STUDY REPORT AND
RECOMMENDATIONS
FOR THE

Restoration
of the
War Memorial Steps
Newton City Hall
and
Civil War Memorial
Newton Cemetery

Prepared for:

City of Newton
Public Buildings Department
Nicholas Parnell, AIA, Commissioner

June 4, 2007

Prepared by:

TBA Architects, Inc.
241 Crescent Street
Waltham, MA 02453

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Public Buildings Department
City of Newton
Nicolas Parnell, AIA, Commissioner
Arthur Cabral

Newton Cemetery Corporation
Michael V. Keblin, Sr., President/Treasurer

TBA Architects, Inc.
Russel Feldman, AIA
Bob Jefferies, CSI

Building Conservation Associates, Inc.
Lisa Harrington

Siegel Associates, Inc.
Steven Siegel

TBA Architects, Inc. prepared the following Report and Analysis with the assistance of BCA to document the existing conditions and provide conservation testing and recommendations, and Siegel Associates for structural analysis and recommendations. TBA is grateful for the support provided by the staff of the Public Buildings Department and the assistance of the Newton Cemetery Corporation.

PART I SUMMARY AND RECOMMENDATIONS

This study describes the inspection of existing conditions, testing and analysis of those conditions, and provides recommendations for construction to remedy the deterioration of two separate stone conservation projects for the City of Newton. These are the steps leading to the Memorial Hall at the Newton City Hall, and also the Civil War Memorial, located on the grounds of the Newton Cemetery.

The need for the work has been well documented by the Newton Public Buildings Department and the Pubic Buildings Preservation Task Force in their initial grant application to the Community Preservation Committee, dated October 15, 2004. We include this application in an Appendix to this Report for reference. Questions raised during inspection of the sites led to additional investigation which has been documented in correspondence also included in an Appendix to this Report.

Observations

Memorial Hall

The step's granite, limestone and brick were all found to be in generally good condition, requiring relatively little replacement of brick and stone. The movement and irregularity of the steps is found to be due to water penetration below the stones, resulting in heaving and dislocation. Water penetration was not found to have affected the foundation structure of the stair or the building itself.

There was limited cracking of brick observed, which was not found to indicate structural problems and should not be a cause of immediate concern.

We noted displacement of granite blocks at the base of both flagpoles that flank the stair.

We also noted some damage to the building itself, including at the portico, brick pilasters and pediment, and at the corner of the occupied structure. This included loss of mortar, open joints between brick and limestone, and a minor vertical crack at the corner of the structure facing the rear portico.

The concrete walks surrounding the stairs and flagpoles evidence some subsidence. This has resulted in a different riser height at the first step. The subsidence is gradual and we do not observe continuing deterioration.

While the stones stairs are in generally good condition, the irregularity poses some risk to the public.

Civil War Memorial

The consulting team determined that the Civil War Memorial required additional excavation and inspection to ascertain the cause of movement by the granite walls. This work was facilitated by Public Buildings Department staff and performed by the Newton Cemetery grounds staff. This work revealed that there was in fact no crypt at the memorial, clarifying the cause of the deterioration. The observations are detailed in appendices to this report.

The substantial movement of the granite walls is due to two causes: (1) water pressure from the hillside, exacerbated by the absence of any weep holes, and (2) the lack of any foundation for the large granite stones. After careful consideration, we do not consider the roots from the nearby tree to be source of the problem.

The granite itself is in generally good condition, with damage limited to a moulded surface has cracked at the base of one marble panel.

The marble panels themselves have weathered and discolored dramatically but are structurally sound.

The wall is substantially dislocated and is not stable. We anticipate that it will fall in the near future without repair.

Recommendations

Memorial Hall

Remove and reset the stone steps to return them to a level condition that accommodates proper drainage. The stairs should be set so as to have equal risers. Unless corrected, the grade change due to subsidence of the walkways will result in the last step being of a different height. While proper regrading and installing new pavement would eliminate this condition, it represents a substantial expense which we do not consider to be critical at this time.

Repoint the existing brick, with limited replacement of damaged units.

Dislocation of the granite bases at both flagpoles is similar in character as that of the stairs. Since the skills necessary for the stair repair are the same required for the flagpole work, and the cost of this additional work would be significantly greater if contracted at another time, we recommend including this work as part of this scope.

Clean the brick, limestone and granite with Klenztone #1 prior to brick repointing. Cleaning should proceed after a sample area is approved and maintained as a quality standard for the final work. Procedures for this work are detailed in the attached Testing and Recommendations Report.

We note that access to Memorial Hall by these stairs is not suitable for persons with special needs. Additionally, there are no stair railings, as would be required by Code were the building

constructed at the present time. Should there be sufficient funds available, we recommend that the City provide railings of a suitable style, scale and material (such as bronze) as part of this work. Because this was not part of the original study, the drawings and specifications provided here do not include this.

The repointing, cracks and deteriorated joints between brick and limestone on the building itself are the effect of normal aging, and exist elsewhere on the building as well. Because this is outside the scope of the study and we see no need for immediate action, we suggest that this be attended to as part of proper maintenance.

Civil War Memorial

Survey the existing stone locations prior to removal, then position the relocated stones on a thin bed of crushed stone to establish their "best fit" positions relative to each other.

Reset the base stone and wing walls on a concrete retaining wall that will serve as a shelf about one foot below finished grade. The final wall geometry will be determined by the "best fit" positioning. The stones should be set on a level bed of grout with weep holes allowing proper drainage. To avoid and surface ice the drainage could be piped to a drywell however this is not included in the present scope of work.

Repair the split section of granite at the base of one of the marble panels with either an epoxy repair and pin or by cutting and patching with a Dutchman.

The ornamental capstone should be reset with stainless steel pins.

Clean the granite cleaned with Klenztone #2 and the marble with a poultice application of Sodium Hypochlorite after disassembly and prior to reassembly. Cleaning should proceed after a sample area is approved and maintained as a quality standard for the final work. Procedures for this work are detailed in the attached Testing and Recommendations Report.

Estimated Cost of the Work

The cost estimates here are based on a single construction contract for both sites. The work is to be performed by a masonry contractor as prime, without separate filed sub-bids, let under the provisions of MGL c149. The contractor is to be a restoration specialist with five years experience and with at least three projects similar in scope and type involving buildings designated as landmarks by local governmental authorities or buildings listed in the National Register or State Register of Historic Places.

Construction (1)	$135,000.
Other Costs (2)	15,500.
Recommended Contingency (10%)	13,500.
Total Recommended Budget	**$164,000**

(1) Includes repair of granite flagpole bases but not hand railings

(2) Bid and construction administration, testing, reimbursable expenses

Both the scope of work and budget was developed after research and on-site discussion with an experienced preservation masonry specialist.

This budget is only for the work identified in the attached documents. It does not include any work on the railings, nor does it involve any repair of the City Hall building itself.

PART II TECHNICAL INFORMATION

A. CONSTRUCTION DOCUMENTS

Part of the purpose of this Study is to prepare technical materials appropriate for construction procurement per the requirements of MGL chapter 149. We do so in four drawings and four specification sections. Recognizing the time table for public construction, all documents are in draft form and labeled "progress not for construction" as the final designers and engineers will need to inspect the condition prior the the public procurement itself. However, all technical components of work are included in these documents and, augmented by final scope of construction decisions (handrails, flagpoles, landscape work, reseeding, etc.) they should be sufficient to implement the construction.

DRAWINGS

Sheet Number	Title
R-1	Elevations and Treatment Notes
R-2	Elevations and Details
R-3	Existing Conditions and Treatment Notes
SKS-1	Construction Details

SPECIFICATIONS

Section Number	Title
040105	Restoration Mortars
040110	Masonry Cleaning
040115	Masonry Pointing
040140	Exterior Stone Masonry Restoration

B. EXTERIOR MASONRY CLEANING TESTING AND RECOMMENDATIONS

This report was prepared by Building Conservation Associates, Inc. and is included under separate cover. It should be incorporated into the Project Manual for procurement of the final construction.

SECTION 040105

RESTORATION MORTARS

(Filed Sub-Bid Required)

PART 1- GENERAL

1.01 GENERAL DOCUMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.02 DESCRIPTION OF WORK

A. General: Provide all labor, materials, equipment, and services required for restoration mortars for restoration of the Steps of the War Memorial Entry at Newton City Hall, Newton, Massachusetts, and the Civil War Memorial, Newton Cemetery, Newton, Massachusetts, as indicated on the Drawings, as specified herein, and as may be required by conditions and authorities.

B. Restoration Mortar includes, but is not limited to, the following:

1. Provide custom mortar for rebuilding and pointing existing limestone and granite masonry at the War Memorial Entry, Newton City Hall.

2. Provide custom composite patching mortar for rebuilding and pointing existing granite and limestone masonry at the War Memorial Entry, Newton City Hall.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Masonry Cleaning – Section 040110.

B. Exterior Stone Masonry Restoration – Section 040140.

C. Masonry Pointing – Section 040115.

1.04 QUALITY ASSURANCE

A. Restoration Specialist: Contractor that performs restoration mortars work shall be regularly engaged in preparation of mortars to match historic mortars. Contractor shall demonstrate to Owner's satisfaction that, within previous five (5) years, he has successfully performed and completed in a timely manner at least three (3) projects similar in scope and type to required work involving buildings

designated as Landmarks by local governmental authorities; or buildings listed on the National Register of Historic Places or on a State Register of Historic Places.

1. Subcontractors: Subcontractors are bound by same requirements as Contractor. No subcontractors shall be employed unless approved in writing by the Architect or Restoration Consultant.

2. Foreman: Mortar preparation shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Restoration Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on project throughout work unless his performance is deemed unacceptable.

3. Mechanics: Mortar preparation shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with materials and methods specified, have a minimum of three (3) years experience with work on historic buildings similar to that required by this Section, and are familiar with design requirements. Contractor shall certify that mechanics employed for work of this Section fully understand project requirements. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.

B. The work of all masonry sections shall comply with the United States Department of the Interior *Secretary of the Interior Standards for Rehabilitation of Historic Buildings.*

C. Source of Materials: Obtain mortar ingredients from a single source for each type of material required to ensure uniform quality, color, and texture.

D. Field Supervised Construction: Notify Architect or Restoration Consultant before beginning mortar preparation.

1.05 SUBMITTALS

A. General: Submit the following in compliance with requirements of Conditions of the Contract and Division 1 specification sections. Revise and resubmit each item as required to obtain approval of the Architect or Restoration Consultant.

B. Qualification Data: Submit qualification data for firm and personnel specified in "Quality Assurance" Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three (3) completed projects within the New England Region similar in size and scope to work required on this project. For each project list project name, address, Architect, conservator, supervising preservation agency, scope of contractor's work, and other specified

information. This information shall be submitted with the bid.

C. Program of Work: Written program for restoration work specified in this Section.

D. Product Literature: Manufacturer's published technical data for each product to be used in work of this Section including recommendations for application and use. Include test reports and certificates verifying that product complies with specified requirements.

E. Samples:

1. Pointing Mortar: Cured mortar samples set in 1/2 in. by 6 in. plastic or aluminum channels for approval of color and texture. Samples shall be matched to existing original mortar as identified by Restoration Consultant. Provide the following:

a. Mortar for granite and limestone masonry.

2. Sand for Pointing Mortars.

3. Custom Patching Mortar for Limestone.

F. Mortar samples must be approved in writing by the Architect or Restoration Consultant.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials to site until they have been approved by the Architect or Restoration Consultant.

B. Deliver and store materials in manufacturer's original sealed containers or packaging, clearly labeled with manufacturer's name, address, and product identification, including grade, type, and color. Immediately reseal containers after partial use.

C. Store materials in spaces designated by Owner. Such spaces shall comply with pertinent federal, state, and local laws, codes, and regulations and shall be locked and inaccessible to those not employed under this Section, except Owner's Representatives.

1. Maintain temperatures in storage spaces within range recommended by manufacturer of material being stored in each case. Protect liquid components from freezing.

2. Store products and materials at least 4 in. above floor and protect them from water, dampness, or high humidity.

D. Deliver, store, and handle products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

E. Discard and remove from site deteriorated or contaminated materials and products that have exceeded their expiration dates. Replace with fresh materials.

1.07 PROJECT CONDITIONS

A. Applicable Regulations: Perform work of this Section in accordance with federal, state, and local laws and regulations.

B. Material Safety: Chemical materials shall be safe in use and shall comply with applicable federal, state, and local laws and regulations.

C. Prohibited Materials: No masonry cements or masonry mortars will be permitted.

1.08 ENVIRONMENTAL CONDITIONS

A. General: Perform work only when temperature of products being used and air temperature and humidity comply with manufacturer's requirements and requirements of this Section. In case of conflict, the most stringent requirements shall govern.

1. Remove all masonry work determined by the Architect or Restoration Consultant to have been damaged by freezing conditions and replace following these specifications to Architect or Restoration Consultant's satisfaction.

B. Proprietary Materials: Do not use proprietary patching materials and mortars unless temperatures are between 50 degrees Fahrenheit and 80 degrees Fahrenheit and will remain within that range for at least 48 hours after work has been completed unless work at other temperatures is specifically approved by manufacturer and Architect or Restoration Consultant.

C. Mortars: Do not mix or use mortars when air or masonry temperature is below 40 degrees Fahrenheit or when it is expected to drop below 40 degrees Fahrenheit within 48 hours.

1.09 COMBINED FILE SUB-BID REQUIREMENTS FOR MASONRY (SECTIONS 040105, 040110, 040115, 040140)

A. Bidding procedures shall be in accordance with latest edition of Massachusetts General Laws, Chapter 30, Section 39M, and Chapter 149, Section 44; as modified by Chapter 484 (1984) and Chapter 30B, Uniform Procurement Act (1990). Time and place for submission of sub-bids is given in Advertisement for

Bids.

B. Sub-bids for work under this Section shall be for complete work and shall be filed in a sealed envelope with Awarding Authority, at time and place specified in Advertisement for Bids. Following shall appear on face of envelope:

CITY OF NEWTON
NEWTON CITY HALL WAR MEMORIAL ENTRY
RESTORATION: PORTICO AND STEPS
[NAME OF SUB-BIDDER]
COMBINED SUB-BID FOR MASONRY (SECTIONS 040105, 040110, 040115, 040120, 040140)

C. Every sub-bid submitted for work under this Section shall be on forms furnished by Awarding Authority, as required by Section 44 of Chapter 149 of General Laws, and specified in Advertisement for Bids.

D. Sub-bids filed with Awarding Authority shall be accompanied by bid deposits in form of a bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank of trust company, payable to Town of Belmont in compliance with Chapter 149, Section 44B. Amount of bid deposit shall be 5 percent of value of bid.

E. This section, together with Section 040110: Masonry Cleaning, Section 040115: Masonry Pointing, Section 040140 Exterior Stone Restoration comprises filed sub-bid on masonry.

F. Work to be done under this Section is shown on the following Drawings: R-1 and R-2.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Grade and Quality: Materials shall conform to requirements of this Section and shall be new, free from defects, and of recent manufacture.

B. Ready-Mixed Products: Wherever a ready-mixed product is specified for use, containers shall bear labels giving exact formula of mixture. Manufacturer shall guarantee formula, and product shall be subject to chemical analysis by laboratory selected by the Architect or Restoration Consultant at Contractor's expense.

C. Manufacturer's Instructions: Comply with material manufacturer's instructions for use of products (including surface preparation, mixing, applying, drying, etc.). In

case of conflict with requirements of this Section, the more stringent requirements shall govern.

D. ASTM Standards: Materials shall comply with relevant ASTM standards.

2.02 PRODUCTS

A. White Portland Cement: Type I, ASTM C 150.

B. Portland Cement: Type I or Type II, ASTM C 150, non-staining. Do not use masonry cement.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: Clean sharp sand, free of loam, silt, soluble salts, organic matter, and other deleterious substances and graded in compliance with ASTM C 144, except that for joints less than 3/16" all aggregate shall pass through a number 16 sieve.

1. Sand for Pointing Mortar: Sand shall match sand in existing original mortar in sieve analysis, grain configuration, and color so that pointing mortar will match color of existing mortar with no or minimum addition of pigment.

E. Water: Clean and free of substances deleterious to mortar and masonry.

F. Pigments: Stable, nonfading, alkali-resistant oxide pigments. Provide one of the following or approved equal:

1. SGS Mortar Colors: Solomon Grind-Chem Services, Inc.

2. True Tone Mortar Colors: Davis Colors, a Subsidiary of Rockwood Industries, Inc.

G. Grout and Slurry for Restoration of Cracked, Broken, or Previously Grouted Masonry: Two-component, latex-modified cementitious compound, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704, (203) 597-9727 or approved equal. Provide custom colors to match color of cleaned existing masonry units being reinforced.

H. Composite Patching Mortars: Two-component, latex-modified cementitious compounds, specifically manufactured for masonry restoration. Provide one of the following:

1. Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704, (203) 597-9727. Provide custom

colors to match color of cleaned existing masonry units being reinforced.

2. Jahn M160 and M70, available from Cathedral Stone Products, Inc., 8332 Bristol Court, #107, Jessup, MD 20794 (800) 684-0901.

3. Mimic Matrix, available from Conproco Corporation, 17 Production Drive, Dover, NH 03820 (800) 258-3500.

I. Additives for Mortar to Set Dutchmen: Additives by Laticrete International, Inc., 1 Laticrete Park, North Bethany CT 06525, (203) 393-0010 to provide mortars as follows:

1. Mortar Bed Less Than 3/8" Thick: Laticrete 4237 for "thin-set" mortars.

J. No additives or admixtures other than those specified shall be used. No chlorides or aggressive corrosive chemicals shall be used.

2.03 MORTAR MIXES

A. Mortars for Setting and Pointing Limestone, Granite, and Brick Masonry: Mortars specified hereinafter shall comply with ASTM C 270, "Standard Specification for Mortar for Unit Masonry." Type "O" Mortar strength, in general, shall be consistent with a low standard deviation, and a 28 day cube compressive strength of a minimum of 350 psi and a maximum of 1799 psi. Mortar mixes may change and may require adjustment before and during construction in accordance with pre-construction conformance testing, field testing, and evaluation thereof by Architect or Restoration Consultant.

1. Type "N" Mortar for Setting and Pointing Limestone Masonry:

a. 1 part by volume white Portland cement (Type I).

b. 1 part by volume hydrated lime (Type S).

c. 6 parts sand (Selected to match sand in original mortar).

d. Oxide pigments as needed to match original mortar color(s). Pigment shall not exceed a ratio of 10% by weight of the cementitious ingredients.

D. Mortars for Setting Dutchmen: Mortars specified hereinafter shall comply with ASTM C 270. "Standard Specification for Mortar for unit Masonry." Mortar mixes may change and may require adjustment before and during construction in accordance with pre-construction conformance testing, field testing, and evaluation thereof by Architect or Restoration Consultant.

1. Slurry for pre-treating Masonry to be Repaired: Grout and Slurry for Restoration of Cracked, Broken, or Previously Grouted Masonry as specified above.

2. "Thin Set" Mortar for Setting Stone Dutchmen: Use when mortar bed is less than 3/8 in. think to produce an initially tacky mortar exhibiting high strength properties when set.

   a. 1 part by volume white Portland cement (Type I).

   b. 3 parts fine sand (selected to match color of existing clean stone).

   c. Temper to workable consistency with Laticrete 4237 polymer admixture mixed in accordance with manufacturer's recommendations for high strength, "thin set' mortar.

2.04 MIXING OF MORTAR

A. Measure mortar ingredients carefully so that proportions are controlled and maintained throughout all work periods.

B. Mix mortar in an approved type of power operated batch mixer. Mix for time required to produce a homogeneous plastic mortar but not less than five minutes: approximately two minutes for mixing dry materials and not less than three minutes for mixing after water has been added.

C. Use minimum amount of water to produce a workable consistency for mortar's intended purpose.

   1. Mortar for Pointing: As dry a consistency as will produce a mortar sufficiently plastic to be worked into joints.

   2. Mortar for Grouting: Consistency as will readily flow in cracks and voids.

   3. Mortar for Slurry: Consistency as will be brushable.

D. After mixing, mortars for pointing or setting shall sit for 20 minutes prior to use to allow for initial shrinkage. Mortar shall be placed in final position within two (2) hours of mixing. Retempering of partially hardened material is not permitted.

   1. Mortar for grout shall be placed in final position within two (2) hours of mixing. Retempering of partially hardened material is not permitted.

   2. Custom Patching Mortars: Mix in strict accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.01. INSTALLATION

A. Installation of Restoration Mortars shall be performed as part of the work of the following Sections:

1. Masonry Cleaning – 040110.

2. Exterior Stone Restoration – Section 040140.

3. Masonry Pointing – Section 040115.

END OF SECTION 040105

SECTION 040110

MASONRY CLEANING

(Filed Sub-Bid Required)

PART 1 – GENERAL

1.01 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.02 SCOPE OF WORK

A. General: Provide all labor, materials, equipment, and services required for masonry cleaning of the Steps of the War Memorial Entry, Newton City Hall, Newton, Massachusetts, and the Civil War Memorial, Newton Cemetery, Newton, Massachusetts, as indicated on the Drawings, as specified herein, and as may be required by conditions and authorities.

B. Masonry Cleaning includes, but is not limited to, the following:

1. Remove general soiling, staining and biological growth from all masonry surfaces using specified chemical and detergent cleaners and pressurized water rinsing.

2. Remove iron stains from masonry using approved chemical stain removers and pressurized water rinsing. Poulticing with approved chemical stain removers will be necessary to remove heavy staining.

3. Newton City Hall War Memorial Steps: All masonry cleaning shall be completed prior to repointing the building and masonry restoration. Note: This includes the cleaning of the masonry at the flagpoles (2).

4. Civil War Memorial, Newton Cemetery: All masonry cleaning shall be completed after dismantling of exterior tomb components and prior to their reassembly.

C. Intent: It is the specific intent of this Section to provide for removal of stains from masonry surfaces in order to produce uniformly clean surfaces without blotches, streaks, runs, overly cleaned areas, or any other kind of spotty or uneven appearance and without damaging or deteriorating underlying materials. All work required to accomplish this intent shall be included. Contractor shall correct

damage to existing masonry caused by masonry cleaning work to satisfaction of Restoration Consultant at no additional cost to Owner.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Exterior Stone Masonry Restoration – Section 040140.

B. Restoration Mortars – Section 040105.

C. Masonry Pointing - Section 040115.

1.04 QUALITY ASSURANCE

A. Masonry Cleaning Specialist: Contractor that performs masonry cleaning work shall be regularly engaged in cleaning masonry on historic buildings. Contractor shall demonstrate to Owner's satisfaction that, within previous five (5) years, he has successfully performed and completed in a timely manner at least three (3) projects similar in scope and type to required work involving buildings designated as Landmarks by local governmental authorities; or buildings listed on the National Register of Historic Places or on a State Register of Historic Places.

1. Subcontractors: Subcontractors are bound by same requirements as Contractor. No subcontractors shall be employed unless approved in writing by Restoration Consultant.

2. Foreman: Masonry cleaning shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Cleaning Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on project throughout work unless his performance is deemed unacceptable.

3. Mechanics: Masonry cleaning shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with materials and methods specified, have a minimum of three (3) years experience with work on historic buildings similar to that required by this Section, and are familiar with design requirements. Contractor shall certify that all mechanics employed for work of this Section fully understand project requirements. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.

B. The work of all masonry sections shall comply with the United States Department of the Interior *Secretary of the Interior Standards for Rehabilitation of Historic Buildings.*

A. Alternate Cleaning Methods: If Contractor proposes use of cleaning procedures and products other than those specified and Restoration Consultant gives preliminary approval following required submittals, Contractor shall create quality control panels demonstrating ability of proposed products and procedures to produce specified cleaning results and for comparison with specified quality control panels at no additional cost to Owner. No alternate method shall be permitted until it has been approved by Restoration Consultant.

B. Knowledge of Site: Bidders must visit site before submitting bid and make themselves thoroughly familiar with specific conditions relating to requirements of this Section. Submission of a bid shall be considered acknowledgement that Contractor has visited site and is thoroughly familiar with site conditions.

C. Daily Log: Contractor shall keep onsite and available for inspection a daily log describing masonry cleaning operations. Log shall record temperature at beginning and ending of work, weather conditions, whether masonry was wet or dry prior to beginning work, personnel on site, areas cleaned and procedures used, areas inspected and approved, and other relevant information.

D. Observation and Inspection of Ongoing and Completed Work: Contractor shall provide Restoration Consultant access for observation and inspection of ongoing work and for inspection for approval of completed work. Architect or Restoration Consultant shall be provided with access to each and every area of masonry surfaces that have been cleaned. No approval of cleaning will be given before Architect or Restoration Consultant is provided with access to cleaned surfaces.

E. Instruments for Measuring Temperature: Maintain accurate instruments for measuring temperature at project site to allow assessment of conditions at various locations on building during masonry cleaning work.

1. Measure temperature before beginning and during progress of work of this Section as required to ensure compliance with all specified conditions for masonry cleaning.

1.05 SUBMITTALS

A. General: Submit each item in this Article in compliance with the Conditions of the Contract and Division 1 specification sections. Revise and resubmit each item as required to obtain approval of Architect or Restoration Consultant.

B. Qualification Data: Qualification data for firm and personnel specified in "Quality Assurance" Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three (3) completed projects within the New England region similar in size and scope to work required on this project. For

each project list project name, address, restoration consultant, conservator, scope of contractor's work, and other relevant information. This information shall be submitted with the bid.

C. Program of Work: Written program for restoration work specified in this Section.

1. Prior to any cleaning work on site, submit program for proposed cleaning of masonry.

a. Protection: Detailed description, including drawings and diagrams, of proposed materials and methods of protection for preventing harm, damage, or deterioration caused by work of this Section to all persons (whether involved in the Work or not), building elements, materials, and finishes, surrounding landscape and site, and the environment (including air and water).

b. Alternate Cleaning Methods and Materials: Contractor proposed alternate methods and materials to those specified for any phase of masonry cleaning. Provide evidence of successful use on comparable projects and demonstrate effectiveness for use on this project.

D. Product Literature: Manufacturer's published technical data for each product to be used in work of this Section including recommendations for application and use. Include test reports and certificates verifying that product complies with specified requirements. Include Material Safety Data Sheets (MSDS) for each cleaning product and for each other chemical product proposed for use in work of this Section.

E. Schedule of Masonry Cleaning: Prior to commencing cleaning operations, submit a complete detailed schedule for specified quality control panels and for completion of masonry cleaning.

F. Waste Disposal Program: Prior to commencing cleaning operations, submit a written description of proposed materials and methods for collection, treatment, and disposal of wastes resulting from cleaning operations.

G. Daily Log: Submit copy of daily log to Architect or Restoration Consultant each week.

H. Quality Control Panels: Prepare quality control panels as described in Article "Quality Control Panels," below. Cleaning may not proceed until quality control panels have been approved in writing by Architect or Restoration Consultant.

1.06 QUALITY CONTROL PANELS

A. General: Provide quality control panels to establish the standard for each

type of masonry cleaning work in compliance with following requirements. Testing: Cleaning tests shall be performed to determine proper cleaning procedures, chemicals, chemical dilutions and dwell time. Following approval by the Architect or Restoration Consultant, Quality Control Panels will be prepared based on this testing.

1. For this project, the control panels shall consist of window protection system and stone designated for cleaning by the Architect or Restoration Consultant.

2. Provide 48 hours notice in writing to Architect or Restoration Consultant prior to start of quality control panels.

3. Restoration Consultant will monitor quality control panels. No quality control panels done in absence of Architect or Restoration Consultant will be accepted.

4. Perform quality control panels using crew that will be executing the work and following requirements of this Section.

5. Allow quality control panels to dry for a minimum of seven (7) days before notifying Architect or Restoration Consultant that they are ready for examination.

6. Repeat quality control panels as necessary to obtain approval by Architect or Restoration Consultant.

7. Protect approved quality control panels to ensure that they are without damage, deterioration, or alteration at time of Substantial Completion.

8. Approved panels in undamaged condition at time of Substantial Completion may be incorporated into the Work.

9. Approved quality control panels will represent minimum acceptable standards for masonry cleaning work. Subsequent work that does not meet standards of approved quality control panels will be rejected.

B. Prepare following quality control panels: Note: Quality Control Panels be required at each site unless otherwise noted:

1. Cleaning General Soiling from Granite Masonry: As designated by the Architect or Restoration Consultant.

2. Cleaning General Soiling from Limestone Masonry: As designated by the Architect or Restoration Consultant. (Newton City Hall only).

3. Cleaning Iron Stains from Masonry: As designated by the Architect or Restoration Consultant (Newton City Hall only).

4. Marble Poulticing: As designated by the Architect or Restoration Consultant (Civil War Memorial only).

5. Window Protection: As designated by the Architect or Restoration Consultant (Newton City Hall only).

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products and materials only after they have been approved by the Architect or Restoration Consultant and after MSDS sheets for products and materials have been submitted and are available in Contractor's onsite office.

B. Deliver and store materials in manufacturers' original sealed containers or packaging, clearly labeled with manufacturer's name, address, and product identification, including grade, type, and color. Immediately reseal containers after partial use.

C. Store all materials in spaces designated by Owner. All such spaces shall comply with pertinent federal, state, and local laws, codes, and regulations and shall be locked and inaccessible to those not employed under this Section, except Owner's Representatives.

1. Maintain temperatures in storage spaces within range recommended by manufacturer of material being stored in each case. Protect liquid components from freezing.

D. Deliver, store, and handle all products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

E. Discard and remove from site deteriorated or contaminated materials and products that have exceeded their expiration dates. Replace with fresh materials.

1.08 PROJECT CONDITIONS

A. Laws and Regulations: Conduct all masonry cleaning work and dispose of all residue from such work in complete compliance with all applicable federal, state, and local laws and regulations.

B. Protection of Persons: Take all measures necessary to protect persons, whether involved with work of this Section or not, from harm caused by work of this Section.

1. Erect temporary protective covers at points of entrance and exit to building that must remain in operation during course of masonry cleaning work when work is ongoing around or above entrances and exits.

2. Provide temporary enclosures, barricades, signage, and other forms of protection to prevent persons, except properly protected cleaning personnel, from coming in contact with cleaning materials.

C. Protection of Building: Protect all building elements and finishes from damage or deterioration caused by masonry cleaning work using all means necessary. Repair any damage to materials or finishes resulting from work of this Section to satisfaction of Architect or Restoration Consultant at no additional cost to Owner.

1. Adjacent Materials: Protect adjacent materials, including but not limited to masonry, metals, glass, paint, and sealants, from cleaning solutions that might damage such materials. Repair or replace materials damaged as a result of work of this Section to Architect or Restoration Consultant's satisfaction at no additional cost to Owner.

2. Spread of Cleaning Solutions: Do not clean masonry during winds of sufficient force to spread cleaning solutions to unprotected surfaces. Cease cleaning operations when winds may carry chemicals, rinse water, or run-off from chemical cleaning to unprotected areas.

3. Window and Door Openings and Other Penetrations in Building Skin: Use all means necessary to prevent cleaning solutions and waste products from entering behind building skin at penetrations in skin.

D. Protection of Surroundings: Protect adjacent buildings, site, landscape features, public rights of way, motor vehicles, and other surrounding elements from damage and deterioration resulting from masonry cleaning work.

1. Collect and dispose of runoff from cleaning operations by legal means and in manner that prevents soil erosion, undermining of paving and foundations, damage to sidewalks, water penetration into building interiors, and any harm to buildings, landscape elements, and natural bodies of water or water table.

2. Provide troughs to direct run-off resulting from masonry cleaning operations.

E. Contract Drawings: Drawings are two-dimensional representations of three-dimensional objects and do not show all surfaces. Perform work on all surfaces of projections, reveals, ornament, and other elements associated with areas on which work is indicated.

F. Coordination: Coordinate work of this Section with work of other specification sections to ensure proper completion of all Work.

1. Clean masonry before beginning masonry restoration.

2. Schedule and stage masonry cleaning so that no runoff from cleaning operations comes in contact with previously cleaned masonry elements.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Use of Water: Do not perform masonry cleaning work that will wet masonry materials or cause them to be wet when ambient temperature is below 40 degrees Fahrenheit, nor when temperature of air or masonry is expected to drop below 40 degrees Fahrenheit within 72 hours. Take all precautions necessary to protect building and materials from freezing. No work shall begin when any part of wall or materials in use are frozen or subject to freezing.

1.10 COLLECTION AND DISPOSAL OF WASTE PRODUCTS

A. General: Collect, contain, test, and dispose of solid and liquid wastes in accordance with applicable federal, state, and local laws and regulations.

B. Provide troughs and gutters to collect runoff from cleaning operations for pretreatment prior to disposal. Do not allow waste materials from cleaning operations to flow or drop onto adjacent sidewalks, plantings, soil, or structures. Direct waste materials to collection vessels for treatment.

C. Neutralize all cleaning waste products to a pH of between 5.0 and 6.5. Propose specific methods and materials for neutralization in Waste Disposal Program submission.

D. Dispose of cleaning run-off by legal means that prevent: erosion, undermining, damage to plant material, and water penetration into building.

1. Install protection and waste collection systems before general cleaning begins.

2. Test all drains and other water removal systems to ensure that they are functioning properly before cleaning operations begin. Notify Owner immediately if any drains or systems are stopped or blocked. Do not begin work of this Section until drains are in good working order.

3. Provide filtration to prevent suspended solids such as masonry residue from entering drains and drain lines. Contractor shall be responsible for cleaning out any drain or drain line that becomes blocked or filled with sand or other solids as a result of work performed under this Section.

E. Dispose of all waste products at regular intervals. Do not allow waste products to accumulate on site.

1.11 COMBINED FILE SUB-BID REQUIREMENTS FOR MASONRY (SECTIONS 040105, 040110, 040115, 040140)

A. Bidding procedures shall be in accordance with latest edition of Massachusetts General Laws, Chapter 30, Section 39M, and Chapter 149, Section 44; as modified by Chapter 484 (1984) and Chapter 30B, Uniform Procurement Act (1990). Time and place for submission of sub-bids is given in Advertisement for Bids.

B. Sub-bids for work under this Section shall be for complete work and shall be filed in a sealed envelope with Awarding Authority, at time and place specified in Advertisement for Bids. Following shall appear on face of envelope:

CITY OF NEWTON
NEWTON CITY HALL WAR MEMORIAL ENTRY
RESTORATION: PORTICO AND STEPS
[NAME OF SUB-BIDDER]
COMBINED SUB-BID FOR MASONRY (SECTIONS 040105, 040110, 040115, 040120, 040140)

C. Every sub-bid submitted for work under this Section shall be on forms furnished by Awarding Authority, as required by Section 44 of Chapter 149 of General Laws, and specified in Advertisement for Bids.

D. Sub-bids filed with Awarding Authority shall be accompanied by bid deposits in form of a bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank of trust company, payable to Town of Belmont in compliance with Chapter 149, Section 44B. Amount of bid deposit shall be 5 percent of value of bid.

E. This section, together with Section 040105: Restoration Mortars, Section 040115: Masonry Pointing, Section 040140 Exterior Stone Restoration comprises filed sub-bid on masonry.

F. Work to be done under this Section is shown on the following Drawings: R-1, R-2, and R-3.

PART 2 – PRODUCTS

2.01 MATERIALS, GENERAL

A. Grade and Quality: Materials shall conform to requirements of this Section and shall be new, free from defects, and of recent manufacture.

B. Ready-Mixed Products: Wherever a ready-mixed product is specified for use, containers shall bear labels giving exact formula of mixture. Manufacturer shall guarantee formula, and product shall be subject to chemical analysis by a laboratory selected by Restoration Consultant.

C. Manufacturer's Instructions: Comply with material manufacturer's instructions for use of products (including surface preparation, mixing, applying, drying, etc.). In case of conflict with requirements of this Section, the more stringent requirements shall govern.

D. ASTM Standards: All materials shall comply with relevant ASTM standards.

E. Chemical materials shall be safe for use and not in violation of federal, state, or local laws or regulations.

2.02 WINDOW PROTECTION MATERIALS

A. General: Provide the following materials for protection of all windows from chemical cleaners and pressurized water.

1. Protective plastic window covers such as Pro Tect's Windows 45 and Windows 180 window protection. (www.pro-tect.com/window-protection.shtml)

2.03 CLEANING CHEMICALS AND MATERIALS

A. General: Provide the following products for use in cleaning substrates and conditions indicated.

B. Cleaner for Removing General Soiling from Masonry, Newton City Hall War Memorial Steps and Flagpole Bases:

1. Klenztone #1, manufactured by K & E Chemical, Inc., 3960 East 93rd Street, Cleveland, OH 44105 800.331.1696, www.klenztone.com.

C. Cleaner for Removing General Soiling Granite and Marble Masonry, Civil War Memorial, Newton Cemetery:

1. Klenztone #2, manufactured by K& E Chemical, Inc., 3960 East 93rd Street, Cleveland, OH 44105. 800.331.1696. www.klenztone.com.

D. Cleaner for Removing Stains in Marble Tablets: Civil War Memorial, Newton Cemetery:

1. Poultice: Sodium Hypochlorite (4-6% NaOCl)

2. Poultice Powder, manufactured by Prosoco, Inc., 3741 Greenway Circle, Lawrence, KS 66046. 800.255.4255. www.prosoco.com.

E. Cleaner for Removing Iron Stains from Masonry: Ferrous Stain Remover, manufactured by Prosoco, Inc., 3741 Greenway Circle, Lawrence, KS 66046. 800.255.4255. www.prosoco.com.

F. Water for Cleaning: Clean, potable, free of oils, acids, alkalis, salts, organic matter, soluble and insoluble iron, and other substances detrimental to surfaces being cleaned and non-staining.

1. Source: Water may be obtained from building water supply.

2.04 EQUIPMENT FOR WATER AND CHEMICAL CLEANING

A. General: Provide all equipment and accessories to distribute water at pressures and flow rates required for masonry cleaning.

B. Pressure Pumps: Pressure pumps capable of producing water flow at a rate of 6 gallons per minute at a pressure of 850 psi at nozzle on end of hose. Pumps, or a combination of pumps plus pressure reducing valves, shall have capability of providing water at a steady pressure and flow rate at all pressures from 300 psi to 8750 psi. Pumps shall have working pressure gauges. Pumps found to be without working pressure gauges shall be removed from site and work shall cease until pumps have been replaced with pumps having working pressure gauges.

C. In-line Pressure Gauges: Each water line used for pressure rinsing shall have a working pressure gauge within 20 feet of nozzle used for rinsing.

D. Spray Nozzles for Pressure Rinsing: Nozzles shall be of nonferrous metal and shall have a minimum 15-degree fan tip.

E. Brushes: Fiber bristle only. No metal bristle brushes are permitted.

2.05 MIXING CHEMICAL CLEANING SOLUTIONS

A. General: Chemical cleaning materials are to be diluted as specified below.

Specified dilutions may be modified to reflect particular conditions on the building.

1. Supply any dilution of specified chemical cleaners at no additional cost to Owner.

2. Newton City Hall War Memorial, General Cleaner: Undiluted (Product is pre-diluted)

3. Civil War Memorial, Newton Cemetery, General Cleaner: Undiluted (Product is prediluted)

4. Civil War Memorial, Marble Poultice (Sodium Hypochlorite) Undiluted.

5. Newton City Hall War Memorial, Ferrous Stain Remover: (diluted up to 3 parts with water)

PART 3 – EXECUTION

3.01 GENERAL CLEANING REQUIREMENTS

A. General: These requirements apply to all work of this Section.

B. Areas To Be Cleaned: Clean designated areas of exterior masonry.

C. Testing: Cleaning tests shall be performed to determine proper cleaning procedures, chemicals, chemical dilutions and dwell time. Following approval by the Architect or Restoration Consultant, Quality Control Panels will be prepared based on this testing.

D. Quality Control Panels: Prepare quality control panels and secure approval of the Architect or Restoration Consultant before beginning general masonry cleaning work.

E. Cleaning Progress: Clean masonry systematically in full-height sections of material to be cleaned.

1. Cleaning with Water: Begin all cleaning using water at bottom of section to be cleaned and proceed to top of section before moving to adjacent section.

F. Timing: Control timing of cleaning operations (including dwell times of cleaners) to ensure that specified times are maintained. Do not allow chemicals to remain on surfaces longer than specified dwell times.

G. Water Pressure and Flow Rate: Limit water pressure and flow rates to maximum pressures specified herein and to lower pressures as required to avoid damaging masonry, metals, and sealants.

1. If any building material is damaged or deteriorated by water rinsing, immediately cease work. Do not begin pressure rinsing again until water pressure and flow rate have been adjusted to avoid damage to building materials.

H. Alteration: Cleaning procedures, including cleaning chemical, chemical dilution, and dwell time may be altered by Restoration Consultant as required based on site conditions.

I. Completion of Cleaning: Cleaned masonry shall match approved quality control panels. Areas are subject to additional cleaning as directed by Restoration Consultant in order to match quality control panels. Work of masonry cleaning on each surface shall not be considered complete until Architect or Restoration Consultant has inspected surface and so notified Contractor in writing.

3.02 QUALITY CONTROL PANELS

A. General: Provide quality control panels for general cleaning of each type of masonry following requirements of "Quality Control Panels" Article, above.

1. Provide protection and water collection facilities during quality control panel phase.

2. Do not begin general masonry cleaning until Architect or Restoration Consultant has approved quality control panels.

3.03 WINDOW PROTECTION

A. General: Provide protection for all windows, including glass and wooden trim elements from chemical cleaners and pressurized water spray. Window protection system for each window opening shall match approved quality control panel to Architect or Restoration Consultant's satisfaction.

B. Install Window Protection System

1. Window protection shall be in place prior to any cleaning operations and remain in place until cleaning of each area has been approved by the Architect or Restoration Consultant.

2. Following removal of window protection, thoroughly rinse all windows with non-pressurized water.

3.04 CLEANING MASONRY

A. General: Clean masonry free of staining as indicated on the Drawings. Cleaned granite masonry shall match approved quality control panel to the satisfaction of Architect or Restoration Consultant.

3.05 GENERAL CLEANING OF MASONRY USING CHEMICAL CLEANERS

A. General: Clean masonry free of general soiling using chemical cleaners and pressurized water rinsing. Pressurized water shall not exceed 850psi. Cleaned masonry shall match approved quality control panels to Architect or Restoration Consultant's satisfaction.

B. Newton City Hall War Memorial Steps: Remove soiling using chemical cleaners and pressure rinsing:

1. Pre-wet masonry to be cleaned and areas directly beneath with pressurized water.

2. Apply chemical with a natural bristle brush of medium stiffness and allow to dwell for 5 minutes, agitating twice during the dwell time.

3. Rinse all traces of chemical and residue using water at a pressure not to exceed 850 psi, and a rate not to exceed 6 gpm with a 25-degree fan tip nozzle.

4. Repeat application a second time as necessary in areas of heavy soiling.

C. Civil War Memorial, Newton Cemetery: Remove general soiling on both granite and marble using chemical cleaners and pressure rinsing:

1. Pre-wet masonry to be cleaned and areas directly beneath with pressurized water.

2. Apply chemical with a natural bristle brush of medium stiffness and allow to dwell for 5 minutes, agitating twice during the dwell time.

3. Rinse all traces of chemical and residue using water at a pressure not to exceed 850 psi, and a rate not to exceed 6 gpm with a 25-degree fan tip nozzle.

4. Repeat application a second time as necessary in areas of heavy soiling (granite only).

Marble Poultice: Remove deep staining on marble using specified poultice and pressure rinsing. Note: Poultice should be applied to marble tablets

following dismantling. For optimal effectiveness, marble should be laid flat (horizontally) during poultice cleaning, and rinsed vertically.

1. Poultice Powder: Prepare poultice according to manufacturer's instructions, using the Sodium Hypochlorite, to a paste-like consistency.

2. Apply the poultice with a plastic scraper to a dry surface, following general cleaning, to a thickness of approximately a half inch (½").

3. Apply plastic wrap over all poulticed surfaces and secure with painter's tape.

4. Allow poultice to remain on the marble for 24-26 hours. Do not allow poultice to dry on marble surface.

5. Carefully remove poultice from marble with a plastic scraper.

6. Rinse all traces of poultice and residue using water at a pressure not to exceed 500 psi with a 25-degree fan tipped nozzle.

3.06 REMOVAL OF METAL STAINS USING CHEMICAL CLEANERS

A. General: Clean masonry free of metal stains using chemical cleaners and pressurized water rinsing. Cleaned masonry shall match approved quality control panels to the Architect or Restoration Consultant's satisfaction.

B. Remove stains using chemical cleaners and pressure rinsing.

1. Pre-wet masonry to be cleaned and areas directly beneath with pressurized water.

2. Rinse all traces of chemical and residue using water at a pressure not to exceed 850 psi, and a rate not to exceed 6 gpm with a 25-degree fan tip nozzle.

C. Repeat cleaning as specified above as required to achieve uniformly cleaned masonry surfaces matching approved quality control panels.

1. Heavy stains may require poulticing using chemical cleaners for adequate removal. Follow all manufacturer's instruction for using cleaners as a poultice. Do not allow masonry surface to dry during poulticing.

2. Heavy pressure washing, at a pressure exceeding 850psi, will not be deemed an acceptable method of cleaning and is not a substitute for repeat applications of chemical cleaners or manual scrubbing.

3.07 ADJUSTMENT AND PROTECTION

A. Re-clean any surface that does not have a uniform clean appearance as required to match approved quality control panels.

B. Protect cleaned surfaces from dirt and soiling from other than normal atmospheric pollution until project completion. Re-clean any surfaces that become soiled to satisfaction of Restoration Consultant at no additional cost to Owner.

END OF SECTION 040110

SECTION 040115

MASONRY POINTING

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.02 SCOPE OF WORK

A. General: Provide all labor, materials, equipment, and services required for masonry pointing of the Steps of the War Memorial Entry, Newton City Hall, Newton, Massachusetts, and the Civil War Memorial, Newton Cemetery, Newton, Massachusetts, as indicated on the Drawings, as specified herein, and as may be required by conditions and authorities.

B. Masonry Pointing includes, but is not limited to, the following:

War Memorial Entry, Newton City Hall:

1. Prepare joints in limestone masonry for repointing as specified herein and where noted on the Drawings.

2. Prepare all joints in 100% of granite masonry steps for repointing as specified herein and noted on the Drawings.

3. Install new mortar in all joints prepared in limestone masonry, tool joints, and clean excess mortar from masonry surfaces.

4. Install new mortar in all joints prepared in granite masonry, tool joints, and clean excess mortar from masonry surfaces.

Civil War Memorial, Newton Cemetery:

1. No pointing is required.

C. RELATED WORK SPECIFIED ELSEWHERE:

1. Restoration Mortars – Section 040105.

2. Masonry Cleaning – Section 040110.

3. Exterior Stone Masonry Restoration – Section 040140.

1.03 QUALITY ASSURANCE

A. Restoration Specialist: Contractor that performs masonry pointing shall be regularly engaged in pointing masonry on historic buildings. Contractor shall demonstrate to Owner's satisfaction that, within previous five (5) years, he has successfully performed and completed in a timely manner at least three (3) projects similar in scope and type to required work involving buildings designated as Landmarks by local governmental authorities; or buildings listed on the National Register of Historic Places or on a State Register of Historic Places.

1. Subcontractors: Subcontractors are bound by same requirements as Contractor. No subcontractors shall be employed unless approved in writing by Architect or Restoration Consultant.

2. Foreman: Masonry pointing shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Restoration Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on project throughout work unless his performance is deemed unacceptable.

3. Mechanics: Masonry pointing shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with materials and methods specified, have a minimum of three (3) years experience with work on historic buildings similar to that required by this Section, and are familiar with design requirements. Contractor shall certify that mechanics employed for work of this Section fully understand project requirements. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.

B. Testing of Workers: All technicians proposed for use on project will be required to successfully complete six (6) linear feet of cutting and raking of mortar joints in presence of Architect or Restoration Consultant prior to working on project. One one-quarter-inch chip of masonry per linear yard will be standard of acceptable skill. Unsuccessful performance in this test area will be grounds for rejection of this technician for this job.

C. The work of all masonry sections shall comply with the United States Department of the Interior Secretary of the Interior Standards for Rehabilitation of Historic Buildings.

D. Source of Materials: Obtain materials for masonry pointing from a single source for each type of material required to ensure a match in quality, color, and texture.

E. Field Supervised Construction: Contractor shall notify Architect or Restoration Consultant before beginning masonry pointing work.

F. Contract Drawings: Drawings are two-dimensional representations of three-dimensional objects and do not show all surfaces. Perform work on surfaces of projections, reveals, ornament, and other elements associated with areas on which work is indicated.

G. Familiarity with Site Conditions: Bidders shall visit site prior to bid and carefully examine project scope and conditions that may affect proper execution of work of this Section and determine or verify dimensions and quantities. Contractor's submission of bid shall be acknowledgment that he is thoroughly familiar with project scope and site conditions.

H. Repair or replace all masonry units damaged during masonry pointing to Architect or Restoration Consultant's satisfaction at no additional cost to Owner.

1.04 SUBMITTALS

A. General: Submit the following in compliance with requirements of Conditions of the Contract and Division 1 specification sections. Revise and resubmit each item as required to obtain approval of Architect or Restoration Consultant.

B. Qualification Data: Submit qualification data for firm and personnel specified in "Quality Assurance" Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three (3) completed projects within the New England region similar in size and scope to work required on this project. For each project list project name, address, Architect, conservator, supervising preservation agency, scope of contractor's work, and other specified information. This information shall be submitted with the bid.

C. Program of Work: Written program for restoration work specified in this Section.

D. Samples:

1. Mortar: Samples of all mortar required for work of this Section are to be submitted as required by Section 040105 – Restoration Mortars.

E. Product Literature: Manufacturer's published technical data for each product to be used in work of this Section including recommendations for application and use. Include test reports and certificates verifying that product complies with specified requirements.

F. Prepare quality control panels as specified in Article "Quality Control Panels," below.

1.05 QUALITY CONTROL PANELS

A. General: Before beginning general masonry pointing work, prepare quality control panels to provide standards for work of this Section. Do not proceed with masonry pointing until Architect or Restoration Consultant has approved relevant quality control panel.

1. Locate quality control panels in locations as directed by Architect or Restoration Consultant.

2. Provide 48 hours notice to Architect or Restoration Consultant prior to start of each quality control panel.

3. Architect or Restoration Consultant will monitor quality control panels. No quality control panel done in absence of Architect or Restoration Consultant will be accepted.

4. Perform quality control panels using crew that will be executing the work and following requirements of this Section.

5. Allow each quality control panel to stand until mortar is thoroughly dry and has reached its natural color (48 -72 hours). Notify Architect or Restoration Consultant that panel is ready for inspection.

6. Repeat quality control panels as necessary to obtain Architect or Restoration Consultant's approval.

7. Protect approved quality control panels to ensure that they are without damage, deterioration, or alteration at time of Substantial Completion.

8. Approved quality control panels in undamaged condition at time of Substantial Completion may be incorporated into the Work.

9. Approved quality control panels will represent minimum acceptable standard for masonry pointing work. Subsequent work that does not meet standard of approved quality control panels will be rejected.

B. Prepare the Following Quality Control Panels:

1. Joint Preparation in Limestone Masonry.

2. Joint Preparation in Granite Masonry.

3. Joint Pointing in Limestone Masonry.

4. Joint Pointing in Granite Masonry.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials to site until they have been approved by the Architect or Restoration Consultant.

B. Deliver and store materials in manufacturers' original sealed containers or packaging, clearly labeled with manufacturer's name, address, and product identification, including grade, type, and color. Immediately reseal containers after partial use.

C. Store all materials in spaces designated by Owner. Such spaces shall comply with pertinent federal, state, and local laws, codes, and regulations and shall be locked and inaccessible to those not employed under this Section, except Owner's representatives.

1. Maintain temperatures in storage spaces within range recommended by manufacturer of material being stored in each case. Protect liquid components from freezing.

2. Store products and materials at least 4 in. above floor and protect them from water, dampness, or high humidity.

D. Deliver, store, and handle products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

E. Discard and remove from site deteriorated or contaminated materials and products that have exceeded their expiration dates. Replace with fresh materials.

1.07 PROJECT CONDITIONS

A. Applicable Regulations: Perform work of this Section following applicable federal, state, and local laws and regulations.

B. Safety: Provide measures necessary to protect all persons, whether or not involved with work of this Section, from risk or harm caused by work of this Section.

C. Protection of Building and Property:

1. Protect adjacent elements and materials from damage or deterioration during work of this Section. Provide necessary protection and procedures to protect masonry not being pointed and all other elements and materials.

2. Repair damage to elements and materials caused by masonry pointing work, using mechanics experienced in respective type of work, to satisfaction of the Architect or Restoration Consultant at no additional cost to Owner.

3. Protect components of storm drainage systems against damage and blockage caused or accelerated by work of this Section.

4. Protection from Weather: Protect exposed areas of building, including areas of masonry from which mortar has been removed, from penetration by wind, water, or other forces at times when work is not in progress. Cover openings when work is not in progress.

D. Protection of Environment: Provide precautions necessary to protect site, site features, surrounding buildings, streets and sidewalks, air, water, and other elements of environment from damage or deterioration caused by work of this Section.

E. Dust: Minimize dissemination of dust to greatest extent possible.

1. Provide dust collection hoods for all cutting tools connected to a vacuum collection system, or other comparable method.

2. Contractor shall hold Owner, Architect, Restoration Consultant, and their consultants harmless from all claims relating to dust resulting from work of this Section.

F. Protection of Masonry Being Pointed: Protect existing masonry from damage during work of this Section. Take special care in removing existing mortar to ensure that no arrises are damaged, chipped, or broken. Contractor shall replace or repair any masonry unit damaged in any manner by work of this Section as directed by and to satisfaction of Architect or Restoration Consultant at no additional cost to Owner.

G. Staining: Prevent grout or mortar from staining face of masonry to be left exposed. Protect sills, ledges, and projections from mortar droppings. Immediately remove grout or mortar in contact with such masonry. Protect base of walls from rain splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

H. Protection from Rain: Protect pointed joints with heavy waterproof sheeting from direct attack by rain or other precipitation for at least 24 hours after mortar has been applied.

I. Coordination: Coordinate work of this Section with work of other Division 4 sections to ensure proper completion of masonry work.

J. Access for Inspection and Approvals: Provide Architect or Restoration Consultant access on a regular basis to all locations on which quality control panels are being carried out, on which work is ongoing, and where work has been completed to allow for inspections and approvals. Provide means of access and safety precautions required to facilitate inspections and approvals.

1.08 ENVIRONMENTAL CONDITIONS

A. Use of Materials: Use materials only under the following conditions unless more stringent conditions are specified by product manufacture. The most stringent conditions shall govern.

1. Cement and Lime Mortars: Prepare and use only when substrate and ambient air temperatures are between 40 degrees Fahrenheit and 90 degrees Fahrenheit. Protect installed mortar by approved methods when exposed to sunlight and when temperatures are above 80 degrees Fahrenheit.

B. Cold Weather Masonry Construction: Do not proceed with masonry construction when masonry temperature or ambient air temperature is below 40 degrees Fahrenheit or when ambient air temperature is expected to drop below 40 degrees Fahrenheit within 72 hours of use of mortar.

1. Remove all masonry work determined by Architect or Restoration Consultant to have been damaged by freezing conditions and rebuild following requirements of these specifications to Architect or Restoration Consultant's satisfaction at no additional cost to Owner.

C. Hot Weather Masonry Construction: Protect work during hot weather (ambient air temperature above 80 degrees Fahrenheit, direct sunlight, or windy conditions) from premature drying or too rapid curing by use of dampened fabric coverings or other approved methods.

1.09 COMBINED FILE SUB-BID REQUIREMENTS FOR MASONRY (SECTIONS 040105, 040110, 040115, 040140)

A. Bidding procedures shall be in accordance with latest edition of Massachusetts General Laws, Chapter 30, Section 39M, and Chapter 149, Section 44; as modified by Chapter 484 (1984) and Chapter 30B, Uniform Procurement Act

(1990). Time and place for submission of sub-bids is given in Advertisement for Bids.

B. Sub-bids for work under this Section shall be for complete work and shall be filed in a sealed envelope with Awarding Authority, at time and place specified in Advertisement for Bids. Following shall appear on face of envelope:

CITY OF NEWTON
NEWTON CITY HALL WAR MEMORIAL ENTRY
RESTORATION: PORTICO AND STEPS
[NAME OF SUB-BIDDER]
COMBINED SUB-BID FOR MASONRY (SECTIONS 040105, 040110, 040115, 040120, 040140)

C. Every sub-bid submitted for work under this Section shall be on forms furnished by Awarding Authority, as required by Section 44 of Chapter 149 of General Laws, and specified in Advertisement for Bids.

D. Sub-bids filed with Awarding Authority shall be accompanied by bid deposits in form of a bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank of trust company, payable to Town of Belmont in compliance with Chapter 149, Section 44B. Amount of bid deposit shall be 5 percent of value of bid.

E. This section, together with Section 040105: Restoration Mortars, Section 040110: Masonry Cleaning, Section 040140: Exterior Stone Restoration, comprises filed sub-bid on masonry.

F. Work to be done under this Section is shown on the following Drawings: R-1 and R-2.

PART 2 -PRODUCTS

2.01 TOOLS

A. Hand Tools: Chisels, hammers, and mallets.

1. Thickness of Chisels: Chisels used to remove mortar from and to otherwise prepare joints shall have a maximum thickness of 5/8 times joint width extending back from tip of chisel a minimum of two (2) times depth at which chisel will be inserted into joint.

2. Special Tools: Provide special knives or special thin cutter blades for use in joints less than 1/8 in. wide.

B. Power Tools: Small, hand-held electric grinders with diamond or abrasive blades no greater than 3/32 in. thick and a maximum of 4-1/2 in. in diameter may be used to cut joints only under certain conditions as described in Part 3, below, and if specifically approved by Architect or Restoration Consultant.

C. Brushes: Stiff, natural bristle brushes.

D. Trowels for Pointing: Long, thin pointing trowels that are narrower than joints being pointed.

1. Fabricate special trowels for pointing if necessary to provide for proper insertion and compaction of mortar.

2.02 MORTAR

A. Follow requirements of Section 040105 – Restoration Mortars. Mortar shall match existing original mortar in cleaned masonry in color, texture, and other visual qualities to satisfaction of Architect or Restoration Consultant.

PART 3 -EXECUTION

3.01 GENERAL PREPARATION

A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Before using power grinders or hand methods that generate airborne dust, erect dust impervious barriers to prevent escape of dust. Take all other necessary measures to prevent dust from traveling beyond work area.

3.02 JOINT PREPARATION

A. Remove mortar from joints to a depth of 3/4 in. or to sound mortar, whichever is greater. In all cases remove all weathered and loose material.

B. Take all necessary precautions to ensure that faces and arrises of masonry units are not damaged in any way during joint preparation.

C. Joint preparation shall cease if, in judgment of Architect or Restoration Consultant, Contractor's methods are damaging masonry units. Work shall not resume until tools, workmen, and methodology are corrected to meet standard of approved quality control panel.

D. Remove all mortar from surfaces of masonry units adjoining joint to allow new mortar to bond directly with masonry units. Surface at rear of joint shall be uniform and roughly perpendicular to sides of joint.

E. Mortar Removal:

1. Hand Tools: Use hand tools for removal of mortar from joints less than 6 in. long and from all other joints in which use of power tools might cause damage to masonry units. Use hand tools to complete mortar removal from joints where power tools have been used to partially remove mortar.

   a. Sharpen chisels hourly to minimize chipping.

2. Power Tools: With specific prior approval from Architect or Restoration Consultant following successful demonstrations of skill by mechanics, power grinders may be used to partially remove mortar from horizontal joints in masonry and from joints longer than 6 in. in stone masonry where there is no danger of cutting into adjacent masonry units.

   a. Demonstrated Ability of Mechanics: Prior to beginning work, demonstrate that all workmen using power tools are proficient in use of power tools for joint preparation. Failure to demonstrate to satisfaction of Architect or Restoration Consultant that each worker is proficient and that power tool joint preparation does not result in damage to masonry to remain shall result in prohibition of use of power tools for joint preparation. If proficiency is not demonstrated, or if work in progress results in damage to masonry to remain, all power tool work shall cease, and joints shall be prepared using hand tools.

   b. Limitations on Use of Power Tools:

      1) Do not use power grinders on joints less than 3/16 in. wide or less than 6 in. long or where projections, ornament, or other surface irregularity might make damage to masonry units likely.

      2) Use power grinder only to score one kerf in center of each joint to depth of mortar removal required. Remove remaining mortar using hand tools.

      3) Stop kerf at least 4 in. from inside corners and projecting elements. Remove remaining mortar using hand tools.

      4) Contractor may construct jigs to guide power tools and to prevent damage to adjacent masonry.

F. Cleaning: Remove loose mortar and foreign material from raked joints using a fine, stiff natural bristle brush. Remove remaining particles, dust, and dirt using filtered, oil-free compressed air. Ensure that dust and dirt are not blown back into joints that have previously been cleaned.

G. Repair or replace masonry units damaged during joint preparation process to satisfaction of Architect or Restoration Consultant at no additional cost to Owner.

3.03 MORTAR APPLICATION FOR STONE-TO-STONE JOINTS

A. Wetting: Thoroughly wet masonry 24 hours prior to and again immediately before pointing. Let surfaces dry slightly. At time of pointing, surfaces should be damp, so that they do not rapidly absorb moisture, but free of standing water.

B. Pointing: Point joints as follows:

1. Using a long, thin pointing trowel, tightly pack mortar into joints in layers not exceeding 1/4 in. thick to fill joint to match original sound joints.

2. Begin by filling areas from which mortar is missing to a depth greater than 3/4 in. in 1/4-in.-thick layers to within 3/4 in. of wall surface to provide a uniform substrate for final pointing. Fill final 3/4-in. depth continuously and uniformly in 1/4-in.-thick layers.

3. Firmly iron each layer to compact mortar to ensure a full bond between mortar and masonry and a firm, solid joint.

4. Allow each layer to reach thumbprint hardness before applying succeeding layer. Do not let previous layer dry out before applying succeeding layer. Construct uniform joints.

5. Do not spread mortar over edges onto exposed surfaces of masonry units. Do not featheredge mortar.

6. When stopping work at end of each day or for other reasons, stagger layers of mortar so that there will be no through joints in pointing. Stagger joints in layers so that they are at least 3 in. from each other.

7. Where one day's work joins that of the previous day, dampen previous work to ensure a good bond.

C. Joint Tooling

1. Tooling: After final layer of mortar is "leather hard," tool joints as directed by Architect or Restoration Consultant.

2. Profile: Tool joints to profile approved by the Architect or Restoration Consultant. Solidly compress mortar so that it adheres well to masonry on both sides and forms a dense surface. Premature or late tooling will result in unacceptable finishes that will be rejected.

3. Duplicate the finish of a slightly weathered joint by brushing newly pointed joints with a nonmetallic natural fiber bristle brush to produce a slight texture.

D. Curing

1. Keep newly pointed joints damp for at least 48 hours after mortar has been inserted. Do not apply a direct stream of water to joints for at least 24 hours after mortar has been placed.

2. Ensure masonry temperature remains as required by specifications until mortar is thoroughly cured.

E. Cleaning And Repair Of Mortar Joints

1. Water Washing: Wash pointed masonry with clean filtered water and nonabrasive hand tools to remove mortar debris from masonry surfaces.

a. Wash within 48 hours following completion of pointing.

b. Use blunt-edged wood scrapers, stiff natural bristle brushes, and rough towels along with water to remove mortar debris. Do not use wire brushes.

2. Repair of Pointed Joints: As cleaning progresses, examine joints to locate cracks, holes, and other defects. Carefully point up and fill such defects with mortar. Where necessary in opinion of Architect or Restoration Consultant, cut out joints and refill with pointing mortar exercising extreme care to ensure that color matches that of original pointing work. Exposed joint surfaces shall be free from protruding mortar, holes, pits, depressions, and other defects.

3.04 CORRECTIVE MEASURES

A. Should a crack occur in a joint surface or should mortar separate from masonry unit, cut out mortar and repoint following requirements of this Section to satisfaction of Architect or Restoration Consultant.

B. Should Architect or Restoration Consultant determine that any masonry pointing work does not equal or exceed minimum standard established by approved quality control panel, cut out mortar and repoint following requirements of this Section to Architect or Restoration Consultant's satisfaction.

END OF SECTION 040115

SECTION 040140

EXTERIOR STONE MASONRY RESTORATION

(Filed Sub-Bid Required)

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.02 SCOPE OF WORK

A. General: Provide all labor, materials, equipment, and services required for exterior stone restoration of the Steps of the War Memorial Entry at Newton City Hall, Newton, Massachusetts, and the Civil War Memorial, Newton Cemetery, Newton, Massachusetts, as indicated on the Drawings, as specified herein, and as may be required by conditions and authorities.

Exterior Stone Restoration includes, but is not limited to, the following

1. Detailed documentation of stone to be dismantled and rebuilt.

2. Rebuild areas of granite and limestone with existing granite and/or limestone and/or replacement units as indicated on the Drawings. Note: This includes the rebuilding of the two (2) granite flagpole bases adjacent to the site at the War Memorial Entry of Newton City Hall.

3. Dismantling and rebuilding all exterior masonry components of granite and marble areas of the Civil War Memorial at Newton Cemetery as indicated on the Drawings.

4. Repair of missing, broken, and severely deteriorated areas of granite and limestone with granite and limestone dutchmen where indicated on Drawings.

5. Preparing and filling cracks in granite and limestone with composite patching material to match profile, color, and texture of adjacent stone where indicated on Drawings.

6. Patching minor losses and voids in granite and limestone using composite patching material to match profile, color, and texture of adjacent stone where indicated on Drawings.

7. Replace deteriorated or missing granite and limestone elements with new granite and limestone to match existing and/or adjacent limestone in color, texture, and profile where indicated on the Drawings.

8. Removal of all ferrous anchors, pins, dowels, and other elements from stone to be rebuilt and replacement of these elements with stainless steel elements during reconstruction.

9. Provision for repair or replacement of any stone broken or damaged during disassembly and reconstruction. Contractor will be responsible for damage resulting from work of this Section. Repairs and replacements should be performed according to the procedures outlined in Parts 2 and 3 of this specification.

10. Providing all shoring and bracing required to maintain stability of stone and brick masonry during work of this Section.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Masonry Cleaning - Section 040110.

B. Restoration Mortars - Section 040105.

C. Masonry Pointing - Section 040115.

1.04 QUALITY ASSURANCE

A. Restoration Specialist: All exterior stone restoration work shall be performed by a firm regularly engaged in restoration of stone masonry on historic buildings. Firm shall demonstrate to Restoration Consultant's satisfaction that, within previous five (5) years, they have successfully performed and completed in a timely manner at least three (3) projects similar in scope and type to required work involving facilities designated as landmarks by local governmental authorities or buildings listed on the National Register or State Registers of Historic Places under the supervision of preservation authorities.

1. Foreman: Work of exterior stone restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Restoration Specialist.

2. Mechanics: Exterior stone restoration shall be carried out by skilled mechanics who are thoroughly experienced with materials and methods specified, have a minimum of three (3) years experience with work on historic buildings similar to that required by this Section, and are familiar with design requirements.

    a. Employ skilled stonecutters at the site to do necessary field cutting.

B. Mechanic's Samples: All mechanics planned for use on project shall successfully complete specified samples of representative types of work in presence of Restoration Consultant prior to working on project. Unsuccessful performance in these sample areas shall be grounds for rejection of this technician for work on project.

C. Standards: Work of this Section shall comply with following standards:

    1. United States. Department of the Interior. *Secretary of the Interior Standards for Rehabilitation of Historic Buildings.*

D. Knowledge of Site: Bidders shall visit site beforehand to make themselves familiar with specific conditions relating to this Section. Signing of contract for work of this Section shall be considered acknowledgment that Contractor for work of this Section has examined site and is fully aware of conditions affecting performance of work of this Section.

E. Shoring and Bracing: Provide shoring and bracing required to ensure stability of stone and brick masonry during work of this Section. If during work of this Section, there is any possibility that removal of masonry units or other work will in any way affect the stability of the remaining masonry or allow portions of the remaining masonry to move or become displaced, provide shoring and bracing to ensure stability of masonry walls.

    1. Shoring and bracing shall be designed by a Professional Engineer licensed by the Commonwealth of Massachusetts employed by the Contractor or engaged by the Contractor at the Contractor's expense. Drawings and calculations for the shoring and bracing shall bear Professional Engineer's original signature and seal.

1.05 SUBMITTALS

A. General: Contractor shall submit the following "Submittals." Revise and resubmit each item as required to obtain approval of Architect or Restoration Consultant. Do not begin work until submittals have been approved in writing by Architect or Restoration Consultant.

B. Qualification Data: Submit qualification data for firm and personnel specified in "Quality Assurance" Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three (3) completed projects within the New England region similar in size and scope to work required on this project. For each project list project name, address, Architect, conservator, supervising preservation agency, scope of contractor's work, and other specified information. This information shall be submitted with the bid.

C. Program of Work: Written program for restoration work specified in this Section.

D. Product Literature: Manufacturer's technical data for each product to be used for work of this Section. Include recommendations for application and use, safety precautions, certified test reports indicating that product complies with specified requirements and referenced standards, and, where applicable, Material Safety Data Sheets (MSDS).

E. Proposed Alternate Methods and Materials: If alternate methods and materials to those specified are proposed for any phase of exterior stone restoration work, the Contractor shall provide a written description of successful use on comparable projects.

F. Documentation of Existing Conditions: Submit documentation of existing condition of masonry to be dismantled prior to beginning disassembly.

G. Samples: Prior to commencement of any work specified under this Section, submit the following:

1. Anchors, Inserts, Dowels, and Attachments: Samples of each type specified in this Section and proposed for use.

2. Replacement Limestone: 6"x6" sample of replacement limestone to be used if replacement is deemed necessary.

H. Designs for Shoring and Bracing (if Any): If shoring and bracing is required to comply with Paragraph "Shoring and Bracing" of Article "Quality Assurance" above, submit designs and calculations for shoring and bracing prepared by Contractor's Professional Engineer.

1. Submission of designs for shoring and bracing does not relieve Contractor of Contractor's sole responsibility for providing shoring and bracing as required to ensure the stability of the masonry.

1.06 QUALITY CONTROL PANELS

A. General: Before beginning general exterior stone restoration, prepare quality control panels to provide standards for work of this Section. Do not proceed with exterior stone restoration until Architect or Restoration Consultant has approved relevant quality control panels in writing.

1. Locate quality control panels in locations as directed by or acceptable to Architect or Restoration Consultant.

2. Provide 48 hours notice to Architect or Restoration Consultant prior to start of each quality control panel.

3. Architect or Restoration Consultant will monitor quality control panels. Panels not performed in presence of Architect or Restoration Consultant will not be accepted.

4. Repeat quality control panels as necessary to obtain approval by Architect or Restoration Consultant.

5. Protect approved quality control panels to ensure that they are without damage, deterioration, or alteration at time of Substantial Completion.

6. Approved quality control panels in undamaged condition at time of Substantial Completion may be incorporated into the Work.

7. Approved quality control panels will represent minimum acceptable standard for exterior stone restoration work. Subsequent work that does not meet standard of approved quality control panels will be rejected.

B. Provide the following quality control panels: Note: Quality Control Panels are to be provided for each site. Below lists all panels that are applicable to one or both sites.

1. Preparation and Filling of Cracks in Limestone and Granite: Two (2) cracks totaling at least two (2) linear feet. Panels will be evaluated for color, texture, and tooling.

2. Dutchman Repair in Limestone and Granite: Two dutchmen. Panels will be evaluated for stone color and texture, preparation, anchors, mortar, and joint width and finish.

3. Composite Patching in Limestone: Two (2) patches. Panels will be evaluated for color, surface finish, profile, and tooling.

4. Stone-to-Stone Repair: One (1) repair. Panel will be evaluated for continuity of plane and profile, anchors, and joints.

5. Pinning: One (1) repair. Panel will be evaluated for continuity of plane and profile, anchors, and joints.

6. Removal of Deteriorated Stone: Two panels, one containing an individual stone block and one area containing multiple stone blocks, as designated by Architect or Restoration Consultant. Panels will be evaluated for methodology, removal techniques, and impact on adjacent stone units.

7. Rebuilding Stone Masonry: One (1) area including at least 1 stone block. Panel will be evaluated for surface finish, continuity of plane and profile, anchors, joints, and impact on adjacent stone units.

1.07 DEFINITIONS

A. Dutchman Repair: Repair of deteriorated or missing portion of existing stone block by insertion of a block of new or salvaged stone of matching color and texture into existing stone unit to restore original planes and profiles.

B. Stone-to-Stone Repair: Repair of stone block where a remaining detached piece of original stone unit is glued and pinned into its original location or to its mated portion.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver materials to site until they have been approved by Architect or Restoration Consultant.

B. Deliver and store materials in manufacturers' original sealed containers or packaging, clearly labeled with manufacturer's name, address and product identification, including grade, type, and color. Immediately reseal containers after partial use.

C. Store all materials in spaces designated by Owner. All such spaces shall comply with pertinent federal, state, and local laws, codes, and regulations.

1. Maintain temperatures in storage spaces within range recommended by manufacturer of material being stored in each case. Protect liquid components from freezing.

2. Store products and materials at least 4 inches above ground and protect them from water, dampness, or high humidity.

D. Deliver, store, and handle all products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

E. Discard and remove from site deteriorated or contaminated materials and products that have exceeded their expiration dates. Replace with fresh materials.

F. Cut Stone:

1. Store stone on dry cured white pine or similar non-staining planking set so as to be entirely clear of ground and arranged so that there shall be no stick marks on exposed faces. Protect arrises from damage and keep all surfaces free from dirt, soot, grime, grease, or other discoloring matter.

2. Stones shall be handled by competent workmen using methods that guard against soiling, chipping, or other mutilation.

G. Remove and replace all materials damaged while in storage or during handling at no additional cost to Owner and in a manner causing no delay in progress of work.

1.09 PROJECT CONDITIONS

A. Laws and Regulations: Perform all work of this Section in compliance with all applicable federal, state, and local laws and regulations.

B. Protection of Persons: Protect all persons, whether or not they are involved with work of this Section, from harm caused by work of this Section.

C. Protection of Building: Protect building elements and finishes from damage or deterioration caused by work of this Section. No damage to existing building elements and finishes to remain shall be acceptable. Repair any damage to building elements and finishes to satisfaction of Architect or Restoration Consultant at no additional cost to Owner.

1. Protection from Weather: Cover all open joints and areas from which units have been removed at all periods during which work is suspended to ensure materials or finishes are not damaged by wind or water penetration. Install covers using methods that do not damage masonry

D. Protection of Existing Masonry: Take all necessary precautions to protect adjacent surfaces and materials from damage resulting from products, equipment, and tools used for exterior stone restoration.

1. Protect sills, ledges, and projections from droppings of mortar.

2. Prevent mortar from staining face of adjacent masonry.

3. Prevent mortar or dirty water from splashing up on stone at bases of walls.

E. Protection of Site and Surroundings: Protect adjacent buildings, site, landscape features, public rights of way, motor vehicles, and other surrounding elements from damage and deterioration resulting from work of this Section.

1. Protect lawns, plantings, and landscape features in a manner that will allow light and water to reach them.

2. Provide for collection and disposal of all excess water used in preparation of mortars and grouts and of all water runoff from procedures of prewetting masonry and misting pointed masonry to prevent contaminated water from damaging lawns, plants, trees, and other elements.

F. Material Safety: All chemical materials shall be safe in use and shall comply with all applicable federal, state, and local laws and regulations.

G. Access for Inspection and Approvals: Provide Restoration Consultant access on a regular basis to locations on which testing or quality control panels are being carried out, on which work is ongoing, and where work has been completed to allow for inspections and approvals. Provide means of access and safety precautions required to facilitate inspections and approvals.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Use of Materials: Use materials only under the following conditions unless more stringent conditions are specified by product manufacture. The most stringent conditions shall govern.

1. Cement and Lime Mortars: Prepare and use only when substrate and ambient air temperatures are between 40 degrees Fahrenheit and 90 degrees Fahrenheit. Protect installed mortar by approved methods when exposed to sunlight and when temperatures are above 80 degrees Fahrenheit.

2. Jahn Patching Mortars: Prepare and use only when substrate and ambient air temperatures are between 40 degrees Fahrenheit and 90 degrees Fahrenheit and when air temperature will remain above 40 degrees for at least 48 hours following use of patching mortar. Protect patching by approved methods when temperatures are above 70 degrees Fahrenheit.

3. Edison Patching Mortars: Prepare and use only when substrate and ambient air temperatures are between 50 degrees Fahrenheit and 90 degrees Fahrenheit and when air temperature will remain above 50 degrees

for at least 48 hours following use of patching mortar. Protect patching by approved methods when there is wind and when temperatures are above 90 degrees Fahrenheit.

4. Mimic Patching Mortars: Prepare and use only when substrate and ambient air temperatures are between 50 degrees Fahrenheit and 90 degrees Fahrenheit and when air temperature will remain above 50 degrees for at least 48 hours following use of patching mortar. Protect patching by approved methods when there is wind and when temperatures are above 90 degrees Fahrenheit.

5. Epoxy Adhesives: Prepare and use only when substrate and ambient air temperatures are between 50 degrees and 90 degrees.

6. Sealants: Prepare and use only when substrate and ambient air temperatures are within middle 2/3rds of temperature range recommended for installation by sealant manufacturer.

B. Cold Weather Masonry Construction: Do not proceed with masonry construction when masonry temperature or ambient air temperature is below 40 degrees Fahrenheit or when ambient air temperature is expected to drop below 40 degrees Fahrenheit within 72 hours of use of mortar.

1. Remove all masonry work determined by Restoration Consultant to have been damaged by freezing conditions and rebuild following requirements of these specifications to Restoration Consultant's satisfaction at no additional cost to Owner.

C. Hot Weather Masonry Construction: Protect work during hot weather (ambient air temperature above 80 degrees Fahrenheit, direct sunlight, or windy conditions) from premature drying or too rapid curing by use of dampened fabric coverings or other approved methods.

1.15 COMBINED FILE SUB-BID REQUIREMENTS FOR MASONRY (SECTIONS 040105, 040110, 040115, 040140)

A. Bidding procedures shall be in accordance with latest edition of Massachusetts General Laws, Chapter 30, Section 39M, and Chapter 149, Section 44; as modified by Chapter 484 (1984) and Chapter 30B, Uniform Procurement Act (1990). Time and place for submission of sub-bids is given in Advertisement for Bids.

B. Sub-bids for work under this Section shall be for complete work and shall be filed in a sealed envelope with Awarding Authority, at time and place specified in Advertisement for Bids. Following shall appear on face of envelope:

CITY OF NEWTON
NEWTON CITY HALL WAR MEMORIAL ENTRY
RESTORATION: PORTICO AND STEPS
[NAME OF SUB-BIDDER]
COMBINED SUB-BID FOR MASONRY (SECTIONS 040105, 040110, 040115, 040120, 040140)

C. Every sub-bid submitted for work under this Section shall be on forms furnished by Awarding Authority, as required by Section 44 of Chapter 149 of General Laws, and specified in Advertisement for Bids.

D. Sub-bids filed with Awarding Authority shall be accompanied by bid deposits in form of a bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank of trust company, payable to Town of Belmont in compliance with Chapter 149, Section 44B. Amount of bid deposit shall be 5 percent of value of bid.

E. This section, together with Section 040105 Restoration Mortars, Section 040110: Masonry Cleaning, Section 040115: Masonry Pointing, comprises filed sub-bid on masonry.

F. Work to be done under this Section is shown on the following Drawings: R-1 and R-2.

PART 2 - PRODUCTS

2.01 MATERIALS, GENERAL

A. Grade and Quality: Materials shall conform to requirements of this Section and shall be new, free from defects, and of recent manufacture.

1. Where any manufacturer makes more than one grade of each material specified, use highest grade and quality of each material.

B. Ready-Mixed Products: Wherever a ready-mixed product is specified for use, containers shall bear labels giving exact formula of product. Product shall be subject to chemical analysis by laboratory selected by Owner.

C. Manufacturer's Instructions: Comply with material manufacturer's instructions for use of products (including surface preparation, mixing, applying, drying, etc.). In case of conflict with requirements of this Section, the more stringent requirements shall govern.

2.02 MASONRY UNITS

A. Limestone: Sound, new limestone complying with ASTM C 568 and matching adjacent cleaned, existing limestone in profile, color, texture, and finish to satisfaction of the Architect or Restoration Consultant.

2.03 ANCHORS AND ATTACHMENTS

A. General: All anchors and attachments for installation of stone masonry and installation of dutchmen shall be stainless steel, ASTM A 167, Type 302, 304, 305L, 316, or 316L. All anchors and attachments to be welded shall be Tye 304L or 316L.

1. Provide anchors, cramps, dowels, and other attachments by one of the following:

a. Hohmann and Barnard, Inc., 30 Rasons Court, P.O. Box 270, Hauppauge NY 11788, (516) 234-0600;

b. Heckmann Masonry Ties & Anchors, 4015 W Carroll Ave., Chicago, IL 60624, (800) 621-4140;

c. Dur-O-Wall, Inc., (800) 438-7692.

2. Expansion bolts, cinch bolts, and plugs are not acceptable.

B. Anchors and Fasteners for Stone Dutchmen:

1. Small Veneers: 1/8"-diameter stainless steel wire with turned up ends.

2. Direct Pinning and Drop Dowels: Threaded stainless steel rod.

a. Pinning Small Dutchmen: 1/4" diameter.

b. Pinning Stone Blocks: 3/8" diameter.

3. Dutchmen Over 1 Cubic Foot: 1" wide by 1/8" thick, stainless steel strap anchors.

C. Anchors for Stone Units: 1" wide by 1/8" thick, stainless steel strap anchors or 3/8" diameter stainless steel rod in configuration to match original anchors and as shown on Drawings and approved shop drawings.

D. Anchors for Setting Individual Stone Replacement Units: Concealed front anchors to tie to adjoining units, Type HB C3.

E. Pins for Composite Patching: 1/4"-diameter or 3/8"-diameter threaded Teflon rod.

2.04 MORTAR INGREDIENTS

A. Refer to Section 040105, Part 2, for mortar mix to be used.

2.05 COMPOSITE FILLING AND PATCHING MATERIALS

A. General: Mortars shall be custom formulated to match existing stone being repaired in all respects and shall be premixed and pigmented at manufacturer's plant.

1. Color Matching: Provide several custom mixes in cooperation with the manufacturer, until match is achieved to Restoration Consultant's satisfaction, of each product as required to match color of various existing stone units to be filled and patched.

B. Patching Mortar for Filling Cracks in Limestone: Refer to Section 040105, Article 2.02 for products to be used.

C. Patching Mortar for Limestone: Refer to Section 040105, Article 2.02 for products to be used.

2.06 MISCELLANEOUS MATERIALS

A. Adhesive for Pinning and Anchor Installation: High modulus, high strength, moisture-insensitive, high-viscosity epoxy adhesive complying with ASTM C 881, Types I, II, IV & V, Grade 1. Provide Sikadur 31, Hi-Mod Gel, as manufactured by Sika Corporation, Lyndhurst, NJ, (201) 933-8800, or approved equal.

B. Adhesive for Adhering Stone Units: High modulus, high strength, moisture-insensitive, low-viscosity epoxy adhesive complying with ASTM C 881, Types I, II, III, IV & V, Grade 1. Provide Sikadur 32, Hi-Mod, as manufactured by Sika Corporation, Lyndhurst, NJ, (201) 933-8800, or approved equal. Modify viscosity as required to completely fill crack without loss of adhesive.

2.07 TOOLS FOR MORTAR REMOVAL

A. Hand Tools: Chisels, hammers, and mallets.

1. Thickness of Chisels: Chisels used to remove mortar from or prepare joints shall have a maximum thickness of 5/8 times joint width extending back from tip of chisel a minimum of one-and-one-half times depth at which chisel will be inserted into joint.

2. Special Tools: Provide special knives or special thin cutter blades for use in joints less than 1/8" in width. Fabricate special tools as required to provide for removal of mortar without damaging masonry units.

B. Power Tools: Small, hand-held electric grinders with diamond or abrasive blades no greater than 3/32" thick and a maximum of 4-1/2" in diameter may be used to cut joints only under certain conditions as described in Part 3, below, and if specifically approved by Restoration Consultant.

C. Brushes: Stiff, natural bristle brushes.

2.08 STONE FABRICATION

A. Cut stone accurately to shape and dimension to comply with Drawings and approved shop drawings. All exposed surfaces shall be true, and arrises shall be sharp and continuous with adjoining arrises. Exposed surfaces shall replicate tooling pattern and textures of adjacent existing stone blocks.

B. Dress bed and head joints full thickness of unit and at right angles to face, unless otherwise shown or required for installation.

C. Cut holes and sinkages to receive anchoring devices indicated on Drawings, to match anchorages of blocks being replaced, and as shown on approved shop drawings.

2.09 PROPORTIONS OF MORTAR MIXES

A. Proportions for mortar mixes are given in Section 040105, Part 2.

PART 3 - EXECUTION

3.01 GENERAL

A. Contractor for work of this Section shall be fully responsible for the proper execution and performance of the work described herein.

B. Contractor for work of this Section shall inspect areas and conditions under which work is to be performed. It shall be Contractor's responsibility to report in writing to Architect or Restoration Consultant any conditions that might adversely affect work of this Section. Work shall not proceed until all defects and all conditions that might adversely affect restoration work have been corrected.

C. Stonework shall be executed by skilled mechanics, thoroughly trained and familiar with the methods required. Employ skilled stonefitters at site to do necessary field cutting.

D. Drill holes for anchors in existing stone using non-percussive, rotating core drills. Do not break joints of in-place existing stone blocks during preparation for rebuilding or replacement block insertion.

E. Coordinate rebuilding activity and repairs to stone with work by other trades.

F. All finished and unfinished work shall be protected from the elements in an approved manner at the end of each day.

D. Shoring and Bracing: If shoring and bracing is required based on requirements of Article "Quality Assurance", above, provide shoring and bracing to ensure stability of masonry walls. Remove shoring and bracing after holes in wall have been filled.

3.02 DOCUMENTATION

A. General: All stones to be dismantled shall be carefully documented photographically and identified in shop drawings prepared by Contractor. Documentation shall include dimensions and configuration of backup masonry. Methodology for documentation shall be submitted to the Architect or Restoration Consultant for approval prior to beginning any work.

B. Record overall dimensions of masonry to be dismantled and thicknesses of all joints prior to dismantling masonry in order to ensure accurate reproduction during rebuilding. Record joint profiles. Drawings shall be reviewed by Restoration Consultant and necessary corrections made prior to rebuilding of masonry.

C. Mark each stone block immediately upon removal with a specific number corresponding to a number on drawings. Mark stone blocks in inconspicuous locations that shall not be visible when stones are reset.

D. Record methods of reinforcement, anchorage, and all other construction elements and details necessary to rebuild masonry to sound condition.

3.03 DISMANTLING OF MASONRY

A. For disassembly purposes, rake bed joints for full thickness using approved techniques. Keep each stone securely in place during entire process of removing old mortar from joints.

1. Do not damage arrises or surfaces of blocks.

a. If damage occurs, stop work. Change methods and personnel as required to dismantle masonry without damage to exposed surfaces.

b. Fill and patch all damaged blocks using composite patching mortar or dutchman repairs following requirements of this Section at no additional cost to Owner.

B. Carefully remove all mortar remaining on stone blocks to be reset using approved methods that do not damage planes or arrises.

C. Remove carefully all existing ferrous anchors, fasteners, dowels, and other elements used to hold stones in place. If necessary, drill out anchor using a masonry bit 1/8" larger in diameter than existing hole created by embedded metal.

D. After removing ferrous anchors and other elements, clean holes left in masonry using compressed air.

E. As far as possible, reuse existing anchor holes for new stainless steel anchors, pins, fasteners etc.

F. Cut holes for lifting stones in all stones weighing more than 100 pounds where such holes do not exist. Do not place these holes closer than 1-1/2" to finished faces.

3.04 REBUILDING OF MASONRY

A. Set all stone units accurately in accordance with approved setting drawings. Setting shall be true to line and level and shall have all joints and anchor holes completely filled with mortar. Upon completion of setting of all cut stone, point and finish joints as specified herein under pointing.

B. Where indicated on Drawings, required by conditions, and as shown on approved shop drawings, drill new holes to receive anchors, cramps, dowels, etc. Use methods that do not damage stone.

C. Install stones with original nonferrous metal anchors if they exist. If there are no existing anchors or if existing anchors are ferrous, provide new stainless steel pins, dowels, and anchors.

D. Use nylon wedges as necessary to secure proper setting of stone. Pack all bed joints tightly with mortar. Clean wedges before using them and remove wedges before mortar has set hard. Fill resulting holes with mortar.

E. Clean all stone before setting. Remove old mortar. Scrub stone with non-ionic detergent and water using synthetic bristle brushes. Thoroughly rinse stone with clean water.

F. The thickness of joints in all cut stonework shall be uniform and shall not exceed existing joint thickness, unless otherwise specified.

G. Patching of defects shall not be permitted. Chips and stains on faces shall be redressed or cleaned. No acid leaching agent shall be permitted.

H. Rake mortar from face of joints to prepare for pointing.

3.05 STONE REPAIR USING DUTCHMEN

A. General: Provide dutchman repairs as indicated on the Drawings.

B. Preparation of Existing Stone: Cut away deteriorated or damaged portion of stone to sound stone. Remove additional sound stone as necessary to provide hole to receive dutchman at least 2" deep. Cut sides of area to receive dutchman parallel to edges of stone block. Sides shall be cut perpendicular to stone face. Do not weaken stone.

C. Dutchman Preparation: Provide sound stone free of defects, cracks, breaks, or other observable damage. Dress dutchman on all sides and carefully fit to opening in stone, with an allowance of not more than 1/8" buttered joints at face. Dress surface of dutchman to match appearance, tooling, and texture of adjacent stone using an approved method. All surface dressing of dutchman shall be done before dutchman is installed.

D. Anchoring: Fasten dutchman with stainless steel wire, pins, and anchors as required to provide mechanical locking and to prevent possible slippage of stone. Position metal fasteners without weakening stone in any way.

1. Provide a minimum of two (2) metal attachments for securing each dutchman with one (1) additional attachment for every two (2) additional square feet.

2. Attach anchors using epoxy adhesive and mechanical fastening.

3. Where permitted, anchors may be held in place with specified epoxy adhesive.

E. Installation: Install using specified "thin-set" mortar. Finish joints between new and old work to match color and texture of stone.

F. Protection and Cleaning:

1. Protect adjacent surfaces during dutchman repair. Remove any mortar accidentally splashed onto adjacent surfaces and rinse residue immediately. Remove uncured epoxy adhesive immediately with acetone.

2. Clean face of new stone patches following completion of dutchman installation. Clean mortar splashes, smears, etc. with scrapers, or by vigorously brushing with stiff natural bristle brushes and potable water. If necessary to remove mortar, clean white sand may be added to water.

3. Repair damage to stone or other materials to remain resulting from epoxy and mortar spills to satisfaction of Architect or Restoration Consultant at no additional cost to Owner.

3.05 STONE-TO-STONE REPAIRS

A. General: Reattach broken or loose stone sections using a concealed repair in locations indicated on Drawings.

B. Provide concealed repairs using the following procedure:

1. Drill holes into fractured inner surface of each of the 2 pieces of stone to be reunited.

2. Secure pieces with pins embedded in specified epoxy adhesive, which shall be applied to both faces of the break.

3. Provide a minimum of two pins for each repair for stone fragments with less than 1 square foot of surface area, and less than 1/8 cubic foot of stone. Provide an additional two pins for each additional square foot of surface area.

4. In situations involving the detachment of a very shallow fragment (no greater than 1" deep) the pieces may be attached using epoxy adhesive without pins.

C. All repaired stone blocks shall have planes and arrises carefully aligned. No piece of stone shall be out of plane by more than 1/16" and no arris shall be out of line with adjacent arris by more than 1/16".

3.07 ROUTING AND FILLING CRACKS

A. Rout out all cracks, including previously filled cracks, and fractures on stone surfaces that are wider than 1/16" to a depth of 5/8" and a width of 1/8". Do not damage stone surfaces.

1. Cracks, breaks, spalls and losses wider than 3/8" require insertion of stainless steel pins every 6" to provide additional key for mortar. Drill holes in the stone, fill hole with specified epoxy resin, and insert pins in holes, and allow epoxy to cure. Protect face of stone block and sides of crack to receive mortar from contact with epoxy.

B. Clean cracks thoroughly using fine brush or oil-free compressed air to remove granular particles and dust. Following cleaning, thoroughly rinse joint surfaces to remove loose mortar within joint so that new mortar bonds directly to stone and to prevent too rapid loss of water from mortar.

C. Brush crack with a mortar slurry coat, and fill with specified composite mortar matching the color and texture of adjacent cleaned stone.

D. Surface of repaired crack shall be flush with face of stone and shall be finished to match texture and finish of adjacent cleaned stone.

3.08 PINNING

A. General: Pin all masonry units designated on Drawings back to sound masonry. Provide a minimum of 2 pins for each masonry unit.

B. Drill holes through face of masonry into sound backup masonry.

C. Fill holes with epoxy resin, insert pins with outer ends at least 1" behind face of stone, and allow epoxy to cure. Protect face of stone block and sides of holes within 1" of stone surface from contact with epoxy.

D. Fill front portions of holes with mortar matching color and texture of cleaned adjacent stone. Apply mortar in lifts not exceeding 3/8" thick.

E. Surfaces of filled holes shall be flush with face of stone and shall be finished to match texture and finish of adjacent cleaned stone.

3.09 REPLACING STONE BLOCKS

A. General: Remove severely deteriorated stone blocks and replace with blocks of replacement stone to match adjacent stone in surface color, texture, and finish.

B. Removal: Carefully remove existing damaged stone block or blocks as specified in Paragraph "Dismantling of Masonry," above. Avoid damage to surfaces or arrises of adjacent blocks.

C. Provide new stone block to match size of original block to ensure continuous even joint lines.

D. Provide anchors specifically designed to secure individual replacement stones as indicated on Drawings.

E. Use clean nylon wedges to position block. Fill all joints solidly with mortar.

F. Rake mortar from face of joints to prepare for pointing.

3.10 REMOVAL OF ABANDONED METAL ELEMENTS AND ANCHORS AND PATCHING HOLES

A. General: Remove all abandoned metal elements, such as metal anchors, fasteners, wire, etc., carefully from stone. Patch holes left by removal of anchors and holes left from previous removal of elements from masonry.

B. Remove elements, where possible, by drilling with a masonry core bit 1/8" larger in diameter than existing hole created by embedded metal. Avoid damage to stone surface.

C. Clean holes from which elements have been removed using oil-free compressed air. Wet surfaces of holes and allow to dry slightly.

D. Fill holes with mortar matching color and texture of cleaned adjacent stone. Apply mortar in lifts not exceeding 3/8" thick.

E. Surfaces of filled holes shall be flush with face of stone and shall be finished to match texture and finish of adjacent cleaned stone.

3.11 PATCHING

A. General: Patch all losses in stone that measure less than 2" x 2" (4 square inches of surface area) with specified patching compound.

B. Remove loose mortar, masonry and old failed patches at areas to receive new patches. Cut stone back to at least 1/4" beyond extent of deteriorated material. Provide edges of area to be patched parallel or perpendicular to edges of stone face. Remove sound stone from bottom of area to be patched as required to provide minimum patch depth of 1/2".

C. Undercut edges of repair area to depth of about 1/2" to provide good mechanical key. Remove feathered edges and roughen substrate surface as necessary to provide mechanical key. Sound masonry with a hammer to verify its integrity.

D. Patch areas using approved composite patching mortar according to manufacturer's printed instructions, except as modified herein.

E. Build up patch in layers 3/8" thick. Score layers. Fully compact each layer and allow to become "thumbprint" hard before applying next layer. Take care not to spread patching compound onto exposed masonry surfaces, or to featheredge mortar.

F. Tool-finish layer to exactly match adjacent stone color, texture, and profile.

G. Cure all patched areas as recommended by manufacturer of patching material.

3.12 ADJUSTMENT

A. Correction of Work: Should Architect or Restoration Consultant determine that any work of this Section does not comply with specified requirements and/or does not equal or exceed minimum standard established by approved quality control panel, remove work and replace following requirements of this Section to the Architect or Restoration Consultant's satisfaction.

END OF SECTION 040140

APPENDICES

1. CORRESPONDANCE RELATING TO INSPECTIONS AND FINDINGS

Email correspondance from Steve Siegel to Russel Feldman, April 7, 2006
Preliminary evaluation and recommendations
Email correspondance from Russel Feldman to Nick Parnell,
Identifying the need for additional investigation at the Cemetery site
Email correspondance from Steve Siegel to Michael Keblin, June 21, 2006
Request for further investigation to Cemetery
Email correspondance from Steve Siegel to Russel Feldman, July 10, 2006
Preliminary findings from further investigation
Letter correspondance from Steve Siegel to Russel Feldman, July 31, 2006
Conclusions from further investigation

2. COMMUNITY PRESERVATION FUNDING GRANT APPLICATION

Dated October 15, 2004 for CPC funding of this Study

Russel Feldman

From: "Steve Siegel" <steve@siegelassociates.com>
To: <rfeldman@tbaarchitects.com>; <lharrington@bcausa.com>
Cc: <dan@siegelassociates.com>
Sent: Friday, April 07, 2006 3:06 AM

Dear Russel and Lisa,

Following our site visit to the civil war memorial/burial vault and subsequent review of Lisa's notes, we have put together our own assessment of how we might move forward on repairs to this structure. Please review and comment, before we include it in a more formal report.

Observed conditions:

- The top center "crown" over the vault face base stone has been removed from the face and rests on the ground in front of it. We don't know the history of this, but we suspect that rotational displacements of the base stone below may have left the crown vulnerable to toppling off.
- The base stone is rotated outward from the ground. An open gap between the base stone and the rough stacked stone seal of the vault can be seen from above.
- Existing wing retaining walls that flank the base stone are also rotated outwards from the ground.

Discussion:

Lisa suggested that the ongoing rotational failure of the stone along the front of the memorial is the result of lateral forces exerted on the rear of the vault by a large tree. After our own consideration of the site conditions, we suspect that a different mechanism is in play – we believe that the base stone and wing walls are not founded very deeply below grade, and are likely moving in response to normal lateral earth pressures.

At some point a modest gap between the base stone and the vault face would have opened up, allowing water, snow, and ice to get between these elements and then wedge them apart through freezing action. This activity should be considered to be ongoing. The gap at the top is quite pronounced.

Engineering and other considerations:

The base stone and wing walls should be reset on frost protected foundations to prevent movements due to frost heave. In addition, they should be tied into the foundations to help them retain the soil behind them. On the other hand a self-supporting concrete backup foundation might be poured, allowing the granite to rest on a shelf in front of the foundation.

We have concerns about whether the vault face and the vault immediately behind the face will be disturbed by the temporary removal and resetting of the base stone and wing walls.

Recommendations:

- Excavate two very narrow inspection pits, by hand, on either side of the vault. The goal is to determine the shape and physical condition of the vault arch construction.

- Hand-excavate a very narrow inspection pit at each wing wall and at the center base stone. The goal is to determine the depth to the bottom of the granite, and to find any footing structures that may be in place.
- Consult with an arborist to confirm or refute the hypothesis that the tree behind the vault is the culprit for the movements.
- Reconsider our approach after weighing the information gathered from the items above.

Further considerations:

- Can the City of Newton provide laborers to hand-dig the pits under our direction?
- Who must be notified if the vault is found to be failing?
- Do members of the cemetery association need to be present while we are doing any probing or excavation at the memorial?
- Our project seems small relative to the reconstruction of a failing vault.
- Our original scope and fee presumes that our work is isolated to just the front granite stones. Should the vault need reconstruction, the design will be under a separate contract.

Thank you in advance for your comments.

Regards, Steve Siegel

TBA ARCHITECTS, INC

MEMORANDUM

TO: NICK PARNELL

FROM: RUSSEL FELDMAN

PROJECT: STONE CONSERVATION, CITY HALL AND CEMETERY

SUBJECT: NEED FOR ADDITIONAL INVESTIGATION

DATE: JUNE 1, 2007

With our subconsultants Steve Siegel (structural engineer) and Lisa Harrington (stone conservator), we examined the existing conditions at the City Hall and also at the City Cemetery. We have advanced in design of the City Hall solutions however our team has concluded that the deterioration at the Civil War Memorial needs addition investigation.

At this point, we believe that the base stone and wing walls are not founded very deeply below grade, and are likely moving in response to normal lateral earth pressures. At some point a modest gap between the base stone and the vault face opened up, allowing water, snow, and ice to get between these elements and then wedge them apart through freezing action. This activity should be considered to be ongoing. The gap at the top is quite pronounced.

We will recommend that the base stone and wing walls be reset on frost-protected foundations to prevent movements due to frost heave. Possible solutions may include ties into the foundations to help them retain the soil or constructing a self-supporting concrete backup foundation to allow the granite to rest on a shelf in front of the foundation.

We are concerned for the condition of the vault itself, as it is possible that its failure may have contributed the displacement we are seeing outwardly. In order to establish the best solution to the condition, we recommend that the City arrange a selective demolition as directed by Mr. Siegel.

- Excavate two very narrow inspection pits, by hand, on either side of the vault. The goal is to determine the shape and physical condition of the vault arch construction.
- Hand-excavate a very narrow inspection pit at each wing wall and at the center base stone. The goal is to determine the depth to the bottom of the granite, and to find any footing structures that may be in place.

TBA ARCHITECTS, INC
241 CRESCENT STREET, WALTHAM, MA 02453
TEL 781 893-5828 FAX 781 893-5834
www.tbaarchitects.com

- Consult with an arborist to confirm or refute the hypothesis that the tree behind the vault is the culprit for the movements.

We will finalize our approach after weighing the information gathered from the items above.

Questions

Can the City of Newton provide the forces required to hand-dig the pits under our direction?

Who must be notified if the vault is found to be failing?

Do members of the cemetery association need to be present while we are doing any probing or excavation at the Memorial?

Please let me know if the City can arrange for the labor for excavation and provide access to the City Arborist for advice relative to the nearby tree. In addition, might you inform us of any member of the Cemetery Association who would be involved in coordinating the work or reviewing the outcome.

END

Russel Feldman

From: Steve Siegel [steve@siegelassociates.com]
Sent: Wednesday, June 21, 2006 12:05 PM
To: mvk@newcemcorp.org
Cc: rfeldman@tbaarchitects.com; acabral@newtonma.gov; nparnell@newtonma.gov; JMULVEY@newtonma.gov; lharrington@bcausa.com
Subject: Exploratory work at the Civil War Memorial, Newton Cemetery

June 21, 2006

Michael V. Keblin, Sr.
President & Treasurer
Newton Cemetery Corporation
Voice: (617) 332-0047 x13
Fax: (617) 969-5520
mvk@newcemcorp.org

Dear Michael,

We are ready to proceed with the site exploration of the War Memorial. Russel Feldman asked that I contact you directly about setting up the site work. The proposed scope of our initial investigation is noted below. It is copied from my May 9th email to you:

- Excavate a very narrow inspection pit against and perpendicular to each wing wall and at the center base stone. This work can be done either by hand, with a narrow bucket of a backhoe, or perhaps most expeditiously by using both. The goal is to determine the depth to the bottom of the granite, and to find any footing structures that may be in place.
- Excavate two very narrow inspection pits, by hand, on either side of where we originally thought there was a vault. Although your records indicate that there is not a burial structure behind the stone face, the piled rubble behind the stone face suggests that something other than soils is present, and I would like to take the conservative approach that something is there before we start an unchecked excavation.

We will need for you to provide digging equipment and staff to perform the physical work under our direction. We understood before that you would be in a position to provide this. Please confirm. Will you or someone else from the cemetery staff be in attendance during this work?

I would like to schedule our work for Thursday afternoon, June 29th, at 1 pm. I am assuming that we will be there for about two hours. Can you get back to me to confirm both the time, as well as your ability to provide the equipment and staffing to aid in our exploration? Also, please contact me in advance if you would like to review our strategy of exploration, and the physical logistics of the work around the memorial.

Thank you, and I look forward to your reply.

Regards,

Steve Siegel

Steven P. Siegel, P.E., Principal
SIEGEL ASSOCIATES, INC.
634 Commonwealth Avenue
Newton Centre, MA 02459
ph: 617-244-1612 x 110
fx: 617-244-1732
em: steve@siegelassociates.com

Russel Feldman

From: SPSIEGEL@aol.com
Sent: Monday, July 10, 2006 2:20 PM
To: rfeldman@tbaarchitects.com
Cc: SPSIEGEL@aol.com; steve@siegelassociates.com
Subject: Newton Civil War Memorial

Dear Russ,

On June 29th, I met with you, Art Cabral from the City of Newton, and a representative of the Newton Cemetery Association. Also, the Association provided a backhoe and a crew of laborers to perform selective excavation at my direction.

The purpose of our work was to carefully excavate in front of and on top of the Civil War Memorial in order to determine three things:
1. Was there a vault behind the memorial stone façade?
2. How deep did the granite face stones extend below grade?
3. What was the shape of the stones relating to their ability to perform as gravity retaining structures?

The laborers dug a hole that was positioned six feet back from the center front of the stone façade. The hole extended 3 and a half feet below grade, well into the area that the vault volume would have projected into, and all that was found was a well-graded sandy-gravel fill. This would likely have been placed at the time of the construction of the memorial and the creation of the mound behind it. We conclude from this that there is no vault.

The stone facing pieces to either side of the main façade measure as much as 16 inches thick. They only sit a few inches below grade, and rest on a base of small flat leveling stones. This is consistent with what we were expecting, based on how much the stones have rotated moved.

Based on what we found onsite and our subsequent conversation, I expect that the repairs will go as follows:

- Carefully survey the positions of the existing granite pieces
- Remove the granite pieces to a level site, perhaps right in front of their existing location, and try to level and position them on a thin bed of crushed stone. The goal is to determine and then measure their "best fit" positions relative to each other. We should try to approximate their pre-displacement positions.
- Design a concrete retaining wall. This wall will have a wide shelf on it to support the granite pieces. The top of the wall will be set roughly a foot below final finished grade, and will follow the slope of this grade. The geometry of the wall will be influenced by the measurements taken in the above steps
- Reset the granite onto the retaining wall shelf, level with grout, weep the stones and/or the veneer wall to allow for proper drainage, and grade to match the original site contours.

A contractor can provide accurate pricing once we develop construction documents, but this work will fall into a pricing order of magnitude of $50-100 thousand dollars.

Please let me know how you would like for us to proceed from this point. I will be back in the office on

Monday July 17th, and should be able to review this project further with you at that time.

Sincerely,

Steve

Steven Siegel, P.E., Principal
SIEGEL ASSOCIATES, INC.
634 Commonwealth Avenue
Newton Centre, MA 02459
ph: 617-244-1612 x 110
fx: 617-244-1732
steve@siegelassociates.com

Siegel Associates, Inc.

CONSULTING STRUCTURAL ENGINEERS

634 Commonwealth Avenue
Newton Centre, MA 02459
voice: 617-244-1612
fax: 617-244-1732

July 31, 2006

Russel Feldman
TBA Architects, Inc.
241 Crescent Street
Waltham, MA 02453

Re: Site Inspection, Observations, Recommendations
Civil War Memorial, Newton Cemetery
Newton Center, MA

Dear Russ,

On June 29th, I met with you, Art Cabral from the City of Newton, and a representative of the Newton Cemetery Association. Also, the Association provided a backhoe and a crew of laborers to perform selective excavation at my direction.

The purpose of our work was to carefully excavate in front of and on top of the Civil War Memorial in order to determine four things:
1. Was there a vault behind the memorial stone façade?
2. How deep did the granite face stones extend below grade?
3. What was the shape of the stones relating to their ability to perform as gravity retaining structures?
4. How soon must these repairs be undertaken to insure the safety of cemetery goers and of the memorial?

The laborers dug a hole that was positioned six feet back from the center front of the stone façade. The hole extended 3 and a half feet below grade, well into the area that the vault volume would have projected into, and all that was found was a well-graded sandy-gravel fill. This would likely have been placed at the time of the construction of the memorial and the creation of the mound behind it. We conclude from this that there is no vault.

The stone facing pieces to either side of the main façade measure as much as 16 inches thick. They only sit a few inches below grade, and rest on a base of small flat leveling stones. This is consistent with what we were expecting, based on how much the stones have rotated moved.

Based on what we found onsite and our subsequent conversation, I expect that the repairs will go as follows:

- Carefully survey the positions of the existing granite pieces

- Remove the granite pieces to a level site, perhaps right in front of their existing location, and try to level and position them on a thin bed of crushed stone. The goal is to determine and then measure their "best fit" positions relative to each other. We should try to approximate their pre-displacement positions.
- Design a concrete retaining wall. This wall will have a wide shelf on it to support the granite pieces. The top of the wall will be set roughly a foot below final finished grade, and will follow the slope of this grade. The geometry of the wall will be influenced by the measurements taken in the above steps
- Reset the granite onto the retaining wall shelf, level with grout, weep the stones and/or the veneer wall to allow for proper drainage, and grade to match the original site contours.

A contractor can provide accurate pricing once we develop construction documents, but this work will fall into a pricing order of magnitude of $50-100 thousand dollars.

Please note that the lateral displacement of the wall has been proceeding for many years and is ongoing. It is difficult to predict with accuracy how much longer the façade and side wings of the memorial will stand before falling. It is also difficult to say whether one or more pieces will fall suddenly, or whether they will continue to gradually displace before they fall. Accordingly, we strongly recommend that this work be started and finished before the coming winter.

Please let me know how you would like for us to proceed from this point.

Sincerely,
SIEGEL ASSOCIATES, INC.

Steven Siegel

Steven Siegel, P.E., Principal

City of Newton Massachusetts

Application for Community Preservation Funding

October 15, 2004

1. Project Goals

A. Historic Importance of Property

The City's Civil War Memorial Monument is located in a wonderful setting in the Newton Cemetery. The City owns the land and the monument. The Newton Cemetery takes care of the land surrounding the monument. The memorial consists of a granite obelisk about thirty feet high and a wonderful curved granite retaining wall that grows out of the ground to a central wall not unlike an underground tomb front. The central portion of the wall is adorned with three marble tablets with the names of those Newton residents who died in the Civil War. (See accompanying photos). The monuments are set in a large circular lawn area bounded by winding roadways on the top of a small hill in the Newton Cemetery. The circular area is about 150 feet across and is graced with three or four beautiful old trees. This is a beautiful and serene monument to the City's Civil War dead. The base of the obelisk has the date 1864 carved in relief. The cemetery's records and newspaper accounts confirm that the monument was dedicated before the Civil War ended. (See attached pages from unpublished manuscript by Thelma Fleishman.)

B. Scope of Restoration Work to Be Documented

The granite obelisk and its base are in excellent condition and aside from light cleaning, need no other preservation work. The wall (which is probably about 40 feet long) has begun to have serious problems. The curved stones of the two rising flanking walls have been pushed forward out of alignment by several inches by the pressure of the earth behind, but have not been otherwise visibly damaged. The pressure of the earth behind the central portion of the monument has caused the wall to lean and various pieces of the granite frame surrounding the three marble tablets have both twisted and moved unevenly. A large granite cartouche carved from a single stone which formerly topped the central frame has been removed and lowered to the ground in front of the monument to prevent its falling and to lessen the pressure on the stones below. A bronze cannon that topped the cartouche has been removed and put in storage. Unequal stress in one of the granite columns has cracked its lower portion and water has begun to disintegrate some of the granite. The marble tablets are still in reasonable shape even though they have weathered somewhat and are badly stained.

The services of a structural engineer and a restoration consulting company with expertise in stone restoration and treatment will be needed to prepare construction documents for the necessary repairs. If the CPC funds this project, funding for implementation of the repairs will be requested in the 2005 application round.

The restoration of this monument is critical to the prevention of more costly damage and the preservation of one of the City's most beautiful and important monuments.

2. Community Need

A. Why This Project is Needed

Increasingly severe movement in the retaining-wall-like portion of the Civil War Monument is putting increasing stress on individual stone components of the memorial and creating damage that will be increasingly difficult to repair. It has already been necessary to remove the stone cartouche that is the cap of the central portion of the memorial to prevent even more accelerated deterioration of the supporting components below. One of the granite support columns has begun to shatter under the increasing loads put on its front plane by tipping of the wall. This stone column forms one side of the frame of the right-hand marble panel inscribed with the names of soldiers who sacrificed their lives in the Civil War. It is likely that any additional force may damage the panel itself. Since Quincy granite is no longer quarried, repair materials must come from salvaged stone. Twisting and leaning of the stones are evident throughout the structure, leading to likelihood of further damage if the problem is not corrected soon.

B. Addressing Needs Identified in Existing City Plans

Although visitors to the Newton Cemetery have noted the deterioration to the Civil War Memorial, most have not realized that this is a City property and many have not realized that the large stone resting on the ground in front of the commemorative tablets belongs on the wall above the tablets and that the bronze cannon has been removed from that stone. The ownership and condition of the monument has been brought to the attention of the Public Buildings Preservation Task Force and has become one of its priorities because of the potential for further damage to this important monument and because of the likelihood that the original design of the monument and parts that have been moved or removed to prevent further damage will be lost or their original locations and purposes forgotten..

3. Community Support

The Newton Public Buildings Preservation Task Force, the Newton Historical Commission, the Newton Cemetery Corporation, and the Newton Veteran's Department are all aware of the need for study and repair of this important City monument and support this important first step. Letters of support from these organizations are included with this application.

4. Timeline

Assuming that final approval of CPA funding is received by 1 March 2005, the following timeline will be followed:

Activity	Completion Date
Preparation of RFP	15 April 2005
Advertising for Proposals	15 May 2005
Receipt of Proposals	1 June 2005
Selection of Consultant Team & Preparation & Execution of Contract	1 July 2005
Design of Restoration, Preparation of Construction Documents & Preparation of Cost Estimate for Construction.	1 September 2005

5. Credentials

After a trial run with the projects for Lighting, Balustrade and Cupola Painting, and Window Restoration, the Newton Public Buildings Task Force feels that it has ironed out the wrinkles in its process for implementing projects and is familiar with the requirements for City bidding and the timelines that must be expected for the process. The joint experience of the Task Force and the Public Buildings Department has led to the conclusion that outside consultants can best fulfill the needs of this project, limiting the work of the two bodies to preparing the RFP and selecting and working with the consultant team.

6. Success Factors

Project success will be measured by the ability of the Public Building Department and Public Building Preservations Task Forces to include a completely ready bid package and cost estimate in its Application for Funding for implementation of the project to the CPC in October 2005, so that implementation of the required stabilization and restoration can take place in a time frame that will prevent more damage to the monument.

7. Budget

The budget has been prepared with the input of a structural engineer who has worked on the restoration of several underground tombs which are very similar in nature to the Civil War Memorial and a preservation consulting company with extensive experience in restoration of stone structures and conservation of stone materials.

Structural Engineer	$ 5,000.00
Preservation/Conservation Consultant	$ 7,500.00
Cost Consultant	$ 1,500.00
Coordinating Architect	4,000.00
Total Fees	$ 18,000.00
Contingency @ 10%	1,800.00
Total Cost	$ 19,800.00

Combining the Civil War Monument & War Memorial Steps Projects can save considerable money.

8. Other Funding

No other source of funding has been identified for this project.

9. Maintenance

For this portion of the project, maintenance is not applicable. After restoration work on the monument has been undertaken, no maintenance should be required beyond the Newton Cemetery's exceptional care of its grounds and perhaps (if recommended by the preservation/conservation consultant) renewal of any protective measures specified for the marble panels.

10. Through 14 – Not Applicable

15. Appropriate Professional Standards

The RFP will be written so that only consultants with appropriate and extensive experience will be qualified to submit proposals. Experience and recommendations will be carefully checked before a consultant team is chosen.

16. Additional Community Benefits

It is hoped that publicity surrounding the CPC's consideration of funding for this project will elicit the interest of the press and result in more public awareness of this City monument and of the extraordinary beauty of the historic landscape and monuments in the Newton Cemetery which in many respects rivals its more famous sister, Mount Auburn Cemetery in Cambridge.

7. Combined Budget for Consulting Services for Preservation of the Civil War Memorial in the Newton Cemetery and the War Memorial Steps at City Hall

The budget has been prepared with the input of a structural engineer who has worked on a large variety of historic building preservation projects including the restoration of several underground tombs similar in nature to the Civil War Memorial and a preservation consulting company with extensive experience in restoration of stone structures and conservation of stone materials.

Structural Engineer	$ 6,000.00
Preservation/Conservation Consultant	$ 14,000.00
Cost Consultant	$ 1,500.00
Coordinating Architect	6,000.00
Total Fees	$ 27,500.00
Contingency @ 10%	2,500.00
Total Cost	$ 30,000.00

Combining the Civil War Monument & War Memorial Steps Projects will save considerable money.