

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 03 07 - Historic - Masonry Repointing.
- .2 Section 04 03 08 - Historic - Mortiers.
- .3 Section 04 03 43 - Historic - Dismantling Stone Masonry.
- .4 Section 04 05 00 - Common Work Results for Masonry.
- .5 Section 31 04 31 - Historic - Subgrade Shoring and Bracing.

1.2 REFERENCES

- .1 Definitions:
 - .1 Lewis: instrument inserted at top of stone as means of attachment in raising and lowering. Holds stone by means of keys or wedges fitted to dovetailed recess.
 - .2 Dogs: metal appliance for securing parts or members together by means of one or more projecting teeth or bent portions, lug, cramp.
 - .3 Fabricator: company having sufficient capacity to quarry, cut, and deliver stonework on schedule.
 - .4 Installer: company or person specializing in masonry restoration work of historic stone structures with (5) years of experience on projects of similar size and complexity to Work of this Contract. Employ skilled stone masons on site to do necessary field cutting as stones are set.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM C97/C97M, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
 - .2 ASTM C170/C170M, Standard Test Method for Compressive Strength of Dimension Stone.
 - .3 ASTM C568, Standard Specification for Limestone Dimension Stone.
 - .4 ASTM C616, Standard Specification for Quartz-Based Dimension Stone.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.
 - .2 Submit shop drawings describing method of stone replacement, including removal, shoring and erection.
 - .3 Keep in mind that no computer file in «.dwg »format will be provided to contractor and/or subcontractor.

- .3 Drawings of stone cutting:
 - .1 Submit a drawing for each type of stone being replaced showing dimensions, type finish on exposed and unexposed faces, bedding planes, location of anchors and other details.
 - .2 Submit drawings along with samples.
- .3 Samples:
 - .1 Submit samples of replacement stones not less than 15 days before masonry work begins.
 - .1 Submit two samples representing full range of colour, pattern and inclusions, one for each type of masonry unit specified: limestone, sandstone.
 - .2 Submit two samples sized and dressed to match the existing stone units, one for each type of masonry unit specified:
 - .1 Limestone: bushhammered, medium;
 - .2 Sandstone: burnt surface.
 - .3 Submit one of each type of masonry reinforcement and tie proposed for use.
 - .4 Submit limestone samples required for testing purposes:
 - .1 Five: 150 mm x 100 mm x 50 mm for compressive strength test to ASTM C170.
 - .2 One: 150 mm x 150 mm x 12 mm for porosity test to ASTM C97.
 - .5 Submit sandstone samples required for testing purposes:
 - .1 Five: 150 mm x 100 mm x 50 mm for compressive strength test to ASTM C170.
 - .2 One: 150 mm x 150 mm x 12 mm for porosity test to ASTM C97.
 - .6 Submit technical data sheets containing the tested chemical and physical-mechanical properties issued by a recognized laboratory. Information on data sheets not date back to more than twenty four (24) months. Where such product data is not available, provide for costs associated with these laboratory tests.
 - .7 Choose samples from the currently mined bed in the quarry and provide a certificate issued by the quarry.
 - .8 Provide mortar samples in quantity and size specified in CAN/CSA A179.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for masonry work for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY CONTROL OF STONES

- .1 Stone units shall be inspected and approved by the Departmental at the following milestones:
 - .1 Prior to cutting: At the stone transformation shop (sawing factory) of the Contractor;
 - .2 Prior to installation into the work for which the stones are to be used.
- .2 It may occur that a stone block apparently shows few defects. However, cutting it may reveal undesirable defects and/or geological imperfections, such as clay layers of more than 2 mm thickness, cracks or fractures. Stones presenting such defects will be refused by Departmental Representative, even if the block has been accepted at the factory.

1.6 QUALITY ASSURANCE - GENERAL

- .1 Allow Departmental Representative access to mason's workshop for inspection of current work-in-progress.
- .2 Qualifications:
 - .1 Refer to Section 04 05 00 - Common Work Results for Masonry.
- .3 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control and Section 04 05 00 - Common Work Results for Masonry.
 - .2 Do not use existing stonework when constructing job mock-up, except for the core between the new stone veneer and the new brick smoke shafts.
 - .3 Construct mock-up where directed by Departmental Representative.
 - .4 Notify Departmental Representative minimum of 48 hours prior to construction of mock-up.
 - .5 Work not to proceed prior to approval of mock-up. Allow 48 hours for inspection of mock-up by Departmental Representative before proceeding with stone repair work.
 - .6 Perform mock-up of masonry cleaning with low pressure 15 psi clean water and soft natural bristle brush.
 - .7 When accepted, mock-up will demonstrate minimum standard for this work.
 - .8 Retain mock-up as part of finished work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .2 Deliver materials to job site in dry condition avoid excessive handling; protect against chipping, damage or soiling, and from frost. Do not put stones directly on the ground.

- .3 Repairing stone damaged during handling is not permitted.
- .4 Mark each stone quarry bed or direction of bedding and location of stone on building referenced to submittals. Use concealed permanent markings.
- .5 Do not use Lewis pins to move stones. Lift stones only by straps or chains with edges protected.
- .6 Damaged stones (spalls, bursting, fractured, fissured, etc.) by transport and handling must be totally replaced by contractor, free of charge
- .3 Packaging Waste Management: remove in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.8 LIST OF STONES

- .1 Using the examples provided in the drawings, make a list of each of the stones to be replaced, indicating their accurate dimensions, their location in the structure and a reference to the stone cutting drawings submitted.

Part 2 Products

2.1 MATERIALS

- .1 Obtain new stone from a single quarry source acceptable to Departmental Representative.
 - .1 Ensure single quarry source has resources to provide materials of consistent quality and matching existing stone.
- .2 Limestone: medium grain fossiliferous limestone, to ASTM C568, category III - High Density, belonging to the Deschambault formation (Trenton) and coming from Saint-Marc-des Carrières, texture and colour matching the existing veneer.
- .3 Sandstone: to ASTM C616, class II - Quartzitic Sandstone, belonging to the Saint-Léon formation and coming from Bas-Saint-Laurent, texture and green colour matching the existing veneer.

2.2 STONE CHARACTERISTICS

- .1 Limestone:
 - .1 Mechanical properties
 - .1 Stratification: low, bedding plane corresponding to more or less 15% of cutting plane
 - .2 Density, ASTM C97: 2600 kg/m³
 - .3 Absorption (wt.), ASTM C97: 0,15 % maximum
 - .4 Modulus of rupture, ASTM C99: 12,6 MPA
 - .5 Compressive strength, ASTM C170: 60 MPa minimum
- .2 Sandstone:
 - .1 Mechanical properties :
 - .1 Density: 2700 kg/m³ minimum.
 - .2 Absorption (wt.): 0,1 à 0,3 %.

- .3 Compressive strength: 120 MPa minimum.
- .2 Mineral composition:
 - .1 Aluminate (Al_2O_3) : 8 % \pm 1 %.
 - .2 Silicon dioxide (SiO_2) : 60 % \pm 10 %.
 - .3 Calcium oxide (CaO) : 12 % \pm 5 %.
- .3 Stones shall not display any trace of sediment deposit bed or quartz vein.

2.3 STONE BEDDING PLANES

- .1 Horizontal bedding plane (natural): All types of stones.

2.4 STONE FABRICATION

- .1 Cut stone to shape and dimensions and full to square with joints as indicated.
 - .1 Dress exposed faces true. Finish exposed faces of stones to match finish of existing stones or as specified on the drawings.
 - .2 The five (5) unexposed faces of the stones shall be roughened after sawing and display perfectly rough surfaces offering good adherence with mortar to full depth of stones. No sawed surface will be accepted.
- .2 Cut-in reglets for flashings where indicated.
- .3 Execute profiled work from full size details and templates.
 - .1 Make exposed arises in true alignment and ease slightly to prevent snipping.
- .4 Stones shall not be drilled to receive clamp holes.
- .5 Finish exposed faces and edges of stones to comply with requirements indicated for finish and to match approved samples and field-constructed mock-up.

2.5 FABRICATION TOLERANCES

- .1 Fabricate dimension stone to the following tolerances:
 - .1 Unit Length: plus or minus 2 mm.
 - .2 Unit Height: plus or minus 2 mm.
 - .3 Deviation From Square: plus or minus 2 mm, with measurement taken using the longest edge as the base.

2.6 EXISTING STONE

- .1 Cut and use hard, sound, and clean existing stone salvaged on site as approved by Departmental Representative to replace stones of smaller dimensions and to fill in the openings into the masonry floor of the attic. Sawed faces shall be roughened as indicated above.
- .4 Existing stones may be used for reconstructing masonry core. Cut stones to fit the dimensions of the work.

2.7 REJECTION

- .1 Rubble and sandstone from blasted quarry bed will be refused.
- .2 Stones from naturally fractured beds will be refused.
- .3 After cutting and dressing, stone units shall display none of the following imperfections:
 - .1 Chipping and pick marks;
 - .2 Crack, fracture and traces of stone splitting;
 - .3 Clay laminations more than 3.0 mm thick.
 - .4 Continuous traces of quartz more than 1.0 mm thick.
 - .5 Molded lines, markings or stains, coal stripes, excessive iron striation, open stylolytes, or foreign substances negatively affecting appearance.

2.8 MORTAR

- .1 Mortar (type N): in accordance with Section 04 03 08 - Historic - Mortaring.

2.9 FLASHING

- .1 Sheet Metal: copper, as indicated architectural drawings.

2.10 ACCESSORIES

- .1 Obtain each type of stone necessary, sealant and other materials from a single manufacturer.
- .2 Anchors, cramps, dowels: stainless steel, as indicated structural drawings.
- .3 Sealant and backer rod: non-staining type, in accordance with Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Report in writing, to Departmental Representative areas of deteriorated masonry not previously identified.
- .2 Obtain Departmental Representative's approval and instructions for repair and replacement of masonry units before proceeding with repair work.
- .3 Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

3.2 PREPARATION

- .1 Move and lift stone units using means to prevent damage, such as belts and chains with separators to protect the edges (do not use Lewises). Submit stone units dropped or impacted to Departmental Representative for inspection and approval.

- .2 Indicate bedding planes of stone units. Duplicate bedding marks on usable pieces of cut stone.
- .3 Place safety devices and signs near work area as directed in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .4 Install and remove shoring or other supports in accordance with Section 31 04 31 - Historic - Subgrade Shoring and Bracing.
- .5 Install and remove self-supporting scaffolding in accordance with Section 01 52 00 - Construction Facilities.

3.3 PROTECTION OF IN-PLACE CONDITIONS

- .1 Protect adjacent plant material and fragile surfaces.

3.4 STONE REMOVAL

- .1 Stone removal in accordance with Section 04 03 43 - Historic - Dismantling Stone Masonry.
- .2 Clean dust, mortar and stone fragments from slot.

3.5 RAKING JOINTS

- .1 Rake joints around stones to be removed in accordance with Section 04 03 07 - Historic - Masonry Repointing.

3.6 MOVING STONES

- .1 Use belts and chains to lift stones to working level.
- .2 Move stones horizontally on carts.
- .3 Slide stones into place on wood ramps.
- .4 Protect edges of stone from damage when hoisting and lifting from position. Use separators or wood shims to isolate units from hoisting belts.
 - .1 Incorporate only undamaged stone in Work.

3.7 STONE REPLACEMENT

- .1 Build in flashings in masonry in accordance with CAN/CSA A-371.
- .2 Install masonry ties and connectors in accordance with CAN/CSA A-370 and CAN/CSA A-371 unless indicated otherwise. Prior to placing mortar, obtain approval of Departmental Representative of placement of ties and connectors.
- .3 Co-ordinate bond pattern, coursing height and joint width with existing brickwork in area selected by Departmental Representative.
- .4 Clean dust and stone fragments from slot. Before proceeding with Work, inspect cleaned surface with Departmental Representative.
- .5 Clean stone by washing with water and natural fibre brush before laying.
- .6 Dampen slot's surfaces before applying mortar.

- .7 Apply mortar and lay stones.
 - .1 Lay stones on full beds of mortar.
 - .2 Lay heavy stones and projecting stones after mortar in courses below has hardened sufficiently to support weight.
 - .3 Prop and anchor large stones on wood blockings to maintain stones until wall above is set.
 - .4 Set large stones on high density plastic wedges to support stone in proper alignment until mortar has set. Remove wedges when dry, do not break off.
 - .5 Install anchors as indicated. Refer to structural drawings.
 - .6 Poser les ancrages, les goujons, les happes et les crampons. Utiliser des ancrages en métal non corrosifs pour fixer les plaques de parement en pierres, selon les indications.
 - .7 Set stones to match alignment of adjacent stones or plumb, true and level in full bed of mortar with vertical joints buttered and placed full. Completely fill anchor, dowel and lifting holes and voids left by removed edges.
 - .2 Fill vertical joints buttered and placed full in face, and at vertical joint between wythes.
 - .3 Lay stones and tool joints in one operation, tooling with a round jointer to provide smooth joints compressed uniformly concave.
 - .4 Rake bedding mortar back to a minimum depth of 25 mm and make ready for pointing with pointing mortar in separate operation.
 - .1 Provide minimum 3-day damp cure to bedding mortar prior to pointing.
- .8 Apply pointing mortar:
 - .1 Fill raked joints with pointing mortar.
- .9 Finish joints to match those of existing stonework, in area identified by Departmental Representative.
- .10 Keep new mortar damp for 7 days at a minimum temperature of 10 degrees C.
- .11 Clean finished stonework as work progresses.
 - .1 Remove mortar splashings on exposed stonework.
 - .2 Leave no mortar on face of bricks.
 - .3 Remove mortar staining before it sets.
 - .4 Clean masonry with clean water and soft bristle brush only.
- .12 Inspect finished brickwork with Departmental Representative.

3.8 FILLING JOINTS/POINTING

- .1 Fill joints and point: in accordance with Section 04 03 07 - Historic - Masonry Repointing.

3.9 REPOINTING

- .1 Do pointing work in accordance with Section 04 03 07 - Historic - Masonry Repointing.

- .2 Dampen joints and porous masonry units.
- .3 Keep masonry damp during performance of pointing.
- .4 Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of the Work. See Section 04 05 00 - Common Work Results for Masonry for protection required for work in this Section.
- .5 Completely fill joint with mortar.
 - .1 Masonry units with worn rounded edges: maintain joint width by pointing back from exterior face.
 - .2 Avoid feather edges.
 - .3 Pack mortar solidly into voids and joints.
 - .4 Build-up pointing in layers not exceeding 25 mm in depth, but always apply the following layer on a damp base jointm (therefore during the same work shift).
 - .1 Allow each layer to set before applying subsequent layers.
 - .2 Maintain joint width.
- .6 Tool and finish joints as directed by Departmental Representative
- .7 Remove excess mortar from masonry face before it sets.

3.10 PROTECTION OF WORK

- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
 - .1 Extend membranes 0.5 m beyond surface area of work.
 - .1 Prevent finished work from drying out too rapidly.
- .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 Damp cure:
 - .1 Provide damp cure for pointing mortars.
 - .1 Install and maintain wetted protection geotextile protection during the curing process:
 - .1 Minimum 7 days.
 - .2 Wet mist geotextiles only - ensure no direct spray reaches surface of curing mortar.
 - .3 Shade areas of work from direct sunlight and maintain constant dampness of geotextiles.
 - .4 Cover wetted protection tarps with polyethylene sheets our nylon tarps.
- .5 Protect from drying winds. Pay particular attention at corners.
- .6 Maintain ambient temperature of minimum 10 degrees C after repointing masonry for:

- .1 Minimum 7 days in summer.
- .2 Minimum 30 days in cold weather conditions using dry heated enclosures.
- .7 Protect adjacent work from marking or damage due to work.
- .8 Protect adjacent finished work against damage which may be caused by on-going work.

3.11 CLEANING

- .1 Confirm acceptance of mock-up cleaning operations to demonstration from Departmental Representative before starting cleaning work.
- .2 Clean stone work surfaces after repairs have been completed and mortar has set.
- .3 Clean stone surfaces of adhesive or mortar residue resulting from work performed without damaging stone or joints.
 - .1 Use of a medium or high pressure water jet is forbidden.
- .4 Clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.
- .5 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION