

Part 1 GENERAL

1.1 RELATED SECTIONS

- .1 03 20 00 – Concrete Reinforcing
- .2 31 05 16 – Aggregate Materials

1.2 REFERENCES STANDARDS

- .1 ASTM International,
 - .1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.
- .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/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-06-(R2016), Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ABBREVIATIONS AND ACRONYMS

- .1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).
 - .1 Type GU or GUb - General use cement.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings: in accordance with Section 01 32 16.07 – Construction Progress Schedules - Bar (GANTT) Chart, convene pre-installation meeting two weeks prior to beginning concrete works.
- .1 Ensure key personnel, site supervisor, Departmental Representative, and speciality contractor - finishing, forming attend, concrete producer and testing agencies attend.
 - .1 Verify project requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .2 At least 4 weeks prior to beginning Work, provide Departmental Representative with samples of materials proposed for use as follows:
 - .1 3 kg of each fine and coarse aggregate.
- .3 Provide testing and inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 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.
- .5 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.

1.6 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 – Quality Control
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, 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.
 - .2 Provide concrete as produced and delivered by a ready-mix plant that is a member of the Atlantic Concrete Association (ACA) and holds a current “Certificate of Conformance for Concrete Production Facilities” issued by the Association. Submit a copy of this certificate to the Departmental Representative for approval.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.
 - .7 Joints.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged 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.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Portland Cement: to CSA A3001, Type GU.
- .2 Blended hydraulic cement: Type GUb to CSA A3001.
- .3 Water: to CSA-A23.1.
- .4 Aggregates: to CSA-A23.1/A23.2.
- .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixtures: to ASTM C494, Departmental Representative to approve accelerating or set-retarding admixtures during cold and hot weather placing.
- .6 Non-premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressing strength of 50 MPa at 28 days.
 - .1 Epoxy grout usage in lieu of standard non-shrink grout to be subject to approval by the Departmental Representative.
- .7 Curing compounds: to CSA-A23.1/A23.2 upon written approval by the Departmental Representative in areas identified.
- .8 Premoulded joint fillers:
 - .1 Bituminous impregnated fibre board: to ASTM D 1751.
 - .2 Saw-cut construction joint fillers to be:
 - .1 Type 2 interior vehicular areas: semi-rigid polyurea or epoxy filler having a minimum shore "A" hardness of 80.
- .9 Polyethylene film: 0.15mm thickness to CAN/CGSB-51.34.
- .10 Bonding adhesive: as approved by Departmental Representative.

2.2 MIXES

- .1 Proportion normal density concrete in accordance with CSA-A23.1/23.2, Alternative 1 to give quality and yield for concrete as follows:
 - .1 All walls, footings and piers:
 - .1 Cement: Type GU or Sub Portland Cement.
 - .2 Minimum compressive strength at 28 days: 30 MPa

- .3 Class of exposure: F-2.
- .4 Nominal size of course aggregate: 20 mm.
- .5 Slump at time and point of discharge: 75 to 100 mm.
- .6 Air content: 4 to 7%.
- .7 Chemical admixtures: admixtures in accordance with ASTM C494.
- .2 Concrete slabs-on-ground, exterior pads and sidewalks:
 - .1 Cement: Type GU or Sub Portland Cement.
 - .2 Minimum compressive strength at 28 days: 35 MPa
 - .3 Class of exposure: C-1.
 - .4 Nominal size of course aggregate: 20 mm.
 - .5 Slump at time and point of discharge: 75 to 100 mm.
 - .6 Air content: 5 to 8%.
 - .7 Chemical admixtures: admixtures in accordance with ASTM C494.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 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 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. Have records stored and readily available for inspection on site by the Departmental Representative at all times.
- .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 epoxy 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 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .2 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
 - .3 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.
 - .4 Confirm locations and sizes of sleeves and openings shown on drawings. Coordination of exact location to be the sole responsibility of the Contractor.
 - .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 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.
 - .1 Formed holes: 100 mm minimum diameter.
 - .2 Drilled holes: 25 mm minimum diameter larger than bolts used and to manufacturers' 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 using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .5 Finishing and curing: in accordance with Section 03 35 00 – Concrete Finishing.
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .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 surface. Provide written declaration that compounds used are compatible.
 - .4 Finish concrete floor to CSA A23.1/A23.2. Class B.
 - .5 Provide machine float swirl finish for new interior slabs unless otherwise indicated.

- .6 Finish concrete floor to meet requirements of CSA-A23.1/A23.2.
- .7 Provide swirl-trowelled finish for exterior walks, ramps, and pads.
- .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.
 - .4 Install joint filler.
 - .5 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.
- .7 Dampproof membrane:
 - .1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete.
 - .4 Use patching material at least 150 mm larger than puncture and seal.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance to CSA A23.1, F-Number Method.
 - .1 $F_F = 25$, $F_L = 20$.

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 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .3 Departmental Representative will pay for costs of tests as specified in Section 01 45 00 – Quality Control.
- .4 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .6 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 74 11 – Cleaning.

END OF SECTION