



Part 1 General

1.1 DESCRIPTION OF WORK

- .1 The work shall consist of the supply and construction of forms, form openings, falsework, shoring, bracing and anchorage, the supply and placement of a skin coat and the stripping of forms and removal of falsework.

1.2 STANDARDS

- .1 CSA International
 178 Rexdale Boulevard,
 Toronto, ON M9W 1R3
- .2 ACI – American Concrete Institute
 PO Box 9094
 Farmington Hills, MI 48333

The Standards referred to shall be the most recent edition.

1.3 SUBMITTALS

- .1 If specified in Section 01 00 10, Special Provisions, the Contractor shall submit to the Engineer for approval prior to the commencement of construction, formwork and falsework drawings prepared by a professional engineer registered in the Province of Manitoba in accordance with the current CSA Standard S269-M, Falsework for Construction Purposes and CSA Standard A23.1, Section 6.5; Concrete Materials and Methods of Concrete Construction and ACI Standard 347 Formwork for Concrete.

1.4 INSPECTION

- .1 Inspection of the work described in this Section shall be performed by the Engineer. In general, inspection shall be required both before and after closing in of the forms and immediately after stripping the forms.

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Part 2 Products

2.1 FALSEWORK

- .1 Falsework materials shall conform to the current CSA Standard S269.3, Falsework for Construction Purposes.

2.2 NAILS, SPIKES & STAPLES

- .1 Nails, spikes and staples used for formwork construction shall be phosphatised.

2.3 FORMS

- .1 Form surfaces for exposed concrete shall be sanded, solid-one-side Douglas Fir plywood (concrete form grade) conforming to the current CSA O121-M or smooth metal. Unless shown otherwise on the plans, all exposed corners shall be chamfered to 20 mm by 20 mm chamfer. All forms shall be sufficiently tight to prevent leakage of mortar. All lumber for forms shall conform to the current CAN/CSA O141, Softwood Lumber. Prefabricated forms shall be acceptable as an alternative provided they are in good condition. Plywood and wood formwork materials shall also meet the latest edition of CAN/CSA A23.1.

2.4 INTERNAL TIES

- .1 Internal form ties shall be of metal and of a commercially manufactured type approved by the Engineer. Ties shall be capable of supporting the concrete and so arranged that slack or spring in the form framing will be eliminated when the tie is tightened. All such ties shall be arranged so that when the forms are removed no permanently embedded tie metal shall be less than 25 mm from the form face. Plastic cone snap ties shall be used on exposed surfaces and all tank wall surfaces.

2.5 FORM RELEASE AGENT

- .1 The Contractor may use a form release agent (i.e. colourless mineral oil) which shall not stain the concrete or impair the natural bonding of any coating intended for use on the concrete. The Contractor shall ensure that any form release agent is suitable for potable water use and that it will not inhibit the use or installation of any required water proofing agent when constructing a water reservoir.

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Part 3 Execution

3.1 DESIGN

- .1 The Contractor is responsible for the design and performance of forms and false work.
- .2 Earth surfaces shall not be used to form concrete unless as indicated on the plans.
- .3 Forms shall be built with sufficient strength and rigidity to carry the weight or fluid pressure of concrete and of any materials, equipment or runways which might be placed upon them. Fluid pressure on forms shall be correlated to the capacity and type of placing equipment, the planned rate of placing concrete, the slump, temperature, and stiffening and curing characteristics of the concrete.
- .4 TOLERANCES

All formwork shall be constructed to maintain the more stringent of the tolerances suggested in CAN/CSA A23.1 or the following:

- .1 Deviation from vertical line - 5 mm in 3.0 m, 10 mm in 6.0 m and 20 mm in 12.0 m or more
- .2 Deviation from horizontal line - 5 mm in 3.0 m
- .3 Deviation from flat surface - 3 mm in 3.0 m
- .4 Deviation of linear building lines from design drawings - 5 mm
- .5 Deviation in thickness of slabs - plus or minus 5 mm

3.2 CONSTRUCTION

- .1 Construction of falsework shall conform to CSA Standard S269.1 and S269.3, Falsework for Construction Purposes.
- .2 Forms shall be so constructed that the finished concrete will conform to the shape and dimensions shown on the Plans.

3.3 PREPARATION

- .1 Before any concrete is placed the interior of the forms shall be cleaned of all earth, chips, sawdust, ice, snow or other foreign substances.
- .2 The Contractor shall install formwork in such a way that removal of formwork will not damage the concrete.

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- .3 Temporary ports or openings shall be provided at the bottom of all deep units to facilitate cleaning and inspection. In restricted units they shall be located so that water can be used to wash out debris. They shall be closed with patches flush on the outside.
- .4 The Contractor may apply form release agent in accordance with the manufacturer's recommendations. The Contractor shall not apply form release agent where concrete surfaces are to receive a special finished covering (i.e. waterproofing) which may be affected by the agent. Reinforcing steel and concrete surfaces to be bonded shall be kept free of oil.
- .5 Unless otherwise specified in Section 01 00 10, Special Provisions, prior to placing reinforcing steel for concrete which is to be cast on a soil or gravel base, a "skin coat" of concrete of approximately 50 mm in thickness shall be laid down and allowed to set for at least 24 hours. The skin coat shall be placed as soon as the soil is excavated to final grade to prevent drying of the underlying soil. The concrete for the skin coat shall have a compressive strength of not less than 15 MPa at 28 days and shall contain the same type of cement as is specified for the overlying concrete. The top or outside surface of the skin coat shall be placed to the neat outline of the bottom surface of the proposed slab. Where a filled expansion joint is to be constructed in the overlying slab, a similar filled joint shall be constructed in the skin coat.

3.4 REMOVAL OF FORMS

- .1 The Contractor shall not disturb formwork until the concrete has sufficiently set. The struts, shoring etc., shall not be removed before the concrete has reached the necessary strength to safely support its own weight as well as the applied construction loads.
- .2 If the ambient temperature is within the range 20 to 35°C forms shall remain in place for not less than 3 days except that forms and falsework supporting beams vertical walls and ceiling slabs shall be left in place not less than 7 days. (Refer to ACI SP-4; "Formwork for Concrete").
- .3 If the temperature falls to between 15 and 20°C, the minimum length of time that forms shall remain in place shall be 5 days except that falsework supporting beams, vertical walls and ceiling slabs shall be left in place not less than 10 days.

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- .4 If the temperature falls to between 10 and 15°C, the minimum length of time that forms shall remain in place shall be 5 days, except that falsework supporting beams, vertical walls and ceiling slabs shall be left in place not less than 14 days.
- .5 The method of dismantling falsework shall comply with CSA Standard S269.1, Falsework for Construction Purposes.
- .6 Refer to CSA A23.1, Section 7.4, Curing and Protection.

3.5 CONE CAVITIES

- .1 The cavities left by the removal of spreader cones shall be filled as specified in Clause 3.10, Section 03 30 00, Cast-In-Place Concrete.

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