

**Part 1 General****1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00 - Concrete Forming and Accessories.
- .2 Section 03 20 00 - Concrete Reinforcing.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.

**1.3 REFERENCES**

- .1 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 HE, HEb and HEL - High early-strength cement.
  - .2 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:
  - .1 ASTM International
    - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
    - .2 ASTM C494/C494M-11, Standard Specification for Chemical Admixtures for Concrete.
    - .3 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
    - .4 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
    - .5 ASTM D624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
    - .6 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
    - .7 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-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(R2011), Qualification Code for Concrete Testing Laboratories.
  - .3 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-installation Meetings: convene pre-installation meeting one week prior to beginning concrete works.
  - .1 Ensure key personnel, site supervisor, Departmental Representative and finishing and forming attend.
    - .1 Verify project requirements.

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

- .1 Provide submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Provide results for review by 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 Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .5 Provide two copies of WHMIS MSDS in accordance with Section 01 00 10 – General Instructions.

#### **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 00 10 – General Instructions.
- .2 Upon request provide Departmental Representative with valid and recognized certificate from plant delivering concrete.
  - .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 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Hot weather concrete.
  - .2 Cold weather concrete.
  - .3 Curing.
  - .4 Finishes.

- .5 Formwork removal.
- .4 Quality Control Plan: provide written report to 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 Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by Departmental Representative.
  - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse, separate and recycle packaging materials in accordance with Section 01 00 10 – General Instructions.

## **Part 2 Products**

### **2.1 DESIGN CRITERIA**

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

### **2.2 PERFORMANCE CRITERIA**

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Hydraulic cement: Type GUB to CSA A3001.
- .3 Portland-limestone cement: Type GUL to CSA A23.1.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2.
- .6 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.
  - .2 Chemical admixture: to ASTM C494 and ASTM C1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
  - .1 Compressive strength: 35 MPa at 28 days.
  - .2 Net shrinkage at 28 days: maximum 0.04 %.

- .8 Non-shrink premixed dry pack grout: composition of non metallic aggregate, non-chloride Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 35 MPa at 28 days.
- .9 Curing compound: to CSA A23.1/A23.2 white.
- .10 Premoulded joint fillers: Bituminous impregnated fiber board: to ASTM D1751.
- .11 Polyethylene film: 0.25 mm (10 mil) thickness to CAN/CGSB-51.34.

## **2.3 MIXES**

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Provide concrete mix to meet following hard state requirements:
    - .1 Durability and class of exposure: C-1.
    - .2 Compressive strength at 28 days: 35 MPa minimum.
    - .3 Intended application: slab-on-grade.
    - .4 Aggregate size 20 mm maximum.
    - .5 Volume stability: acceptable volume change range 0.04 due to shrinkage, creep and freeze thaw cycle.
  - .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
  - .4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

## **Part 3 Execution**

### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete. Provide 24 hours 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 reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.

- .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 Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

### **3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through walls 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.
  - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
  - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
  - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
  - .6 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 in co-ordination with appropriate trade prior to placing concrete.
  - .2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written approval from Departmental Representative.
  - .3 Formed holes: 100 mm minimum diameter.
  - .4 Drilled holes: 25 mm minimum diameter larger than bolts used.
  - .5 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .6 Set bolts and fill holes with shrinkage compensating grout.
  - .7 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 and curing:
  - .1 Finish and cure concrete to CSA A23.1/A23.2.
    - .1 Provide broom finish to concrete slabs-on-grade.
  - .2 Use procedures as reviewed by Departmental Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
  - .4 Finish concrete floor to CSA A23.1/A23.2. Class B.
  - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum 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.
  - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .3 Locate and form isolation, construction and expansion joints as indicated. Install joint filler.
  - .4 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1 Straightedge Method (+/- 6 mm) FF = 25 : FL = 20.

### **3.4 FIELD QUALITY CONTROL**

- .1 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .2 Departmental Representative will pay for costs of tests as specified in Section 01 00 10 – General Instructions.
- .3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 00 10 – General Instructions.

- .2 Waste Management: separate waste materials for reuse and recycling.
  - .1 Provide appropriate area on job site where concrete trucks can be safely washed.
  - .2 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
  - .3 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .4 Prevent admixtures and additive materials from entering drinking water supplies or streams.
  - .5 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

**END OF SECTION**