

Part 1 General

1.1 Related Requirements	.1	Section 03 20 00 - Concrete Reinforcing.
	.2	Section 03 30 00.01 - Cast-in-Place Concrete Short Form.
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	CAN/CSA-O325.0-92(R2003), Construction Sheathing.
	.6	CSA S269.1-1975(R2003), Falsework for Construction Purposes.
	.7	CAN/CSA-S269.3-M92(R2003), Concrete Formwork, National Standard of Canada
	.2	Underwriters' Laboratories of Canada (ULC).
1.3 Action And Informational Submittals	.1	Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data, and Samples.
1.4 Delivery, Storage And Handling	.1	Waste Management and Disposal:
	.1	Separate waste materials for recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
	.2	Place materials defined as hazardous or toxic in designated containers.
	.3	Divert wood materials from landfill to a recycling facility as approved by Departmental Representative.
	.4	Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.
	.5	Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

Part 2 Products

2.1 Materials

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121 and CAN/CSA-O86.
 - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
- .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.
- .3 Form liner:
 - .1 Plywood: medium density overlay, Douglas Fir to CSA O121, square edge, 20 mm thick.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene.
- .6 Falsework materials: to CSA-S269.1.

Part 3 Execution

3.1 Fabrication And Erection

- .1 Verify lines, levels and centres 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.
- .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-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

- .9 Align form joints and make watertight.
 - .1 Keep form joints to minimum..
- .10 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 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.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 Removal And Reshoring

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 3 days for footings and abutments.
- .2 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 General

1.1 Related Requirements	.1	Section 03 10 00 – Concrete Forming and Accessories.
	.2	Section 03 30 00.01 – Cast-in-Place Concrete Short Form.
1.2 References	.1	ASTM International
	.1	ASTM A82/A82M-07, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
	.2	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	CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
	.3	CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
	.4	CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
	.5	CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
	.6	CSA W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
	.3	Reinforcing Steel Institute of Canada (RSIC)
	.1	RSIC-2004, Reinforcing Steel Manual of Standard Practice.
	.1	Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
	.1	Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
	.2	Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
1.4 Delivery, Storage And Handling	.1	Deliver, store and handle materials in accordance with Section 01 61 10 - Product Requirements and with manufacturer's written instructions.
	.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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section.

Part 2 Products

2.1 Materials

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400 or 400W, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .4 Deformed steel wire for concrete reinforcement: to ASTM A82/A82M.
- .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .6 Mechanical splices: subject to approval of Departmental Representative.
- .7 Plain round bars: to CSA-G40.20/G40.21.

2.2 Fabrication

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 Source Quality Control

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

3.1 Field Bending

- ### 3.2 Placing Reinforcement

- ### 3.3 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 recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

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Part 1 General

1.1 Related Requirements	.1	Section 03 10 00 – Concrete Forming and Accessories.
	.2	Section 03 20 00 – Concrete Reinforcing.
1.2 References	.1	Canadian General Standards Board (CGSB)
	.1	CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
	.2	CSA International
	.1	CSA-A23.1/A23.2-2009, 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).
1.3 Action And Informational Submittals	.1	Provide submittals in accordance with Section 01 33 01 – Shop Drawings, Product Data, and Samples.
	.2	At least 4 weeks prior to beginning Work, submit concrete mix designs for review by Departmental Representative.
	.3	If requested, submit a letter signed and sealed by a Professional Engineer registered in the Province of British Columbia, stating that all concrete supplied meets the project specifications and requirement of CSA-A23-1.
	.4	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.
	.5	Provide testing reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
	.6	Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
1.4 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.

	.2	Batching of concrete on site is not permitted.
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.
	.3	Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials in accordance with Section 01 74 19 – Waste Management and Disposal.
Part 2 Products		
2.1 Design Criteria	.1	Alternative 1 – Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.
2.2 Performance Criteria	.1	Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.
2.3 Materials	.1	Cement: to CSA A3001, Type MS or MSb Hydraulic cement..
	.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	Other concrete materials: to CSA A23.1/A23.2.
2.4 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: S-3.
	.2	Compressive strength at 28 age: 30 MPa minimum.
	.3	Intended application: footing and abutments.

		.4	Aggregate size 20 mm maximum.
		.3	Concrete supplier's certification.
		.4	Provide quality management plan to ensure verification of concrete quality to specified performance.
2.5 Adhesive Set Anchors	.1		Anchors: threaded rod to ASTM A307, hot-dipped galvanized.
	.2		Adhesive: acceptable products listed below or approved equivalent.
		.1	Hilti HIT-HY 200 hybrid adhesive.
		.2	Simpson Strong-Tie SET-XP epoxy adhesive.
		.3	Red Head Epcon G5 epoxy adhesive.
Part 3 Execution			
3.1 Preparation	.1		Provide Departmental Representative 48 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.
3.2 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		Adhesive set reinforcing steel and anchors:
		.1	Submit adhesive system product data to Departmental Representative for approval.
		.2	Install strictly in accordance with manufacturer's written instructions.
3.3 Finishes	.1		Formed surfaces exposed to view: smooth-form finish in accordance with CSA A23.1/A23.2.
	.2		Pavements, walks, curbs and exposed site concrete:

		.1	Screed to plane surfaces and use aluminum floats.
		.2	Provide round edges and joint spacings using standard tools.
		.3	Trowel smooth to provide lightly brushed non-slip finish.
3.4	Field Quality Control	.1	Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.
		.2	A CSA certified materials testing laboratory shall be appointed to review concrete mixes and to gather and test concrete cylinders. Copies of test results to be sent to the Departmental Representative and Contractor.
		.1	A sufficient number of tests shall be made to ensure a uniform slump of concrete. A slump test shall be made with every strength test and every second or third air test.
		.2	An air content determination shall be made with every strength test.
		.3	Not less than one strength test (set of three cylinders) shall be made for each 100 cubic meters of concrete placed, and in no case shall there be fewer than one test for each class of concrete placed on any one day, as designated by the Departmental Representative.
3.5	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	Cleaning of concrete equipment to be done in accordance with Section 01 35 43 Environmental Procedures.
		.5	Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - 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 systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

END OF SECTION