Part 1 GENERAL

1.1 SECTION INCLUDES

1. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
2. Openings in forms for other work.
3. Form accessories.
4. Form stripping.

1.2 RELATED SECTIONS

1. Division 01 of this Specification.
2. Section 03 30 00 - Cast-in-Place Concrete: Supply of concrete accessories for placement by this section.
3. Section 04 04 15 - Masonry Anchorage and Reinforcement: Supply of masonry accessories for placement by this section.
4. Division 23 - Heating, Ventilating, and Air-Conditioning (HVAC): Supply of mechanical items for placement by this section.
5. Division 26 - Electrical: Supply of electrical items for placement by this section.

1.3 REFERENCES

1. ACI 301-05 - Specification for Structural Concrete for Buildings.
2. ASME A17.1-2007/CSA-B44-07 – Safety Code for Elevators and Escalators (Canada/USA harmonized standard).
3. CSA-S269.1-1975 (R2003) - Falsework for Construction Purposes.
4. CAN/CSA-S269.3-M92 (R2008) - Concrete Formwork.
5. CSA-A23.1-09/A23.2-09 - Concrete Materials and Methods of Concrete Construction / Methods of Test for Concrete.
6. CSA-O121-08 - Douglas Fir Plywood.
7. CSA-O151-09 - Canadian Softwood Plywood.
8. CSA-O153-M1980 (R2008) - Poplar Plywood.
9. CSA-O437 Series-93 (R2006) - OSB and Waferboard.
10. CSA-S269.1-1975 (R2003) - Falsework for Construction Purposes.
11. COFI (Council of Forest Industries of British Columbia) - Exterior Plywood for Concrete Formwork.

1.4 DESIGN REQUIREMENTS

1. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.
2. Conform to CSA-S269.1.

1.5 SUBMITTALS FOR INFORMATION

1. Section 01 33 00: Submittals.
2. Installation Data: Manufacturer's special installation requirements.

1.6 QUALITY ASSURANCE

1. Perform Work in accordance with CAN/CSA-S269.3.

1.7 INSPECTION AND TESTING

1. Materials and workmanship will be subject to inspection at any time. Co-operate in permitting access for inspection at all places where work is being done.
2. Do not enclose formwork until reinforcing steel has been reviewed.

1.8 REGULATORY REQUIREMENTS

1. Conform to applicable code for design, fabrication, erection and removal of formwork.

1.9 DELIVERY, STORAGE, AND PROTECTION

1. Place materials defined as hazardous or toxic in designated containers.
2. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

Part 2 PRODUCTS

2.1 WOOD FORM MATERIALS

1. Board Formed Concrete: Wood facing for exposed board-formed concrete to be rough sawn Douglas Fir with a nominal face dimension 184 mm. Vertical orientation.
2. Plywood: new, sound and undamaged sheets with clean, true edges confirming to CAN/CSA-A23.1, CAN/CSA-O86.1, CSA O121, CSA-O151.
3. Lumber: lumber for forms, falsework, shoring and bracing shall be of new materials conforming to CAN/CSA-A23.1, CAN/CSA-O86.1, CAN/CSA-O141 and the applicable grading authority. All lumber shall be of a grade to which unit stresses can be assigned in accordance with CAN/CSA-O86.1 and all lumber shall bear the grade stamp of the authorized grading authority.

2.2 FORMWORK ACCESSORIES

1. Form Ties: Removable or Snap-off type, fixed and adjustable length, free of devices leaving holes larger than 25mm (1") diameter in concrete surfaces and conforming to CAN/CSA-S269.3. Twisted wire ties will not be permitted.
2. Form Release Agent:
    1. Colourless mineral oil which will not stain concrete, or absorb moisture or impair natural bonding or colour characteristics of coating intended for use on concrete.

2. Non-toxic, biodegradable and low VOC.

3. Form Stripping Agent: Colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal, 15 to 24 mm2/s at 401C, flashpoint minimum 1501C, open cup.

4. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.

5. Waterstops, where indicated on drawings:

   1. Minimum 102mm (4") Polyvinyl chloride, by W.R. Meadows, or approved substitution.
   2. Superstop Bentonite Waterstop, by Tremco, or approved substitution.

Part 3 EXECUTION

3.1 EXAMINATION

1. Verify existing conditions before starting work.
2. Verify lines, levels and centres before proceeding with formwork.
3. Ensure that dimensions agree with drawings.

3.2 EARTH FORMS

1. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

3.3 ERECTION - FORMWORK

1. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of CAN/CSA-S269.3.
2. Fabricate and erect false work in accordance with CSA-S269.1.
3. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
4. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
5. Align joints and make watertight. Keep form joints to a minimum.
6. Obtain approval before framing openings in structural members which are not indicated on Drawings.
7. Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
8. Coordinate this section with other sections of work which require attachment of components to formwork.
9. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Consultant.

3.4 APPLICATION - FORM RELEASE AGENT

1. Apply form release agent on formwork in accordance with manufacturer's recommendations.
2. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS

1. Provide formed openings where required for items to be embedded in passing through concrete work.
2. Locate and set in place items which will be cast directly into concrete.
3. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
4. Install accessories in accordance with manufacturer's written instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
5. Install waterstops to manufacturer's written instructions continuous without displacing reinforcement. Heat seal joints watertight.
6. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
7. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

3.6 FORM CLEANING

1. Clean forms as erection proceeds, to remove foreign matter within forms.
2. Clean formed cavities of debris prior to placing concrete.
3. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
4. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.7 FORMWORK TOLERANCES

1. Construct formwork to maintain tolerances in accordance with CSA-A23.1.

3.8 FORM REMOVAL

1. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
2. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
3. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

END OF SECTION 03 11 00