

PART 1 - GENERAL

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| <u>1.1 Related Sections</u> | .1 | Section 32 16 15 - Concrete Walks, Curbs and Gutters. |
| <u>1.2 Measurement Procedures</u> | .1 | There will be no measurement for payment under this section. |
| <u>1.3 References</u> | .1 | <p>Canadian Standards Association (CSA International)</p> <p>.1 CSA-A23.1/A23.2-2004, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.</p> <p>.2 CSA A283-00(R2003), Qualification Code for Concrete Testing Laboratories.</p> <p>.3 CAN/CSA-A3000-03, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).</p> <p>.1 CSA-A3001-03, Cementitious Materials for Use in Concrete.</p> |
| <u>1.4 Acronyms and Types</u> | .1 | <p>Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).</p> <p>.1 Type GU or GUb - General use cement.</p> <p>.2 Type MS or MSb - Moderate sulphate-resistant cement.</p> <p>.3 Type MH or MHb - Moderate heat of hydration cement.</p> <p>.4 Type HE or Heb - High early-strength cement.</p> <p>.5 Type LH or LHb - Low heat of hydration cement.</p> <p>.6 Type HS or HSb - High sulphate-resistant cement.</p> |
| | .2 | <p>Fly ash:</p> <p>.1 Type F - with CaO content less than 8%.</p> <p>.2 Type CI - with CaO content ranging from 8 to 20%.</p> <p>.3 Type CH - with CaO greater than 20%.</p> |
| | .3 | GGBFS - Ground, granulated blast-furnace slag. |
| <u>1.5 Submittals</u> | .1 | Submittals in accordance with Section 01 33 00 - Submittal Procedures. |
| | .2 | Minimum 4 weeks prior to starting concrete work, submit to Departmental Representative manufacturer's test data and certification by qualified independent |
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| 1.5 Submittals
(Cont'd) | .2 | (Cont'd)
inspection and testing laboratory that following materials will meet specified requirements:
.1 Portland Cement;
.2 Blended Hydraulic Cement;
.3 Supplementary Cementing Materials;
.4 Admixtures;
.5 Aggregates;
.6 Water. |
| | .3 | Provide mix design and certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1. |
| | .4 | Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1. |
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| 1.6 Quality Assurance | .1 | Quality Assurance: in accordance with Section 01 45 00 - Quality Control. |
| | .2 | Submit to Departmental Representative minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
.1 When plant does not hold valid certification, provide test data and certification by qualified independent inspection and testing laboratory that materials used in concrete mixture will meet specified requirements. |
| | .3 | Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures for review by Departmental Representative on following items:
.1 Falsework erection.
.2 Hot weather concrete.
.3 Cold weather concrete.
.4 Curing.
.5 Formwork removal.
.6 Joints. |
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| 1.7 Delivery, Storage and Handling | .1 | Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
.1 Modifications to maximum time limit must be agreed to Departmental Representative, laboratory representative and concrete producer as described in CSA A23.1/A23.2.
.2 Deviations to be submitted for review by Departmental Representative. |
| | .2 | Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2. |
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PART 2 - PRODUCTS

2.1 Materials

- .1 Cement: to CAN/CSA-A3001, Type GU.
- .2 Water: to CSA-A23.1.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2. Coarse aggregates to be normal density.
- .4 Admixtures:
 - .1 Air entraining admixture: to ASTM C260.
 - .2 Chemical admixture: to ASTM C 494 ASTM C1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .5 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.

2.2 Mixes

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternate 1.
- .2 Mix proportions to provide workable concrete having required durability and strength.
- .3 Air entraining admixtures: to obtain Air Content Category as defined in CSA A23.1, Tables 1, 2 and 4.
- .4 Slump: to CAN/CSA A23.1, Section 4.3.2.3.
- .5 Compressive Strength at 28 days: The strength shall be evaluated in accordance with CSA A23.1.
- .6 Water/Cement Ratio: to CSA A23.1, Tables 1, 2 and 4 as required for exposure conditions.
- .7 Ready mix plant shall conform to CSA and possess a current active membership in the Atlantic Provinces Ready Mix Concrete Association.

PART 3 - EXECUTION

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| <u>3.1 General</u> | .1 Do concrete work to CSA A23.1 and as herein specified. |
| | .2 Use ready mixed concrete. |
| | .3 Do not change concrete mix without prior approval of Departmental Representative. Changes in material supply will require submission of a new mix design for review. |
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<u>3.2 Formwork and Falsework</u> |
.1 Construct formwork and falsework to CSA A23.1. |
| | .2 Construct formwork to produce finished concrete to required shape, dimensions, and levels indicated within tolerances required by CSA A23.1. Provide close fitting joints to prevent leakage of mortar, and form ties and bracing sufficient to withstand pressure of plastic concrete without deflection. |
| | .3 Falsework to be of sufficient strength to support total load of formwork, concrete, reinforcing steel, workers and equipment. |
| | .4 Use approved form release agent. |
| | .5 Formwork removal shall be in accordance with CSA A23.1. |
| | .6 Fill form tie holes with non-shrink mortar and finish to texture of adjacent concrete. |
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<u>3.3 Reinforcement and Embedded Items</u> |
.1 Clean reinforcing of rust build-up, mill scale or other coatings that prevent or reduce bond. |
| | .2 Bend all bars cold to measurements required. |
| | .3 Ensure reinforcement and inserts are not disturbed during concrete placement. |
| | .4 Place and support reinforcing using bar supports and side form spacers to ensure cover, spacing and location indicated. |
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<u>3.4 Waterstops</u> |
.1 Install waterstops where indicated. |
| | .2 Do not pierce, except near edges as required for securing, or distort waterstops, or displace reinforcement. |
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3.4 Waterstops (Cont'd)	.3	Tie waterstops securely in place.
	.4	Weld all joints in waterstop in accordance with manufacturer's published instructions.
<hr/> 3.5 Placing	.1	Place concrete to CSA A23.1, Section 7.
	.2	Convey concrete from mixer to forms by methods that will maintain specified slump and prevent segregation.
	.3	Do not drop concrete more than 1.5 meters vertically unless it can be shown that the concrete will not segregate. Deposit concrete in final position in forms to avoid lateral movement.
	.4	Place concrete in continuous operation, starting from lowest point in form, in lifts not greater than 500 mm.
	.5	Vibrate or tamp each layer to obtain dense homogeneous structure free of cold joints, fill planes, voids and honeycombing. For vertical installation vibrate at least 150 mm into previously placed layers. Concrete to be well bonded to all reinforcing steel, anchors, waterstops and other embedded parts.
<hr/> 3.6 Joints	.1	Make joints in accordance with CSA A23.1, Section 7.3.
<hr/> 3.7 Finishing	.1	Finish concrete in accordance with CSA A23.1, Section 7.5.
	.2	Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise specified.
<hr/> 3.8 Curing and Protection	.1	Provide curing and protection to CSA A23.1, Section 7.4. The temperature of the concrete as placed to be within the limits of Table 14.
	.2	Do not place concrete on frozen base. Remove all snow, ice and frost from area prior to placing concrete. Do not place concrete on, or against, any surface that will lower the temperature of the concrete in place below the minimum value shown in Table 14.
	.3	When air temperature may drop below 5 degrees Celsius or when there is a probability that it will

3.8 Curing and
Protection
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drop below 5 degrees Celsius within 24 hours of placing, raise temperature of base, reinforcing steel, embedded parts and forms above 5 degrees Celsius prior to placing concrete. In addition, before placement have available all materials and equipment needed for adequate protection and curing.
- .4 When air temperature is at or above 27 degrees Celsius, or when there is a possibility of its rising to 27 degrees Celsius during the placing period, provide facilities for protection of concrete in place from effects of hot and/or drying weather conditions. Under severe drying conditions, protect formwork reinforcement and concreting equipment from direct rays of sun, or cool by fogging.
- .5 After placing is completed, maintain minimum curing conditions for the concrete in accordance with CSA A23.1, Section 7.4.

3.9 Field Quality
Control
Control

- .1 Site tests: conduct following test and submit report as described in PART 1 - SUBMITTALS.
 - .1 Concrete pours.
 - .2 Slump tests.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory retained by the contractor for review in accordance with CSA-A23.1/A23.2.
 - .1 Ensure testing laboratory is certified in accordance with CSA A283.
- .3 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-Destructive Methods for Testing Concrete: in accordance with CSA-A23.1/A23.2.
- .5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.