

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00.
- .2 Section 03 20 00.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 Measurement Procedures: in accordance with Section 01 29 00—Payment Procedures.
  - .2 Cast-in-place concrete will not be measured but paid for as fixed price item.
  - .3 Supply and installation of anchor bolts, nuts, washers, and bolt grouting will not be measured but considered incidental to work.

**1.3 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
  - .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .5 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - .6 ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
  - .7 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
  - .8 ASTM D1752-04a(2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
  - .2 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

- .3 CSA International
  - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283-06, Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### **1.4 ABBREVIATIONS AND ACRONYMS**

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb—b denotes blended) and Portland-limestone cement.
  - .1 Type GU, GUb and GUL—General use cement.
  - .2 Type MS and MSb—Moderate sulphate-resistant cement.
  - .3 Type MH, MHb and MHL—Moderate heat of hydration cement.
  - .4 Type HE, HEb and HEL—High early-strength cement.
  - .5 Type LH, LHb and LHL—Low heat of hydration cement.
  - .6 Type HS and HSb—High sulphate-resistant cement.
- .2 Fly ash:
  - .1 Type F—with CaO content less than 15%.
  - .2 Type CI—with CaO content ranging from 15 to 20%.
  - .3 Type CH—with CaO greater than 20%.
- .3 GGBFS—Ground, granulated blast-furnace slag.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00—Submittal Procedures.
- .2 Provide testing results for review by the Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .3 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature, and test samples taken as described in PART 3—FIELD QUALITY CONTROL.
- .4 Concrete hauling time: provide for review by the Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to the site of work and discharged after batching.
- .5 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06—Health and Safety Requirements.

#### **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 45 00—Quality Control.

- .2 Provide the Departmental Representative with valid and recognized certificate from plant delivering concrete minimum 3 weeks prior to starting concrete work.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum three weeks prior to starting concrete work, provide proposed quality control procedures for review by the Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
- .4 Quality Control Plan: provide written report to the Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2—PRODUCTS.

## **1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharge within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from the Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by the Departmental Representative.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

## **PART 2 PRODUCT**

### **2.1 DESIGN CRITERIA**

- .1 Performance: according to CSA A23.1/A23.2, and as described in MIXES of PART 2—PRODUCTS.

### **2.2 PERFORMANCE CRITERIA**

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by the Departmental Representative and provide verification of compliance as described in PART 1—QUALITY ASSURANCE.

## **2.3 MATERIALS**

- .1 Portland Cement: according to CSA A3001, Type GU.
- .2 Water: according to CSA A23.1.
- .3 Aggregates: according to CSA A23.1/A23.2.
- .4 Admixtures:
  - .1 Air entraining admixture: according to ASTM C260.
  - .2 Chemical admixture: according to ASTM C494 and ASTM C1017. The Departmental Representative shall approve accelerating or set retarding admixtures during cold and hot weather placing.
- .5 Bonding adhesive: according to ASTM C1059, Type II.

## **2.4 MIXES**

- .1 Performance Method for specifying concrete shall meet the Departmental Representative performance criteria according to CSA A23.1/A23.2.
  - .1 Ensure that concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Provide concrete mix to meet the following plastic-state requirements:
    - .1 Workability: free of segregation, surface blemishes, loss of mortar, and colour variations.
  - .3 Provide concrete mix to meet the following hard-state requirements:
    - .1 Durability and class of exposure: C-1.
    - .2 Compressive strength at 28 days age: 30 MPa minimum.
    - .3 Intended application: slab on grade, footing, wall repairs.
    - .4 Aggregate size: min. **19 mm** for slabs and footings and **10 mm** for repairs.
    - .5 Pre-qualification: BNQ 2621-905 certified batch plant.
  - .4 Provide quality management plan to ensure verification of concrete quality to specified performance.
  - .5 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Obtain the Departmental Representative's written approval before placing concrete.
  - .1 Provide 24-hour minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00—Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.

- .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure that reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to concrete placement, obtain the Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature, and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Properly clean (jet of compressed air and brushing) the bored holes.
  - .2 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy anchor gel to anchor and hold dowels in positions as indicated.
  - .3 The epoxy anchor gel shall have bond strength (according to ASTM C882) at two days age of 20 MPa and a linear shrinkage coefficient of 0.0007.
- .11 Do not place load upon new concrete until authorized by the Departmental Representative.

### **3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work according to CSA A23.1/A23.2.
- .2 Finishing and curing:
  - .1 Finish concrete according to CSA A23.1/A23.2.
  - .2 Use procedures as reviewed by the Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure that surface is not damaged.
  - .3 Finish concrete floor according to CSA A23.1/A23.2 class A.
  - .4 Provide finish, unless otherwise indicated.
  - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges, unless otherwise indicated.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance according to CSA A23.1 Straightedge Method and classifications of Table 21.

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows and submit report as described in PART 1—ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.

- .2 Slump.
- .3 Air content.
- .4 Compressive strength at 7 and 28 days.
- .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by the Departmental Representative for review according to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified according to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and the Departmental Representative.
- .4 Contractor shall assume the testing cost.
- .5 Testing laboratory 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: according to CSA A23.1/A23.2.
- .7 Inspection or testing by the Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.
- .8 Concrete floor surface tolerance measurements shall be done within 72 hours following concrete pour of each slab.

### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11—Cleaning.
- .2 Divert unused concrete materials from landfill to local facility after receipt of written approval from the Departmental Representative.
- .3 Provide appropriate area on job site where concrete trucks and be safely washed.
- .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Departmental Representative.
- .5 Do not dispose of unused admixtures and additive materials into sewer systems, lakes, streams, or onto ground, or in other location where it will pose health or environmental hazard.
- .6 Prevent admixtures and additive materials from entering drinking water supplies or streams.
- .7 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
- .8 Dispose of waste in accordance with applicable local, Provincial/Territorial, and National Regulations.

**END OF SECTION**