

PART 1 - GENERAL

1.1 RELATED SECTIONS

- .1 Section 03 20 00 - Concrete Reinforcing.
- .2 Section 03 30 00 - Cast-in-Place Concrete.
- .3 Section 03 35 00 - Concrete Finishing.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-04/A23.2-09, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA-O86S1-05, Engineering Design in Wood (Limit States Design).
 - .3 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .4 CAN/CSA-S269.3-M92 (R2013) Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI)
 - .1 COFI Exterior Plywood for Concrete Formwork.

1.3 SHOP DRAWINGS

- .1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangements 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.
 - .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
 - .4 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.
 - .5 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in the Province of Newfoundland and Labrador.
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1.4 RESPONSIBILITY

- .1 Contractor to design for method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms upon request from Departmental Representative.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .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.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store formwork materials to prevent weathering, warping or damage detrimental to the strength of the materials or to the surface to be formed.
- .2 Ensure that formwork surfaces which will be in contact with concrete are not contaminated by foreign matter. Handle and erect the fabricated formwork so as to prevent damage.

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-A23.1/A23.2.
 - .2 for Concrete with special architectural features, use formwork materials to CAN/CSA-A23.1/A23.2.
 - .3 The form facing material shall be free from surface defects and meet deflection requirements in accordance with CAN/CSA S269.3.
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- .2 Falsework materials: to CSA S269.1.
- .3 Form ties:
 - .1 Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface. Holes are to be filled with non-shrink grout.
 - .2 Patch all form tie holes and finish surface to remove all evidence of tie holes and/or patching.
 - .3 Adjustable in lengths to permit tightening and alignment of forms.
 - .4 Flat tie for Architectural exposed concrete to include plastic cones leaving no metal within 20 mm of surface.
- .4 Form release agent: non-toxic, biodegradable, low VOC, 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.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm² /sat 40°C, flashpoint minimum 150°C, open cup.

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. The walls are to be formed and poured monolithically. Review all drawings and check dimensions prior to construction for proper fit and report any discrepancies before proceeding with the work.
 - .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
 - .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
 - .4 Assemble formwork so that concrete is not damaged during its removal.
 - .5 Fabricate and erect falsework in accordance with CSA S269.1 and COFI exterior plywood for concrete formwork.
 - .6 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
 - .7 Do not place shores and mud sills on frozen ground.
 - .8 Provide site drainage to prevent washout of soil supporting mud sills and shores.
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- .9 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
 - .10 Align form joints and make watertight. Keep form joints to a minimum.
 - .11 Locate horizontal form joints for walls and pilasters below top of finished grade.
 - .12 Where concrete is to remain exposed, use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.
 - .13 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
 - .14 Prior to placing concrete, the elevations of forms shall be checked to verify drainage slopes.
 - .15 Provide 48 hours notice to Departmental Representative for inspection prior to concrete placement.
 - .16 Build in anchors, dowels, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .17 Clean formwork as erection proceeds, to remove foreign matter. Remove cuttings, shavings and debris from within forms. Flush completely with water to remove remaining foreign matters. Ensure that water and debris drain to exterior through clean-out ports.
 - .18 During cold weather, remove ice and snow from within forms, do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and concrete construction proceed within a heated enclosure.
 - .19 Patch all form tie holes and finish surface to remove all evidence of tie holes and/or patching.
 - .20 Construction Joints:
 - .1 Form construction joints where required and as approved.
 - .2 Build waterstops into forms, supported against displacement by pouring of concrete. Locate waterstops at construction joints in pits and trenches below floor levels, and as indicated on Drawings. Do not install waterstops between footings and walls, or between slabs on fill and walls except where indicated on Drawings.
 - .3 Use preformed waterstop corners and intersections where they are available to suit conditions.
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- .4 Join waterstops to preformed corners and intersections, and between lengths with butted and welded connections in accordance with manufacturer's recommendations.
- .21 Build inserts, anchor bolts, miscellaneous frames, flashing reglets, weather bars, holes, sleeves, and items otherwise specified as supplied and located under the Work of other Sections into formwork. Imbed no wood in concrete for purposes of anchorage.
- .22 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .23 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Notify Departmental Representative prior to form removal.
 - .2 Form removal times are dependent on proper curing in accordance with CAN/CSA-A23.1, CSA S269.1 and CAN/CSA-S269.3. Contractor shall provide written evidence of concrete strength to the Departmental Representative 24 hours prior to form removal to show that suitable strength has been achieved. Contractor shall pay for the concrete cylinder strength tests to demonstrate concrete strength prior to form removal.
 - .3 Remove formwork progressively and in accordance with the reference code requirements, and so that no shock loads or imbalanced loads are imposed on the structure.
 - .4 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 3 day for footings.
 - .2 3 days for walls and sides of beams.
 - .3 28 days for beam soffits and slabs or 7 days when replaced immediately with adequate shoring and concrete has achieved at least 70% of its 28 day design strength.
 - .5 Remove forms not directly supporting the weight of concrete as soon as stripping operations will not damage concrete.
 - .6 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.
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- .7 Loosen forms carefully. Do not wedge pry bars, hammers or tools against concrete surfaces.
- .8 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .9 Re-shore beams and slabs immediately as form removal proceeds. Suspend beams and slabs shall not be left unshored for more than one (1) hour after form removal.
- .10 Space reshoring in each principal direction at not more than 3,000 mm apart.