

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 03 06 – Historic works – masonry cleaning.
- .2 Section 04 03 07– Historic works – masonry repointing and repair .
- .3 Section 04 03 08 – Historic works – Mortaring.
- .4 Section 04 03 09 – Historic works – Injection Grouting.
- .5 Section 04 03 31 – Historic works – Brick masonry.
- .6 Section 04 03 41 – Historic works –Stone repairing.
- .7 Section 04 03 42 – Historic works – Replacement of Stone.
- .8 Section 04 03 43 – Historic works – Dismantling of stone masonry.
- .9 Section 04 05 19 – Masonry Reinforcement and Connectors.
- .10 Section 04 11 00 – Proprietary Grout Anchors.
- .11 Section 07 92 00 –Joint Sealants

1.2 UNIT PRICES TABLE

- .1 Items of work specified below will be paid based on quantities shown in plans and specifications. Only quantities as a supplement to quantities contained in plans and specifications will be measured on site by the Contractor and validated by the Departmental Representative, and will be payed on the basis of the unit prices indicated in the unit price table for additional quantities which is part of the Tender Form. The methodology of measurement of the quantity on site has to be approved by the Departmental Representative. Refer to various masonry sections for applicable requirements for each unit of work.
- .2 No additional charges will be permitted for extra costs to unit rates of the table such as overhead and profit, weekend double time, administration fees, scaffold rentals, winter heating or management charges.
- .3 The unit prices are all inclusive, including contractor's and sub-contractor's administration and profit except taxes, and will be identical as both an extra and as a credit.
- .4 Unit prices as well as the total amount estimated for each item in the list must be obligatorily furnished by the contractor.
- .5 The scope of works for each section is as described in specifications and plans in reference to the table.
- .6 Only one modification amendment will be emitted only at the end of the works included in the table of unit prices to cover extra and credit amounts for the whole of items in the table.

- .7 Contractor must furnish a precise state of progress of executed quantities of supplementary works to plans and specifications for each item in the table at each of his payment requests. These quantities will be validated by Departmental Representative. Contractor must emit a file of monthly progress **on the plans** indicating all additional interventions done and additional surface measurements on the 25 of each month. Supplementary quantities must be validated on site with Departmental Representative and contractor on a monthly basis.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA):
- .1 CSA-A179-04, Mortar and Grout for Unit Masonry.
 - .2 CSA-A371-04, Masonry Construction for Buildings.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

1.4 SUBMITTALS

- .1 Submit documents and samples in accordance with Section 01 33 00 - Submittal Procedures and as specified in related Sections.
- .2 Product Data: submit manufacturer's printed product literature, specifications and data sheet for each product:
- .1 Indicate date of manufacture of product and shelf life.
 - .2 Indicate initial rate of absorption, saturation coefficient and compressive strength of bricks.
 - .3 Submit two copies of WHMIS MSDS - Material Safety Data Sheets.
 - .4 Indicate VOC's for epoxy coatings and galvanized protective coatings and touch-up products for masonry reinforcement and connectors.
 - .5 Indicate VOC's for joint fillers and lap adhesives.
- .3 Table of anchors, cramps and dowels; include dimensions, shapes and assemblies for standard and non-standard items.
- .4 Shop drawings: submit drawings for non-standard anchors, cramps and dowels.
- .5 Stone cutting schedule; submit shop drawings for all stones to replace. Drawings must show different faces of stone, molded profiles, sedimentation bedding direction, dimensions and finishes of each of the faces of the stone. Each stone must also be illustrated in axonometric view. A key plan showing position of new stones must be joined to shop drawings.
- .6 In addition to all samples enumerated in other sections of Division 4 of specifications, submit the following samples:
- .1 One of each type of masonry reinforcements, accessories, and anchors.
 - .2 One of each mortar constituent (Portland Cement, Lime, Sand) in 500 ml plastic container with screw top lid.

- .3 Three of each type of stone, sized and shaped to match existing stone units with direction of bedding marked. Indicate visible markings and finish.
- .4 One of each type of cleaning material in 250 ml container with safety screw caps.
- .5 One of each type of proprietary product including mortars, anchors and consolidation materials.
- .6 All other samples required in other sections of Division 4 of the specifications.
- .7 Scheduling:
 - .1 Include materials supply date, date of completion of shop fabrication and date of delivery to site
 - .2 Include dates of works mock ups period (4 weeks) before beginning of masonry works.
 - .3 Include date of masonry cleaning (each type) by sections;
 - .4 Include periods of obligatory approvals by Departmental Representative;
 - .5 Include the following activities: works on foundation walls, beginning and ending of dismantling/rebuilding by sections, beginning and ending of repointing works indicating curing period, beginning and ending of stone repairing works by sections.
 - .6 Periods of deficiencies corrections.
- .8 .Manufacturer's Instructions: Submit manufacturer's installation instructions.
- .9 Test Reports: Submit certified test reports showing compliance of materials with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE EXECUTION

- .1 Perform work under the supervision of the Departmental Representative.
- .2 Perform work in accordance with established procedures for historic masonry conservation and The Standards and Guidelines for the Conservation of Historic Places in Canada, published by Parks Canada.
- .3 Shoring and cradling, and other temporary framing work needed to support the structure shall be designed by a qualified structural engineer, recognized, hired and paid by the general contractor, familiar with historic masonry structures and licensed to practise in the Province of Québec. Drawings to be stamped and signed by the aforementioned engineer.

1.6 QUALITY ASSURANCE MOCK UPS

- .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control, as described herein and as specified in the applicable other Sections of the Specifications.
- .2 Work mock ups must obligatorily begin 4 weeks before the beginning of masonry works. Contractor will be held responsible of delays generated to schedule by non-compliance to this requirement.
- .3 Construct mock-ups under supervision of Departmental Representative to demonstrate a full understanding of specified procedures, techniques and formulations are achieved before work commences.

- .4 In addition to all work mock ups enumerated in other sections of the specifications, construct the following mock-ups to illustrate:
- .1 **Stone repairs:** Construct a mock-up of a representative sample of each type of repair. Include the following mock-ups:
 - .1 All masonry cleaning samples mentioned in section 04 03 06.
 - .2 Five surface fissure repairs.
 - .3 Five deep crack repairs.
 - .4 Ten restoration mortar repairs (2 by color).
 - .5 Five stone surface desquamations (0.5m x 0.5m).
 - .6 Five stone insertions (see paragraph 3.6 of section 04 03 41).
 - .7 Five reinstallation of displaced stones.
 - .8 Five fracture repair, in place.
 - .9 Five spalling repairs.
 - .10 Five repairs of consolidation of fractured stones and deep fissures.
 - .11 Six big Dutchman repairs with anchor dowels (two of each type, flat, template and sculpted).
 - .12 Six small Dutchman repairs without anchor dowels (two of each type, flat, template and sculpted).
 - .13 Grout injection in cavity at three locations.
 - .14 One works mock up of dismantling/rebuilding of 4mx4m of masonry of north wall (all stages, from marking to final product).
 - .2 **Backpointing and repointing:** Construct mock-up 1.5 m x 1.5 m to demonstrate raking out, backpointing and repointing procedures as per the following (important: locations of all the tests to be identified by the Departmental Representative once the scaffold is set up). Construct two works mock-ups by type of stones in the specification (see section 04 03 42 par. 2.1 for types of stone):
 - .1 Raking out of joints
 - .2 Backpointing of joints (2 tests for each type of stonework and mortar type, including junctions at differing stonework and methodology to meet environmental requirements for mortar curing).
 - .3 Front pointing of joint. Two tests for each type of mortar and each type of stonework, including junctions at differing stonework and methodology to meet environmental requirements for mortar curing.
 - .3 **Injection Grouting:** Filling of voids and cracks in the core of the wall as specified in Section 04 03 07 - Historic works- masonry Repointing and repair. Provide a mock-up of 0.75 m³ of grout injection.
 - .4 **Cleaning:** Each type of stone and each type of masonry cleaning specified in Section 04 03 06 - Historic Masonry Cleaning. Illustrate cleaning techniques required representative of full range of soiling or stains. Extents of mock-ups as indicated in section 04 03 06. Locations to be identified by the Departmental Representative once the scaffold is set up.

- .5 Stone: Type of bond pattern and bedding, joints between units, and movement control joints.
- .6 Backup wall: connectors and accessories.
- .5 Allow samples to cure at least 5 days before asking Departmental Representative's approval for colour match. Samples shall be viewed from a distance of approximately 3.5 m.
- .6 When accepted, mock-ups shall demonstrate the minimum standard for this work. Accepted mock-ups may remain as part of the finished work.
- .7 Mock-ups will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .2 For testing to determine compliance with performance requirements.
 - .3 To determine quality and degree of finish required.
- .8 Construct mock-ups where indicated by Departmental Representative.
 - .1 Coordinate and sequence activities accordingly.
- .9 Allow 4 working days for inspection of mock-ups by Departmental Representative before proceeding with work.
- .10 Repeat mock-ups until satisfactory results are obtained to satisfaction of Departmental Representative (above and beyond the mock-up quantities mentioned in the specifications).
- .11 When accepted by Departmental Representative in writing, mock-ups will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.7 QUALITY ASSURANCE—INSPECTIONS

- .1 Make mason's workshop accessible to Departmental Representative for review of current work-in-progress.

1.8 QUALITY ASSURANCE—LABOR

- .1 The ratio of masons apprentice or junior (at least 3 years experience) by mason companion or mason senior (more than 10 years experience) must be 1 for 2. Masonry contractor is not authorized to leave masons apprentices/ juniors without supervision of a mason companion or senior. Departmental Representative will require from contractor to respect the ratio of 1 for 2 (ex: for 20 masons apprentices or juniors of less than 3 years experience, there must be 10 masons companion or senior of more than 10 years experience).
- .2 Contractor must schedule a start-up meeting with Departmental representative and ALL the masons of his masonry contractor at the beginning of the works. The goal of this meeting is to increase awareness the workers to the patrimonial context.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

- .2 Deliver materials to job site in dry condition.
- .3 Storage and Protection:
 - .1 Keep materials dry until use except where wetting of bricks or stone is specified. Protect from freezing and contamination.
 - .2 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
- .4 Do not use materials which have exceeded manufacturer's recommended shelf life.
- .5 Comply with the requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of hazardous material; and regarding labelling and the provision of Material Safety Data Sheets.

1.10 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Unused metal materials are to be diverted from landfill to a metal recycling facility as approved by Departmental Representative.
- .5 Unused or damaged masonry materials must be diverted from landfill to a local facility as approved by Departmental Representative.
- .6 Identify hazardous and related materials which cannot be reused, are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from the Provincial Ministries of Environment and Regional Levels of Government.
- .7 Safely store materials defined as hazardous or toxic waste, including emptied containers and application apparatus, in containers or areas designated for hazardous waste and dispose of contaminants in an approved legal manner.
- .8 Place materials defined as hazardous or toxic in designated containers.
- .9 Handle and dispose of hazardous materials in accordance with applicable federal, regional and municipal regulations.
- .10 Do not dispose of unused sealant products or waste materials into sewer systems, into lakes, streams, onto ground or in other location where they will pose health or environmental hazard
- .11 Fold up metal banding, flatten, and place in designated area for recycling

1.11 WORKING CONDITIONS (TEMPERATURE AND HUMIDITY)

- .1 Execute all mortar work when ambient temperature is between 15°C and 25°C and Relative Humidity (RH) is greater than 50% during installation.

- .1 Curing conditions for repointing mortars: maintain for a period of 7 days, 100% humidity.
- .2 Curing conditions for repair mortars: maintain for a period of 7 days, 100% humidity.
- .2 When ambient conditions do not meet requirements prescribed herein, provide enclosure system around curing area to ensure that stated environmental conditions are maintained for curing period. Take precautions to avoid overheating masonry.
 - .1 The use of heated temporary enclosures to maintain ambient and surface temperatures above 10°C in cold weather is subject to the written approval of the material manufacturer and the Departmental Representative.
 - .2 Submit enclosure system for approval from Departmental Representative in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Remove work exposed to lower temperatures as directed by the Departmental Representative.
- .4 Install thermometers and relative humidity probes at every 2 levels in the exterior scaffoldings and at each 7 meters of distance from one to the other on the same storey of scaffoldings in exterior conditions. A thermometer and relative humidity probe must be installed in each interior room where masonry works are being held. Checking and temperature and relative humidity must be done at each hour even during the night (24 hours /24 and 7 days on 7 during all duration of masonry works.). The contractor must transmit all data of all thermometers and probes on a weekly basis in Excel format to Departmental representative. All readings under 15 °C and over 25°C must be highlighted in the Excel file.
- .5 Protection requirements are specified in Section 04 05 00 - Common Work Results for Masonry.
- .6 Obtain approval from Departmental Representative for methods of protection and fabrication of enclosures.
- .7 Hot Weather Requirements:
 - .1 Protect repair mortar from direct sunlight and wind when the ambient air temperature exceeds 21°C.
 - .2 Use protection methods acceptable to the Departmental Representative.
 - .3 Keep repaired area humid for a period of 7 days for a proper cure.
 - .4 Do not use or prepare mortar when the ambient air temperature is above 32°C at the location of the work.

1.12 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products

Part 2 Products

2.1 MATERIALS

- .1 Refer to related sections for stone, brick, related materials, accessories and material preparation procedures.
- .2 Burlap: clean, non-staining, free of printed matter, to Departmental Representative's approval.
- .3 Plumber's hemp: asbestos-free, oil- free jute rope.

2.2 SOURCE QUALITY CONTROL

- .1 Retain purchase orders, invoices, suppliers test certificates and documents to prove that materials used in contract meet requirements of specification.
- .2 Produce above upon request by Departmental Representative and allow free access to sources where materials were procured.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 SITE VERIFICATION CONDITIONS

- .1 Report in writing, to Departmental Representative, areas of deteriorated masonry revealed and not conforming to specified requirements of the Work.
- .2 Once the scaffold is set up, providing access to all walls areas, obtain Departmental Representative's review, approval and instructions for each specified repair and replacement of masonry units before proceeding with repair work.
- .3 Obtain Departmental Representative's review and approval after the raking out of the mortar joints and prior the backpointing / repointing work. See section 04 03 07 for complementary information.

3.3 PROTECTION

- .1 Take necessary precautions to ensure that existing masonry sculptural carvings are not damaged during work. Provide protection of these elements. Submit protection measures to Departmental Representative for approval.

3.4 PREPARATION WORKS

- .1 Inspect site with Departmental Representative and verify extent and location of mortar types prior to commencing installation.

- .2 Supports:
 - .1 Construct shoring, cradling, and temporary framing work to support structure parts during removal and resetting operations, in accordance with approved drawings. Drawings to be stamped and signed by engineer experienced with historic masonry structures and registered in Province of Québec.
 - .2 Leave work in safe condition when work is not in progress.
- .3 Take utmost care not to damage historic fabric. If need be, repair any damage.
- .4 Seal and protect openings, doors, windows, and adjacent areas to prevent damage and spread of construction dust, water or other materials into the building.
- .5 Cover sills and projecting courses with rigid protection, secured into joints, for duration of work.
- .6 Prevent scaffolding, hoists or construction equipment from bearing directly against masonry or roof. Provide lumber or plywood with padding of sufficient thickness to prevent damage.
- .7 Obtain Departmental Representative's approval prior to proceeding, for:
 - .1 Extent and type of stone to be replaced repaired or removed.
 - .2 Methodology and tools to be employed before commencing work.
- .8 Determine precise exterior wall thicknesses at each level of building by drilling minimal size pilot holes. Repair and make good holes to match existing condition.

3.5 **INSTALLATION**

- .1 Do masonry work in accordance with CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Lay out coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.
- .4 Prevent materials from entering or penetrating wall cavities of building. Report findings of materials to Departmental Representative before continuing with work

3.6 **CONSTRUCTION**

- .1 Remove, repair and replace masonry as indicated.
- .2 Jointing:
 - .1 Allow joints to set just enough to remove excess water, then finish joint as specified.
 - .2 Finish brick masonry joints to match existing.
 - .3 Finish stone joints as specified in Section 04 03 07 – Historic Masonry Repointing and Repair.
- .3 Cutting:
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make brick cuts straight, clean, and free from uneven edges.

- .4 Building-In:
 - .1 Build in items required to be built into masonry.
 - .2 Prevent displacement of built- in items during construction. Check plumb, location and alignment frequently, as work progresses.
- .5 Wetting of bricks:
 - .1 Except in cold weather, wet bricks having an initial rate of absorption exceeding 1 g/minute/1000 mm²: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.
 - .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.
- .6 Support of loads:
 - .1 Use grout to CSA A179 where grout is used in lieu of solid units.
- .7 Interface with other work:
 - .1 Cut openings in existing work as indicated on drawings (ex: concrete floor cutting to get access to the floor structure).
 - .2 Openings in walls: approved by Departmental Representative prior to commencing the work.
 - .3 Make good existing work. Use materials to match existing.
 - .4 Finish all existing metal elements found within masonry assemblies, or that are in contact with masonry, in accordance with Section 09 91 10 - Painting.

3.7 SITE TOLÉRANCES

- .1 Tolerances in notes to Clause 5.3 of CSA-A371 apply.

3.8 FIELD QUALITY CONTROL

- .1 Testing on all types of mortars and grouts in the project (grouting, bedding mortar, front pointing mortar and backpointing mortar) shall be carried out by a Testing Laboratory designated by the Departmental Representative and engaged by the contractor. The laboratory tests shall occur once a week (2 tests on each type of mortar) during the entire grouting and mortaring operations throughout the project on all types of mortars and grouts. The tests shall be done with on-site fresh samples and shall include the compressive strength at 7 days and 28 days, air entrainment %age, vicat cone testing (mortar only) and flexural strength.
- .2 Prepare and update a register including a drawing of elevations on which the positions of « data-logger » will be marked as well as dates of beginnings of humid curing of mortars for a given sector. Update and transmit once a week to Departmental Representative.
- .3 Inspection and tests of mortar will be done by a testing laboratory designated by the Departmental Representative, in compliance with CSA A179 standard. Departmental Representative must visit the laboratory before it's hiring by the contractor to ensure that equipments and used testing processes meet the standards and the specification requirements.

- .4 Contractor will pay for costs of initial mortar testings (plan for two tests per type of mortar).contractor must pay and perform tests on all types of mortar used two times a week for the whole duration of masonry works.
- .5 Air content for all mortars containing lime and Vicat cone penetration tests for the mortars used in stone works must be tested at the same frequency as testings for resistance, or more often according to requirement of Departmental Representative.
- .6 Contractor must possess and have on the site a penetrometer Vicat functional and well maintained for the whole duration of works of the project.

3.9 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.10 PROTECTION

- .1 At end of each working day, cover unprotected work with waterproof membranes. Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.
- .2 Protect masonry and other work from marking and impact damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .3 Maintain protection for minimum three weeks.

END OF SECTION