

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Concrete Reinforcing Section 03 20 00
- .2 Cast-in-place Concrete Section 03 30 00

**1.2 REFERENCE STANDARDS**

- .1 CAN/CSA-A23.1-09/A23.2, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
- .2 CSA O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
- .3 CSA 0151-09 Canadian Softwood Plywood.
- .4 CAN/CSA-S269.3-M92 (R2013) Concrete Formwork.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

**Part 2 Products****2.1 FORMWORK MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features use wood and wood product formwork materials to CSA-0121, CAN/CSA-086-09, CSA 0437 Series and CSA-0153-M1980.

**Part 3 Execution****3.1 FABRICATION AND ERECTION**

- .1 Lay out lines, levels and centers before proceeding with formwork and ensure dimensions agree with drawings.
- .2 Fabricate and erect formwork in accordance with CAN/CSA-S269.3-M92 (R2013) to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1-14.
- .3 Align form joints and make watertight. Keep form joints to minimum.
- .4 Use 25 mm chamfer strips on external corners unless specified otherwise.
- .5 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

- .6 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes including painting.
- .7 Provide temporary shoring as required to suit concrete removals. Temporary shoring to be designed by a Professional Engineer licensed in Ontario.
- .8 Clean formwork in accordance with CAN/CSA-A23.1-14, before placing concrete.

### **3.2 REMOVAL**

- .1 Formwork removal must be done in such a manner as to avoid rapid temperature change and loss of moisture on the concrete surface.
- .2 Re-use formwork subject to requirements of CAN/CSA-A23.1-14.
- .3 Leave formwork in place for 24 hours after placing concrete. After form removal, cover and protect concrete for the remainder of the initial curing period of 7 days.
- .4 Re-use of formwork subject to requirements of CAN/CSA-A23.1-M94.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Concrete Forming & Accessories                      Section 03 10 00
- .2 Cast-In-Place Concrete                                Section 03 30 00

**1.2 REFERENCE STANDARDS**

- .1 CAN/CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction / Methods of Test and Standard Practices for Concrete.
- .2 CAN3-A23.3-04, Design of Concrete Structures for Buildings.
- .3 CSA G30.3-(M1983 (R1991)), Cold Drawn Steel Wire for Concrete Reinforcement.
- .4 CSA G30.5-(M1983(R1991) ), Welded Steel, Wire Fabric for Concrete Reinforcement.

**1.3 SHOP DRAWINGS**

- .1 Submit shop drawings including placing of reinforcement in accordance with Section 01 33 00 (if required)
- .2 Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, 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 Detail lap lengths and bar development lengths to CAN3-A23.3-04 unless noted otherwise.
- .4 Detail placement of reinforcement where congestion or special conditions occur.

**Part 2 Products****2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative
- .2 Reinforcing steel: billet steel, grade 400R, deformed bars to CAN/CSA-G30.18-M92, unless indicated otherwise.
- .3 Use 3 component, epoxy modified, cementitious, anti corrosion coating for reinforcing steel in concrete restoration.

**2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1-14, 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/mesh 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,
- .2 Upon request, inform Departmental Representative of proposed source of material to be supplied.

## **Part 3 Execution**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.

### **3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1-14.
- .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.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Concrete Forms and Accessories Section 03 10 00
- .2 Concrete Reinforcing Section 03 20 00

**1.2 REFERENCE STANDARDS**

- .1 CAN/CSA-A5-(93), Portland Cement.
- .2 CAN/CSA-A23.1-14 Concrete Materials and Methods of Concrete Construction
- .3 CAN/CSA-A23.2- 14, Test Methods and Standard Practices for Concrete.
- .4 CAN/ CSA-A23.5-(M86(R1992)), Supplementary Cementing Materials.
- .5 CAN/CSA A363-(M88(R1196)), Cementitious Hydraulic Slag.

**1.3 CERTIFICATES**

- .1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1-14.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1-14.
- .3 Submit product data for admixtures, grout, joint fillers, and bonding agents proposed.

**1.4 QUALITY ASSURANCE**

- .1 Prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:
  - .1 Hot weather concrete or cold weather concrete
  - .2 Curing.
  - .3 Finishes.
  - .4 Formwork removal.
  - .5 Joints.
  - .6 Bonding agents.

**Part 2 Products****2.1 MATERIALS**

- .1 Portland cement replacement: to CAN/CSA-A5.
- .2 Blended hydraulic cement: to CANB-A362-M1988.
- .3 Supplementary cementing materials: to CAN/CSA-A23.5.
- .4 Cementitious hydraulic slag: to CAN/CSA-A363.
- .5 Water: to CAN/CSA-A23.1-14.
- .6 Aggregates: to CAN/CSA-A23.1-14 Coarse aggregates to be normal density.

- .7 Curing compound: to CAN/CSA-A23.1-14 to ASTM C 309, Type 1.
- .8 Bonding agent: 3 component, epoxy modified bonding agent

## **2.2 MIXES**

### **Grout Mixes.**

- .1 Proportion non shrink (shrinkage compensating) grout to give the following properties.
  - .1 Consistency to pressure grout in formwork as specified on drawings.
  - .2 Minimum compressive strength: 16 MPa at 24 hours & 50 MPa at 28 days
  - .3 Dry pack to manufacturers requirements for any voids.
  - .4 Ensure compatibility with bonding agent.
- .2 Use of calcium chloride or admixtures containing calcium chloride, not permitted.

## **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 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .3 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .4 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .5 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 CAN/CSA-A23.1-14.
- .2 Sleeves and inserts.
  - .1 No sleeves, ducts, pipes or other openings shall pass through piers or footings, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100x100 mm not indicated must be 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 drawings.
  - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.

- .3 Anchor bolts
  - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
  - .2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
- .4 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in (100)% contact over grouted area.
- .5 Finishing
  - .1 Finish concrete in accordance with CAN/CSA-A23.1-14.
  - .2 Use procedures noted in CAN/CSA-A23.1-14 to remove excess bleed water. Ensure surface is not damaged.
  - .3 Use curing compounds compatible with applied finish on concrete surfaces

### **3.3 SITE TOLERANCES**

- .1 Slabs on grade shall have a steel trowel finish Class A in accordance with CAN/ CSA-A23.1-14, straight edge method.

### **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 to CSA A23.1/A23.2., and Section 01 45 00 – Quality Control.
- .2 Departmental Representative may take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete, which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .5 Inspections or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

**END OF SECTION**

**Part 1 General****1.1 RELATED SECTIONS**

- .1 Concrete Reinforcement Section 03 20 00
- .2 Cast-In-Place Concrete Section 03 30 00

**1.2 REFERENCE STANDARDS**

- .1 Do concrete floor finishing work in accordance CAN/CSA-A23.1-14 except where specified otherwise.

**Part 2 Products****2.1 MATERIALS**

- .1 Concrete materials to Section 03 30 00 - Cast-In-Place Concrete; and reinforcement to Section 03 20 00 - Concrete Reinforcement.
- .2 Curing and sealing compound: to ASTM C309 Type 1 Class B, clear.

**Part 3 Execution****3.1 FLOOR FINISH**

- .1 Floor slab surfaces shall be finished to Class A classification as defined in CAN/CSA-A23.1-14, Table 22.
- .2 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.
- .3 Saw cut crack-control joints to CSA-A23.1-14.
- .4 Apply floor curing and sealing compounds to manufacturer's instructions. Cure to manufacturer's recommendations.
- .5 Cure concrete in accordance with CAN/CSA-A23.1-14 except where specified otherwise.
- .6 Provide any housekeeping pads for electrical and mechanical equipment.
- .7 Provide non-slip light broom finish to exposed interior steps and landings. Provide non-slip medium broom finish to exposed exterior steps, ramps and landings.

**3.2 PROTECTION**

- .1 Protect concrete to be left exposed throughout the course of construction. Make good damaged areas to the approval of the Engineer.

**END OF SECTION**