TENDER DOCUMENTS

SUBSECTION 6.39
PRECAST CONCRETE ELEMENTS

TABLE OF CONTENTS

PAGE

SUBSECTION 6.39 PRECAST CONCRETE ELEMENTS

6.39.1 GENERAL

6.39.1.1 This subsection describes the requirements relating to the precasting of concrete elements covered by this Contract.

6.39.1.2 Any specific requirements pertaining to the precasting of concrete elements covered by this Contract are set out on the drawings and in Section 4 *Special Technical Conditions*.

6.39.1.3 The requirements relating to reinforcing steel are described in subsection 6.31 *Reinforcing Steel for Concrete*.

6.39.1.4 The requirements relating to formwork are described in subsection 6.32 *Formwork.*

6.39.1.5 The requirements relating to concrete are described in subsection 6.33 *Cast-in-Place Concrete*.

6.39.2 MEASUREMENT UNITS

6.39.2.1 The measurement units and respective symbols thereof used in this subsection are described as follows:

Measurement Unit	Designation	Symbol
temperature	degree Celsius	ºC

6.39.3 REFERENCE STANDARDS

6.39.3.1 The **Contractor** shall carry out all concrete elements precasting work in accordance with the requirements of the following standards and documents, to which the provisions of this Contract are added:

6.39.3.1.1 (ACNOR(CSA)) Canadian Standards Association:

- CAN/CSA A23.1/A23.2 *Béton: Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete;*
- CAN/CSA A23.4 *Precast Concrete – Materials and Construction;*
- CAN/CSA A231.1/A231.2 *Precast Concrete Paving Slabs/Precast Concrete Pavers;*
- CAN/CSA G40.20/G40.21 *General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel;*
- CAN/CSA S6-06 *Canadian Highway Bridge Design Code.*

6.39.3.1.2 (ASTM) ASTM International:

- ASTM A123/A123M *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products*.

6.39.3.1.3 (BNQ) Bureau de normalisation du Québec:

- BNQ 2622-126 *Tuyaux et branchements latéraux monolithiques en béton armé et non armé pour l'évacuation des eaux d'égout domestique et pluvial*;
- BNQ 2622-420 *Regards d'égout, puisards, chambres des vannes et postes de pompage préfabriqués en béton armé*;
- BNQ 2622-951 *Tuyaux et branchements latéraux monolithiques en béton armé et non armé, et regards d'égout, puisards, chambres des vannes et postes de pompage préfabriqués en béton armé – Protocole de certification;*
- BNQ 2624-210 *Bordures en béton préfabriquées – Caractéristiques dimensionnelles, géométriques et physiques*.

6.39.3.1.4 (MTQ) Ministère des transports du Québec:

- MTQ – *Cahier des charges et devis généraux* (CCDG) – *Construction et réparation*.

6.39.4 MATERIALS

6.39.4.1 The **Contractor** is responsible for the selection of products used and performance thereof once in place.

6.39.4.2 The Engineer may reject any materials that have not met the technical requirements in previous projects of the same type, in the opinion of the **Owner**.

6.39.4.3 The **Contractor** shall not, without having obtained the prior written authorization from the Engineer, make such changes to the materials or construction details that it deems necessary or desirable.

6.39.4.4 All materials shall, at all stages of the work, be new and free of any dirt, rust, oil, grease or any other deleterious materials.

6.39.4.5 REINFORCING STEEL

6.39.4.5.1 The reinforcing steel shall comply with subsection 6.31 *Reinforcing Steel for Concrete*.

6.39.4.5.2 Unless otherwise indicated on the drawings, the reinforcing steel shall be galvanized in accordance with standard ASTM A123/A123M.

6.39.4.6 STRUCTURAL STEEL

6.39.4.6.1 The structural steel shall comply with subsection 6.41 *Steelwork.*

6.39.4.6.2 Unless otherwise indicated on the drawings, the structural steel shall be galvanized in accordance with standard ASTM A123/A123M.

6.39.4.7 ANCHOR BOLTS

6.39.4.7.1 The anchors bolts shall comply with subsection 6.41 *Steelwork*.

6.39.4.7.2 Unless otherwise indicated on the drawings, the anchors bolts shall be galvanized in accordance with standard ASTM A123/A123M.

6.39.4.8 CONCRETE

6.39.4.8.1 The manufacture and placement of the concrete shall comply with subsection 6.33 *Cast-in-Place Concrete*.

6.39.4.9 SHOP DRAWINGS

6.39.4.9.1 At least fourteen (14) days prior to placing any order for precast concrete elements, the **Contractor** shall submit to the Engineer, for review, the shop drawings signed and sealed by an engineer member of the *Ordre des ingénieurs du Québec* (OIQ) and has at least five (5) years of relevant experience.

6.39.4.9.2 The shop drawings shall include, without however being limited to, the following information:

6.39.4.9.2.1 the main dimensions, location of the different parts to be embedded and identification mark thereof;

6.39.4.9.2.2 the bends and dimensions of the reinforcing bars;

6.39.4.9.2.3 the position and location of the anchor bolts;

6.39.4.9.2.4 the position and dimension of the embedded conduit, if any;

6.39.4.9.2.5 the quality of the materials;

6.39.4.9.2.6 all information required for the understanding of the drawings.

6.39.4.9.3 All measurements and dimensions shown on the Contract drawings shall be checked before undertaking the preparation of the shop drawings.

6.39.5 EXECUTION OF WORK

6.39.5.1 GENERAL

6.39.5.1.1 The **Contractor** shall provide all labor and supply all machinery, equipment and tools required for the manufacture of the concrete elements according to the indications on the drawings.

6.39.5.2 MANUFACTURE OF ELEMENTS

6.39.5.2.1 The **Contractor** or subcontractor thereof, if any, shall have a recognized precast concrete element manufacturing plant that comprises a permanent building in which the concrete structural elements are manufactured by means of permanently installed equipment. The ambient temperature inside the building shall be maintained at or above 10°C.

6.39.5.2.2 The precast concrete elements shall be produced by a manufacturer whose plant is certified by the Canadian Standards Association (CSA) or by the Canadian Precast/Prestressed Concrete Institute (CPCI), according to the requirements of standard CAN/CSA A23.4 in category “Precast Structural Concrete Products”. The certificate shall be obtained before the start of manufacture and the certification shall be maintained throughout the duration of manufacturing and placement of the elements.

6.39.5.2.3 The formwork used for the manufacture of the concrete elements shall be made of steel.

6.39.5.2.4 The precast concrete elements shall comprise at least two (2) lifting devices integrated into the concrete to allow handling thereof.

6.39.5.2.5 The concreting of the precast elements shall meet the requirements of standard CAN/CSA A23.1 as well as the following requirement:

6.39.5.2.5.1 The ambient temperature shall be maintained at or above 10°C from the start of concreting.

6.39.5.3 CURING OF PRECAST CONCRETE ELEMENTS

6.39.5.3.1 The curing of the precast concrete elements shall be carried out according to the same requirements as for the cast-in-place concrete elements with the exception of the curing period, which shall be of maintained at a minimum temperature of 140ºC every day, until the concrete reaches the specified compressive strength at twenty-eight (28) days.

6.39.5.3.2 In the case of elements subjected to an accelerated curing, the curing shall be carried out according to Article 23.2.2.3 of standard CAN/CSA A23.4, with the exception of the maximum concrete temperature specified in Table 2 “Accelerated Curing Cycle”, which shall be of 60°C with a tolerance of +10°C for the high humidity category. The **Contractor** shall demonstrate, prior to the manufacturing of the precast concrete elements, that the heating system allows uniform distribution of heat over the entire length of the element.

6.39.5.3.3 The maximum permissible deviation between the warmest and the coldest point is 5°C.

6.39.5.3.4 In the case of elements subjected to normal curing, the maximum temperature reached by the concrete shall not exceed 70°C. In addition, during and after the curing period, the elements shall be protected from thermal gradients so as not to be subjected to a temperature difference of more than 20°C between the temperature of the element surface and the ambient temperature.

6.39.5.4 TRANSPORTATION, STORAGE AND HANDLING

6.39.5.4.1 The precast concrete elements cannot be transported before concrete has reached a compressive strength of at least 70% of the specified compressive strength at twenty-eight (28) days.

6.39.5.4.2 The handling, storage and transportation of all elements shall be carried out so as to eliminate the risk of flaking, cracking and bending stress.

6.39.5.5 EXECUTION OF WORK

6.39.5.5.1 The elements shall be assembled and placed according to the alignments and levels indicated on the drawings with the precision required to ensure that the joints between all elements are closed.

6.39.6 QUALITY CONTROL

6.39.6.1 In addition to the quality control process to be carried out by the **Contractor**, the manufacture of the concrete elements will also be checked by an external firm retained by the **Owner**. The costs of these independent checks will be borne by the **Owner**. The **Contractor** shall cooperate with the firm retained by the **Owner** in order to facilitate the monitoring work.

6.39.6.2 The **Contractor** shall report to the Engineer, in writing, any defect in the manufacture of the elements prior to taking corrective measures. These measures shall be authorized by the Engineer.

END OF SUBSECTION