
CAST-IN-PLACE CONCRETE

PART 1 GENERAL**1.1 Related Work**

- .1 All Division 1 Specification Sections
- .2 Section [02233](#) Granular Base
- .3 Section [02311](#) Site Grading
- .4 Section [03100](#) Concrete Formwork
- .5 Section [03200](#) Concrete Reinforcement

1.2 References

- .1 Canadian Standards Association (CSA):
 - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Testing and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.2, Methods of Test for Concrete.
 - .3 CSA-A266.4, Guidelines for the Use of Admixtures in Concrete.
 - .4 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .5 CSA-A3001, Cementitious Materials for Use in Concrete.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .3 Construction of concrete curbs and gutters are to conform to the Corporation of the City of Brampton Standard Specification and Details.

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1.3 Description

- .1 Co-operation with the Consultant: Before commencing Work, review with the Consultant the sampling program for Work performed under this section. Schedule Work to allow for sufficient time and access for the Consultant to carry out sampling program during regular working hours.
- .2 Architectural Concrete: Architectural concrete shall mean all exposed concrete surfaces designated as “architectural concrete” in contract documents. Broom finished concrete surfaces shall be considered as architectural concrete.

1.4 Quality Assurance

- .1 Reference Standards: The following reference standards shall govern Work of this section, except where they are in conflict with requirements imposed by this specification, in which case the latter shall govern. Standards of CAN3-A23.1 are not repeated in the following list:
 - .1 CSA Standard CAN3-A23.1, Concrete Materials and Methods of Concrete Construction.
 - .2 CSA Standard CAN3-A23.2, Methods of Test for Concrete.
 - .3 CSASTA – CAN A266.2 – Chemical Admixtures.
- .2 Construction of concrete curbs and gutters are to conform to the Corporation of the City of Brampton Standard Specification and Details.

1.5 Tolerances

- .1 Tolerances for formed concrete surfaces and thickness of slabs are specified in Section [03100](#), **Concrete Formwork**. Finish slabs and other horizontal surfaces to conform to the following limits. All limits are plus or minus unless otherwise noted.
 - .1 Top of Walls and Caps:
 - A. Variation from finish elevation shown on drawings: Maximum for entire length 12mm (1/2”)
 - B. Variation in surface finish: Depression in surface shall not exceed 6mm (1/4”) below a 3.0m (10’) long straight edge.

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- .2 Horizontal slabs with a flat gradient: Maintain specified fall gradient so that no still water will be retained in any part of the surface.

1.6 Source Quality Control

- .1 Both source quality control and field quality control specified elsewhere in this section will be performed by an Inspection and Testing Company appointed by the Consultant. All costs associated with the inspection or testing of any material or Work shall be borne by the contractor as per Section **01450 Quality Control & Inspection** or unless otherwise stated.
- .2 Inspection and Testing Company shall be certified under CSA A283, Qualification Code for Concrete Testing laboratories, for Category 1 Certification.
- .3 Perform Work of source quality control in acceptance with CSA-A23.2 and to include:
 - .1 Verification that ready-mix supplier is qualified to supply concrete in accordance with specification.
 - .2 Review of proposed concrete mix designs.
 - .3 Sampling, inspection and testing of materials as may be required.

1.7 Project Records

- .1 Concrete Pour Records: Record time, date, weather conditions, delivery slip serial number and location of each concrete pour and identify related test cylinders. Keep these records on site until the project is completed.
- .2 Delivery Records: File duplicate copies of the concrete delivery slips on which shall be recorded: supplier, serial number of slip, date, truck number, contractor, project, concrete exposure class, cementing materials content, air content, volume in load and time of the first mixing of aggregate, cementing materials and water.

1.8 Submittals

- .1 Concrete Mix Designs: Submit all concrete mix designs for review as noted:

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- .2 Inspection Reports: Submit written reports of inspections and tests.
 - .1 Distribute as follows:
 - .1 Two (2) copies to the Consultant.
 - .2 One (1) copy to the Structural Engineer.
 - .3 One (1) copy to the Contractor.
 - .2 On concrete cylinder test reports, include:
 - .1 specific location of concrete represented by sample.
 - .2 design strength.
 - .3 unit weight of sample.
 - .4 exposure class.
 - .5 aggregate size and admixtures incorporated.
 - .6 date, hour, and temperature at time sample was taken.
 - .7 percentage air content.
 - .8 test strength of cylinder.
 - .9 type of failure if test fails to meet specification.
- .3 Samples:
 - 1. Prepare a one (1) metre sample of the architectural concrete finishes; concrete wall cap as applicable.
 - 2. Mock-ups of various approved finishes shall remain in place during the construction period and if accepted will form part of the Work.

1.9 Job Conditions

- .1 Environmental Conditions:

In addition to Cold Weather and Hot Weather Requirements of CSA-A23.1, the following shall apply to Work of this section:
- .2 Provide protection and or heat so that the temperature of the concrete at surface is maintained at not less than 21deg.C (70deg.F) for three days after placing, not less than 10deg. C (50deg.F) for the next two (2) days and above freezing for the next two days. Do not permit alternate freezing and thawing for fourteen days after placing.
- .3 Provide protection to maintain concrete continuously moist during the curing period.
- .4 Provide same specified hot and cold weather protection for storage of each concrete compression specimen as for the concrete from which it was taken, until it is sent to the laboratory.

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- .5 Protection: protect concrete surfaces exposed to view from grease, oil and other soil which will affect the appearance of the concrete.

PART 2 PRODUCTS**2.1 Materials**

- .1 Water: CAN/CSA-A23.1
- .2 Cementing Materials:
 - .1 Portland Cement: CAN/CSA-A3001
- .3 Coarse Aggregates, CSA-A23.1/A23.2:
 - .1 For all concrete: 20mm (3/4") to 5mm (No. 4 sieve).
- .4 Admixtures:
 - .1 Air entraining admixture: ASTM-C260
 - .2 Chemical admixtures: ASTM-C494
 - .3 Provide only admixtures that are free of chlorides.

2.2 Concrete Mixes

- .1 Concrete:
 - .1 Ready mix, with 28-day compressive strength as indicated on drawings and in specifications. Coloured concrete mixes and samples to be approved by the Consultant.
 - .2 Design concrete mixes in accordance with CSA-A23.1/A23.2, Clause 14, Table 11 (Alternative 1) and Tables 7 and 8. Class A exposure, with surface finish approved for sandblasting but not for curb and gutters. Provide air content in accordance with the first line of Table 8 of CSA-A23.1. Class C-1 exposure for other concrete.
 - .3 Submit evidence and material samples if requested, acceptable to the Inspection and Testing Company to verify that then proposed concrete mix design will produce specified quality of concrete.
 - .4 Concrete Weight: Air dry unit weight: minimum 2320 kg/m³ (145 lbs./cu.ft.) adjusted proportionally for maximum air content listed in Table 8, CSA –A23.1, Clause 14, Table 8.
- .2 Admixtures:
 - .1 Chemical Admixtures: Incorporate water reducing admixture,

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type WN, in all concrete.

- .2 Air-Entraining Agent: Incorporate air entraining agent in addition to chemical admixture in concrete of A and C Class exposure in accordance with CSA-A23.1, Clause 14, Table 8.
- .3 Calcium Chloride: Do not use calcium chloride or admixtures containing chloride in concrete.
- .3 Architectural Precast Concrete: (For concrete designated as “architectural precast concrete”, refer to Section [3450 Architectural Precast Concrete](#))
 - .1 Mixes: Standard Portland cement concrete
- .4 For sand and coloured aggregates for standard and type ‘A’ alternative concrete mixtures, source to be approved by the Consultant. Ratios of material will vary depending on concrete strength specified.
- .5 Obtain aggregate, cement and sand from same source at same time, for entire project.
- .6 Use tools and handling equipment that are absolutely clear of rust, salts, hardened concrete and other harmful and foreign materials.

PART 3 EXECUTION**3.1 Examination**

- .1 Confirm that the subgrade of compacted fill conforms to requirements specified for backfilling before placing slab underbed;
- .2 That a surface on which concrete is to be placed is free of frost and water before placing;
- .3 Confirm that reinforcement, dowels control joints, inserts and all other built in Work are in place and secured before placing concrete.

3.2 Placing Concrete

- .1 Notification: Notify the Consultant at least twenty-four (24) hours before commencing to place concrete. Regardless of any requirement of reference standards to inspect all of the Work prior to placing concrete, field review of construction will be in accordance with sampling program.

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3.3 Finishing Concrete**.1 Slab Surfaces:**

1. Perform finishing operations on plastic concrete surfaces in accordance with CSA-A23.1, Clause 22 and as specified herein.
2. Refer to drawings, schedules and other sections of specifications for required finishes.
3. Verify with those responsible for Work of other sections that proposed finish is satisfactory.

.2 Formed Surfaces:

- .1 Treat formed surfaces in accordance with CSA-A23.1, Clause 24.1 and 24.2 and as additionally specified herein. Obtain the Consultant approval of exposed concrete. Regrind or otherwise correct surfaces are not to the satisfaction of the Consultant.
- .2 Edging: Finish external corners of curbs, walls and steps rounded and smooth, as detailed.

.3 Architectural Finishing (all exposed concrete):

- .1 Sandblast concrete surfaces evenly over all exposed concrete surfaces and consistently throughout project to Consultant's satisfaction.
- .2 Concrete surfaces to match the finish and colour of samples approved by the Consultant.
- .3 Protect other surfaces and equipment against damage resulting from sandblasting operations.
- .4 Use materials that will minimize environmental contamination.
- .5 Take care to avoid breaking external corners of concrete.
- .6 Remove debris from finishing operations.

3.4 Curing and Sealing

1. Cure concrete in accordance with CSA-A23.1, Clause 21 and as

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specified herein.

2. Plastic curing Method:
Where curing compound methods cannot be used, cure finished surfaces by covering with 0.102mm (4mil.) thick polyethylene sheets as follows:
 - .1 Lap all edges 100mm (4") minimum and seal all laps.
 - .2 Leave in place seven days, minimum.
 - .3 Check that concrete is damp and apply water to maintain damp condition.

3.5 Field Quality Control

- .1 The Contractor shall appoint an Inspections and Testing Company as specified for source quality control elsewhere in this section shall perform sampling, inspections and testing of concrete Work at site.
- .2 Perform sampling, inspection and tests in accordance with CSA-A23-2 and to include:
 - .1 Making of standard slump tests.
 - .2 Obtaining three (3) standard specimens for strength test from each 100m³ (130 cu.yd.) of concrete or fraction thereof, of each design mix design of concrete placed in any one day. Verify that the test cylinders are stored in an enclosure, maintained at specified temperatures.
 - .3 Making compression tests of each set of three (3) specimens, one at seven (7) days and two at twenty-eight (28) days.
 - .4 Verification of air content of air-entrained concrete:
 - .1 For Class A exposure, test at frequency in accordance with CSA-A23.1, Clause 17.2.2.1. Make first test before placing any concrete. After stable air content has been established, frequency of tests will be determined by Structural Site representative.
 - .2 For Class C-1 exposure, test at time of obtaining strength test specimens.
- .5 Inspections and Tolerances:

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- .1 Confirm that concrete Work meets the tolerance requirements specified herein.

3.6 Defective Work

- .1 Variations in excess of specified tolerances and marked and disfigured surfaces that cannot be repaired by approved methods will be considered defective Work performed by this section.
- .2 Replace or modify concrete that is out of place or does not conform to lines, detail or grade as directed by the Consultant.
- .3 Replace or repair defectively placed or finished concrete as directed by the Consultant.
- .4 Testing and replacement of deficient Concrete-in-Place:
 - .1 The Contractor shall pay for additional testing and related expenses if concrete has proved to be deficient;
 - .2 Replace or strengthen deficient concrete Work as directed by Consultant and pay all testing and related expenses for replaced Work until approved by the Consultant.

3.7 Finishes

- .1 All concrete or exposed concrete to be finished as indicated on the Contract Document drawings.

3.8 Clean Up

- .1 Remove from site excess and waste materials, mock up panels, test areas and debris resulting from Work in this section. Leave premises in a condition acceptable to the Consultant before completion of the Work.

END OF SECTION - 03300