PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 30 00 Cast-in-Place Concrete.

1.2 Description

.1 This section specifies the materials for forms, form ties and release agents as well as their fabrication, erection, removal and restoring.

1.3 Measurement Procedures

.1 No measurement will be made under this section. Include costs in items of concrete work for which formwork is required.

1.4 References

.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 CSA O86-14, Engineering Design in Wood.
- .3 CSA O121-17, Douglas Fir Plywood.
- .4 CSA O151-17, Canadian Softwood Plywood.
- .5 CSA O153-13 (R2017), Poplar Plywood.
- .6 CSA S269.1-16, Falsework and Formwork.

1.5 Submittals

.1 Submittals in accordance with Section 01 33 00 Submittal Procedures.

.2 Submit shop drawings for formwork.
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of New Brunswick.

.3 Indicate method and schedule of construction, stripping, materials, arrangement of joints, and ties. Comply with CSA S269.1, for formwork drawings.

.4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

.5 Indicate sequence of erection and removal of formwork as directed by Departmental Representative.

1.6 Delivery, Storage and Handling

.1 Store and manage hazardous materials in accordance with Section 01 74 21 Construction/Demolition Waste Management and Disposal.

.2 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Divert wood materials from landfill to a recycling facility.
- .4 Divert plastic materials from landfill to a recycling facility.
- .5 Divert unused form release material from landfill to an official hazardous material collections site.

PART 2 - PRODUCTS

2.1 Materials

.1 Formwork materials:
- .1 Formwork materials to be to CSA A23.1/A23.2.
- .2 Wood and wood product formwork materials to be to CSA O86, CSA O121 and CSA O153.

.2 Form ties:
- .1 Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

.3 Form release agent: non-toxic, biodegradable.

.4 Form stripping agent: colourless mineral oil, non-toxic, and biodegradable.

.5 Falsework materials: to CSA-S269.1.

PART 3 - EXECUTION

3.1 Fabrication and

.1 Verify lines, levels and centres before proceeding with

Erection

formwork and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Fabricate and erect formwork in accordance with CSA S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.4 Align form joints and make watertight.
.1 Keep form joints to minimum.

.5 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections.

.6 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

3.2 Formwork Removal

.1 Leave formwork in place for following minimum periods of time after placing concrete.
.1 2 days for sides of cast-in-place concrete ramp slab.

.2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later.

.3 Re-use formwork subject to requirements of CSA A23.1/A23.2.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 10 00 Concrete Forming and Accessories.

.2 Section 03 30 00 Cast-in-Place Concrete.

1.2 Description

.1 This section specifies concrete reinforcing materials, their fabrication and placing.

1.3 Measurement Procedures

.1 No measurement will be made under this section. Include costs in items of concrete work for which reinforcement is required.

1.4 References

.1 American Society for Testing and Materials International (ASTM).

.1 ASTM A1064/A1064M-18a, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.2 Canadian Standards Association (CSA)

.1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A23.3-14, Design of Concrete Structures.

.3 CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement.

1.5 Shop Drawings

.1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 Submittal Procedures.

.2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, and locations of reinforcement with identifying code marks to permit correct placement without reference to structural drawings. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada.

.3 Submit information on slip dowel installation system

to be installed at construction joints.

.4 Detail lap lengths and bar development lengths to CSA A23.3, unless otherwise indicated. Provide Class B tension lap splices unless otherwise indicated.

.5 Each shop drawing submitted to bear the stamp and signature of a qualified Professional Engineer registered in the Province of New Brunswick.

PART 2 - PRODUCTS

2.1 Materials

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: carbon steel, having a yield stress of 400 MPa, deformed bars to CSA G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.

.4 Chairs, bolsters, bar supports, spacers: to CSA A23.1.

.5 Slip dowel installation system at construction joints to be sleeves attached to edge of form with epoxy coated steel dowels: Acceptable Products:
- .1 Speed Dowel by Sika Greenstreak.
- .2 Alternate materials: Approved by addendum in accordance with Instructions to Tenderers.

2.2 Fabrication

.1 Fabricate reinforcing steel in accordance with CSA A23.1 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.

.3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 Source Quality Control

.1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing

steel, showing physical and chemical analysis.

PART 3 - EXECUTION

3.1 Field Bending

.1 Do not field bend or field weld reinforcement.

3.2 Placing Reinforcement

.1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA A23.1.

.2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.

.3 Ensure cover to reinforcement is maintained during concrete pour.

.4 Install dowels at ramp slab control joints using slip dowel installation system. Follow manufacturer's direction and obtain approval of Departmental Representative when installed, before the concrete pour.

END OF SECTION

PART 1 - GENERAL

1.1 Related Sections

.1 Section 03 10 00 Concrete Forming and Accessories.

.2 Section 03 20 00 Concrete Reinforcing.

1.2 Description

.1 This section specifies the materials, mixes, accessories, preparations, construction and verification for cast-in-place concrete.

1.3 Measurement Procedures

.1 Cast-in-Place Concrete Ramp Slab: The cast-in-place reinforced concrete slab will be measured for payment in square metres, (m^2), calculated from neat dimensions indicated or as authorized in writing by Departmental Representative. Measurements to be made on the surface area of the slab. Concrete curbs to be incidental to the work and will not be measured separately. Concrete placed beyond dimensions indicated will not be measured.

.2 Reinforcing steel to be incidental to the work and will not be measured separately.

.3 Formwork to be incidental to the work and will not be measured separately.

.4 Joints, joint sealants, fillers and dowels to be incidental to the work and will not be measured separately.

.5 No deductions will be made for volume of concrete displaced by reinforcing steel.

.6 Heating of water and aggregates and cold weather protection to be incidental to the work and will not be measured separately.

.7 Cooling of concrete and providing hot weather protection to be incidental to the work and will not be measured separately.

.8 Supply and installation of concrete additives as recommended by the concrete supplier to be incidental to the work and will not be measured separately.

1.4 References

.1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.

.2 Canadian Standards Association (CSA)
- .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CSA A283-06 (R2016), Qualification Code for Concrete Testing Laboratories.
- .3 CSA A3000-18, Cementitious Materials Compendium.

1.5 Certificates

.1 Submit certificates in accordance with Section 01 33 00 Submittal Procedures.

.2 Provide certification indicating the concrete supplier is certified in accordance with the Atlantic Provinces Ready Mix Concrete Association Program or equivalent.
- .1 Only concrete supplied from such certified plants shall be acceptable to the Departmental Representative.
- .2 Plant certification shall be maintained for the duration of the fabrication and erection until the warranty period expires.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA A23.1.

.4 Provide mix design in compliance with CSA A23.1 to provide concrete of quality, yield and strength as specified under 2.2 Mix Design. Mix design to be prepared by and stamped by an engineer licensed to practice in the Province of New Brunswick.

.5 Prior to starting concrete work, submit to Departmental

Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.
.2 Blended hydraulic cement.
.3 Supplementary cementing materials.
.4 Admixtures.
.5 Aggregates.
.6 Water.

1.6 Waste Management and Disposal

.1 Designate a cleaning area for concrete trucks off site, at a company owned site for such a purpose meeting all federal and provincial requirements.

.2 Use trigger operated spray nozzles for water hoses.

.3 Designate a cleaning area for tools to limit water use and runoff.

.4 Carefully coordinate the specified concrete work with weather conditions.

.5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or waterways. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal.

.6 Choose least harmful, appropriate cleaning method which will perform adequately.

PART 2 - PRODUCTS

2.1 Materials

.1 Blended hydraulic cement: Type GUb-F/SF to CSA A3001.

.2 Supplementary cementing materials: to CSA A3001.

.3 Water: to CSA A23.1/A23.2.

.4 Aggregates: to CSA A23.1/A23.2. Coarse aggregates to be normal density.

.5 Air entraining admixture: to ASTM C260.

.6 Chemical admixtures: to ASTM C494/C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.7 Concrete retarders: to ASTM C494/C494M water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.

.8 Joint Sealant:
- .1 Sikaflex 2c SL by Sika Canada Inc.
- .2 Alternate materials: Approved by addendum in accordance with Instructions to Tenderers.

2.2 Mix Design

.1 The contractor shall be responsible for the concrete mix design.

.2 It shall be the responsibility of the Contractor to ensure that the mixture proportions shall be properly batched, mixed, placed and cured such that the concrete conforms to the specifications.

.3 Proportion normal density concrete in accordance with CSA A23.1, Alternative 1, to give following properties:
- .1 Cement: GUb-F/SF.
- .2 Minimum compressive strength at 28 days: 35 MPa.
- .3 Minimum cement content: 400 kg/m³ of concrete.
- .4 Maximum water/cement ratio: 0.40.
- .5 Class of exposure: C-1 and S-3.
- .6 Nominal size of coarse aggregate: 20 mm.
- .7 Slump at time and point of discharge: 50 to 100 mm.
- .8 Air content: to CSA A23.1.
- .9 Chloride ion penetrability: less than 1500 coulombs within 91 days.
- .10 Concrete mix design for curb and slipway shall have a maximum shrinkage less than 0.04% at 28 days as per CSA A23.1.

.1 Shrinkage reducing admixtures will be permitted in the mix.

.2 Submit written laboratory test results showing that proposed mix will meet or exceed performance specified. Costs of these tests shall be the responsibility of the Contractor.

PART 3 - EXECUTION

3.1 Preparation

.1 Inform Department Representative before placing concrete. Provide 24 hours notice prior to placing of concrete.

.2 Pumping of concrete is permitted only after review of equipment and mix.

.3 Ensure reinforcement and inserts are not disturbed during concrete placement.

.4 Prior to placing of concrete advise Departmental Representative of proposed method for protection of concrete during placing and curing in adverse weather.

.5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.

.6 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 Construction

.1 Do cast-in-place concrete work in accordance with CSA A23.1.

3.3 Finishing

.1 Only ACI (American Concrete Institute) certified or other pre-approved concrete finishers are to be utilized in finishing all concrete work.

.2 Finish concrete in accordance with CSA A23.1.

.1 Float surfaces with wood or metal floats or power finishing machines and bring surfaces to true grade or dimensions.

.2 Finish slab surface with coarse broom. Texture to be pre-approved or mock-up prior to

placement of slab concrete.

.3 All formed surfaces to be smooth form finish.

3.4 Curing

.1 Concrete curbs and concrete ramp slab surface to be continuously moist cured for initial 7 days after finishing.

.2 Moist curing shall be in accordance with CSA A23.1/A23.2 and shall be done by:

.1 Non-staining absorptive mat fabric kept continuously wet.

.2 Additionally, curing mats shall be thoroughly wet when applied and kept continuously wet and in intimate contact with the concrete surface for the duration of the moist curing period. Mats shall be long enough to cover the entire width and edges of the concrete and lapped at joint to prevent drying between adjacent sheets. Mats shall be applied to concrete immediately after disappearance of surface water sheen after the final finishing pass.

.3 End laps shall be at least 75 mm and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during period using cover material and waterproof tape.

3.5 Site Tolerance

.1 Concrete tolerance in accordance with CSA A23.1.

3.6 Field Quality Control

.1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CSA A23.1 and Section 01 45 00 Testing and Quality Control.

.2 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.

.3 Non-destructive Methods for Testing Concrete shall be in accordance with CSA A23.2.

3.7 Joint Sealant

.1 Clean the joint as per manufacturer recommendations.

.2 Install backer rod and joint sealant in accordance with manufacturer's instructions.

.3 Seal the concrete with joint sealant immediately after cleaning. Protect pavement joint sealant from traffic until fully cured.

END OF SECTION