

**Part 1 General**

**1.1 RELATED SECTIONS**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3 CAN/CSA-O86-01 Consolidation (R2006), Engineering Design in Wood along with O86S1-05 Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .4 CSA O121-08, Douglas Fir Plywood.
  - .5 CSA O151-04, Canadian Softwood Plywood.
  - .6 CSA O153-M1980 (R2003), Poplar Plywood.
  - .7 CAN/CSA-O325-07, Construction Sheathing.
  - .8 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
  - .9 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .10 CAN/CSA-S269.3-M92 (R2003), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

**1.3 INCLUSIONS**

- .1 Costs associated with the work described in this section that is not subject to a particular item of the Unit Price Table must be included either in the general lump sum portion of the contract or in the cost of the associated work paid under an article of the Unit Price Table.
- .2 Payment of costs associated with the work described in this section applicable under the fixed price item “Approach Road Works” shall not be measured.

**1.4 SUBMITTALS**

- 1. Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- 2. Submit shop drawings for formwork and falsework.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Provinces of Ontario and Quebec, Canada.
- 3. Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1-1975(R2003), for falsework drawings Comply with CAN/CSA-S269.3-M92 (R2003) 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 / falsework as directed by Departmental Representative.

## **Part 2 Products**

### **2.1 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121-08 and CAN/CSA-O86-01.
  - .2 For concrete with special architectural features, use formwork materials to CAN/CSA-A23.1-04.
  - .3 All plywood for formwork shall be 7 ply, 17 mm minimum thickness, exterior grade, Douglas Fir Plywood in conformance with CSA O121-08.
  - .4 All surfaces shall have smooth form finish in conformance with CAN/CSA-A23.1-04. For smooth form finish, plywood shall be medium density overlay plywood.
  - .5 Smooth form finish is not required for the following: - Sides of grade beams against which backfill is placed. - Face of ballast wall against which backfill is placed.
- .2 Accessories:
  - .1 All accessories used shall comply with the details shown on the drawings or with the recommendations of the manufacturer of the specified accessory.
  - .2 Hardware left in place, either exposed or embedded in concrete within 20 mm of its surface shall be hot dip galvanized in accordance with CAN/CSA-G164-M92 (R2003).
- .3 Form ties:
  - .1 All form ties left in place in a barrier and parapet wall shall be hot dip galvanized, coated with an approved material or be non-corrodible.
  - .2 The maximum diameter of plastic cones for form ties shall be 30 mm.
  - .3 Hot dip galvanizing shall conform to CAN/CSA-G164-M92 (R2003).
- .4 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps.
- .5 Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .6 Falsework materials: to CSA S269.1-1975(R2003).

## **Part 3 Execution**

### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Forms for exposed surfaces shall be new except that forms may be re-used for exposed

surfaces providing their condition is such as to produce a surface equal to that which would be attained using new materials.

- .3 Fabricate and erect falsework in accordance with CSA S269.1- 1975(R2003).
- .4 Refer to Contract Drawings for concrete members requiring architectural exposed finishes.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3-M92 (R2003) to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CAN/CSA-A23.1-04. Do not allow tolerances to accumulate or combine.
- .8 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
  - .2 Form joints shall not be visible in exposed areas or finished concrete.
- .9 Use 20 mm chamfer strips on all formed edges, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Construct forms for architectural concrete, and place ties as indicated and/or as directed.
  - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .12 When internal form ties are used, concrete cover to any metal left on removal shall be 20 mm minimum.
- .13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .14 Clean formwork in accordance with CAN/CSA-A23.1-04, before placing concrete.
- .15 Plywood used on exposed surfaces shall be used in full sheets.

### **3.2 REMOVAL**

- .1 Remove formwork when concrete has reached 20 MPa strength.
- .2 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1-04 and written approval of the Departmental Representative. File written approvals with project records.

**END OF SECTION**