

PART 1 – GENERAL

1.1 RELATED WORK

- .1 Division 1: General Requirements.
- .2 Section 32 16 15: Concrete Walks, Curbs and Gutters.
- .3 Section 03 10 00: Concrete Forming and Accessories.
- .4 Section 03 20 00: Concrete Reinforcing.
- .5 Section 03 35 00: Concrete Finishing.
- .6 Section 07 21 00: Building Insulation.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete
 - .2 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005)
 - .3 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
 - .4 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel
 - .5 CSA S16-14, Design of Steel Structures
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM C260/C260M-10a Standard Specification for Air-Entraining Admixtures for Concrete
 - .2 ASTM C494/C494M-13, Standard Specification for Chemical Admixtures for Concrete

1.3 SUBMITTALS

- .1 Submit mixture proportions in accordance with CSA A23.1 and Clause 2.2 of this specification for review by Departmental Representative at least 72 hours prior to commencing cast-in-place concrete work. No concrete shall be placed prior to written review of the concrete mixes.
- .2 Provide certification that plant, equipment, and all materials to be used in concrete comply with the requirements of CSA A23.1.
- .3 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CSA A23.1.
- .4 At least 4 weeks prior to commencing cast-in-place concrete work, inform Departmental Representative of proposed source of aggregates and SCMs, and provide access for sampling.

- .5 Provide certification that mixture proportions include preventative measures to mitigate potential expansions due to alkali aggregate reactivity in accordance with CSA A23.2.
- .6 Provide proof that the ready mixed concrete producer has a current membership with Atlantic Concrete Association as well as a current Certificate of Conformance for Concrete Production Facilities, issued by ACA.
- .7 Submit a plan for curing to the Departmental Representative for review and approval together with other tender documents. The curing plan shall be prepared in strict accordance with the requirements of CSA A23.1 including without limitation:
 - .1 Method of protecting the concrete from evaporation of surface moisture from the fresh concrete
 - .2 Type of curing material to be used
 - .3 How the surface will be kept moist and the quality control requirements for keeping the surface moist
 - .4 Time of initiation and duration of curing
 - .5 Provisions to address potential problems such as high winds, and hot and cold weather
 - .6 Limitations of access, if any, to the surfaces being cured.

1.4 AS-BUILT DRAWINGS

- .1 Maintain "As Built" conditions on record drawings for all concrete work as specified in Division 1.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Cement: Type GU in accordance with CSA A3001.
- .2 Supplementary cementing materials: in accordance with CSA A3001.
- .3 Water: in accordance with CSA A23.1.
- .4 Fine aggregate: FA1 as per (Table 10 of) CSA A23.1.
- .5 Coarse aggregate: 20 to 5 mm maximum nominal size as per CSA A23.1.
- .6 Air entraining admixture: in accordance with ASTM C260.
- .7 Chemical admixtures: in accordance with) ASTM C494/C494M.
- .8 Non-shrink grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, of fluid consistency, having minimum 28 day compressive strength of 50 MPa.

- .9 Chemical adhesive anchor system: Hilti HIT HY200, Epcon Acrylic 7, Powers AC100 + Gold or approved equal.
- .10 Anchor rods: in accordance with CAN/CSA-G40.21, Grade 300W.
- .11 Welding materials: in accordance with CSA W59.
- .12 Welding electrodes: E49XX.
- .13 Steel sections and plates: angles, plates, etc., to be set in or anchored to concrete in accordance with CAN/CSA-G40.21, 300W.
- .14 Shop paint primer: in accordance with CISC/CPMA 1.73a.

2.2 CONCRETE MIXTURES

- .1 Proportion normal density concrete in accordance with Alternative 1 (Performance) of CSA A23.1, Table 5, for the following elements and applications:
 - Perimeter piers and foundation walls:
 - .1 Class F-2 exposure
 - .2 Compressive strength at 28 days: 25 MPa
 - .3 Total air content: 4 - 7%
 - .4 Slump at point of discharge into the work: 80 mm
 - Footings:
 - .1 Class N exposure
 - .2 Compressive strength at 28 days: 25 MPa
 - .3 Total air content: less than 3 percent
 - .4 Slump at point of discharge into the work: 80 mm
 - Exterior slabs-on-grade, walkways, curbs:
 - .1 Class C-2 exposure
 - .2 Compressive strength at 28 days: 35 MPa
 - .3 Total air content: 5 - 8 percent
 - .4 Slump at point of discharge into the work: 80 mm
- .2 The use of supplementary cementing materials is not permitted in slabs on grade.

2.3 ADMIXTURES

- .1 Use of admixtures subject to review by Departmental Representative.
- .2 Use only compatible admixtures.
- .3 Use of free calcium chloride and chloride bearing admixtures is not permitted.
- .4 If required, add a water reducing admixture to concrete in accordance with manufacturer's specifications. Incorporate admixture as a liquid by automatic mechanical dispenser.

Reduce mix water, thereby, but do not change cement content from that required in plain mix design. Take admixtures into account when designing mix, and ensure that they are compatible with each other and with concrete accessories.

PART 3 – EXECUTION

3.1 WORKMANSHIP

- .1 All cast-in-place concrete work shall be in accordance with CSA A23.1 and CSA A23.2 except where specified otherwise.
- .2 Hard copies of CSA A23.1 and CSA A23.2 shall be on site at all times.
- .3 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours of notice to Departmental Representative prior to placing of concrete.
- .4 All concrete shall be consolidated using high frequency vibrators.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement and consolidation.
- .6 Preparations prior to placing of concrete shall include:
 - .1 Formwork completed and secured.
 - .2 Ice and free standing water removed.
 - .3 Reinforcement secured in place.
 - .4 All anchor rods and other embedded items accurately located and held in position.
- .7 Maintain accurate records of all concrete placed to indicate date, location of placement, quantity placed, concrete temperature and test specimens cast. Keep these records at site until project is complete.
- .8 Prior to placing, submit to the Departmental Representative for review the proposed method of curing and protection of concrete during placing and curing in adverse weather conditions.

3.2 INSERTS

- .1 Anchor rods shall be supplied by Subcontractor responsible for structural steel under Section 05 12 23 to the site and installed by the Subcontractor responsible for cast-in-place concrete, unless noted otherwise on the construction drawings prepared as part of this project.
- .2 All anchor rods and embedded metal shall be carefully set to conform to the dimensions shown on the drawings and shall be rigidly held in place during placing of the concrete.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from Departmental Representative

before placing of concrete. See architectural and electrical drawings for additional inserts to be installed in this section.

- .4 Check locations and sizes of sleeves, openings, etc., shown on structural drawings with Departmental Representative prior to placing concrete. Sleeves, openings, etc., greater than 100 mm square or a series of continuous small openings with a linear length greater than 100 mm not indicated on structural drawings must be approved by the Departmental Representative.
- .5 Coordinate and review placement of architectural and electrical inserts, sleeves, ties, anchor rods, pipe hangers, etc. as required by other trades before concrete is placed.
- .6 No core drilling of concrete is allowed unless approved by the Departmental Representative.

3.3 HOUSEKEEPING PADS, CURBS

- .1 Accurately place all required concrete bases, curbs and housekeeping pads as shown for architectural and electrical equipment, including reinforcing steel indicated on drawings.
- .2 Build in anchor rods as required.
- .3 Finish slabs to match adjacent surfaces.
- .4 Refer to architectural and electrical drawings for size, locations and number of pads.

3.4 GROUTING

- .1 Grout underside of steel columns and beam bearing plates with a minimum 25 mm thickness of non-shrink grout mixed in accordance with the manufacturer's instructions to ensure a smooth level surface at the elevation indicated and having full contact with the underside of the bearing plate.
- .2 Proposed grout shall be capable of being mixed at a fluid consistency; dry pack placement of the grout is not permitted.
- .3 Provide 24 hours notice to Departmental Representative prior to grouting base plates.

3.5 INSTALLATION OF REINFORCING STEEL/ANCHOR RODS USING ADHESIVE ANCHOR SYSTEM

- .1 Install reinforcing steel/anchor rods using adhesive anchor system in concrete at locations noted or shown on the drawings and/or as required to complete the work. Installation shall be in strict accordance with the manufacturer's written instructions.

3.6 FINISHING

- .1 Finish exposed concrete to CSA A23.1.
- .2 Unless specified elsewhere, interior slabs on grade shall receive sufficient passes with a trowel to obtain a dense hard smooth surface free of trowel marks.
- .3 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise detailed or specified elsewhere.
- .4 All concrete exposed to view requires a smooth form finish.

3.7 CURING

- .1 Curing of all elements cast under this section shall begin immediately following placing and finishing following the requirements CSA A23.1.
- .2 Obtain the approval of the Departmental Representative for proposed means of monitoring concrete curing conditions. Contractor shall be responsible for confirming completion of curing.

3.8 COLD WEATHER REQUIREMENTS

- .1 As a minimum, the requirements of CSA A23.1 shall be followed for cold weather protection.
- .2 All materials and equipment needed for the protection and curing of the concrete in cold weather, as defined by CSA A23.1, shall be available on site before the concrete placement begins.
- .3 Cold weather protection and curing shall be applied in order to maintain the concrete temperature at or above 10°C for the time of the curing periods specified in CSA A23.1. Measures shall be taken to prevent subsequent frost penetration to the footing level.

3.9 HOT WEATHER CURING

- .1 Hot weather curing and protection shall conform to the requirements of CSA A23.1.
- .2 When the air temperature is at or above 25°C, the basic curing period (3 days) shall be accomplished by water spray, or saturated absorptive fabric rather than by curing compounds, in order to achieve cooling by evaporation. Apply curing compound immediately following the basic curing period.

3.10 DEFECTIVE CONCRETE

- .1 All honeycombed concrete shall be removed to sound concrete and the areas patched in a manner acceptable to the Departmental Representative.

- .2 All imperfections greater than 30 mm deep shall be removed to sound concrete and the areas patched in a manner acceptable to the Departmental Representative.
- .3 Embedded debris shall be removed to sound concrete and the areas patched in a manner acceptable to the Departmental Representative.
- .4 At the Departmental Representative's discretion, exposed architectural concrete surfaces shall be demolished and reconstructed if there is defective concrete.

3.11 PATCHING

- .1 Patch imperfections within 24 hours of stripping of forms. Patch imperfections less than 30 mm deep as follows:
 - .1 Chip down edges perpendicular to surface to Departmental Representative's approval.
 - .2 Wet area and brush on 1:1 cement-sand grout.
 - .3 Patch with 1:2 cement-sand mortar with 10% hydrated lime.
- .2 Patch existing concrete surfaces where damaged by cutting or drilling.
- .3 Patch all form tie holes.

3.12 INSPECTION AND TESTING

- .1 Inspection, sampling, testing and reporting of concrete and concrete materials will be carried out by a testing laboratory approved by the Departmental Representative as specified in Division 1. All test methods shall be in accordance with CSA A23.2.
- .2 Testing laboratory will cast three test specimens from each 75 m³ of concrete placed, for every placement or when required by the Departmental Representative. Cylindrical specimens shall be tested in compression at 7 and 28 days (2 specimens) unless directed otherwise by the Departmental Representative.
- .3 Testing laboratory will make at least one slump test and one air content test for each set of test specimens cast.
- .4 Alkali-aggregate reaction tests are to be performed or certification reports supplied verifying the quality of the aggregates to be used.
- .5 Copies of all test reports to be submitted to the Departmental Representative's Representative, General Contractor, Ready Mixed Concrete Producer, and the Departmental Representative.
- .6 Cost of all testing to be borne by the Departmental Representative as specified in Division 1.

- .7 CSA A23.1 shall form the basis for acceptance, strengthening or replacement of concrete not meeting specified quality.
- .8 Cooperate with and assist the testing company by providing access to all parts of the work as required.

END OF SECTION