

This specification outlines the requirements for the supply and installation of concrete formwork and falsework.

PART 1 REFERENCES

This specification refers to the following standards, specifications, or publications:

American Concrete Institute (ACI)

347R Guide to Formwork for Concrete

CSA Group

A23.1/A23.2 Concrete Materials and Methods of Concrete Construction
 / Test Methods and Standard Practices for Concrete

O121 Douglas Fir Plywood

O151 Canadian Softwood Plywood

O153 Poplar Plywood

S269.1 Falsework and Formwork

Underwriters Laboratories of Canada (ULC)

CAN/ULC-S701.1 Standard for Thermal Insulation, Polystyrene Boards

PART 2 GENERAL

2.1 SUBMITTALS

- .1 Submittals in accordance with Section 01340 – Shop Drawing, Samples and Submissions.
- .2 Submit shop drawings for formwork and false work.

- .1 Each shop drawing submission shall bear stamp and signature of qualified professional engineer licensed in the Province of Newfoundland and Labrador, Canada.
- .2 Prepare Shop Drawings in accordance with CSA S269.1, for falsework and formwork drawings.
- .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .4 When slip forming is used, submit details of equipment and procedures for review by the Owner.
- .2.5 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.

.6 Indicate sequence of erection and removal of formwork/falsework as directed by Owner.

.7 Include the following information on falsework Shop Drawings:

.1 Design to be in accordance with limit state principles.

.2 Pour pressures exerted by the liquid head of concrete.

.3 Longitudinal, lateral, vertical, dead, live and impact loads used in design. Horizontal loads shall be designed to clause 5.3.3 of CSA S269.1.

.1 Fresh concrete shall normally be taken as a dead load with a minimum load factor of 1.25 unless unusual conditions require a higher value.

.4 Safe bearing capacity of soil underneath mud sills and falsework support reactions.

.5 Maximum column, post and support loads.

.6 Deflection diagrams for beams with deflection of 10 mm or more.

.7 Deflection diagrams indicating initial and final elevation of deck surfaces, roofs and soffits.

.8 Grade of structural steel or concrete size and shape.

.9 Species, grading, and size of timber members.

.10 Indicate steel posts, girders, beams, connections, bracing and welding, providing sufficient detail for safe performance of falsework.

.11 Fully detailed steel frame shoring.

.12 Species, grades and sizes of wood.

.13 Type and weight of equipment (moving or stationary) supported by falsework.

.14 Sequence, methods and rate of concrete placement.

.15 For prestressed concrete slab type structures, the falsework submission shall have a side falsework design provided. The effects of the same shall be considered in the exterior leg load and load on exterior stringers;

.16 Proprietary equipment, adequately identified for checking purposes.

.17 Full details and locations of splices.

.3 Acceptance of these drawings will be for conformance with the design and shall not relieve the Contractor of any responsibility for the safe design, and installation of the false work and for adherence to all applicable standards.

2.2 QUALITY ASSURANCE

- .1 Retain a professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada, with experience in formwork and falsework design of comparable complexity and scope, to perform following services as part of Work of this Section:
 - .1 Design of formwork and falsework.
 - .2 Review, stamp, and sign fabrication and erection Shop Drawings, design calculations and amendments.
 - .3 Conduct on-site inspections and prepare and submit inspection reports verifying this part of Work is in accordance with Contract Documents and reviewed Shop Drawings. Perform inspections a minimum of once per month.

2.3 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01600 – Material and Equipment.
- .2 Delivery and Acceptance Requirements: Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect formwork from damages.

PART 3 PRODUCTS

3.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121.
 - .2 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701.1
- .2 Falsework materials: in accordance with CSA S269.1.
- .3 Form release agent: Proprietary, non-volatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non-petroleum containing,

non-toxic, biodegradable, low VOC, colourless mineral oil, with viscosity between 15 to 24 mm/s at 40 °C, flash point minimum 150 °C, open cup.

- .4 Pan forms: as indicated, free of bends, dents, and residual concrete; having a high potential for reuse as indicated.
- .5 Tubular column forms: round spirally wound laminated fibre forms, internally treated with release material. Spiral of form must not show in hardened concrete.
- .6 Form ties:
 - .1 For concrete not designated 'Architectural': removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface. All such devices shall be so arranged that when the forms are removed no permanently embedded tie metal shall be less than 15 mm from the form face.
 - .2 For Architectural concrete; snap ties complete with plastic cones and light grey concrete plugs.
- .7 Form liner:
 - .1 Plywood: medium density overlay Douglas Fir in accordance with CAN/CSA O121, Canadian Softwood Plywood in accordance with CSA O151, and Poplar in accordance with CAN/CSA O153, T and G thickness as indicated.

PART 4 EXECUTION

4.1 FABRICATION AND ERECTION

- .1 Verify lines, levels and column centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain the Owner's approval for use of earth forms framing openings not indicated on drawings. Obtain the Owner's permission before framing openings not indicated in concrete joists, beams or columns.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CAN/CSA S269.1.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.

- .8 Fabricate and erect formwork in accordance with CAN/CSA S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerance required by CAN/CSA A23.1/A23.2, ACI 347R.
- .9 Align form joints and make watertight. Keep form joints to minimum.
- .10 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- .11 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, beams, and columns unless specified otherwise.
- .12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .13 Construct forms for architectural concrete, and place ties as indicated and as directed.
 - .1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .14 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.
- .15 Line forms for following surfaces with material only as approved by the Owner:
 - .1 Outer face of outside girders beams and vertical edge of bridge sidewalk slab.
 - .2 Soffit of girders and underside of bridge decks if exposed.
 - .3 Exposed faces of abutments, wingwalls, piers and pylons. Do not stagger joints of form lining material. Align joints to obtain a uniform pattern.
 - .4 Secure lining taut to formwork to prevent folds.
 - .5 Pull down lining over edges of formwork panels.
 - .6 Ensure lining is new and not reused material.
 - .7 Ensure lining is dry and free of oil when concrete is poured.
 - .8 Application of form release agents on formwork surface is prohibited where drainage lining is used.
 - .9 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
 - .10 Cost of textile lining is included in price of concrete for corresponding portion of Work.
- .16 Clean formwork in accordance with CAN/CSA A23.1/A23.2.

.17 Slip forming may be approved by the Owner subject to evaluation of procedures and mechanical equipment proposed for use.

4.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

- .1 7 calendar days for walls and side of beams.
- .2 14 calendar days for columns
- .3 14 calendar days for beam soffits, slabs, decks and other structural members.
- .4 4 calendar days for footings and abutments.

.2 Remove formwork when concrete has reached 70 % of its 28 day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide 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.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2

4.3 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01710 – Reinstatement and Cleaning.

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01710 – Reinstatement and Cleaning.

PART 5 PAYMENT

5.1 MEASUREMENT FOR PAYMENT

.1 No measurement will be made under this Section. Include costs in items of work for which Concrete Formwork and Falsework is required.

5.2 BASIS OF PAYMENT

.1 No separate or direct payment will be made for work specified in this specification. Costs of all work specified is deemed to be included in the

lump sum and unit prices quoted in the MERX Schedule of Quantities and Prices.

Not For Construction

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