

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures
- .2 Section 01 45 00 - Quality Control
- .3 Section 01 29 83 Payment Procedures for Testing Laboratory Services.
- .4 Section 01 35 29.06 - Health and Safety Requirements
- .5 Section 31 53 13.01 – Timber Cribwork.
- .6 Section 03 20 00 – Concrete Reinforcing.

1.2 MEASUREMENT FOR PAYMENT

- .1 Cast-in-place concrete in reinforced concrete deck to be measured in square meters (m²) calculated from actual field measurements, excluding area occupied by cleat blocks and coping.
 - .1 Concrete placed beyond dimensions indicated will not be measured.
 - .2 Concrete placed for doorway ramps to be included as part of the total area of the reinforced concrete deck.
- .2 Cast-in-place concrete for new electrical shed foundations and floor to be included in lump sum fixed price.
- .3 Cast-in-place concrete for electrical conduit encasement to be included in lump sum fixed price.
- .4 No deductions will be made for volume of concrete displaced by reinforcing steel, structural steel or electrical conduits.
- .5 Supply and installation of anchor bolts, nuts and washers, bolt grouting, reinforcing steel, cement, cold weather protection and all plant and labour will be considered as being included in the unit price for item and incidental to work.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM), latest edition
 - .1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- .2 Canadian Standards Association (CSA International), latest edition
 - .1 CSA-A23.1-09/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

- .2 CSA A283, Qualification Code for Concrete Testing Laboratories.
- .3 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), includes update No. 1 (2009).
 - .1 CSA-A3001, Cementitious Materials for Use in Concrete.

1.4 DESIGN REQUIREMENTS

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

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 At least 1 week prior to beginning Concrete work, submit to Departmental Representative samples of following materials proposed for use:
 - .1 10 kg of each type of blended hydraulic cement.
 - .2 5 kg of each admixture.
- .4 Submit testing results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .5 Concrete pours: submit 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.
- .6 Concrete hauling time: where applicable, submit for review 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 Site Meetings: in accordance with Section 01 10 10 - General Instructions.
- .3 Submit to Departmental Representative, minimum 1 week prior to starting concrete work, valid and recognized certificate from plant providing or delivering concrete products or mix.
 - .1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements.
 - .2 Submit to Departmental Representative 1 week prior to concrete work, concrete mix design.
- .4 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to

Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

- .5 Health and Safety Requirements: construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: where applicable, maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
- .1 Modifications to maximum time limit must be agreed to by 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.
- .3 Waste Management and Disposal:
- .1 Divert unused concrete materials from landfill to local quarry facility, approved by Departmental Representative.
- .2 Provide an appropriate area on the job site where concrete trucks or mixing equipment can be safely washed.
- .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Departmental Representative.
- .4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- .5 Prevent admixtures and additive materials from entering drinking water supplies or streams. 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/Territorial and National regulations.

Part 2 Products

2.1 MATERIALS

- .1 Cement: to CAN/CSA-A3001, Type GUb – F/SF.
- .2 Water: to CSA-A23.1. **(sea water not to be used)**.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2.
- .4 Admixtures:
- .1 Air entraining admixture: to ASTM C260.

- .2 Chemical admixture: to ASTM C494/C494, ASTM C1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .5 Shrinkage compensating grout: premixed compound consisting of metallic or non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA-A23.1/A23.2.
 - .1 Compressive strength: 35 MPa at 28 days.
- .6 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
 - .2 Sponge rubber: to ASTM D1752, Type I, flexible grade.
 - .3 Joint sealer – to CGSB 19-GP-24M and CSA A23.1, chemical curing, multi-component, Class “B”, Type 1 for horizontal joints.
- .7 Polyethylene film: to CAN/CGSB-51.34 and thickness specified.

2.2 MIXES

- .1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.
 - .1 Provide concrete mix to meet following plastic state requirements:
 - .1 Workability: free of surface blemishes loss of mortar colour variations segregation.
 - .2 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure.
 - .1 Wharf Decks: C-1
 - .2 Exterior Foundation Walls: F-2
 - .3 Exterior ramps and walks: C-2
 - .4 Footings and Interior Slabs: N
 - .2 Minimum compressive strength at 28 days:
 - .1 Wharf Decks: 35MPa.
 - .2 Exterior Foundation Walls: 25MPa.
 - .3 Exterior ramps and walks: 30MPa.
 - .4 Footings and Interior Slabs: 20MPa.
 - .3 Volume stability: acceptable volume change range due to shrinkage, creep and freeze thaw cycle.
 - .4 Surface texture: non-skid finish.
 - .5 Maximum W/C ratio: 0.40.
 - .6 Air Content: 5% to 8%.
 - .7 Slump at discharge: 75 mm ± 25 mm.
 - .8 Nominal size of coarse aggregate 20mm.
 - .9 Minimum cement content: 385 kg/m³ of concrete.
 - .10 Density of air-dry concrete in the range of 2240 kg/m³ to 2400 kg/m³.

- .3 For concrete supplied by “*ready-mix*” supplier:
 - .1 Ensure concrete supplier is certified by the Atlantic Provinces Ready Mixed Concrete Association and meets all concrete performance criteria as established above. Provide copy of supplier’s certification to Departmental Representative
- .4 For concrete “*mixed on-site*”:
 - .1 Identify the source of aggregates and submit samples of fine and course aggregates to a testing laboratory for testing and trial mixes to determine a suitable mix design for each requirement. At contractor’s cost, the testing laboratory will determine if the trial mixes meet all concrete performance criteria as established above. All test results will be submitted to the Departmental Representative for review and approval. Approval must be obtained prior to any concrete placement.
 - .2 The course and fine aggregate, water and air entraining agent is to be mixed prior to the addition of cement and water reducer.
 - .3 Aggregates, cement, water and admixtures are to be weighed when batching. No alternative methods of measuring will be permitted.
 - .4 Do not use calcium chloride.
- .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's approval before placing concrete.
 - .1 Provide 48 hours 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 Maintain accurate records of poured concrete items to indicate date, location of pour, quality,

air temperature and test samples taken.

- .9 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/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 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.

.3 Anchor bolts:

- .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
- .2 With approval of Departmental Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100mm diameter. Drilled holes to be minimum 25mm larger in diameter than bolts used.
- .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .4 Set bolts and fill holes with shrinkage compensating grout.

.4 Finishing and curing:

- .1 Only ACI certified or other pre-approved concrete finishers are to be utilized in finishing all concrete works. All work is to be finished to CAN/CSA-A23.1, and as specified below.
- .2 The surface will be brought to the specified level by means of darbying or bull floating which will be carried out immediately following screeding and must be completed before any bleed water is present on the surface. Surface tolerance to be 8mm under a 3 metre straight edge.
- .3 Provide slope as shown on the drawings to permit proper drainage of the concrete deck.
- .4 Finish slabs to elevations indicated on drawings.
- .5 Strike off the surface with a straight edge.
- .6 Darby or bull float the surface to smooth and level the concrete.
- .7 Allow bleed water or sheen to disappear.
- .8 Float the surface by means of power and/or hand float where the concrete has hardened enough for a man to leave only slight footprints on the surface.
- .9 Do not bring water and fines to the surface by over floating. Where extra floating is required the floating operation shall be repeated after the time interval necessary for any sheen to disappear and for concrete to set further.
- .10 Lightly broom surface with a soft bristle broom obtaining a fine and even textured finish with a non-slip finish. All brush strokes to be parallel across paving.
- .11 The surface shall be true and accurate to a maximum tolerance of 1mm in 500mm.

- .12 Cure to CAN/CSA-A23.1.
- .5 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.

3.3 SURFACE TOLERANCE

- .1 Concrete tolerance in accordance with CSA-A23.1/A23.2 straightedge method to tolerance of 8mm under a 3 meter straight edge.

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 in accordance with CSA-A23.1/A23.2.
 - .1 Ensure testing laboratory is certified in accordance with 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 29 83 - Payment Procedures for Testing Laboratory Services.
- .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: in accordance with CSA-A23.1/A23.2.
- .6 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - Products, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

END OF SECTION