

PART 1 - GENERAL

- 1.1 Related Sections .1 Section 03 30 00 - Cast-in-Place Concrete.
- 1.2 Measurement Procedures .1 No measurement will be made under this section. Include costs in items of concrete work for which reinforcement is required.
- 1.3 References .1 Canadian Standards Association (CSA)
.1 CAN/CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction.
.2 CAN/CSA A23.3-14, Design of concrete structure.
.3 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.
.4 CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.
.5 ASTM A82-07, Standard specification for Steel Wire, Plain, for Concrete Reinforcement.

PART 2 - PRODUCTS

- 2.1 Materials .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, having a yield stress of 400 MPa, deformed bars to CAN/CSA-G30.18-09, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82.
- .4 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
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- 2.2 Fabrication .1 Fabricate reinforcing steel in accordance with CAN/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 CAN/CSA-A23.1.
- .2 Prior to placing concrete, obtain Departmental Representative's review of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- 3.3 Splicing .1 Where splicing of rebar is allow, the minimum splice length will be 40 times the rebar size diameter.

PART 1 - GENERAL

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| <u>1.1 Related Sections</u> | .1 | Section 03 20 00 - Concrete Reinforcing. |
| | .2 | Section 05 50 00 - Metal Fabrications. |
| | .3 | Section 31 62 16.16 - Steel H-Piles |
| <u>1.2 Measurement Procedures</u> | .1 | Concrete Deck: 300mm thick cast-in-place reinforced concrete deck to be measured in square metres (m ²) calculated from neat dimensions indicated or authorized in writing by the Departmental Representative. Measurements to be made on the surface area of the deck to the outside face of the wheelguard. Construction/control joints as shown will be considered incidental to this item. |
| | .2 | Concrete Beams: cast-in-place reinforced concrete beams over piles to be measured in cubic metres (m ³) calculated from neat dimensions indicated or authorized in writing by Departmental Representative. |
| | .3 | Concrete Retaining Wall: cast-in-place reinforced concrete retaining wall to be measured in cubic metres (m ³) calculated from neat dimensions indicated or authorized in writing by the Departmental Representative. |
| | .4 | Concrete Encasement for H-Piles: cast-in-place fibre reinforced concrete for steel H-piles will be measured per linear meter of concrete encasement in place. Price will include cleaning of piles, excavation of material at the mud line and underwater where required, pile jackets or forms, concrete with synthetic fibre reinforcing and all other material, labour and equipment required to complete the work as shown. |
| | .5 | Formwork and falsework will not be measured but considered incidental to the work. |
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- .6 No deductions will be made for volume of concrete displaced by reinforcing steel.
- .7 Heating of water and aggregates and providing cold weather protection will not be measured but considered incidental to the work.
- .8 Cooling of concrete and providing hot weather protection will not be measured but considered incidental to the work.
- .9 Concrete used in the casting of concrete cylinders for testing and other miscellaneous concrete fill-in of voids will not be measured but will be considered incidental to the work.
- .10 Supply and installation of concrete additives as recommended by the supplier will not be measured but considered incidental to the work.
- .11 Reinforcing steel will not be measured but considered incidental to the work.

1.3 References

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283-00 (R2011), Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C260/C260M 10a, Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C494/C494M 11, Standard Specification for Chemical Admixtures for Concrete.
 - .3 ASTM C1116-03, Standard Specification for Fibre Reinforced Concrete.
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- 1.4 Certificates
- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 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 Blended hydraulic cement.
 - .2 Supplementary cementing materials.
 - .3 Admixtures.
 - .4 Aggregates.
 - .5 Water.
 - .6 Synthetic fiber reinforcement.
 - .3 Provide mix design and certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1.
 - .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.
- 1.5 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.
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- .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 CAN/CSA-A3000.
- .2 Supplementary cementing materials: to CAN/CSA-A3000.
- .3 Water: to CAN/CSA-A23.1.
- .4 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
- .5 Air entraining admixture: to ASTM C 260.
- .6 Chemical admixtures: to ASTM C 494/C 494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Concrete retarders: to ASTM C 494/C 494M water based,, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.

2.2 Mixes

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1.
 - .1 Portland Cement: GUb-F/SF.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Minimum cement content: 385 kg/m³ of concrete.

- .4 Maximum water/cement ratio: 0.4
- .5 Class of exposure: C1.
- .6 Nominal size of coarse aggregate: 5-20 mm.
- .7 Slump at time and point of discharge: 50 to 100 mm.
- .8 Air content: 5 to 8 %.

2.3 Synthetic Fiber Reinforcement

- .1 Fibermesh 150, 100 percent homopolymer polypropylene multifilament fibers.
- .2 Conformance to ASTM C1116, Type 3.
- .3 Single cut Fiber lengths.
- .4 Alkali proof.
- .5 Absorption: nil.
- .6 Specific gravity: 0.91.
- .7 Melt point: 162 degrees C.

2.4 Pile Jackets

- .1 The contractor will submit proposed Pile jackets or form system to the Departmental Representative for approval to complete the concrete encasement on the steel H-piles as shown on drawings.

PART 3 - EXECUTION

3.1 Preparation

- .1 Obtain Departmental Representative's approval before placing concrete. Provide 24 hours notice prior to placing of concrete.
 - .2 Pumping of concrete is permitted only after approval of equipment and mix.
 - .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
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- .4 Prior to placing of concrete inform Departmental Representative's approval 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 the Departmental Representative.

3.2 Construction

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

3.3 Finishing

- .1 Finish concrete in accordance with CAN/CSA-A23.1.
 - .1 Float surfaces with wood or metal floats or power finishing machines and bring surfaces to true grade or dimensions.
 - .2 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
- .2 Broom finish deck surface with coarse bristle obtaining a coarse textured finish with a non-slip finish. All brush strokes to be in the direction perpendicular to traffic.

3.4 Site Tolerance

- .1 Concrete tolerance in accordance with CAN/CSA-A23.1.

3.5 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 CAN/CSA-A23.1/A23.2 and Section 01 45 00.
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- .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 CAN/CSA-A23.2.

3.6 Synthetic Fiber Reinforcement

- .1 Add synthetic fiber reinforcement to concrete in accordance with manufacturer's instructions.
- .2 Add synthetic fiber reinforcement at standard rate of 1.0 kg/m³ of concrete.

3.7 Pile Jackets

- .1 Clean steel piles from underside of concrete cap to 1100 mm below L.N.T.
 - .2 Cleaning includes removal of marine growth, and rust scales by use of chipping hammers, wire brush and other mechanical equipment.
 - .3 The cleaning of the pile is subject to the approval of the Departmental representative before the pile jacket or formwork is installed.
 - .4 Install fabric jacket or form system in accordance with manufacturer's instructions for the size and lengths specified on the drawings.
 - .5 Secure the top and bottom of the pile jacket or formwork.
 - .6 Placing concrete underwater shall be accomplished by the proper use of a tremie pipe, or a concrete pump with its discharge line used a tremie. The pipe or hose through the fill opening shall extend down to the lowest point in the form.
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3.8 Formwork
Removal

- .1 Leave the formwork in place for the following minimum time after placing concrete provided the air surrounding the concrete is above 10 degree Celcius.
 - .1 2 days for vertical surfaces.
 - .2 7 days for beam and slab or 70% of design strength.
 - .3 3 days for retaining wall base.
 - .4 7 days for retaining wall or 70% of design strength.