

1 GENERAL

1.01 RELATED SECTIONS

- .1 CAST-IN-PLACE CONCRETE: Section 03 30 00
- .2 CONCRETE REINFORCING: Section 03 20 00

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .3 CSA O121-M1978(R2003), Douglas Fir Plywood.
 - .4 CSA O151-04, Canadian Softwood Plywood.
 - .5 CSA O153-M1980(R2003), Poplar Plywood.
 - .6 CAN/CSA-O325.0-92(R2003), Construction Sheathing.
 - .7 CSA O437 Series-93(R2006), Standards for OSB and Waferboard.
 - .8 CSA S269.1-1975(R2003), Falsework for Construction Purposes.
 - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.03 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
- .3 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. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
- .4 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Place materials defined as hazardous or toxic in designated containers.
 - .2 Divert wood materials from landfill to a recycling/composting facility as approved by Departmental Representative.
 - .3 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.

- .4 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

2 PRODUCTS

2.01 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-0121, CAN/CSA-086, CSA 0437 Series, and CSA-0153.
 - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701.
- .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 diameter in concrete surface.
 - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
 - .3 Plywood: medium density overlay conforming to CAN/CSA-0325.0.
- .3 Form release agent: non-toxic, biodegradable, low VOC.
- .4 Falsework materials: to CSA-S269.1.

3 EXECUTION

3.01 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .3 Fabricate and erect falsework in accordance with CSA S269.1.
- .4 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .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 CSA-A23.1/A23.2.

- .8 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 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.
- .11 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Remove formwork when concrete has reached 70 % of its design strength.
- .2 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.
- .3 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 CONCRETE FORMING AND ACCESSORIES: Section 03 10 00.
- .2 CAST-IN-PLACE CONCRETE: Section 03 30 00.

1.02 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 No measurement will be made under this Section.
 - .1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

1.03 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
 - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
 - .2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- .2 ASTM International
 - .1 ASTM A 82/A 82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
- .3 CSA International
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA-A23.3-04, Design of Concrete Structures.
 - .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in New Brunswick.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.

- .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
- .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
 - .1 Provide type A tension lap splices unless otherwise indicated.

1.05 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
- .2 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel.

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labeled with manufacturer's name and address.

2 PRODUCTS

2.01 MATERIALS

- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .2 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .3 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .5 Plain round bars: to CSA-G40.20/G40.21.

2.02 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .1 ACI 315R unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.

2.03 SOURCE QUALITY CONTROL

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

3 EXECUTION

3.01 FIELD BENDING

- .1 Do not field bend or field weld 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.

3.02 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 CONCRETE FORMING AND ACCESSORIES: Section 03 10 00.
- .2 CONCRETE REINFORCING: Section 03 20 00.

1.02 PRICE AND PAYEMENT PROCEDURES

- .1 Supply and installation of the concrete retaining wall complete with reinforcing steel installation shall be measured as a lump sum item.
 - .1 Excavation and disposal shall be included in the work.
 - .2 Demolition and disposal shall be included in the work.
 - .3 Concrete sidewalk shall be paid under section 32 16 15.

1.03 REFERENCES

- .1 ASTM International
 - .1 ASTM A 185/A 185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .2 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 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide 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 necessary details of reinforcing.
 - .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.
 - .3 Submit drawings stamped and signed by professional engineer registered or licensed in New Brunswick.
- .3 At least 4 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.
 - .1 Do not change source of fly ash without written approval of

Departmental Representative.

- .4 Provide inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .5 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 for concrete to be delivered to site of Work and discharged after batching.

1.05 QUALITY ASSURANCE

- .1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
 - .1 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.

1.06 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

2 PRODUCTS

2.01 DESIGN CRITERIA

- .1 Alternative 1 - Prescription: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.02 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by [Departmental Representative] [DCC Representative] [Consultant] and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.03 MATERIALS

- .1 Cement: to CSA A3001, Type GU.

- .2 Supplementary cementing materials: with minimum 20% fly ash replacement, by mass of total cementitious materials to CSA A3001.
- .3 Water: to CSA A23.1/A23.2.
- .4 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .5 Other concrete materials: to CSA A23.1/A23.2.

2.04 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
 - .2 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: C-1.
 - .2 Compressive strength at 28 age: 35 MPa minimum.
 - .3 Aggregate size 25 mm maximum.
 - .3 Concrete supplier's certification.
 - .4 Provide quality management plan to ensure verification of concrete quality to specified performance.

3 EXECUTION

3.01 PREPARATION

- .1 Provide Departmental Representative 24 hours notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application of concrete finishes.

3.02 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required

- to be built-in.
- .2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative .

3.03 FINISHES

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.
- .2 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use magnesium floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth.

3.04 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.05 SEALING APPLICATION

- .1 After curing is complete, apply poly-siloxane resin blend sealer at 4 m² /L.

3.06 SITE TOLERANCES

- .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

3.07 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.

3.08 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate cleaning area for tools to limit water use and runoff.
- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.
 - .2 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .3 Divert admixtures and additive materials from landfill to approved official hazardous material collections site after receipt of written approval from Departmental Representative.
 - .4 Do not dispose of unused admixtures and additive materials into sewer

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systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 29 – Health and Safety Requirements.
- .3 Section 01 35 43 – Environmental Procedures.
- .4 Section 01 74 11 - Cleaning.
- .5 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM D260-86(2001), Standard Specification for Boiled Linseed Oil.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 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 CSA A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-M92(R2002), Billet-Steel Bars for Concrete Reinforcement.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.4 QUALITY ASSURANCE

- .1 Provide to Departmental Representative, 2 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
- .2 Owner will employ materials testing consultant to verify compliance of cast-in-place concrete. Notify Departmental Representative 48 hours prior to concrete pouring. This verification by the Owner does not relieve the contractor from its own quality control.
- .3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 – Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by the Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 MATERIALS

- .1 Cement: to CSA A3001, Type GU.
- .2 Water: to CSA A23.1/A23.2.
- .3 Reinforcing bars: to CAN/CSA-G30.18, Grade 400 (if required).
- .4 Welded steel wire fabric: to ASTM A185 (if required).
- .5 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D1751.
- .6 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .7 Other concrete materials: to CSA A23.1/A23.2.

2.2 MIXES

- .1 Ensure materials used in concrete mix have been submitted for testing and meet requirements of CSA A23.1.
 - .1 Class of exposure: C-1.
 - .2 Aggregate: normal-density to CAN/CSA-A23.1.
 - .3 Admixtures: to CAN/CSA-A23.1.
 - .4 Maximum W/CM ratio: 0.45.
 - .5 Air content category range: 5% to 8%.
 - .6 Slump: at time and point of discharge 30 to 80 mm.
 - .7 Minimum specified compressive strength at 28 days: 32 Mpa.

Part 3 Execution

3.1 PREPARATION

- .1 Provide Consultant 24 hours notice before each concrete pour.
- .2 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .3 Protect previous Work from staining.
- .4 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

3.3 FINISHES

- .1 Formed surfaces exposed to view: in accordance with CSA A23.1/A23.2.
- .2 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use aluminum, magnesium or wood floats.
 - .2 Provide round edges and joint spacings using standard tools.
 - .3 Trowel smooth to provide lightly brushed non-slip finish.

3.4 CONTROL JOINTS

- .1 Cut control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.5 EXPANSION AND ISOLATION JOINTS

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.6 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.7 SEALING APPLICATION

- .1 After curing is complete, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m²/L. Allow first coat to dry before applying second coat.

3.8 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated by Owner.

3.9 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43 Environmental Procedures.
- .4 Waste Management: separate waste materials for reuse, recycling and disposal in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Provide appropriate area on job site where concrete trucks and be safely washed.
 - .2 Divert unused concrete materials from landfill to local quarry or facility after receipt approval from Departmental Representative.
 - .3 Divert admixtures and additive materials from landfill to approved official hazardous material collections site after receipt of approval from Departmental Representative.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

END OF SECTION