Part 1 GENERAL

1.1 SUMMARY

1. This Section to conform to Section 01 10 00, General Requirements.
2. This Section describes the preparation and supply of mortar for all masonry work.

1.2 RELATED WORK

1. Masonry Procedures: Section 04 03 05 01
2. Masonry Restoration: Section 04 05 20 91

1.3 REFERENCES

1. CSA A179.M94 Mortar and Grout for Unit Masonry.
2. CSA A82.56M, Aggregates for Masonry Mortar.
3. CAN/CSA-A5-M93, Portland Cement
4. ASTM C207-91, Hydrated Lime for Masonry Purposes.

1.4 SAMPLES

1. Submit samples of all mortar materials and obtain approvals as specified in Section 04 03 05 01, Masonry Procedures.

1.5 DESIGN PERFORMANCE REQUIREMENTS

1. The following design performance criteria are applicable for the mortar.
2. Mortar compressive strength: minimum 3.5 MPa, maximum 6MPa at 7 days.
3. Mortar compressive strength: minimum 6.0 MPa, maximum 9MPa at 28 days.
4. Air content of plastic mix: not less than 10%, nor more than 15%.
5. Vicat Cone penetration of mortar mix in plastic state: not less than 22mm, nor more than 28mm. for pointing mortar. Bedding mortar may exceed the maximum penetration by not more than 20%.

1.6 TESTING STANDARDS

1. CSA A 179-94 Mortar and Grout for Unit Masonry [for cube strength].
2. ASTM C780 Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry. [for Vicat Cone test].

1.7 TEST REPORTS PRIOR TO COMMENCEMENT OF WORK

1. Submit test reports on the following:

    1. Sieve analysis of proposed sand.

    2. Bulking analysis of proposed sand in condition as delivered to site and after any change in environmental conditions.

    3. Vicat cone penetration of mortar mix.

    4. Compressive Strength of mortar at 7 and 28 days, a minimum of 35 days prior to commencing work, or as agreed with Consultant.

1.8 TEST REPORTS FOLLOWING COMMENCEMENT OF WORK

1. Submit test reports on the following at the intervals indicated:

    1. Bulking analysis of sand following any new delivery of sand, following any change in environmental conditions, or when requested by Consultant.

    2. Vicat cone penetration on every batch for the first three days and thereafter on a daily basis at the discretion of the Consultant.

    3. Compressive strength of mortar for 7 and 28 day tests on a daily basis at the discretion of the Consultant.

1.9 QUALITY ASSURANCE

1. The mixing of mortars shall only be done by mechanics having a minimum of 3 years experience in the preparation of cement-lime mortars.

Part 2 PRODUCTS

2.1 MATERIALS

1. Water: Clean and free from contaminants.

2. Aggregates:

    1. Sand: to CSA A82.56M, [Aggregates for Masonry Mortar] sharp, screened and washed pit sand, free of any organic material. Grading and colour to approval of Consultant as follows:

        1. Provide custom-blended sand conforming to the following sieve analysis for mortar joints less than 10mm in width:

SIEVE SIZE		PERCENTAGE BY WEIGHT PASSING EACH SIEVE	PERCENTAGE BY WEIGHT RETAINED ON EACH SIEVE
Imperial	Metric		
No. 4	4.75 mm	100	0
No. 8	2.36 mm	100	0
No. 16	1.18 mm	80	20
No. 30	600 microns	55	25
No. 50	300 microns	30	25
No. 100	150 microns	15	15
No. 200	75 microns	15	15

2. Where a standard sand falls outside the above analysis, blend and screen to meet the above requirements.

3. Lime: Hydrated Lime: Type SA, to ASTM C207-91. Type SA lime contains air entraining agent.

4. Cement: Non-staining, white Portland cement to CAN3-A5.M93, normal (symbol 10) type.

5. Admixture for Colour: Inorganic pigment, dry powder, mineral oxide type. Standard of acceptance, Elementis Pigments Inc., Toronto, Ontario.

2.2 SOURCES

1. Use same manufacturer brands and suppliers for sources of mortar materials for entire project.

2.3 EQUIPMENT

1. Mortars are to be prepared in a mechanical paddle mixer.

2.4 BACK-POINTING, BEDDING, POINTING AND REPAIR MORTARS

1. Mortars are based on the proportion specifications of CSA A179.

2. Mortar for bedding and backpointing brick, stone and cast stone: by volume: one part white Portland cement, three parts hydrated lime and nine parts aggregate. [1:3:9].

3. Mortar for pointing brick, stone and cast stone: by volume: one part white Portland cement: two and one half parts hydrated lime and eight parts aggregate. [1:2.5:8].

4. Pointing mortars may require the addition of pigment in order to match existing mortar on building. Pigment shall not exceed 10% of the binder content by volume.

Part 3 EXECUTION

3.1 PREPARATION OF MORTARS

1. Bulking of Sand and Aggregates

2. Bulking is the increase in volume of dry sand when it becomes damp.

3. Damp sand can occupy as much as one-third more volume than either dry or saturated sand.

4. Damp sand may be used if its volume is adjusted for bulking. Obtain acceptance of Consultant of bulked sand volume. The Consultant reserves the right to reject sand if bulked volumes are excessive.

3.2 TEST AND ADJUSTMENT OF SAND QUANTITIES FOR BULKING

1. Test sand to be used in mortar for bulking at the start of the work, after each new delivery of sand and after any severe change in weather.

2. Obtain a sample of sand that accurately reflects the average condition of the pile of damp sand, by the following methods:

    1. Take 4 shovelfuls of sand, each from a different level of the pile, and mix thoroughly.

    2. Place this sand in a conical pile and divide into 4 quarters with a board. Remove 2 opposite quarters from the pile, and combine the 2 remaining quarters and mix thoroughly.

    3. Repeat this quartering and mixing procedure until a sample of the size required for testing remains.

    4. Fill a 1-litre capacity jar, about two-thirds full with the damp sand to be tested. Drop the sand in loosely. Do not pack it in. Level off the surface, then measure the depth of the damp sand (D).

    5. Empty the sand into another container, being careful not to lose any, and half fill the first container with water.

    6. Pour back about half of the test sample of sand slowly into the water so that it is entirely saturated. Rod it thoroughly to remove any air.

    7. Add the rest of the sand, rodding again to remove, and level off the surface. Measure the depth of the saturated sand (S), which will be less than the depth of the damp sand.

    8. Calculate the percentage bulking, using formula: [(D-S) x 100%]/S = percentage bulking; where D = depth of damp sand, and S = depth of saturated sand.

9. When batching the sand for use in mortar, increase the volume of the sand used by the percentage bulking shown in the test. For example, if the mortar mix is a standard 1:1:6 mix requiring 6 parts of sand and the percentage bulking is found to be 20%, the volume of sand used in the mortar should be: (6 x 12)/100 = 7.2 parts. To adjust for bulking, the actual mortar mix will therefore be 1:1:7.2 when this same damp sand is being used.

3.3 Preparation of Cement-Lime-Sand Mixes

1. Prepare measuring boxes to ensure accurate proportioning of mortar ingredients.

2. Introduce approximately 75% of the total volume of water into the mixer, followed by 50% of the sand and all of the dry hydrated lime and any pigment. Mix for approximately 3 minutes or until the materials are thoroughly blended and no particles of white lime are apparent in the mix.

3. Let stand for 5 minutes.

4. Add the full volume of Portland cement, the remainder of the sand and water. Mix for further 3-5 minutes until thoroughly blended and mortar has reached consistency determined by Vicat Cone penetration testing.

5. Add just sufficient water to obtain workable consistency for setting units. Avoid too wet a mix which stains the face of the work. Vicat Cone penetration may be slightly greater for bedding mixes, but should not exceed maximum value specified by more than 20%. Record water quantities and use for subsequent mixes to help ensure uniformity of all subsequent mixes.

6. Use all mixes within two hours. Do not re-temper more than once.

End of Section 04 05 13