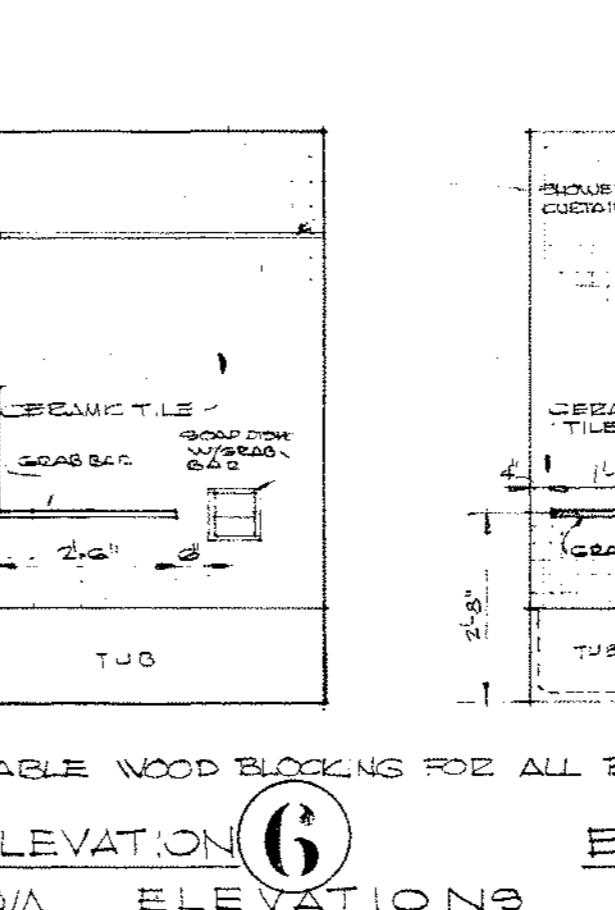
DETAIL - CERAMIC TILE AT KITCHEN COUNTER 3
SCALE - 1/2" = 1'-0"



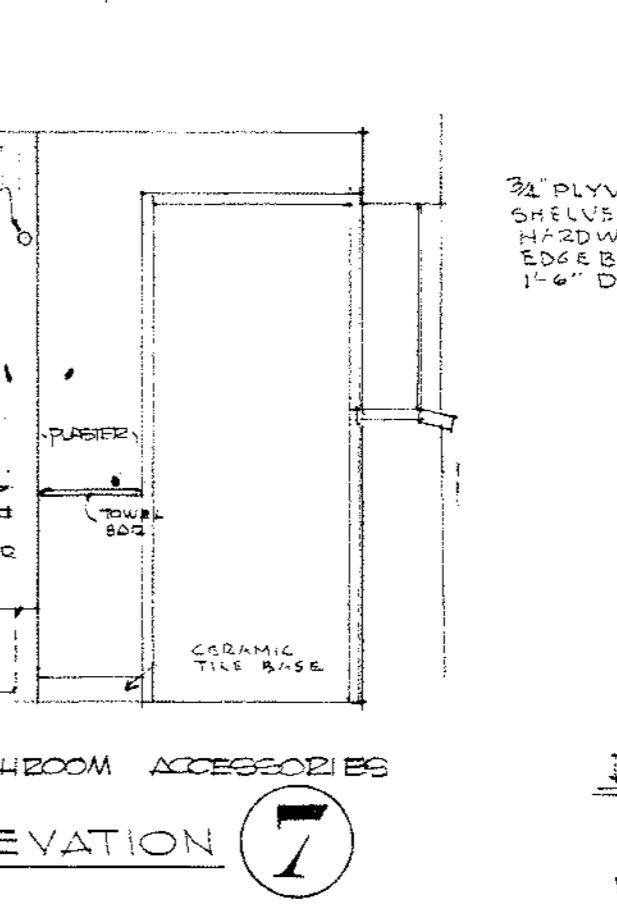
ELEVATION 4
SCALE - 3/8" = 1'-0"



ELEVATION 5
SCALE - 3/8" = 1'-0"

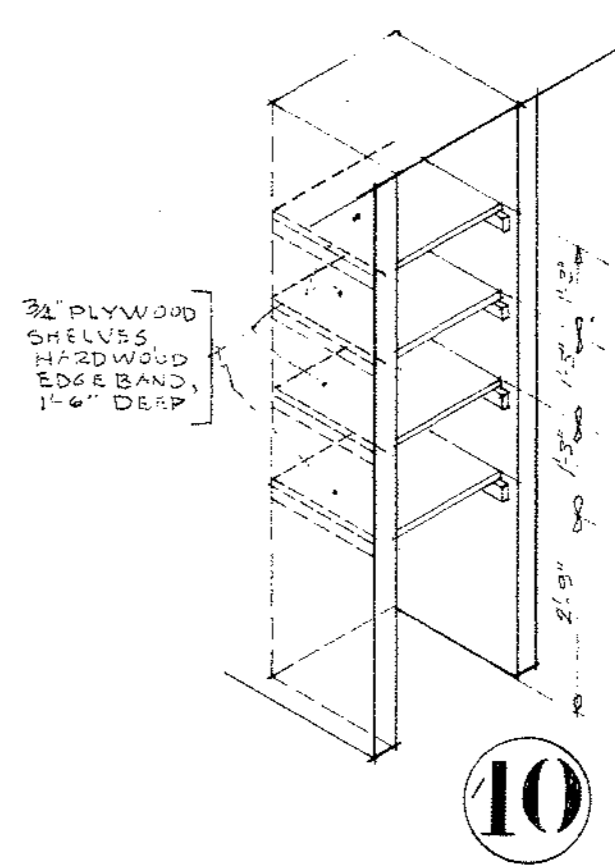


ELEVATION 6
SCALE - 3/8" = 1'-0"

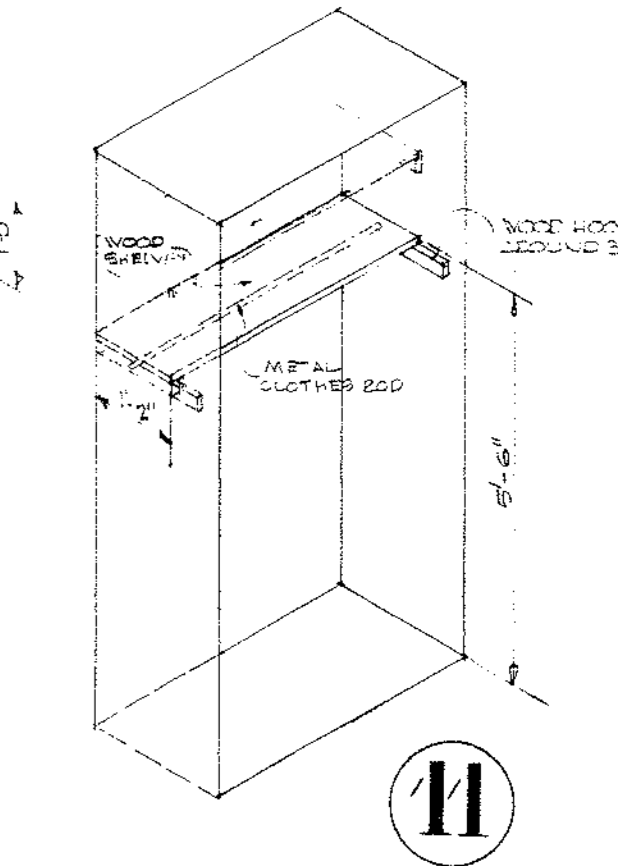


ELEVATION 7
SCALE - 3/8" = 1'-0"

NOTE: GEN. CONT. TO PROVIDE SUITABLE WOOD BLOCKING FOR ALL BATHROOM ACCESSORIES

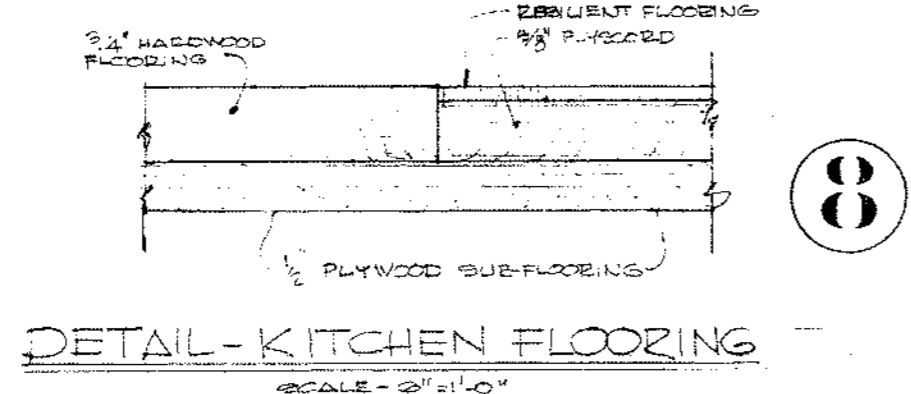


DETAIL - LINEN CLOSET #7
NO SCALE

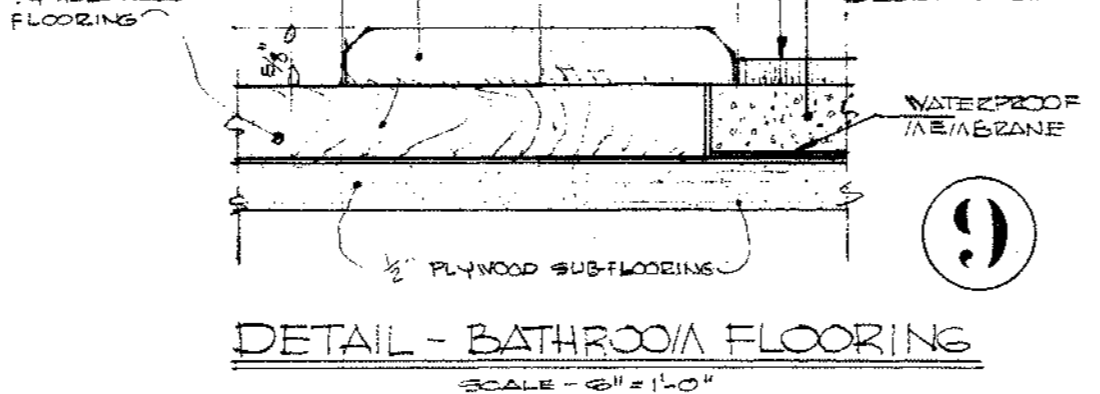


DETAIL - TYPICAL CLOSETS #2, #3, #4, #5, #6, #7 IN COMMUNITY BLDG
NO SCALE

NOTE: SUPPORT ALL SHELVES W/ 1" x 3" WOOD CLEATS

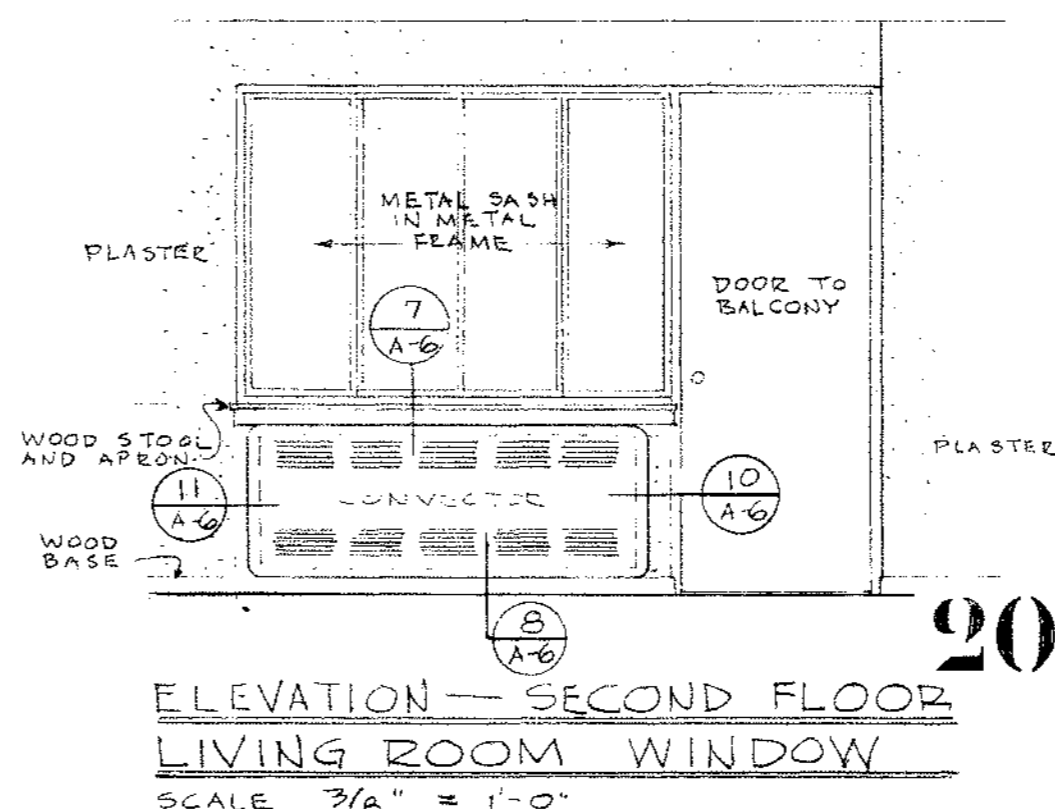


DETAIL - KITCHEN FLOORING
SCALE - 3/8" = 1'-0"

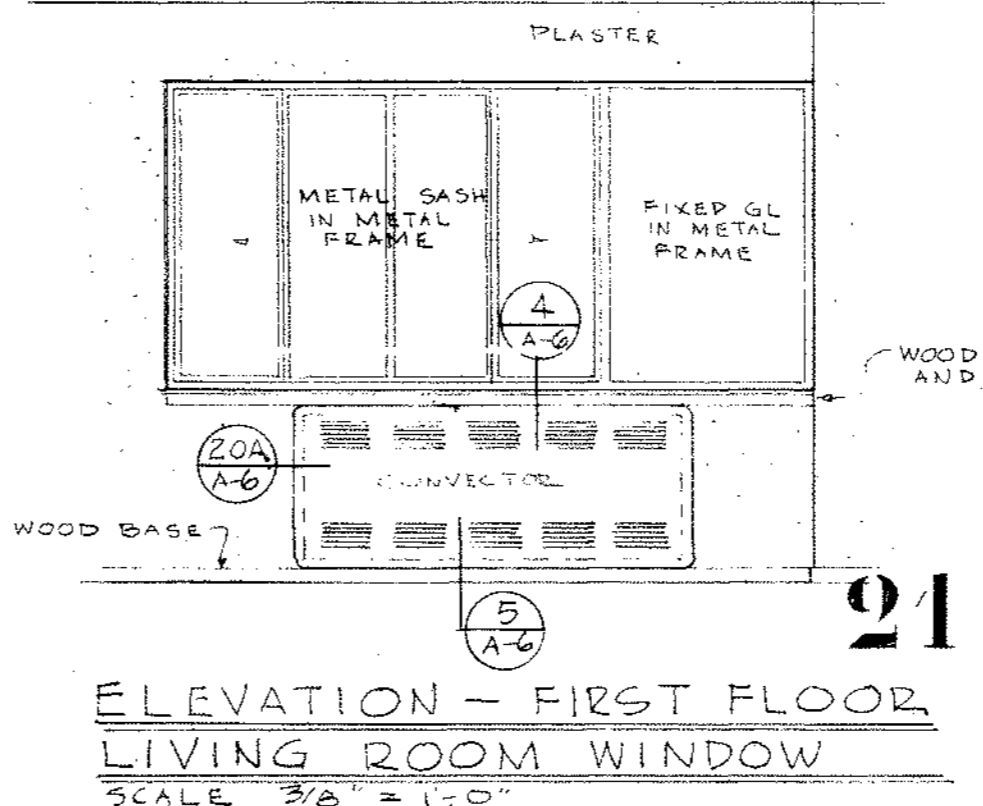


DETAIL - BATHROOM FLOORING
SCALE - 3/8" = 1'-0"

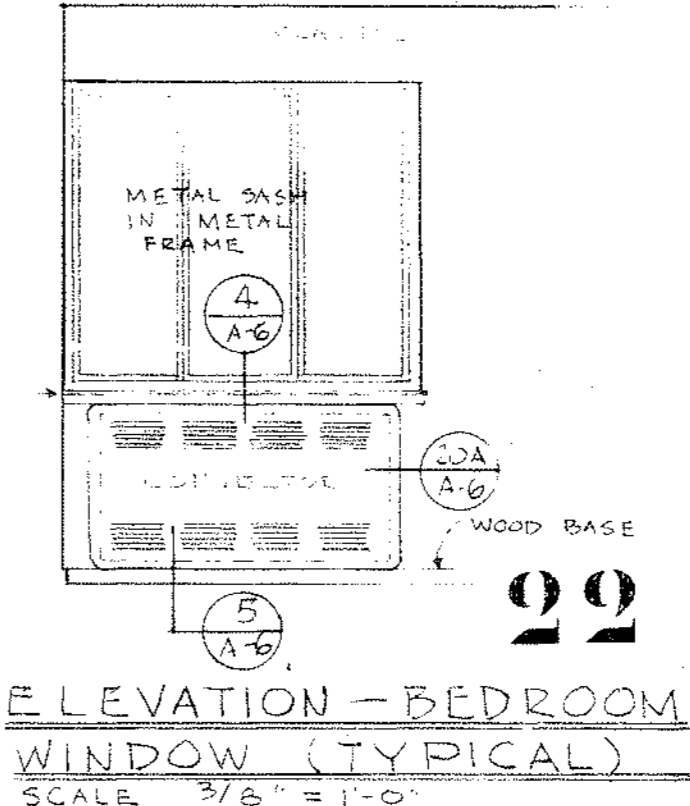
ALL CABINETS TO BE FLUSH FACE & ALL EXPOSED SURFACES TO BE COVERED WITH PLASTIC LAMINATE FINISH
GEN. CONT. TO VERIFY EXACT KITCHEN LAYOUT DIMENSIONS FROM SIZES OF CABINETWORK, RANGE, REFRIGERATOR



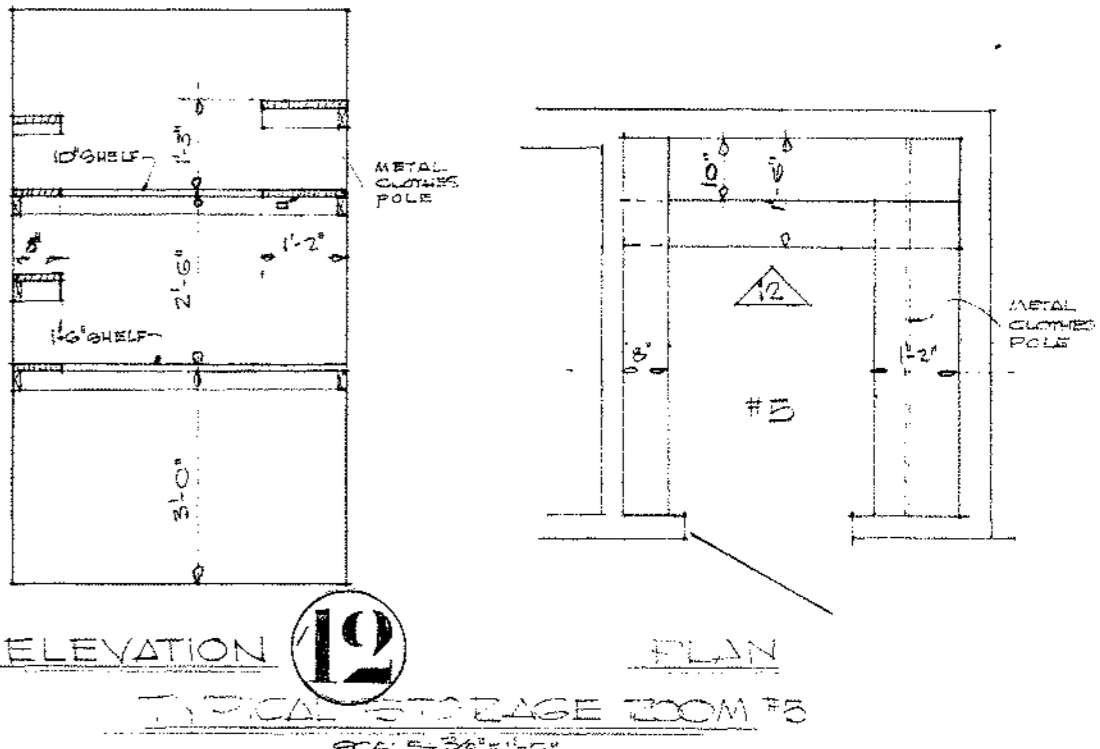
ELEVATION - SECOND FLOOR LIVING ROOM WINDOW
SCALE - 3/8" = 1'-0"



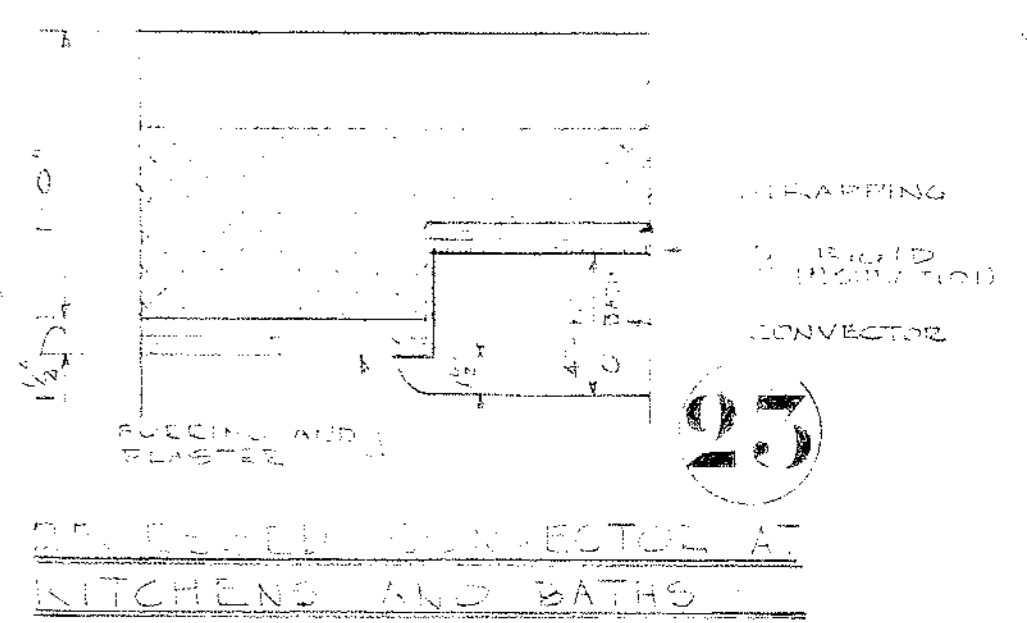
ELEVATION - FIRST FLOOR LIVING ROOM WINDOW
SCALE - 3/8" = 1'-0"



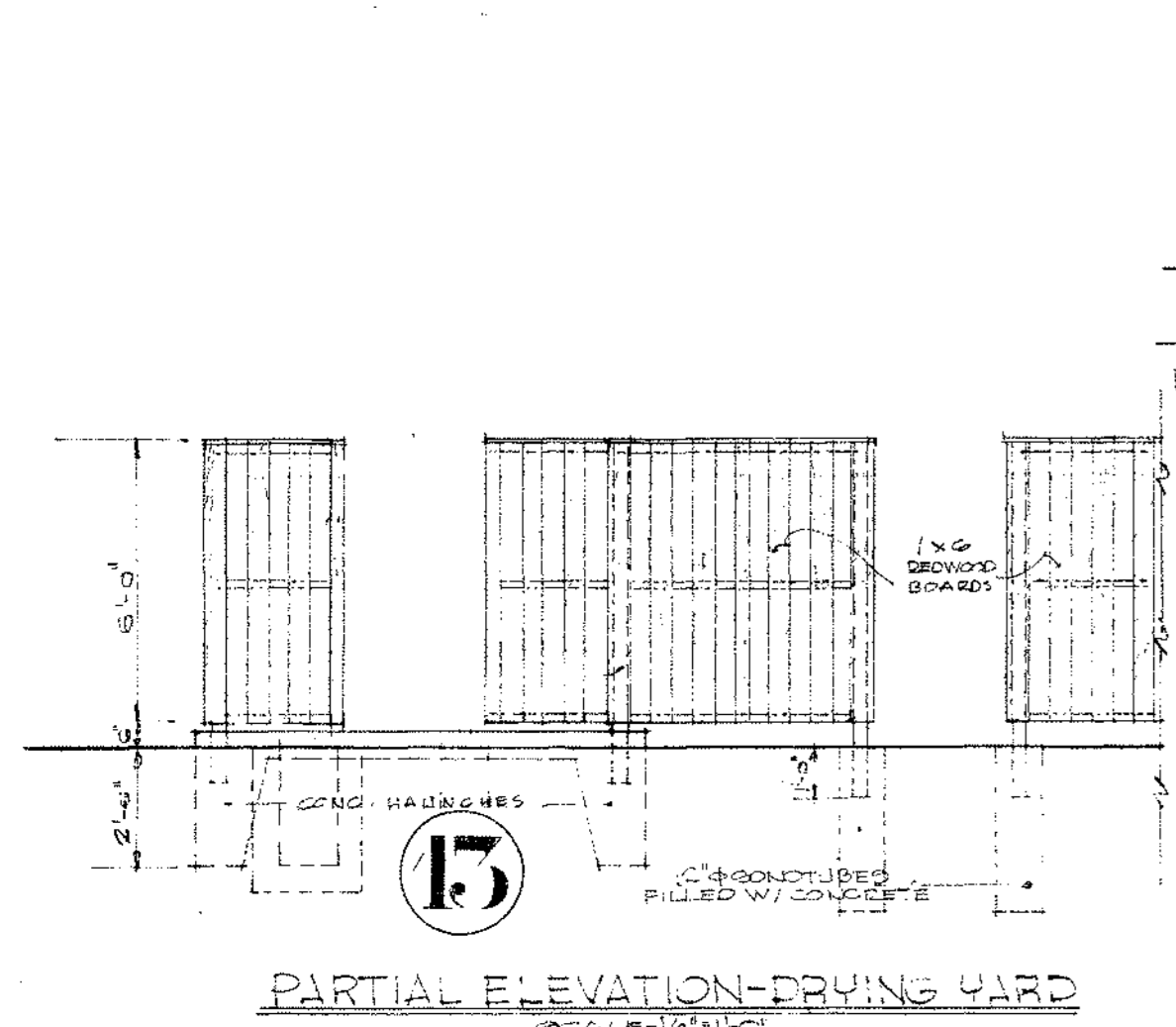
ELEVATION - BEDROOM WINDOW (TYPICAL)
SCALE - 3/8" = 1'-0"



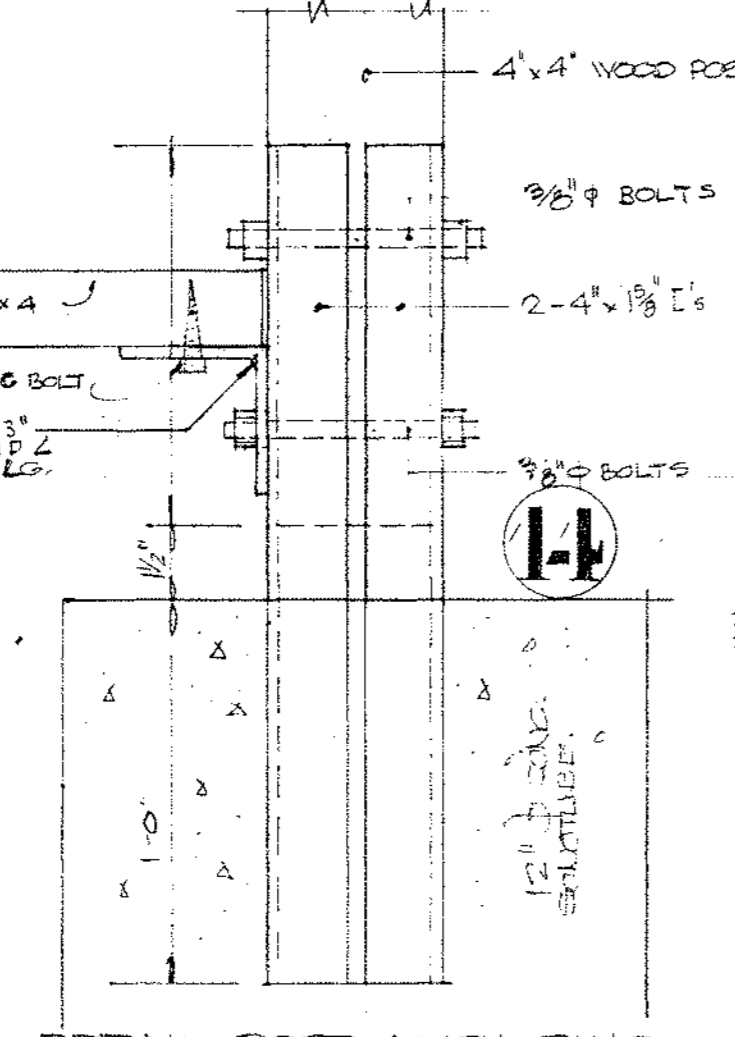
ELEVATION 12
TYPICAL STORAGE ROOM #3
SCALE - 3/8" = 1'-0"



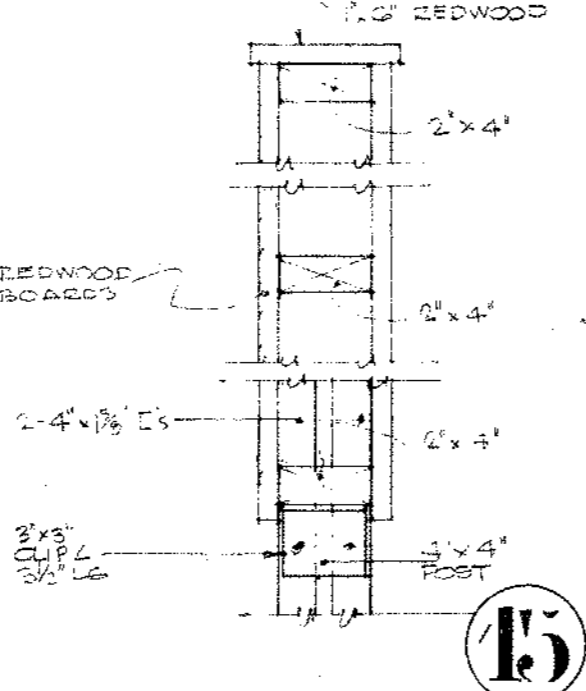
ELEVATION 25
TYPICAL STORAGE ROOM #3
SCALE - 3/8" = 1'-0"



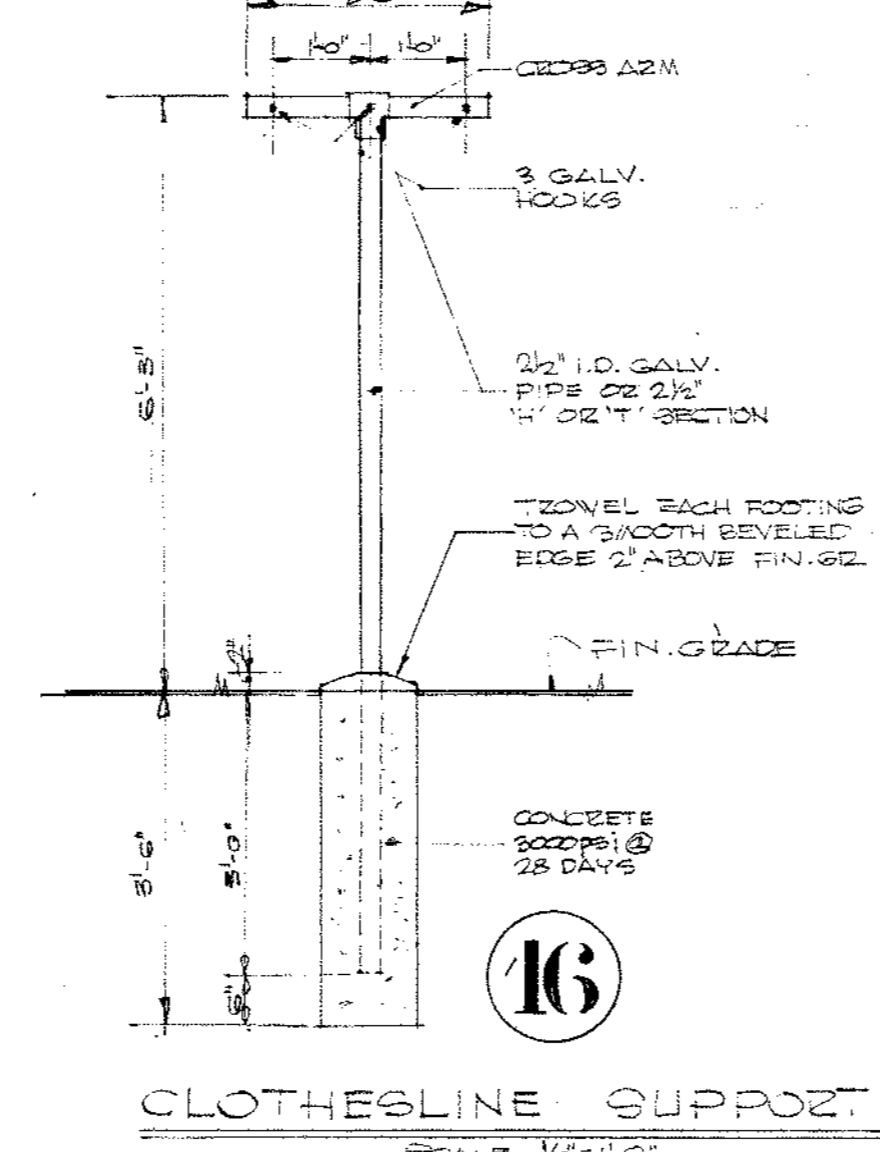
PARTIAL ELEVATION - DRYING YARD
SCALE - 3/8" = 1'-0"



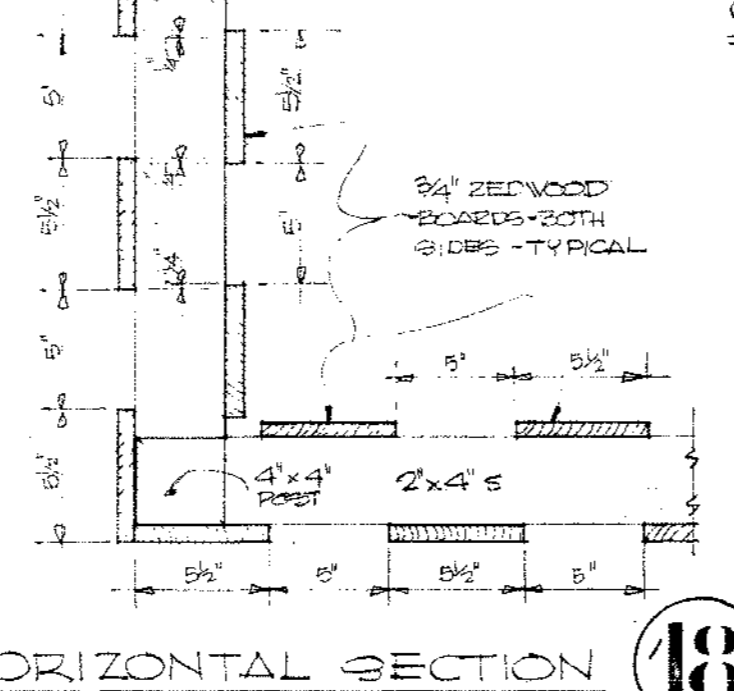
DETAIL - POST ANCHORING
SCALE - 3/8" = 1'-0"



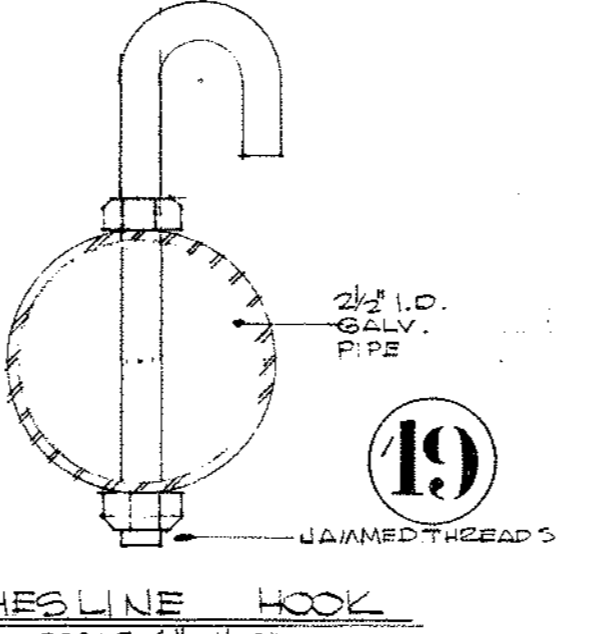
VERTICAL SECTION 15
SCALE - 3/8" = 1'-0"



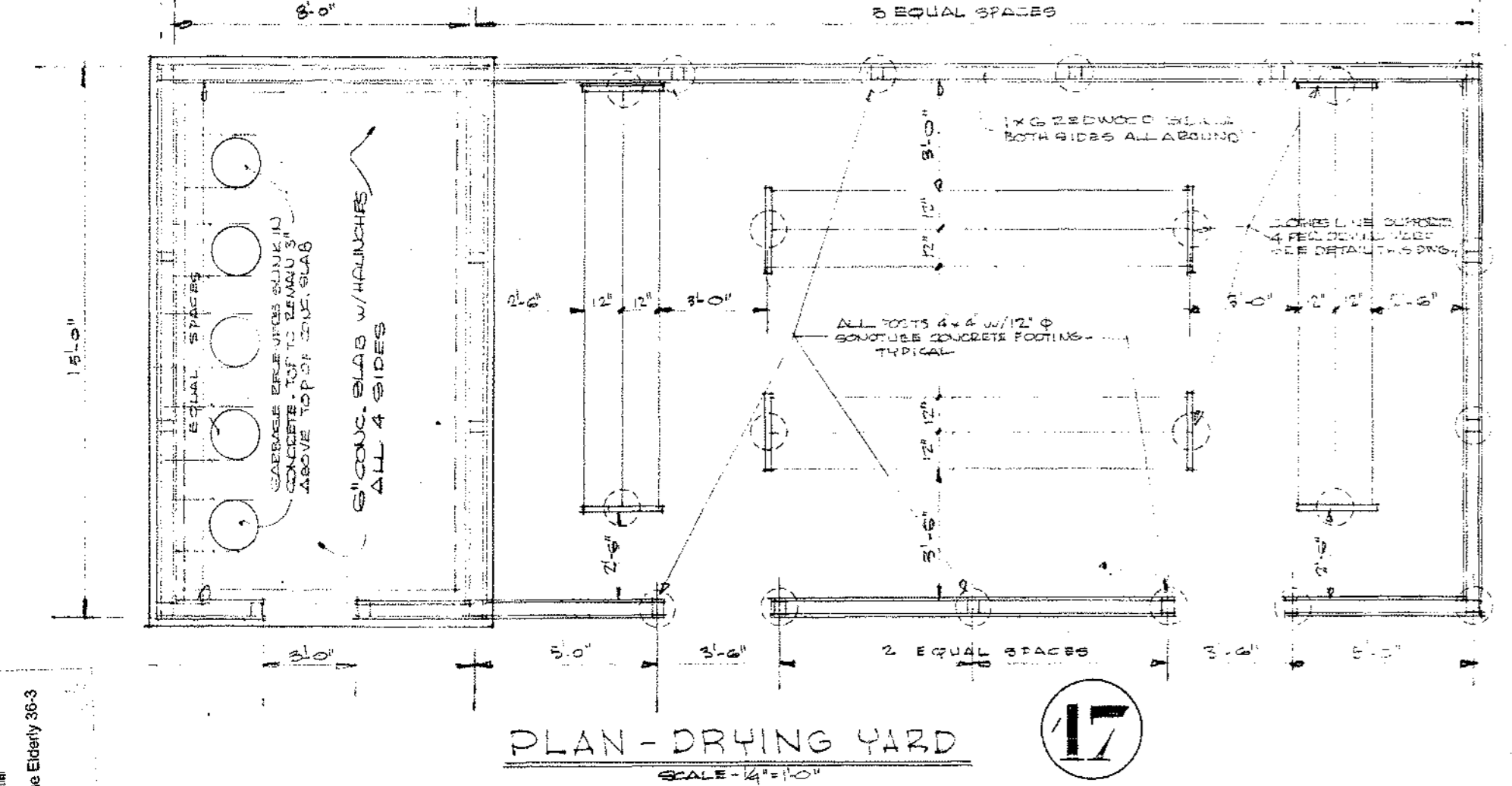
CLOTHESLINE SUPPORT
SCALE - 1/2" = 1'-0"



HORIZONTAL SECTION 18
SCALE - 1/2" = 1'-0"

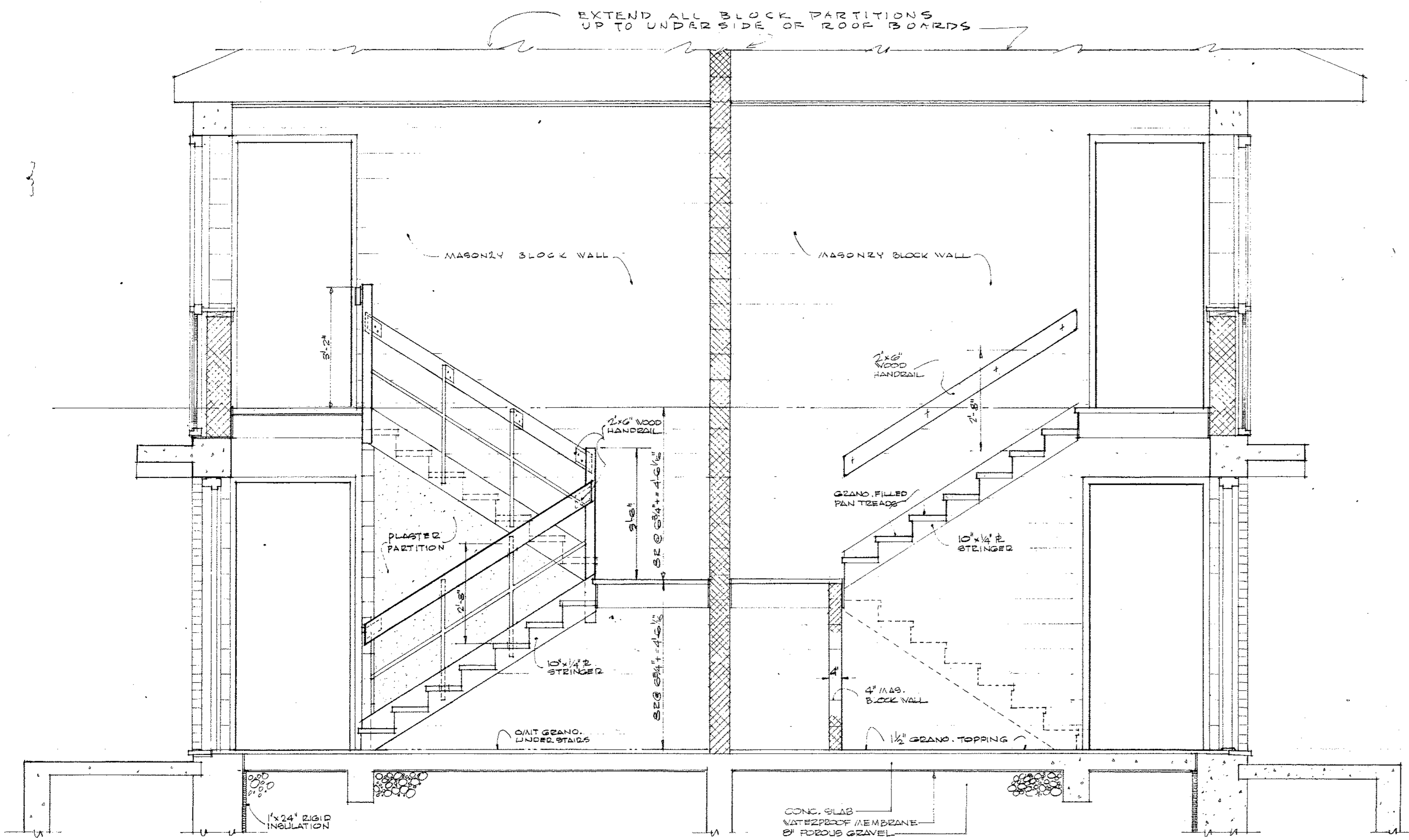


CLOTHESLINE HOOK
SCALE - 1/2" = 1'-0"

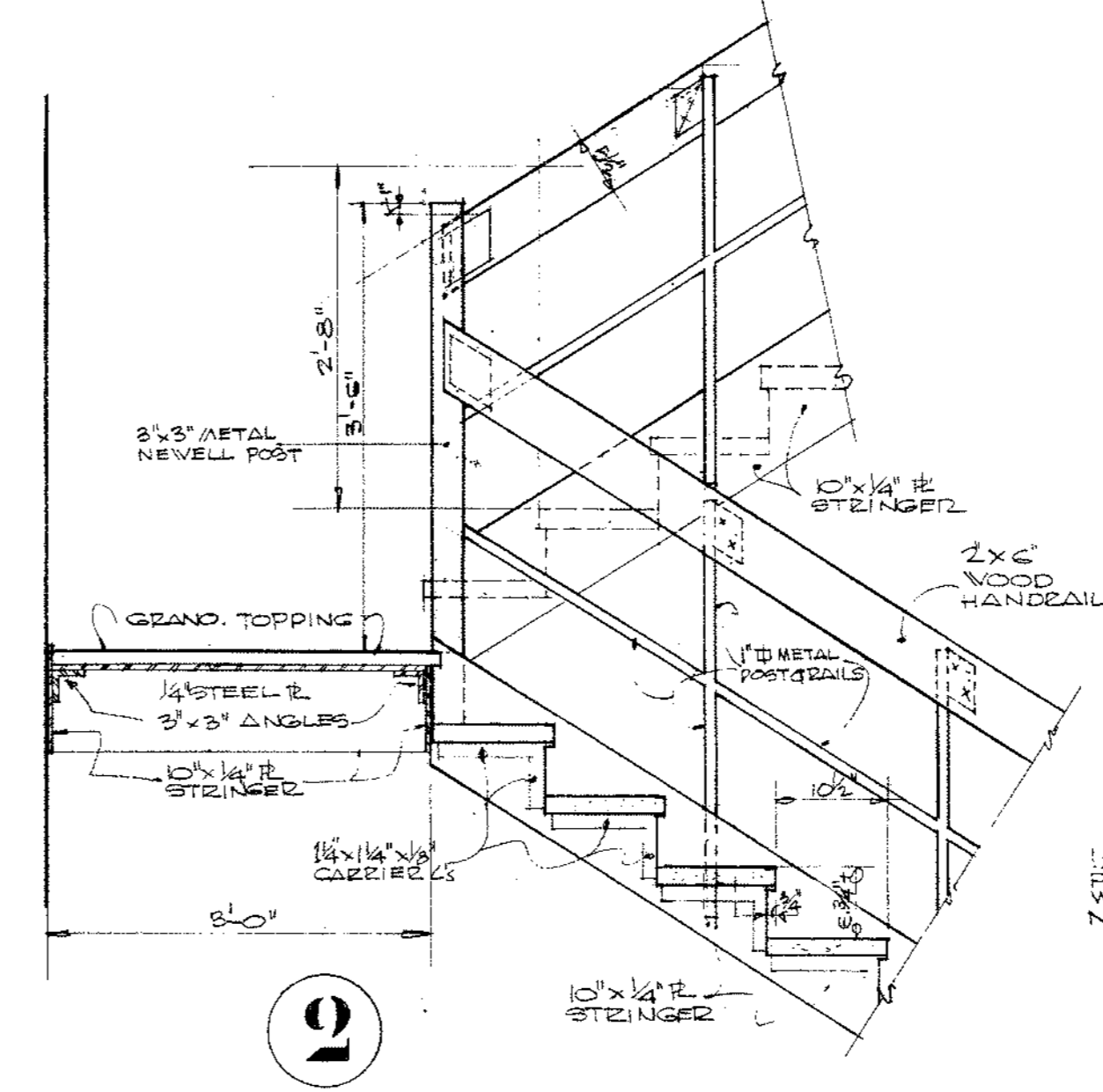


PLAN - DRYING YARD 17
SCALE - 3/8" = 1'-0"

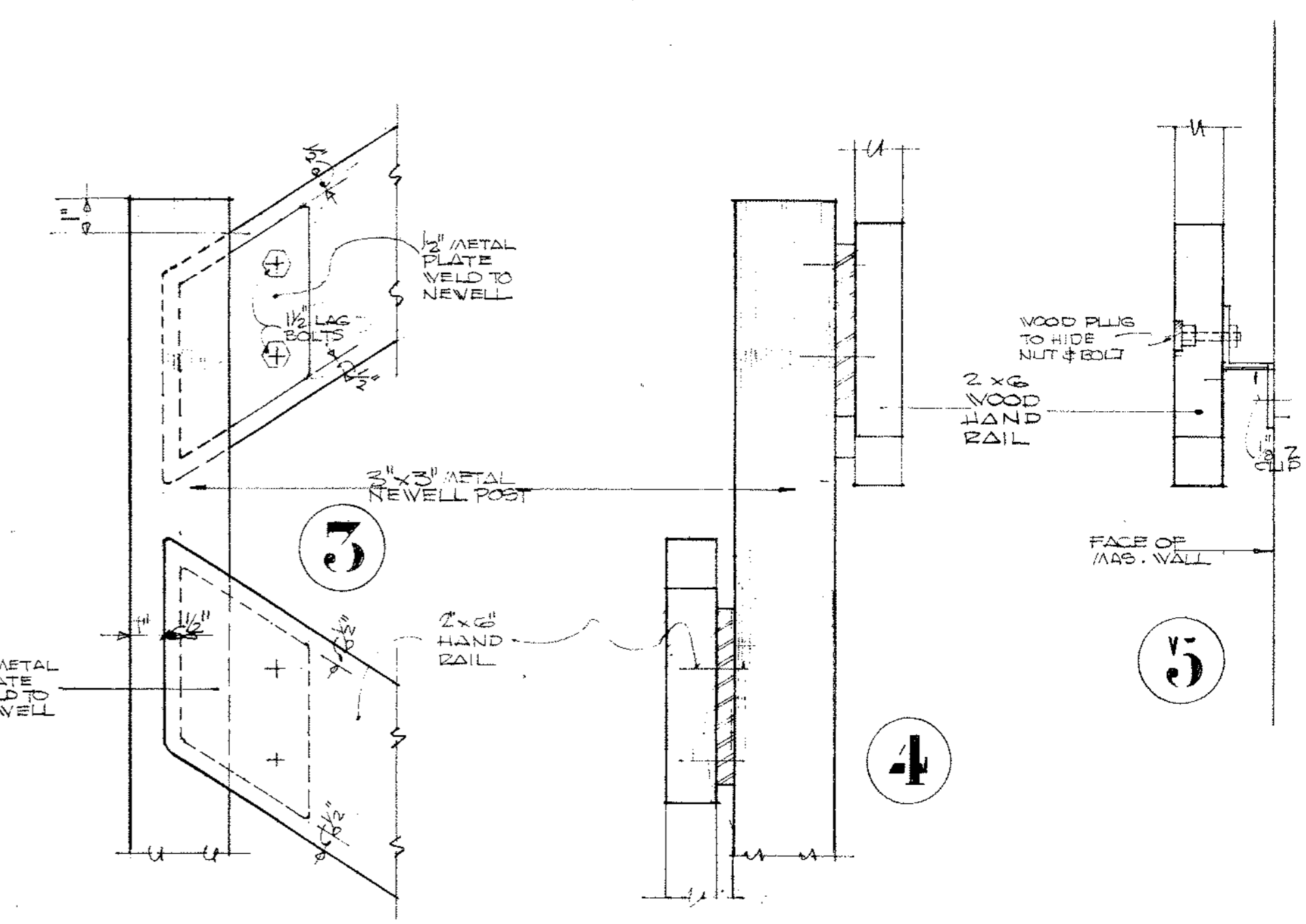
EXTEND ALL BLOCK PARTITIONS UP TO UNDER SIDE OF ROOF BOARDS



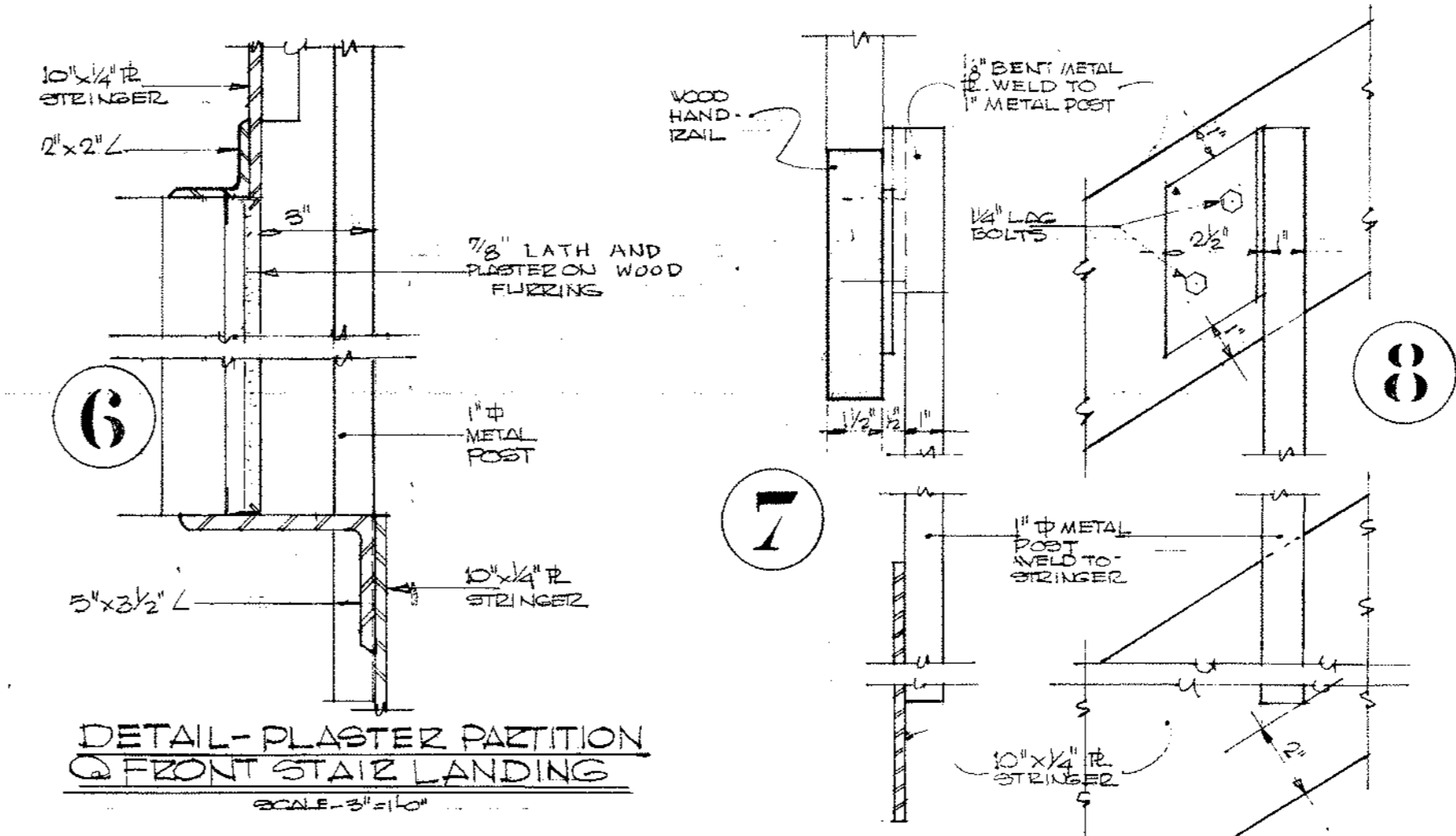
SECTION 1
SCALE: 1/2" = 1'-0"



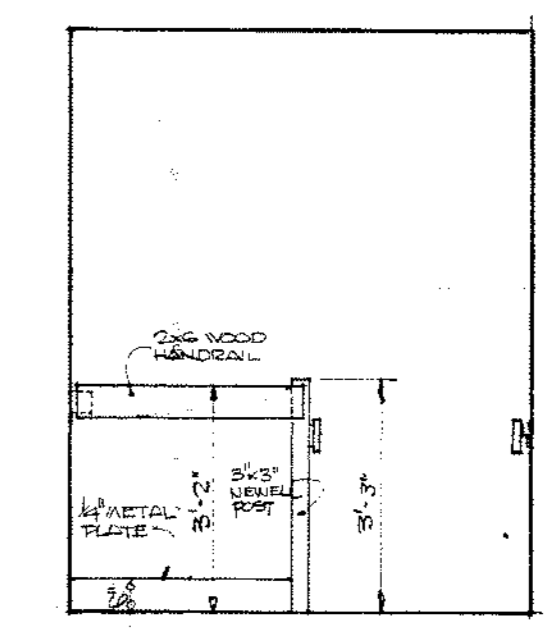
TYPICAL TREAD & RISE DETAIL
SCALE: 3/4" = 1'-0"



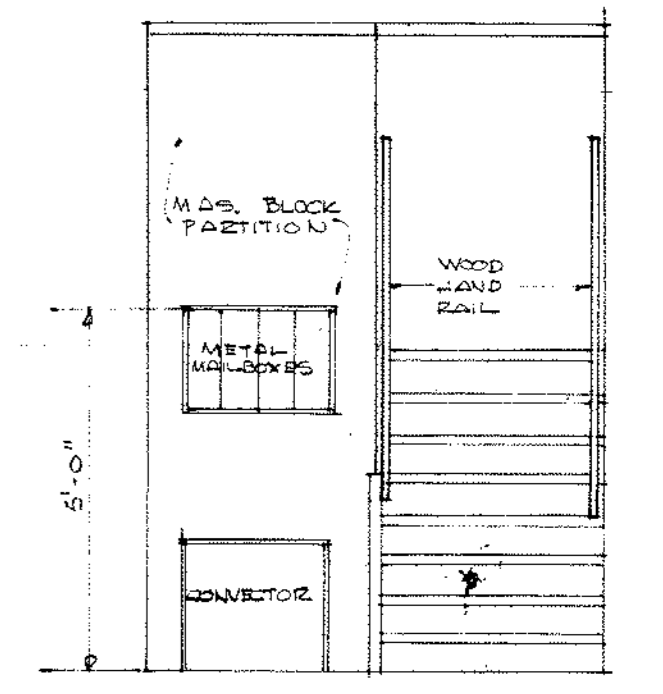
DETAILS - WOOD HANDRAIL
SCALE: 3/4" = 1'-0"



DETAIL - PLASTER PARTITION @ FRONT STAIR LANDING
SCALE: 3/4" = 1'-0"

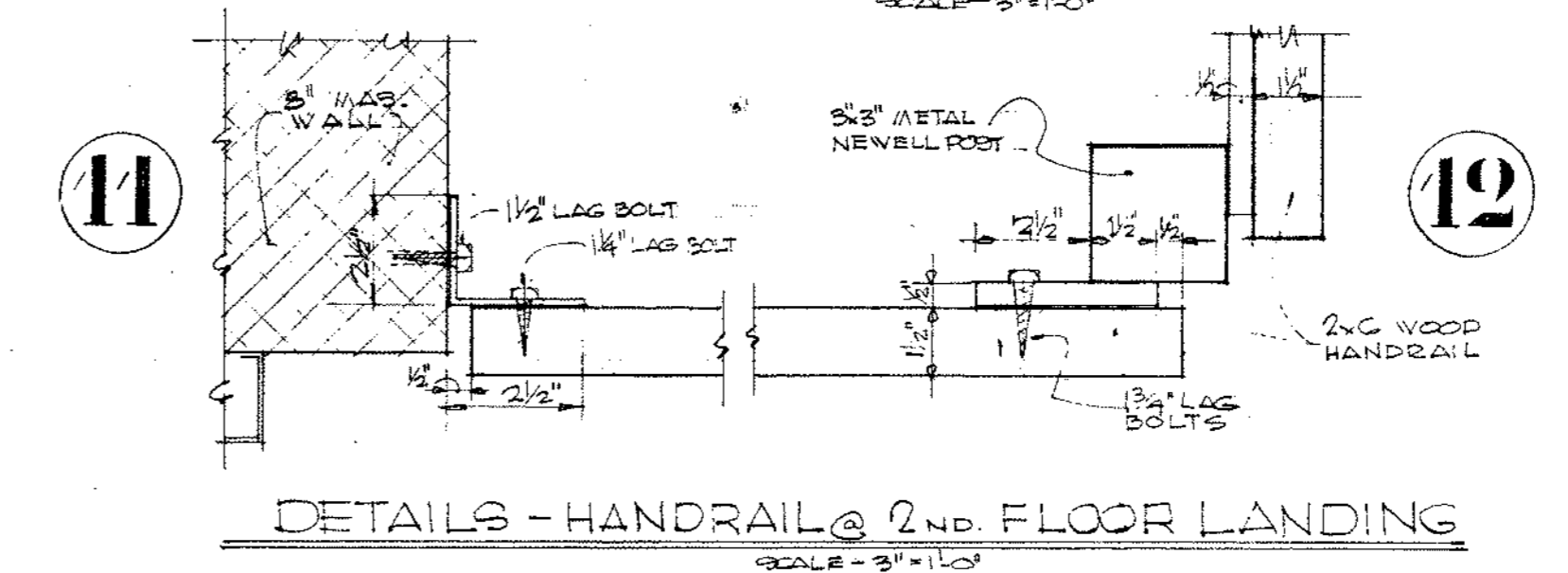


ELEVATION - ZAILING @ 2ND FLOOR LANDING
SCALE: 3/4" = 1'-0"

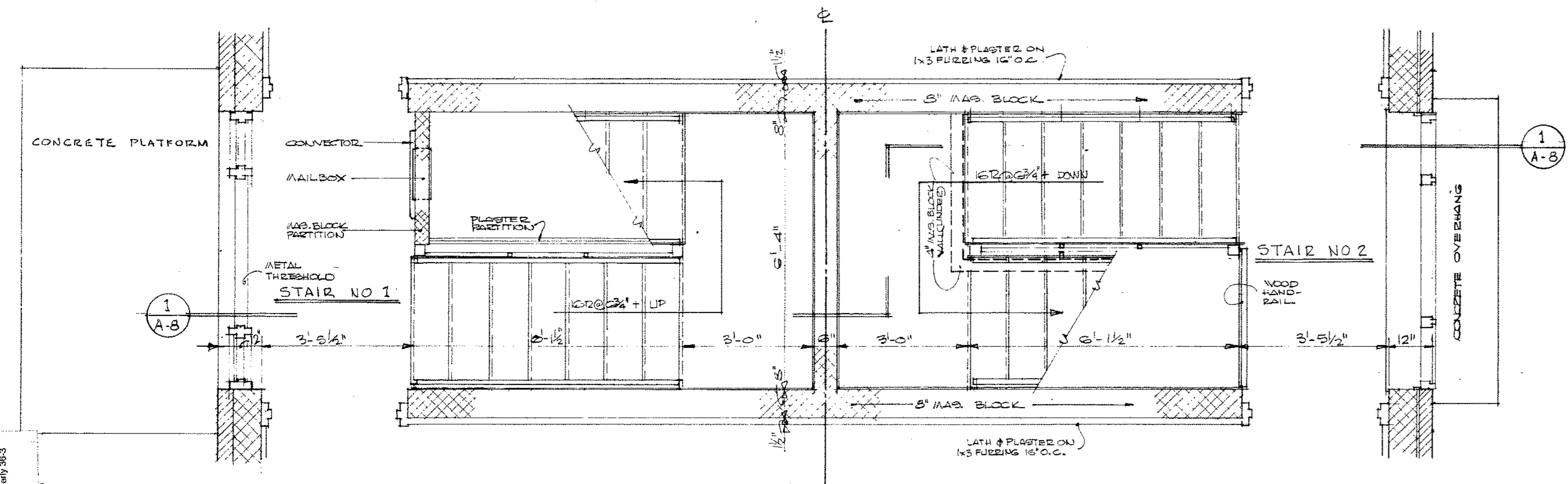


ELEVATION - FRONT ENTRY
SCALE: 3/4" = 1'-0"

SECTION ELEVATION
DETAIL - STAIR HANDRAIL POSTS
SCALE: 3/4" = 1'-0"



DETAILS - HANDRAIL @ 2ND FLOOR LANDING
SCALE: 3/4" = 1'-0"



PLAN-STAIRS @ 1st FLOOR

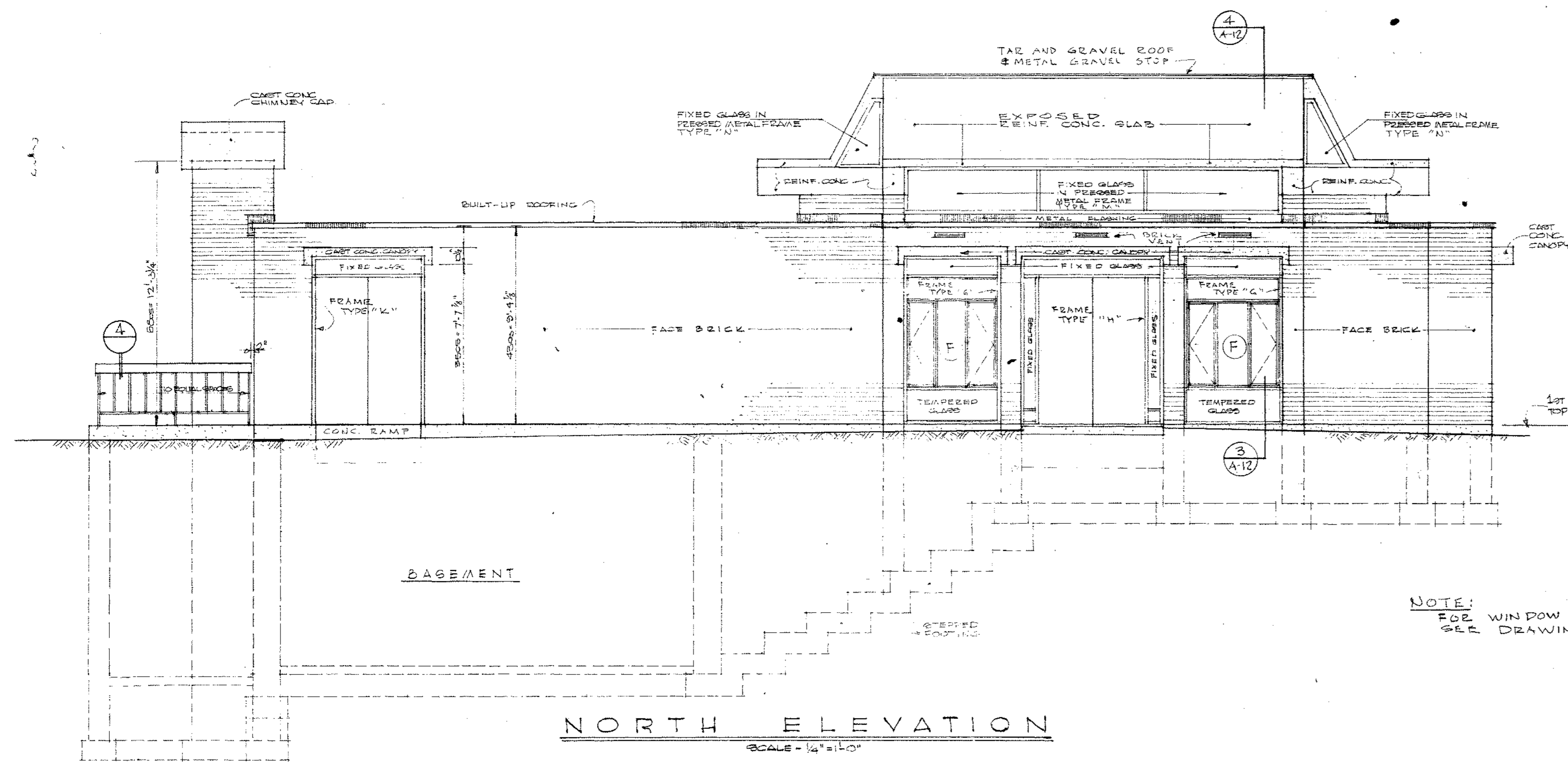
PLAN-STAIRS @ 2nd FLOOR

SCALE: 1/2" = 1'-0"

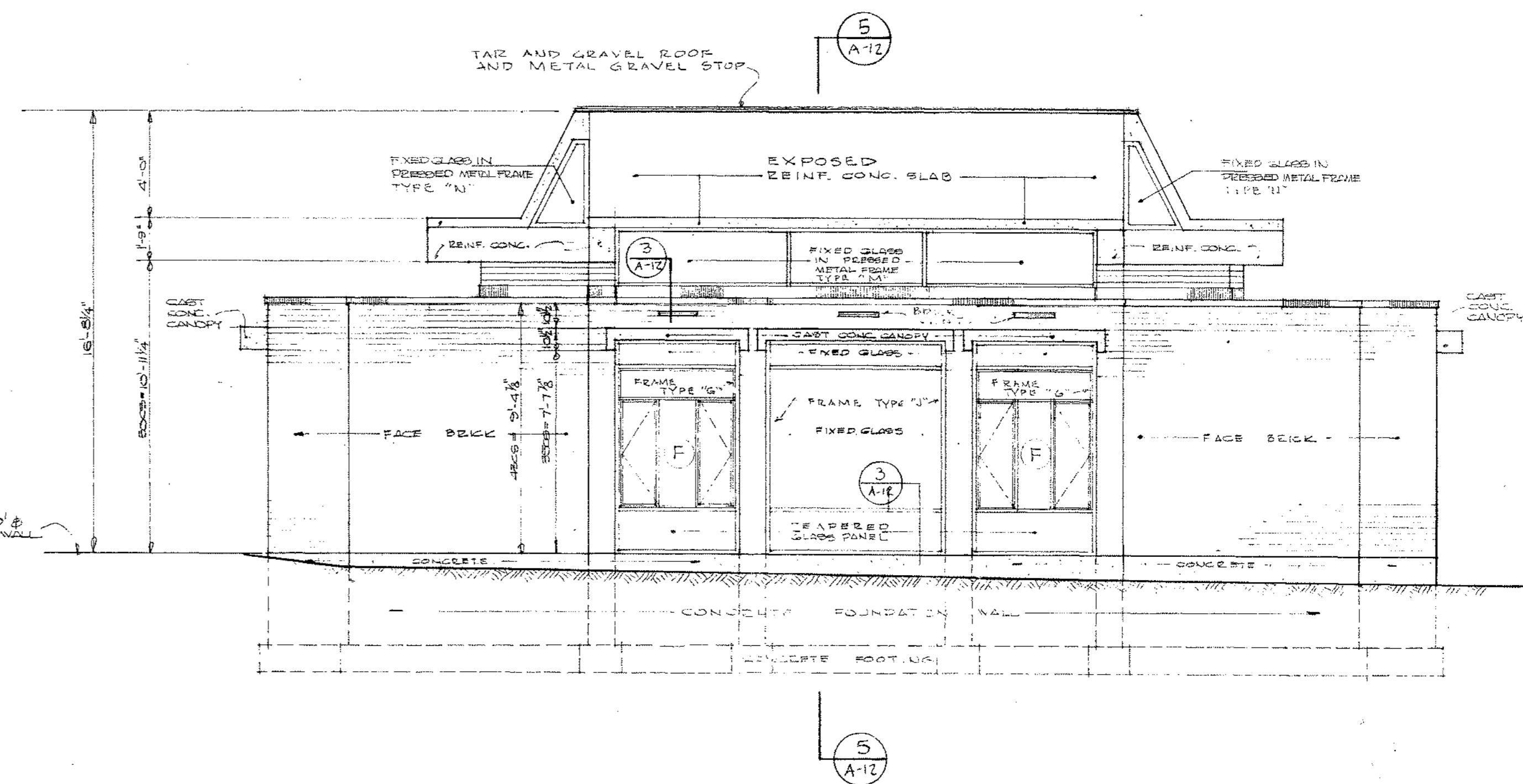
FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.	
STAIRS: PLANS, ELEVATIONS AND DETAILS DWELLING UNITS	SCALE: AS NOTED OCT. 19, 1964

A-8

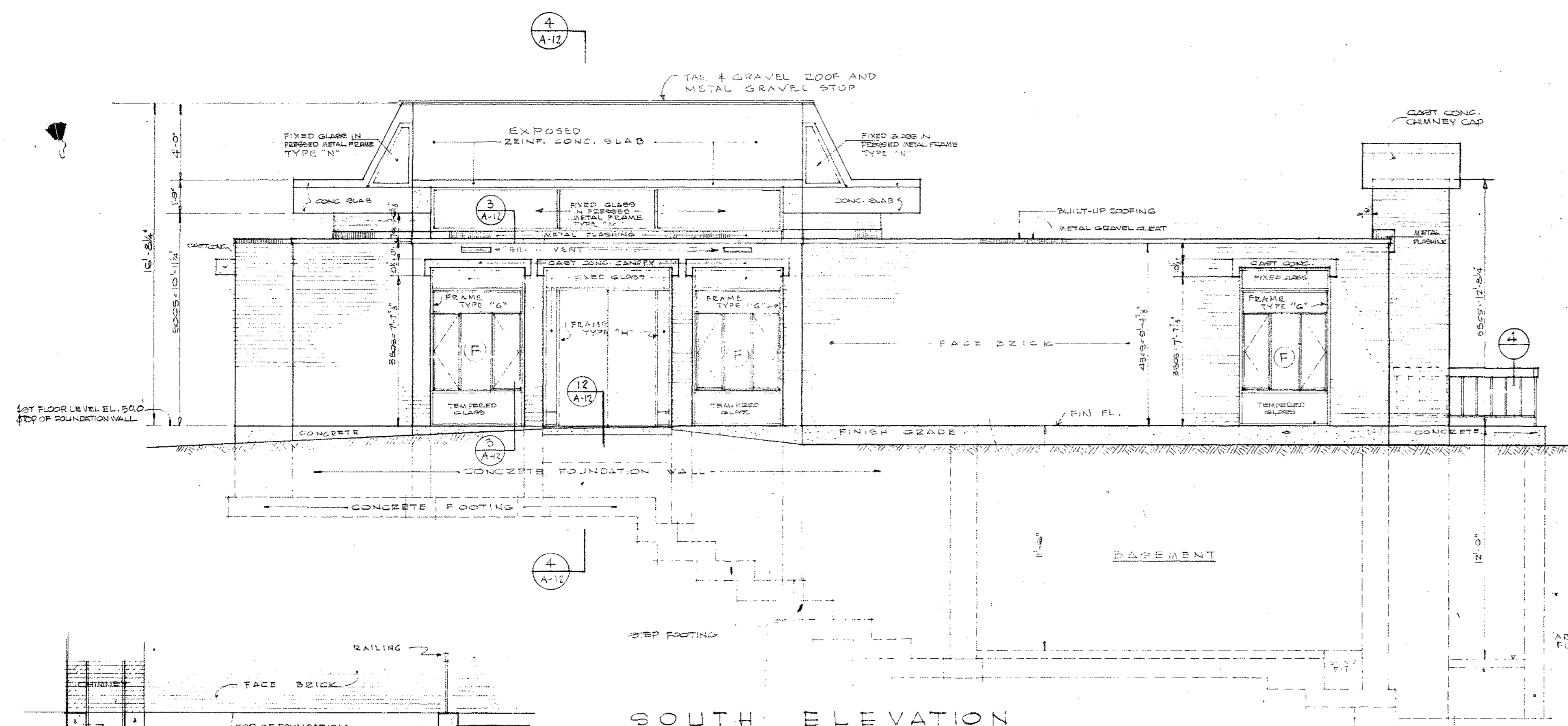
Boston Museum of Science
 1000 Museum Street
 Boston, MA 02115
 617-552-3700



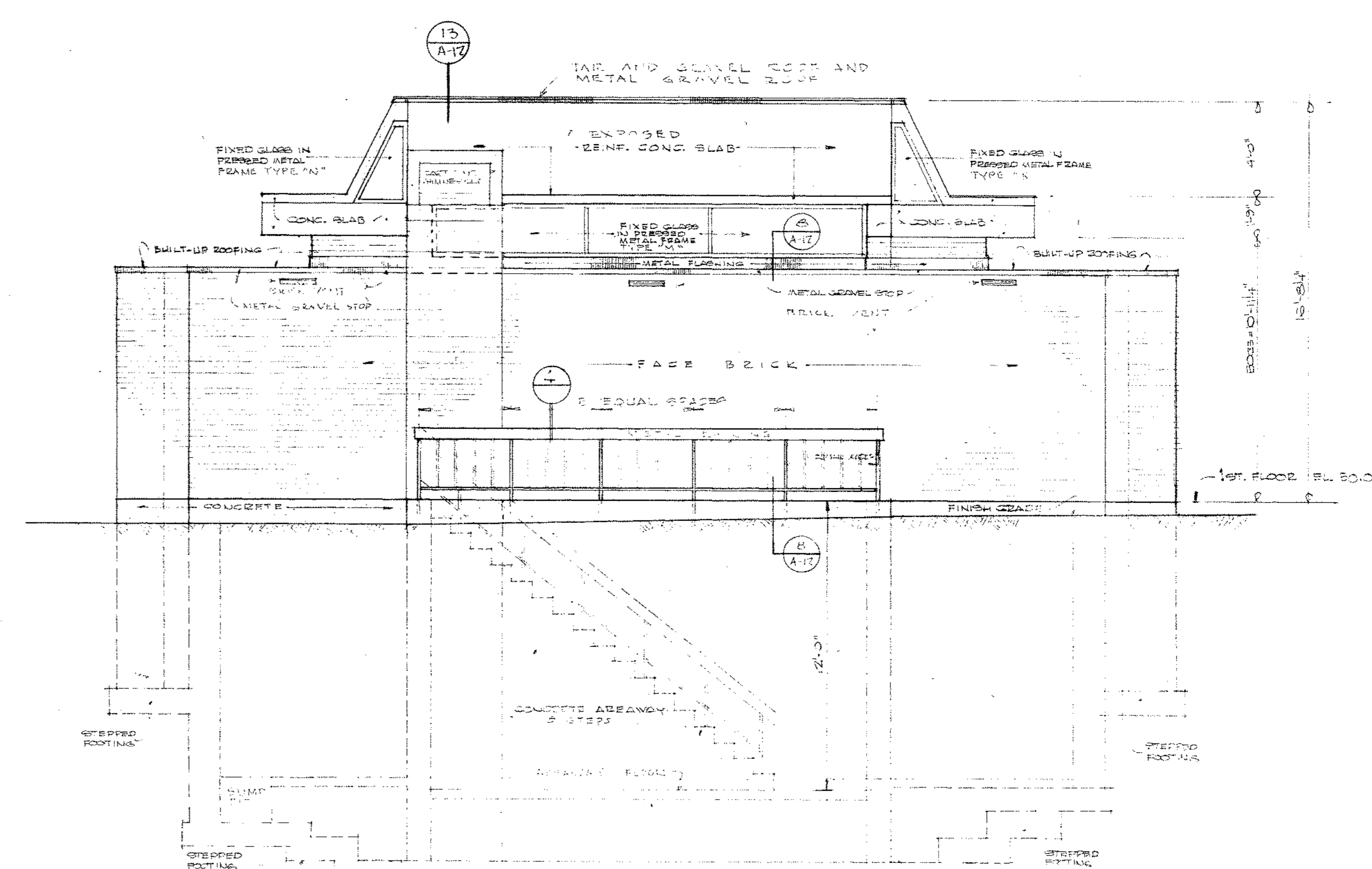
NORTH ELEVATION
SCALE - 1/4" = 1'-0"



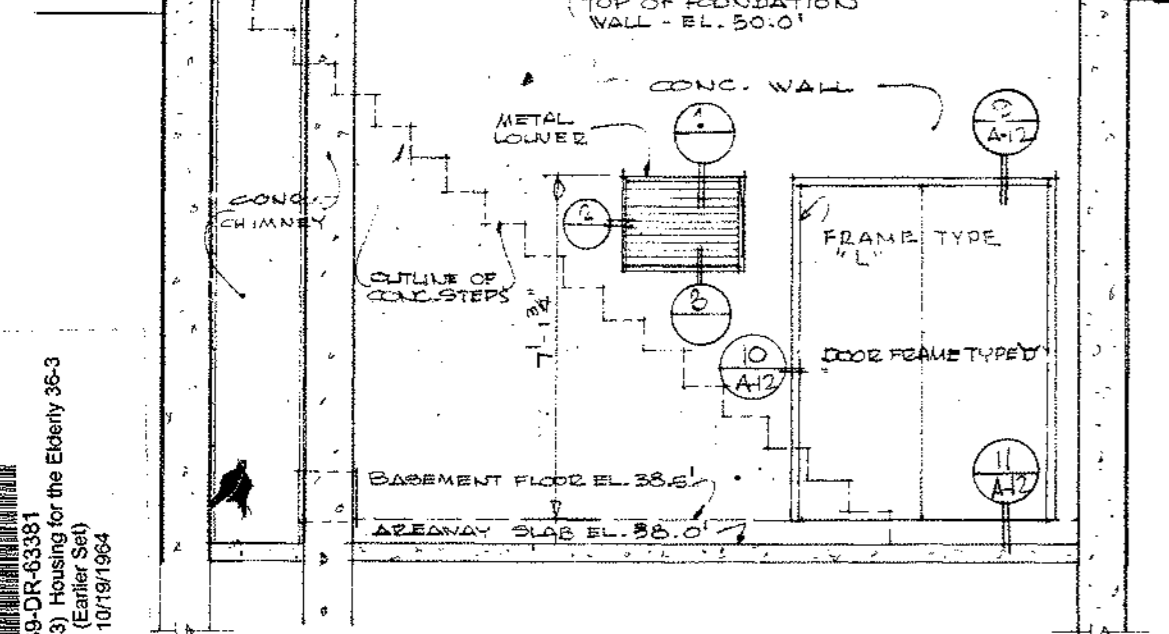
WEST ELEVATION
SCALE - 1/4" = 1'-0"



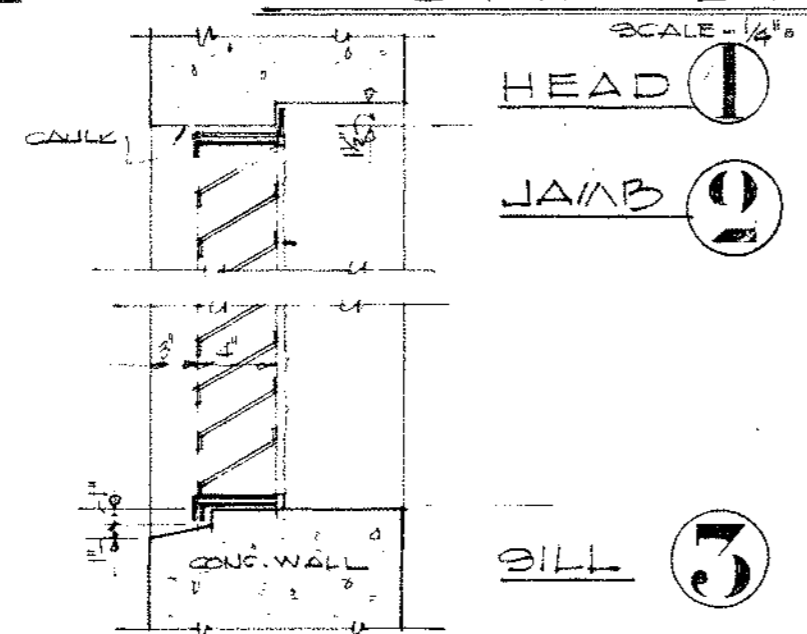
SOUTH ELEVATION
SCALE - 1/4" = 1'-0"



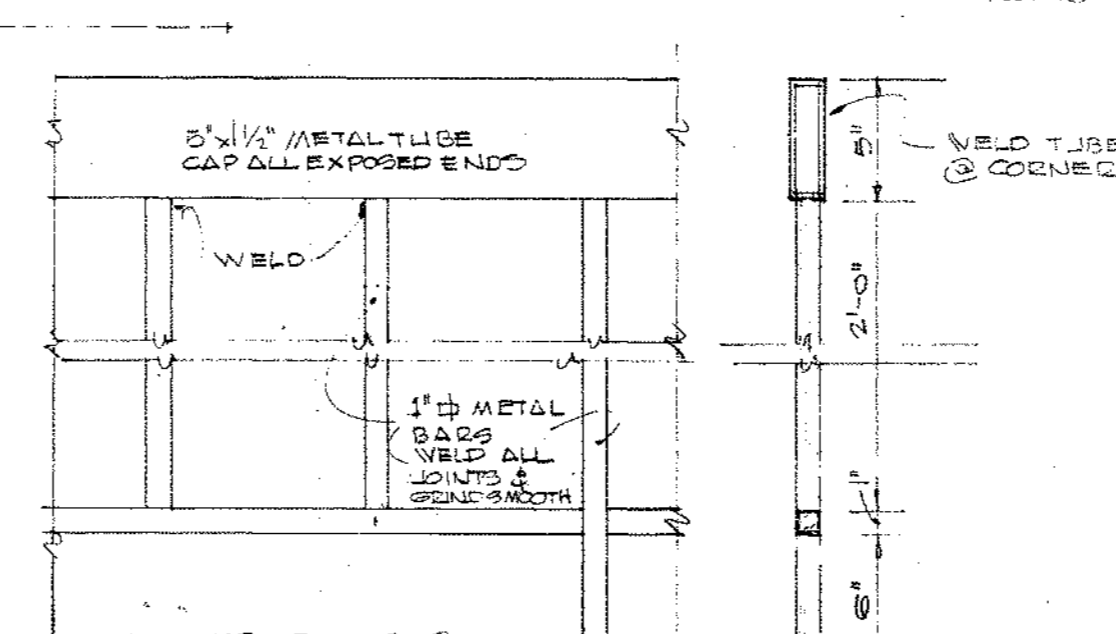
EAST ELEVATION
SCALE - 1/4" = 1'-0"



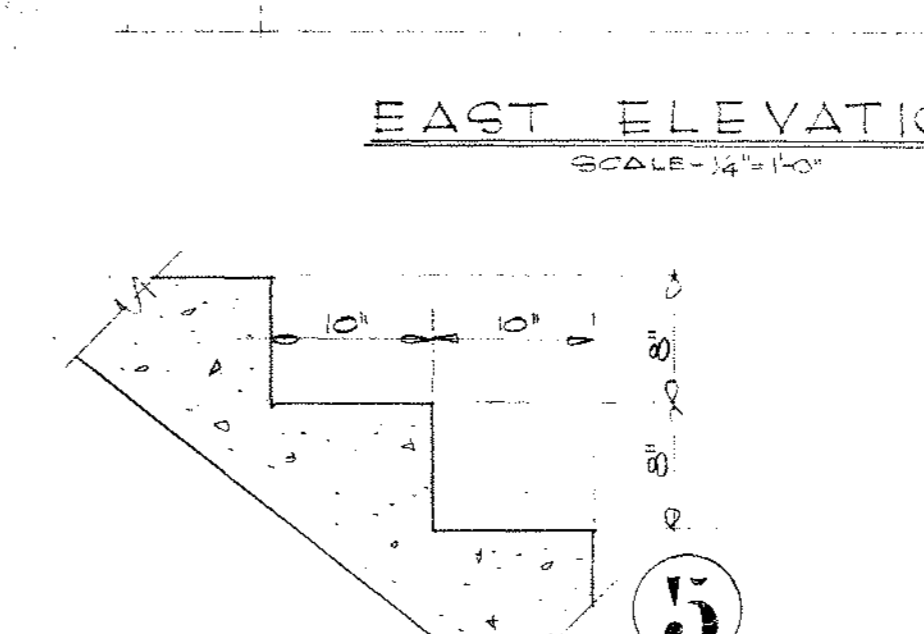
ELEVATION - AZEWAY INTERIOR
SCALE - 1/4" = 1'-0"



DETAIL - METAL LOUVER
SCALE - 1/4" = 1'-0"



AZEWAY RAILING DETAILS
SCALE - 1/4" = 1'-0"



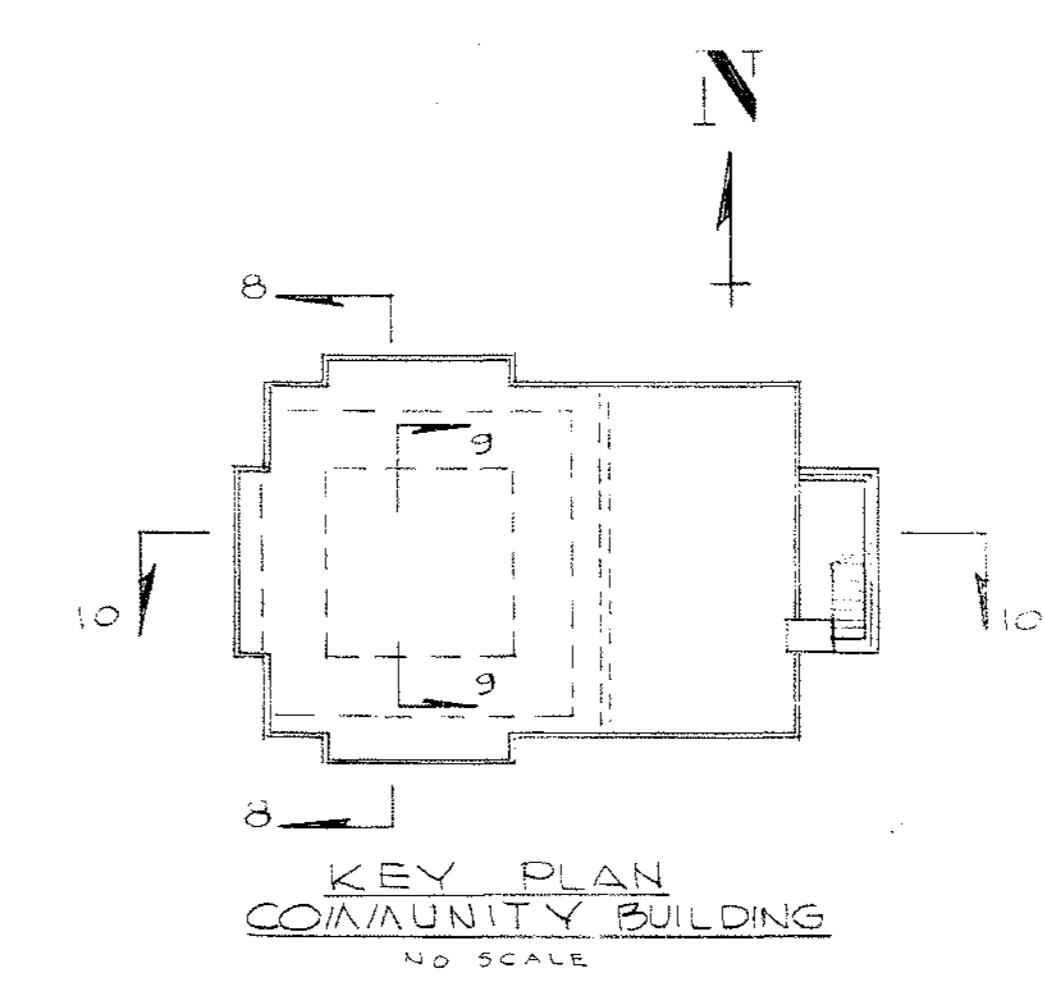
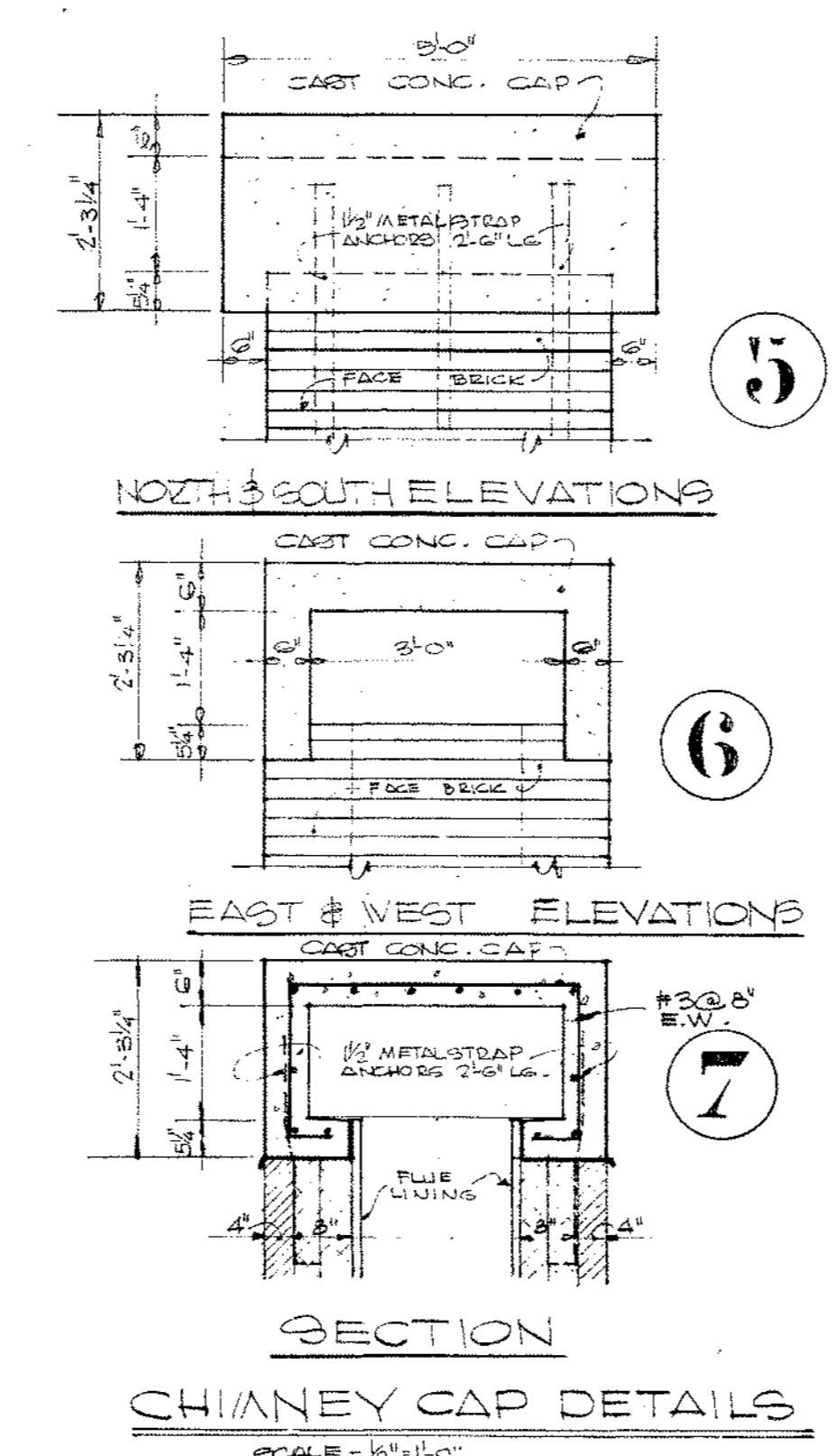
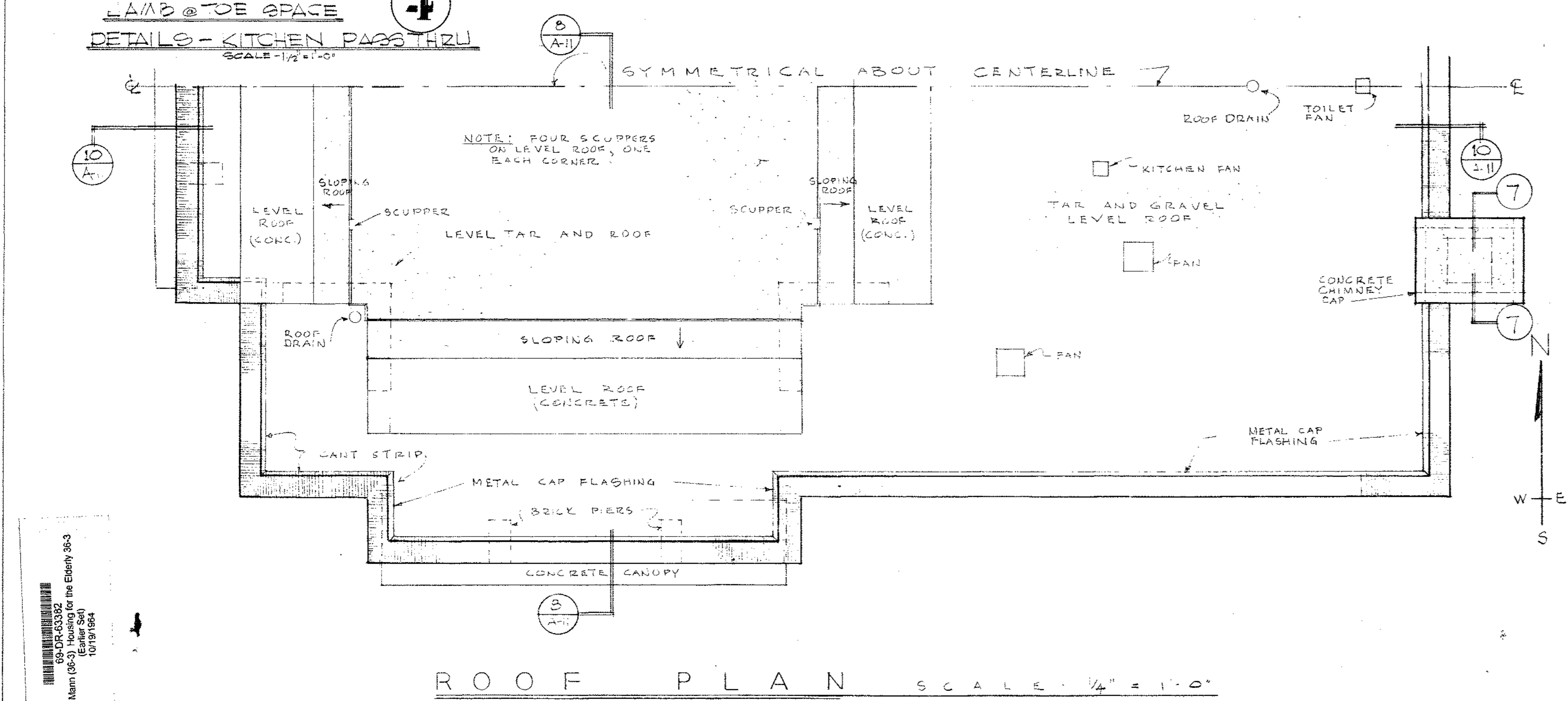
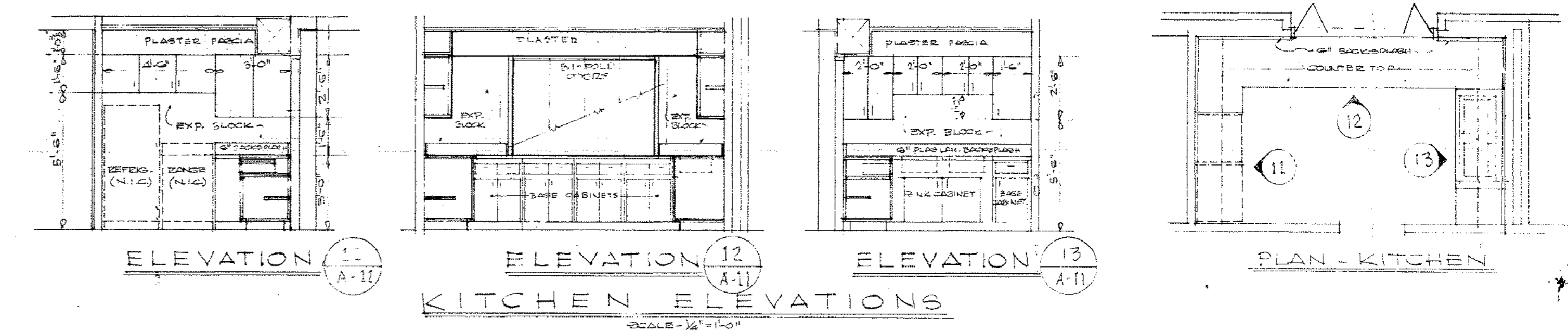
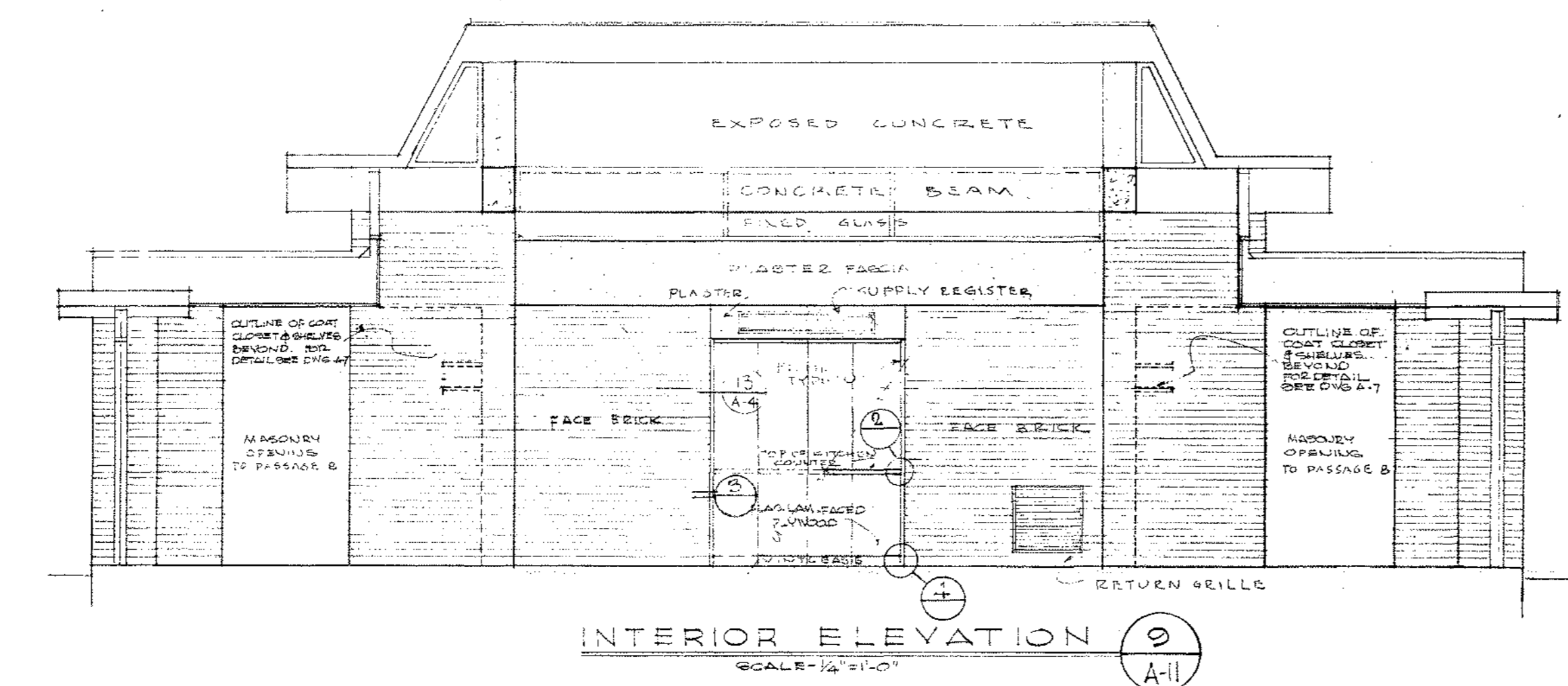
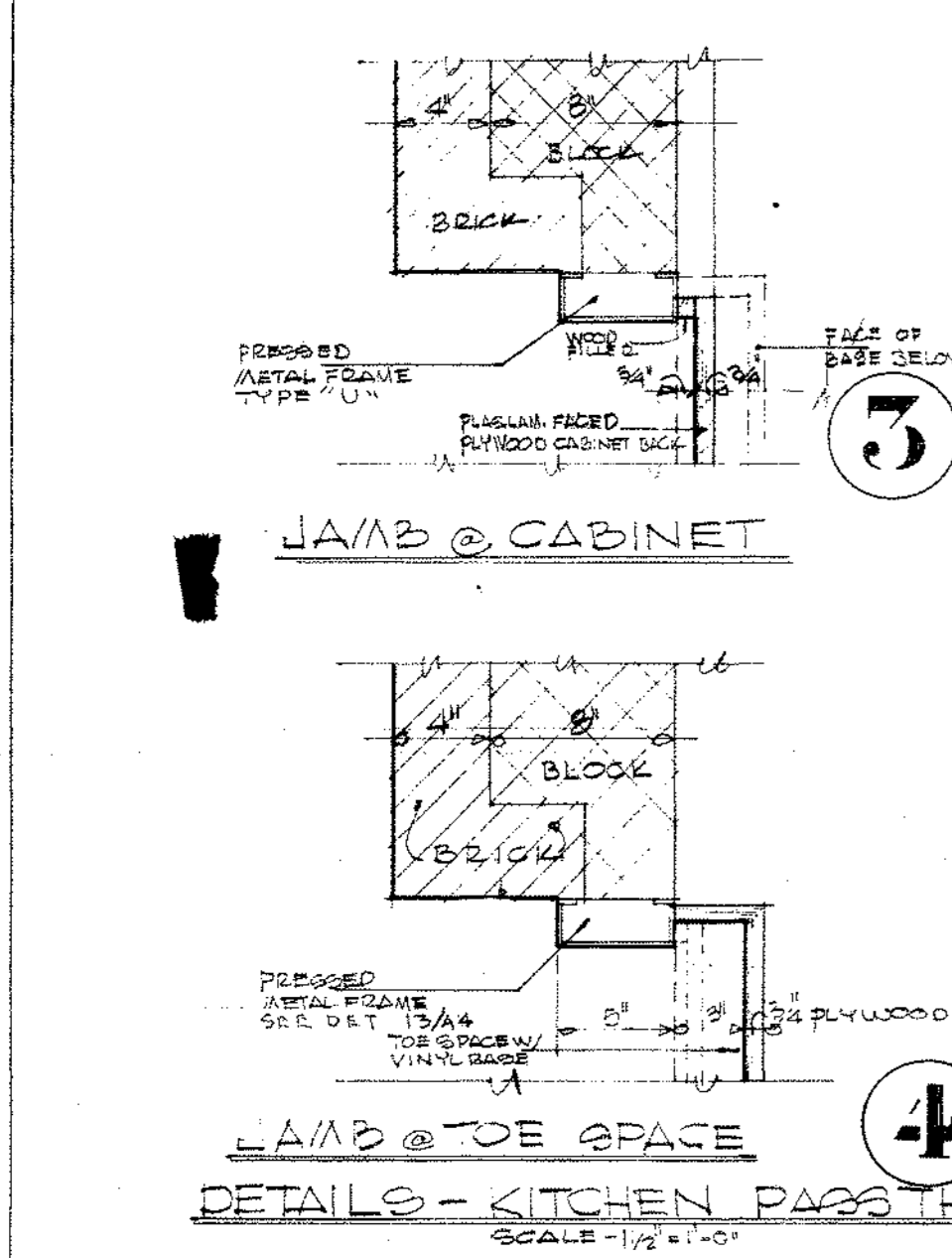
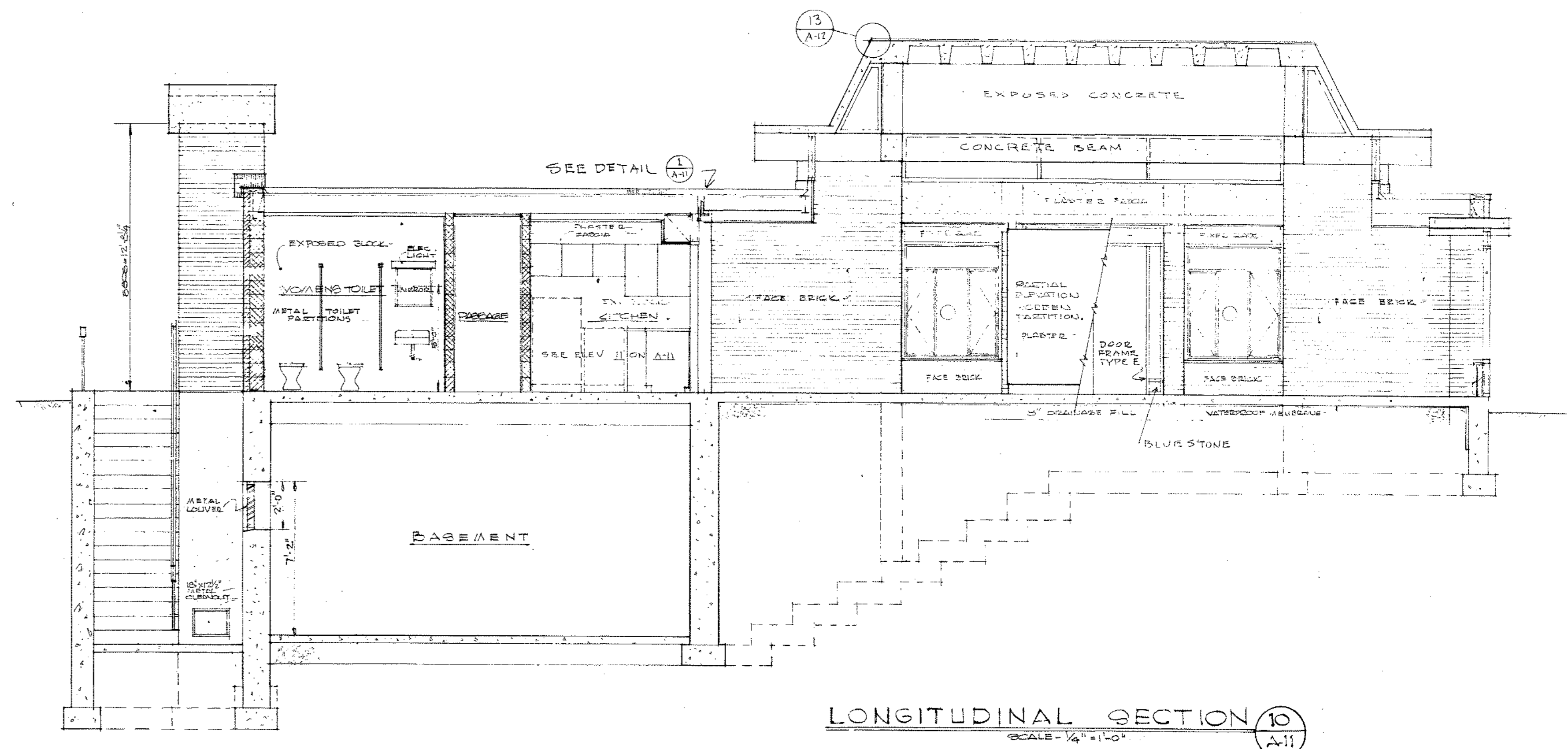
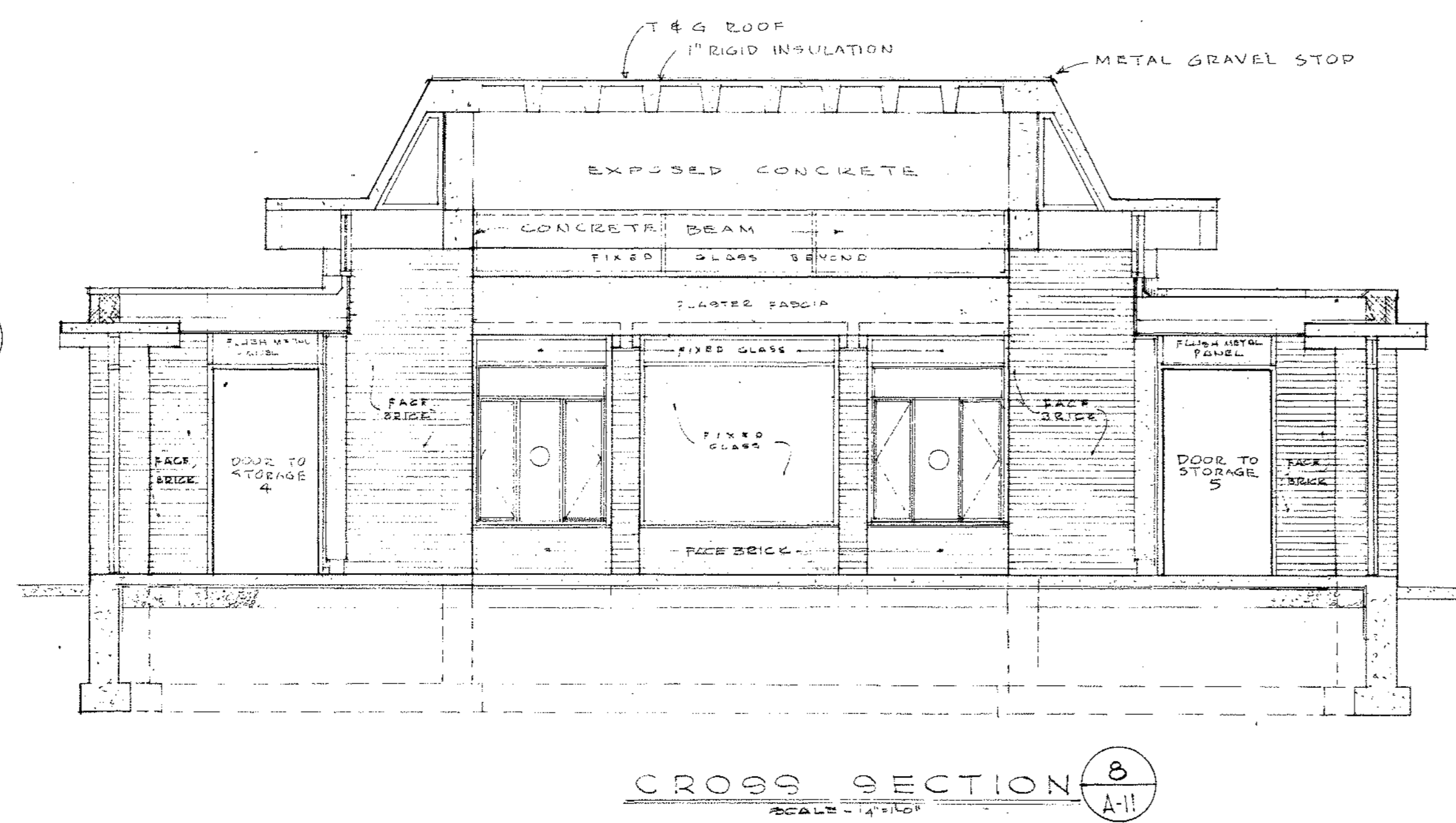
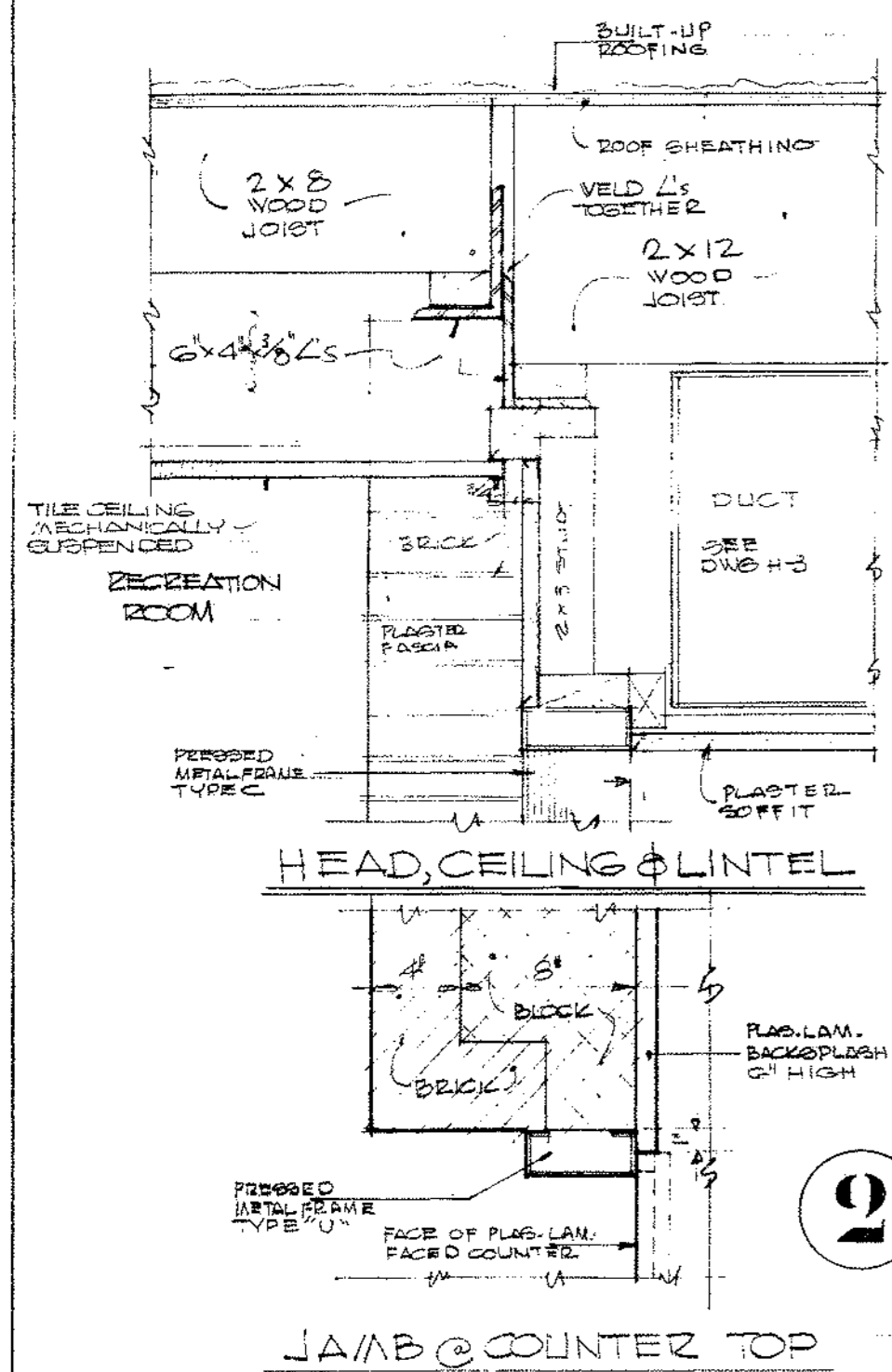
AZEWAY TREAD & RISER DETAIL
SCALE - 1/4" = 1'-0"

FEDERAL AIDED HOUSING FOR THE ELDERLY
MASS. PROJECT 363
NEWTON HOUSING AUTHORITY
NEWTON, MASS.

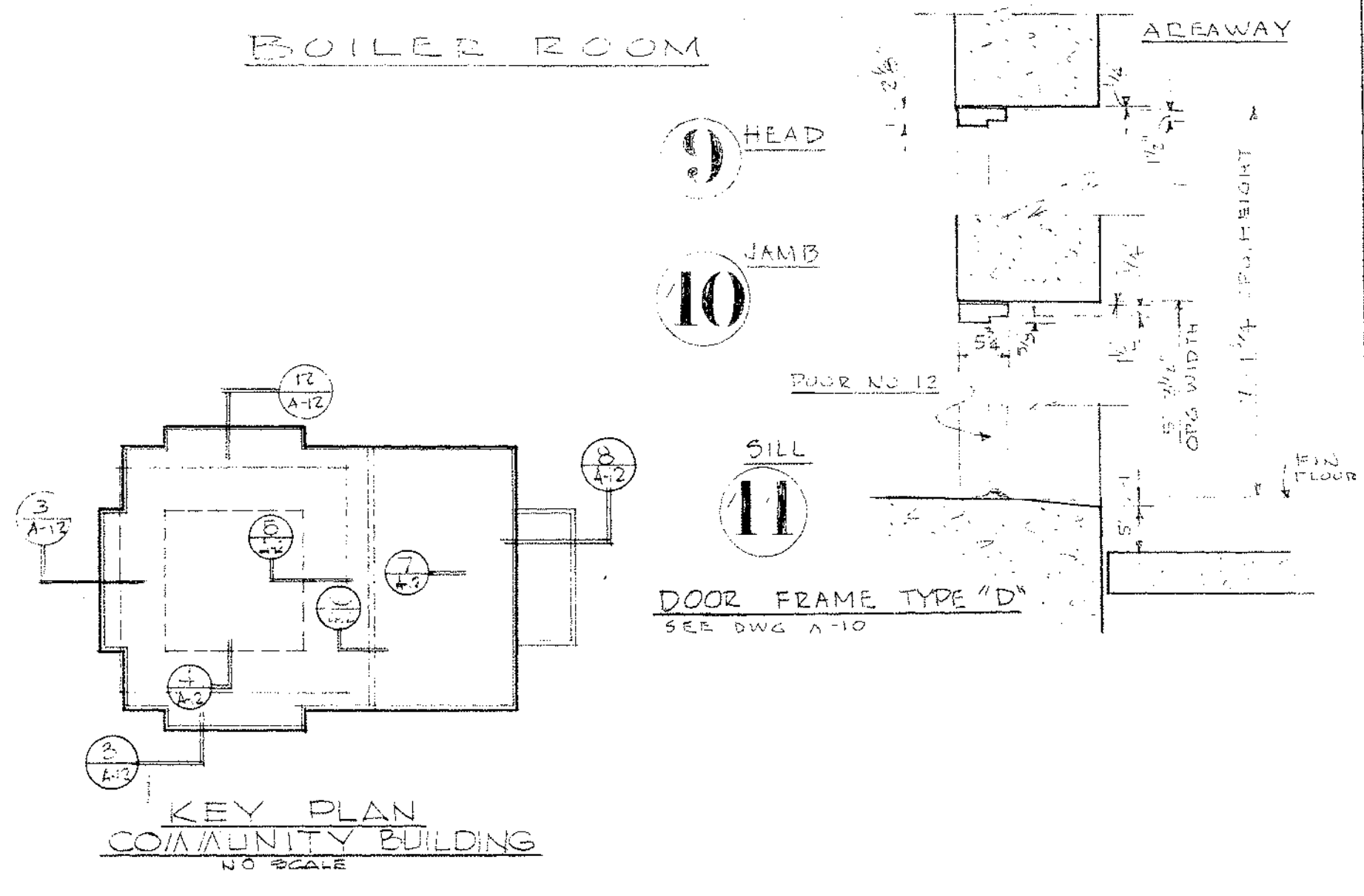
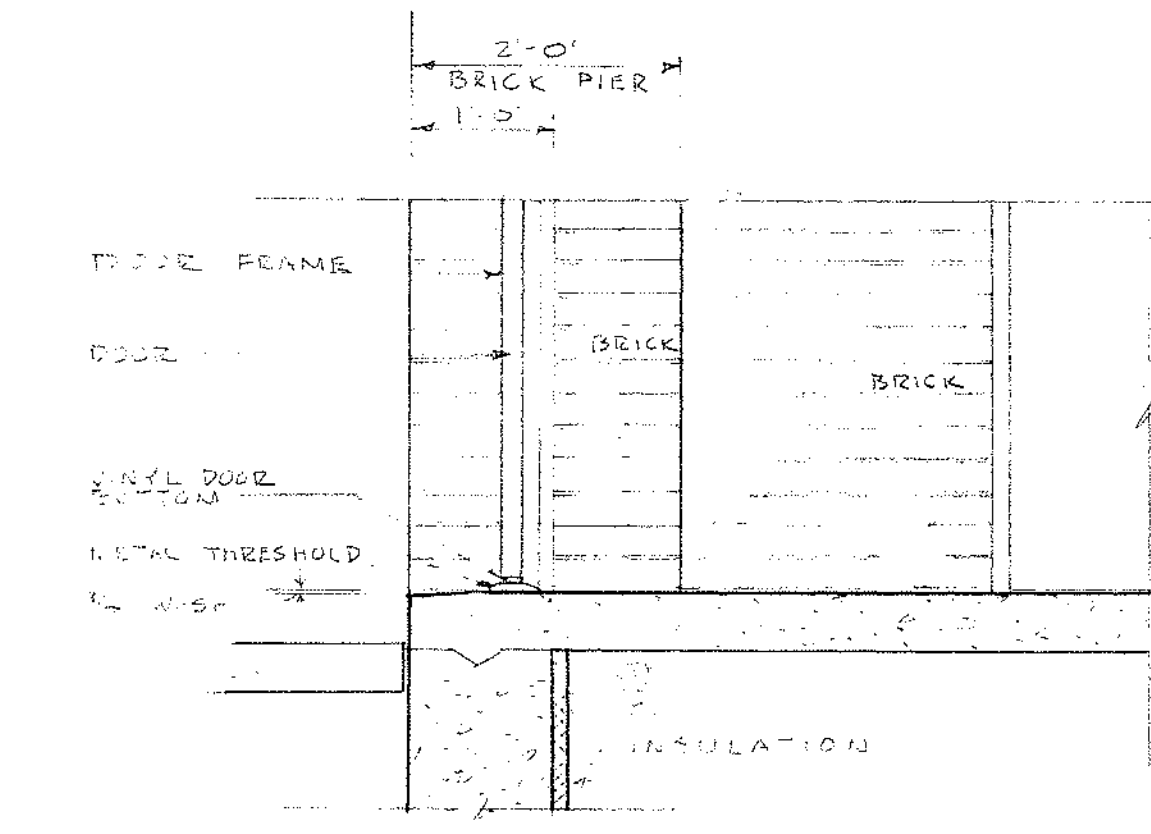
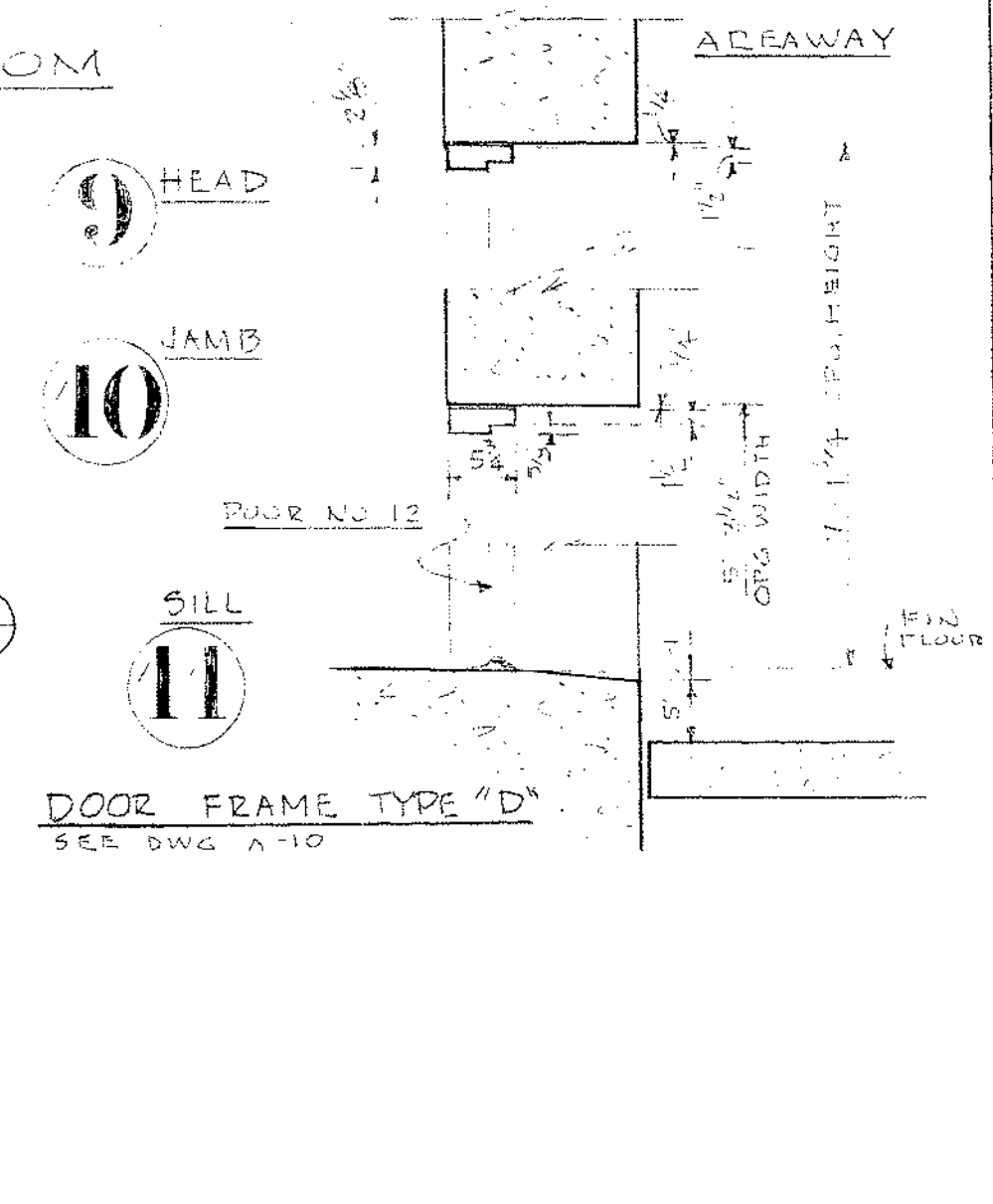
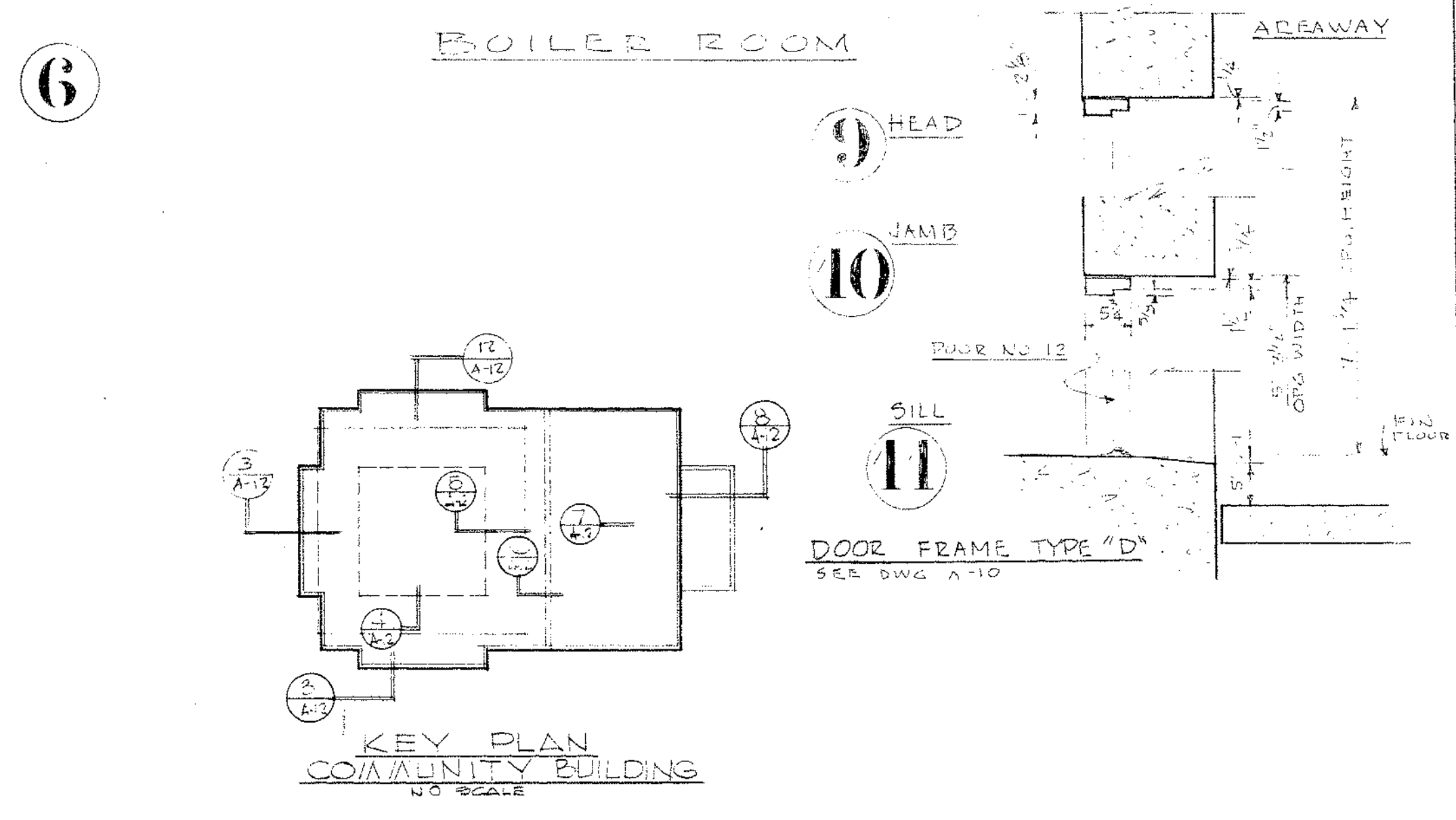
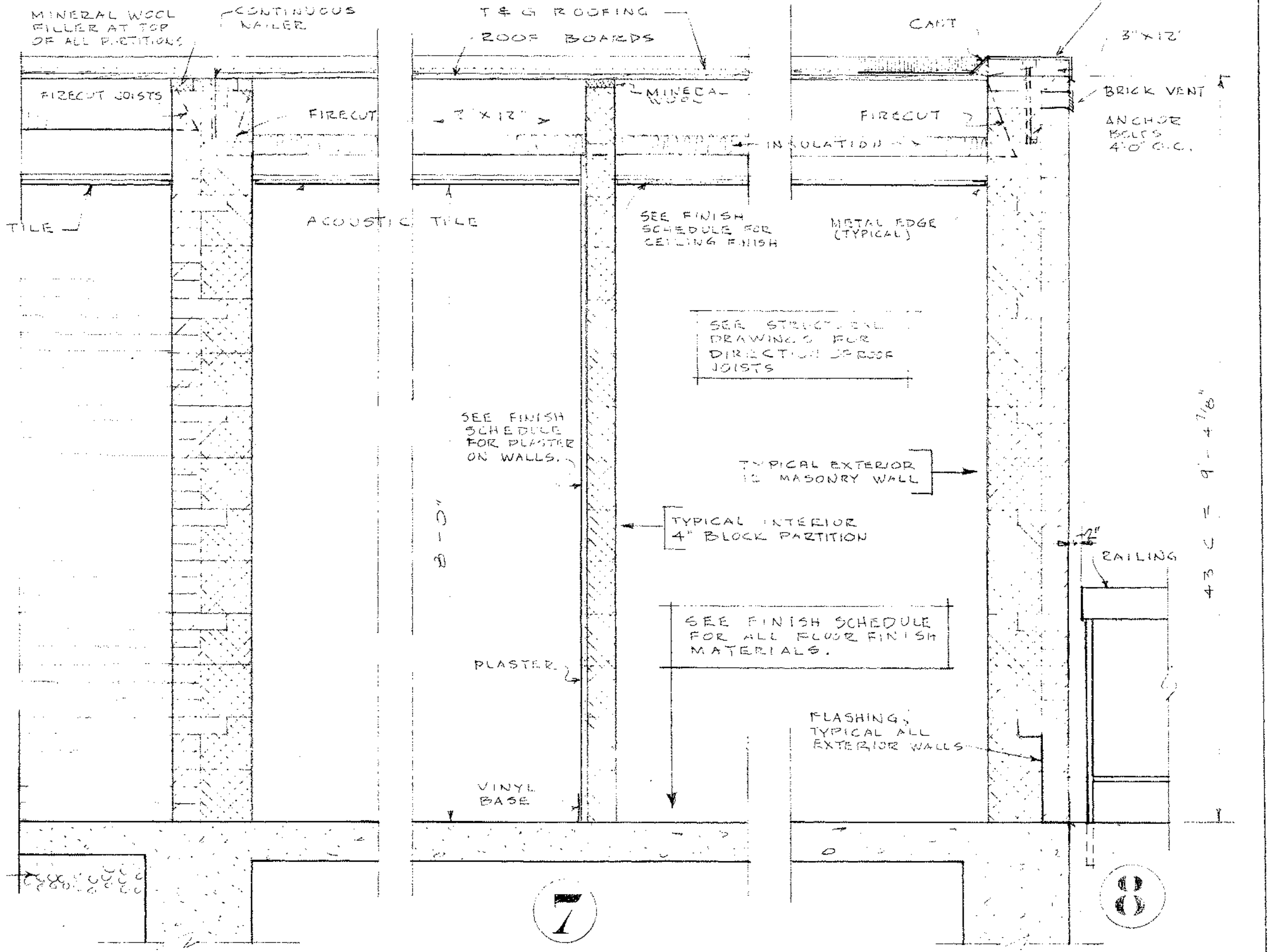
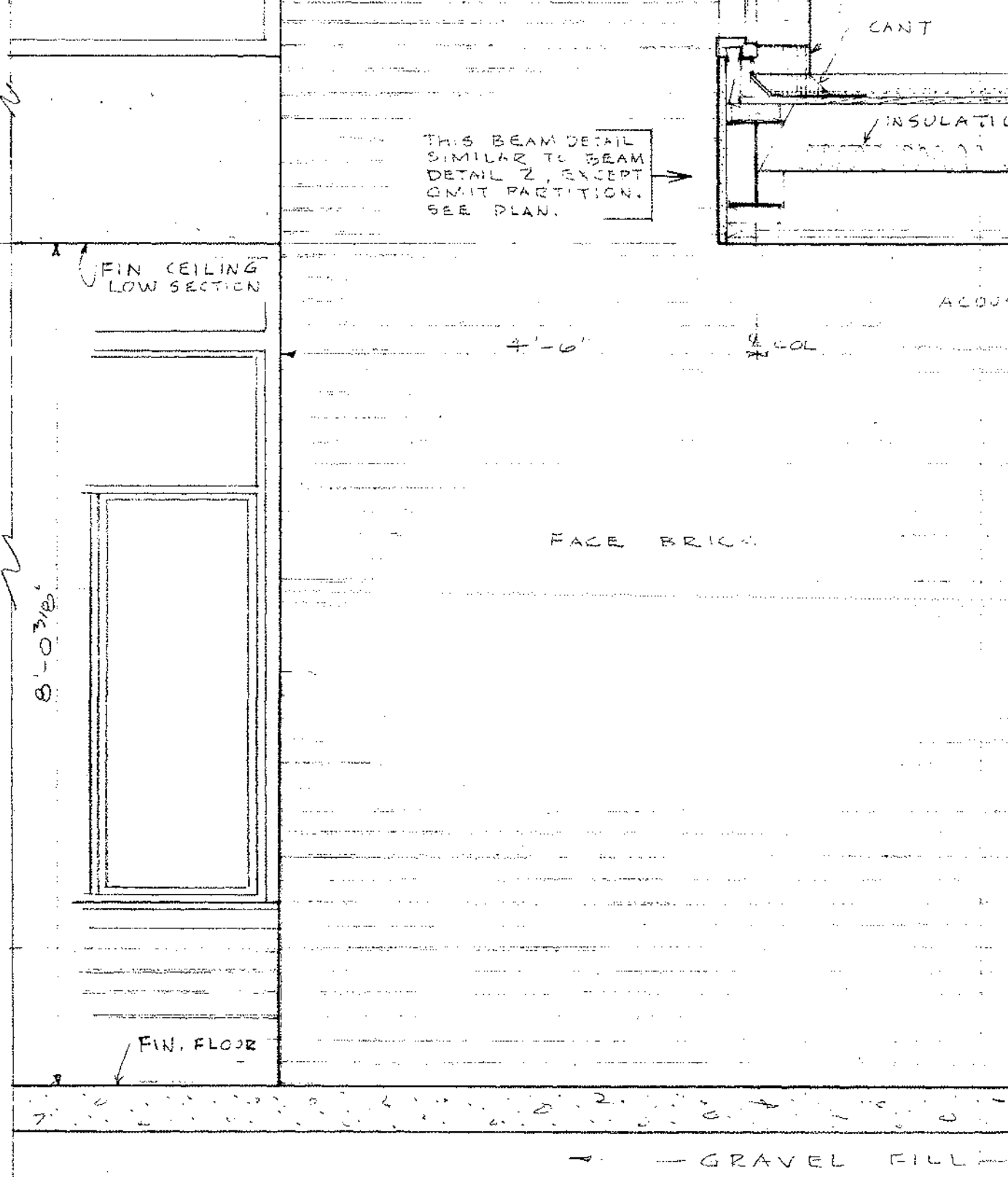
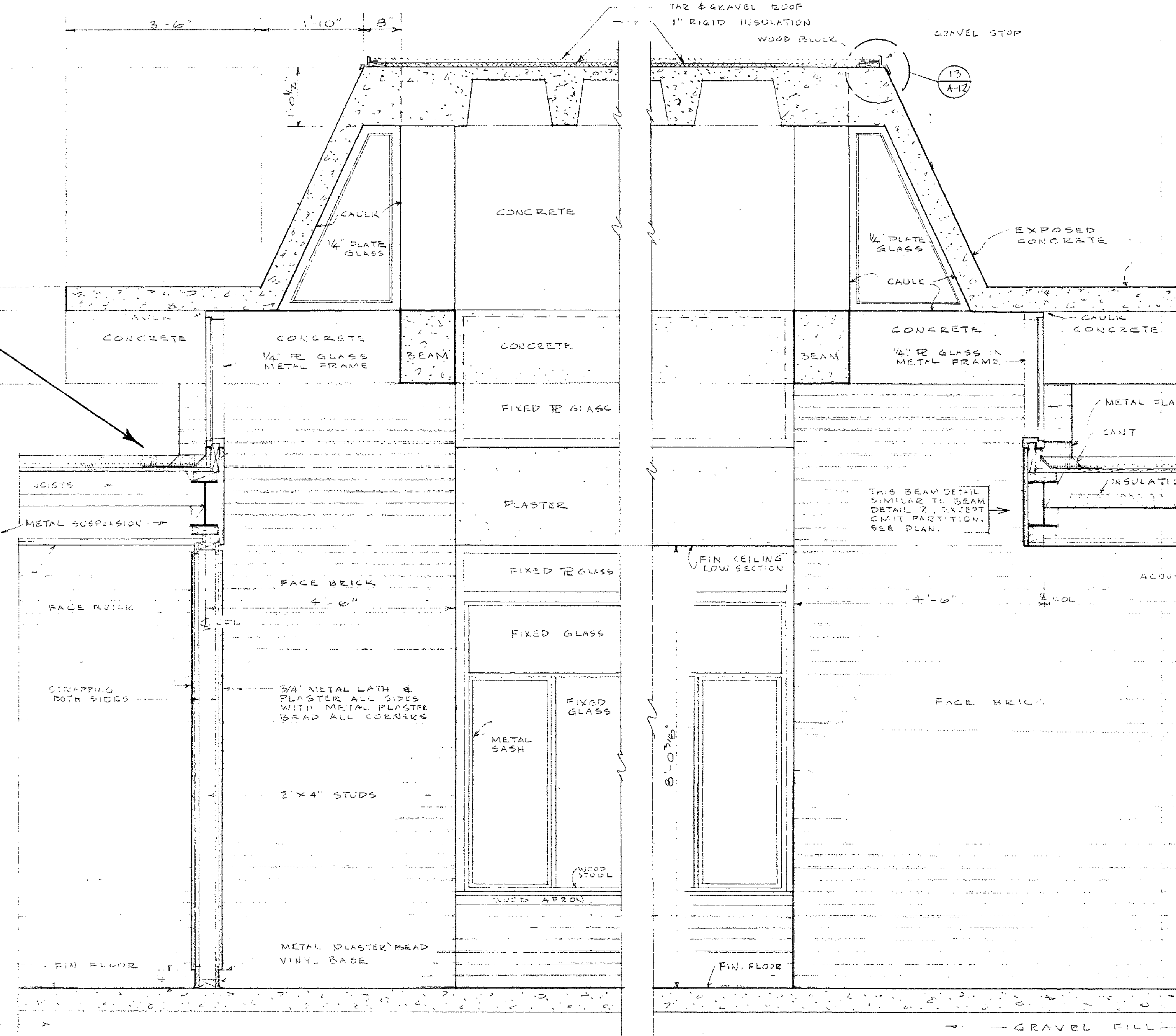
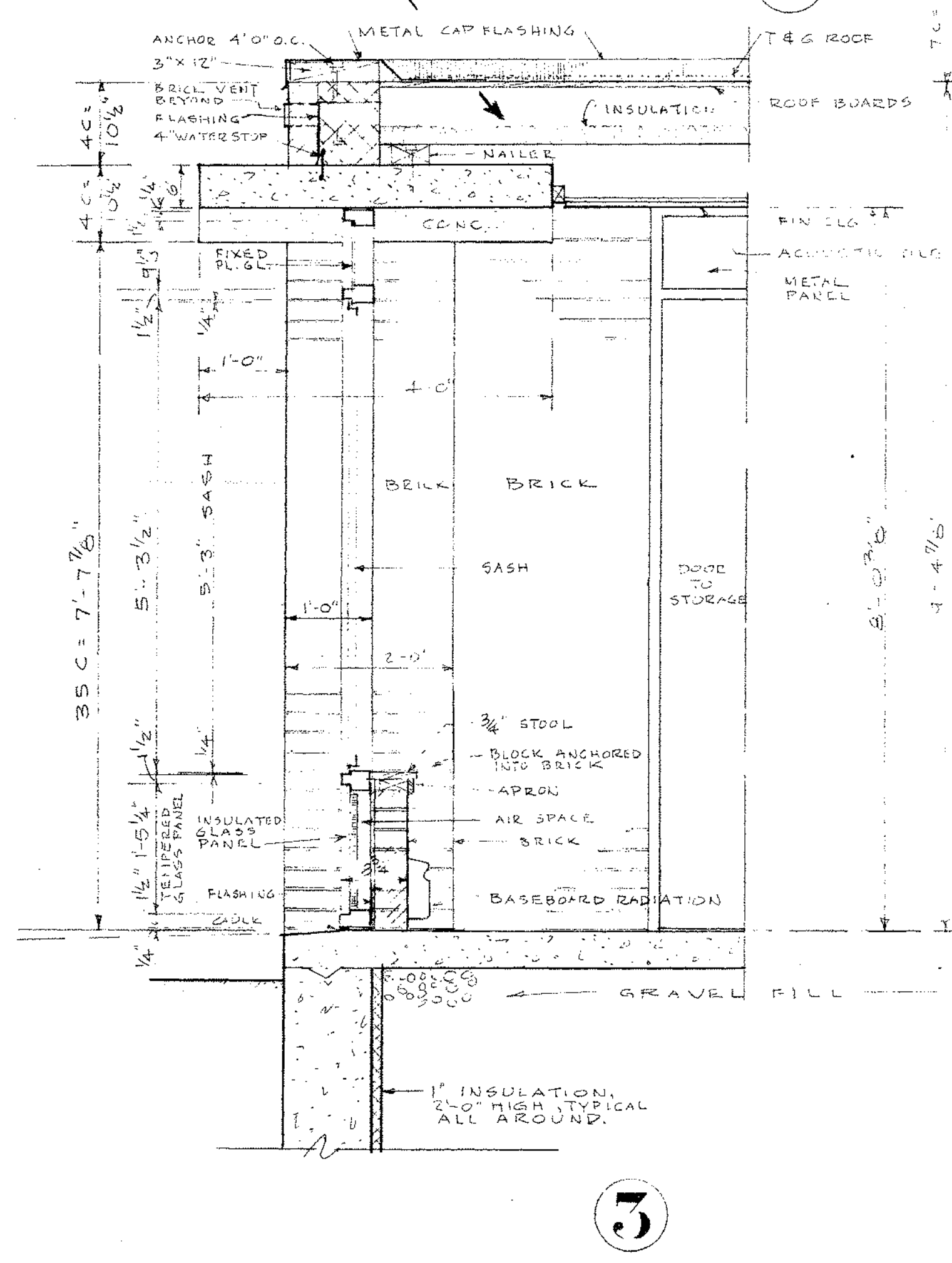
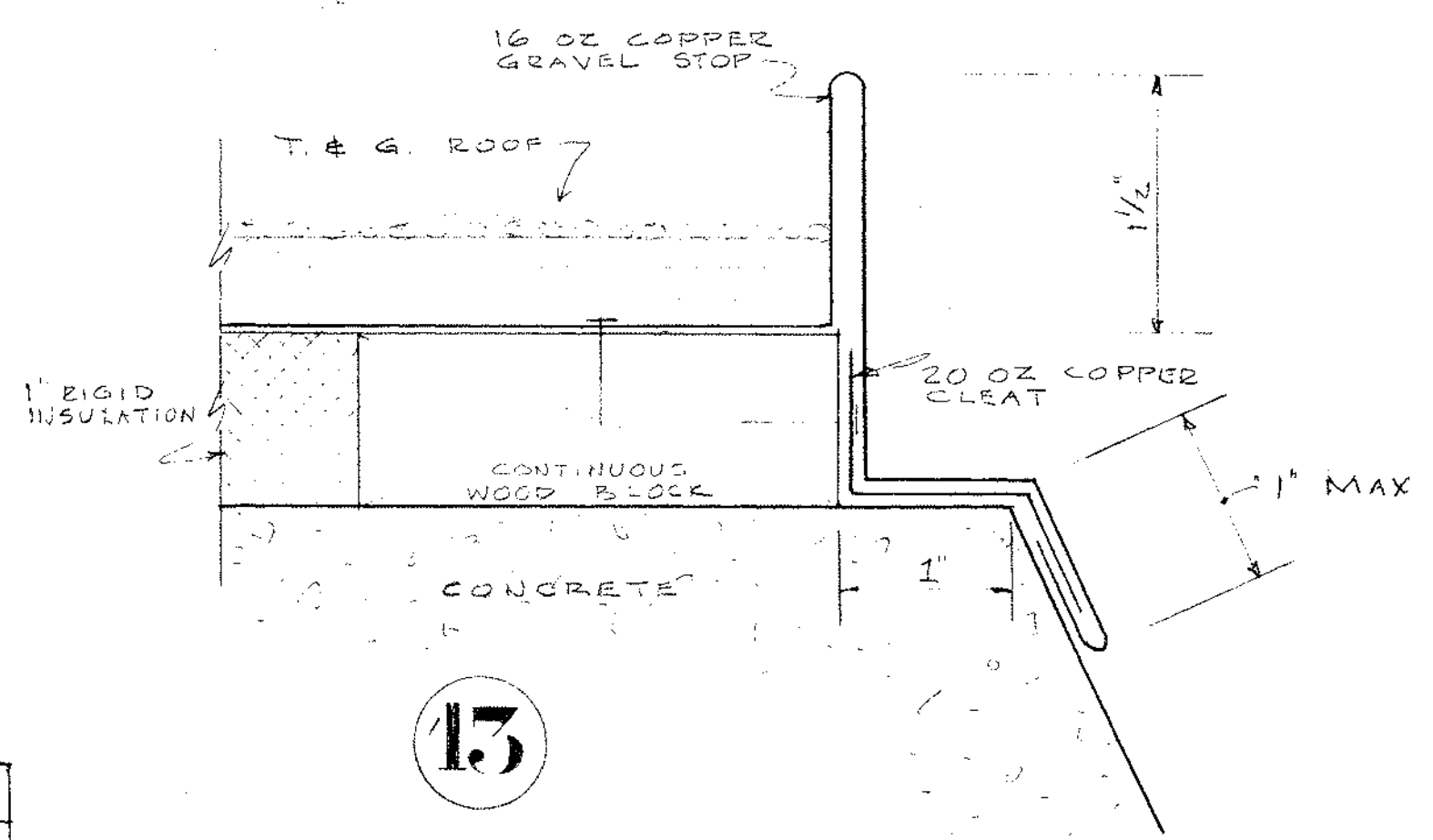
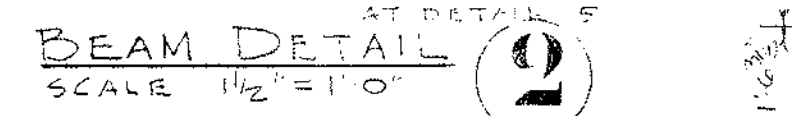
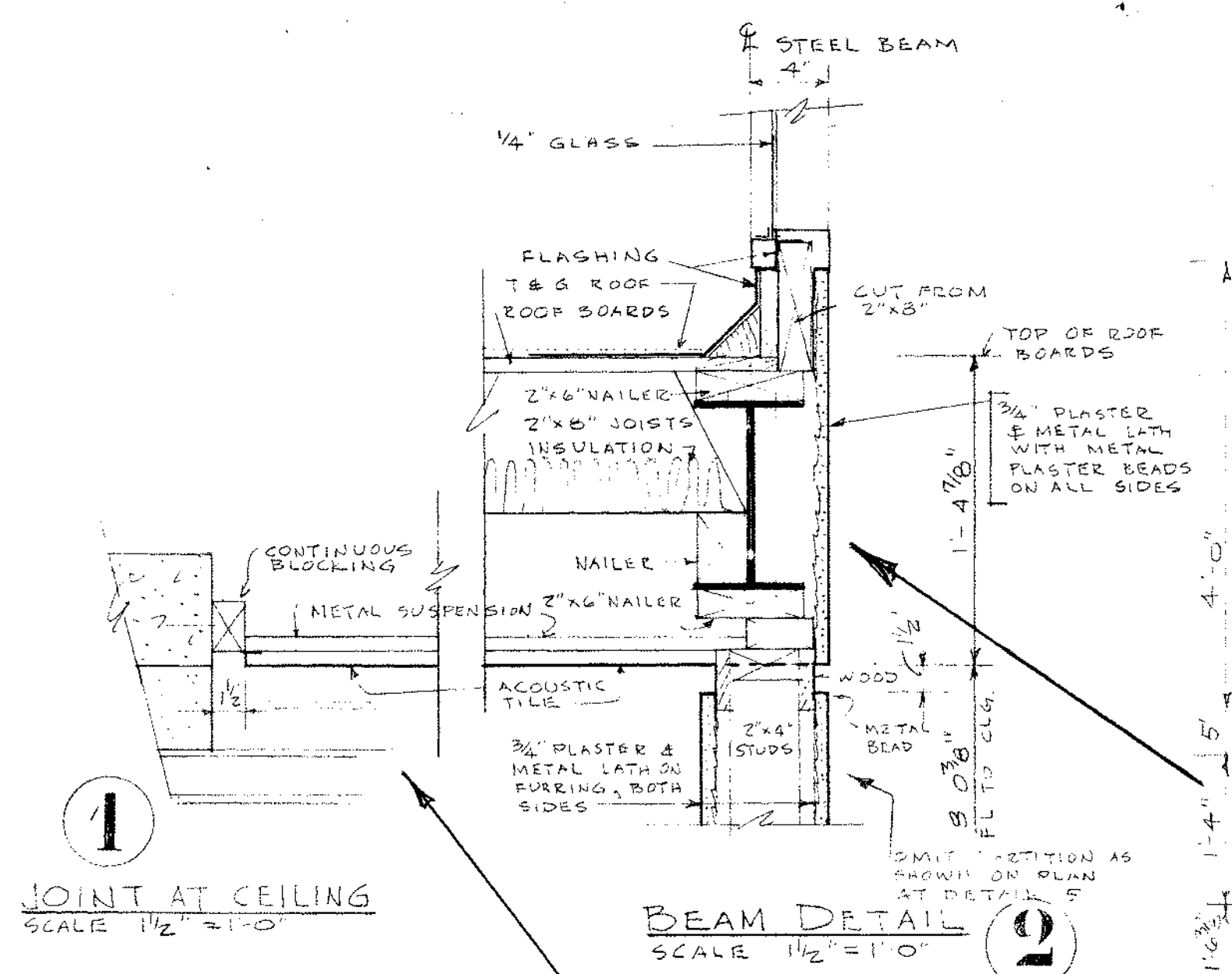
EXTERIOR ELEVATIONS
COMMUNITY BUILDING

SCALE: AS NOTED
OCT. 19, 1964

A-10



FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.		WM NELSON JACOBS ASSOCIATES, INC. REGISTERED ENGINEERS 250 CANTON STREET BOSTON, MASS. 02111
ROOF PLAN - CROSS SECTIONS COMMUNITY BUILDING	SCALE AS NOTED OCT. 19, 1964	A-11



50-108-10333
Home Made 100-108-10333
10/19/64

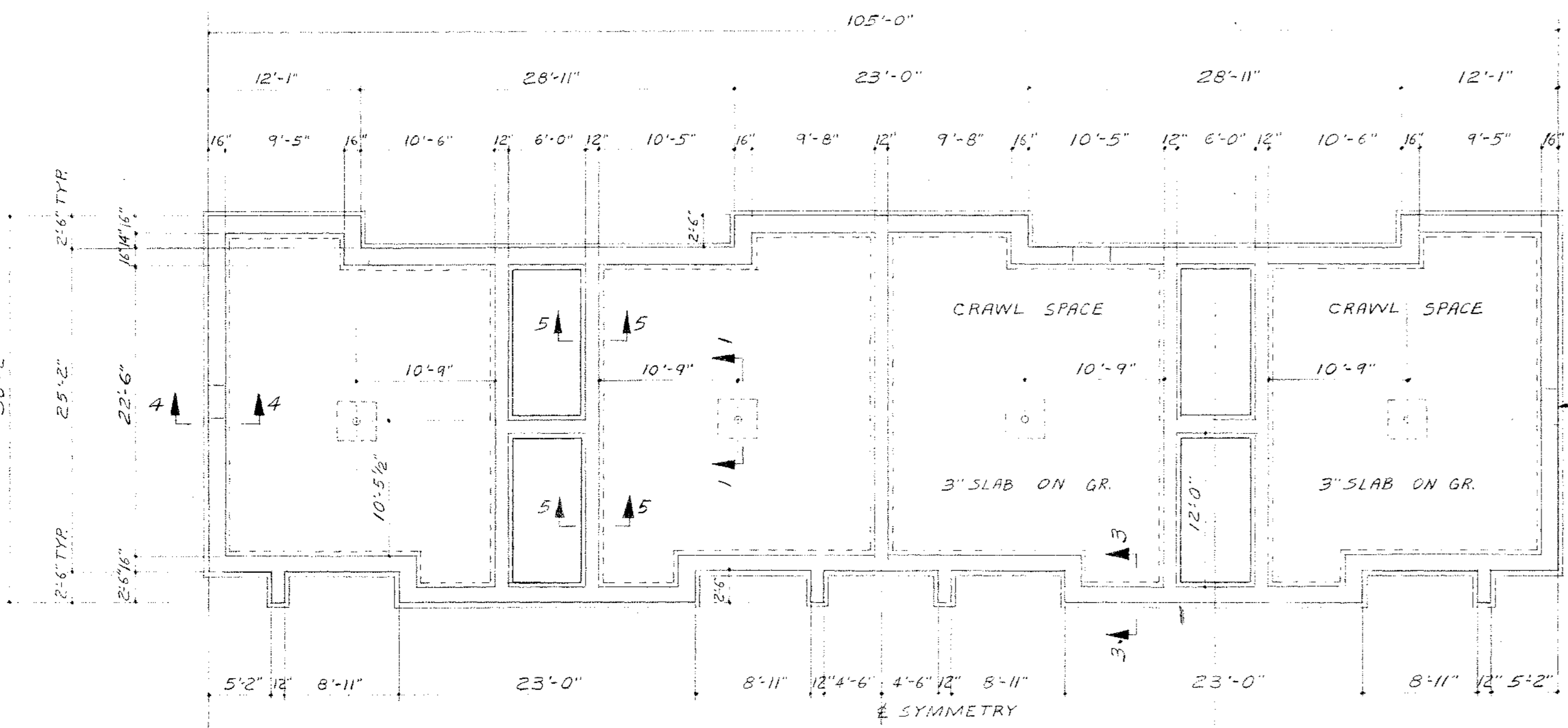
FEDERAL AIDED HOUSING FOR THE ELDERLY
MASS. PROJECT 36-3
NEWTON HOUSING AUTHORITY
NEWTON, MASS.

WM NELSON JACOBS
& ASSOCIATES, INC.
ARCHITECTS - ENGINEERS
216 STUART STREET
BOSTON, MASSACHUSETTS

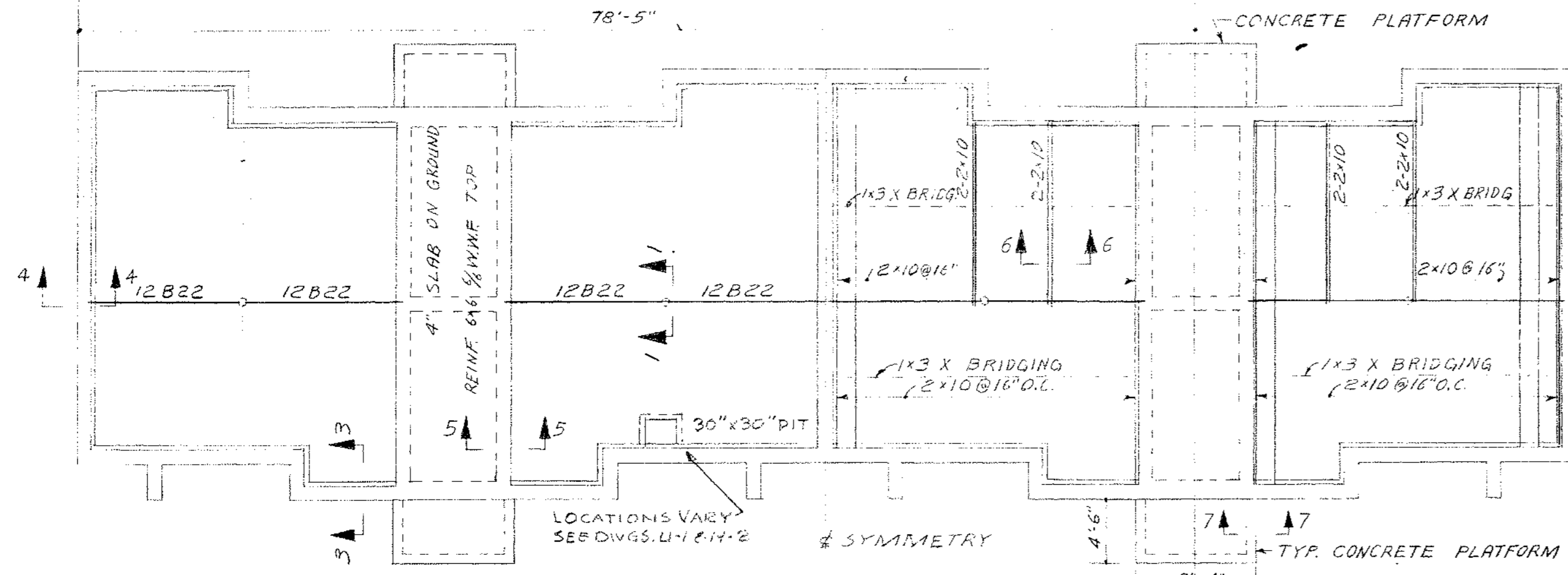
WALL SECTIONS
AND DETAILS
- COMMUNITY BUILDING -

OCT. 19, 1964

A-12



TYPICAL 8 UNIT BUILDING
CRAWL SPACE & FOUNDATION PLAN
SCALE: 1/8"=1'-0"



TYPICAL 8 UNIT BUILDING
FIRST FLOOR PLAN
SCALE: 1/8"=1'-0"

1/2 SYMM. FOR 12 UNIT BUILDING

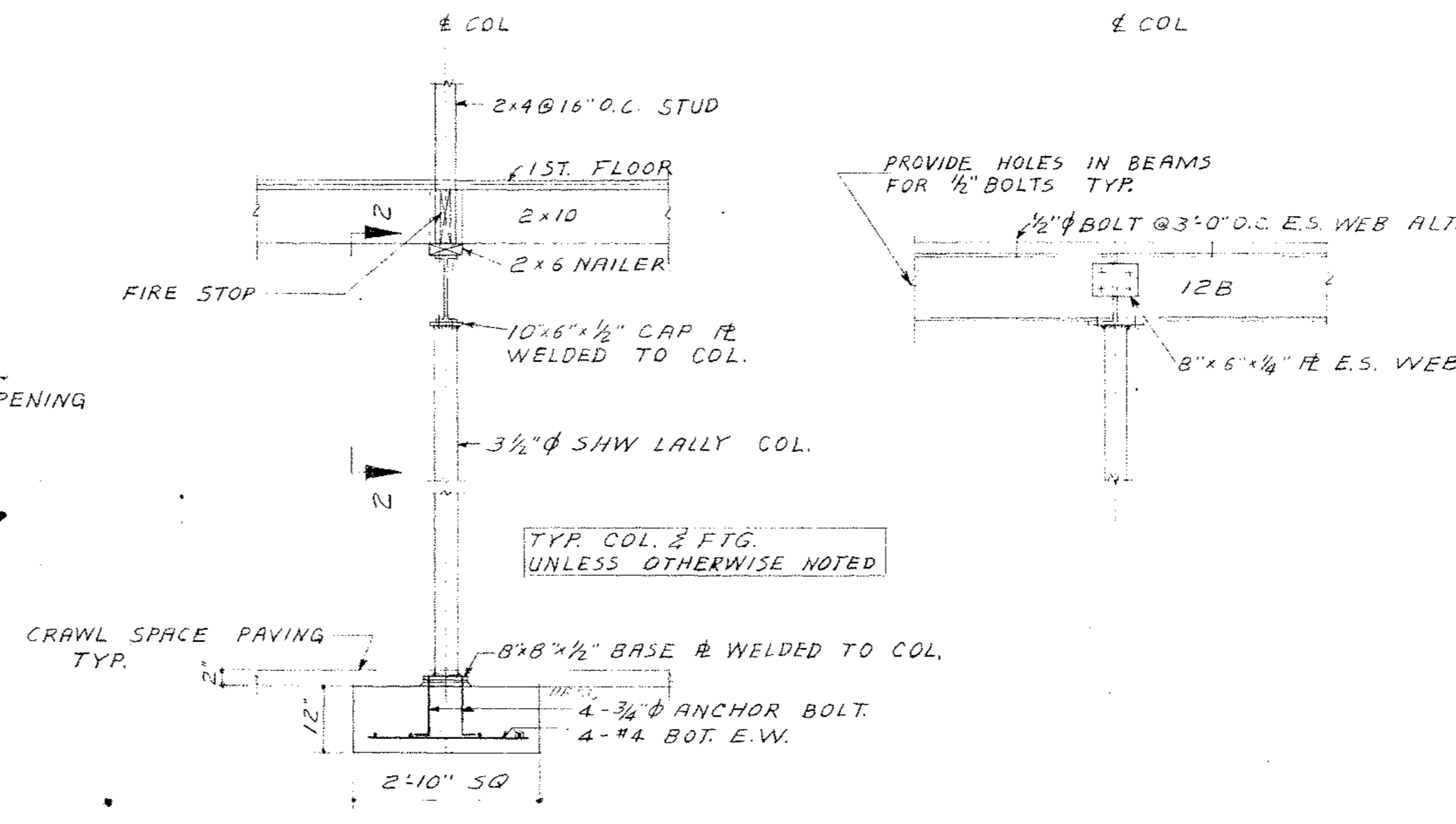
FOR TYPICAL EXTERIOR ACCESS PANEL OPENING & BRICK VENT DETAIL.
SEE DWG. A-5

BOTTOM OF FOOTING ELEVATIONS

BUILDINGS	ELEVATIONS
A-1	49'-5"
A-2	46'-11"
A-3	47'-8"
A-4	47'-8"
A-5	45'-11"
A-6	50'-11"
B-1	48'-11"
B-2	44'-8"
C	SEE DWG. S-3

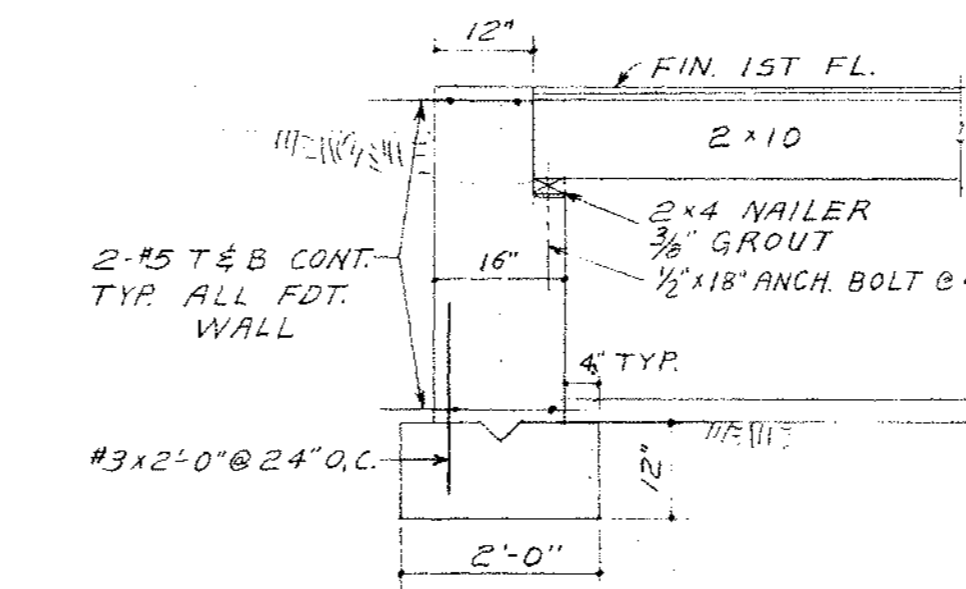
IF ELEVATION MUST BE LOWER THAN INDICATED ABOVE
TO REACH THE REQUIRED BEARING CAPACITY, ARCHITECT
MUST BE NOTIFIED BEFORE FURTHER EXCAVATION.

FOR AREAWAY OPENING
SEE ARCH. DWG.

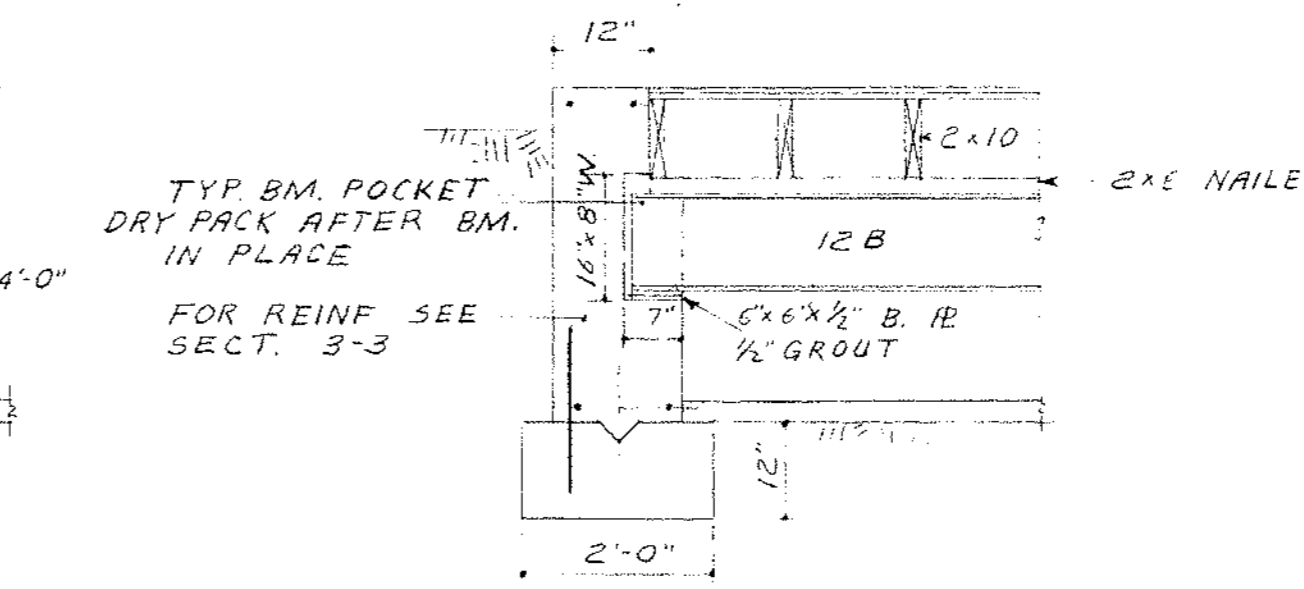


SECTION 1-1
SCALE: 1/2"=1'-0"

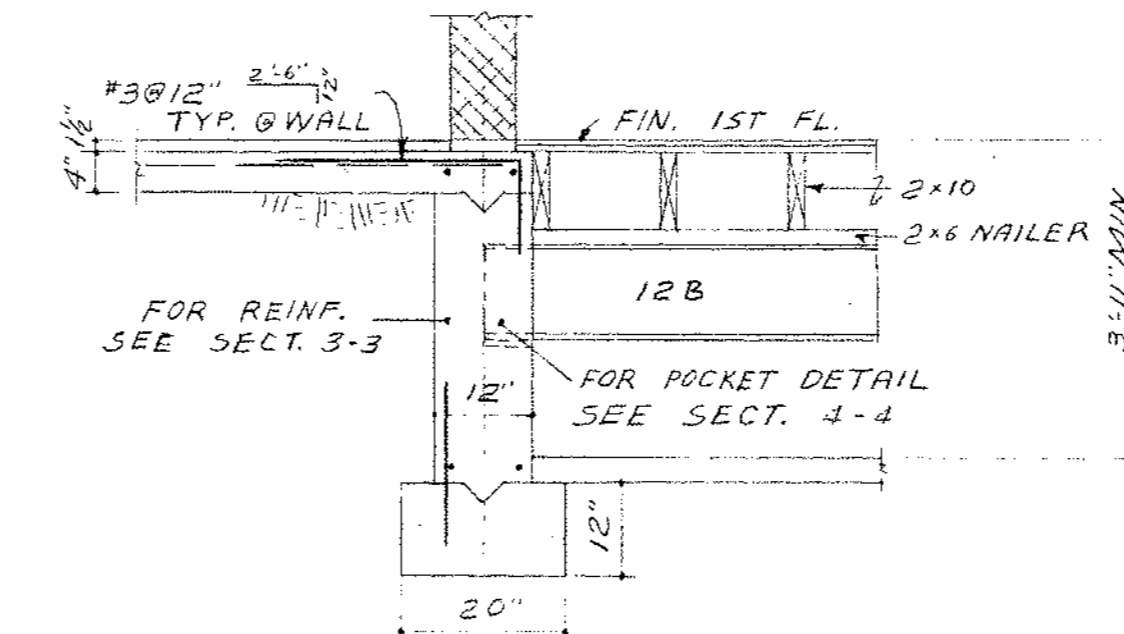
SECTION 2-2
SCALE: 1/2"=1'-0"



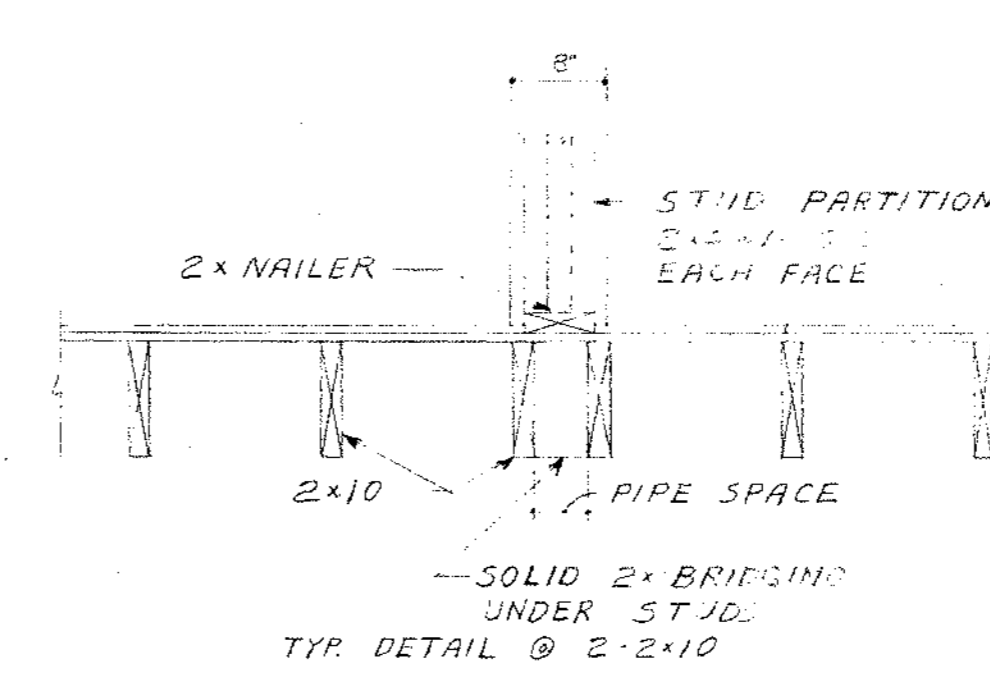
SECTION 3-3
SCALE: 1/2"=1'-0"



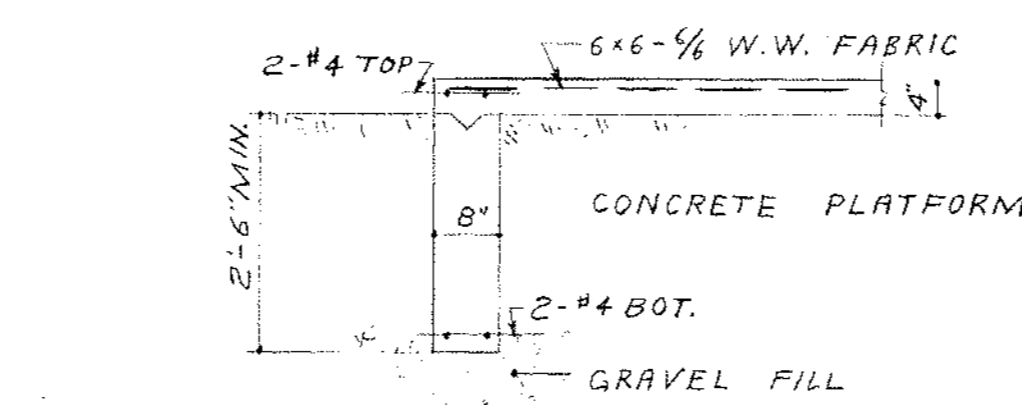
SECTION 4-4
SCALE: 1/2"=1'-0"



SECTION 5-5
SCALE: 1/2"=1'-0"



SECTION 6-6
SCALE: 1/2"=1'-0"



SECTION 7-7
SCALE: 1/2"=1'-0"

GENERAL NOTES

1. Designated Live Loads:
Snow - 30 P.S.P.
Apartment Floor - 50 "
Community Floor - 100 "
2. All slabs on ground shall be poured in alternate panels not to exceed 1000 square feet.
3. All work shall be done in accordance with Newton building code requirements.
4. All free standing columns during construction shall be braced properly until floor members are permanently attached.
5. Slab on ground to be poured against 1 layer of polytholene (4 mils.).
6. All organic materials under slab on grade shall be removed and replaced with compacted gravel fill.
7. A 6" minimum of compacted gravel fill is required under all slab on ground.
8. The contractor shall verify all dimensions and locations of all openings, slots, pipe sleeves, anchor bolts as required for all trades before concrete is poured.
9. All slabs poured on ground shall be reinforced with welded wire mesh 6x6-6/6. Mesh shall be lapped 6".

FOUNDATION NOTES

1. Footing foundations designed for 5 tons per square foot on very compact medium to coarse yellow sand and gravel.
2. All wall footings shall have 4" projection beyond all faces of walls except as otherwise noted.
3. Control or construction joints in foundation walls shall be placed not more than 60 feet apart.
4. All footing keys to be diagonal cut 4"x4" (nominal) unless otherwise shown.
5. No footing shall be placed in water or on frozen ground. Exterior footings shall not be less than 4'-0" below finish grade.
6. Provide corner rods and dowels for all continuous steel.
7. Wall footings shall be stepped 1" vertical to 2" horizontal with 1'-0" maximum for each vertical where elevation changes, except as noted.
8. All organic material and loose fill shall be removed under all footings.

CONCRETE NOTES

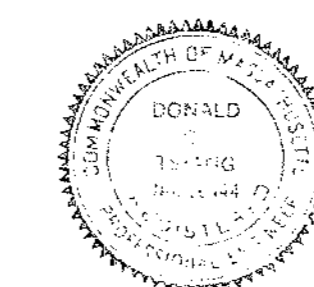
1. All concrete to have the following minimum compressive strength in 28 days: First Floor and below - 2500 PSI
Above First Floor - 3000 "
2. Concrete cover - 1 1/2" - slab
1 1/2" - walls and beams
3" - footings
3. All concrete shall be controlled concrete, mixed and placed under the supervision of an approved concrete control engineer.
4. All concrete work shall conform to the latest ACI Code and Manual.
5. Grid construction shall be 10" deep domes, plus 2 1/2" topping with ribs 5" wide.
6. Domes shall be removable steel type.

REINFORCING STEEL NOTES

1. All reinforcing steel shall be billet steel (A432) deformed bars except as noted.
2. All reinforcing steel shall be detailed in accordance with ACI Code and Manual except as noted.
3. Provide bar supports and spacers in accordance with ACI Detailing Manual.
4. All reinforcing steel after in place shall be inspected by Architect-Engineer. The General Contractor must notify the Architect-Engineer 24 hours before pouring.
5. Unless otherwise noted, provide at all four sides of an opening, 2 #5 top and bottom in slabs and 1 #5 each face in walls, extending 2'-0" beyond opening, or hooked if necessary.
6. Shop drawings in triplicate shall be submitted for the Architect's approval before fabrication.

STRUCTURAL STEEL NOTES

1. All structural steel shall be detailed in accordance with A.I.S.C. and American Welding Society specifications.
2. One prime coat of Thomec 99-6 grey Metal Primer as manufactured by Thomec Company, or approved equal, shall be applied to all structural members. If touch up is required in the field, same paint shall be used.
3. Welding shall be done by an approved certified welder.
4. All lally columns shall be genuine lally columns, or approved equal.
5. Shop drawings in triplicate shall be submitted for the Architect's approval before fabrication.
6. All structural steel shall be new steel conforming to ASTM A-36 standard to date.
7. Shop connections, unless otherwise noted, shall be made by welding or riveting.
8. Provide 3/4" grout and 1/4" leveling plate under all column base plates, unless noted otherwise.
9. Field connections shall be made by bolting (3/4" diameter min.) welding.
10. Unless otherwise noted, provide suitable bearing plates and standard government anchors for wall bearing loads.
11. Bearing for angle lintels shall be 1" for each foot of span with 5" minimum.



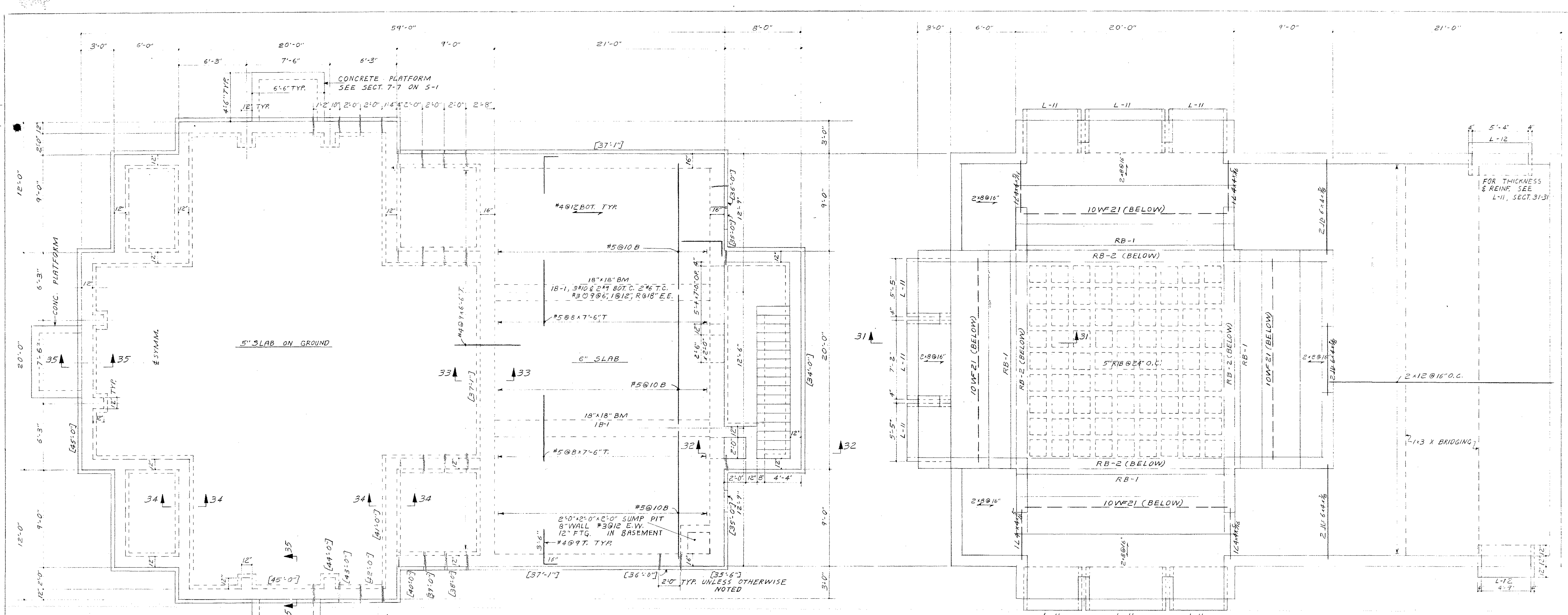
FEDERAL AIDED HOUSING FOR THE ELDERLY
MASS. PROJECT 36-3
NEWTON HOUSING AUTHORITY
NEWTON, MASS.

FOUNDATION & FIRST FLOOR
FRAMING PLANS
- DWELLING UNITS -

DR. NELSON
REGISTERED PROFESSIONAL ENGINEER
STATE OF MASSACHUSETTS
LICENSE NO. 10123

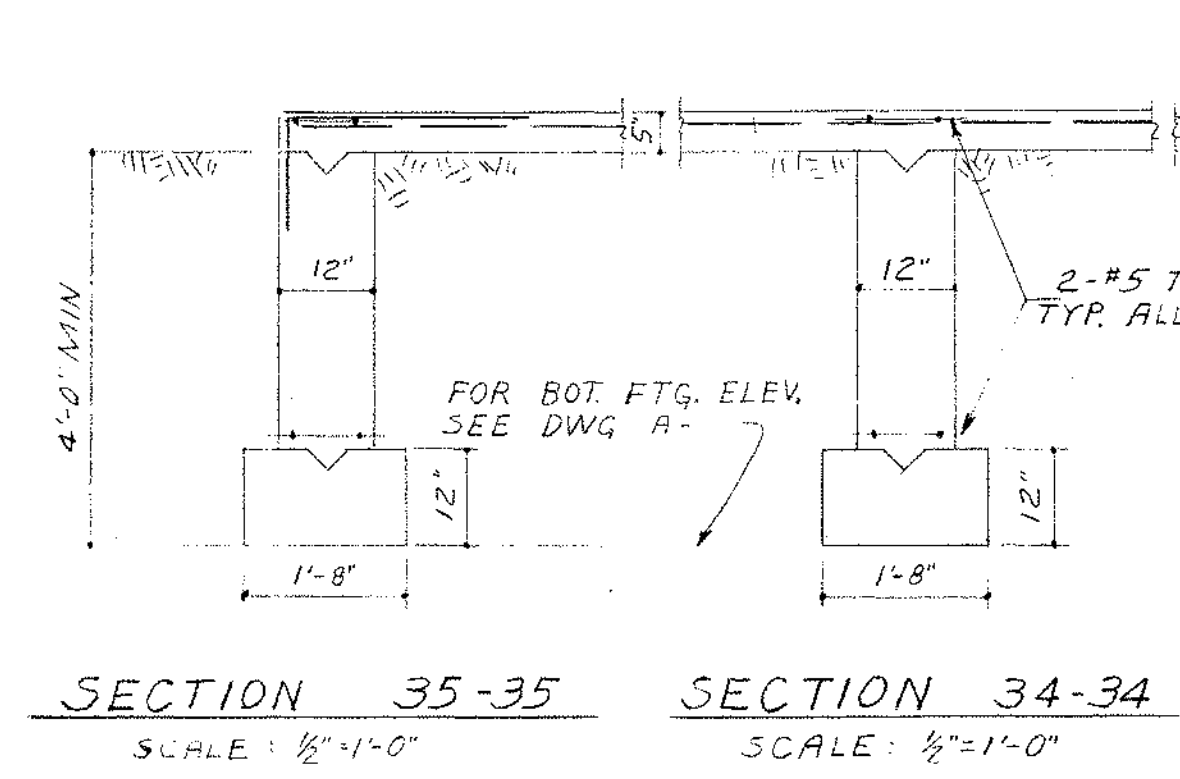
SCALE: AS NOTED
OCT. 19, 1964

S-1

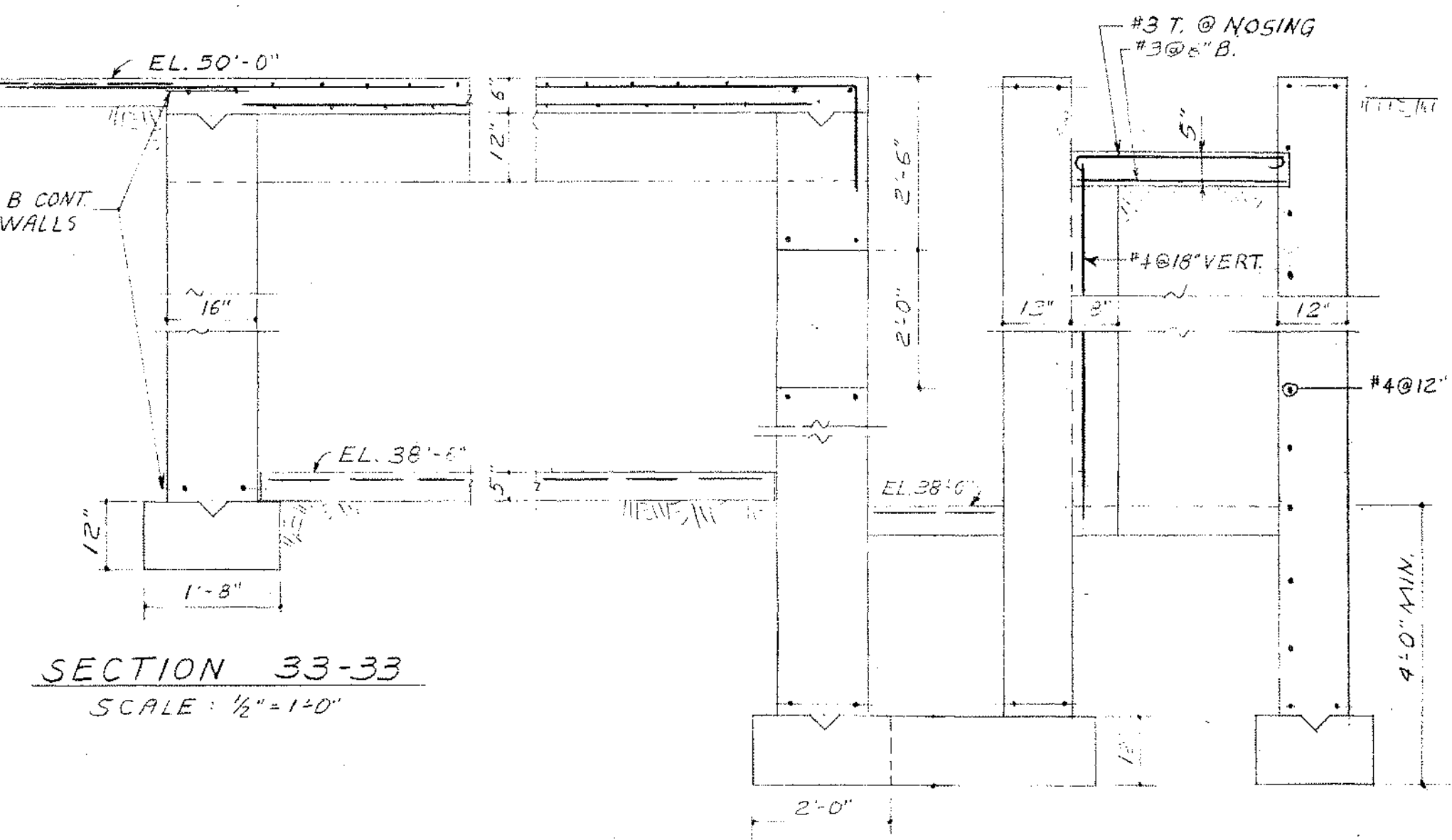


FOUNDATION & FIRST FLOOR PLAN
SCALE: 1/4"=1'-0"

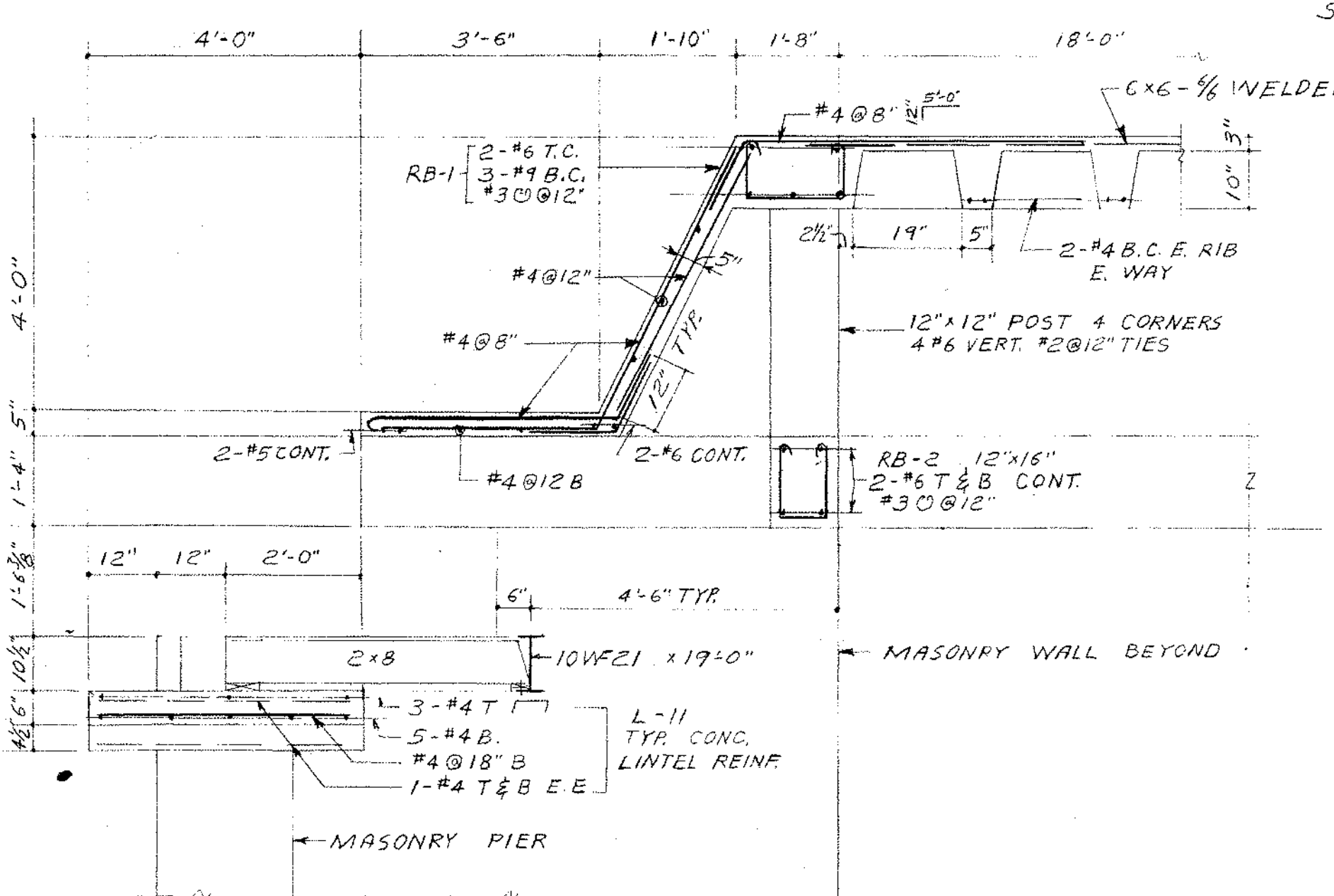
ROOF PLAN
SCALE: 1/4"=1'-0"



SECTION 35-35 SCALE: 1/2"=1'-0"
SECTION 34-34 SCALE: 1/2"=1'-0"



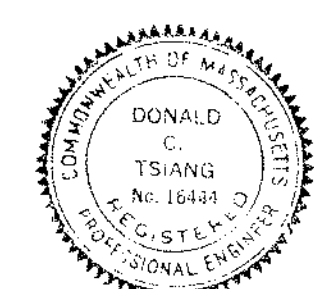
SECTION 33-33 SCALE: 1/2"=1'-0"
SECTION 32-32 SCALE: 1/2"=1'-0"



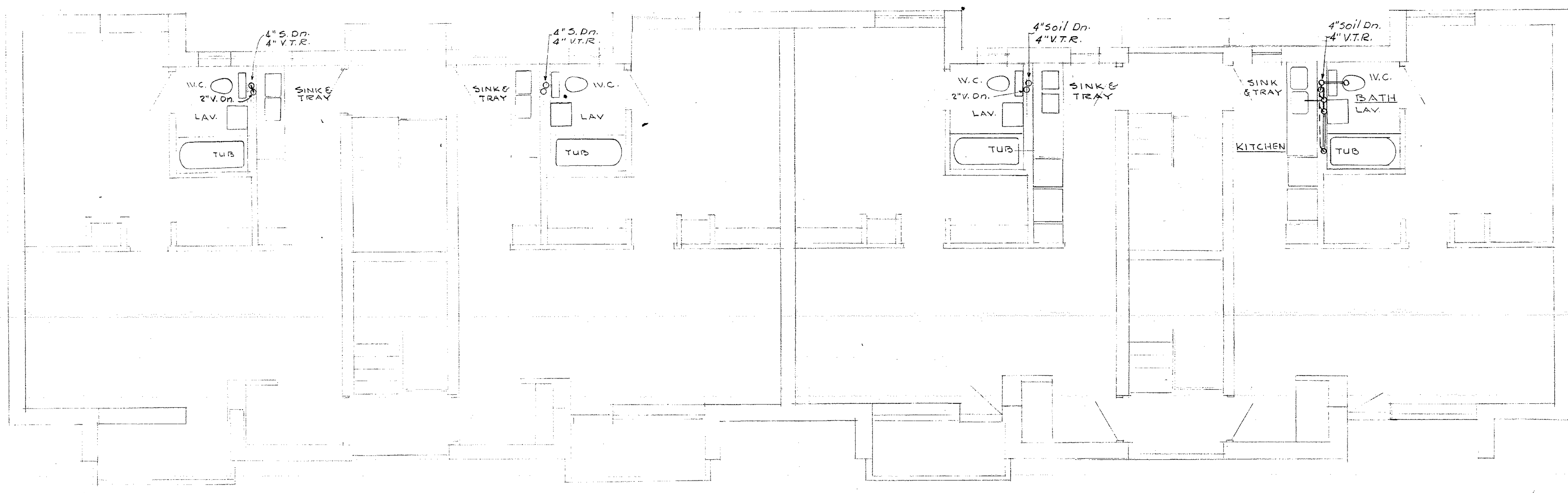
SECTION 31-31 SCALE: 1/2"=1'-0"

1. FOR STRUCTURAL NOTES SEE DWG. 5-1 & 5-2.
2. PROVIDE 6\"/>

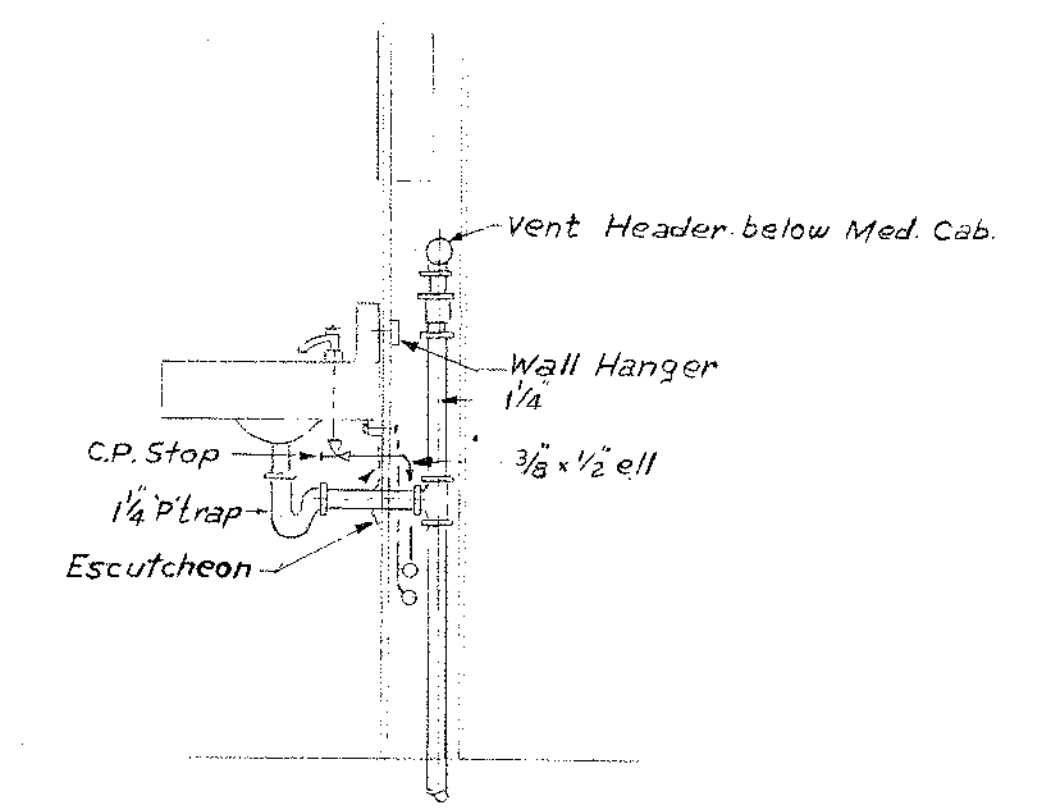
MASSACHUSETTS
STATE BOARD OF BUILDING REGULATIONS
65 STATE STREET, 10TH FLOOR
BOSTON, MASS. 02109
TEL: 552-2222



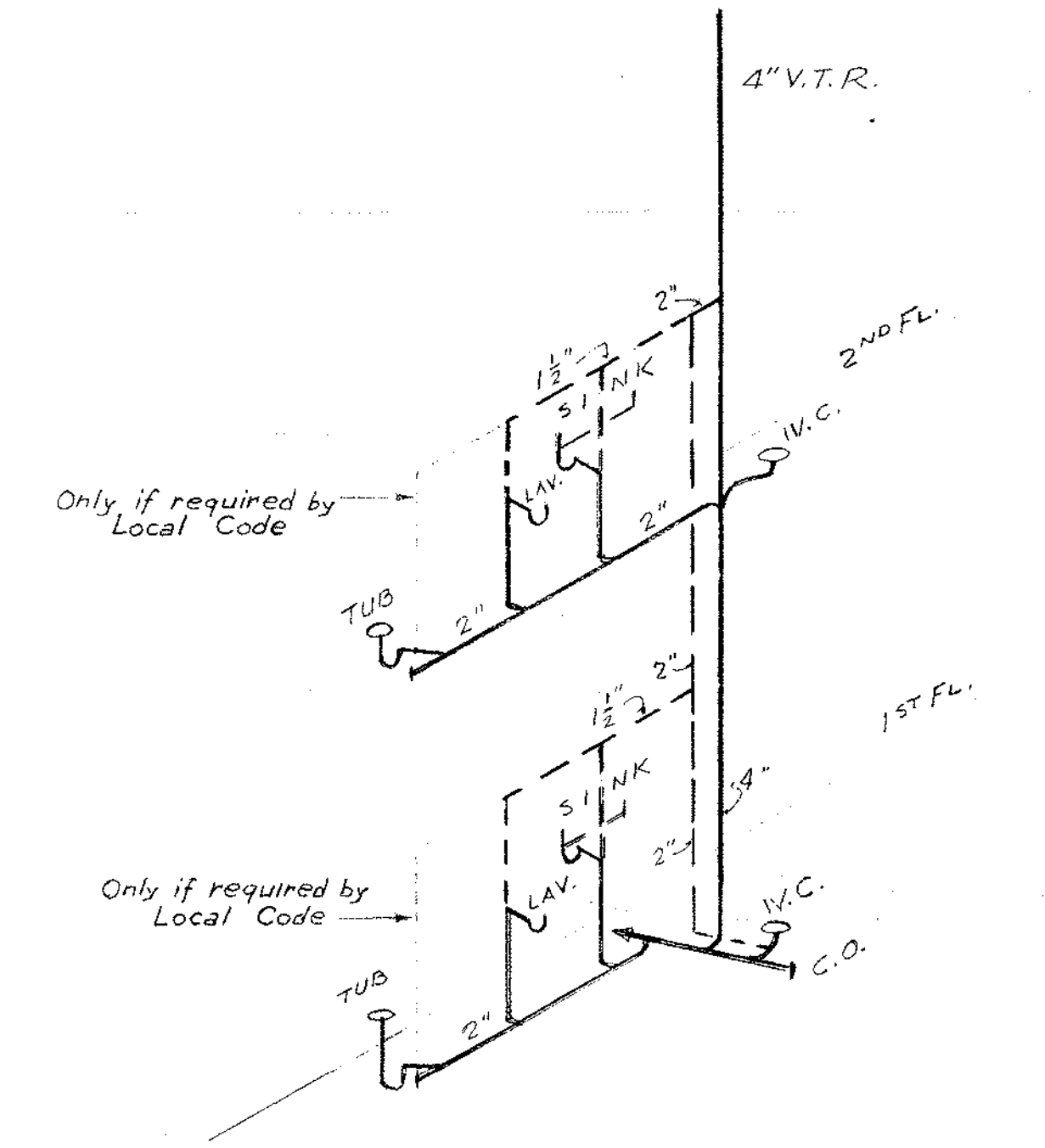
FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.		DATE: 10/19/64	S-3
FOUNDATION, FIRST FLOOR & ROOF FRAMING PLANS - COMMUNITY BUILDING -		SCALE: AS NOTED	



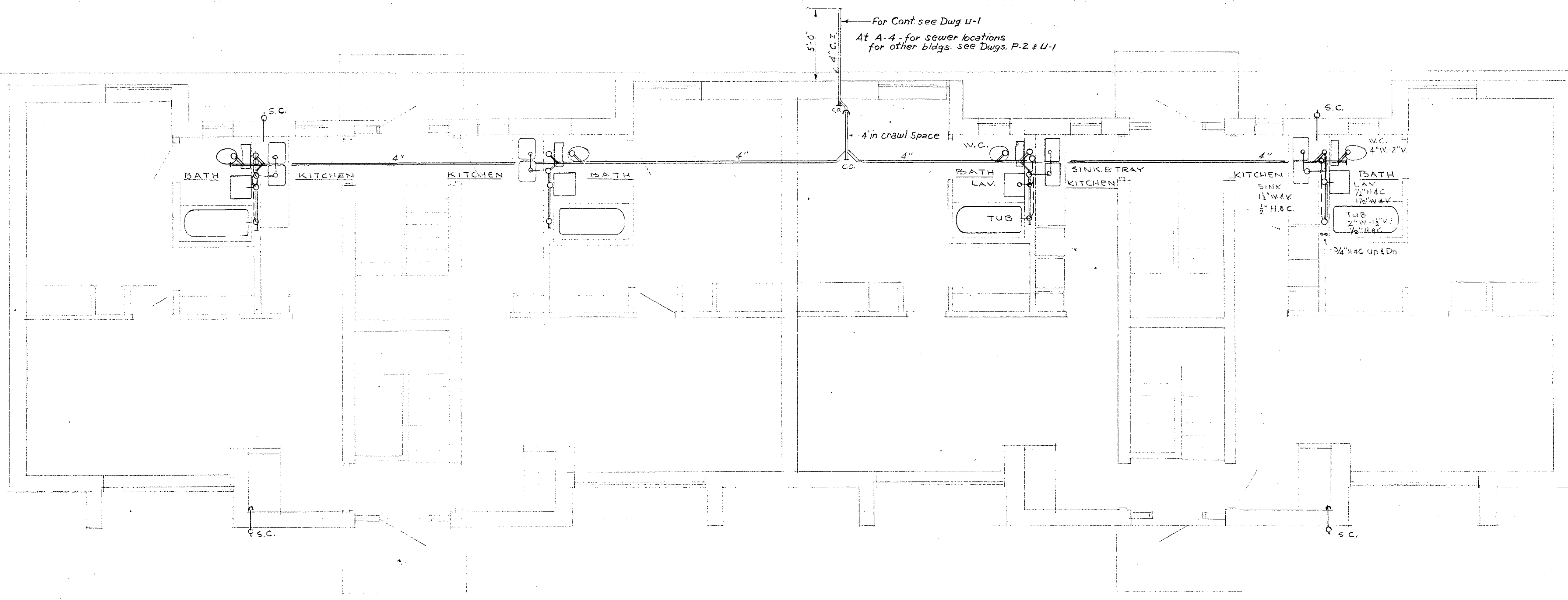
SECOND FLOOR PLAN



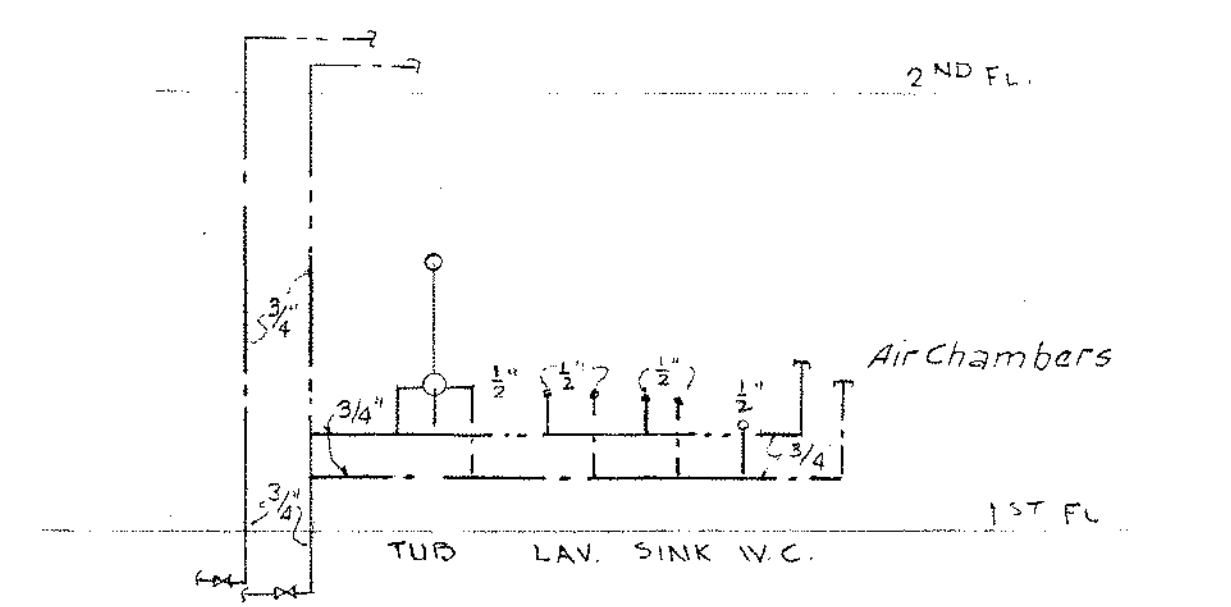
TYPICAL LAVATORY CONNS.



SOIL, WASTE & VENT PIPING DIAGRAM



FIRST FLOOR PLAN



HOT & COLD WATER PIPING DIAGRAM

LEGEND

—	Soil or Waste above Ground	F.D.	Floor Drain
—	Soil or Waste below Ground	C.O.	Clean Out
—	Vent Piping	FCO	Flush Cleanout
—	Cold Water piping	D.S.	Down Spout
—	Domestic Hot Water	R.D.	Roof Drain
—	Hot Water Recirculation	S.C.	Sill Cock
—	Gate Valve		
—	Check Valve		

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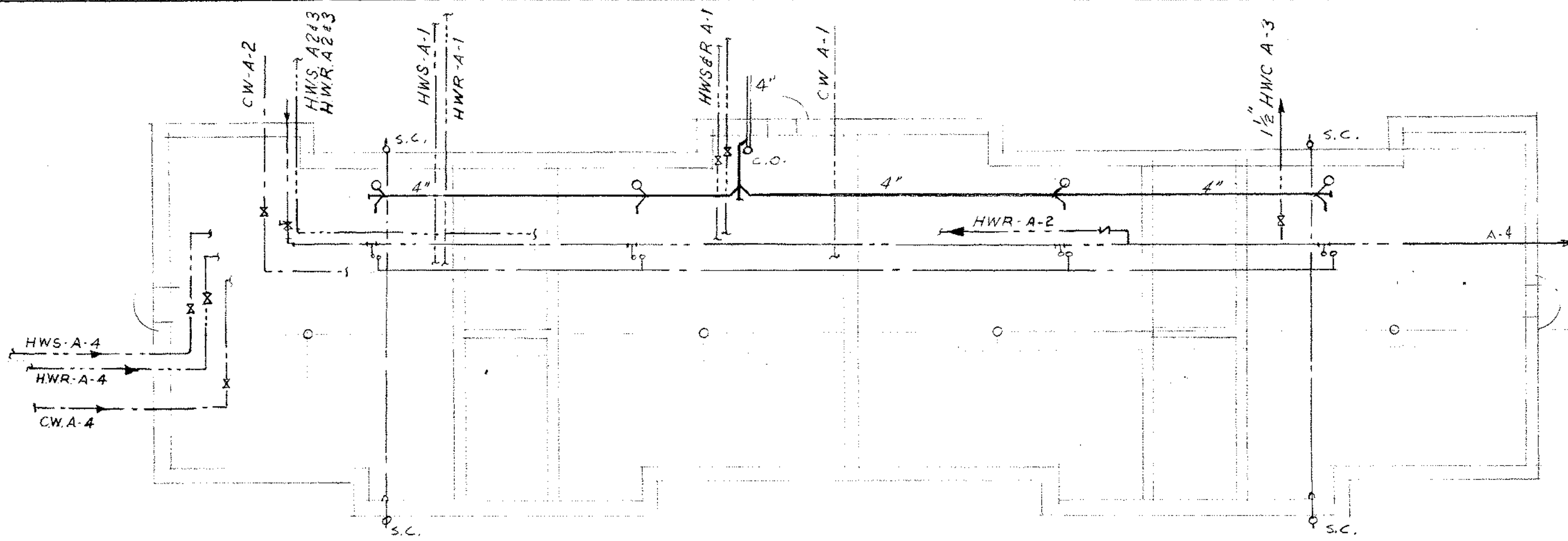


FEDERAL AIDED HOUSING FOR THE ELDERLY
 MASS. PROJECT 363
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.

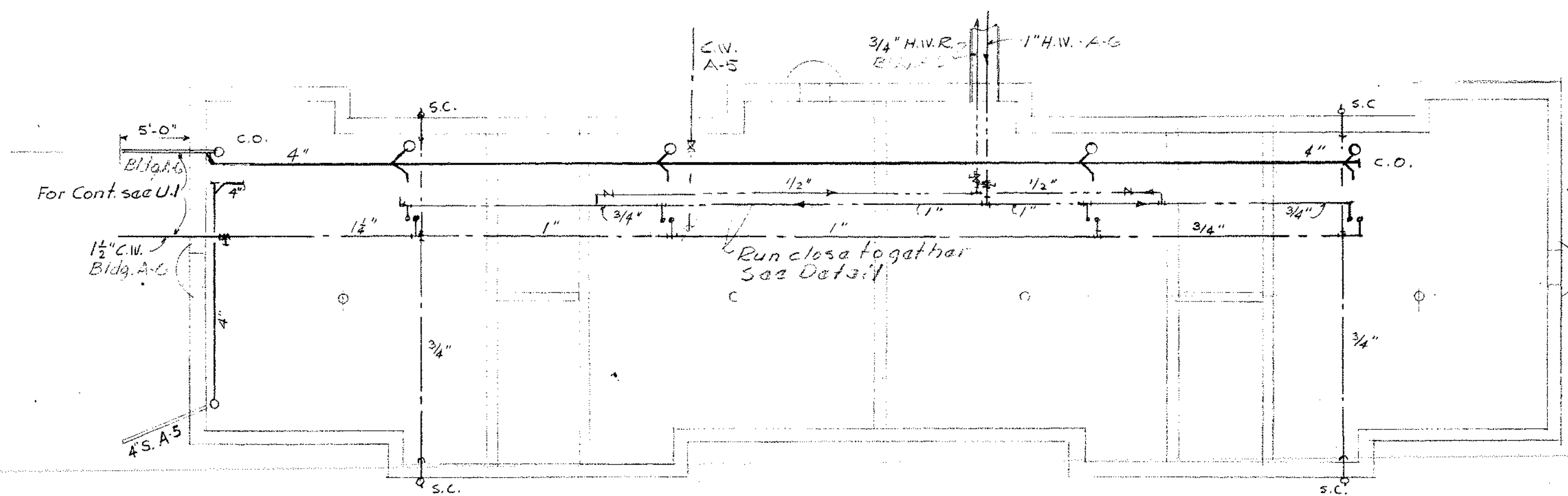
W. H. BELLAMY, ARCHT.
 ASSOCIATES, INC.
 ARCHITECT-ENGINEER
 375 STURGEON STREET
 BOSTON, MASSACHUSETTS

PLUMBING PLAN
 BLDGS. A-1, A-2, A-3 & A-4

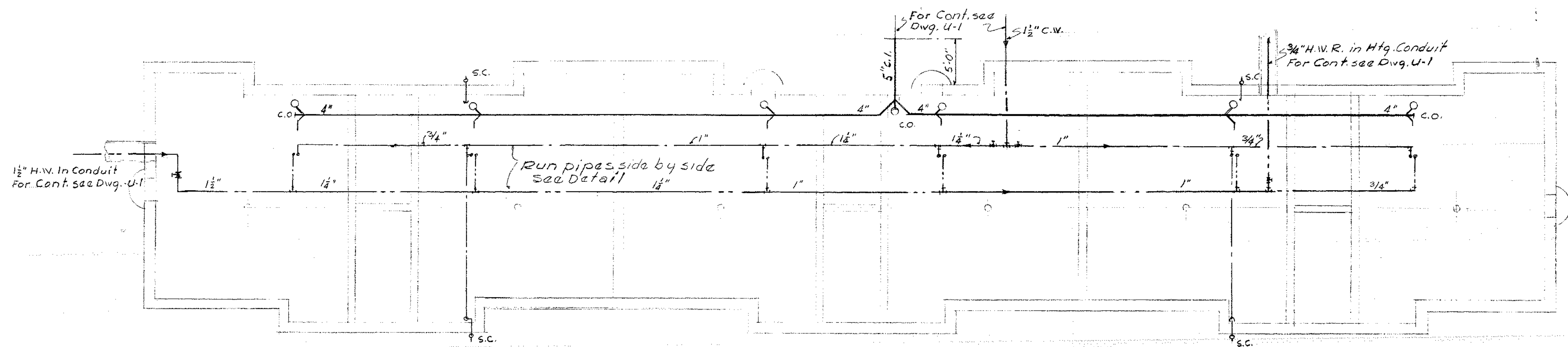
SCALE: AS NOTED
 OCT. 19, 1964
P-1



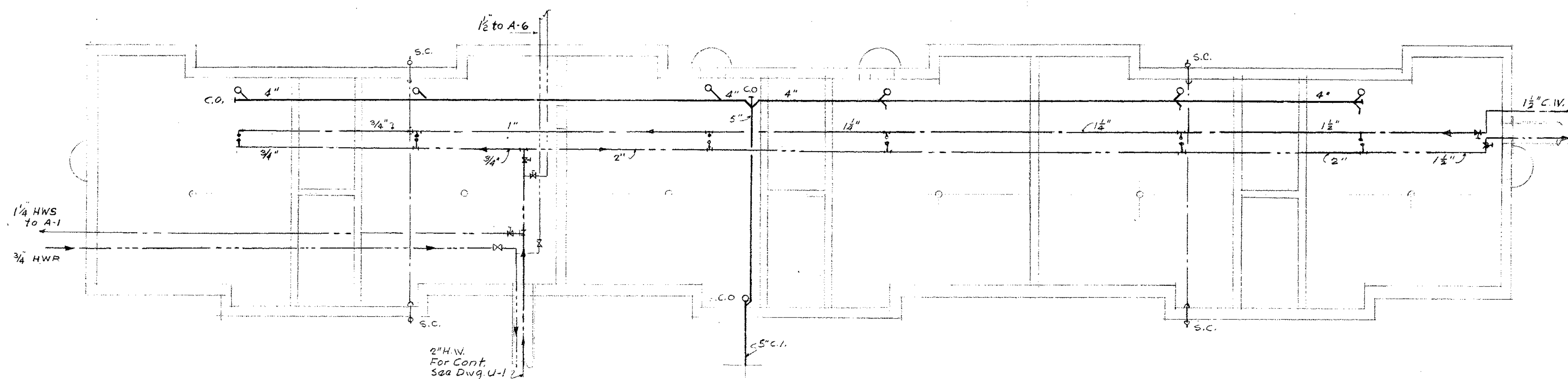
CRAWL SPACE PLAN - BLDGS A1 THRU A-4
WITH DIFFERENCES AS NOTED



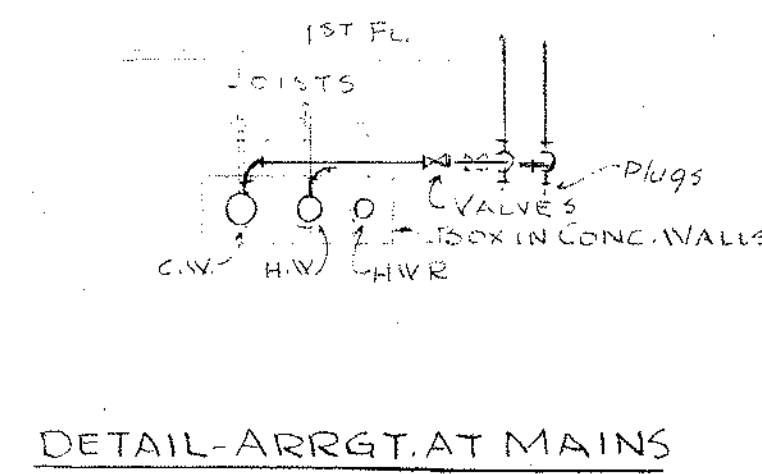
CRAWL SPACE PLAN - BLDGS. A-5 & A-6



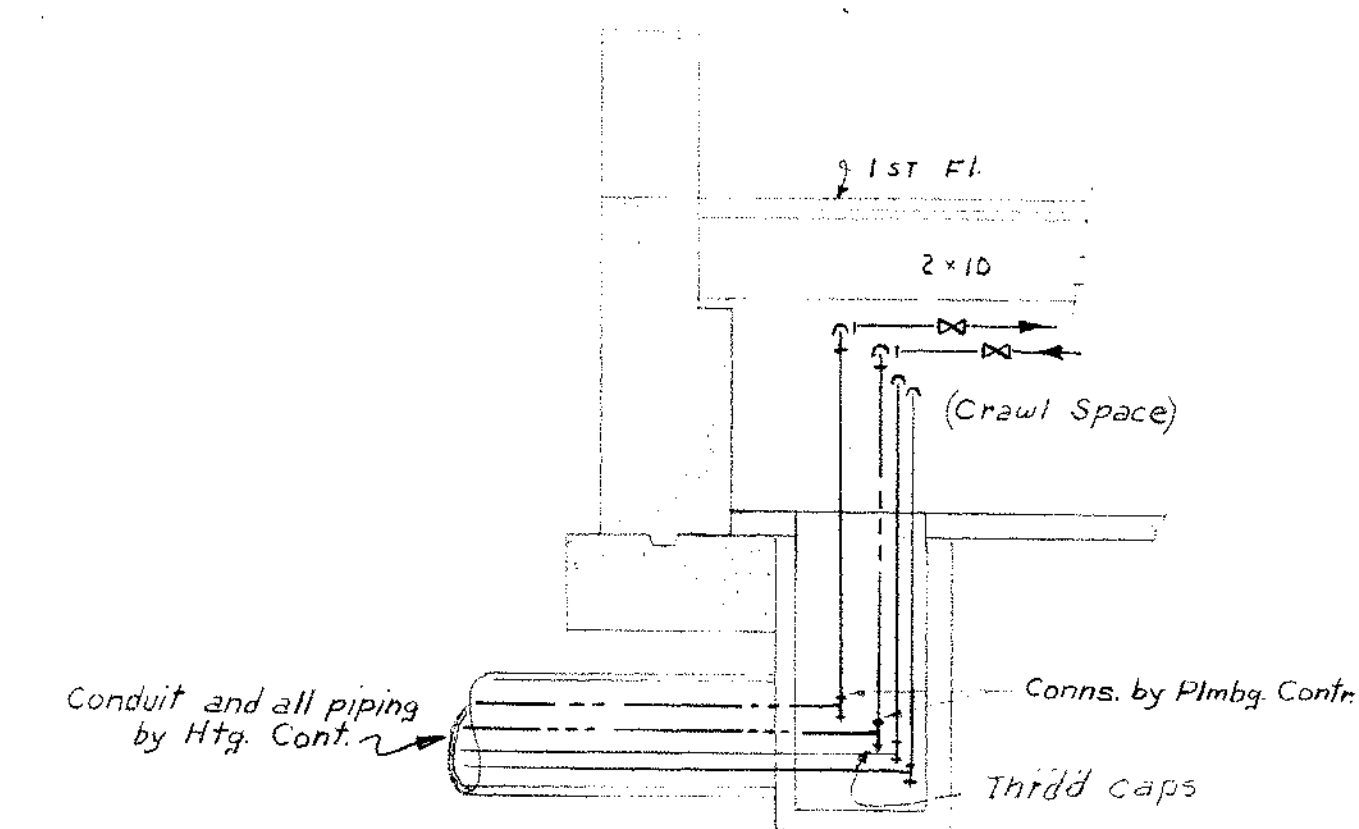
CRAWL SPACE PLAN - BLDG. B-2



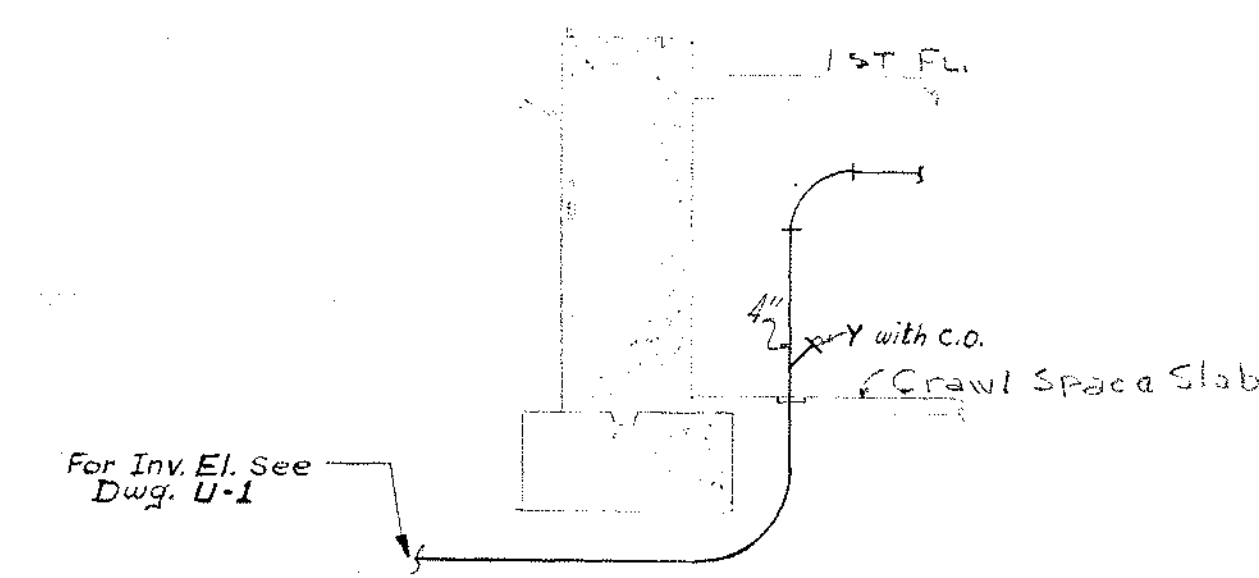
CRAWL SPACE PLAN - BLDG. B-1



DETAIL - ARRGT. AT MAINS



SECTION AT CONDUIT ENTRANCE
SCALE: 1/2" = 1'-0"



TYPICAL SECT HOUSE SEWER

NOTE
See Divg. U-1 For Service Line Sizes to Indiv. Bldgs.

LEGEND (For Other Symbols See P-1)

- Sanitary Sewer
- Cold Water
- Hot Water Supply
- Hot Water Return

Federal Housing Administration
 Division of Housing and Community Development
 Office of Technical Assistance
 Washington, D.C. 20548

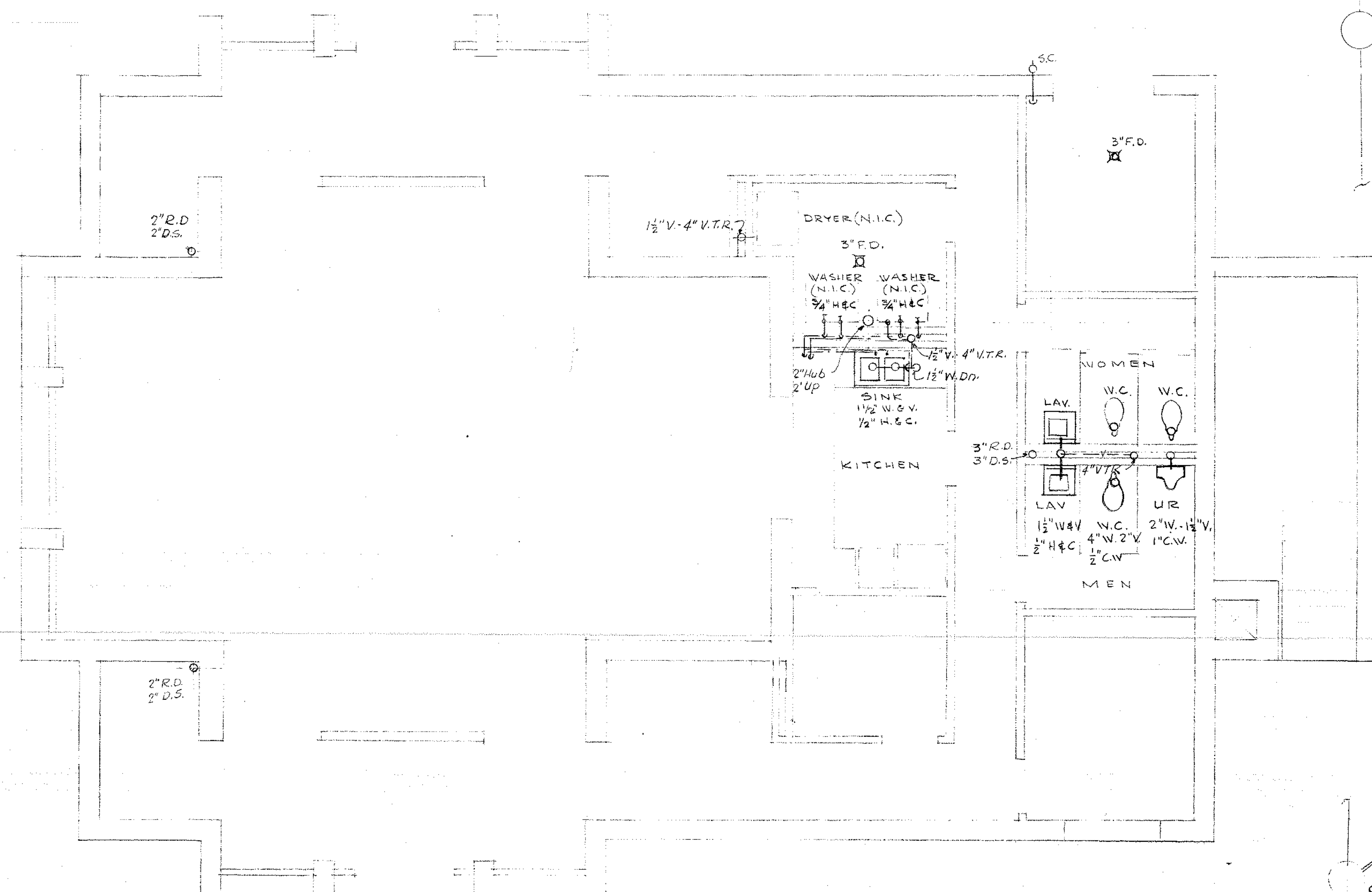
FEDERAL AIDED HOUSING FOR THE ELDERLY
 MASS. PROJECT 363
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.

WM NELSON JACOBSON
 & ASSOCIATES, INC.
 ARCHITECTS - ENGINEERS
 218 STUART STREET
 BOSTON, MASSACHUSETTS

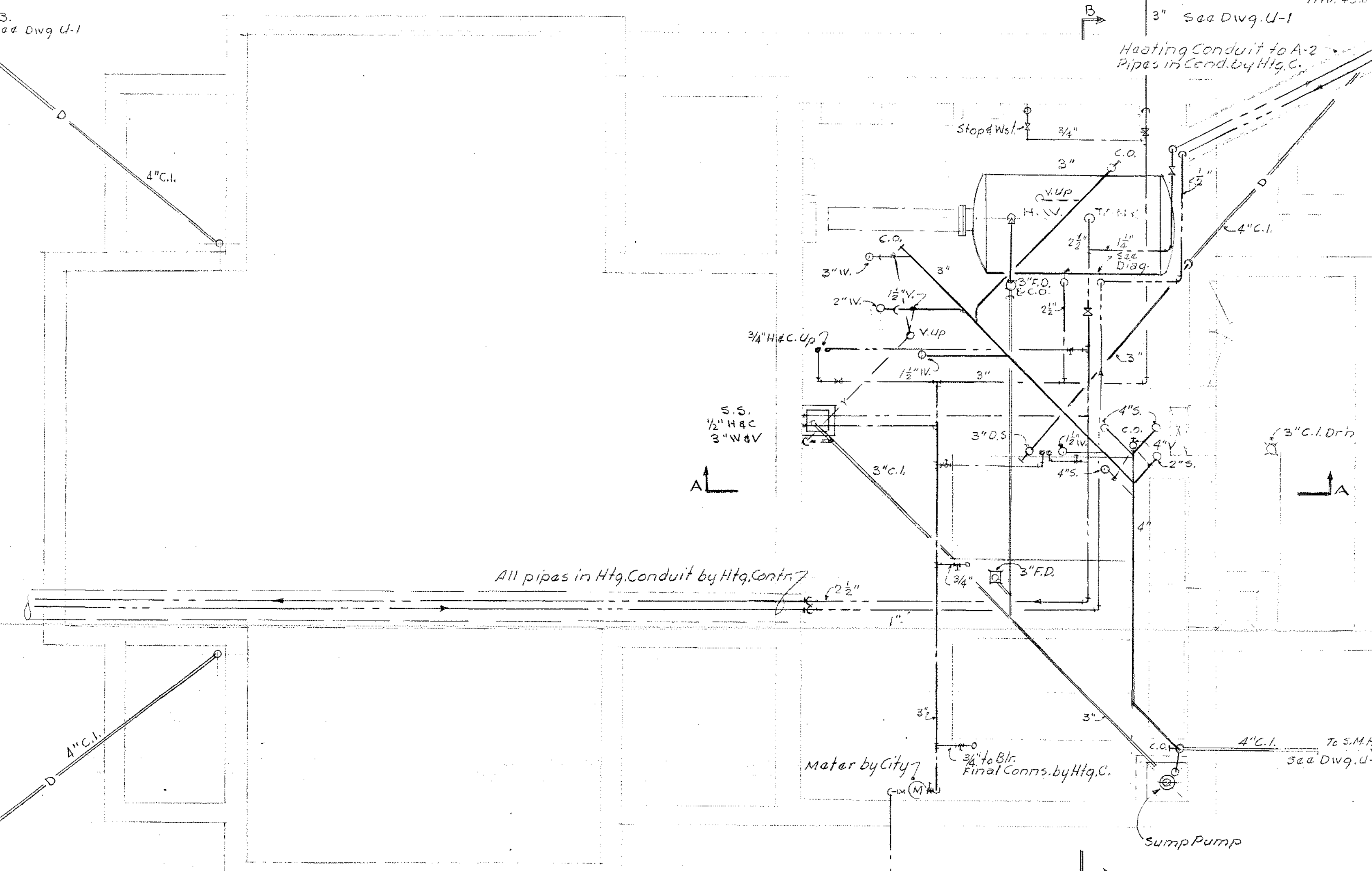
PLUMBING
 CRAWL SPACE PLANS & DETS.

SCALE: 1/8" = 1'-0"
 OCT. 19, 1964

P-2



FIRST FLOOR PLAN



BASEMENT PLAN

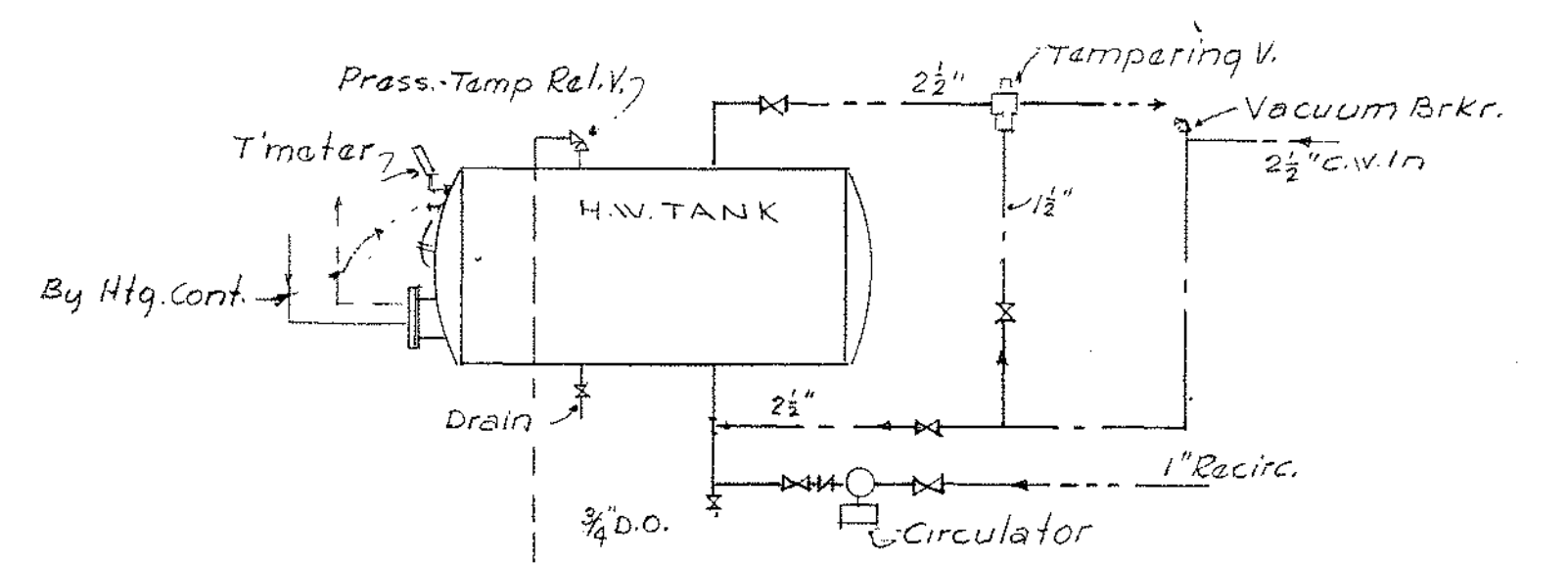
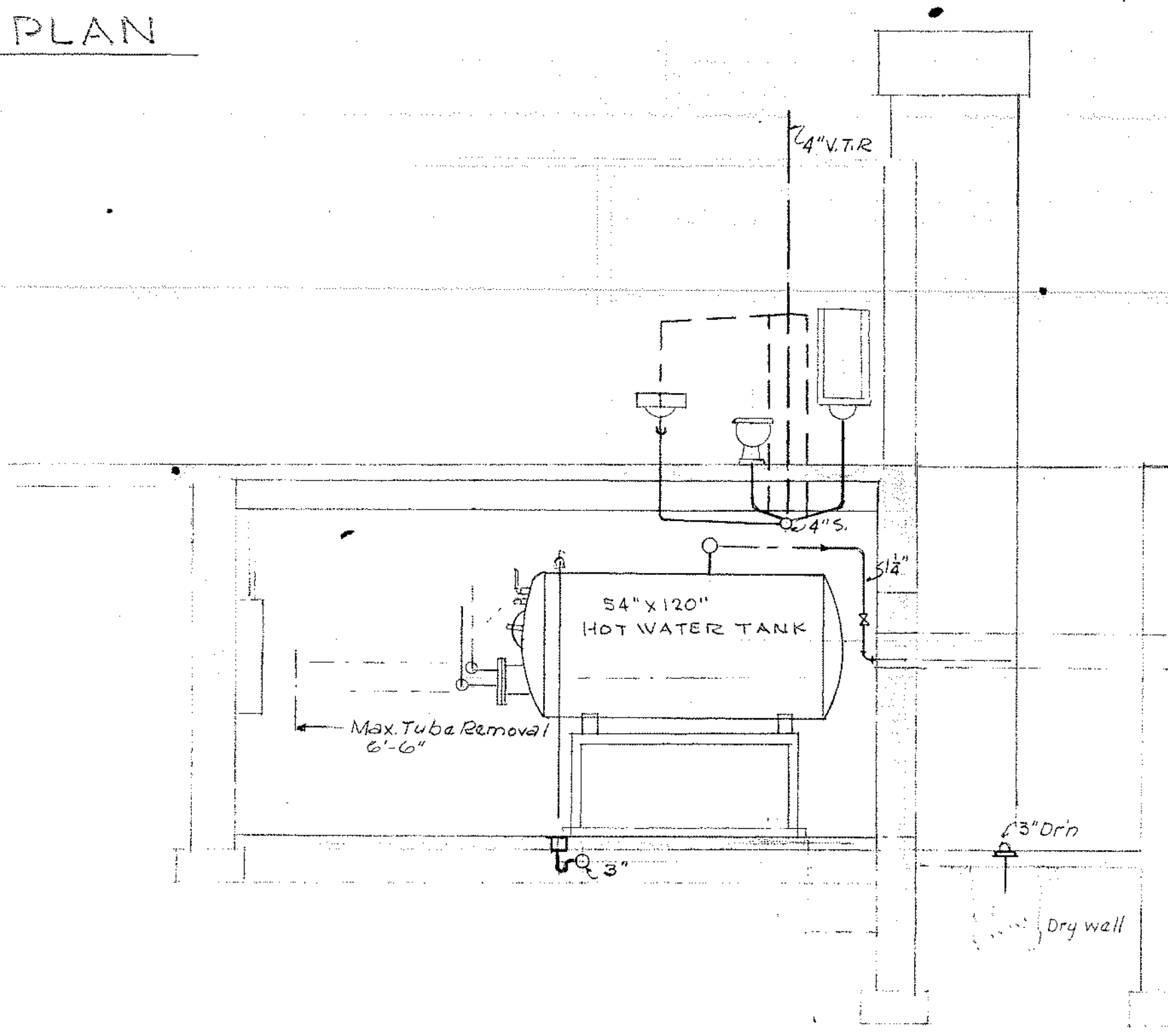
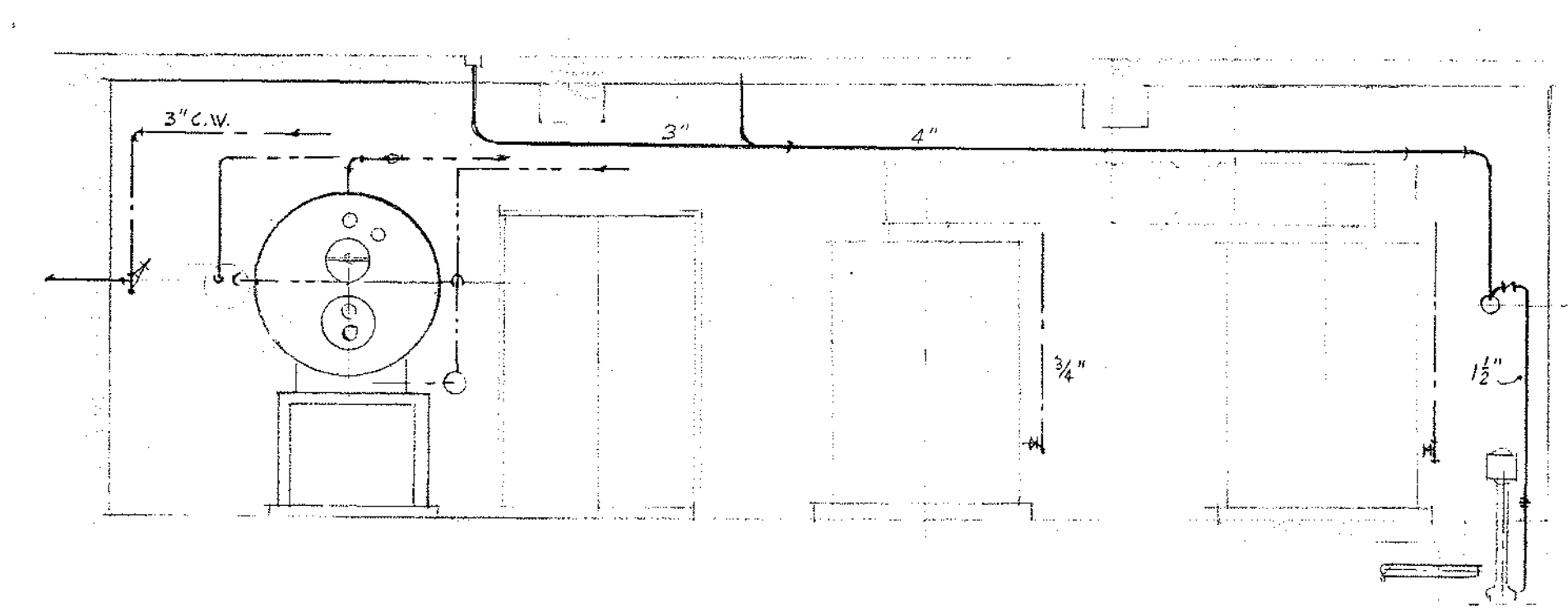


DIAGRAM AT HOT WATER TANK
No Scale



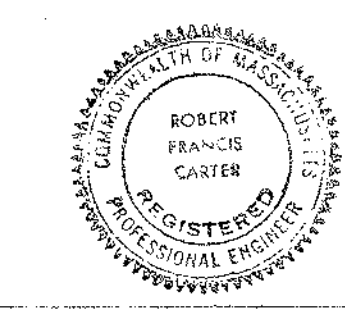
SECTION "A-A"



SECTION "B-B"

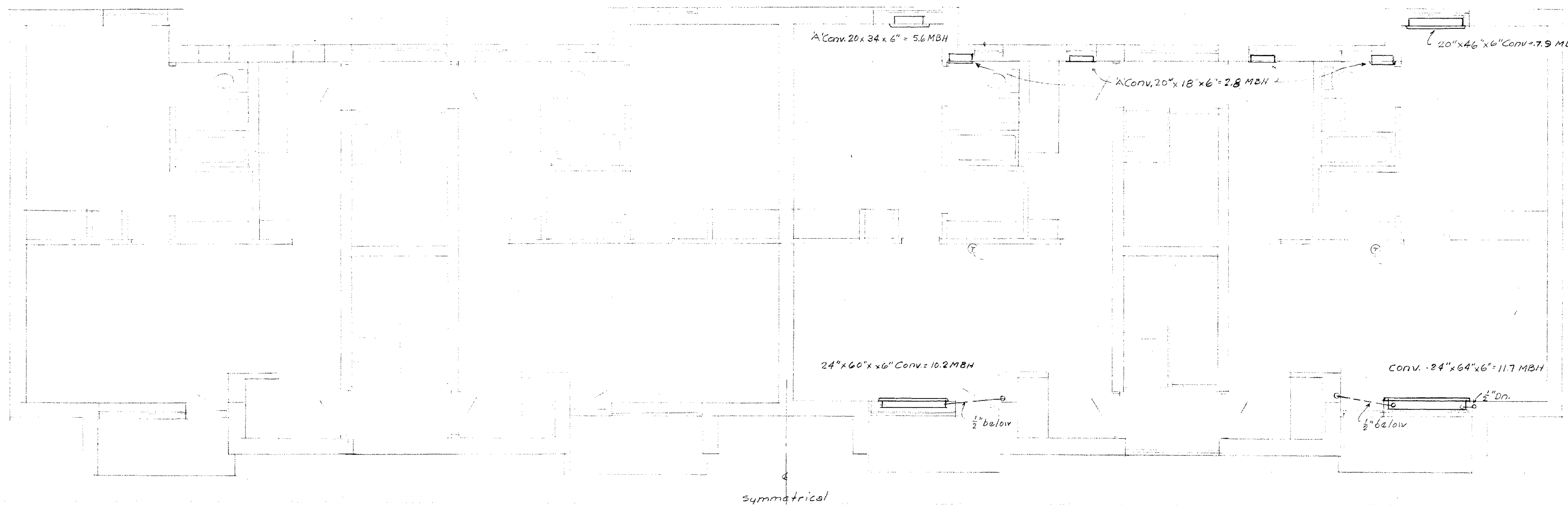
NOTES
For General Notes & Legend see Dwg. P-1

FEDERAL AIDED HOUSING FOR THE ELDERLY
 MASS. PROJECT 36-3
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.
 PLUMBING COMMUNITY BLDG. 'C'
 OCT. 19, 1964

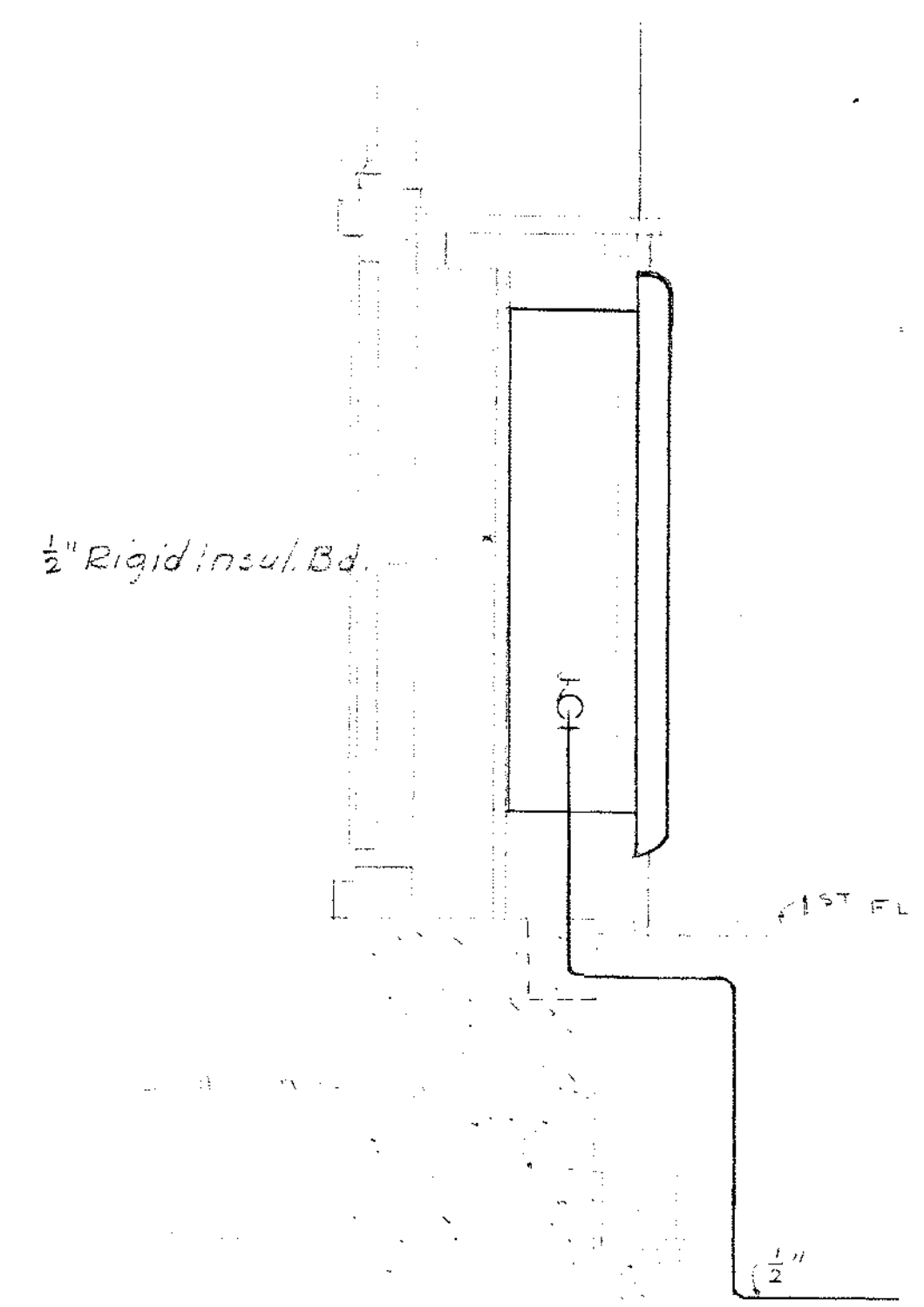


FEDERAL AIDED HOUSING FOR THE ELDERLY
 MASS. PROJECT 36-3
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.
 PLUMBING COMMUNITY BLDG. 'C'

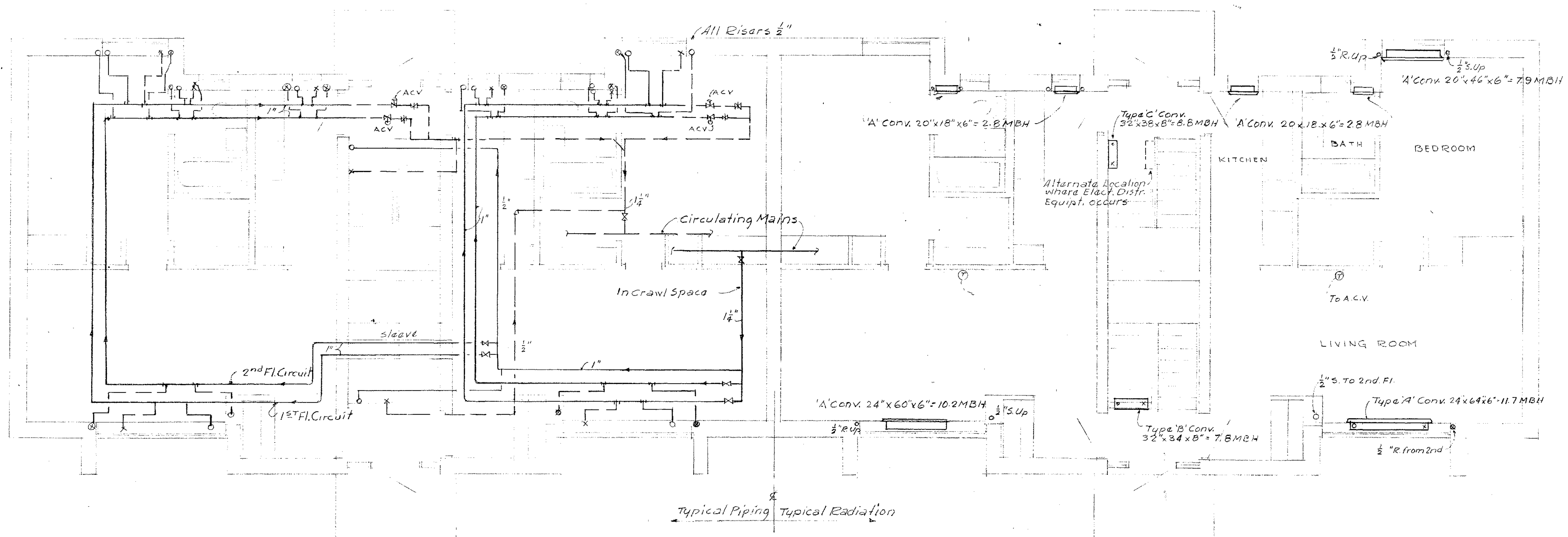
WALTER NELSON JACKSON
 ARCHITECTS AND ENGINEERS
 313 STUART STREET
 BOSTON, MASSACHUSETTS
 SCALE: 1/2" = 1'-0"
 OCT. 19, 1964
P-3



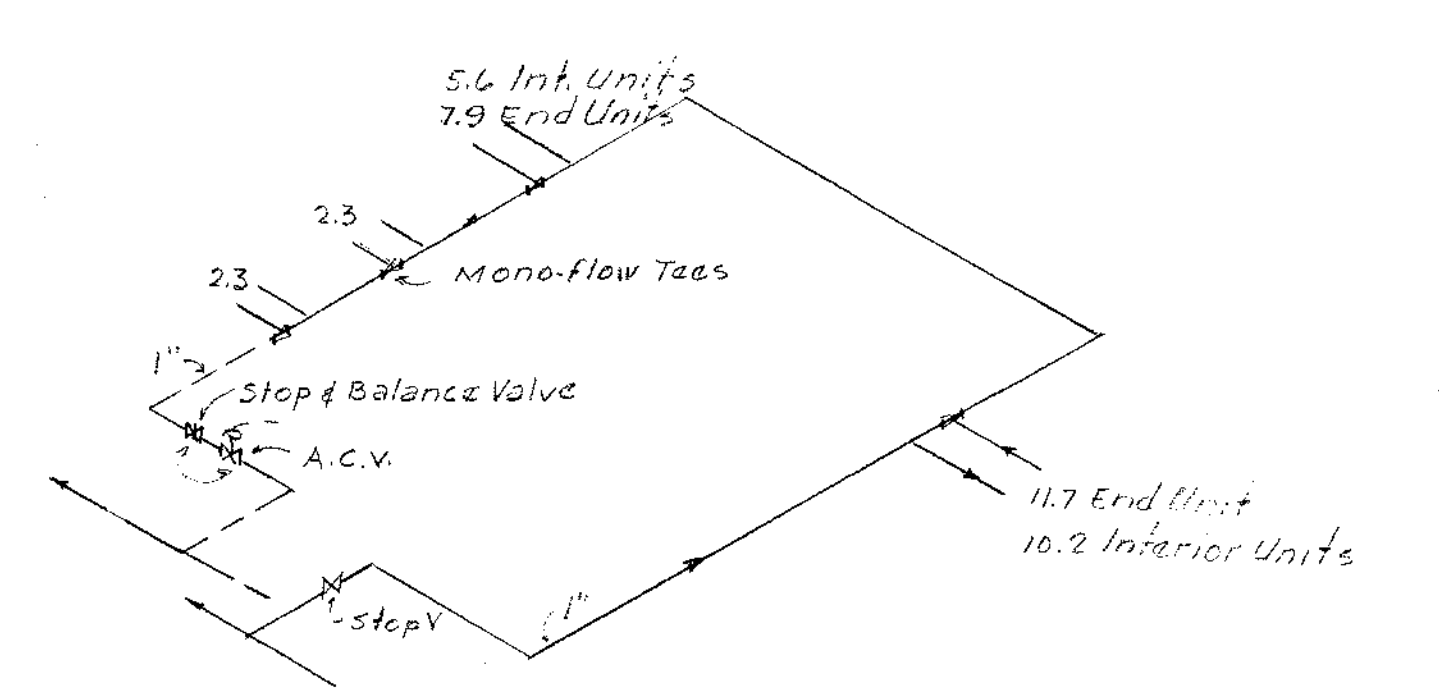
SECOND FLOOR PLAN



SECTION-TYPICAL 'A' CONVECTOR



FIRST FLOOR PLAN



TYPICAL CIRCUIT-EACH UNIT

NOTES
For Crawl Piping for Various Bldgs. see Dwg. H-2

LEGEND

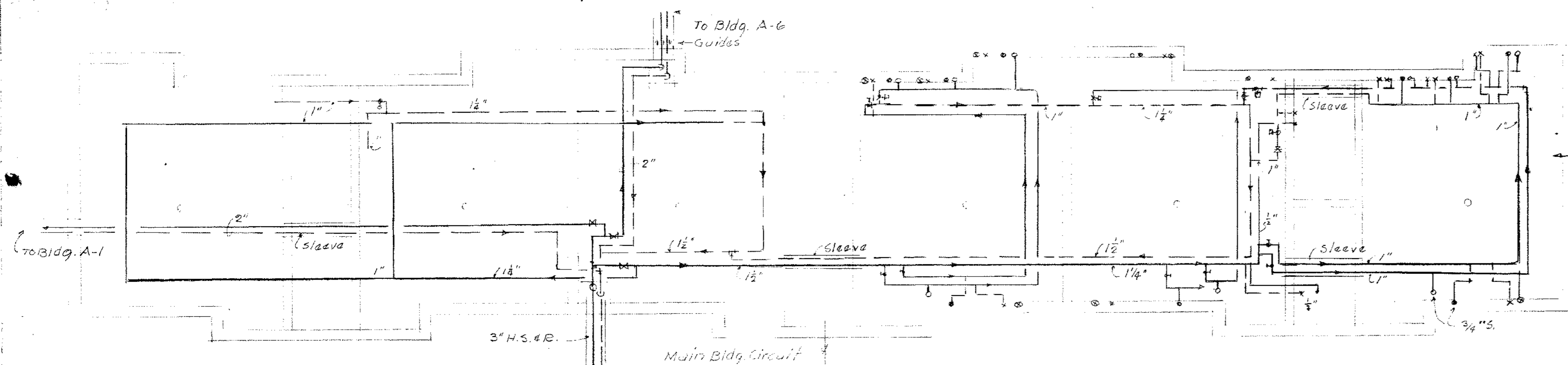
—	Heating Supply
- - -	Heating Return
⊘	Gate Valve
⊘	Check Valve
⊘	Flow-check
⊘	Balancing Cock
⊘	Air Vent
⊘	Pressure Gauge
⊘	Thermostat
⊘	Automatic Control Valve
A.C.V.	Automatic Damper

FEDERAL AIDED HOUSING FOR THE ELDERLY
MASS. PROJECT 36-3
NEWTON HOUSING AUTHORITY
NEWTON, MASS.

W. W. NELSON JACOBY
ASSOCIATES, INC.
ARCHITECTS, ENGINEERS
115 STATE STREET
CAMBRIDGE, MASSACHUSETTS

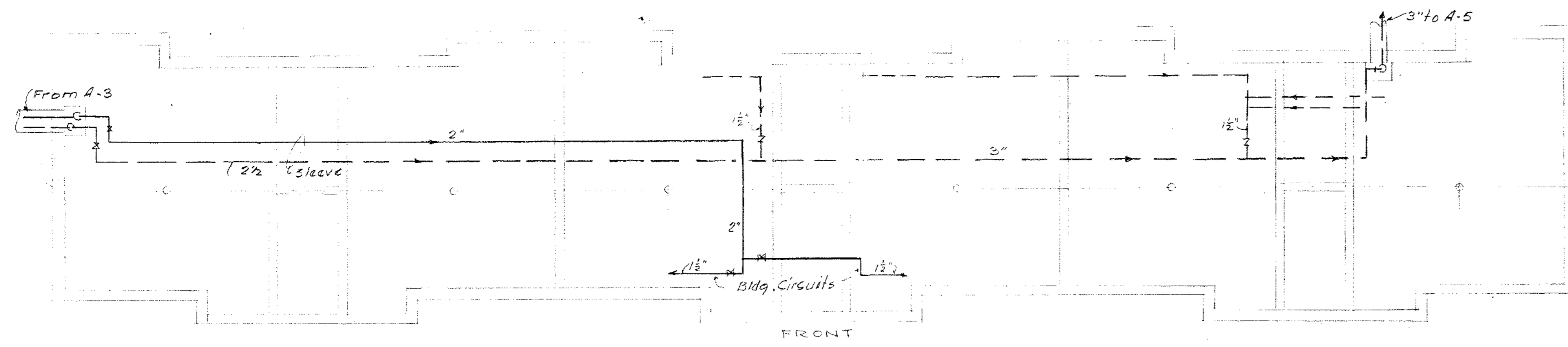
HEATING TYPICAL DWELLING UNIT	SCALE: AS NOTED	H-1
	OCT. 19, 1964	

50-108-03-001
 Project No. 36-3
 Newton Housing Authority
 Newton, Mass.
 10/19/64

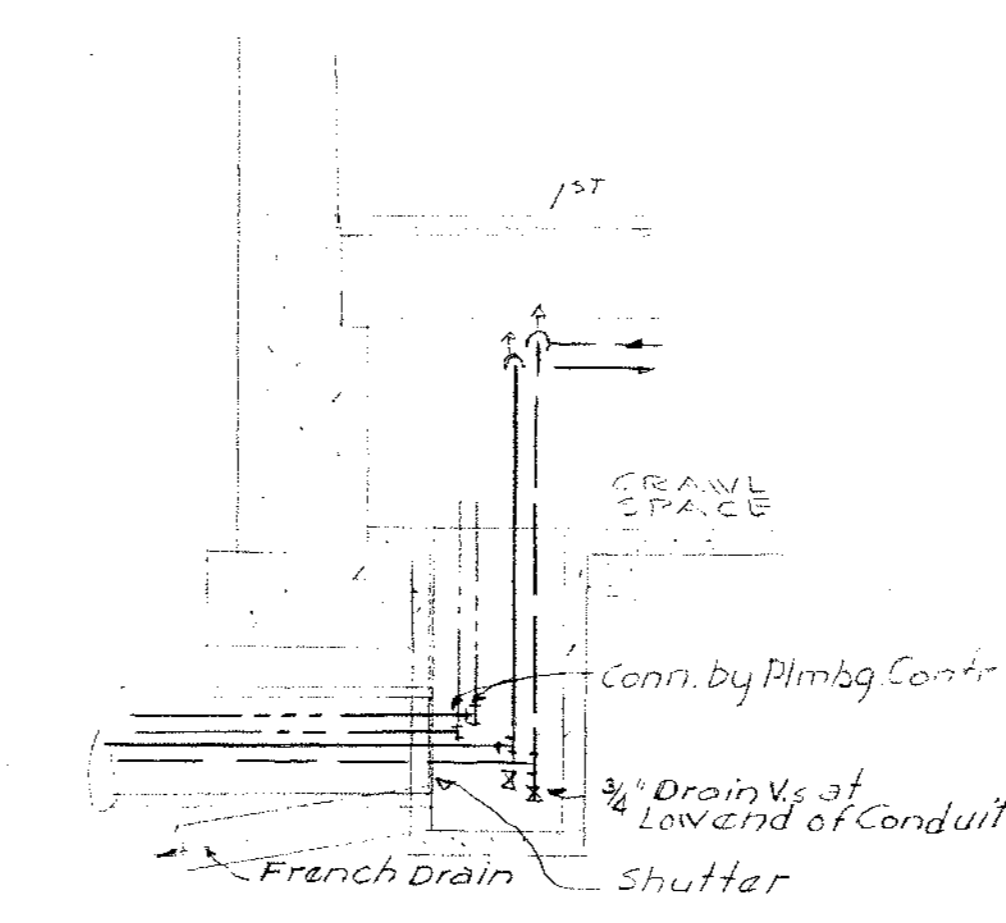


CRAWL SPACE PLAN - BLDG. B-1

SEE DWG. H-1 FOR CLARIFICATION OF TYPICAL BLDG. CIRCUIT PIPING

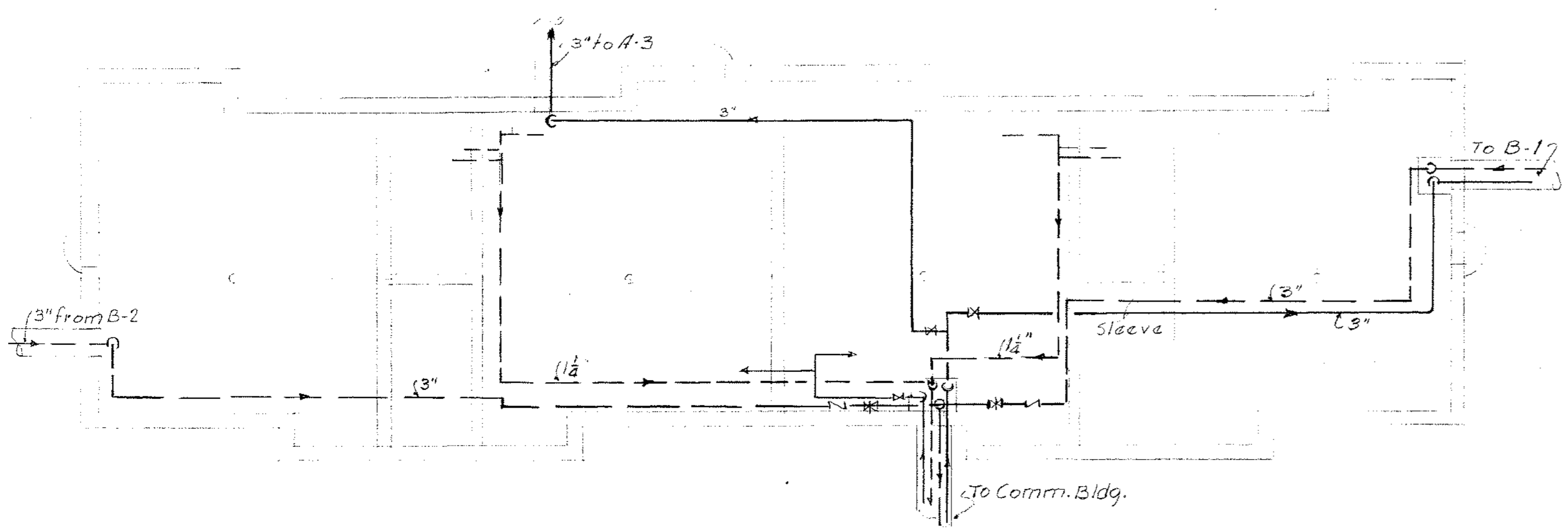


CRAWL SPACE PLAN - BLDG. B-2



SECT. AT CONDUIT ENTRANCE
Scale: 1/2" = 1'-0"

NOTE:
For Dom. Hot Water Lines in Htg. Conduits
see Dwg. U-1 & Dwg. P-2



CRAWL SPACE PLAN - BLDG. A-5

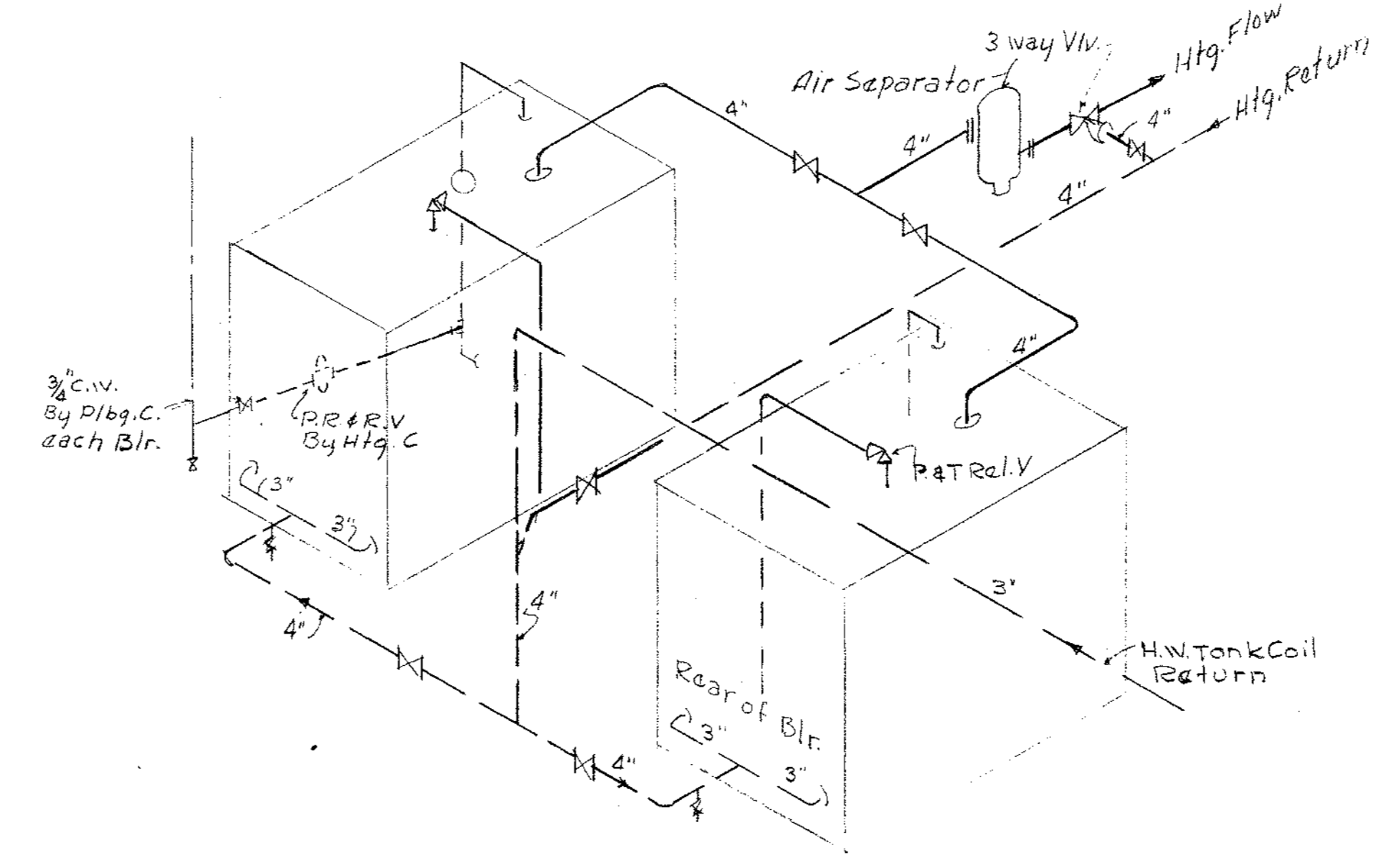


DIAGRAM OF BOILER PIPING CONNS.

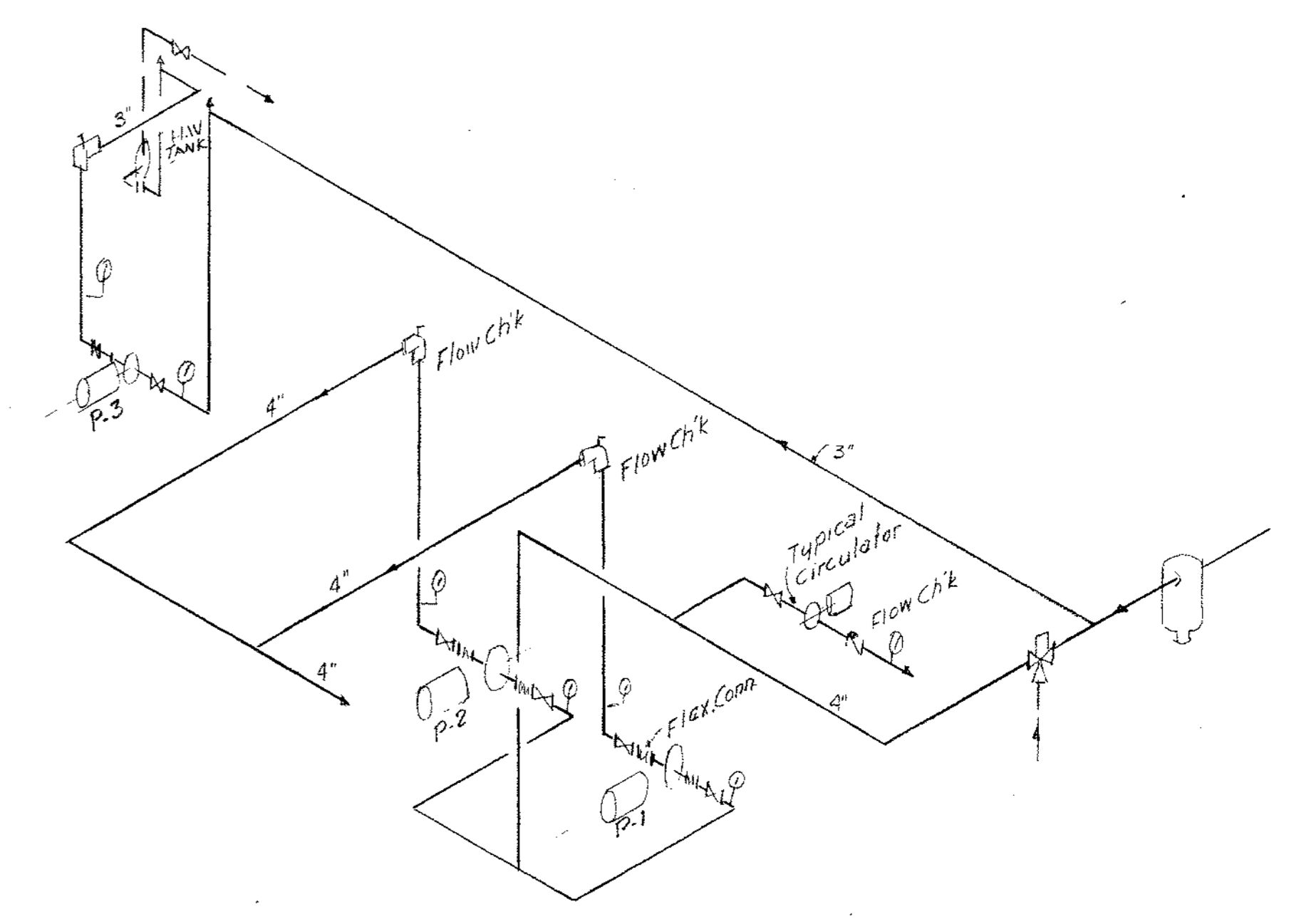
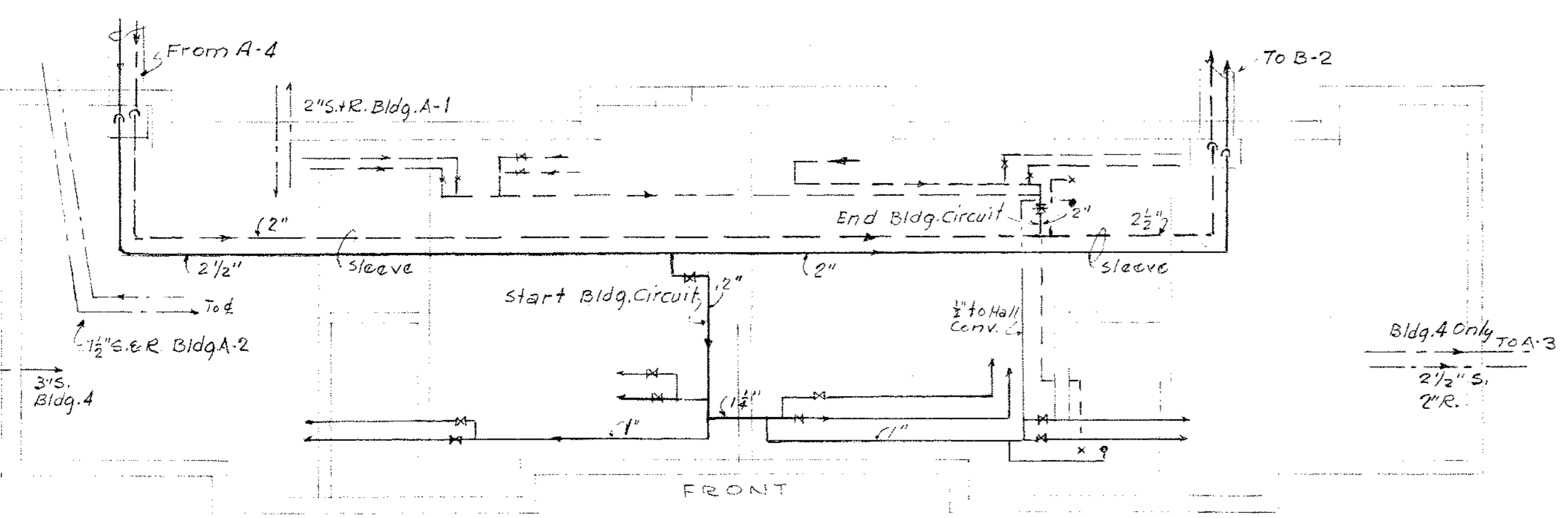


DIAGRAM AT HEATING PUMPS



CRAWL SPACE PLAN - BLDG. A-3

BUILDINGS A-1, A-2 & A-4 SIMILAR EXCEPT AS NOTED

ITEM	SERVICES	NET MBH	LINE LOSS	TOTAL MBH	G.P. CFM	TOTAL HP	HP	E.L.	W.P.T.	NOTE
P-1	MAIN HTG.	1250	150	1400	192	35	5	1340	250	208/8/60
P-2	STANDBY FOR P-1			SAME	RATING					
P-3	DOM. H.W. HEATING	1000		1000	100	6.8	1/2	715	275	120/1/60
P-4	BLDG. A-2	200	10	210	20	3.8	1/2	740	250	208/8/60
P-5	BLDG. A-3	200	10	210	20	3.8	1/2	740	250	208/8/60
P-6	COMM. BLDG.	200		200	20	17	4	800	225	120/1/60

ITEM	MBH	STM STD.	E.A.	L.A.	E.W.	MOTOR
UH-1	24	140	60°	100°	100°	1/2 HP - 120/1/60
UH-2	24	140	60°	100°	100°	1/2 HP - 120/1/60

APPLIC.	MBH	CFM	ENT SIZE	E.W.	AT	MAX. AIR FLOW VEL.	FILTER	ARRGT.	MOTOR
HORIZ.	105	400	1/2"	200°	125°	200 FPM	2-16x16	FLAT	1/2 HP - 120/1/60

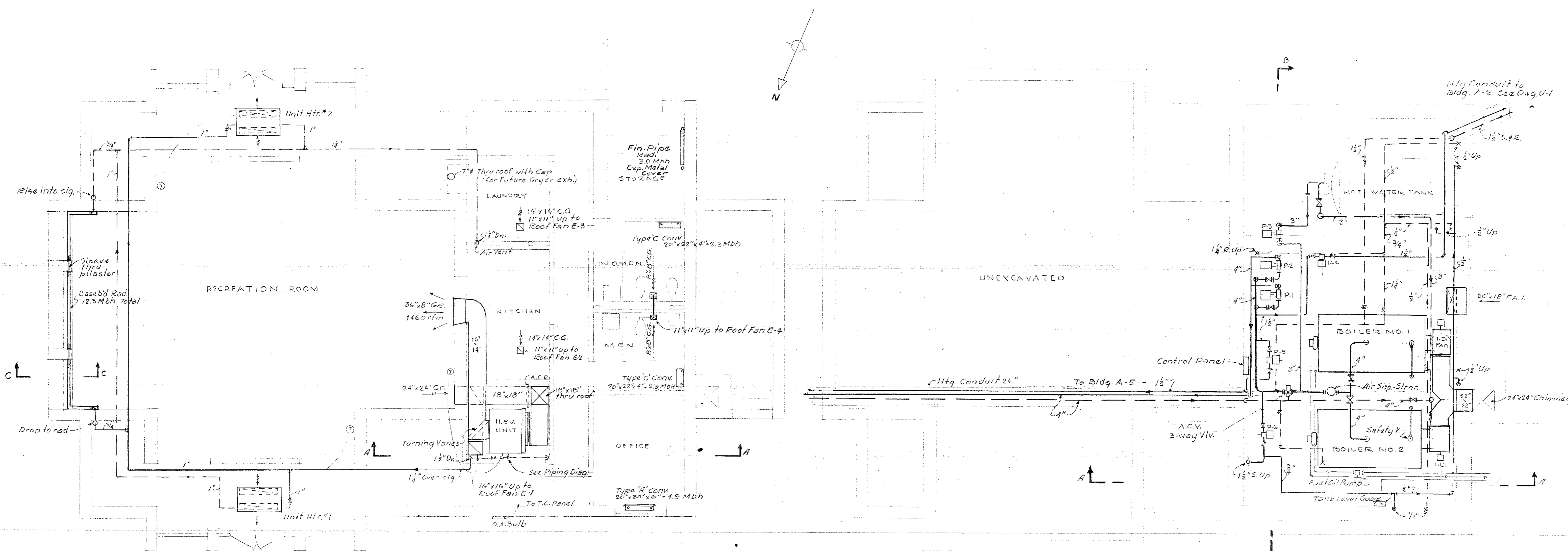
NOTE: TYPICAL SIZE SHALL NOT EXCEED 47" W. X 26" H. X 22 1/2" DEEP

ITEM	CFM	SPR	HP	MOTOR	SWITCH	REMARKS
E-1	1400	1/2"	1140	1/2 HP - 120/1/60	N.R.O. TEMP. CONT.	SOUND CONTROL CURB
E-2	200	1/8"	1730	1/2 HP - 120/1/60	LOCAL W/P.L.	KITCHEN
E-3	200	1/8"	1730	1/2 HP - 120/1/60	LOCAL W/P.L.	LAUNDRY
E-4	200	1/8"	1730	1/2 HP - 120/1/60	NONE	LITEL. SWITCHES TOILETS

NOTES -
For Typical Unit Details see Dwg. H-1
For Legend see Dwg. H-1
For Orientation of Bldgs. see Dwg. U-1

FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.	WM. NELSON JACOBS ASSOCIATES, INC. ARCHITECTS - ENGINEERS 518 STUART STREET BOSTON, MASSACHUSETTS
HEATING CRAWL SPACE PIPING	SCALE: AS NOTED OCT. 19, 1964

H-2



FIRST FLOOR PLAN

BASEMENT PLAN

SECTION 'C-C'

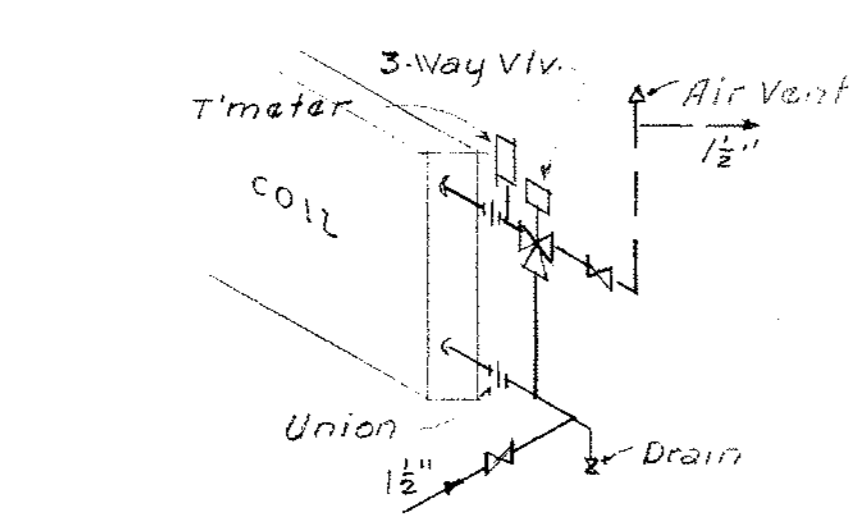
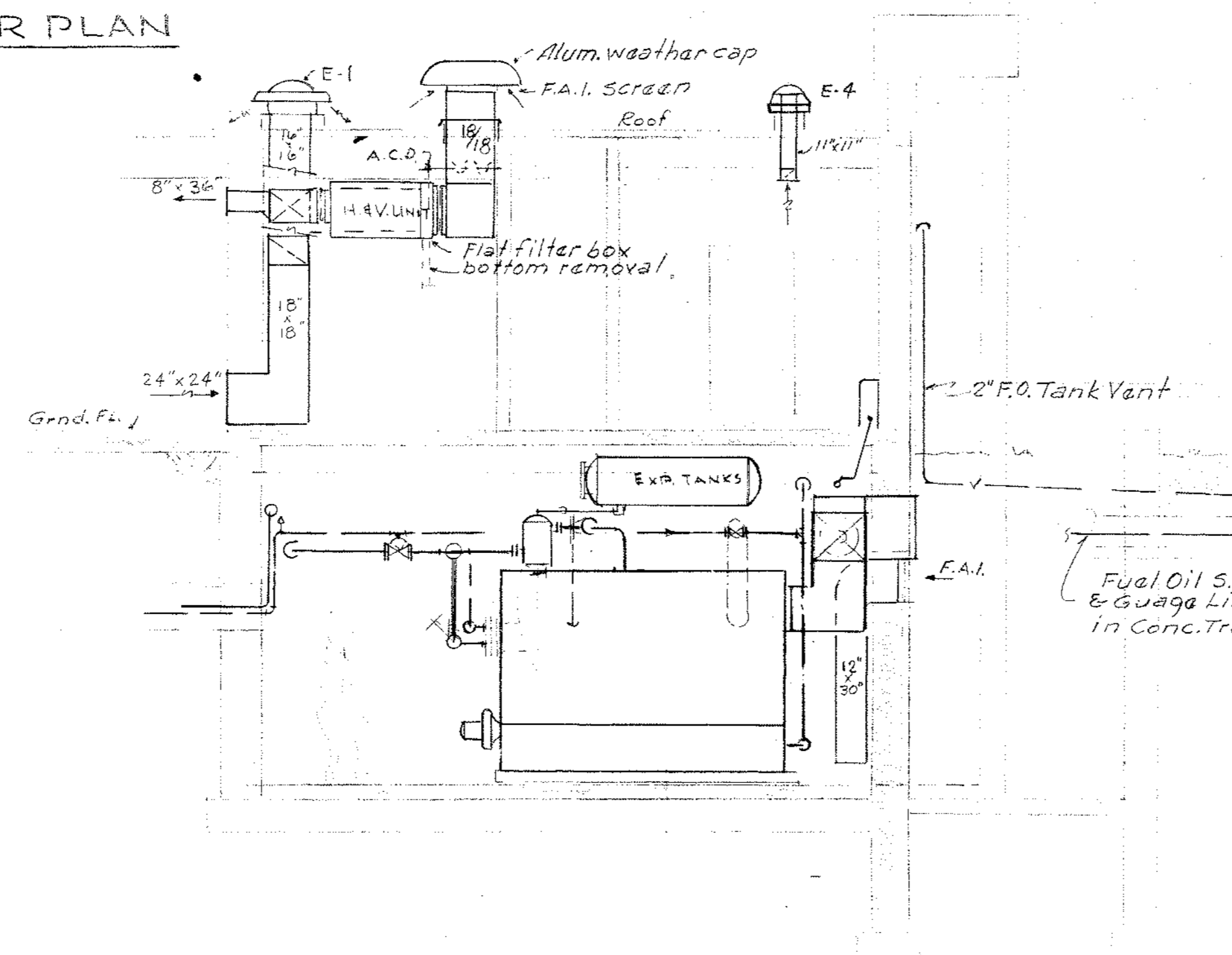
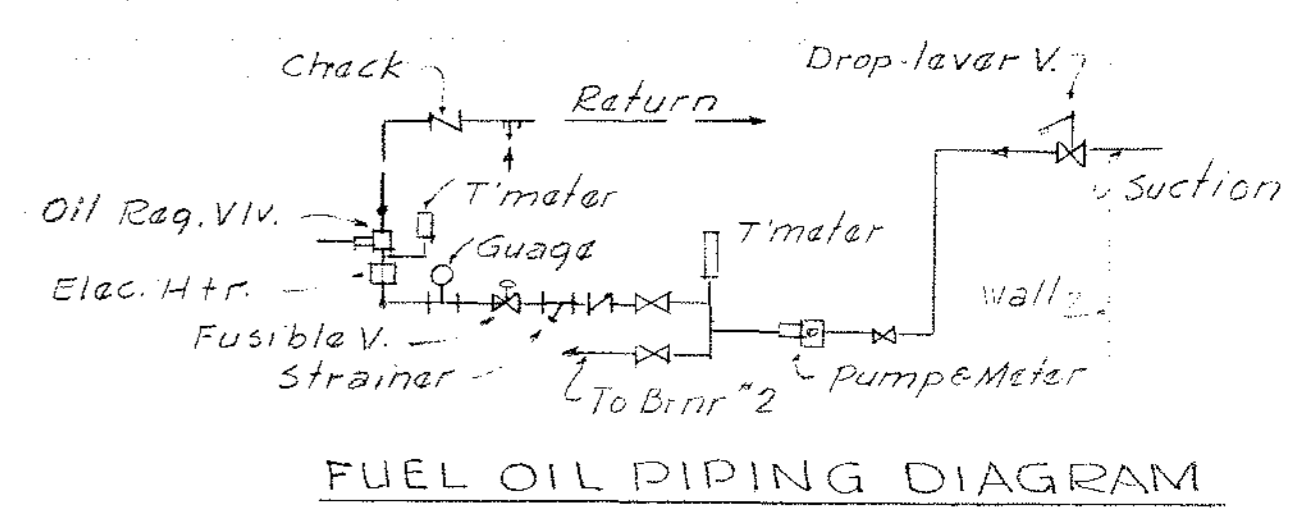
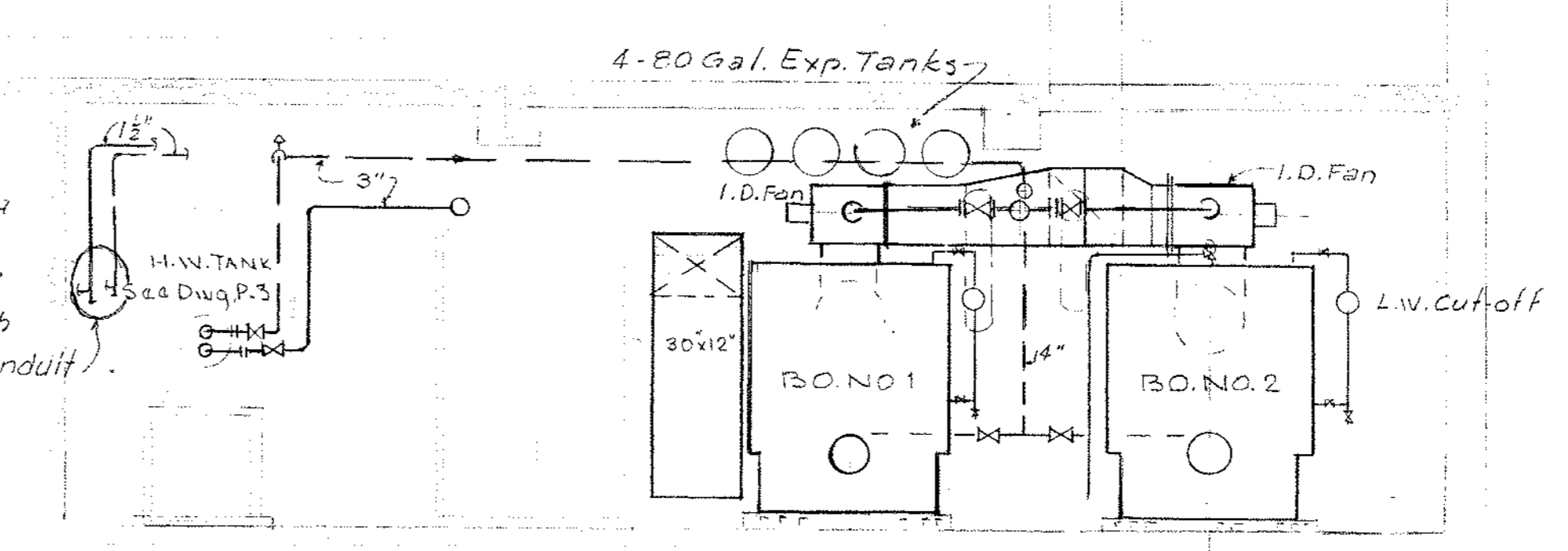


DIAGRAM AT H & V UNIT

SECTION 'A-A'



SECTION 'B-B'



FUEL OIL PIPING DIAGRAM

NOTES:-
 For General Notes & Legend see Dwg. H-1
 For Schedules of Equipment see Dwg. H-3
 For Boiler & Pump Piping Diagrams and Details see Dwg. H-2

FEDERAL AIDED HOUSING FOR THE ELDERLY MASS. PROJECT 36-3 NEWTON HOUSING AUTHORITY NEWTON, MASS.	
HEATING COMM. BLDG. & BO. RM.	SCALE: 1/4" = 1'-0" OCT. 19, 1964
H-3	

PANEL "BSP1" SCHEDULE (TYPICAL FOR ALL BUILDINGS)
 150 AMP MAINS, 120/208V, 3Ø, 4WIRE, SURFACE TRIM, MAIN LUGS
 4-70A, 2P CIRCUIT BREAKER (APT. LOADCENTER PROTECTION)

PANEL SHALL BE GENERAL ELECTRIC, TYPE TFB3, WESTINGHOUSE
 ITE, OR EQUAL

PANEL "BSP2" SCHEDULE (TYPICAL FOR BUILDINGS A-1, A-2, A-3, A-5, A-6, B-2)
 225 AMP MAINS, 120/208V, 3Ø, 4WIRE, SURFACE TRIM, MAIN LUGS
 4-70A, 2P CIRCUIT BREAKERS (APT. LOADCENTER PROTECTION)
 1-125A, 3P CIRCUIT BREAKER (PANEL "BSP1" PROTECTION)
 1-50A, 2P CIRCUIT BREAKER (PANEL "BP" PROTECTION)

* BUILDING "A-5" SHALL HAVE A 175 AMP, 3P MAIN BREAKER.
 1. BUILDING "B-2" PANEL "BSP2" SHALL BE SIMILAR TO ABOVE EXCEPT
 SHALL HAVE 1- ADDITIONAL 125A, 3P CIRCUIT BREAKER (FOR EXTRA "BSP1")
 AND A 225 AMP MAIN BREAKER.
 2. PANELS SHALL BE GENERAL ELECTRIC, TYPE NLAB, WESTINGHOUSE,
 ITE, OR EQUAL

PANEL "BSP3" SCHEDULE (TYPICAL FOR BUILDINGS A-4, B-1)
 400 AMP MAINS, 120/208V, 3Ø, 4WIRE, SURFACE TRIM, MAIN BREAKER,
 4-70A, 2P CIRCUIT BREAKERS (APT. LOADCENTER PROTECTION)
 1-125A, 3P CIRCUIT BREAKER (PANEL "BSP1" PROTECTION)
 1-175A, 3P CIRCUIT BREAKER (PANEL "BP" PROTECTION)
 1-175A, 3P CIRCUIT BREAKER (ADJACENT BUILDING PROTECTION)

1. BUILDING "A-4" MAIN BREAKER SHALL BE 250A, 3P
 2. BUILDING "B-1" PANEL "BSP3" SHALL ALSO CONTAIN ONE ADDITIONAL
 125A, 3P (FOR EXTRA "BSP1"), 175A, 3P (FOR EXTRA ADJACENT BUILDING) AND
 A 350 AMP 3POLE MAIN BREAKER.
 3. PANEL SHALL BE GENERAL ELECTRIC, TYPE NLAB, WESTINGHOUSE
 ITE, OR EQUAL

PANEL "BP" SCHEDULE (TYPICAL FOR ALL BUILDINGS)
 70 AMP MAINS, 120/208V, 1Ø, 3WIRE, SURFACE TRIM, MAIN LUGS,
 12-20A, 1P CIRCUIT BREAKERS (PUBLIC AREA LIGHTING & POWER CIRCUITS)

PANEL SHALL BE GENERAL ELECTRIC, TYPE TFB3, WESTINGHOUSE,
 ITE, OR EQUAL

FROM	TO	SIZE	REMARKS
PANELS "BSP3"	PANELS "BSP1"	2" CONDUIT, 4" x 2"	BLDG'S A-4 & B-1
PANELS "BSP2"	PANELS "BSP1"	2" CONDUIT, 4" x 2"	BLDG'S A-1, 2, 3, 5, 6, B-2
BLDG "B-1"	BLDG "A-1"	2" FIBER, 4" x 2"	
BLDG "B-1"	BLDG "A-6"	2" FIBER, 4" x 2"	
BLDG "A-4"	BLDG "A-3"	2" FIBER, 4" x 2"	
MDP-CIR. "1"	BLDG "A-2"	2" FIBER, 4" x 2"	
MDP-CIR. "2"	BLDG "B-1"	3" FIBER, 4" x 2" x 100MCM	
MDP-CIR. "3"	BLDG'S A-5 (A-4)	3" FIBER, 4" x 2" x 100MCM	
MDP-CIR. "4"	BLDG "B-2"	3" FIBER, 4" x 2"	
TRANSFORMER PAD	PANEL "UDP"	2" x 4" x 500 MCM 1" x 4" SPARE	
PANELS "BSP1, BSP2, BSP3"	APT. LOADCENTERS	3" CONDUIT, 4" x 2"	TO EACH APT.

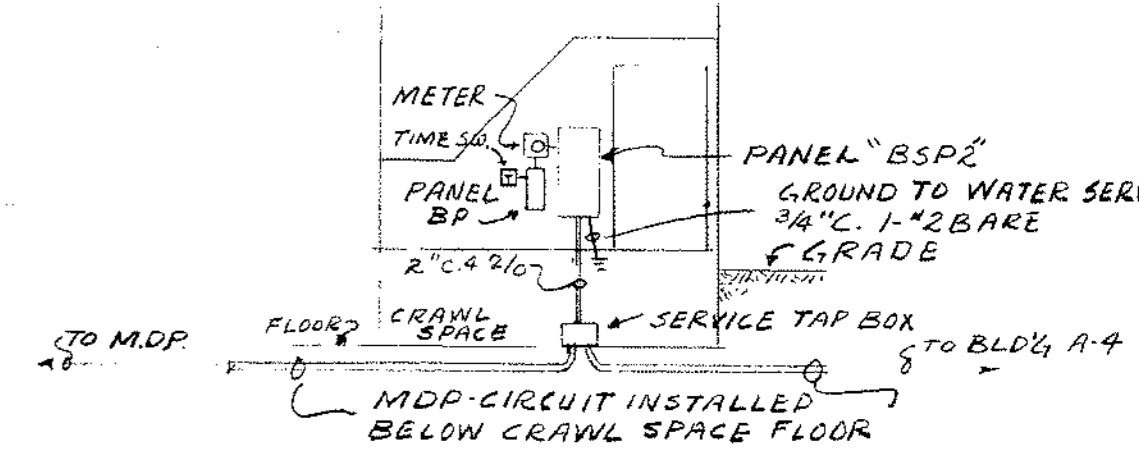
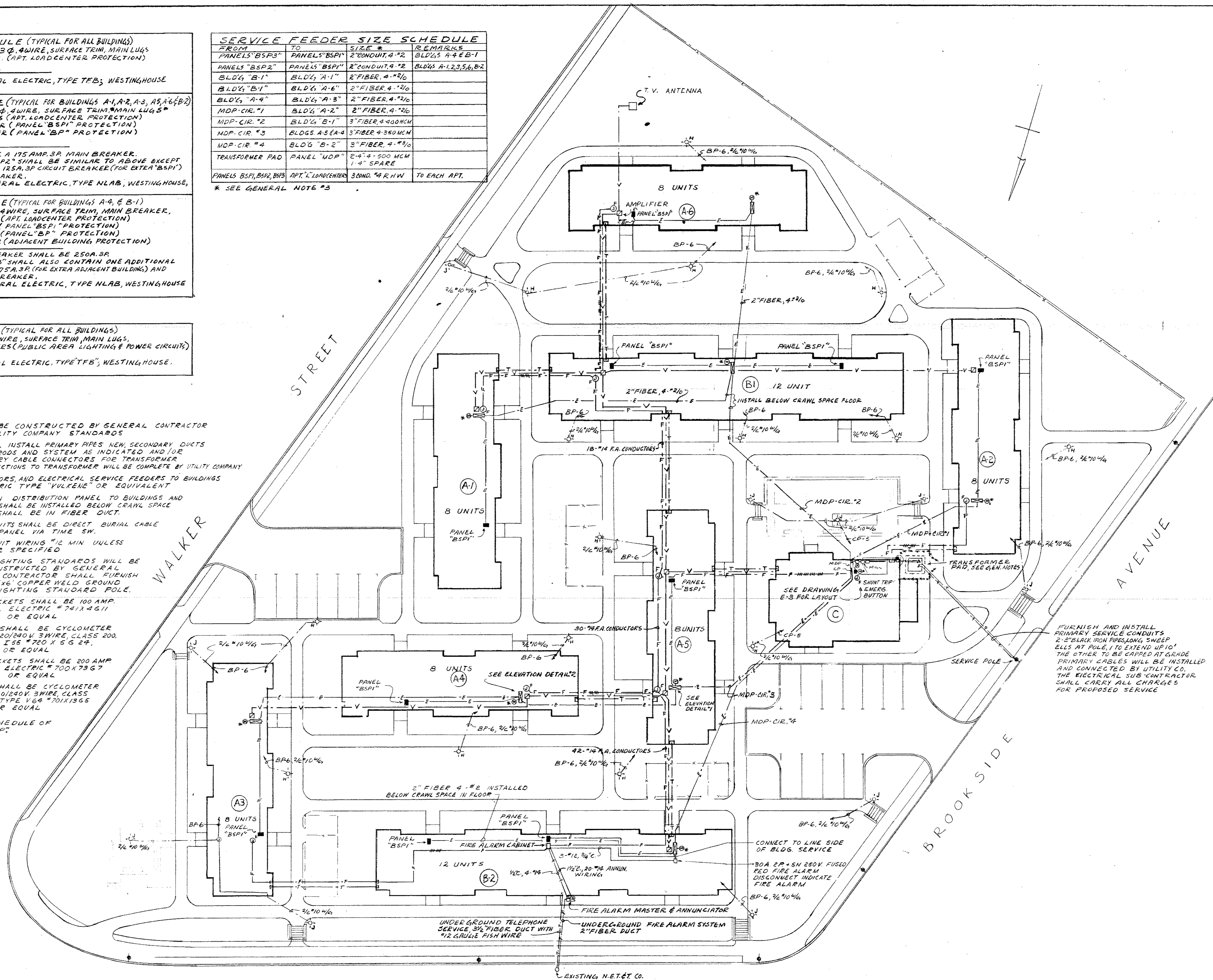
* SEE GENERAL NOTE #3

GENERAL NOTES

1. TRANSFORMER PAD WILL BE CONSTRUCTED BY GENERAL CONTRACTOR IN ACCORDANCE WITH UTILITY COMPANY STANDARDS
2. ELECTRIC CONTRACTOR SHALL INSTALL PRIMARY PIPES NEW, SECONDARY DUCTS AND CABLES AND GROUND RODS AND SYSTEM AS INDICATED AND/OR REQUIRED. PROVIDE SECONDARY CABLE CONDUCTORS FOR TRANSFORMER CONNECTIONS. SECONDARY CONNECTIONS TO TRANSFORMER WILL BE COMPLETE BY UTILITY COMPANY
3. SECONDARY SERVICE CONDUCTORS AND ELECTRICAL SERVICE FEEDERS TO BUILDINGS SHALL BE GENERAL ELECTRIC TYPE "VULKENE" OR EQUIVALENT
4. SERVICE FEEDER FROM MAIN DISTRIBUTION PANEL TO BUILDINGS AND FROM BUILDING TO BUILDING SHALL BE INSTALLED BELOW CRAWL SPACE FLOOR. SERVICE FEEDERS SHALL BE IN FIBER DUCT.
5. EXTERIOR LIGHTING CIRCUITS SHALL BE DIRECT BURIAL CABLE INSTALLED TO INDICATED PANEL VIA TIME SW.
6. PANEL "BP" BRANCH CIRCUIT WIRING "12 MIN UNLESS OTHERWISE INDICATED OR SPECIFIED
7. CONCRETE BASES FOR LIGHTING STANDARDS WILL BE 24" DIA x 36" LONG AND CONSTRUCTED BY GENERAL CONTRACTOR. ELECTRICAL CONTRACTOR SHALL FURNISH INSTALL AND CONNECT 1/2" x 6" COPPER WELD GROUND ROD AND CONNECT TO LIGHTING STANDARD POLE.
8. SINGLE PHASE METER SOCKETS SHALL BE 100 AMP, 120/240V, 3 WIRE GENERAL ELECTRIC "741X4611 WESTINGHOUSE, SANGAMO OR EQUAL
9. SINGLE PHASE METERS SHALL BE CYCLOMETER TYPE REGISTER, 5 DIAL, 120/240V, 3 WIRE, CLASS 200, GENERAL ELECTRIC TYPE I 55 "720 X 5 6 24", WESTINGHOUSE, SANGAMO OR EQUAL
10. THREE PHASE METER SOCKETS SHALL BE 200 AMP, 120/240V, 3 WIRE GENERAL ELECTRIC "700X79G7 WESTINGHOUSE, SANGAMO OR EQUAL
11. THREE PHASE METERS SHALL BE CYCLOMETER TYPE REGISTER, 5 DIAL, 120/240V, 3 WIRE, CLASS 200, GENERAL ELECTRIC TYPE V 64 "701X1365 WESTINGHOUSE, SANGAMO OR EQUAL
12. SEE DRAWING E-3 FOR SCHEDULE OF PANELS "MDP", "CBP", & "CF"

SITE LEGEND

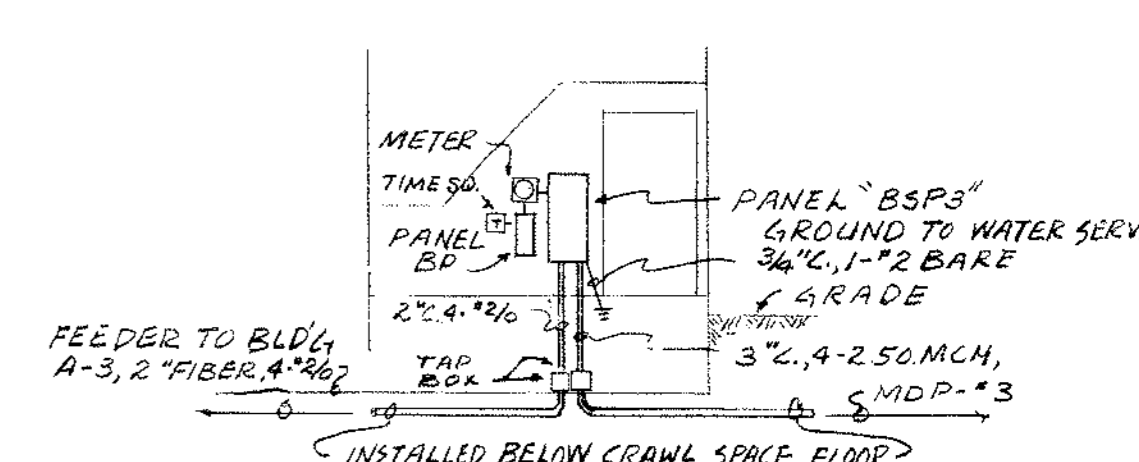
- T— EXISTING UTILITY POLE
- V— TELEPHONE SERVICE UNDERGROUND, 2" FIBER UNLESS OTHERWISE
- V— TELEVISION SYSTEM CONDUIT EXPOSED IN CRAWL SPACE
- V— TELEVISION SYSTEM UNDERGROUND, 2" FIBER DUCT
- F— FIRE ALARM SYSTEM CONDUIT EXPOSED IN CRAWL SPACE
- F— FIRE ALARM SYSTEM UNDERGROUND, FIBER DUCT SIZE AS REQUIRED
- P— PROJECT LIGHTING STANDARD
- F— FIRE ALARM SYSTEM JUNCTION BOX
- S— TELEVISION SYSTEM LINE SPLITTER
- E— INDICATES BUSHED END
- E— ELECTRIC SERVICE UNDERGROUND
- S— SECONDARY SERVICE UNDERGROUND-ELECTRIC
- P— PRIMARY SERVICE GALVANIZED CONDUIT UNDERGROUND
- E— ELECTRICAL DISTRIBUTION EQUIPMENT, SEE DETAILS AND NOTES
- S— SERVICE METER BY UTILITY COMPANY
- E— BUILDING PUBLIC AREA POWER CHECK METER SEE GEN. NOTE "BSP3"
- E— ELECTRIC SUB-FEEDER WITHIN BUILDING, IN CRAWL SPACE, 4" x 2"
- E— 2" x 2" INDICATES TWO CONDUCTOR, NUMBER TEN GAUGE, WITH GROUND WIRE



ELEVATION DETAIL #1
BUILDING A-5 SERVICE
 NOTE TO SCALE

1. BUILDINGS A-1, A-2, A-3 & A-4 SIMILAR EXCEPT SERVICE FEEDER WILL TERMINATE AT SERVICE TAP BOX AND INDICATED SERVICE TAP CONNECTED. GROUND SHALL BE 1/2" x 4" BARE 1/2" x 4" BARE 1/2" x 4" BARE, INTERMEDIATE OR EQUAL

2. BUILDING B-2 SIMILAR IN ARRANGEMENT EXCEPT SERVICE FEEDER TO TERMINATE AS IN NOTE 1 ABOVE AND PANEL "BSP2" WILL HAVE ADDITIONAL BREAKER, SEE SCHEDULE.



ELEVATION DETAIL #2
BUILDING A-4 SERVICE
 NOTE TO SCALE

1. BUILDING "B-1" SIMILAR IN ARRANGEMENT EXCEPT ONE ADDITIONAL FEEDER AND TAP BOX AND ONE ADDITIONAL CIRCUIT BREAKER IN PANEL "BSP3", SEE SCHEDULE.

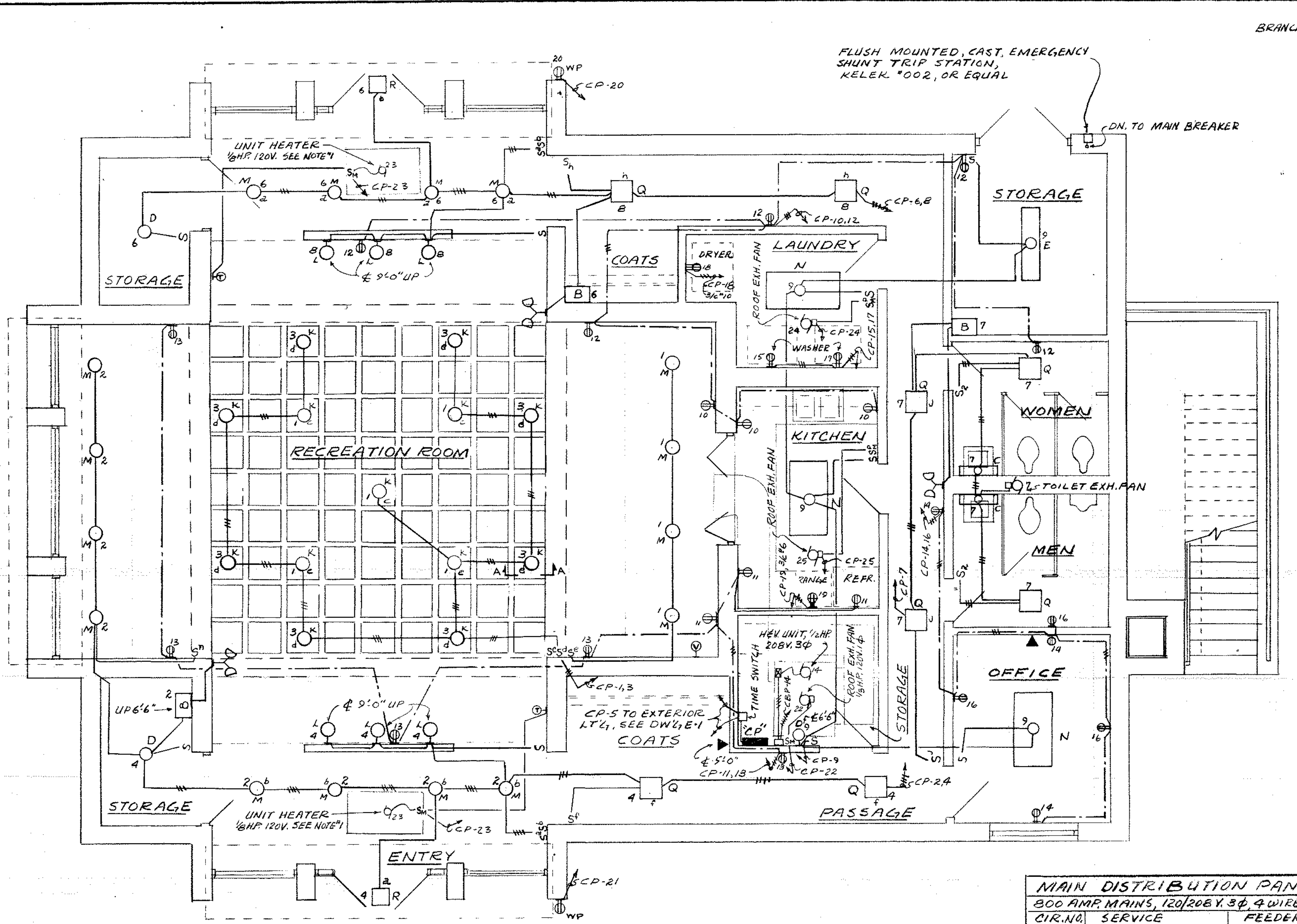
WATERTOWN STREET

SITE PLAN
 SCALE: 1" = 20'-0"

HOUSING FOR THE ELDERLY
 MASS. PROJECT 36-3
 NEWTON HOUSING AUTHORITY
 NEWTON, MASS.

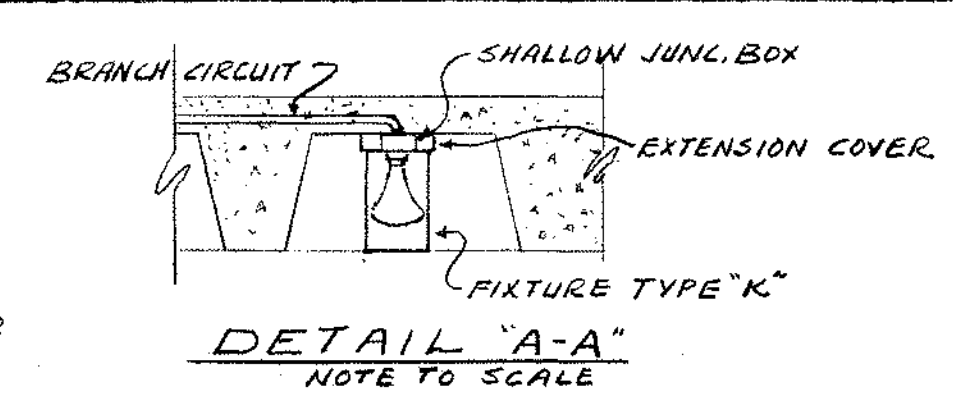
ELECTRICAL SITE PLAN
 SCALE: 1" = 20'
 OCT. 19, 1964

E-1

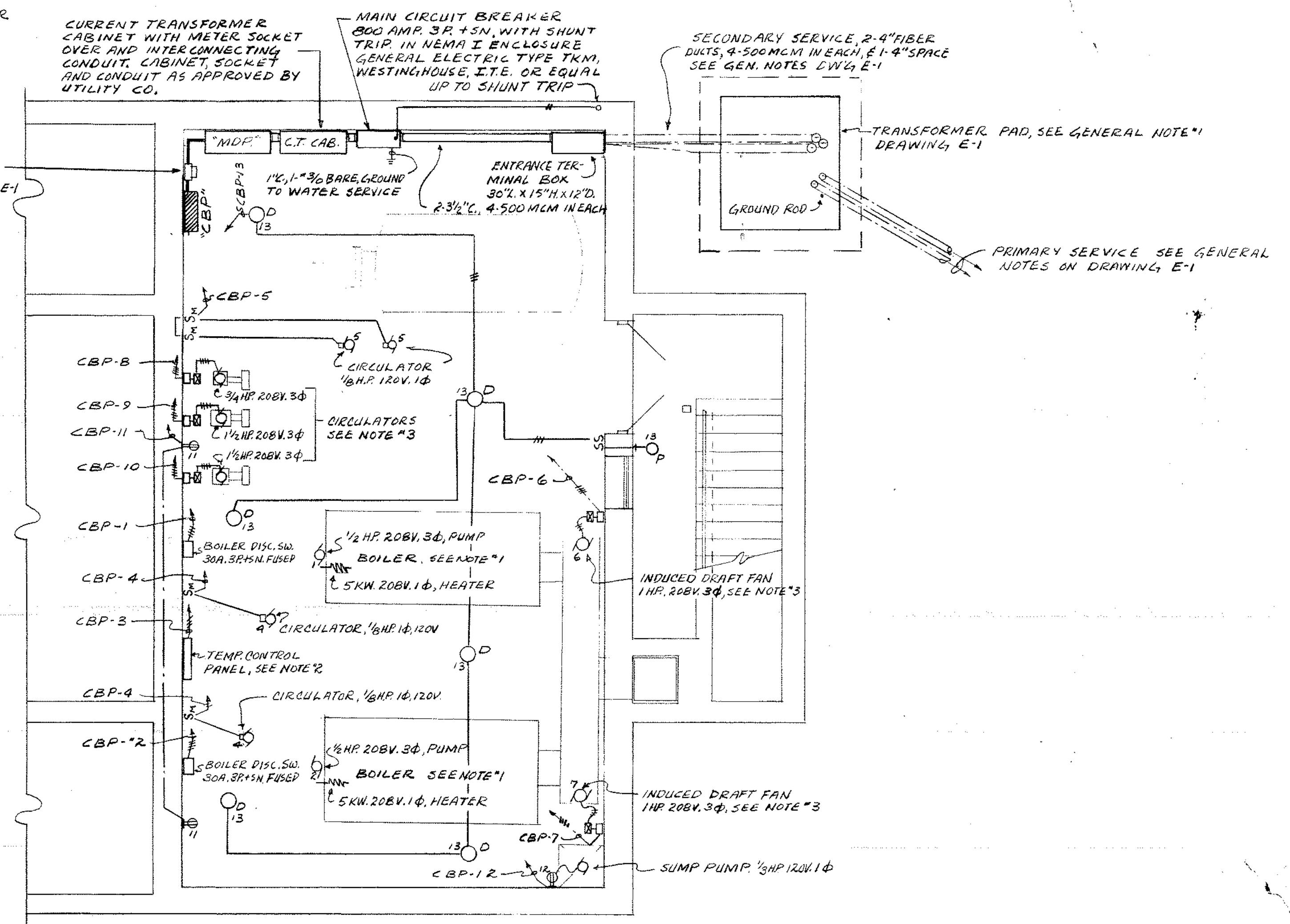


FIRST FLOOR PLAN
SCALE: 1/4" = 1'-0"

- NOTES:**
- UNIT HEATERS - FURNISH, INSTALL AND CONNECT POWER AND CONTROL WIRING, AS REQUIRED FOR COMPLETE OPERATION.
 - HEATING & VENT UNIT - FURNISH, INSTALL AND CONNECT POWER WIRING ONLY. CONTROL WIRING WILL BE COMPLETED BY HEATING/VENTILATING CONTRACTOR. STARTER FURNISHED WITH UNIT.
 - EXHAUST FANS - FURNISH, INSTALL AND CONNECT REQUIRED WIRING FOR COMPLETE OPERATION. MOTOR SWITCHES WITH PILOT LIGHT INDICATED SW WILL BE FURNISHED BY HEATING/VENTILATING CONTRACTOR FOR INSTALLATION AND CONNECTION BY ELECTRICAL CONTRACTOR.
 - ALL COMMUNITY BUILDING WIRING SHALL BE INSTALLED IN METAL RACEWAYS OF THE TYPE REQUIRED BY CONSTRUCTION CONDITIONS.



DETAIL 'A-A'
NOTE TO SCALE



BASEMENT PLAN
SCALE: 1/4" = 1'-0"

- NOTES:**
- BOILERS - POWER AND CONTROL WIRING BEYOND INDICATED DISCONNECT SWITCHES WILL BE COMPLETED AS SPECIFIED UNDER HEATING/VENTILATING SECTION OF SPECIFICATIONS.
 - FURNISH, INSTALL AND CONNECT POWER WIRING TO TEMPERATURE CONTROL PANEL. ALL WIRING BEYOND TEMPERATURE CONTROL PANEL WILL BE COMPLETED BY TEMPERATURE CONTROL MANUFACTURER.
 - INDUCED DRAFT FANS AND CIRCULATOR PUMPS - FURNISH, INSTALL AND CONNECT POWER WIRING ONLY, AS INDICATED. INDICATED STARTERS WILL BE FURNISHED BY H.E.V. CONTRACTOR FOR INSTALLATION AND CONNECTION BY ELECTRICAL CONTRACTOR. CONTROL WIRING WILL BE COMPLETED BY H.E.V. CONTRACTOR.

MAIN DISTRIBUTION PANEL 'MDP' SCHEDULE
200 AMP MAINS, 120/208V 3Ø, 4 WIRE, SURFACE TRIM, MAIN LUGS

CIR. NO.	SERVICE	FEEDER SIZE	BREAKER	REMARKS
1.	BUILDING, A-2	SEE SCHEDULE DWG 41	175	3
2.	BUILDING, B-1	SEE SCHEDULE DWG 41	400	3
3.	BUILDING, A-5	SEE SCHEDULE DWG 41	350	3
4.	BUILDING, B-2	SEE SCHEDULE DWG 41	200	3
5.	PANEL CBP	2 1/2" C, 4-Ø 10 RHW	175	3

PANEL SHALL BE GENERAL ELECTRIC, TYPE CCB; WESTINGHOUSE, I.T.E. OR EQUAL

PANEL 'CBP' SCHEDULE
200 AMP MAINS, 120/208V 3Ø, 4 WIRE, SURFACE TRIM, MAIN LUGS

NO.	DESCRIPTION	WIRE SIZE	QUANTITY	REMARKS
1 & 2	BOILERS	3/8" C, 4-Ø 10	30	3 EACH CIR.
3	TEMP. CONTROL PANEL	3/8" C, 3-Ø 12	20	2
4 & 5	CIRCULATORS	1/2" C, 2-Ø 12	20	1 EACH CIR.
6 & 7	INDUCED DRAFT FAN	3/8" C, 4-Ø 12	20	3 EACH CIR.
8, 9, 10	CIRCULATORS	3/8" C, 4-Ø 12	20	3 EACH CIR.
11	RECEPTACLE	1/2" C, 2-Ø 12	20	1
12	SUMP PUMP	1/2" C, 2-Ø 12	20	1
13	LIGHTING	1/2 AS REQUIRED	20	1
14	H.E.V. UNIT	3/8" C, 4-Ø 12	20	3
15	PANEL 'CP'	2" C, 4-Ø 2	100	3
16	SPARE		20	1
17	SPARE		20	1
18	SPARE		20	3
19	SPARE		20	3

PANEL SHALL BE GENERAL ELECTRIC, TYPE NAB; WESTINGHOUSE, I.T.E. OR EQUAL

PANEL 'CP' SCHEDULE
100 AMP MAINS, 120/208V 3Ø, 4 WIRE, SURFACE TRIM, MAIN LUGS

NO.	DESCRIPTION	WIRE SIZE	QUANTITY	REMARKS
1 THROUGH 17	LIGHTING & RECEPTACLES	Ø 12 WIRE	20	1 EACH CIR.
18 & 19	WASHERS	Ø 12 WIRE	20	1 EACH CIR.
16	RECEPTACLES	Ø 12 WIRE	20	1
18	DRYER	Ø 12 WIRE	30	2
19	RANGE	Ø 12 WIRE	50	2
20, 21	EXTERIOR RECEPTACLES	Ø 12 WIRE	20	1 EACH CIR.
22	EXHAUST FAN	Ø 12 WIRE	20	1
23	UNIT HEATERS	Ø 12 WIRE	20	1 EACH CIR.
24, 25	EXHAUST FANS	Ø 12 WIRE	20	1 EACH CIR.
26, 27, 28, 29, 30	SPACE BREAKERS	Ø 12 WIRE	20	1 EACH CIR.

PANEL SHALL BE GENERAL ELECTRIC, TYPE NLAB; WESTINGHOUSE, I.T.E. OR EQUAL

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ELECTRICAL
 COMMUNITY BUILDING

DATE: 10/19/64