

PART 1 - GENERAL

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| 1.1 | <u>Related Sections</u> | .1 | Section 01 74 21 - Construction/Demolition Waste Management And Disposal. |
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| 1.2 | <u>References</u> | .1 | Canadian Standards Association (CSA) |
| | | .1 | CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction. |
| | | .2 | CAN/CSA-A23.2-00, Methods of Test for Concrete. |
| | | .3 | CAN/CSA-A3000-98-A5-98, Portland Cement. |
| | | .4 | CAN/CSA-G30.18-M92(R1998), Billet-Steel Bars for Concrete Reinforcement. |
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| 1.3 | <u>Submittals</u> | .1 | Shop Drawings |
| | | .1 | Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and all necessary details of reinforcing. |
| | | .2 | Submit drawings showing formwork and falsework design to: CAN/CSA-A23.1. |
| | | .3 | Drawings to bear stamp and signature of qualified professional engineer registered or licensed in Province of New Brunswick, Canada. |
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| 1.4 | <u>Waste Management and Disposal</u> | .1 | Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposals. |
| | | .2 | Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan. |
| | | .3 | Place materials defined as hazardous or toxic in designated containers. |
| | | .4 | Ensure emptied containers are sealed and stored safely. |
| | | .5 | Use trigger operated spray nozzles for water hoses. |
| | | .6 | Designate cleaning area for tools to limit water use and runoff. |

PART 2 - PRODUCTS

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| 2.1 | <u>Materials</u> | .1 | Portland cement: to CAN/CSA-A3000-A5, Type 10. |
| | | .2 | Reinforcing bars: to CAN/CSA-G30.18, Grade 400. |
| | | .3 | Joint sealer/filler: grey, to CAN/CGSB-19.24, Type 1, Class B. |
| | | .4 | Sealer: proprietary poly-siloxane resin blend. |
| | | .5 | Other concrete materials: to CAN/CSA-A23.1. |
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| 2.2 | <u>Mixes</u> | .1 | Proportion concrete in accordance with CAN/CSA-A23.1. |
| | | .2 | Minimum compressive strength at 35 MPa as specified by Departmental Representative. |
| | | .3 | Nominal maximum size of coarse aggregate: to CAN/CSA-A23.1. |
| | | .4 | Slump: to CAN/CSA-A23.1. |
| | | .5 | Air content: concrete to contain purposely entrained air in accordance with CAN/CSA-A23.1, Table 10. |
| | | .6 | Admixtures: to CAN/CSA-A23.1. |

PART 3 - EXECUTION

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| 3.1 | <u>Construction</u> | .1 | Do concrete work in accordance with CAN/CSA-A23.1. |
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| 3.2 | <u>Inserts</u> | .1 | Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint filers and other inserts required to be built-in. Sleeves and openings greater than 100 mm x 100 mm not indicated, must be approved by Departmental Representative. |

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| 3.3 | <u>Finishes</u> | .1 | Concrete deck, guard:
.1 Screed to plane surfaces and use wood floats.
.2 Provide round edges and joint spacings using standard tools.
.3 Trowel smooth and provide lightly brushed non-slip finish. |
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| 3.4 | <u>Control Joints</u> | .1 | Cut control joints in slabs on grade at locations indicated or specified by the Departmental Representative, in accordance with CAN/CSA-A23.1 and install specified joint sealer/filler. |
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| 3.5 | <u>Expansion and Isolation Joints</u> | .1 | Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface. |
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| 3.6 | <u>Curing</u> | .1 | Cure and protect concrete in accordance with CAN/CSA-A23.1.
.1 Do not use curing compounds where bond is required by subsequent topping or coating. |
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| 3.7 | <u>Sealing</u> | .1 | Following curing, apply poly-siloxane resin blend sealer at 4 m ² /L. |
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| 3.8 | <u>Site Tolerances</u> | .1 | Concrete deck slab finishing tolerance in accordance with CAN/CSA-A23.1. |
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| 3.9 | <u>Field Quality Control</u> | .1 | Concrete testing: to CAN/CSA-A23.2 by testing laboratory designated and paid for by Departmental Representative. |

PART 1 - GENERAL

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| 1.1 | <u>Measurement Procedures</u> | .1 | No measurement will be made under this Section. Include costs in items of work for which concrete formwork is required. |
| 1.2 | <u>References</u> | .1 | Canadian Standards Association (CSA)
.1 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
.2 CAN/CSA-S269.3-M92, Concrete Formwork. |
| 1.3 | <u>Shop Drawings</u> | .1 | Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 – Shop Drawings and other Submittal Procedures. |
| | | .2 | Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, and locations of temporary embedded parts. 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 qualified professional engineer registered or licensed in Province of New Brunswick, Canada. |
| 1.4 | <u>Waste Management and Disposal</u> | .1 | Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal and the Waste Reduction Workplan. |
| | | .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.

PART 2 - PRODUCTS

2.1 Materials

- .1 Formwork materials:
 - .1 For concrete, use wood and wood product formwork materials to CAN/CSA-O86.1.
- .2 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.
- .3 Form release agent: non-toxic.
- .4 Form stripping agent: colourless mineral oil, non-toxic.
- .5 Falsework materials: to CSA-S269.1.

PART 3 - EXECUTION

3.1 Fabrication and Erection

- .1 Verify lines, levels and centers before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .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 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.

- .7 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 CAN/CSA-A23.1.
- .8 Align form joints and make watertight. Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

3.2 Removal and
Reshoring

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Five days for slabs, decks and other structural members.
- .2 Remove formwork, when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 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.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

PART 1 - GENERAL

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| 1.1 | <u>Description</u> | .1 | This section specifies the requirements for the supply and installation of reinforcing steel for structural concrete. |
| 1.2 | <u>Related Section</u> | .1 | Cast-In-Place Concrete: Section 03 30 00 |
| 1.3 | <u>Measurement for Payment</u> | .1 | No measurement will be made under this section. Include costs in items of concrete work for which reinforcement is required. |
| 1.4 | <u>Reference Standards</u> | .1 | Do concrete reinforcement work in accordance with CAN3-A23.1-M94 except where specified otherwise. Welding of reinforcement is not permitted. |
| 1.5 | <u>Source Sampling</u> | .1 | Upon request, provide Departmental Representative with certified copy of mill test of steel supplied showing physical and chemical analysis. |
| 1.6 | <u>Shop Drawings</u> | .1 | Submit shop drawings in accordance with Section 01 33 00. |
| | | .2 | Clearly indicate bar sizes, spacing, location and quantities of reinforcement, chairs, spacers and hangers with identifying code marks to permit correct placement without reference to structural drawings; to ACI Manual of Standard Practice for Detailing Reinforced Concrete Structures. |
| | | .3 | Detail placement of reinforcing where special conditions occur. |
| | | .4 | Design and detail lap lengths and bar development lengths to CAN3-A23.3-M90, unless otherwise specified on drawings. |
| | | .5 | Unless otherwise noted on design drawings, all reinforcing laps shall be detailed as Class C tension lap splices. |

PART 2 - PRODUCTS

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| 2.1 | <u>Materials</u> | .1 | Reinforcing steel: to CSA G30-18-M92 billet steel grade 400, deformed bars. |
| | | .2 | Wire Ties: to CSA G30.3-1972 (R1979) plain, cold drawn annealed steel wire. |
| | | .3 | Supports: to CAN3-A23.1-M90. |
| 2.2 | <u>Fabrication</u> | .1 | Fabricate reinforcing steel within following tolerances:
.1 Sheared length: plus or minus 25 mm.
.2 Ties: plus or minus 12 mm.
.3 Other bends: plus or minus 25 mm. |
| | | .2 | Ship bundles of bar reinforcement, clearly identified in accordance with bar list. |

PART 3 - EXECUTION

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| 3.1 | <u>Field Bending</u> | .1 | Do not field bend reinforcement except where indicated or authorized by Departmental Representative. |
| | | .2 | When field bending is authorized, bend without heat, applying slow and steady pressure. |
| | | .3 | Replace bars, which develop cracks or splits. |
| 3.2 | <u>Placing</u> | .1 | Accurately place reinforcing steel in positions indicated and hold firmly during placing, compacting and setting of concrete. |
| | | .2 | Reinforcement shall be placed so that it is completely isolated from embedded parts. |
| | | .3 | Tie reinforcement where spacing in direction is:
.1 Less than 300 mm: - tie at alternate intersections.
.2 300 mm or more: - tie at each intersection. |

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| | .4 | Keep reinforcement 75 mm back from edges unless otherwise noted on Plan. |
| 3.3 <u>Cleaning</u> | .1 | Clean reinforcing before placing concrete. |
| 3.4 <u>Inspection</u> | .1 | Do not place concrete until Departmental Representative has inspected and approved reinforcement work in place. |

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| 1.1 | <u>Related Sections</u> | .1 | Concrete General: Section 03 05 10 |
| | | .2 | Concrete Forming and Accessories: Section 03 10 00 |
| | | .3 | Concrete Reinforcing: Section 03 20 00 |
| | | .4 | Miscellaneous Metals: Section 05 50 00 |
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| 1.2 | <u>References</u> | .1 | American Society for Testing and Materials International (ASTM)
.1 ASTM A 185-05, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete. Specification for Boiled Linseed Oil.
.2 ASTM D 1751-04, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types). |
| | | .2 | Canadian General Standards Board (CGSB)
.1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound. |
| | | .3 | Canadian Standards Association (CSA International)
.1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
.2 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
.3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement. |
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| 1.3 | <u>Measurement Procedures</u> | .1 | Reinforced concrete: cast-in-place reinforced concrete to be measured in cubic metres (m ³) calculated from neat dimensions indicated or authorized in writing by Departmental Representative.
.1 Concrete placed beyond dimensions indicated will not be measured. |

- .2 Formwork and falsework will not be measured but considered incidental to the work.
- .3 No deductions will be made for volume of concrete displaced by reinforcing steel.
- .4 Heating of water and aggregate and providing cold weather protection such as insulated blankets will not be measured but considered incidental to the work.
- .5 Cooling of concrete and providing hot weather protection will not be measured but considered incidental to the work.
- .6 Supply and installation of concrete additives as recommended by the supplier will not be measured but considered incidental to the work.
- .7 Supply and installation of anchor bolts, nuts, washers and bolt grouting will not be measured but considered incidental to the work.

1.4 Certificates

- .1 Submit certificates in accordance with Section 01 33 00 Submittal Procedures.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA23.1.
- .3 Provide mix design in compliance with CSA-A23.1 to provide concrete of quality, yield and strength as specified under 2.2 Mix. Mix design to be prepared by and stamped by an Engineer licensed to practice in the Province of New Brunswick.
- .4 Prior to starting concrete work, submit to Departmental Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Admixtures,
 - .5 Aggregates.
 - .6 Water.

- 1.5 Submittals
- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Shop Drawings:
 - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and all necessary details of reinforcing.
 - .2 Submit drawings showing formwork and falsework design to: CSA-A23.1.
 - .3 Drawings to bear stamp and signature of qualified professional engineer registered or licensed in Province of New Brunswick, Canada.
- 1.6 Waste Management And Disposal
- .1 Designate a cleaning area for concrete trucks off site, at a company owned site for such a purpose meeting all federal and provincial requirements.
 - .2 Use trigger operated spray nozzles for water hoses.
 - .3 Designate a cleaning area for tools to limit water use and runoff.
 - .4 Carefully coordinate the specified concrete work with weather conditions.
 - .5 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or waterways. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal.
 - .6 Choose least harmful, appropriate cleaning method which will perform adequately.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Blended hydraulic cement: to CAN/CSA-A3001, Type GU10.

- .2 Water: to CSA-A23.1.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2. Coarse aggregates to be normal density.
- .4 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .5 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D 1751.
- .6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .7 Sealer: boiled linseed oil to ASTM D 260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend.
- .8 Other concrete materials: to CSA-A23.1/A23.2.
- .9 Curing compound: to CSA A23.1/A23.2.

2.2 Mix Design

- .1 The contractor shall be responsible for the concrete mix design.
- .2 It shall be the responsibility of the contractor to ensure that the mixture proportions shall be properly batched, mixed, placed and cured such that the concrete conforms to the specification.
- .3 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1, to give following properties:
 - .1 Cement: GUb-F/SF.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Minimum cement content: 400 kg/m³ of concrete.
 - .4 Maximum water/cement ratio: 0.40.
 - .5 Class of exposure: C-1.
 - .6 Nominal size of coarse aggregate: 20 mm.
 - .7 Slump at time and point of discharge: 50 to 100 mm.
 - .8 Air content: 5 to 8%.

PART 3 - EXECUTION

3.1 Preparation

- .1 Inform Departmental Representative before placing concrete. Provide 48 hours notice prior to placing of concrete.
- .2 Pumping of concrete is permitted only after review of equipment and mix.

- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
 - .4 Prior to placing of concrete advise Departmental Representative of proposed method for protection of concrete during placing and curing in adverse weather.
 - .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
 - .6 Do not place load upon new concrete until authorized by Departmental Representative.
- 3.2 Construction
- .1 Perform cast-in-place concrete work in accordance with CSA-A23.1.
- 3.3 Inserts
- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint filers and other inserts required to be built-in.
 - .1 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.
- 3.4 Finishes
- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA-A23.1.
 - .2 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use aluminum magnesium, wood floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish.
- 3.5 Control Joints
- .1 Cut and form control joints in slabs on grade at locations indicated, in accordance with CSA-A23.1 and install specified joint sealer/filler.

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| 3.6 | <u>Expansion and Isolation Joints</u> | .1 | Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA-A23.1. |
| 3.7 | <u>Curing</u> | .1 | Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and in accordance with CSA-A23.1. |
| 3.8 | <u>Sealing</u> | .1 | If Specified, following curing, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m ² /L. Allow first coat to dry before applying second coat. Apply poly-siloxane resin blend sealer at 4 m ² /L |
| 3.9 | <u>Site Tolerances</u> | .1 | Finishing tolerance in accordance with CSA-A23.1. |
| 3.10 | <u>Field Quality Control</u> | .1 | Concrete testing: to CSA-A23.1 by testing laboratory designated and paid for by Departmental Representative. |
| 3.11 | <u>Cleaning</u> | .1 | Use trigger operated spray nozzles for water hoses. |
| | | .2 | Designate cleaning area for tools to limit water use and runoff. |
| | | .3 | Cleaning of concrete equipment to be done in accordance with Section 01 35 43: Environmental Procedures. |