

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, special  
architectural exposed finishes, 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: 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.

### 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 Align form joints and made watertight. Keep form joints to minimum.
- .6 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .8 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.
- .9 Clean formwork in accordance with CAN/CSA-A23.1, before placing concrete.

#### 3.2 Removal and Re-Shoring

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
- .2 Remove formwork when concrete has reached 80% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate re-shoring.
- .3 Provide all necessary re-shoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

3.2 Removal and Re-Shoring (Cont'd)	.4 Re-use formwork and falsework subject to requirements of CAN/CSA-A23.1.
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PART 1 - GENERAL

1.1 Reference  
Standards

- .1 Conform to the latest issues of the following standards, amendments and supplements except where otherwise stated in the project documents:
  - .1 Canadian Standards Association (CSA)
    - .1 CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
    - .2 CSA-A23.2-14, Methods of Test for Concrete.
    - .3 CSA-A23.3, Design of Concrete Structures.
    - .4 CSA A3000, Cementitious Materials Compendium.
  - .2 American Society for Testing and Materials (ASTM).
    - .1 ASTM C 156, Test Method for Water Retention by Concrete Curing Materials.
    - .2 ASTM C 260, Specification for Air-Entraining Admixtures.
    - .3 ASTM C 309, Standard Specification for Liquid Membrane-Forming Compounds for Concrete.
    - .4 ASTM C 494, Specification for Chemical Admixtures for Concrete.
  - .3 American Concrete Institute
    - .1 ACI 117, Standard Tolerances for Concrete Construction and Materials.
    - .2 ACI 202R, Guide to Durable Concrete.
    - .3 ACI 305, Hot Weather Concreting.
  - .4 Conflicts between the specifications, codes and standards shall be resolved by the Department Representative in the best interest of the project.
  - .5 Concrete quality will be assessed by the Department Representative in accordance with CSA A23.2-14, Methods of Test for Concrete.

PART 2 - PRODUCTS

2.1 Materials

- .1 Cement type shall be:
  - .1 Normal Portland Type 10 meeting the requirements of CSA Standard A5. Silica fume shall be added to the mixture at a rate of 7.5% by mass of the Portland cement.
- .2 Water:
  - .1 Water used in mixing and curing concrete shall be fresh, clean, potable and free of injurious amounts of contaminants and chemicals. Recycled wash water from concrete plants shall not be used.
- .3 Aggregates: Only concrete aggregate that have a historical record of usage in a similar environment shall be used in the work.
  - .1 The aggregate shall conform to CSA A23.1-14 and with this specification.
  - .2 The contractor at his own expense shall provide the necessary certification that the aggregate meets the requirements of this specification. No change in aggregate source shall be made without the prior approval of the Department Representative.
- .4 Chemical Admixers:
  - .1 Admixtures for concrete shall conform to ASTM C260 - 86.
  - .2 All concrete supplied by the contractor shall be air-entrained and contain such other admixtures as required by these specifications.
  - .3 A water-reducing admixture shall be used in all concrete mixtures containing Normal Type 10 cement.
  - .4 Chloride base admixtures shall not be used.
  - .5 The contractor shall provide certification that all admixtures proposed for use are compatible with the Portland cement when used in the proposed combinations.

2.2 Concrete Mixers

- .1 Mixture Proportions:
  - .1 All concrete mixture proportions shall be designed in accordance with CSA A23.1-14.
  - .2 Normal density concrete to be used for exterior curbs, in accordance with:
    - .1 Cement: Type 10 Portland cement.

- 2.2 Concrete Mixers .1 (Cont'd)  
(Cont'd) .2 (Cont'd)
- .2 Minimum compressive strength at 28 days: 32 MPa.
  - .3 Minimum cement content: CAN/CSA-A23.1-M90.
  - .4 Class of exposure: C2.
  - .5 Nominal size of coarse aggregate: 20 mm.
  - .6 Slump at time and point of discharge: 80 to ±30 mm.

PART 3 - EXECUTION

- 3.1 General .1 .1 Perform all cast-in-place concrete work in accordance with A23.1, as specified in these specifications and in accordance with the manufacturer's literature for proprietary products.
- .2 The contractor shall maintain daily and accurate records of all concrete placed in the work, indicating date, time of batching, time and location of placement, concrete quantity and proportions, concrete temperature and records of samples taken. These records shall be available to the Department Representative on a daily basis.
- 3.2 Workmanship .1 The contractor shall submit for approval of the Department Representative, concrete mixture proportions, placement procedures and equipment to be used.
- .2 The concrete placement temperatures shall be in accordance with CSA A23.1 for the size and thickness of section under construction.
- .3 The minimum cover over the reinforcing steel shall be as shown on the drawings.
- 3.3 Construction Joints .1 Construction joints shall comply with CSA A23.1 for the type of joint specified unless otherwise shown on the drawings and in this specification.
- .2 Joints may be used for the convenience of the contractor with the approval of the Department

3.3 Construction Joints (Cont'd)	.2	(Cont'd) Representative. Any such joints shall include a water stop.
3.4 Bonding Fresh Concrete to Hardened Concrete	.1	All new concrete shall be well bonded to the surface of the base concrete, with an approved two part epoxy agent. The new concrete shall be placed prior to stiffening of the bonding agent.
3.5 Finishing	.1	.1 Concrete shall be finished in accordance with CSA A23.1 and in accordance with this specification.
	.2	For unformed exposed surfaces, the finish shall be by hand or power float. The surface tolerance shall be as follows: .1 Abrupt irregularities - 2 mm .2 Gradual irregularities - 4 mm .3 Bugholes and pits maximum 12 mm diameter .4 Maximum surface pits 1 per 0.1m <sup>2</sup> .
3.6 Curing	.1	Curing and cold weather concrete placement shall be in accordance with CSA A23.1.
	.2	Freshly placed concrete shall be protected from drying and extremes of temperature. After the concrete has hardened sufficiently to avoid damage, it shall be suitably and adequately protected from shock and impact, temperature extremes and loss of moisture. Concrete containing silica fume shall be cured immediately after strike-off and floating by fog misting to prevent plastic cracking.
	.3	The exposed surfaces of freshly placed concrete shall be kept in a continuously moist condition for a period of 7-days by the use of absorbent mats or burlap which shall be wetted down as required to prevent any dry areas on the concrete surface.
	.4	In areas where appropriate, the Department Representative may allow the use of water based curing compounds.

3.7 Inserts and  
Embedded Steel

- .1 The contractor shall place embedded parts and assemblies in accordance with CSA A23.1. The embedded parts shall be carefully positioned and placed securely.
- .2 The contractor shall not eliminate or displace reinforcement to accommodate embedded fixtures. Any modifications shall be at the discretion of the Department Representative.
- .3 All items to be embedded in the concrete shall be clean and free of oil films, rust, dirt or other deleterious substances which affect bond.

3.8 Patching and  
Repair

- .1 Patching and repair of new concrete in defective areas or where embedded fixtures for construction purposes are present shall be repaired in accordance with CSA A23.1 except where otherwise stated.
- .2 Concrete surfaces found to be defective upon removal of the forms shall not be repaired until the Department Representative has examined them.
- .3 The Contractor shall commence all permitted repairs within 48 hours of the examination by the Department Representative.
- .4 In general, all repairs shall be conducted using similar concrete to that of the parent concrete. Bonding agents acceptable to the Department Representative shall be used in all repairs.
- .5 Repair patches or replacement concrete shall be cured for the same length of curing period as the base concrete.
  - .1 Immediately prior to application of the mortar or concrete, the surface shall be blown with air jets to remove free water.
  - .2 The mortar or concrete surface shall then be rubbed thoroughly with clean burlap or other approved methods so as to fill all the voids.
  - .3 While the mortar in the voids is still plastic, the surface shall be sack rubbed with a mix of the same proportions and materials except that no water shall be used.
  - .4 The final rubbing shall be performed in a manner which assures that the voids are filled and left flush with the surface of the surrounding concrete.



3.8 Patching and  
Repair

(Cont'd)

- .6 Cracks which develop in the new concrete and which are considered by the Department Representative to lessen the durability of the work shall be repaired by grout injection at no extra cost to the contract. The type of grout to be used shall be determined by the Department Representative based on durability and placing considerations.

3.9 Field Quality  
Control

- .1 The Contractor in accordance with CSA A23.1 and A23.2, will carry out inspection and testing of concrete and concrete materials. Standard test cylinders of 4 x 8 inches shall be used. The contractor shall provide the necessary facilities for taking and storing the cylinders. The cylinders must be collected and returned to the testing laboratory within 24 hours.
- .2 If defects are revealed, the contractor shall perform additional inspection and/or testing to ascertain the full extent of the non-conforming materials. This additional inspection and testing shall be performed at the contractor's expense.
- .3 Non-destructive testing shall be performed in accordance with CSA A23.2 or as directed by the Department Representative. Only personnel experienced in non-destructive testing and interpretation of the results shall be employed to perform non-destructive testing.

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
  - .2 CAN/CSA-A23.2-14, Methods of Test for Concrete.
  - .3 CAN/CSA-A3000-98-A5-98, Portland Cement.
  - .4 CAN/CSA-G30.18-M92 (R2002), Billet-Steel Bars for Concrete Reinforcement.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Precast concrete wheelstops: dimensions detailed on drawings as manufactured by Campbell's Concrete or Shaw Precast Solutions.
  - .2 Anchor rods shall be reinforced bars, 15M diameter meeting to: CAN/CSA-G30.18-M92 (R2002), Grade 400.

PART 3 - EXECUTION

- 3.1 CONSTRUCTION
- .1 Obtain Departmental Representative's approval of asphalt surface before placing wheel stops.
  - .2 Install as shown on drawings.
  - .3 Protect wheelstops from damage until approved by Departmental Representative.