TENDER DOCUMENTS

SUBSECTION 6.44

SIGNAGE STRUCTURES

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SUBSECTION 6.44 SIGNAGE STRUCTURES

6.44.1 GENERAL

6.44.1.1 This subsection sets out the requirements for signage structure work covered by this contract.

6.44.1.2 Any specific requirements pertaining to the signage structure work provided for in this contract are set out in Section 4 *Specific Technical Conditions* and on the drawings.

6.44.1.3 The requirements pertaining to reinforcing steel are set out in subsection 6.31 *Reinforcing Steel for Concrete*.

6.44.1.4 The requirements pertaining to formwork are set out in subsection 6.32 *Formwork*.

6.44.1.5 The requirements pertaining to cast-in-place concrete are set out in subsection 6.33 *Cast-in-Place Concrete*.

6.44.1.6 The requirements pertaining to steelwork are set out in subsection 6.41 *Steelwork*.

6.44.1.7 The requirements pertaining to aluminum work are set out in subsection 6.43 *Aluminum Work*.

6.44.2 REFERENCE STANDARDS

6.44.2.1 The **Contractor** shall carry out all signage structure work in accordance with the requirements set out in the following standards and documents to which the provisions of the contract are added:

6.44.2.2 (ASME) American Society of Mechanical Engineers

- *B1.1-2003 Unified Inch Screw Threads, (UN and UNR Thread Form)*

6.44.2.3 (CSA) Canadian Standards Association

- CAN/CSA S6-F06 *Canadian Highway Bridge Design Code*

6.44.2.4 (ASTM) ASTM International

- ASTM F593-02 (2008) *Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs*

6.44.2.5 (MTQ) Quebec Department of Transport

- MTQ – *Cahier des charges et devis généraux (CCDG)*
- MTQ – *Normes – Ouvrages routiers* – Tome III – *Ouvrages d'art*, chapitre 6 *Structures de signalisation, d'éclairage et de signaux lumineux*

- MTQ – *Normes – Ouvrages routiers* – Tome V – *Signalisation routière*
- MTQ – *Normes – Ouvrages routiers* – Tome VII – *Matériaux*, Chapitre 4 *Liants et enrobés bitumineux*, Norme 4301 *Traitements de surface*
- MTQ – *Normes – Ouvrages routiers* – Tome VII *Matériaux*, Chapitre 5 *Armatures*, Norme 5101 *Armature pour les ouvrages en béton*
- MTQ – *Normes – Ouvrages routiers* – Tome VII *Matériaux*, Chapitre 6 *Pièces métalliques*, Norme 6201 *Boulons, tiges d'ancrages, écrous et rondelles en acier*

6.44.3 MATERIALS

6.44.3.1 CONCRETE

6.44.3.1.1 Concrete shall meet the requirements set out in subsection 6.33 *Cast-in-Place Concrete* of the specifications.

6.44.3.1.2 Unless otherwise indicated in Section 4 *Specific Technical Conditions*, the concrete used for the foundation block shall be standard 35 MPa concrete. The concrete used for the anchor block shall the same type as the concrete used for the reinforced concrete components of the structure into which it is incorporated. The concrete used for the support cushion shall be standard 15 MPa concrete.

6.44.3.2 REINFORCING STEEL

6.44.3.2.1 Reinforcing steel shall meet the requirements set out in subsection 6.31 *Reinforcing Steel for Concrete* of these specifications.

6.44.3.2.2 Reinforcing steel, galvanizing and mechanical joints between reinforcing bars shall conform to MTQ standard 5101 - *Armature pour les ouvrages en béton*.

6.44.3.3 STEEL

6.44.3.3.1 Structural steel shall meet the requirements set out in subsection 6.41 *Steelwork* of these specifications.

6.44.3.3.2 Metal structures shall be protected against corrosion in accordance with the requirements applicable to galvanizing and painting set out in subsections 6.41 *Steelwork* and 6.42 *Painting*.

6.44.3.3.3 Structures shall be uniform in colour over their entire surface. Where this requirement cannot be met, a new coat of corrosion protection shall be applied.

6.44.3.4 ALUMINUM

6.44.3.4.1 Aluminum shall conform to subsection 6.43 *Aluminum Work.*

6.44.3.4.2 With the exception of overhead signage structures in sections with aluminum housings, aluminum structures shall comprise components with no lengthwise welds.

6.44.3.4.3 Where a component has a reinforcing sleeve, the component shall be fabricated in such a way that the sleeve and the reinforced component are well bonded.

6.44.3.4.4 Surfaces shall have an even 80-grip bright finish. Sharp edges shall be rounded off, and surfaces shall be coated with silicone wax.

6.44.3.4.5 Dust and grease shall be removed from aluminum structures.

6.44.3.5 ANCHORS

6.44.3.5.1 Steel anchor rods, bolts and washers

6.44.3.5.1.1 Stainless steel anchor rods, bolts and washers shall conform to MTQ standard 620 and ASTM standard F593. Where a breakaway device requires a specific anchor rod, the rod shall meet the requirements applicable to the device.

6.44.3.5.1.2 The threads of anchor rods and bolts shall conform to American Society of Mechanical Engineers standard B1.1 and shall be Class 1A or Class 1B as the case may be.

6.44.3.5.2 Insert sheath

6.44.3.5.2.1 The insert sheath shall meet the requirements applicable to the breakaway device that requires a sheath.

6.44.3.5.3 Stub

6.44.3.5.3.1 The stub shall meet the requirements applicable to the breakaway device that requires a stub.

6.44.3.5.4 Breakaway device

6.44.3.5.4.1 A breakaway device includes the breakaway base and, depending on the type of structure indicated on the drawings, the flexible joint and frangible connector.

6.44.3.5.4.2 The **Contractor** shall use a breakaway support chosen from the list of products approved by the MTQ if the support is one of the following:

- one-piece pole driven straight into the ground (L6X-1);
- pole fitted onto a stub (L6X-2);
- pole mounted on a stub with a sleeve (L6X-3);
- pole mounted on a stub with a gasket (L6X-4);
- safety housing;
- electrical service housing;

- frangible coupler system for side-mounted overhead signage (L2X);
- frangible coupler system for lighting structures.

6.44.3.5.4.3 For approved breakaway supports, the **Contractor** shall meet the requirements of this subsection and the requirements set out in the *Specific Technical Conditions*.

6.44.3.5.5 Identification plate

6.44.3.5.5.1 The identification plate shall be fabricated from 3003-H14 aluminum alloy 0.8 mm thick. It shall be chromate treated and then given one coat of black series 630 DURACRON thermoset enamel with a 15% sheen for all structures other than the tension block, which shall be red. The enamel shall be baked at 232°C.

6.44.4 EXECUTION OF WORK

6.44.4.1 GENERAL

6.44.4.1.1 For each structure, the **Contractor** shall comply with the locations and heights indicated on the drawings. The **Contractor** shall take measurements on site and shall have the Engineer approve the location and height of structures before starting work.

6.44.4.1.2 Signage structures shall be designed, fabricated and installed in accordance with standard CAN/CSA S6.

6.44.4.1.3 The **Contractor** shall check on site any existing structures that have to be modified or that may impede performance of the work. The **Contractor** shall also check on site all the exact dimensions of the spans and heights of the overhead structures and other supports. The **Contractor** may not claim damages for errors or omissions in the dimensions shown on the drawings.

6.44.4.1.4 The information shown on the drawings is intended to guide the **Contractor**. The **Contractor** is responsible for providing shop drawings of the final structures.

6.44.4.1.5 This subsection does not necessarily contain a full and detailed description of all the accessories needed to perform the work. Consequently, the **Contractor** shall supply and install in a professional manner all accessories needed to complete the work in accordance with the requirements set out in this subsection.

6.44.4.1.6 The foundation block or anchor block shall be constructed in accordance with the drawings and the requirements set out in subsections 6.31 *Reinforcing steel for concrete*, 6.32 *Formwork* and 6.33 *Cast-in-place*.

6.44.4.1.7 The structure includes all metal framing, anchor components, failure devices and accessories.

6.44.4.1.8 The **Contractor** shall provide the Engineer with a calculation sheet containing design details and details of the support structure mounting. The design shown on the drawings is provided to the **Contractor** for information and the actual design shall be validated and completed by the **Contractor**. The calculation sheet shall include calculations of the mechanical and fatigue resistance of the support structure. The calculation sheet and documents showing details of the mounting shall be signed and sealed by an engineer who is a member of the Ordre des ingénieurs du Québec. The signage structures supplied by the **Contractor** shall not have reserve capacity unless indicated on the drawings.

6.44.4.1.9 Where breakaway devices are incorporated into a frangible structure, the shop drawings shall also include the information required on the drawings and in the specifications.

6.44.4.1.10 The design and installation of structures shall meet the requirements set out in subsections 6.41 *Steelwork* and 6.43 *Aluminum Work* as the case may be.

6.44.4.1.11 The conditions under which materials are stored shall meet the manufacturer's requirements.

6.44.4.2 CERTIFICATE OF CONFORMITY

6.44.4.2.1 Whenever breakaway supports are delivered, the **Contractor** shall provide the **Owner** with a certificate of conformity containing the following information:

- supplier's name;
- manufacturer's name;
- date of manufacture;
- place of fabrication;
- identification of approved components used to build the structures;
- identification of marking;
- certification of the composition of the materials used to fabricate the components;
- the characteristics of the components (nominal dimensions, grade of steel, aluminum alloy;
- the casting number and results of tests and analyses;
- production batch number.

6.44.4.3 FOUNDATION COMPONENTS

6.44.4.3.1 Foundation block

6.44.4.3.1.1 Excavation and backfilling shall be carried out in accordance with the requirements for excavation and foundation preparation set out on the drawings and in the specifications.

6.44.4.3.1.2 As the case may be, the **Contractor** shall put a support cushion in place in accordance with the foundation requirements set out on the drawings and in the specifications.

6.44.4.3.1.3 The minimum bearing capacity of the soil at the bottom of the excavation shall be 170 kPa. Where that requirement cannot be met, the **Contractor** shall put a support cushion in place based on the laboratory's recommendations. The bearing capacity of the existing soil shall be determined by a laboratory at the **Contractor**'s expense.

6.44.4.3.1.4 The **Contractor** shall place the foundation block with sufficient precision to ensure that the connector flanges between the components of the structure being installed fit perfectly.

6.44.4.3.1.5 The anchor components for the structure shall be placed in the forms using a template before the concrete is poured. The **Contractor** shall check the alignment of the vertical supports to be anchored in the foundation block or the anchor block. The templates used to place the anchor components shall have alignment marks to ensure that the posts, masts and triangulated supports are parallel and plumb.

6.44.4.3.1.6 The vertical supports of overhead structures shall be aligned, and the horizontal support shall be perpendicular to each of the vertical members.

6.44.4.3.1.7 The levelling of the top of a foundation block and the amount the anchor components extend out of the block shall meet the criteria governing the amount of a breakaway support that is allowed to protrude from the ground.

6.44.4.3.1.8 The **Contractor** shall ensure that foundation blocks or anchor blocks for single-span overhead signage structures are levelled in such a way that they are even with the base of the triangulated girder or box girder. For double-span girders and girders with one or more cantilevers, the **Contractor** shall take into account the cambers and the bearing on the middle support, which may not be level with the bearing points on the end supports.

6.44.4.3.2 Tumulus

6.44.4.3.2.1 Where a tumulus is required, it shall be constructed in accordance with the backfilling requirements set out in subsection 6.87 - *Earthwork* and as indicated on the drawings.

6.44.4.3.2.2 The slopes of a tumulus shall be sodded (P-1) in accordance with the landscaping requirements for sodding set out in subsection 6.88 *Landscaping*.

6.44.4.3.3 Surface treatment around a foundation block

6.44.4.3.3.1 Surface treatment around a foundation block required by the *Specific Technical Conditions* shall conform to MTQ standard 4301.

6.44.4.3.3.2 TS2 granular material shall be spread and compacted to a thickness of 150 mm. An asphalt emulsion compatible with the granular material shall be applied at the rate of 1.40 l/m^2. TS4 granular material shall be applied to the surface at the rate of 15 kg/m^2 and lightly compacted.

6.44.4.4 SIGNAGE STRUCTURE

6.44.4.4.1 Implementation

6.44.4.4.1.1 The modules or sections of the structure shall be moved and placed using a crane, slings and hoisting rings. The manufacturer of the structure shall indicate which points may be used for hoisting. All components shall be handled, stored and transported in such a way that the risk of damage is kept to a minimum.

6.44.4.4.1.2 Unless otherwise indicated in the *Specific Technical Conditions*, posts, masts and triangulated vertical supports shall be placed vertically.

6.44.4.4.1.3 The structure shall be installed in accordance with the requirements for metal frames, the drawings and specifications, the shop drawings and the manufacturer's recommendations.

6.44.4.4.1.4 The **Contractor** shall obtain authorization from the Engineer before modifying or cutting the structure on site. Boring of holes on site is strictly prohibited.

6.44.4.4.1.5 An electric or percussion tool shall not be used to tighten bolts. To tighten bolts that require a specific amount of torque, the **Contractor** shall use a properly calibrated torque wrench.

6.44.4.4.1.6 The identification plate shall be mounted using stainless steel screws or rivets. Identification shall be placed on every vertical support and every section of a triangulated girder, box girder, bracket and other horizontal support.

6.44.4.4.1.7 The antivibration device shall be permanently installed.

6.44.4.4.2 Welding

6.44.4.4.2.1 Aluminum components shall not be butt welded or welded lengthwise.

6.44.4.4.2.2 Welds between a post and an anchor plate shall be made by inserting the post into the anchor plate and making two angle welds along the edges. In aluminum assemblies, the walls of the post shall be pushed against the side of the anchor plate. The allowable gap between the post and the inside edge of the anchor plate is 0.5 mm over the entire perimeter. Alternately, aluminum components may be assembled using full-depth welds around the perimeter with an angle weld to add extra thickness to the prepared surface.

6.44.4.4.3 Shop fitting of bolted joints

6.44.4.4.3.1 Triangulated girders and monotube girders with on-site connector flange joints shall be shop fitted. Identification numbers shall be etched onto the connector flanges before the joints are disassembled and a corrosion-resistant coating is applied.

6.44.4.5 EXISTING STRUCTURES

6.44.4.5.1 The removal and demolition of existing structures shall meet the requirements of subsection 6.21 *Demolition and Removal Work* in addition to the following:

6.44.4.5.1.1 The structures shall be dismantled carefully so as not to damage any components that are to be left in place. Unless otherwise indicated in the *Specific Technical Conditions*, the **Contractor** shall report the structures to the **Owner**'s maintenance centre located on the south side of the Jacques Cartier Bridge.

6.44.4.5.1.2 Where required on the drawings and in the specifications, the **Contractor** shall level the ground with topsoil and carry out mechanical seeding (M-1) according to the landscaping requirements for mechanical seeding or hydroseeding set out in subsection 6.88 *Landscaping*.

6.44.4.5.1.3 Where the foundation blocks to be demolished are not impeding construction of the works provided for in the contract, the **Contractor** shall demolish the blocks to 1 m below grade (natural ground level). Where a block to be demolished impedes or prevents construction of a work provided for in the contract, the entire block shall be demolished.

6.44.4.5.1.4 The **Contractor** shall dismantle all components of the existing structure, including overhead signage panels, vertical supports and hardware.

6.44.4.5.1.5 The **Contractor** shall remove from the site and dispose of any dismantled components that are not being reused.

6.44.4.5.1.6 Unless otherwise indicated in the *Specific Technical Conditions*, overhead signage panels shall be reinstalled temporarily for the duration of the work period.

6.44.4.5.1.7 The **Contractor** shall submit a drawing signed and sealed by a member of the Ordre des ingénieurs du Québec showing details of the signage panel, the type of installation, the required hardware and the location where it plans to temporarily install the overhead signage panel.

6.44.4.5.1.8 This installation shall meet the requirements set out in subsection 6.14 *Traffic control and temporary signage*, more specifically clause 6.14.7 *Information Signs*, the *Standard Technical Conditions* and the Engineer's instructions.

6.44.4.5.1.9 With approval from the Engineer, the **Contractor** may dismantle and immediately reinstall the overhead signage panel.

6.44.4.5.1.10 The **Contractor** shall, at the end of the work, completely dismantle the signage and its temporary installation, remove it from the site and dispose of it or reinstall it in accordance with the requirements set out in *Specific Technical Conditions* and subsection 6.71 *Overhead signage*.

6.44.4.5.2 Dismantling of each existing structure and the signage mounted on it and installation of each new structure and the signage mounted on it shall be carried out in a single step in one night.

6.44.5 QUALITY CONTROL

6.44.5.1 Inspection of welds

6.44.5.1.1 The welds in a signage structure shall undergo the following inspections in addition to the tests prescribed in the other subsections of the specifications:

6.44.5.1.1.1 100% of a butt weld in each component shall be ultrasound or X-ray inspected;

6.44.5.1.1.2 100% of a full-depth weld shall be ultrasound or X-ray inspected;

6.44.5.1.1.3 one lengthwise weld shall be magnetic particle inspected over a distance equal to 25% of the length of the welding cords;

6.44.5.1.1.4 one angle weld on a steel support structure shall be magnetic particle inspected over a distance equal to 25% of the length of the welding cords.

6.44.5.1.2 Where an assembly of components for signage structures is made in whole or in part in a shop other than the manufacturer's, non-destructive testing of the welds shall be carried out in the shop of the manufacturer of the signage structures. The **Contractor** shall submit the X-rays and the report on non-destructive testing of the welds to the Engineer.

END OF SUBSECTION