

**Part 1 General**

**1.1 RELATED SECTIONS**

- .1 Section 31 23 10 - Excavating, Trenching and Backfilling.
- .2 Section 32 11 23 – Aggregate Base Courses

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C 260-00, Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C494/C494M-99ae1, Specification for Chemical Admixtures for Concrete.
  - .3 ASTM D1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
  - .4 ASTM D3569-95, Standard Specification for Joint Sealant, Hot-Applied, Elastomeric, Jet-Fuel-Resistant Type for Portland Cement Concrete Pavements
  - .5 ASTM A 184/A 184M, Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
  - .6 ASTM A 615/A 615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- .2 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.

**1.3 SAMPLES**

- .1 At least 1 week prior to commencing work, inform Departmental Representative of proposed concrete supplier.
- .2 Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

**1.4 CERTIFICATES**

- .1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1.

**1.5 QUALITY ASSURANCE**

- .1 Minimum 1 week prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:

- .1 Hot weather concrete.
- .2 Cold weather concrete.
- .3 Curing.
- .4 Concrete testing

## **1.6 WASTE MANAGEMENT AND DISPOSAL**

- .1 Use trigger operated spray nozzles for water hoses.
- .2 Designate a cleaning area for tools to limit water use and runoff.
- .3 Carefully coordinate the specified concrete work with weather conditions.
- .4 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
- .6 Choose least harmful, appropriate cleaning method which will perform adequately.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Portland cement: to CSA-A3000.
- .2 Supplementary cementing materials: to CSA-A3000.
- .3 Water: to CSA-A23.1.
- .4 Aggregates: to CSA-A23.1. Coarse aggregates to be normal density.
- .5 Air entraining admixture: to ASTM C 260.
- .6 Chemical admixtures: to ASTM C 494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Bituminous impregnated fiber board: to ASTM D 1751.
- .8 Joint fillers:
  - .1 Hot-Applied, Elastomeric, Jet-Fuel-Resistant Type for Portland Cement Concrete Pavements to ASTM D3569-95,

### **2.2 STEEL REINFORCEMENT**

- .1 Reinforcing Bars: Billet Steel, Grade 400, deformed bars to CAN/CSA-630.18
- .1 Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60 (420) deformed bars, assembled with clips.

- .2 Plain-Steel Welded Wire Reinforcement: CSA-630.5, plain, fabricated from as-drawn steel wire into flat sheets.
- .3 Deformed Steel Wire for Concrete Reinforcement: to CSA-630.14
- .4 Chairs, bolsters, bar supports: to CAN/CSA-A23.1

## **2.3 REINFORCEMENT ACCESSORIES**

- .1 Control Joint Dowel Bars: ASTM A 615/A 615M, Grade 604(20), plain-steel bars, cut true to length with ends square and free of burrs.
  - .1 Dowels shall be set in dowel baskets with side frame supports fabricated from 6mm diameter cold drawn wire.
  - .2 Dowels shall be welded on one end, into the side frames
  - .3 Eight gage wires will be welded, across the side frames at approximately 300mm o.c. to keep the assembly stable during shipping and installation.
  - .4 The finished assembly shall hold the dowels straight and level to within 3mm of the mid-depth of the concrete slab.
- .2 Construction Joint Dowel Bars: Smooth, round dowels shall be cut from hot rolled bar per ASTM A36. One end of the dowel shall be greased.
  - .1 Alternate: plate dowels shall be prefabricated flat plate steel dowels with pre-assembled pocket former

## **2.4 MIXES**

- .1 Concrete:
  - .1 Method: Alternative 1 of CSA Standard.
  - .2 Cement Type: as specified under 2.1.
  - .3 Minimum 28 day compressive strengths and exposure classifications:
    - .1 Structurally reinforced concrete exposed to chloride, concrete for slab on grade : 35 MPa: C-1.
  - .4 Nominal size of coarse aggregate in accordance with CSA-A23.1.
  - .5 Slump as specified in CSA-A23.1.
  - .6 Air content as specified in CSA-A23.1.
  - .7 Admixtures: to CSA-A23.1 and subject to approval of Departmental Representative.
- .2 Pressure grout: Mixture of one part Portland cement and two parts clean washed sand, with only sufficient water added to allow placing.

## **Part 3 Execution**

### **3.1 GRADE PREPARATION**

- .1 Do grade preparation work in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

### **3.2 GRANULAR BASE**

- .1 Obtain Departmental Representative's approval of subgrade before placing granular base.
- .2 Place granular base material to lines, widths, and depths as indicated to re-instate trench excavations to existing conditions.
- .3 Compaction of granular base: refer to Section 32 11 23 – Aggregate Base Courses.

### **3.3 CONCRETE**

- .1 Obtain Departmental Representative's approval of granular base prior to placing concrete. Provide 24 hours notice prior to placing of concrete.
- .2 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .3 Ensure inserts are not disturbed during concrete placement.
- .4 Immediately after floating, give slab on grade surface uniform broom finish to produce regular corrugations not exceeding 2 mm deep, by drawing broom in direction normal to centre line.
- .5 Provide edging as indicated with 25 mm radius edging tool.
- .6 Pumping of concrete will not be permitted.

### **3.4 TOLERANCES**

- .1 Finish surfaces to within 3 mm in 3 m as measured with 3 m straightedge placed on surface.

### **3.5 EXPANSION AND CONTRACTION JOINTS**

- .1 For slab on grade:
  - .1 Install tooled transverse contraction joints after floating, when concrete is stiff, but still plastic, at intervals of 5 m maximum.
  - .2 Install expansion joints at intervals of 5 m.
  - .3 Install expansion joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structure.
- .2 For sawn joints.
  - .1 Ensure joints are sawn straight. Install end stakes to ensure straight joint alignment across paved area. Mark joint alignment with chalk line or other suitable guide to approval of Departmental Representative.
  - .2 Saw joints using approved equipment and methods to produce joint dimensions indicated.
  - .3 Restrict speed of saw cutting to ensure proper joint alignment and to avoid damage to concrete.
  - .4 Supply sufficient workers and equipment including standby equipment, to maintain satisfactory sawing schedule.

- .5 Schedule sawing operations on 24 hours basis and consistent with concrete placing.
- .6 Make initial saw cuts in progressive manner and as soon as concrete surface has hardened sufficiently to resist ravelling as cut is made and before shrinkage cracks occurs.
- .7 If cracking occurs ahead of saw cut, stop sawing immediately. Move ahead several joints and cut one or more joints before returning to saw intermediate joints. Where cracking persists, make 2.5 m saw cut from one edge and complete sawing from opposite edge. Adjust sawing schedule accordingly.
- .8 If uncontrolled cracking or other surface damage results from inadequate or improper sawing techniques suspend further concrete operations until situation is corrected and immediately remove and replace damaged slabs.
- .9 Immediately on completion of sawing, flush joints with water to remove laitance.
- .3 Sealing:
  - .1 Seal joints before allowing vehicular traffic on new pavement.
  - .2 Provide Departmental Representative with copy of sealant manufacturer's instructions for application..
  - .3 Just prior to sealing joint, clean with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air to remove loose and foreign material.
  - .4 Do not apply joint sealant in rainy weather or when ambient temperature is less than 5 degrees C.
  - .5 Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.
  - .6 Prepare sealant for application using equipment and methods approved by Departmental Representative.
  - .7 Apply sealant strictly in accordance with manufacturer's recommendations with special attention to temperature ranges for safe heating and for application of hot poured sealants and cleanliness of concrete to be bonded.
  - .8 On completion of first application of sealant, return and top up any underfilled areas.
  - .9 Replace sealant which fails to bond to concrete or fails to cure properly, as directed by Departmental Representative.

### **3.6 CURING**

- .1 Cure concrete by adding moisture continuously in accordance with CSA-A23.1 to exposed finished surfaces for at least 1 day after placing.
- .2 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
- .3 Do cold weather concrete work in accordance with CSA-A23.1.

### **3.7 BACKFILL**

- .1 Allow concrete to cure for 7 days prior to backfilling.

- .2 Backfill as indicated to match existing grades, in accordance with Section 31 23 10 - Excavating, Trenching and Backfilling.

**3.8 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CSA-A23.2 and Section 01 00 10 - General Instructions.
- .2 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility

**END OF SECTION**