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**Part 1            General**

**1.1               SCOPE OF WORKS**

- .1       The list of works enumerated in this section is informative and non-restrictive. It does not exclude works described in other sections of the specifications, shown on drawings or necessary to the complete execution of the works in the spirit of the plans.
- .2       Grouting injection works comprise, the injection of cavities in the old masonry walls as indicated on drawings and in the unit price form. Works also include the Cintec type anchors.

**1.2               RELATED REQUIREMENTS**

- .1       Section 04 03 07 – Historic works – masonry repointing and repair.
- .2       Section 04 03 08 – Historic works – Mortars.
- .3       Section 04 05 00 – Common Work Results for Masonry.
- .4       Section 04 05 19 – Masonry anchorage and reinforcing.

**1.3               REFERENCES**

- .1       Canadian Standards Association (CSA International)
  - .1       CAN/CSA A23.1-04/A23.2-[04], Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2       CAN/CSA-A179-[04], Mortar and Grout for Unit Masonry.
  - .3       CAN/CSA-A3000-[03(R2006)], Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

**1.4               DEFINITIONS**

- .1       Grout: hydraulic binding based mixture of liquid consistency suitable for pouring or pumping, to fill voids between masonry elements and for injected anchors

**1.5               PERFORMANCE REQUIREMENTS**

- .1       Hydraulic binding based grout (Hydraulic lime) compression strength: 2,0 MPa, after cure of 7 days and 3.5 MPa after cure of 28 days.

**1.6               SUBMITTALS**

- .1       Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and section 04 05 00- Common Work Results for Masonry.
- .2       Provide hydraulic binding based grout samples to CAN/CSA A179.
- .3       Provide upon request of Departmental Representative purchase orders, invoices, supplier's test certificates and documents to prove materials used in contract meet requirements of specification. Allow free access to source where materials procured.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Store materials in dry area and support free of ground.
  - .3 Deliver materials in sealed containers with labels legible and intact.
  - .4 Handle materials in safe manner in accordance with manufacturer's instructions. Avoid breaking container seals.
  - .5 Store materials at temperatures between 5 degrees C to 38 degrees C unless otherwise stated by manufacturer.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

## **1.8 AMBIENT CONDITIONS**

- .1 Maintain temperature of masonry elements to be grouted above 15 degrees C throughout their thickness, during grouting and in the following 7 days.
- .2 Maintain temperature of elements to be grouted between 20 degrees C to 25 degrees C throughout its thickness during grouting and 48 hours after.
- .3 Provide temporary enclosure and temporary equipment to maintain specified temperatures.

## **1.9 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 Pre-mixed injection grout based on natural hydraulic lime.

### **2.2 EQUIPMENT**

- .1 Mechanical mixer: size compatible with volume of mortar grout prepared.
- .2 Mechanical regulator to prevent segregation of ingredients after mixing and ensure injection continuity.
- .3 For injection equipment refer to Section 04 03 43 - Historic - Dismantling of Stone Masonry Removals.
- .4 Injection pump to include motor, gears and two separate reservoirs for resin and hardener. Set gear ratio to feed injection gun to recommended proportions, using two separate conduits.

- .5 Maintain mixing equipment in good working order. Ensure that necessary spare parts are available on site.

### **Part 3 Execution**

#### **3.1 SITE VERIFICATION OF CONDITIONS**

- .1 Report to Departmental Representative before start of work possible structural masonry problems and conditions that do not conform to those specified including existing voids or possible openings which risk being compromised when grout will flow.

#### **3.2 INSPECTION**

- .1 Mixing operations: continuously inspected by Departmental Representative. Provide required assistance to facilitate taking of grout samples and inspection work.

#### **3.3 CONDITION OF SURFACES**

- .1 Evaluate moisture content of masonry work by taping 3 x 3 m polyethylene sheet to masonry surface. If moisture collects on underside of sheet before grout would cure, allow masonry work to dry sufficiently before commencing injection work.

#### **3.4 MEASUREMENT AND MIXING**

- .1 In mechanical mixer, pour specified amount of water, add gradually the dry ingredients and mix at high speed for period of at least 5 minutes nor more than 10 minutes with.
- .2 Use grout before it has begun to set but not more than 30 minutes after initial mixing.

#### **3.5 PREPARATION**

- .1 Ensure substrate is free from loose material or particles.
- .2 Prepare voids around to control flow of grout.
- .3 Prepare joints before grout injection:
  - .1 Insert hemp ropes into joints.
  - .2 Point joints.
- .4 Wet surfaces, deep into substrate.

#### **3.6 INSTALLATION**

- .1 If gravity injection (as mentioned in other sections does not work to satisfaction of Departmental Representative, the Contractor must inject at low pressure (minimum 0,7 bars / 10 psi) with a grout pump. The injection method must be approved by Departmental Representative.

#### **3.7 FIELD QUALITY CONTROL**

- .1 Take 2 samples of grout and submit to Departmental Representative for testing in accordance with paragraph 1.5 of this section.

- .1 The contractor must pay the costs of the initial laboratory tests of the injection grout. Compressive strength tests at 7 days and 28 days are required. Do 3 initial tests with samples mixed in the presence of Departmental representative.
- .2 Contractor must pay costs of laboratory tests on the injection grout at the rate of 2 tests per week (taken at different days) during the injection works.

### **3.8 GROUT INSTALLATION IN MASONRY WALL SECTIONS**

- .1 Where stones are identified to be replaced and/or resetted and where there is masonry dismantling, the Departmental Representative will identify the voids to be grout injected. Where indicated on drawings and where determined by the Departmental Representative that there are voids in the core of the wall, prepare and install specified grout.
- .2 Clean out voids with clean water followed by 10% ethyl alcohol solution until water runs clear. Ensure ambient temperature remains above 15°C for at least 48 hours after voids are cleaned out.
- .3 Fill joints and cracks with mortar set back 25 mm from front edge/arris of stone unit.
- .4 Install grout tubes in joints, in sufficient numbers to insure grout feeds to all areas of the core cavity to be covered (plan for 2 per 1000 cm<sup>2</sup>). Flexible plastic grout tubes (6 mm dia.) must reach at least 200 mm into where the void must be filled as determined by Departmental Representative.
- .5 Inject Hydraulic lime-based grout by gravity in a state sufficiently fluid to suit application condition. Gently vibrate to assist flow. Ensure voids are full through grout tubes.
- .6 Grout from the bottom of the wall opening and/or joint to the top.
- .7 Allow grout to set prior to proceeding with repairs, frontpointing, backpointing, substrate consolidation and stone setting.
- .8 Take great care not to allow the grout to seep inside the wall and damage the interior finishes such as historic plasters. Damages to the interior finishes caused by undue care must be repaired at the Contractor's expense.
- .9 Allow grout to firm up and thoroughly clean and rinse any grout spills from the surface of the stone to avoid staining.
- .10 Frontpoint joints and/or consolidate the substrate only after grout has cured and humidity from the operation has subsided.

**END OF SECTION**