

Part 1 General

1.1 REFERENCES

- .1 Conform to the latest edition of the following reference standards:
 - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.
 - .3 Reinforcing Steel Manual of Standard Practice - Reinforcing Steel Institute of Canada.
 - .4 CAN/CSA A23.3 - Design of Concrete Structures.

1.2 SOURCE QUALITY CONTROL

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 013300.
- .2 Shop drawings consist of bar bending details, lists and placing drawings.
- .3 On placing drawings, clearly indicate sizes, spacing, location and quantities of reinforcement and mechanical splices, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacing and location of chairs, spacers and hangers. Do drawings in accordance with Reinforcing Steel Manual of Standard Practice.
- .4 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated. Provide Type B tension lap splices unless otherwise indicated.

1.4 SUBSTITUTES

- .1 Substitution of different size bars permitted only upon written approval of Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Reinforcing steel: billet steel, grade 400, type R deformed bars to CSA G30.18.
- .2 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1.
- .3 Mechanical splices: subject to approval of Departmental Representative.

2.2 FABRICATION

- .1 Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice.
- .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than shown on placing drawings.
- .3 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

Part 3 Execution

3.1 FIELD BENDING

- .1 Do not field bend reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on submitted placing drawings and in accordance with CAN/CSA-A23.1.
- .2 Place, support and space reinforcing in alignment to position indicated and as follows;
 - .1 Exposed concrete, including the underside of slabs of the main floor and walls are considered as architectural concrete and use non-staining supports and spacers.
 - .2 Slabs on grade, structural beams, structural slabs: support reinforcement on and secure to supports.
 - .3 Provide additional bars necessary to support dowels, stirrups or straight bars.
- .3 Prior to closing forms and placing concrete, obtain Departmental Representative's acceptance of completed reinforcement installation.
- .4 Reinforcement is not to be placed or forced into fresh concrete.
- .5 Reinforcement to be clean and free of excessive rust. Remove scale, mortar, paint, oil, mud, ice and other foreign substances which will reduce bond, to the satisfaction of the Departmental Representative, prior to placing concrete.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
- .2 CAN/CSA-A23.2, Methods of Test for Concrete.
- .3 CAN/CSA-A5, Portland Cement.
- .4 CAN/CSA-A23.5, Supplementary Cementing Materials.

1.2 SUBMITTALS

- .1 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.
- .2 Provide certification that mix proportions selected will produce concrete of specified quality and yield and that strength will comply with CAN/CSA-A23.1 and that mix design is adjusted to prevent alkali aggregate reactivity problems.
- .3 Submit mix designs and aggregate tests prior to starting concrete work.
- .4 Submit proposed quality control procedures.

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A5, Type 50.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5.
- .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 CAN/CSA A23.1.
- .6 Chemical admixtures: to CAN/CSA A23.1. Departmental Representative to review any accelerating or set retarding admixtures required during cold and hot weather placing.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: 40 MPa at 28 days.

- .8 Curing compound: to CAN/CSA-A23.1 and to ASTM C309, Type 1-chlorinated rubber for exterior use.
- .9 Cementitious waterproofing: Waterproofing compound, consisting of a patented formula of chemicals, cement and special treated quartz which waterproofs by crystalline growth through the capillary voids in the concrete.
- .10 Pressure Injected Epoxy Grout: to be reviewed by Departmental Representative.
- .11 Bonding Agent: 100% solids polysulphide epoxy compound.
- .12 Floor Hardener: non metallic, premixed, quartz aggregate coloured, abrasion resistance hardener.

2.2 CONCRETE MIXES

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1 Alternative 1 to give following properties:
 - .1 Minimum compressive strength at 28 days: 30 Mpa.
 - .2 Class of exposure: F1.
 - .3 Nominal size of coarse aggregate: 19 mm.
 - .4 Air content: 5 to 8%.
 - .5 If fly ash is used, its effect on the requirement for air entraining admixture is to be accounted for in the mix design.
 - .6 For concrete in reservoir: use min. 20% flyash and limit water/Cementitious ratio to 0.4.
- .2 Do not change concrete mix without prior approval of Departmental Representative. Should change in material source be proposed, new mix design to be approved by Departmental Representative.

Part 3 Execution

3.1 GENERAL

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

3.2 WORKMANSHIP

- .1 Obtain Departmental Representative's approval before placing concrete. Provide 24 h notice prior to placing of concrete.
- .2 Pumping of concrete is permitted.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.

- .4 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Do not place concrete against any surfaces such as rebar concrete or formwork that have a surface temperature of less than 0°C.
- .6 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .7 Consolidate concrete using internal vibrators. Use pencil vibrators where larger sizes are unsuitable.
- .8 Do not place load upon new concrete until authorized by Departmental Representative.
- .9 Minimum 3 days to elapse between adjacent wall or slab pours.

3.3 CURING

- .1 Cure basement, filters and reservoir base, walls and roof by maintaining concrete surfaces continuously moist for a minimum of 7 days at a minimum temperature of 10°C.
- .2 Cure all other concrete in accordance with CAN/CSA A23.1.

3.4 INSERTS

- .1 Set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated on structural or civil drawings must be approved by Departmental Representative.
- .2 No sleeves, ducts, pipes or other openings shall pass through beams, except where expressly detailed on structural or civil drawings or approved by Departmental Representative.
- .3 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.
- .4 Check locations and sizes of sleeves and openings shown on structural and civil drawings with architectural, mechanical and electrical drawings.
- .5 Set special inserts for strength testing as indicated and as required by Non-Destructive Method of Testing Concrete.

.6 Anchor bolts:

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

3.5 CONSTRUCTION JOINTS

- .1 Move length of pour in any direction to be limited to 11 m. Submit pour sequence in accordance with Section 03300.
- .2 Surfaces shall be clean, free of all laitance and rough. Green cut or sandblast as required.
- .3 Install bentonite waterstop in all tank joints. Waterstop to be fully adhered in-place. Reinforcement continuous through the joint.
- .4 Horizontal wall construction joints to have a mix with an excess of mortar achieved by the removal of all coarse aggregate. Place mix 150 mm deep as shown and in accordance with CAN/CSA A23.1. Surface of vertical and horizontal joints to be saturated, surface dry with no standing water.

3.6 PLACING GROUT

- .1 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

3.7 FINISHING

- .1 Finish concrete in accordance with CAN/CSA A23.1 and as shown.
- .2 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
- .3 Exposed surfaces within the building shall be given a sack-rubbed finish.
- .4 Exposed exterior work and reservoir interior wall surfaces shall be given a smooth rubbed finish.
- .5 All tie recesses are to be grouted with waterproof grout.
- .6 Roughen top of equipment bases to provide bond for grout.

- .7 Finish interior floor surfaces with hardener. Rate of application to be according to manufacturer's recommendation.
- .8 Contractor to ensure curing compound is compatible with floor hardener.

3.8 CRACK REPAIR

- .1 Utilize the best possible care and construction techniques to minimize cracking of concrete walls and slabs.
- .2 Cracks which do appear shall be routed out on each face and repaired with Cementitious waterproof grout in accordance with manufacturer's recommendations, except that cracks which are in excess of 0.50 mm width, or deemed by the Departmental Representative to be structurally detrimental, or subject to movement shall be grouted with pressure injected epoxy resin.
- .3 Obtain approval from Departmental Representative of pressure grouting techniques and epoxy materials to be utilized prior to proceeding with the work.
- .4 Depth of epoxy grouting shall be sufficient to restore structural integrity and/or water-tightness, as required, but shall not be less than 100 mm.
- .5 Cure crack repairs to manufacturer's instructions.

3.9 COLD WEATHER & HOT WEATHER CONCRETING

- .1 Protection and preparation to comply with CAN3-A23.1.

3.10 FIELD QUALITY ASSURANCE

- .1 Inspection and testing of concrete and concrete materials may be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA-A23.1.
- .2 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.
- .4 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

3.11 BOLLARDS

- .1 Bollards to consist of 150 mm diameter galvanized steel pipe, filled with concrete. Concrete to be smooth and rounded at the top.

- .2 Bollards to be painted to match existing.
- .3 Bollards to extend 1.2 m above finished grade.
- .4 Bollards to extend a minimum of 1.5 m below ground and be encased in a minimum of 150 mm thick concrete. Concrete surround to be 20 MPa, Type 50 cement.

Part 4 END OF SECTION