

PART 1 – GENERAL

1.1 RELATED WORK

- .1 Division 1: General Requirements.
- .2 Section 03 20 00: Concrete Reinforcing.
- .3 Section 03 30 00: Cast-in-Place Concrete.
- .4 Section 03 35 00: Concrete Finishing.

1.2 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA International)
 - .1. CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA O121-08 (R2013), Douglas Fir Plywood.
 - .3 CSA S269.1-1975 (R2003), Falsework for Construction Purposes.
 - .4 CAN/CSA-S269.3-M92 (R2013), Concrete Formwork
- .2 American Society for Testing and Materials (ASTM International)
 - .1 ASTM D1751-04 (R2013), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - .2 ASTM D2240-05(2010), Standard Test Method for Rubber Property-Durometer Hardness
 - .3 ASTM D3575, Foam Test Methods.
 - .4 ASTM D412-06a (2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
 - .5 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics
 - .6 ASTM E 1643-11, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
 - .7 ASTM E1745-11, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
- .3 Canadian General Standards Board
 - .1 CGSB 19-GP-16M, Sealing Compound, One Component, Polyurethane Base, Chemical Curing

1.3 QUALITY ASSURANCE

- .1 The Contractor shall be responsible for the structural design of formwork and falsework and its construction, including shoring and bracing, to ensure its stability, and to support safely and resist loads imposed by weight of forms and wet concrete, wind, fluid pressure of concrete, equipment and workers.

- .2 Design of retaining wall formwork to be performed by a structural Engineer registered or licensed to practice lawfully in the Province of Nova Scotia and who is experienced in design of formwork.
- .3 The Contractor shall be responsible for the safety of the structure, both before and after removal of the forms, until the concrete has reached the specified 28 day compressive strength.
- .4 The Subcontractor responsible for formwork shall have a minimum of 3 years documented experience in designing and constructing formwork similar to that required for this project. The Subcontractor responsible for formwork shall submit documentation describing previously completed projects similar in scope, including project location.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Construction shall conform to requirements of Governmental Authorities and Applicable Laws including, without limitation the Nova Scotia Occupational Health and Safety Act and Regulations.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Handle and store formwork to prevent damage affecting function or appearance of concrete surfaces exposed to view.

PART 2 – PRODUCTS

2.1 MATERIALS

- .1 Formwork lumber:
 - .1 Plywood and wood formwork materials shall be in accordance with CSA A23.1.
 - .2 Form boards shall be matched pine or spruce, dressed on three sides and in uniform widths.
 - .3 Plywood form panels: Douglas fir, minimum thickness 19 mm, to meet specified requirements of CSA O121, finished one side, fabricated specially for use as concrete form panels, with sealed edges.
 - .4 Exposed concrete: for concrete surfaces exposed to view, use panels that are smooth and free of defects which would be reproduced as concrete blemishes. Refer to architectural drawings for concrete exposed to view.

- .2 Form release agent: use VOC compliant, biodegradable agent that prevents set of film of concrete in contact with form. To be non-staining, non-grain raising; suitable for type of formwork on which used; having no adverse effect on paint, adhesives, or other treatments which are specified for application to concrete; and containing no non-drying ingredients such as mineral oil.
- .3 Form ties: removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes no larger than 25 mm diameter in concrete surface.
- .4 Chamfers: wood, 45° cut from 20 mm x 20 mm nominal material, or plastic type, unless specified differently on the construction drawings prepared as part of this project.
- .5 Joint tape: non-staining, water impermeable, self-release
- .6 Premoulded joint fillers:
 - .1 Bituminous impregnated fiberboard: in accordance with ASTM D1751.
 - .2 Polyethylene or urethane: extruded closed cell foam 16 mm and 8 mm diameter.
 - .3 Joint Sealant: polyurethane base, self-leveling, Class A to CGSB 19-GP-16M.
- .7 Expanding rubber waterstop: acceptable material: Adeka Ultra Seal Waterstop MC-2010M and P-201.
 - .1 Tensile strength: ASTM D412, 0.98 MPa.
 - .2 Elongation: in accordance with ASTM D412, 550%
 - .3 Hardness: in accordance with ASTM D2240 Duror Type A, 30 hrs.

PART 3 – EXECUTION

3.1 ERECTION

- .1 Verify lines, levels and column centers before proceeding with formwork and ensure dimensions agree with construction drawings prepared as part of this project.
- .2 Construct and remove formwork to produce finished concrete conforming to shape, dimensions, locations and levels shown on the structural drawings within the tolerances required by CSA A23.1.
- .3 On completion of formwork and reinforcing steel for each contemplated concrete placement, notify Departmental Representative so that they may review the work in advance of placing of concrete. Do not place concrete in forms until review has been completed.
- .4 Construct falsework to CSA S269.1.
- .5 Construct concrete formwork and provide sufficient ties and bracing to safely resist concrete pressures and other construction loadings without excessive bulging, distortion or displacement.

- .6 Construction of formwork shall permit easy dismantling and stripping in order to avoid damage to concrete during formwork removal.
- .7 Obtain Departmental Representative's approval before framing openings in concrete unless shown on structural drawings prepared as part of this project.
- .8 Hand-trim bottom and remove loose earth or lean concrete before placing concrete. All footings and generator slab shall be founded on engineered fill bearing on glacial till with an allowable bearing capacity of 200 kPa as per Division 31. Earth forms on sides will not be permitted, i.e. formwork shall extend full depth of all footings.
- .9 Install wood stringers for suspension of reinforcement in place where chairs are not utilized.
- .10 Align form joints and make watertight. Keep form joints to minimum.
- .11 Use 20 mm chamfer strips on external corners walls exposed to view, unless noted otherwise. Coordinate with Architectural drawings.
- .12 Construction joints:
 - .1 In general, incorporate either horizontal or vertical construction joints in accordance with CSA A23.1.
 - .2 Provide construction joints in concrete where work is left off at day's end. Run reinforcement continuous through joint.
 - .3 Provide proper key, reinforcement and V-joint on exposed faces.
 - .4 Immediately before next pour, clean construction joint and brush with grout of neat cement.
- .13 Form chases, slots, openings, drips, recesses, expansion and control joints as detailed.
- .14 Coat formwork with form release agent before reinforcement, anchors or other accessories are placed. Do not coat plywood forms precoated with a chemical release agent.
- .15 Set all required bolts, anchor rods, inserts, angles, plates, decking and other embedded items. Anchor securely to formwork before placing concrete.
- .16 Leave formwork in place for following minimum periods of time after placing concrete:
 - .1 Two days for footings.
 - .2 Three days for edges of exterior walkways and curbs.
 - .3 Three days for walls, columns, and piers.
- .17 Take care in removing plywood forms. Use wood wedges and gradual force to pry the formwork loose from the concrete. Do not beat, jar or shake the formwork or pry with metal bars. Leave plywood forms in place as long as possible and until other adjacent formwork is stripped to permit maximum shrinkage away from concrete and to protect concrete surfaces. Take particular care to prevent damage to external corners and top edges of walls.

- .18 Re-use of formwork and falsework:
 - .1 Re-use of formwork and falsework subject to requirements of CSA A23.1, CAN/CSA S269.1 and CAN/CSA S269.3.
 - .2 Re-use forms that can be repaired to original condition only. Remove nails, clean and repair surfaces and reapply specified form coating.
 - .3 Re-use forms for exposed concrete surfaces only if their surfaces are not marred in any manner, they are cleaned and retreated and their tie holes may be utilized to maintain pattern of layout.

3.3 JOINT FILLERS

- .1 Locate and form isolation joint as indicated. Install joint filler to manufacturer's instructions.
- .2 Unless otherwise indicated, use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces. Extend joint filler from bottom of slab to within 24 mm of finished slab surface.
- .3 Install 16 mm foam filler to separate joint filler and sealer.
- .4 Fill remaining 8 mm with joint sealer to manufacturer's instructions.
- .5 Locate saw cut control joints in slabs as indicated and detailed.
- .6 Install 8 mm foam filler 8 mm below finished slab surface and fill saw cut with joint sealer to manufacturer's instructions.

3.4 WATERSTOPS

- .1 Expanding rubber waterstop: Comply with manufacturer's printed instructions for field installation.
- .2 Sidelap 50 mm minimum when connecting straps end to end.

END OF SECTION