

PART 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA S269.1, Falsework for Construction Purposes.
 - .3 CAN/CSA-S269.3, Concrete Formwork.

1.2 SHOP DRAWINGS

- .1 When requested, submit shop drawings for formwork and falsework.
- .2 Indicate method and schedule of construction shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, liners, and locations of temporary embedded parts.
- .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Place materials defined as hazardous or toxic waste in designated containers.
- .2 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .3 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 Use formwork materials to CAN/CSA-A23.1.
- .2 Form release agent: Non-staining chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
- .3 Falsework materials: to CSA-S269.1.
- .4 Chamfer strips: Milled from clear straight-grain lumber, surfaced on all sides. Other material of equal quality may be used only as authorized by Engineer.

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 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 and COFI Exterior Plywood for Concrete Formwork.
- .4 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.
- .5 Unless otherwise indicated, contact surfaces in fabricated forms shall be smooth and uniform without warps, bends, dents, sags or irregular absorptive conditions and imperfections which might telegraph or produce objectionable irregularities in the exposed concrete finish.
- .6 Form ties and spreaders shall leave a hole not larger than 7/8-inch nor less than 1/2-inch in diameter in the concrete surface. The portion of the tie remaining in the concrete shall be at least 1-inch back from the concrete surface that will be exposed to view, painted, damp proofed or waterproofed.
- .7 Align form joints and made watertight. Keep form joints to minimum.
- .8 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .9 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .10 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.
- .11 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.
 - .1 All dirt, chips, sawdust and other foreign matter shall be completely removed before concrete is placed. Forms previously used shall be thoroughly cleaned of all dirt, mortar and foreign matter before being used.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Three days for foundation walls, two days for footings, and seven days for beams with props left under for 14 days.
- .2 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.
- .3 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.

END OF SECTION

PART 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CAN3-A23.3, Design of Concrete structures for Buildings.
 - .3 CSA G30.3, Cold Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CSA G30.14, Deformed Steel Wire for Concrete Reinforcement.
 - .6 CSA G30.15, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - .7 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
 - .8 CAN/CSA-G40.21, Structural Quality Steels.
 - .9 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings including placing of reinforcement.
- .2 Design of detail lap lengths and bar development lengths to CAN3-A23.3, unless otherwise indicated.

PART 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Engineer.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to CSA G30.3.
- .4 Welded steel wire fabric: to CSA G30.5. Provide in flat sheets only.
- .5 Chairs, bolsters, bar supports, spacers: to CAN/CSA-A23.1. Chairs shall be plastic or stainless steel.
- .6 Mechanical splices: subject to approval of Engineer.
- .7 Plain round bars: to CAN/CSA-G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CAN/CSA-A23.1, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Engineer's approval for locations of reinforcement splices other than those shown of placing drawings.
- .3 Upon approval of Engineer, 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 Engineer with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to commencing reinforcing work.

PART 3 Execution

3.1 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Engineer.
- .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CAN/CSA-A23.1.
- .2 Place WWF on mesh-up chairs in the centre of slab.
- .3 Prior to placing concrete, obtain Engineer's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Clean reinforcing prior to placing concrete.

3.3 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 03 10 00 - Concrete Forms and Accessories
- .2 Section 03 20 00 - Concrete Reinforcement
- .3 Section 07 26 00 - Sheet Vapour Retarders
- .4 Section 07 92 10 – Joint Sealers
- .5 Section 31 23 10 - Excavation, Backfilling and Compaction

1.2 REFERENCE STANDARDS

- .1 Do Cast-in-Place Concrete Work in accordance with CAN/CSA-A23.1 and testing in accordance with CAN/CSA-A23.2, except where specified otherwise. All reference standards shall be of latest edition.

1.3 SAMPLES

- .1 At least 4 weeks prior to commencing Work, inform Consultant of proposed source of aggregates and provide access for sampling.

1.4 CERTIFICATES

- .1 Minimum 3 weeks prior to starting Work, submit to Consultant manufacturer's test data and certification by qualified independent inspection and testing laboratory that the following materials will meet specified requirements:
 - .1 Portland cement
 - .2 Admixtures
 - .3 Aggregates
 - .4 Water
 - .5 Joint filler
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1.
- .3 Provide certification that mix proportions selected will produce concrete of specified quality/yield and that strength will comply with CAN/CSA-A23.1.

1.5 QUALITY CONTROL

- .1 The Contractor shall be familiar with the above Standard Requirements, which will be strictly enforced.
- .2 Submit proposed Quality Control procedures for Engineer's approval.

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A5.
- .2 Water: to CAN/CSA-A23.1.
- .3 Aggregates: to CAN/CSA-A23.1. Coarse aggregates to be normal density.
- .4 Air entraining admixture: to CAN/CSA-A266.
- .5 Chemical admixtures: to CAN/CSA-A266.2 water reducing type WN. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .6 Pozzolanic mineral admixtures: to CAN/CSA-A23.5
- .7 Non-shrink grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents, of pouring consistency, capable of developing compressive strength of 50 MPa at 28 days.
- .8 Dry pack: premixed or non premixed composition of non-metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 50 MPa at 28 days.
- .9 Curing compound: to CAN/CSA-A23.1 white Type 1-chlorinated rubber. The Contractor is to confirm that the curing compound will not effect the floor finishes.
- .10 Weep hole tubes: purpose made plastic.
- .11 Dampproofing: Emulsified asphalt, mineral colloid type, unfilled, to CGSB 37-GP-2M.
- .12 Vapour Barrier: to CAN/CGSB-51.34, thickness 10 mil, reinforced.
- .13 Anchor bolts: to ASTM A36.

2.2 CONCRETE MIXES

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, to give following properties for exterior flat work, walkways, slabs and curb:
 - .1 Cement: Type GU.
 - .2 Minimum compressive strength at 28 days: 32MPa.
 - .3 Class of exposure: C-2.
 - .4 Nominal size of coarse aggregate: 20 mm.
 - .5 Slump at time and point of discharge: to CSA, 80 +/- 20 mm max.
 - .6 Air content: To Table 4 of CAN/CSA A23.2: 5-8 % for exterior exposure.
 - .7 Chemical admixtures: type as approved, and in accordance with CSA A266.2.
 - .8 Maximum water cement ratio: 0.45.

- .2 Proportion normal density concrete in accordance with CAN/CSA-A23.1, to give following properties for foundations.
 - .1 Cement: Type GU
 - .2 Minimum compressive strength at 28 days: 25MPa.
 - .3 Class of exposure: F-2
 - .4 Nominal size of coarse aggregate: 20 mm
 - .5 Slump at time and point of discharge: to CSA, 80 +/- 20 mm max.
 - .6 Air content: To Table 4 of CAN/CSA A23.2: 4-7%
 - .7 Chemical admixtures: Type as approved, and in accordance with CSA A266.2
 - .8 Maximum water cement ratio: 0.45

Part 3 Execution

3.1 WORKMANSHIP

- .1 Obtain Consultant's approval before placing concrete. Provide 24 hours notice prior to placing of concrete. All reinforcement shall be in place and approved before concrete placement shall commence.
- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing of concrete obtain Consultant's approval 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, concrete temperature in place for seven (7) days, and test samples taken.
- .6 Do not place load upon new concrete until authorized by Consultant.
- .7 Provide winter concrete protection as per CAN/CSA-A23.1 and A23.2 Clause 21.2.3. Also, protect footing trenches from cold weather. Provide required protection to prevent frost penetration before trenches are filled.

3.2 INSERTS

- .1 Set sleeves, ties, pipe hangers and other inserts and openings as indicated specified elsewhere. Sleeves and openings greater than 100x100 mm not indicated on the drawings must be approved by the Consultant.
- .2 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where expressly detailed on the drawings or approved by Consultant.
- .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as Specified, obtain approval of all modifications from Consultant before placing of concrete.

- .4 Anchor bolts:
 - .1 Anchor bolts should be to ASTM A36.
 - .2 Anchor bolts shall be supplied for steel columns as shown on the Contract Drawings.
 - .3 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .4 All anchor bolts and dowels shall be set before concrete is placed and not pushed in/through after the concrete is poured.
 - .5 Anchor bolts shall be placed in tolerances in accordance with CSA S16.1.

3.3 FINISHING

- .1 Finish concrete in accordance with CAN/CSA-A23.1. Refer to Section 03 35 00 for interior slab on grade.
- .2 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise detailed.
- .3 Provide 25 mm x 25 mm chamfer for all exposed surfaces.

3.4 JOINT FILLERS

- .1 Furnish filler for each isolation (expansion) joint in single piece for depth and width required for joint, unless as otherwise authorized by Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form isolation (expansion) joints as indicated and as follows:
 - .1 Between floors and columns, walls and machinery bases.
 - .2 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.

3.5 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Consultant in accordance with CAN/CSA-A23.1 Clause 17.
- .2 The Owner will pay for costs of tests as specified. All concrete slabs, walls, curbs, sidewalks, paving and structural slabs to be as detailed on the drawings.
- .3 Consultant will take additional test cylinders during cold weather Work. Cure cylinders on job site under similar conditions as placed Work.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .5 Inspection or testing by Consultant will not augment or replace Contractor's quality control nor Contractual Responsibility.
- .6 All concrete tolerances as per CAN/CSA-A231.1 Clause 10. Tolerance for floor slabs shall be as per Clause 22. All slabs considered as flat.

3.6 CURING

- .1 All curing shall conform to CAN/CSA-A23.1 Clause 21.
- .2 All concrete work including walls and beams shall be cured for min. seven (7) days at a minimum temperature of 10 °C. Contractor is to provide necessary means to maintain 10 °C. The Contractor shall keep the temperature records at which the Work is cured.
- .3 Use water to cure interior floor slabs where possible when structure is enclosed and can be maintained in a saturated state, particularly in the early curing stage. Curing compound, if used, shall not have any detrimental effect on floor finishes. Concrete slabs shall require water curing if the curing compound reacts to floor finishes.

END OF SECTION