

## **PART 1 GENERAL**

### **1.1 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM C260-94, Specification for Air Entraining Admixtures for Concrete.
  - .2 ASTM C309-94, Specification for Liquid Membrane Forming Compounds for Curing Concrete.
  - .3 ASTM C494-92, Specification for Chemical Admixtures for Concrete.
- .2 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A3000-03 Consolidation.
  - .2 CAN/CSA-A23.1-04, Concrete Materials and Methods of Concrete Construction.
  - .3 CAN/CSA-A23.2-04, Methods of Test for Concrete.

### **1.2 CERTIFICATES**

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Minimum 4 weeks prior to starting concrete work submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
  - .1 Portland cement.
  - .2 Supplementary cementing materials.
  - .3 Admixtures.
  - .4 Aggregates.
  - .5 Water.
  - .6 Waterstops.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.

### **1.3 QUALITY ASSURANCE**

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Departmental Representative's approval for following items:
  - .1 Hot weather concrete.
  - .2 Cold weather concrete.
  - .3 Curing.
  - .4 Finishes.

## **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .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, non-combustible 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 with 15% fly ash replacement: to CAN/CSA-A3001-03.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5.
- .3 Water: to CAN/CSA-A23.1.
- .4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal low high density.
- .5 Air entraining admixture: to ASTM C260.
- .6 Chemical admixtures: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Concrete retarders: to ASTM C494 water based. Do not allow moisture of any kind to come in contact with the retarder film.
- .8 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
  - .1 Compressive strength: 50 MPa at 28 days.
    - .1 Dry pack to manufacturer's requirements.
    - .2 Curing compound: to CAN/CSA-A23.1 white and to ASTM C309.

### **2.2 MIXES**

- .1 Type 'B' Concrete - Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following quality for all exterior flatwork concrete:
  - .1 Cement: Type HS Portland cement.
  - .2 Minimum compressive strength at 28 days: 30 MPa.

- .3 Nominal size of coarse aggregate: 20 mm.
- .4 Slump at time and point of discharge: 80 mm.
- .5 Air content: 5 to 7 %.
- .6 Chemical admixtures: following admixtures in accordance with ASTM C494, type, quantity, water reducing strength increasing air entraining.

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's approval before placing concrete. Provide 48 hours' notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
- .7 Do not place load upon new concrete until authorized by Departmental Representative.

#### **3.2 CONSTRUCTION**

- .1 Do cast-in-place concrete work in accordance with CAN/CSA-A23.1.
- .2 Sleeves and inserts
  - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Departmental Representative.
  - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.
  - .4 Check locations and sizes of sleeves and openings shown on drawings.
  - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts

- 
- .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
  - .2 With approval of Departmental Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used or to manufacturer's recommendations.
  - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .4 Set bolts and fill holes with epoxy grout.
  - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
  - .5 Finishing
    - .1 Finish concrete in accordance with CAN/CSA-A23.1.
    - .2 Use procedures acceptable to Departmental Representative or those noted in CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
    - .3 Provide screed float steel swirl-trowelled finish unless otherwise indicated.
    - .4 Provide broom finish on all exterior concrete slabs or aprons.
    - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
  - .6 Joint fillers
    - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
    - .2 Locate and form construction joints as indicated. Install joint filler.
    - .3 Use 12 mm thick joint filler where joint fillers are indicated.

### **3.3 SITE TOLERANCE**

- .1 Concrete tolerance in accordance with CAN/CSA-A23.1 straight edge method.

### **3.4 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 CAN/CSA-A23.1 and Section 01 45 00 - Quality Control.
- .2 Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures: Testing Laboratory Services.

- .3 Slump and Air-Content Tests
  - .1 Make test at the time of concrete placement where strength specimens are made, as often are required by the Departmental Representative but not less frequently than one test each of slump and air content for every truckload of concrete placed.
- .4 Strength Tests
  - .1 Frequency: one strength, slump and air-content test for each 50 m<sup>3</sup> of each class of concrete or at least one set of tests each day when concrete is poured.
  - .2 Cylinders: take not less than 3 cylinders for each test. One cylinder to be tested at 7 days, two cylinders to be tested at 28 days. Prepare cylinders in accordance with CSA A23.2.
  - .3 Compressive Strength: use the average of the compressive strength of two standard cylinders tested at the age specified. If either of the two cylinders shows definite evidence, other than low strength, of improper sampling, moulding, handling, curing or testing, discard cylinder and use the strength of the remaining cylinder for test result.
  - .4 Strength Requirements: strength requirements for each class of concrete are met if the averages of all sets of three consecutive strength tests equal or exceed the specified strength and no single test falls more than 3.5 MPa below specified compressive strength.
- .5 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .6 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .7 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

**END OF SECTION**