Part 1 General

1.1 SUMMARY

.1 This Section includes the restoration of masonry construction including cracking and displacement, both in the units and in the mortar joints. This section details the types of repairs to be utilized to address these areas of distress.

1.2 RELATED SECTIONS

.1 Section 01 45 00 – Quality Control

.2 Section 01 61 00 – Common Product Requirements

.3 Section 04 03 07 – Mortar for Masonry Restoration.

.4 Section 04 43 00 – Stone Masonry

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM F593-02(2008)e1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.3 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts.

.2 Canadian Standards Association (CSA International)

.1 CAN/CSA A179-04 (R2009), Mortar and Grout for Unit Masonry.

.2 CAN/CSA-A371-04 (R2009), Masonry Construction for Buildings.

.3 CAN/CSA-A3000-08, Cementitious Materials compendium (consists of A3001, A3002, A3003, A3004 and A3005).

1.4 MEASUREMENT PROCEDURES

.1 The repair areas will be identified by the Contract Administrator on-site in the presence of, and with the assistance of the Contractor. The areas will then be measured and agreed upon by the Contractor and Contract Administrator prior to commencement of work. These measurements will form the basis of payment for the area.

.2 Unit prices must include all supervision, labour and materials, and equipment.

.3 The Contractor is to note that if the area of the repair is increased over that originally measured without consultation with the Contract Administrator, then the Contractor will not be paid for the increased area.

.4 Method A: Mortar Joint Repointing, and Resetting.

.1 Repointing – Fixed price for podium base. Fixed-add price for cenotaph monument. Podium base stones require full depth pointing.

.2 Resetting Dislodged Unit – Fixed price for south-east and south-west corner. For all other stones, unit price per masonry unit. Minimum unit of payment is one (1) masonry unit.

.1 Method B: Hand Patching of Masonry

.1 Unit price per $0.05m^2$ patch. Minimum unit of payment is $0.05m^2$.

.2 Method C:Dutchmen Repair

.1 Unit price per 0.05m^2 repair. Minimum unit payment is 0.05m^2.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.6 QUALITY ASSURANCE

.1 Masonry Contractor:

.1 Use single Masonry Contractor for all masonry work.

.2 Masonry contractor to have 5 years experience minimum in historic stone masonry restoration work.

.3 Masonry contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stones which are part of structural masonry work.

.4 Provide minimum 5 examples of local projects demonstrating successful performance with historic masonry repairs of similar size and complexity to specified Work within the last 3 years.

.5 Provide minimum 3 references exhibiting successful performance with historic masonry repairs within the last 3 years.

.2 Masons:

.1 Mason to have certificate of qualification with 5 years minimum experience in historic stone masonry restoration work. Provide references upon request.

.2 Masons to have proof of license certification for propriety restoration mortars.

.3 Ensure all personnel involved with historic masonry restoration is adequately trained and familiar with the requirements of this Section.

.3 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.

.4 Obtain approval from Contract Administrator for changes to qualified personnel.

1.7 MOCK-UPS

.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.

.2 Construct mock-up at Project site or pre-selected area of building or location approved by Contract Administrator.

.3 Construct mock-up for each repair method for each type of masonry material.

.4 Construct mock-up under supervision of Contract Administrator to demonstrate a full understanding of specified procedures, techniques and formulations are achieved before work commences.

.5 Allow 24 hours for inspection of mock-up by Contract Administrator before proceeding with masonry restoration work.

.6 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

.7 Manufacturer's representative or designated representative will review technical aspects; surface preparation, repair, and workmanship.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Comply with Section 01 61 00.

.2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store tightly sealed materials off ground and away from moisture, direct sunlight, extreme heat, and freezing temperatures.

.4 Keep materials in manufacturer's original, unopened containers and packaging until installation.

.5 Protect materials during storage, handling, and application to prevent contamination or damage.

1.9 PROJECT CONDITIONS

.1 Environmental Requirements:

.1 Ensure that substrate surface and ambient air temperature are minimum of 4°C and rising at application time and remain above 4°C for at least 24 hours after application. Ensure that frost or frozen surfaces are thawed and dry.

.2 Ensure that substrate surface and ambient air temperature are below of 32°C and remain below 32°C for at least 8 hours after application.

.3 Do not apply material if snow, rain, fog, and mist are anticipated within 12 hours after application. Allow surfaces to attain temperature and conditions specified before proceeding with application.

1.10 DEFINITIONS

.1 Raking: the removal of existing mortar until a minimum depth of 2.5x the joint thickness is reached or all unsound mortar is removed, whichever is greater.

.2 Repointing: filling and finishing of masonry joints from which mortar is missing or has been raked out.

.3 Backpointing: the initial repointing of joints deeper than 50 mm.

.4 Tooling: finishing of masonry joints using tool to provide final contour.

.5 Repair: using adhesives to rebond sections of fractured masonry.

.6 Consolidation: strengthening masonry units to prevent deterioration (spalling).

.7 Descaling: the removal of loose portions of the masonry (usually spalled area) through impact with a brush hammer or similar device.

Part 2 Products

2.1 MATERIALS

.1 Mortar and Mortar Materials: to Section 04 03 07 – Mortar for Masonry Restoration.

.2 Stone Patching: Single-component, cementitious, mineral-based mortar is designed for the restoration of granite, and hardstones. Vapor permeable and contains no latex or acrylic bonding agents or additives.

.1 Acceptable product: Jahn M160 by Jahn Restoration Mortars.

2.2 ACCESSORIES

.1 Not used

Part 3 Execution

3.1 GENERAL

.1 Do masonry work in accordance with CSA-A371 except where specified otherwise.

.2 Manufacturer's Instructions: Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

.1 The location number and extent of repairs shown on Drawings are indicative only. Repairs areas will be identified on-site by the Contract Administrator in the presence of and with the assistance of the Contractor. The approximately periphery of the repair will be marked on the surface of the member and the location and extent recorded on drawings

.2 Allow time in the Schedule for inspection work carried out by the Contract Administrator ahead of repairs. Provide sufficient safe access to enable review of all areas designated for repairs.

.3 The Contractor shall make available as required throughout the Contract labour to carry out the following under the direction of Contract Administrator:

.1 Identification of repairs.

.2 Sample chipping and/or drilling.

.3 Operators for access equipment.

.4 The Contractor shall make available as required throughout the Contract equipment for the use of the Contract Administrator:

.1 Marking paint and chalk.

.2 Hammer and chain for sounding surveys.

.3 Tape measure.

3.3 PREPARATION

.1 All necessary measures shall be taken to provide protection to the general public, occupants of the building.

.2 Remove or protect all surface attachments (e.g. signs, notices, electrical fittings) from the areas to be repaired or from positions that obstruct access or which may be damaged from Work.

.3 Carefully store items removed during the course of the works. Reinstall when restoration work is complete.

.4 The Contractor shall make good or rectify any damage caused as a result of insufficient protection.

.5 Provide temporary access required to facilitate Work.

3.4 METHOD A: MORTAR JOINT REPOINTING, RESETTING, AND REPLACEMENT.

.1 Repoint podium base stones (fixed price) and cenotaph monument stones (fixed-add price). All podium stones will require backpointing, as existing mortar joints are not full depth. Reset stones on south east and south west corners of podium, and as indicated on drawings and by Contract Administrator. The 4 large podium base stones located centre of each side do not require resetting.

.2 Procedure of testing: All existing cenotaph monument and podium base stone mortar is unsuitable for existing granite stones and is to be removed to a minimum depth of 2.5x the joint thickness. For all remaining mortar use the following criteria to judge which joints may need repointing:

.1 Open Joints: the mortar is deeply eroded (more than one 12 mm from the face of the masonry), or the mortar has fallen out, or,

.2 Cracked Joints: cracks, hairline width or larger, have formed in the mortar, or,

.3 Separated Joints: the mortar and masonry no longer adhere, resulting in a gap or crack between the two, or the mortar is sitting loosely in the joint, or,

.4 Unsound Joints: joint is found to contain voids or weak areas as revealed by hammer-sounding, by raking with an appropriate tool or other approved method to determine score resistance, surface unsoundness or delamination.

.3 Raking joints:

.1 Rake unsound joints free of deteriorated and loose mortar, dirt and other undesirable material. Joints should be raked to a minimum depth of 2.5 times the joint width, but at no point less than 25 mm, with the exception of the podium stones. The podium stones should be raked to the full depth of the joint. Do not reuse the existing backer rod.

.2 Clean out voids and cavities encountered during raking. Remove mortar cleanly from masonry, leaving square corners and a flat surface at back of cut.

.3 Clean by compressed air, surfaces of joints without damaging texture of exposed joints.

.4 Flush open joints and voids; clean with low pressure water and if not free draining blow clean with compressed air.

.5 Leave no standing water.

.6 Before filling joints, any masonry that is loose should be reset. Any pieces that are chipped off while removing old mortar shall be repaired at the contractor's cost.

.4 Repointing

.1 Masonry to be repointed shall be damp but not wet. Do not allow free standing water.

.2 Mortar joints are to be filled in successive layers. Deeper joints shall be filled first compacting new mortar in several layers until back of joint is flat. Several layers (maximum 12 mm each) will be needed to fill the joint flush with the surface of the masonry. Allow each layer to reach thumbprint hardness before the next is applied.

.3 Use backpointing mortar as specified in Section 04 03 07 – Mortar for Masonry Restoration for filling joints deeper than 50 mm. The top 50 mm of the joint should be filled with repointing mortar as specified in in Section 04 03 07 – Mortar for Masonry Restoration. Refer to section detail in drawings. Allow 24 hours for the backpointing mortar to cure prior to the application of the exterior

repointing mortar. Provide a rough surface on the face of the backpointing mortar to ensure a strong bond with the repointing mortar.

.4 Keep masonry damp while pointing is being performed.

.5 Do no pointing in freezing weather unless provisions are in place to protect mortar.

.5 Resetting

.1 Clean units by washing with water and natural fibre brush before laying.

.2 Remove loose granular in bedding area.

.3 Dampen surfaces and apply mortar until bedding area is level.

.4 Lay unit after mortar in courses below has hardened sufficiently to support weight.

.5 Set unit on water soaked softwood wedges to support it in proper alignment until mortar has set. Remove wedges when dry, do not break off.

.6 Remove mortar dropping from face of stone before mortar is set. Sponge stone free of mortar along joints as work progresses.

.6 Tooling

.1 Do not finish joint by using trowel to smooth out mortar.

.2 Finish joint with slicker narrow enough to be placed inside the joint. Pull the slicker across surface of mortar to compress it.

.3 Proper timing of the tooling operation is essential. If mortar is tooled when it is too soft, the colour will be too light and hairline cracks may occur; if mortar is too hard, dark streaks may result and good closure between mortar and stone may be difficult to achieve.

.4 Do not feather edge mortar. Joints shall be finished with a slight concave joint profile unless noted otherwise.

.7 Mock-ups

.1 Provide mock-ups of repointing in accordance with 01 45 00 Quality control.

.2 Provide mock-up size of 1 square meter. Allow to stand minimum 3 days prior to continuing patching work to allow assessment of colour.

3.5 METHOD B: HAND PATCHING OF MASONRY

.1 Where masonry fractures are shallow, or small original piece is missing, follow the steps outlined below under the direction of the Contract Administrator.

.2 Patch spalled areas with approved repair mortar according to manufacturer's instructions, except as modified herein.

.3 At areas to receive patches, remove all loose mortar and masonry. Cut away an additional 12 mm of substrate to ensure that surface to be patched is solid and stable. Sound masonry with hammer or chain to verify its integrity. Remove any sealant residue.

.4 Where existing cramp anchors, threaded rod anchors, or dowels have been cut and pieces remain embedded in the substrate; anchor pieces that are free of rust, are solidly embedded, and do not project beyond the surface of the masonry unit may remain. Anchor pieces that are rusted, loose or that project beyond the edges of the masonry unit shall be removed. Method of anchor removal must be approved by the Contract Administrator. Repair damage to substrate resulting from anchor removal.

.5 Cut the edges of the repair area to provide a minimum depth of 6 mm. Do not overcut corners of patch; stop short of corner and chip out remainder by hand without damaging surrounding masonry. Feathered edges in patch area are not permitted. Supply and install stainless steel dowels. Clean surface to receive patch with pressure water wash.

.6 Moisten the substrate using clean water. Jahn M160 mortar should be applied to a glistening wet surface with no pooling water. If the surface is allowed to dry out before applying M160, this step must be repeated.

.7 Apply mortar using a trowel in a series of lifts with no waiting periods or scratch coat necessary between layers, up to a total maximum thickness of 75 mm. For patches thicker than 75 mm, apply mortar in two layers, allowing the first to cure before applying the second. If cement skin forms, scrape approximately 3 mm of mortar off, then dampen first layer before application of second layer. Use light pressure during applications. Work mortar firmly into surface of masonry and under and around all mechanical anchors.

.8 Build up patching material so that it is slightly above the adjacent masonry surface. Allow 15-30 minutes to set lightly, then scrape off excess using a straight edge. Do not press down or float the patch. Where patch occurs at a panel edge or corner, form mortar to match the profile of the surrounding masonry. In all cases, finish patch so that it is indistinguishable from surrounding adjacent masonry.

.9 To ensure colour uniformity, wait until the appropriate time has lapsed and the material being removed is the consistency of dry sand.

.10 To obtain a smooth finish, extra water can be used in the mix and the finished patch can be floated or trowelled to leave a smooth finish.

.11 Lightly mist the patch with water to wet the entire surface of the finished patch approximately 30 minutes to 1 hour after completion of hot sunny days, and approximately 2 hours on cool cloudy days. Time will vary with temperature and humidity. Mist at least once a day, but as often as possible on the two days following patch installation. Install patch on days when area will be available for misting during the next two consecutive days. If this is not possible, cover patch with plastic, taped in place, and begin misting as soon as possible.

.12 Mock-ups

.1 Provide mock-ups in accordance with 01 45 00 Quality control.

.2 Provide mock-up size of minimum 100 mm x 100 mm. Allow to stand minimum 5 days prior to continuing patching work to allow assessment of colour change for cured patching material.

3.6 METHOD C:DUTCHMEN REPAIR

.1 At locations selected in conjunction with the Engineer, repair granite segments with a damaged area on the face utilizing a Dutchman repair. Depending on the condition of the damaged area, the Dutchman may be created by reinstalling the original piece, to reinstate the integrity of the granite unit, or a new segment may be required to create the Dutchman repair.

.2 Remove fractured area carefully in order to prevent fracturing of sound substrate. Saw-cut to depth required to remove damaged section of granite unit. Where freeze-thaw deterioration has induced multiple fractures, saw-cut a minimum one inch beyond deteriorated area. Do not overcut corners of granite segment to remain; stop short of corner and chip out remainder by hand without damaging surrounding masonry.

.3 Drill 3/8" diameter holes a minimum of three inches into substrate. Not less than two dowels will be used for each Dutchman segment, but allow for four dowels for every square foot of exposed face. Additional dowels may be required, depending on the size and shape of the repair.

.4 Blow-out holes, install Sikadur injection gel into base of holes and install ¼" threaded stainless steel dowels. Ensure dowels project a minimum of three inches into the Dutchman. Where the repair section is less than three inches in overall depth, have dowel project to within ½" of exterior face.

.5 Upon sufficient cure, butter faces of both stone with Sikadur epoxy, join stones and clamp for a minimum of 24 hours or longer as required to ensure full cure of the resin. Promptly remove any resin from surface that may leak out of joint.

.6 Repoint all affected mortar joints ad patch remaining voids with approved patch mortar as required to match existing surface profile.

.7 Follow all written instructions by epoxy resin and patching mortar manufacturers, related to, but not limited to, surface preparation, mixing, installation procedures, and curing, except where the information provided herein is more stringent.

3.7 CLEANING

.1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.

.2 Remove droppings and splashing's using clean sponge and water.

.3 Do further cleaning using stiff natural bristle brushes after mortar has obtained its initial set and has not fully cured.

.4 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.

.5 Clean masonry with low pressure 100 to 300 kPa clean water and soft natural bristle brush.

.6 Obtain approval of Contract Administrator prior to using other cleaning methods for persistent stains.

3.8 PROTECTION OF COMPLETED WORK

.1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.

.2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.

.1 Maintain tarps in place for minimum of 2 weeks after repointing.

.2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.

.3 Anchor coverings securely in position.

.4 Install and maintain wetted burlap protection during the curing process:

.1 Minimum 7 days in summer.

.2 Minimum 30 days in cold weather conditions using dry heated enclosures.

.5 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.

.6 Shade areas of work from direct sunlight during periods over 25 degrees C, and maintain constant dampness of burlap.

.7 Maintain ambient temperature of 10 degrees C for minimum of 4 weeks after repointing masonry.

END OF SECTION

Part 1. General

1.1 SECTION INCLUDES

.1 Cleaning method for cleaning of the existing granite stone on the cenotaph monument and base. Cleaning method must remove sufficient dirt and grime without removing or altering the masonry's protective patina. This section also refers to the cleaning of the brass plaque located on the cenotaph monument.

1.2 RELATED SECTIONS

.1 Section 04 01 01 – Masonry Restoration.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-A179-04 (R2014) – Mortar and Grout for Unit Masonry.

.2 CAN/CSA-A371-04 (R2014) – Masonry Construction for Buildings.

1.4 MEASUREMENT PROCEDURES

.1 No measurement will be made for work under this section.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Execute work when ambient temperature is within the range recommended by the manufacturer. Water cleaning methods shall terminate seven (7) days before first statistical frost date or if temperatures are anticipated to go below freezing over night.

.2 Comply with applicable Municipal, Provincial & Federal regulations regarding testing, handling, treatment, containment, collection, transport, disposal & discharge of hazardous material.

1.6 MOCKUP TEST PANELS

.1 Before full scale application, review manufacturer's product data sheets to determine the suitability of process for the specific surfaces and conditions.

.2 Include mockups in base bid. Include a separate TORC (Jos) system mockup for both Dolomite and Calcite aggregate types.

.3 Test areas selected by the Contract Administrator to determine number of applications, effectiveness, application procedures, and desired results.

.4 Clean test areas in accordance with manufacturer's instructions or as specified herein. Allow test areas to thoroughly dry before evaluating final appearance and results. Do not begin full scale application until test areas are reviewed and approved by the Contract Administrator.

.1 Size:

.1 For granite stone: minimum 0.5m by 0.5m each, or as specified by Contract Administrator. Ensure minimum one vertical and bed joint is included.

.2 For bronze plaque: minimum 100 mm by 100 mm each, or as specified by the Contract Administrator.

.2 Locations: As determined by the Contract Administrator.

1.7 SCHEDULING OF WORK

.1 Commencement at top of structure and work down to reduce staining on lower levels of the monument.

1.8 ALTERNATIVES

.1 Obtain Contract Administrator's approval before changing manufacturer's specific brands or products.

Part 2. Products

2.1 MATERIALS

.1 Granite stone cleaning
- .1 Enviro Klean 2010 All Surface Cleaner, by Prosoco

.2 Bronze plaque cleaning
- .1 Enviro Klean 2010 All Surface Cleaner, by Prosoco

.3 Granite stone cleaning (fixed add/delete price):
- .1 TORC (Jos) cleaning system.
  - .1 Aggregate Types:
    - .1 Dolomite
    - .2 Calcite

Part 3. Execution

3.1 EXISTING CONDITIONS

.1 Investigate possible structural or substrate problems and report to Contract Administrator before beginning work.

.2 All structural repairs, repointing, stone repairs and caulking shall be completed prior to cleaning exterior masonry.

.3 When using the TORC cleaning system, be sure to protect and cover the bronze plaques located on the cenotaph monument.

3.2 PREPARATION

.1 Ensure that safety measures have been taken each day before any job is started.

.2 Verify that equipment meets safety standards.

.3 Totally mask off bronze and other decorative areas with protective material.

3.3 MASONRY CLEANING PROCESSES

.1 TORC (Jos) cleaning system

.1 Protect all surfaces not designated for cleaning. Protect bronze plaque located on the cenotaph monument. Provide hoarding to contain granulate debris to within the boundary of the work area.

.2 Select appropriate granulate as determined by results of test mockup. Preference should be given to natural abrasives, such as Calcite and Dolomite to reduce water course contamination.

.3 Perform cleaning when air temperatures are above 10°C. Cleaning when temperatures are to drop below freezing overnight may damage the stone.

.4 Adjust water and air pressure at an appropriate distance from the work. Be sure to select a pressure which results in an effective and even cleaning, but does not abrade the substrate.

.5 Begin work from the uppermost level and continue downward.

.6 Rinsing of the surface should take place every 2-3 square metres or at least before the unrinsed surface is dry.

.7 Following the completion of any repair work it is recommended that a final rinse be given to remove any residue.

.8 Closely conform to all manufacturer's written specifications for these products.

.2 Enviro Klean 2010

.1 Protect all surfaces not designated for cleaning with the product.

.2 Perform cleaning when air temperatures are above 10°C. Cleaning when temperatures are to drop below freezing overnight may damage the stone.

.3 Prewet the surface with clean water.

.4 Apply with low-pressure sprayer, brush or heavy nap roller. Gently scrub heavily soiled surfaces with non-abrasive brush or synthetic scrubbing pad. Do not let Enviro Klean dry on the surface. If drying occurs lightly wet surfaces with fresh water and reapply cleaner in a gentle scrubbing manner.

.5 Rinse surface with enough water and pressure to flush cleaner and dissolved soilings from the masonry surface and surface pores, while taking care not to damage the stone.

.6 Closely conform to all manufacturer's written specifications for these products

3.4 CLEANUP

.1 After completion of this work, thoroughly clean up any debris or residue and remove from site. Ensure all residue on the stone & adjacent surfaces, including but not restricted to projections, sidewalk, landscaping resulting from the cleaning process is completely removed. Ensure any damaged areas are returned to pre-construction form at no cost to the Owner.

.2 Ensure that local by-laws are followed with respect to environmental containment and disposal considerations.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This section details the requirements for mortar used in the restoration of stone masonry construction.

1.2 RELATED SECTIONS

.1 Section 04 01 01 – Masonry Restoration

.2 Section 03 30 00 – Cast-in-Place Concrete

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

.1 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.

.2 ASTM C270-14a, Standard Specification for Mortar for Unit Masonry.

.3 ASTM C979/C979M, Standard Specification for Pigments for Integrally Colored Concrete.

.4 ASTM C1324-15, Examination and Analysis of Hardened Masonry Mortar.

.5 ASTM C1489-15, Standard Specification for Lime Putty for Structural Purposes.

.2 Canadian Standards Association (CSA)

.1 CAN/CSA-A179-14, Mortar and Grout for Unit Masonry.

.2 CSA-A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.

.3 CAN/CSA-A3000-13, Cementitious Materials Compendium.

1.4 MEASUREMENT PROCEDURES

.1 No measurements will be made under this section. Include costs for masonry mortar under applicable fixed and unit price components.

1.5 SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for mortar and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Prior to mixing or preparation of mortars submit for review to Contract Administrator confirmation of source or product data sheet of:

.1 Aggregate.

.2 Cement.

.3 Lime.

.4 Premixed products.

.5 Pigments.

1.6 QUALITY ASSURANCE

.1 Masonry Contractor qualifications to Section 04 01 01.

.2 Preconstruction Testing:

.1 Existing mortar samples:

.1 Minimum 1 week prior to commencement of masonry repairs submit samples of existing mortar for each type for colour comparison.

.2 Include costs of testing in Contract Price.

.2 Prepare mortar samples for each type in quantity and size in accordance with CAN/CSA-A179.

.3 Test reports:

.1 Submit test results during site work as follows:

.1 Sieve analysis: sand.

.2 Bulking analysis: sand.

.3 Air content: mortar mix in plastic state.

.4 Vicat cone penetration: mortar mix.

.5 Mortar compressive strength: at 7 and 28 days or otherwise required.

.4 Submit mortar samples for colour comparison.

.1 Establish existing mortar colour by cutting back existing mortar joints to expose unweathered mortar.

.5 Coordinate preconstruction mortar testing with mock-up testing required in other Sections.

.6 Include in Contract Price all preconstruction mortar testing.

Part 2 Products

2.1 MATERIALS

.1 Water: potable, clean and free from contaminants.

.2 Sand: gradation of fine and course aggregate to Table 1 of CSA A179.

.3 Portland cement: Type GU to CAN/CSA-A3001.

.4 Masonry cement: to CAN/CSA-A3002.

.5 Lime:

.1 Hydrated Lime (Type S or SA): to ASTM C207

.2 Lime Putty: to ASTM C1489.

.6 Colouring Pigments: to ASTM C979/C979M.

.1 Ground coloured natural aggregates to match existing. If a pigment is required, ensure that only chemically pure synthetic oxide pigments are utilized and are alkali proof and sun fast. Do not use organic dyes, metallic oxide pigments, coloured sand to match existing. Use minimum amount necessary.

.7 Air Entrainment: factory processed lime (Type SA) with agents for air entrainment shall be used on exterior mortar mixes at dosages recommended day the manufacturer.

.8 Additives: Obtain written approval of Contract Administrator before using additives.

2.2 MORTAR MIXES

.1 Exact ratio of lime and sand varies according to proper types of material sources, and to properties of historic lime mortars. Use of a mixture which has lower ultimate compression strength than masonry unit is required.

.2 Design Performance Requirements to be confirmed by preconstruction testing:

.1 Mortar for granite masonry backpointing and bedding (resetting):

.1 Mortar compressive strength minimum 5.0 MPa, maximum 8.0 MPa at 7 days.

.2 Mortar compressive strength minimum 7.5 MPa, maximum 10.0 MPa at 28 days.

.3 Type: S

.4 Air content: 7% to 14%.

.2 Mortar for granite masonry repointing:

.1 Mortar compressive strength minimum 2.0 MPa, maximum 3.0 MPa at 7 days.

.2 Mortar compressive strength minimum 3.5 MPa, maximum 5 MPa at 28 days.

.3 Type: N

.4 Air content: 7% to 14%.

.3 Starting point for development of mortar by volume to meet design performance requirements. Proportion requirements:

.1 Mortar for granite masonry backpointing and bedding (resetting):

.1 Based on proportion specifications, consisting of 1 part Portland cement, 1 part lime, and 4.5 to 6 parts sand.

.2 Mortar for granite masonry repointing:

.1 Based on proportion specifications, consisting of 1 part Portland cement, 1 parts lime and 4.5 to 6 parts sand.

.3 Final proportions to be determined from results of testing.

.4 Obtain written approval of Contract Administrator before changing mix proportions. Change mix proportions only as directed by Contract Administrator.

.5 If mortar fails to meet the 7 day compressive strength requirements, but meets the 28 day compressive strength requirement, it is acceptable. If mortar fails to meet the 7 day compressive strength requirement, but its strength at 7 days exceeds two thirds of the value required for the 7 day strength, contractor may elect to continue work at his own risk while awaiting the results of the 28 day tests, or to take down the work affected.

2.3 COLOURED LIME MORTAR

.1 Use sand as colouring agent.

.2 Maintain one mortar mixer exclusively for coloured mortar.

Part 3 Execution

3.1 PREPARATION

.1 Slake processed lime in water for not less than 24 hours or soak hydrated lime in water for not less than 12 hours.

.2 Place safety devices and signs near the work.

3.2 MIXING

.1 Prepare mortar by:

.1 mixing dry pulverized quicklime and dry sand; add water; mix whole mass.

.2 mixing thoroughly dry sand in lime paste; add water if necessary.

.3 slaking lime powder, sand and water together simultaneously.

.4 mixing lime, cement, sand and water in specified proportions.

.5 add mixture as per manufacturers' instructions.

.2 Mix mortar ingredients in quantities for use in 2 hours.

.3 Mix all dry ingredients before adding any water to obtain even colour and remove lumps.

.4 Use manual mixing as long as quantities of materials and water are accurately controlled and the method of mixing is approved by Contract Administrator.

.5 Operate power driven mixer when fully charged, for minimum of 3 to 5 minutes.

.6 Add water slowly while mixing until all lumps are eliminated.

.7 Mix to a consistency of soft mush.

.8 Retempering or addition of more water after the initial mix is prepared is not permitted.

.9 Allow mortar to age approximately ½ hour prior to application to reduce shrinkage.

.10 Use batching box.

.11 Monitor mixing time.

3.3 CURING

.1 Provide 7 day wet cure for all masonry mortar.

3.4 FIELD QUALITY CONTROL

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Contract Administrator in accordance with CSA-A23.1 and Section 01 45 00 - Quality Control and as described herein.

.1 Testing laboratory to be certified in accordance with CSA A283.

.2 The Contractor will pay for costs of tests.

.3 Frequency and Number of Tests:

.1 Sampling and testing of mortar: to CAN/CSA-A179.

.2 Not less than 1 test consisting of six mortar cubes for each type of mortar for each day of type of mortar used on any one day:

.1 Test 3 three cubes at 7 days; and

.2 Test 3 three cubes at 28 days.

.4 Testing agency to submit copies of concrete test reports directly to Contract Administrator.

.5 Inspection or testing by Contract Administrator will not augment or replace Contractor quality control nor relieve contractual responsibility.

3.5 CLEANING

.1 Remove droppings and splashings using clean sponge and water.

.2 Clean masonry with low pressure clean water and soft natural bristle brush.

3.6 PROTECTION OF COMPLETED WORK

.1 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.

.2 Provide if necessary temporary bracing as required.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Work under this Section includes removal, cleaning and marking stones according to an identification system, proper transportation and storage in a designated location.

1.2 MEASUREMENT PROCEDURES

.1 No measurement will be made for work under this Section.

1.3 PRECAUTIONS

.1 Should operations be sufficiently limited and storage area large enough, it would be worthwhile to store stones to reflect their position in structure, and even their orientation. This would facilitate direct checking and make it possible to detect and avoid faults.

.2 Take precautions necessary to protect stones and facilitate their resetting.

.3 Take full height elevation photographs and transpose ID numbers on to photographs prior to removal and correlate with contract drawings.

1.4 CONTROL

.1 In all instances, stones are to be removed intact.

.2 Mark following:
- .1 Stones and other elements or components to show identity and position.
- .2 Wood platforms or other equipment used to transport and store stones.
- .3 Work and storage areas.
- .4 Spaces from which stones are removed.

.3 Prepare chart or card index to help locate any stone or unit when necessary, and to control availability of platforms and of work and storage areas.

.4 Keep chart or card index up-to-date and, if required, produce copy every day.

.5 Ensure that chart or card index contains relevant information.

.6 Submit up-to-date copies of chart or card index, as well as chronological information concerning each numbered unit (individual cards of units), when requested.

Part 2 Products

2.1 NOT USED

.1 Not used

Part 3 Execution

3.1 INSPECTION

.1 Record and report, to Contract Administrator, site conditions not described in contract.

3.2 TEMPORARY MARKINGS

.1 Mark stone, on face, before removal using:

.1 Ball-point pen on diachylon, glued to stone.

.2 Waxless chalk directly on stone.

.2 Do marking on faces of stones before removal operations.

.3 Ensure that temporary marking will remain in use resistant to weather handling and cleaning until final marking stones.

.4 Ensure that markings and adhesive are removable by brushing with vegetable fibre brush used either dry or with water, use no solvent, acid or other chemical product.

3.3 SUPPORT

.1 Construct shoring and cradling, and other temporary framing work needed to support structure, or parts of it, during removing operations, and in anticipation of resetting, according to approved drawings, bearing seal and signature of qualified Engineer licensed to practice in Manitoba.

3.4 LOOSENING STONES

.1 Loosen stones using approved methods which will cause no damage either to stones or to other architectural elements.

.2 Do not use circular millstone or saw pneumatic chisel or hammer, steel tools exerting concentrated pressure on exerting concentrated pressure on edge of stone.

.3 Drill out existing anchor pins at bearing level.

3.5 HANDLING AND TRANSPORTATION

.1 Maintain stones in original orientation at all times.

.2 Place detached stones on to wood surfaces during handling. Prevent contact with metal.

.3 When stones are lowered to ground, place them directly on wooden platform that will be used for transport or storage.

.4 Transport and keep stones on wooden platforms all the time.

.5 Provide sufficient protection for stones during transportation.

.6 Ensure that sharp edges of stones do not come into contact with any hard object.

.7 Do not place stones directly on ground or vegetation.

.8 Contractor responsible for any damage caused during handling and transportation.

3.6 TEMPORARY STORAGE

.1 Coordinate placement in advance with Contract Administrator.

.2 Stones to be stored on site in the Plaza area adjacent to the cenotaph monument.

.3 Layout storage so that each stone will have faces visible, and be accessible or removable without having to move adjacent stones.

3.7 CLEANING

.1 Unless permitted by Contract Administrator, clean stones by wet scrubbing (with vegetable fibre brush). Do not use high pressure water jet.

.2 Removal of excess mortar may be done with hand or chisel, provided faces and edges are not damaged.

.3 Drying process of stones may be accelerated by fans or unit heaters. Heat must not exceed 27°C.

3.8 FINAL MARKINGS

.1 Do final marking after cleaning, on surface that supports good adhesion and legibility and will not be visible after resetting.

.2 Do marking in colour and dimensions to be legible from distance of 2 m.

.3 Ensure that product used will not affect mortar to stone adhesion when resetting.

.4 Ensure that product used for marking will survive storage until resetting of stone.

.5 Ensure that product will not "bleed" through stone.

END OF SECTION