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5.5 SUPPLY OF PORTLAND CEMENT CONCRETE**5.5.1 DESCRIPTION****5.5.1.1 General**

Portland Cement Concrete shall consist of a mixture of Portland Cement, fine aggregate, coarse aggregate, water, and admixtures where required, combined in proportions to meet the specifications herein.

5.5.1.2 Class of Concrete

The Contractor shall supply Portland Cement Concrete in accordance with the following requirements for the class of concrete specified or designated by the Consultant:

Class of Concrete	Minimum Compressive Strength @ 28 Days MPa	Size of Coarse Aggregate mm	Range of Slump mm	Entrained Air Cont. %	Maximum Water/Cement Ratio
*A	25	40 to 5	50 to 70	5 - 8	0.45
B	25	28 to 5	50 to 70	5 - 8	0.45
C	30	20 to 5	60 to 80	5 - 8	0.42
**SF	35	20 to 5	80 to 110	5 - 8	0.38
D	30	14 to 5	50 to 70	5 - 8	0.42
S	20	28 to 5	50 to 70	5 - 8	0.50
Pile	25	28 to 5	50 to 70	5 - 8	0.45

NOTE:

- * The Contractor will be permitted to supply Class "B" concrete where Class "A" has been specified; payment will be as if Class "A" had been supplied.
- ** Class SF Concrete shall be used for all cast to grade decks, curbs, medians and Deck Overlay Concrete.
The requirements for Class SF Concrete with Steel Fibres are the same as for Class SF Concrete.

All properties shall be determined in accordance with the requirements of the latest version of CSA Standards CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction, and CAN 3-A23.2, Methods of Test for Concrete.

5.5.2 MATERIALS**5.5.2.1 Portland Cement**

The Contractor shall supply Portland Cement conforming to the requirements of Specification 5.11, Supply of Portland Cement and concrete products in accordance with CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction.

Unless otherwise specified, directed or approved by the Consultant, Normal Type 10 Portland Cement shall be used.

5.5.2.2 Water

Mixing and curing water shall be supplied by the Contractor.

Water shall conform to the requirements of the latest version of CSA Standard CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction. Water used in Portland Cement Concrete construction shall be subject to the prior approval of the Consultant.

5.5.2.3 Aggregates

The Contractor shall supply aggregates conforming to the requirements of the latest version of CSA Standard CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction. Aggregates used in Portland Cement Concrete shall be subject to the prior approval of the Consultant.

5.5.2.4 Air-Entraining Admixtures

Air-entraining admixtures shall be supplied by the Contractor.

Air-entraining admixtures shall conform to the requirements of the latest version of CSA Standards CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction, and CAN 3-A266.1, Air-Entraining Admixtures for Concrete. Air-entraining admixtures used in Portland cement concrete construction shall be subject to the prior approval of the Consultant.

5.5.2.5 Other Admixtures

Use of other admixtures shall be subject to the prior approval of the Consultant. Where the use of other admixtures is approved, such admixtures shall conform to the requirements of the latest version of CSA Standard CAN 3-A266.2, Chemical Admixtures for Concrete. Unless otherwise approved by the Department, the use of flyash is not permitted.

Where the approved admixture, or its method of use, is not covered by an appropriate CSA Standard, such admixtures shall be used in accordance with the manufacturer's recommendations, or as otherwise approved by the Consultant.

5.5.3 CONSTRUCTION

5.5.3.1 **Care and Storage of Materials**

All Portland Cement Concrete materials shall be handled and protected in such a way as to prevent segregation, damage and contamination.

All cement, aggregate and other concrete construction materials shall be stored in accordance with the requirements of the latest version of CSA Standards CAN 3-A5, Portland Cements and CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction. Any segregated, damaged, or contaminated materials shall be rejected.

5.5.3.2 **Proportioning and Composition of Concrete**

The Contractor shall be responsible for providing concrete mix designs for each Class of concrete specified and proposed for use. The mix design shall be of a standard acceptable to the Consultant. The proposed mix design, certified by the Contractor or his design agent, shall be submitted to the Consultant for approval at least 72 hours before concrete production is due to start. The Contractor shall not produce concrete until the corresponding mix design has been approved by the Consultant.

If, during the progress of the work, it is determined that the concrete has inadequate workability, or does not meet the requirements of the specification, the Contractor shall provide a new mix design for the Consultants approval, in accordance with the foregoing requirements.

All concrete shall be proportioned in accordance with the approved mix designs.

The Contractor shall provide written certification that the concrete has been proportioned and produced in accordance with the approved mix designs and the requirements of these specifications.

5.5.3.3 **Consistency**

The slump shall be in accordance with the specifications herein, however, the slump for slip-formed concrete shall be limited to a maximum of 50 mm, or to such other value as may be necessary to enable the material to be slip-formed without subsequent distortion.

Generally, mass and mechanically vibrated concrete shall have slumps in the lower portion of the specified range, and heavily reinforced and/or inaccessible sections shall have slumps in the higher end of the range.

5.5.3.4 **Concrete Production**

Portland Cement Concrete shall be produced in accordance with the requirements of the latest version of CSA Standard CAN 3-A23.1, Concrete Materials and Methods of Concrete Construction, unless otherwise approved by the Consultant.

5.5.3.5 **Delivery**

Delivery of Portland Cement Concrete shall be regulated so as to enable continuous deposition until the placement of each concrete section is completed.

5.5.4 MEASUREMENT AND PAYMENT

5.5.4.1 **Portland Cement Concrete**

Payment for the production of Portland Cement Concrete, including the supply of all constituent materials, will not be made separately, but will be included in the cost for the respective structure for which the concrete is being used.