DIVISION 03 CONCRETE

Section 03 00 00 Concrete - General

1 Information relates to technical requirements for concrete, including falsework, concrete forms and accessories, concrete reinforcement, cast-in-place concrete, precast concrete, cementitious decks and underlayment, grouts, mass concrete, concrete restoration and cleaning.

2 Design

2.1 All concrete work shall be designed by a Structural Engineer licensed to practice in the Province of Nova Scotia.

2.2 Design footings, foundations, floor slabs including slabs on grade, retaining walls, and other structural concrete to satisfy the necessary requirements indicated by the subsurface soils investigation and report by a Geotechnical Engineer, licensed to practice in the Province of Nova Scotia.

2.3 Consultant to ensure that falsework is designed and constructed in accordance with CAN/CSA S269.2-16.

3 Concrete sealer, form release and stripping agents to be non-toxic, biodegradable and have zero or low VOC's.

4 Inspection and Testing, Source Quality Control:

4.1 The consultant shall ensure that the project manual provides for appropriate inspection and testing for slump, strength, material and air entrainment. Authorization and payment for such tests will be as per the project specific contract and agreements.

Section 03 10 00 Concrete Forming and Accessories

1 Materials

1.1 Formwork

1.1.1 For concrete without special architectural features, use plywood and wood formwork materials to CSA O121-17, CSA O86-2014, CSA O153-13 (R2017).

1.1.2 For concrete with special architectural features, use formwork materials to CSA A23.1-14/A23.2-14.

1.2 Form Ties:

1.2.1 Removable or snap-off purpose made metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm in diameter in the concrete surface.

1.3 Form Release Agent:

1.3.1 Chemically active, non-staining, release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps.

1.4 Form Stripping Agent:

1.4.1 Colourless, non-staining, mineral oil, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 400 C, and having a minimum flashpoint of 1500 C.

2 When complicated concrete formwork is required, or when concrete work requires structural design of formwork:

2.1 Shop drawings, as required by jurisdictional authorities, shall be submitted to Consultant for review. Such shop drawings shall show tie location, panel layout and joint details where architectural concrete is exposed to view. Shop drawings to be signed and sealed by the design engineer responsible for the design of the form work.

3 Where Architectural Concrete finish is desired:

3.1 Where architecturally detailed, exposed concrete faces are desired, ensure special formwork is appropriately specified, detailed and located.

3.2 Specify type of formwork for each concrete finish specified. Consider layouts for cone ties and other special formwork details.

4 Where waterstops are required in the design, ensure their location and extent are either shown or specified.

Section 03 11 19 Insulated Concrete Forms

1 Insulated concrete form (ICF) building system: factory-assembled and site-installed, stay-in-place polystyrene rigid board insulation panels, with plastic web spacers, interlocking strip and clip accessories, connection ties, and inserts, concrete reinforcement, concrete accessories and cast-in-place concrete is an acceptable construction system.

2 Ensure submittal of shop drawings bearing stamp and signature of a professional engineer registered in the Province of Nova Scotia indicating method and schedule of construction, shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, corner, intersection and connector ties, braces and locations of temporary embedded parts.

3 Ensure system design and installation meets:

3.1 Standard ASTM D1761-12 test methods for mechanical fasteners in polypropylene web material,

3.2 fire resistance rating requirements

3.3 sound transmission requirements, and

3.4 best practices and manufactures requirements for installation methods.

4 Acceptable product/system:

4.1 Nudura or approved equal

Section 03 20 00 Concrete Reinforcing

1 Material

1.1 Reinforcing Steel

1.1.1 Billet steel, grade 400, deformed bars to CSA G30.18-09 (R2014), unless indicated otherwise.

1.2 Wire Ties

1.2.1 Cold drawn annealed steel wire ties to ASTM A82/A82M-07.

1.3 Chairs, bolsters, bar supports, spacers

1.3.1 To CSA A23.1-14/A23.2-14

1.4 Nylon and Polypropylene Reinforcing Fiber

2 Ensure a design engineer verifies steel type and grade requirements, and fiber type, quantity and distribution requirements. Ensure such steel types and grade requirements are noted on drawings and specified in the appropriate section of the project manual.

3 Ensure concrete reinforcement placing requirements are adequately detailed or specified.

Section 03 30 00 Cast -in -Place Concrete

1. Quality Assurance

1.1. Concrete shall be produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the Association.

2. Materials: all concrete and materials supplied shall confirm to CSA A23.1-14/A23.2-14.

2.1. Portland Cement: to CAN/CSA A3000-18

2.2. Supplementary Cementing Materials: To CAN/CSA A3000-18

2.3. Cementitious Hydraulic Slag: To CAN/CSA A3000-18

2.4. Water: To CSA A23.1-14/A23.2-14.

2.5. Aggregates: To CSA A23.1-14/A23.2-14, Coarse aggregates to be normal density.

2.6. Air Entraining Admixtures: To ASTM C260/C260M-10a (2016)

2.7. Chemical Admixtures: To ASTM C494/C494M-17

2.8. Non pre-mixed dry pack grout

2.8.1. 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 compressive strength of 35 MPa at 7 days.

2.9. Curing Compound: To CSA A23.1-14/A23.2-14, white and to ASTM C309-11, Type 1 - chlorinated rubber.

2.10. Pre-molded Joint Fillers

2.10.1. Bituminous impregnated fibre board to ASTM D1751-18

2.10.2. Sponge rubber to ASTM D1752-18, Type I, Flexible grade

2.11. Weep holes: Plastic type tubes, or 90% open polyester mesh by Mortar Net or approved equal

2.12. Dampproof membrane:

2.12.1. Kraft/polyethylene membrane

2.12.1.1. Plain Type

2.12.1.1.1. 10 mils thick Polyethylene film bonded to asphalt treated creped kraft.

2.12.1.2. Reinforced Type

2.12.1.2.1 Two 75 mils thick polyethylene films bonded each side of asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.

2.12.2. Membrane Adhesive

2.12.2.1. Type recommended by the membrane manufacturer.

2.13. Dampproofing

2.13.1. Emulsified asphalt, mineral colloid type, unfilled

2.13.2. To Part 1, Section 2, Division 07, item 07 10 00 references to Bituminous sheet waterproofing.

2.14. Polyethylene Film

2.14.1. To CAN/CGSB 51.34-M86

2.14.2. 6 mil thickness

2.15. Concrete Mixes

2.15.1. Provide concrete in accordance with CSA A23.1-14/A23.2-14.

2.15.1.1. Chemical Admixtures: In accordance with ASTM C494/C494M-17, type, quantity, water reducing strength increasing.

3. Cast-in-place concrete work shall be in accordance with CSA A23.1-14/A23.2-14.

4. Refer to Part 1, Section 2, Division 32 - Curbs and Gutters for requirements on concrete walks and curbs.

5. If radon is suspected or known to occur in the area, ensure appropriate testing for poured concrete is conducted.

5.1. Refer to Section 31 21 00 - Off-Gassing Mitigation requirements.

6. 10 to 20% substitution of type 'F' fly ash for portland cement in normal mix design is acceptable.

7. Finishing

7.1. Finish concrete in accordance with CSA A23.1-14/A23.2-14.

7.2. Use curing compounds compatible with applied finish on concrete surfaces.

7.3. Finish concrete floor to meet requirements of CGSB 81-GP-1M: 1977.

7.4. Rub exposed sharp edges of concrete with Carborundum to produce 3 mm radius edges unless otherwise indicated.

8. Dampproof membrane

    8.1. Install membrane under concrete slabs-on-grade inside building.

    8.2. Lap membrane a minimum of 150 mm at joints and seal with tape.

    8.3. Seal punctures in membrane before placing concrete. Use patching material at least 150 mm larger than puncture.

    8.4. Contractor to protect from damage or punctures.

9. Tolerances

    9.1. Ensure concrete dimensional tolerances are in accordance with CSA A23.1-14/A23.2-14, straight edge method.

10. Field Quality Control

    10.1. Provide inspection and testing of concrete and concrete materials in accordance with CSA A23.1-14/A23.2-14. The Minister shall pay for costs of inspection and testing.

11. Admixtures

    11.1. Ensure exterior exposed concrete, including walks, curbs, steps and landings have an approved air entraining agent (ASTM) added to the mix to bring the total air content to 6 ½% plus or minus 1 ½%.

12. Grouting

    12.1. Grout construction joints in concrete construction to conform to Division 03 - Concrete.

    12.2. Grout construction joints in steel construction to conform to Division 05 - Metals.

13. Unless otherwise required in the design, ensure minimum level of finished concrete floors are within 6mm of established elevations in any 6000 mm square area, and is sufficiently even to contact a 3000mm long straightedge with a tolerance of 6 mm. Consider as well, contribution of deflection and shrinkage in suspended slabs. Discuss and resolve issues with DTIR project team leader in such situations.

14. Ensure joints in slabs on grade around columns are adequately detailed on drawings or specified in the appropriate section of the project manual.

Section 03 41 00 Precast Structural Concrete

1 Inspection and Testing, Field Quality Control:

    1.1 Ensure that all precast concrete meets the appropriate requirements for design, materials and

construction methods as identified in CSA A23.1-14/A23.2-14, CSA A23.3-14 and CSA A23.4-16.

1.2 The inspection and testing company responsible for Source Quality Control will inspect workmanship in installation of precast units and verify completion of work in accordance with the Consultant's design documents.

1.3 Ensure provision for such inspection is specified in the appropriate section of the project manual.

1.4 Inspection and testing company should be same for both source and field quality control.

2 On large projects, consider specifying either more frequent visits or the maximum volume of concrete which may be produced before testing shall be required.

3 Indicate maximum size of holes which can be incorporated in precast units. Provide structural framing for larger holes or indicate method of secondary framing installed under work of this section which is suitable for the specified precast unit.

4 Where accelerated curing is desired indicate whether low pressure steam or radiant heat and moisture is the method. Specify time of cure corresponding to method employed.

5 Indicate method of finish for all precast units.

6 Warranty

6.1 Where precast concrete or tilt-up wall panels are incorporated into design, make provision in the project manual for extended warranty. Ensure warranty is valid for a period of four (4) years beyond the expiration of the performance assurance requirements specified in the General Conditions. As a minimum, definition of defective work to include but not be limited to: failure or leaking of joints or joint sealant, spalling, visible cracking, changes in colour, excessive weathering of surfaces, warping of units and displacement of units because of failure of anchors or other attachments.

Section 03 45 00 Precast Architectural Concrete

1 Source and Field Quality Control to requirements of 03 41 00 - Precast Structural Concrete

2 For cavity wall systems, ensure exterior wall design utilizes the "rain screen" principle, providing a pressure-equalized cavity between the exterior precast concrete and the air barrier. Size and locate vents in the exterior wythe to achieve "nearly instantaneous" pressure equalization of the cavity and protection from rain entry. Refer also to DC350, Part 1, Section 1, Article 10.

3 Ensure the precast or tilt-up concrete wall systems contain an air chamber vent and are weeped to the exterior, pressure equalized and sealed to perform as an air barrier.

4 Where specially finished panels are incorporated into design ensure maintenance instructions are provided by the Contractor in the O& M Manual.

5 Warranty

5.1 Where precast concrete or tilt-up wall panels are incorporated into design, make provision in the project manual for manufacturer's extended warranty. Ensure warranty is valid for a period of four (4) years beyond the date of expiration of performance assurance. As a minimum, definition of defective work to include but may not be limited to: failure or leaking of joints or joint sealant, spalling, visible cracking, changes in colour, excessive weathering of surfaces, warping of units, and displacement of units because of failure of anchors or other attachments.

5.2 Manufacturer's warranty is to provide guarantee that precast elements will not spall or show visible evidence of cracking, except for unavoidable hairline shrinkage cracks, for the minimum period of four (4) years beyond the date of expiration of performance assurance.

6 Joint breathers are required only where air pressure equalization is required.

7 Provide precast concrete panels having a minimum of 35 mpa concrete with a maximum water absorption of 5% at 28 days.

END