

**Partie 1      General**

**1.1            RELATED REQUIREMENTS**

- .1      Section 31 11 16.01 Granular Sub-Base

**1.2            REFERENCES**

- .1      ASTM International
  - .1      ASTM C136-[13], Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .2      ASTM C979/C979M-[10], Standard Specification for Pigments for Integrally Colored Concrete.
- .2      CSA Group
  - .1      CSA A23.1/A23.2-F09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2      CSA A231.1/A231.2-06 (R2010), Precast Concrete Paving Slabs/Precast Concrete Pavers.
  - .3      CSA A283-F06 (C2011), Qualification Code for Concrete Testing Laboratories.
- .3      Canadian Standards Association (CSA)
  - .1      CSA A23.1-F04      Concrete Materials and Methods of Concrete Construction.
  - .2      CSA A23.2-F04      Test Methods and Standard Practices of Concrete.
  - .3      CSA A23.4-F00      Precast Concrete: Materials and Construction.
  - .4      CSA A179-F04      Mortar and Grout for Unit Masonry.
  - .5      CSA A251-F00 C2005 Qualification Code for Architectural and Structural Precast Concrete Products.
  - .6      CSA A231.2      Precast Concrete Pavers.
- .4      Bureau de normalisation du Québec [NQ]
  - .1      NQ 1809-840      Pavés préfabriqués en béton de ciment - Pose -Clauses techniques générales (Precast Cement Concrete Pavers).
  - .2      NQ 2624-120      Pavés de béton de ciment préfabriqués. (Precast Concrete Pavers)
  - .3      NQ 2624-900      Protocole particulier de certification - Pavés préfabriqués de béton de ciment (Precast Cement Concrete Pavers).

### 1.3 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 precast concrete unit paving and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Subject product data to supervisor for samples, tests, origin, granulation, mineral content and characteristics of following materials:
    - .1 Stone dust for bedding.
    - .2 Polymeric sand joint filler.
- .3 Samples
  - .1 Submit full size sample of each type standard paver.
  - .2 Submit one (1) sample for approval:
    - .1 Joint material.
    - .2 Sand (bedding) in sufficient quantity for laboratory tests.
  - .3 Mock-up will be used:
    - .1 To judge quality of work, substrate preparation, operation of equipment and material application.
    - .2 To determine surcharge of bedding layer, joint sizes, lines, laying patterns, colours and texture.
    - .3 For testing to determine compliance with performance requirements. Perform the following tests.
    - .4 Locate where indicated.
    - .5 Allow 24 hours for inspection of mock-up before proceeding with work.
    - .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- .4 Test and Evaluation Reports:
  - .1 Submit following sampling and testing data:
    - .1 Sieve analysis for gradation of bedding and joint material.
    - .2 Unit paver sampling and testing.
  - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
  - .3 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

## **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in precast concrete paver installations.

## **1.5 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 accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect precast concrete units from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.6 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

## **Partie 2 Product**

### **2.1 CONCRETE PAVERS**

- .1 Factory made pavers corresponding to following indications.
  - LEED certified pavers, two colours, grey granite and smoke grey, grainy finish. Variations in homogenous pattern acceptable to Departmental Representative.
  - Size: 300 x 300 x 100 mm thick and 150 x 300 x 100mm.
  - Physical characteristics:
    - Compressive strength: 50MPa.
    - Water absorption: 5% maximum
    - Maximum mass loss in saline solution (NaCl 3%): 225 g/m<sup>2</sup> after 28 cycles and 500 g/m<sup>2</sup> after 49 cycles.
  - .2 Manufactured in moulds, with spacers, suitable for installation and delivered on site in cubes of laying panels, in protective wrapping.
  - .3 Pigment in concrete pavers: to ASTM C979/C979M.

### **2.2 BEDDING AND JOINT MATERIAL**

- .1 Determine bedding sand hardness as follows:
  - .1 Randomly select single 1.4 kg sample from sand source.

- .2 Dry sample for 24 hours at 115 degrees C to 121 degrees C.
- .3 Obtain 3 sub-samples each weighing 0.2 kg by passing original sample several times through riffle box.

**2.2 BEDDING AND JOINT MATERIAL (cont'd)**

- .4 Carry out sieve analysis test on each sub-sample in accordance with CSA A23.1/A23.2.
- .2 Remix each sub-sample and place in nominal litre capacity porcelain jar with two 2 mm diameter steel ball bearings weighing 75 +/-5 g each. Rotate each jar at 50 rpm for six 6 hours. Repeat sieve analysis. Record individual and average sieve analysis.
- .3 For each sample tested, maximum increase in percentages passing each sieve and maximum individual percent passing is in accordance with table as follows:

Sieve Size	Maximum Increase	Maximum Passing
0.075 mm	2%	2%
0.150 mm	5%	15%
0.300 mm	5%	35%

- .4 Bedding and joint sand: clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock or gravel. Do not use limestone screenings or stone dust.
- .5 Manufactured commercial grade polymeric joint sand, high yield, colours as selected by Departmental Representative.
- .6 Gradation: to CSA A23.1/A23.2, Table 4 - Grading Limits for Fine Aggregate, and CAN/CSA-A179 as follows.

Sieve Designation	% Passing for Bedding Sand	Joint Sand
10 mm	100	
5 mm	95 - 100	100
2.5 mm	80 - 100	95 - 100
1.25 mm	50 - 90	60 - 100
630 microns	25 - 65	
600 microns	35 - 80	
315 microns	10 - 35	
300 microns	15 - 20	
160 microns	2 - 10	
150 microns	2 - 15	

**2.3 EDGE RESTRAINTS**

- .1 Edge restraints shall be concrete and plastic.
- .2 Structural curb: as prescribed in specifications.
- .3 PVC or medium density polyethylene, industrial and flexible type edging, manufactured for use in paver installation, complete with connectors and pre-manufactured anchoring locations for spikes. Edging to include connectors spiral spikes at 254 mm x9,5 mm and spikes necessary for anchoring.

## **2.4 CLEANING COMPOUND**

- .1 Clear, organic solvent, designed and recommended by manufacturer for cleaning concrete pavers of contamination encountered.
- .2 Acid based chemical detergent, designed and recommended by manufacturer for removal of contamination encountered on pavers.

## **Partie 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for precast concrete unit paving installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after approval from Departmental Representative.

### **3.2 STRUCTURAL SURFACE**

- .1 Verify that structural surfaces conform to levels and compaction required for installation of unit pavers. If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Verify that top of structural surface (top of base) does not exceed plus or minus 10 mm of grade over 3 m straightedge.
- .3 Ensure that structural surface is not frozen or standing water is present during installation.

### **3.3 INSTALLATION OF EDGE RESTRAINTS**

- .1 Install restraints true to grade, in accordance with manufacturer's recommendations.

### **3.4 PLACING OF BEDDING MATERIAL**

- .1 Ensure bedding material is not saturated or frozen at all times until installation is complete.
- .2 Spread and screed material on structural surface to achieve 25 mm compacted thickness after vibrating pavers in place. Do not use joint sand for bedding sand.
- .3 Do not disturb screeded material. Do not use bedding material to fill depressions in structural surface.

### 3.5 INSTALLATION OF CONCRETE PAVERS

- .1 Lay pavers to patterns indicated. Joint spacing as recommended by manufacturer approximately 3 mm wide.
- .2 Use appropriate end, edge and corner stones. Saw cut pavers to fit around obstructions and at abutting structures.
- .3 Place pavers and edge stones according to to plan patterns. Place pavers manually or mechanically, following slopes, levels, sizes, layout and sequence illustrated on plan.
- .4 Installation by mechanical equipment:
  - .1 Prepare installation sequence and obtain approval of sequence by Departmental Representative.
  - .2 Place paver pallets and other materials without exceeding load bearing capacity, or otherwise detrimentally affecting installations.
  - .3 Run equipment approved for installation only on paving surfaces vibrated in place.
  - .4 Complete installation after placing each 100 square metres and 5 m width of installation.
  - .5 Inspect pavers and remove chipped, broken or otherwise damaged pavers if structural performance or aesthetics is adversely compromised as directed by Departmental Representative.
  - .6 Replace pavers removed without altering layout and structural quality.
- .5 Cut pavers and edges using masonry saw. Cut circles or angles as necessary to adjust to elements in place (furniture, lamp posts, bollards, manholes, etc.) Unless otherwise indicated on plan or by supervisor on site, use only full paver components at edges, ends and corners. Tolerate pavers according to plan details and supervisor on site to satisfy Work requirements.
- .6 Do not cut concrete pavers more than half their total size. Contractor must adjust ahead to avoid finishing with pavers less than half their size.
- .7 Where pavers are adjacent to bituminous concrete, overlap paver pattern 1 to 3 metres before cutting bituminous concrete, setting joint widths as specified in this Section to determine the actual width to cut.
- .8 Do not circulate with machinery, vehicles and equipment on concrete paver surfaces prior to compaction and filling joints. Place paver palettes and other materials to not exceed load capacity of covered surface or otherwise damage surface in any way.
- .9 Use a low amplitude, high frequency plate compactor capable of at least 22 kN centrifugal compaction force to vibrate pavers into bedding sand.
- .10 Inspect, remove, and replace chipped, broken and damaged pavers.
- .11 Sweep dry joint sand material into joints.
- .12 Settle sand by vibrating pavers with plate compactor.
- .13 Continue application of joint material and vibrating of pavers until joints are full. Do not vibrate within 1 m of unrestrained edges of pavers.

- .14 Complete installation to within 1 m of laying face, with sand-filled joints, at completion of each work day.
- .15 Sweep off excess joint material when installation is complete.
- .16 Proof roll street pavements with at least two passes of a 10 T rubber-tired roller.
- .17 Final surface elevations not to exceed plus or minus 10 mm under 3 m long straightedge.
- .18 Surface elevation of pavers: 3 to 4 mm above adjacent drainage inlets, concrete collars or channels.
- .19 Ensure conformance of final elevations.

### **3.6 PRECAST CONCRETE UNIT CLEANING**

- .1 Remove and dispose of loose, extraneous materials from surfaces to be cleaned.
- .2 Apply cleaning compounds appropriate for removal of various contaminants encountered in accordance with manufacturer's recommendations.
- .3 Final surface to be free of contamination.

### **3.7 FIELD QUALITY CONTROL**

- .1 Retain concrete testing laboratory accredited in accordance with CSA A283.
- .2 Sample and test in accordance CSA A23.1/A23.2.
- .3 Do sampling and testing once for each 5,000 square metres of material on site, as directed by Departmental Representative.
- .4 Departmental Representative will select 10 pavers for testing from material on site for each sampling.
- .5 Submit test results to Departmental Representative for approval of precast concrete pavers.

### **3.8 CLEANING**

- .1 Leave Work area clean at end of each day.  
Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .2 Remove of loose, extraneous materials from surfaces to be cleaned.
- .3 Final surface to be free of dirt or tire marks.

### **3.9 MAINTENANCE**

- .1 Regularly inspect Work. As needed, fill joints between pavers according to steps described above, until final acceptance of Work.

**END OF SECTION**