

PART 1 - GENERAL

1.1 References

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 Canadian Standards Association (CSA International):
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA O86, Engineering Design in Wood.
 - .3 CSA O121, Douglas Fir Plywood.
 - .4 CSA 0141, Softwood Lumber.
 - .5 CSA O151, Canadian Softwood Plywood.
 - .6 CSA O153, Poplar Plywood.
 - .7 CSA O325.0, Construction Sheathing.
 - .8 CSA O437 Series, Standards for OSB and Waferboard.
 - .9 CSA S269.1, Falsework and Formwork
- .3 American Concrete Institute (ACI):
 - .1 ACI 117, Specification for Tolerances for Concrete Construction and Materials.
 - .2 ACI 347, Guide to Formwork for Concrete.

PART 2 - PRODUCTS

2.1 Materials

- .1 Formwork materials: to CSA S269.1.
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121, CSA 0141, CSA O437 or CSA-O153.

PART 3 - EXECUTION

3.1 Fabrication and Erection

- .1 Confirm to CSA A23.1.
- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Do not place on frozen ground.
- .4 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .5 Fabricate and erect formwork in accordance with CSA S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

- .6 Make formwork tight and flush faced to prevent the leakage of mortar and the creation of unspecified fins or panel outlines.
- .7 Obtain approval for formed openings, slots and chases not indicated on Structural Drawings.
- .8 Do not permit loads from formwork to be transmitted to adjacent existing structure.
- .9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .10 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.

3.2 Joints

- .1 Refer to Section 03 30 00 for construction joints, sawcut joints and isolation joints in slab on grade.

END OF SECTION 03 10 00

PART 1 - GENERAL

1.1 References

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- .2 Canadian Standards Association (CSA International):
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A23.3, Design of Concrete Structures.
 - .3 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC):
 - .1 Reinforcing Steel Manual of Standard Practice.
- .4 American Concrete Institute (ACI):
 - .1 SP-66, ACI Detailing Manual.

1.2 Quality Control

- .1 Submit in accordance with Section 01 45 00 - Quality Control.
- .2 Source Quality Control Submittals:
 - .1 Upon request, provide certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.

1.3 Action and Informational Submittals

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Prepare shop drawings in accordance with RSIC Manual of Standard Practice unless the Contract Documents contain a more stringent requirement. Conform to ACI SP-66 Detailing Manual whenever a detail condition is not covered by any of the above.
 - .2 Submit plans, elevations, sections and details necessary to fabricate, place and review reinforcement without reference to structural drawings, including masonry wall reinforcement. Draw to scale not smaller than 1:50 ($\frac{1}{4}" = 1'-0"$).

.3 Show on drawings:

- .1 Sizes, spacings and locations of reinforcement, with identifying labels.
- .2 Bar bending details.
- .3 Lengths and locations of all lap splices.
- .4 Types and locations of mechanical splices.
- .5 Placing sequence.
- .6 Bar lists.
- .7 Quantities of reinforcement (including all rebar added to accommodate installation).
- .8 Construction joint, control joint locations.
- .9 Concrete cover.

PART 2 - PRODUCTS

2.1 Materials

- .1 Reinforcing steel: carbon steel, deformed bars to CSA G30.18., unless indicated otherwise.
- .2 Weldable Reinforcing steel: weldable low alloy steel deformed bars to CSA G30.18.
- .3 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.
- .5 Mechanical splices: to concentrically align bars and develop specified tensile strength of rebar. Threaded couplers to have plastic internal coupler thread protectors.
- .6 Plain round bars: to CSA G40.20/G40.21.

PART 3 - EXECUTION

3.1 Fabrication

- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice.
- .2 Ship bundles of bar reinforcement, clearly identified in accordance with bar lists.
- .3 Provide standard hooks at ends of all hooked bars.
- .4 Substitute different size bars only if permitted in writing by Departmental Representative.

3.2 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. Use tools which will limit bend radii to the values given in CSA A23.1.
- .3 Replace bars which develop cracks or splits.

3.3 Placing Reinforcement

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA A23.1/A23.2.
- .2 Remove all loose scale, dirt, oil or other coatings which would reduce bond.
- .3 Ensure cover to reinforcement is maintained during concrete pour.
- .4 Turn ends of tie wire towards the interior of concrete.
- .5 Support bars, chairs and spacers:
 - .1 Provide sufficient support bars, chairs, carriers and side form spacers as necessary to secure against displacement of reinforcement and maintain concrete cover before and during concrete placement. Support devices contacting surfaces exposed to the exterior to be non-corroding. Bars which are not shown on Structural Drawings and whose only function is supporting other reinforcing in lieu of other supporting devices to be considered accessories.
 - .2 Use precast concrete chairs where supports rest on the ground.
- .6 Do not cut reinforcement without Departmental Representative written approval.
- .7 Do not field weld reinforcement except where indicated or authorized by Departmental Representative.
- .8 Slip dowels:
 - .1 Use plain round bars.
 - .2 After the first pour, apply thick even film of mineral lubricating grease to the portion of the dowel intended to move within hardened concrete.
- .9 Obtain Departmental Representative field review of all reinforcing materials and placement before pouring concrete.

END OF SECTION 03 20 00

PART 1 - GENERAL

1.1 References

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 Canadian Standards Association (CSA International):
 - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A283, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.2 Quality Assurance

- .1 In accordance with Section 01 43 00 – Quality Assurance.
- .2 Qualifications
 - .1 Concrete supplier to have a valid “Certificate of Ready Mixed Concrete Production Facilities” issued by the relevant Ready Mixed Concrete Association.

1.3 Quality Control

- .1 Submit in accordance with Section 01 45 00 - Quality Control.
- .2 Minimum two weeks prior to starting concrete work, provide valid certificate from plant delivering concrete.
- .3 Minimum four weeks prior to starting concrete work, provide proposed quality control procedures on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishing.
 - .5 Protection.

1.4 Administrative Requirements

- .1 Pre-installation Meeting: convene pre-installation meeting one week prior to beginning concrete works. Ensure key personnel to attend.
- .2 Batch Logs: keep record of each batch delivered to site.
- .3 Concrete Delivery Slips: Keep all concrete delivery slips (“driver’s tickets”) on site until building is completed. Record on delivery slip where concrete was placed, including time and date.

1.5 Action and Informational Submittals

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Minimum 2 weeks prior to starting concrete work, submit all concrete mix designs, and indicate where each concrete mix is to be used.
- .3 Minimum submission requirements for each concrete mix design shall include the following:
 - .1 Minimum specified compressive strength at 28 day (or at the time specified on drawings).
 - .2 Maximum aggregate size.
 - .3 Aggregate type (if not normal density).
 - .4 Concrete density range, wet and dry (if not normal density).
 - .5 CSA exposure class.
 - .6 Cement type (if not type GU).
 - .7 Percentage and type of supplemental cementing materials.
 - .8 Maximum water/cementitious materials ratio.
 - .9 Assumed method of placement of concrete.

PART 2 - PRODUCTS

2.1 Design Criteria

- .1 To CSA A23.1/A23.2, Alternative 1 – Performance, and as described under Mixes and on Structural Drawings.

2.2 Performance Criteria

- .1 Concrete supplier to meet the concrete performance criteria established by Departmental Representative and to provide verification of compliance.

2.3 Materials

- .1 Portland cement: to CSA A3001.
- .2 Cementitious hydraulic slag: to CSA A3000.
- .3 Fly ash: to CSA A3001, Type CI.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2. Do not use recycled concrete as aggregate.
- .6 Admixtures: not to contain chlorides.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2. Minimum compressive strength: 40 MPa at 28 days.
- .8 Control joint filler: semi-rigid filler to protect against slab edge breakdown:
 - .1 For conventional sawcuts in exterior slabs: two or multy component polyurethane based elastomeric.

.9 Granular Material:

- .1 Lower 300mm of granular to be of sub-base material according to table below. Upper 200mm to be base course material. Each lift of maximum 150mm to be compacted to 98% of Standard Proctor Density.

Grain Size (mm)	Percent Passing	
	Base Course	Sub-Base Course
50.0	--	100
25.0	100	85 – 100
18.0	87 – 100	80 – 100
12.5	72 – 93	70 – 100
5.0	45 – 77	50 – 85
2.0	29 – 56	35 – 75
0.900	18 - 39	25 – 50
0.400	13 – 26	15 – 35
0.160	7 – 16	8 – 22
0.071	6 – 11	0 – 13
Plasticity Index (%)	0 – 6	0 – 6
CBR (min.)	65	30
% Fracture (min.)	50	--

2.4 Concrete Mixes

- .1 Use ready-mix concrete. Proportion concrete in accordance with CSA A23.1, Alternative 1 - Performance Method for Specifying Concrete.
- .2 Set performance characteristics of concrete in plastic state in coordination with all trades involved.
- .3 Meet performance criteria of concrete in hardened state as shown on Structural Drawings and provide verification of compliance.
- .4 Use water-reducing agent in all concrete.
- .5 Do not use admixtures containing chlorides.
- .6 Supplementary cementing materials (SCM):
 - .1 Conform to CSA A23.1.
 - .2 Follow slag and fly ash manufacturers' directions for proportioning and mixing of concrete.

PART 3 - EXECUTION

3.1 Preparation

- .1 Provide advanced notice as indicated on drawings to allow Departmental Representative field review of reinforcing prior to placing of concrete/closing of forms.
- .2 Obtain Departmental Representative written approval before placing concrete.

- .3 Remove water and disturbed soil from excavations before placing concrete.
- .4 Slab on grade preparations:
 - .1 Remove all organic and deleterious materials.
 - .2 Proofroll subgrade to delineate any soft areas. Soft areas to be excavated and recompact.
 - .3 Beneath slab, provide minimum 500mm well graded granular fill compacted to 98% of standard proctor density. Maximum 150mm lifts.
- .5 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

3.2 Installation/Application

- .1 Set sleeves, conduits, and other inserts and openings as indicated or specified elsewhere.
- .2 Check locations and sizes of sleeves and openings with Architectural, Mechanical and Electrical Drawings.
- .3 Set anchor rods using templates under supervision of appropriate trade prior to placing concrete. Locate each anchor rod group to within 6 mm (1/4") of required location.

3.3 Placing Concrete

- .1 Place concrete in accordance with CSA A23.1.
- .2 Delivery and place concrete with minimum re-handling.
- .3 If concrete is pumped or placed pneumatically, control discharge velocity to prevent separation or scattering of concrete mix ingredients.
- .4 Place concrete in a continuous operation without cold joints. If cold joints develop inadvertently, notify Departmental Representative obtain instructions for required remedial work.

3.4 Finishing Concrete

- .1 Finish concrete to CSA A23.1/A23.2.
- .2 Finishing Flatwork:
 - .1 Wood float finish with brooming for: exterior exposed slabs.
 - .2 Surface Tolerances:
 - .1 Maintain surface flatness of slabs with maximum variation of 5mm in 3.0m and overall maximum of 6mm.
- .3 Finishing Formed Surfaces:
 - .1 Completely fill holes left by through-bolts with grout.

3.5 Concrete Curing and Protection

- .1 At a minimum cure and protect concrete in accordance with CSA A23.1

- .2 Cure slab surfaces immediately after finishing is completed. Unless otherwise noted or required, use 7 day wet cure.
- .3 Do not load concrete until sufficient strength is developed.

3.6 Slabs on Grade

- .1 Construction joints and sawcut joints:
 - .1 Refer to Notes on Structural Drawings for maximum spacing requirements.
 - .2 Protect edges of sawcuts from breakage.
 - .3 Clean out sawcuts in exposed concrete and fill with control joint filler after concrete is at least 28 days old.
 - .4 Sawcut top 25 mm (1") at construction joints in exposed concrete for a width of 5 mm (3/16") and fill with control joint filler after concrete is at least 28 days old.
- .2 Cracks in Slabs-on-Grade:
 - .1 Extensive cracking of slabs-on-grade or cracks in excess of 3 mm (1/8") in width may be cause for rejection of slab or portion of slab at the Architect's discretion.
 - .2 Protect edges of cracks in slabs-on-grade from breakage.
 - .3 Exposed slab on grade: Unless slab is rejected, repair cracks that are over 0.4 mm (0.016") wide:
 - .1 Fill cracks with a sand-cement grout after concrete is at least 120 days old.
 - .2 Seven days later, cut out top 20 mm (3/4") of crack for a width of 5 mm (3/16") and fill with control joint filler.

3.7 Grouting Under Base Plates

- .1 Grout under base plates and bearing plates using procedures in accordance with manufacturer's recommendations.
- .2 Provide 100% contact over grouted area.
- .3 Grout column base plates and beam bearing plates as soon as steelwork is completed.
- .4 Do not add load on steelwork until grouting is completed and grout strength has reached at least 20 MPa.

3.8 Testing:

- .1 As per Structural General Notes on Drawings.

END OF SECTION 03 30 00