
CONCRETE FORMWORK

PART 1 GENERAL**1.1 Related Work**

- .1 All Division 1 Specification Sections
- .2 Section [02233](#) Granular Base
- .3 Section [02311](#) Site Grading
- .4 Section [03200](#) Concrete Reinforcement
- .5 Section [03300](#) Cast-In-Place Concrete
- .6 Section [07910](#) Joint Sealant

1.2 References

- .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CSA-086.01, Supplement No.1 to CAN/CSA-086-01, Engineering Design in Wood.
- .3 CSA-O121, Douglas Fir Plywood.
- .4 CSA O151, Canadian Softwood Plywood.
- .5 CSA-S269.1, Falsework for Construction Purposes.
- .6 CAN/CSA-S269.3. Concrete Formwork.

1.3 Submittals

- .1 Submit shop drawings in accordance with Section [01330 Submittals](#).
- .2 Indicate method and schedule of construction, materials, arrangement of joints, ties shores and location of embedded parts including waterstops and anchor bolts.
- .3 Each shop drawing submitted shall bear the stamp and signature of a qualified Professional Engineer licensed in the Province of Ontario.
- .4 At time of submission, the Contractor shall notify the Consultant in writing of any deviations in shop drawings from requirements of Contract Documents.
- .5 The Consultant will review and return shop drawings in accordance with an agreed schedule. Review of the shop drawings by the Consultant is intended as assistance to the Contractor and does not

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relieve the Contractor of responsibilities for the completeness and accuracy of the work and conformance with the Contract drawings and specifications.

1.4 Shop drawings

- .1 Submit shop drawings in accordance with Section [01330 Submittals](#).
- .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, and materials, arrangement of joints, special architectural exposed finishes, ties, liners and locations of temporary embedded parts. (Comply with CSA-S269.1 for drawings. Comply with CAN/CSA-S269.3 for formwork drawings.)
- .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .4 Each shop drawing submission shall bear stamp and signature of a qualified Professional Engineer registered or licensed in the Province of Ontario.

1.5 Sample Panel

- .1 Sample panel shall be 600 mm x 600 mm to fully indicate special treatment, pattern, module or finish required. Obtain the Consultant's approval prior to casting concrete sample.
- .2 Obtain the Consultant's approval resulting concrete surface finish prior to erecting subsequent forms.
- .3 Approved concrete surface of sample will be considered the standard of quality for the finished work. Quality of all formwork shall match the approved sample panel.
- .4 Leave sample panel and concrete sample exposed to view for duration of concrete work.
- .5 Remove sample panel and concrete sample, if not incorporated into the work, from site when directed by the Consultant.

1.6 Description

- .1 Install anchors, ties, expansion joint components and other items to be built into, anchored to, or passing through concrete Work which are specified for supply on Work of other section(s).

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- .2 Co-operation with Work of other Sections:
 - .1 Check project drawings and specifications for requirements of other sections that affect construction of formwork.
 - .2 Inform those performing Work of other sections, in writing or by schedules, of requirements for services, materials and built-in items prepared or supplied by other sections which affect Work of this section.
- .3 Co-operation with the Consultant.
 - .1 Before commencing Work, review with the Consultant the sampling program for Work performed under this section.
 - .2 Schedule Work to allow sufficient time and access for the Consultant to carry out sampling program during regular working hours.
- .4 Definition: Architectural Concrete shall mean concrete surfaces designated as "Architectural Concrete" in the contract documents. Exposed paving surfaces and curbs shall be considered as architectural concrete.

1.7 Quality Assurance

- .1 Reference Standards: The following reference standards shall govern Work in this section, except where they are in conflict with the requirements imposed by this specification, in which case the latter shall govern. Standards referenced in CAN3-A23.1 shall apply but are not repeated in the following list.
 - 1. CAN Standard CAN3-A23.1-M77, Concrete Materials and Methods of Concrete Construction.
- .2 Design of Formwork: Assume full responsibility for complete structural design and construction of formwork in accordance with CSA Standard S269.1.
- .3 Requirement of Regulatory Agencies: Conform to local and provincial regulations, including construction safety regulations.
- .4 Tolerances:
 - .1 Conform to CSA-A23.1/A23.2 and as specified herein.
 - .2 Where drawings call for "architectural concrete" to be

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provided, construct formwork so that the hardened concrete surface will conform to the following tolerances:

Variation from plumb:

- A. In lines and surfaces of columns, walls and in arises:
 - In any 3.0m (10') of length 3mm (1/8")
 - The greater of bay length or 6.0m (20') 5mm (3/16")
 - Maximum for entire length 12mm (1/2")

- B. For exposed corner columns and other conspicuous lines:
 - The greater of bay length or 6.0m (20') 5mm (3/16")
 - Maximum for entire length 12mm (1/2")

- C. Variation from level or from grades specified in Contract Documents:
 - In exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:
 - The greater of bay length or 6.0m (20') 5mm (3/16")
 - Maximum for entire length 12mm (1/2")

1.8 Product Delivery, Storage and Handling

- .1 Protect formwork to prevent functional damages and damage to faces affecting appearance of concrete surfaces to exposed view.

PART 2 PRODUCTS**2.1 Materials**

- .1 Formwork materials: Use new plywood and wood formwork materials to CSA-O121.

- .2 Plywood:
 - .1 Generally: Douglas fir, minimum thickness of 17mm (11/16"), to CSA O121, finished one side, fabricated specially for use as concrete form panels, with sealed edges.

 - .2 For concrete surfaces exposed to view, provide panels smooth and free of defects which would be reproduced as concrete blemishes.

 - .3 Where surfaces receive architectural finishes, such as sandblasting, use coated or overlaid form panels as indicated.

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- .3 Form Ties: Use removable or snap-off metal ties, fixed or adjustable length.
 - .1 At architectural concrete surfaces, snap ties with plastic cone, 25mm (1") break back and grey plastic plugs, to the Consultant's approval and to provide 6mm (1/4") reveal.
 - .2 At other surfaces use snap ties with spreader washer and 25mm (1") break back.
- 4. Chamfers:
 - .1 Cut chamfers from wood, smooth, with no open defects.
- 5. Form Liners
 - .1 Provide product literature or a sample of the proposed form liner for approval prior to placing in the form work.

PART 3 EXECUTION**3.1 Fabrication, Formwork and Construction**

- .1 Verify lines, levels and centres before proceeding with formwork or and ensure dimensions agree with drawings.
- .2 Fabricate and erect in accordance with CSA S269.1 1975 (R2003)
- .3 Build formwork with joints sufficiently tight to prevent leakage of grout or cement paste.
- .4 Obtain the Consultant's approval before commencement of Work.
- .5 Forms for concrete surfaces or surfaces which will be exposed or painted.
- .6 Construction:
 - .1 Construct panels with continuous and level horizontal joints.
 - .2 Back all edges of plywood to prevent separation of plywood panels at joints.
 - .3 Construct corners so that concrete is not placed against panel edges.

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- .4 Where tie marks will show, place ties in regular pattern as approved by the Consultant or as indicated on the Contract Document drawings.
- .5 Reuse forms only if their surfaces are not marred in any manner and where established patterns of holes can be maintained with no alterations to panels.
- .6 Form footing sides unless footings are shown to be place against undisturbed soil.
- .7 Set anchor bolts, templates. Steel connection units, hardware, or other insets into the forms and secure them rigidly so that they do not become displaced during concreting. Set and secure them items to the tolerances specified and required in the appropriate Sections.
- .7 Sleeves, Chases and Formed Openings:
 - .1 Form sleeves, chases and opening except where such items are specified to be formed or sleeved by the appropriate trade.
 - .2 All openings, sleeves, chases are not necessarily shown on the drawings nor are their sizes or locations shown. Refer to mechanical and electrical drawings and specifications for openings and sleeving requirements not shown, located and dimensioned on the drawings.
- .8 Exposed Concrete Forms:
 - .1 Make joints of forms sufficiently tight to prevent leakage of concrete fines at corners of exposed beams, walls and columns or at the corners of exposed edges or slabs, and other concrete.
 - .2 Provide chamfer strips at all exposed edges of concrete.
 - .3 Form panels for exposed concrete may be reused three (3) times, providing the tie holes are reused and panels are not damaged in a way that will cause visual defects.
- .9 Advise the Consultant when an area of formwork will be ready for review. Allow sufficient time for review before starting concrete placing.
- .10 Clean formwork in accordance with CAN/CSA-A23.1/A23.2 before

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placing concrete. Clean forms of all loose debris and other deleterious materials prior to placement of the concrete.

- .11 Finished concrete exhibiting excessive form displacement or excessive deflection shall be cause for rejection of the work and its removal and replacement at the Contractor's expense.

3.2 Built-In Work.

- .1 Do not embed wood in concrete.
- .2 Ensure that all fixtures and hardware have been properly placed before starting concrete placing.

3.3 Construction and Expansion Joints.

- .1 Review with the Consultant the proposed location and details of joints in foundations, walls and columns.
- .2 Construction Joints: shall present appearance of normal form panel joint.
- .3 Expansion Joint: shall be installed in locations as detailed and noted on drawings.

3.4 Treatment of Formwork Surfaces.

- .1 Form Release Agent: coat formwork with form release agent before reinforcement, anchors, accessories and other built-in items are installed.
- .2 Use chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
- .3 Do not coat plywood forms pre-treated with release agent.
- .4 Form release agent shall be non-toxic.

3.5 Stripping of Formwork

- .1 Be responsible for the safety of the structure, both before and after removal of forms, until concrete has reached its specified 28 day strength.
- .2 Strip formwork for columns and piers not supporting weight of concrete only when no damage will result from stripping operations.

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- .3 Remove formwork at architectural surfaces after other formwork has been removed to prevent damage to surfaces.
- .4 Do not remove plywood formwork by jerking loose or by metal pinch bars. Use wood wedges and gradually force panels loose. Leave plywood forms in place as long as possible to permit maximum shrinkage away from concrete.
- .5 Take particular care not to damage external corners when stripping formwork.
- .6 In hot weather, wood forms remaining in place should not be considered adequate for curing but should be removed or loosened so concrete surfaces may be kept moist or coated with curing agent.
- .7 In cold weather, defer removal of formwork or insulate formwork, to avoid thermal shock and consequent cracking of concrete surface.
- .8 When forms are stripped during curing process, cure and protect exposed concrete in accordance with Section [03300](#) **Cast-In-Place Concrete**.

3.6 Replacement of Defective Work

- .1 Movement and displacement of formwork during construction, variations in excess of specified tolerances and marked and disfigured surfaces that cannot be repaired by approved methods will be considered defective work performed by this Section.
- .2 Reconstruct defective formwork and replace concrete and reinforcement placed in defective formwork at no additional cost to the Owner.

END OF SECTION - 03100