1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Division 1 – General Requirements.

.2 Section 04 03 06 Historic – Cleaning Historic Masonry

.3 Section 04 03 07 Historic – Masonry Repointing

.4 Section 04 03 08 Historic – Mortaring

.5 Section 04 03 43 Historic Works – Dismantling Stone Masonry

.6 Section 04 05 00 Common Work Results for Masonry

1.02 ALTERNATES

.1 Obtain Departmental Representative's approval before changing manufacturer's brands or sources of supply of mortar materials during entire contract or other methods of mixing mortar specified elsewhere in this specification.

1.03 REFERENCES

.1 ASTM International
- .1 ASTM C 5-10, Standard Specification for Quicklime for Structural Purposes.
- .2 ASTM C 144-11, Standard Specification for Aggregate for Masonry Mortar.
- .3 ASTM C 185-08, Standard Test Method for Air Content of Hydraulic Cement Mortar.
- .4 ASTM C 207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
- .5 ASTM C 260/C 260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
- .6 ASTM C 270-12a, Standard Specification for Mortar for Unit Masonry.
- .7 ASTM C 780-12, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- .8 ASTM C 1072-11, Standard Test Method for Measurement of Masonry Flexural Bond Strength.

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

1.04 ACTION AND INFORMATIONAL 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 Departmental Representative confirmation of source or product data sheet of:
.1 Aggregate.
.2 Cement.
.3 Lime.
.4 Premixed products.
.5 Pigments.

.3 Samples:
.1 Provide samples in quantity and size in accordance with CAN/CSA-A179.

.4 Test reports:
.1 Submit test results during site work as directed by Departmental Representative's 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.

1.05 QUALITY ASSURANCE

.1 Qualifications:
.1 Use only contractors competent to meet all performance criteria specified.
.2 Mortar to be mixed by same masons throughout project.

.2 Materials Testing

.1 At the time of initial mix verification submit written test results for the following:

.1 By Contractor - Bulking analysis of mortar sands

.2 By a recognized testing laboratory

.1 Sieve Analysis of fine and Coarse Aggregate (ASTM C136)

.2 Water Soluble Chloride Ion Content (CSA A23.2)

.3 Mock-ups:
.1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
.2 Submit methods of reproducing existing mortar colour, texture and pointing types, and samples.
.3 Construct mock-up 1000 x 1000 mm.
.4 Mock-up will be used:
.1 To judge quality of work, substrate preparation, and material application.
.2 For testing to determine compliance with performance requirements.
.5 Locate as directed by Departmental Representative.
.6 Notify Departmental Representative48 hours before commencing mock-up.
.1 Obtain approval from Departmental Representative before

commencing mock-up.

.7 Allow 48 hours for inspection of mock-up before proceeding with work.

.8 When accepted, mock-up will demonstrate minimum standard for this Work. Approved mock-up will remain as part of finished work.

1.06 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store cementitious materials and aggregates in accordance with CSA A23.1/A23.2.

.3 Store lime putty in plastic lined sealed drums.

.4 Protect from weather, freezing and contamination.

.5 Remove rejected or contaminated material from site.

.6 Store and protect mortar materials from nicks, scratches, and blemishes.

.7 Replace defective or damaged materials with new.

1.07 SITE CONDITIONS

.1 Ambient Conditions:

.1 Provide weather-tight enclosure to store materials and mix mortars, maintain air temperature above 10 degrees C at all times.

.2 Maintain maximum/minimum thermometers and relative humidity gauges on site and in enclosures.

.1 Maintain a daily record of temperature and humidity.

.2 Install relative humidity and temperature equipment, record temperature and relative humidity and submit report to Departmental Representative.

2 PRODUCTS

2.01 MATERIALS

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

.2 Sand: to CAN/CSA-A179.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4 (4.75 mm)	100	0
No. 8	90	10
No. 16 (1.18 mm)	70	20
No. 30 (600	50	20

µm)		
No. 50 (300 µm)	30	20
No. 100 (150 µm)	15	15
No. 200 (75 µm)	0	15

.1 Sharp, screened and washed pit sand, free of organic material, with final grading and colour to review of Departmental Representative.
.2 Custom blend sands where necessary to provide appropriate colour match and gradation to review of Departmental Representative.

.3 Portland cement: to CAN/CSA-A3000.

.4 Masonry cement: to CAN/CSA-A3000.

.5 Lime:
.1 Hydrated Lime:
.1 Dolomitic finishing lime, Type "S", to ASTM C 207.

.6 Colour:
.1 coloured sand to match existing. Use minimum amount necessary.
.2 Maximum colour: 2% of total volume of aggregate.
.3 Match core of freshly broken sample of original mortar.
.4 Coloured admixtures: maximum 15% of binder content by mass.

.7 Additives:
.1 Obtain written approval of Departmental Representative before using additives.

.8 Air entrainment:
.1 Vinsol resin type: to ASTM C 260/C 260M.

.9 Mortar mill:
.1 Mortar mill comprising mortar pan with adjustable cast iron sprung rollers on cranked roller shaft, steel scrapers and blades for lime putty mixing.

.10 Spiral paddle mill comprising a mechanically driven rotating barrel with integral internal paddles for other than lime putty mixing
.1 Each batch add up to 6 large stones to tumble and pound mortar during mixing process.

.12 Plasterer's metal troughs.

2.02 MORTAR MIXES

.1 Proportion requirements:

.1 Portland cement-lime mortar:

.1 For exterior and interior back pointing and bedding: type S, based on proportion specifications, consisting of 1 parts white Portland cement, 2 parts lime, and 7 parts sand.

.2 For interior pointing: type O, based on proportion specifications,

consisting of 1 parts white Portland cement, 2 parts lime, and 9 parts sand.

.2 Property requirements:
.1 Mixes: as required to achieve specified performance criteria, functionally compatible with adjacent materials and components.
.2 Obtain written approval of Departmental Representative before changing mix proportions. Change mix proportions only as directed by Departmental Representative.

2.03 COLOURED MORTAR

.1 Use sand or tint as colouring agent.

.2 Maintain one mortar mixer exclusively for coloured mortar.

2.04 ALLOWABLE TOLERANCES

.1 Bedding mortar compression strength minimum 5 MPa, maximum 9 MPa, cured for 28 days.

.2 Back pointing mortar compression strength minimum 5 MPa, maximum 0.75 MPa.

.3 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.

3 EXECUTION

3.01 GENERAL PREPARATIONS

.1 Traditional Lime-Cement Mortar:
.1 Prepare measuring boxes to ensure accurate proportioning of dry lime putty and sand.
.2 Mix dry lime and sand thoroughly in mortar mill minimum 3 minutes and maximum 10 minutes. Do not add water. No spots or streaks of lime to remain upon completion of mixing.
.3 Add water as required.

3.02 BULKING OF SAND

.1 Test sand for bulking:
.1 At start of work.
.2 After each new delivery of sand.
.3 After severe change in weather.

.2 Test and adjust sand quantities for bulking:
.1 Obtain sample of sand which accurately reflects average condition of pile of damp sand, as follows:

.1 Take 4 shovels full of sand, each from a different level of the pile, and mix thoroughly.
.2 Place sand in a conical pile and divide into 4 quarters with a board. Remove 2 opposite quarters from pile, and combine remaining 2 quarters and mix thoroughly.
.3 Repeat quartering and mixing procedure until a sample of size required for testing remains.

.2 Fill a 1-litre capacity jar, about two-thirds full with damp sand to be tested. Drop sand in loosely. Do not pack it in. Level off surface, measure depth of damp sand (D).
.1 Carefully empty sand into another container, and half fill first container with water.
.2 Pour back about half of test sample of sand slowly into water so it is entirely saturated. Rod it thoroughly to remove air.
.3 Add rest of sand, rodding again to remove air and level off surface. Measure depth of saturated sand (S), which will be less than depth of damp sand.
.4 Calculate percentage bulking using formula: [(D-S) x 100%]/S = percentage bulking; where D = depth of damp sand, and S = depth of saturated sand.

.3 Increase volume of sand by percentage bulking shown in test.

3.03 PREPARATION OF MORTAR

.1 Lime Putty Mortar:
.1 Prepare lime putty from hydrated mason's lime by adding dry bagged hydrated lime to water. Stir and hoe the mass to form a thick cream.
.2 Seal containers.
.3 Label and date all containers.
.4 Keep prepared material from freezing. Discard frozen material.
.5 Allow to stand at least 48 hours in covered containers before use, preferably longer.
.6 Take lime putty from bins, siphon off water by screening lime through muslin, or cheesecloth, to remove excess water. Rework lime without adding water until it regains its plasticity by beating, ramming and chopping.
.7 Adjust sand for bulking as described in article [3.2].
.8 Mix lime putty with sand as required.

3.04 PREPARATION OF LIME-SAND ROUGHAGE (COARSE STUFF)

.1 Store lime sand roughage in air-tight plastic bins.

.2 Keep prepared material from freezing. Discard frozen material.

.3 Maintain measuring containers for correct quantity of materials for use in batches.

.4 Thoroughly clean mortar boards, measuring boxes and mixers between batches.

3.05 MIXING

.1 General:
.1 Use batching box.
.2 Follow proper batching procedure.
.3 Monitor mixing time.

.2 Mortar:
.1 Mix Characteristics:
.1 Pointing mortar: slightly stiffer than bedding mortar with a consistency such that the mortar can be hand-formed into a stiff ball.
.2 Record amount of water required to reach this consistency and use for subsequent mixes.
.2 Prepare only enough mortar to be used within two hours. Do not retemper mortar beyond this time.

.3 Follow manufacturer instructions when premixed mortar is used.

.4 Contractor to appoint 1 individual to mix mortar for duration of project. If this individual must be changed, mortar mixing must cease until new individual is trained, and mortar mix is tested.

3.06 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CAN/CSA-A179 except where specified otherwise.

3.07 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

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

.4 Clean masonry with low pressure 15 to 45 psi clean water and soft natural bristle brush.

.5 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

.6 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.08 PROTECTION OF COMPLETED WORK

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

.2 Enclose and protect work using wetted burlap.

.3 Cover with waterproof tarps to prevent weather from eroding recently laid material.
.1 Maintain tarps in place for minimum of 4 weeks after laying.
.2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.

.4 Anchor coverings securely in position.

END OF SECTION