TENDER DOCUMENTS

SUBSECTION 6.37
MISCELLANEOUS PRODUCTS FOR CONCRETE WORK

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SUBSECTION 6.37 MISCELLANEOUS PRODUCTS FOR CONCRETE WORK

6.37.1 GENERAL

6.37.1.1 This subsection describes the main products that may be used in concrete work. Section 4 *Special Technical Conditions* specifies which products must be used under this Contract and sets out the requirements related to those products.

6.37.1.2 The requirements related to demolition work are set out in subsection 6.21 *Demolition and Removal*.

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

6.37.1.4 The requirements related to formwork are set out in subsection 6.32 *Formwork*.

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

6.37.1.6 The requirements related to filling cracks by injection are set out in subsection 6.35 *Injection*.

6.37.1.7 The requirements related to the addition of post-tensioning are set out in subsection 6.36 *Pre-stressing*.

6.37.2 GALVANIC ANODES

6.37.2.1 REFERENCE STANDARDS

6.37.2.1.1 The **Contractor** shall perform all work related to the installation of galvanic anodes and current measurement boxes for galvanic anodes in conformity to the following standards and documents to which the provisions of the Contract are added:

6.37.2.1.1.1 (ASTM) ASTM International

- ASTM A615/A615M-08a *Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement*;
- ASTM B418-06 *Standard Specification for Cast and Wrought Galvanic Zinc Anodes*;
- ASTM A82/A82M-07 *Standard Specification for Steel Wire, Plain, for Concrete Reinforcement*.

6.37.2.2 MATERIALS

6.37.2.2.1 Galvanic anodes

6.37.2.2.1.1 Anodes shall be galvanic anodes embedded in concrete such as Galvashield XP anodes manufactured by Vector Corrosion Technologies or an equivalent. Sika Canada Inc. is an authorized distributor of Galvashield XP galvanic anodes, and Les Industries Pirandello Ltée is an authorized supplier.

6.37.2.2.1.2 Without limiting the scope of subsection 5.32 *Substitution*, in cases where the **Contractor** wishes to use a product equal or better in quality to the specified anode, it shall submit a written request to the Engineer. To allow proper comparison, the **Contractor** shall supply a sample along with the costs, terms and conditions of supply and installation, technical data sheets describing performance, independent laboratory certification of product specification compliance, and a complete list of similar installations with the names and telephone numbers of the contact persons.

6.37.2.2.2 Mortar

6.37.2.2.2.1 The special low electrical resistance mortar used to embed and adhere anodes shall be approved by the manufacturer, Vector Corrosion Technologies, and the Engineer. The electrical resistance of the mortar shall be lower than 15,000 ohm-cm.

6.37.2.2.3 Wiring, conduits and current measuring boxes

6.37.2.2.3.1 Wiring, conduits and current measuring boxes shall be supplied by the **Contractor** and approved by the manufacturer, Vector Corrosion Technologies, and the Engineer.

6.37.2.3 INSPECTION AND STORAGE

6.37.2.3.1 Delivery, storage and handling of materials shall conform strictly to the manufacturer's recommendations. Waybills shall be given to the Engineer on request.

6.37.2.4 PERFORMANCE OF WORK

6.37.2.4.1 The **Contractor** or its subcontractor (if applicable) shall be a qualified galvanic anode installer.

6.37.2.4.2 The **Contractor** shall maintain a log of data and measurements related to anode installation. The log shall be submitted to the Engineer on request.

6.37.2.4.3 All rust and dust shall be removed from existing and new reinforcing steel at the electrical connection points as prescribed in subsection 6.21 *Demolition and Removal*. Electrical connections shall be made at prepared contact points between the existing and the new reinforcing steel using metal wire securely attached to the components over a 3,000 mm x 3,000 mm grid in order to permit maximum electrical conductivity.

6.37.2.4.4 Galvanic anodes shall be installed in repair areas on a grid no larger than 600 mm x 600 mm and around the perimeters, as indicated on the drawings. The spacing between anodes may be modified at the Engineer's request.

6.37.2.4.5 Galvanic anodes shall be completely covered with low electrical resistance mortar as recommended by the anode manufacturer and adhered to the existing concrete.

6.37.2.4.6 Galvanic anodes shall be attached to the deepest layer of exposed reinforcing steel as indicated on the drawings and attached in a way that will prevent the galvanic anode from moving out of position and maximize electrical conductivity.

6.37.2.4.7 Electrical bonding between the anodes and the reinforcing bars shall be checked with a multimeter measuring instrument. Electrical conductivity of new and existing reinforcing steel shall be measured and the readings recorded in a report a copy of which shall be submitted to the Engineer.

6.37.2.4.8 Current measuring boxes shall have two (2) separate circuits so that readings can be obtained for two (2) separate zones. The location of the reading zones will be indicated by the Engineer.

6.37.2.4.9 Current measuring boxes shall be installed behind the New Jersey-type sliding concrete barriers so that they are readily accessible from the deck of the bridge. The exact location of the measuring boxes will be indicated by the Engineer.

6.37.2.4.10 Care shall be taken when placing repair products (standard and self-placing concrete) to avoid creating voids under the galvanic anodes and prevent the anodes from moving out of position.

6.37.3 FORMWORK LINING

6.37.3.1 MATERIALS

6.37.3.1.1 The lining to be used on all inner surfaces of the steel and wood formwork shall be Hyroform-2000, Zemdrain or an equivalent approved by the Engineer.

6.37.3.2 PERFORMANCE OF WORK

6.37.3.2.1 Steel and wood formwork shall be fully lined.

6.37.3.2.2 Formwork lining shall be installed as directed by the manufacturer and so as not to form any folds or pockets when the concrete is placed or any creases on the surface once the formwork is removed and to ensure an even finish.

6.37.3.2.3 The lining shall be completely dry at the time the concrete is placed and shall be protected accordingly.

6.37.4 CONCRETE WATERPROOFING

6.37.4.1 MATERIALS

6.37.4.1.1 Silicone polymer (Silane), applied at a rate of 0.33 L/m^2 to a sample of concrete, shall meet the following requirements:

Product	(%) reduction in water absorption (min.)	(%) reduction in chloride penetration (min.)
Silane (solids content ≥ 40% by mass)	80	80
Silane or related product (solids content < 40% by mass	75	75

6.37.5 JOINT SEALANT

6.37.5.1 MATERIALS

6.37.5.1.1 The product shall be a grey, permanently-flexible, one-component, polyurethane-based elastomer sealant such as Sikaflex-1a, manufactured by Sika Canada Inc., or an equivalent approved by the Engineer.

6.37.5.1.2 The sealant shall retain its elasticity and durability in a temperature range of -40°C to +65°C.

6.37.6 PREMOULDED BACKER ROD

6.37.6.1 REFERENCE STANDARDS

6.37.6.1.1 The **Contractor** shall install premoulded backer rods in conformity to the following standards and documents to which the provisions of the Contract are added:

6.37.6.1.1.1 (ASTM) ASTM International

- ASTM D5167-03 *Standard Practice for Melting of Hot-Applied Joint and Crack Sealant and Filler for Evaluation*;
- ASTM D5329-04 *Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphaltic and Portland Cement Concrete Pavements*.

6.37.6.2 MATERIALS

6.37.6.2.1 The premoulded backer shall be a bitumen-impregnated material such as Flexcell, manufactured by Sternson Ltd., or an equivalent approved by the Engineer.

6.37.6.2.2 The premoulded backer rod (also known as expansion joint filler) shall conform to standards ASTM D5167 and ASTM D5329 and Quebec Department of Transport standard 4401 *Produits de colmatage de fissures et de joints*.

6.37.7 WATER STOPS

6.37.7.1 REFERENCE STANDARDS

6.37.7.1.1 The **Contractor** shall install water stops in conformity to the following standards and documents to which the provisions of the Contract are added:

6.37.7.1.1.1 (CGSB) Canadian General Standards Board

- CGSB 41-GP-35M *Polyvinyl Chloride Waterstop*.

6.37.7.2 MATERIALS

6.37.7.2.1 Water stops shall be made of a composite in which the basic resin is continuous polyvinyl chloride (PVC) with a centre bulb in conformity to standard CGSB 41-GP-35M.

6.37.7.2.2 Water stops shall meet the following criteria:

6.37.7.2.2.1 withstand indefinitely, when elongated by a 20 mm gap between monoliths, hydrostatic heads up to 20 m;

6.37.7.2.2.2 retain essential plasticity and elasticity at temperatures to -32°C;

6.37.7.2.2.3 have high durability under conditions of moisture, temperature and physical environment to which they will be subjected.

6.37.7.2.3 Water stops shall have a minimum weight of 2.16 kg/m for a width of 150 mm.

6.37.7.2.4 Joints in water stops shall be as waterproof as and have at least 50% of the tensile strength and flexibility of the continuous stop.

6.37.7.2.5 At the Engineer's request, the **Contractor** shall provide for testing purposes a 3 m length of the type of moulded water stop for which review is requested.

6.37.7.2.6 The sample shall be accompanied by a certificate identifying the material and certifying that it is the same in all respects as that used in the manufacture of the proposed water stops.

6.37.7.2.7 The sample and the certificate shall be provided at least fourteen (14) days before the water stops are delivered to the work site.

6.37.8 COATINGS FOR CONCRETE

6.37.8.1 REFERENCE STANDARDS

6.37.8.1.1 The **Contractor** shall remove and place the waterproof membrane in conformity to the following standards and documents to which the provisions of the Contract are added:

6.37.8.1.1.1 (CAN/CSA) Canadian Standards Association

- CAN/CSA-A23.1-04/A23.2-04 *Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete*;
- CAN/CSA A23.3-04 *Design of Concrete Structures*.

6.37.8.1.1.2 Ministère des Transports du Québec

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

6.37.8.2 WATERPROOF MEMBRANE

6.37.8.2.1 Materials

6.37.8.2.1.1 The new waterproof membrane shall be Vulkem 450/351 by Tremco or an equivalent approved by the Engineer.

6.37.8.2.1.2 Primer

6.37.8.2.1.2.1 The primer shall be Vulkem 171 by Tremco compatible with the waterproof membrane or an equivalent approved by the Engineer.

6.37.8.2.1.3 Base coat

6.37.8.2.1.3.1 The base coat shall be Vulkem 450 by Tremco, a one-component polyurethane elastomer coating that provides monolithic moisture protection for concrete, or an equivalent approved by the Engineer.

6.37.8.2.1.4 Top coat

6.37.8.2.1.4.1 The top coat shall be Vulkem 351 by Tremco, a one-component aliphatic polyurethane coating that provides UV stability and resistance to chemicals, or an equivalent approved by the Engineer.

6.37.8.2.2 Inspection and storage

6.37.8.2.2.1 Products shall be stored in a room where they are protected from moisture and freezing.

6.37.8.2.2.2 Once a container is opened, the product shall be used within twenty-four (24) hours.

6.37.8.2.3 Equipment and tools

6.37.8.2.3.1 Waterproofing products shall be applied as recommended by the manufacturer.

6.37.8.2.3.2 Products may be applied using a roller, brush or spray gun. Where a spray gun is used, it is recommended that the product be diluted with xylol at a ratio of 1 litre per 20 litres of product prior to spraying.

6.37.8.2.4 Performance of work

6.37.8.2.4.1 Removal of existing membrane

6.37.8.2.4.1.1 The **Contractor** shall note that the existing membrane consists of Vulkem 450 by Tremco (two (2) layers 1.5 mm thick) with a protective coating of Vulkem 451 by Tremco (0.15 mm thick).

6.37.8.2.4.1.2 Unless otherwise indicated by the Engineer, the **Contractor** shall remove the existing waterproof membrane in the areas indicated in the *Special Technical Conditions* and on the drawings.

6.37.8.2.4.1.3 Areas where existing membrane is removed beyond the limits specified in the *Special Technical Conditions*, on the drawings or by the Engineer will not be measured for payment and shall be covered with new membrane by the **Contractor** at no additional cost to the **Owner**.

6.37.8.2.4.1.4 The cost of demolition and disposal of the existing membrane during concrete demolition shall be included in the price tendered for the relevant concrete demolition payment items unless otherwise indicated in the *Special Technical Conditions*.

6.37.8.2.4.2 Placement of new membrane

6.37.8.2.4.2.1 The **Contractor** shall install the new waterproof membrane according to the manufacturer's instructions.

6.37.8.2.4.2.2 Unless otherwise indicated by the manufacturer, the concrete shall have been placed at least twenty-eight (28) days prior to application of the new membrane. If the membrane is applied earlier, the **Contractor** shall provide the Engineer with written certification from the manufacturer confirming the validity of the product guarantee.

6.37.8.2.4.2.3 The **Contractor** shall not apply a new membrane to damp or contaminated surfaces. Before the product is applied, measurements taken on the concrete by the **Contractor** with the Engineer present shall confirm that the moisture content of the concrete is less than 6%.

6.37.8.2.4.2.4 The concrete surfaces to be covered shall be free of dirt, laitance, oil, grease and other contaminants.

6.37.8.2.4.2.5 The temperature shall be above +10°C when the product is applied.

6.37.8.2.4.2.6 Unless otherwise indicated by the Engineer, the **Contractor** shall place a new waterproof membrane in the locations indicated in the *Special Technical Conditions* and on the drawings.

6.37.8.2.4.2.7 New membrane placed beyond the limits specified in the *Special Technical Conditions*, on the drawings or by the Engineer will not be measured for payment and shall be removed by the **Contractor** at no additional cost to the **Owner**.

6.37.8.2.5 Quality control

6.37.8.2.5.1 Quality control and compliance with any other requirements or recommendations from the manufacturer of the new membrane are the responsibility of the **Contractor**.

6.37.8.3 WATERPROOFING PRODUCT

6.37.8.3.1 Materials

6.37.8.3.1.1 Waterproofing of pre-stressed concrete beams shall be done by applying two (2) coats of a siloxane sealant such as Sikaguard-70 or an equivalent approved by the Engineer.

6.37.8.3.2 Performance of work

6.37.8.3.2.1 Waterproofing shall be applied in two (2) layers according to the manufacturer's instructions; the second layer shall be applied diagonally relative to the first.

END OF SUBSECTION