TENDER DOCUMENTS

SUBSECTION 6.42
PAINTING WORK

TABLE OF CONTENTS

PAGE

SUBSECTION 6.42 PAINTING WORK

6.42.1 GENERAL

6.42.1.1 This subsection describes the requirements relating to the painting works of steel surfaces covered by this Contract.

6.42.1.2 Any specific requirements, when necessary, pertaining to the painting of steel surfaces covered by this Contract are set out on the drawings and in Section 4 *Special Technical Conditions*.

6.42.1.3 The requirements relating to temporary structures are described in subsection 6.15 *Temporary Structures*.

6.42.1.4 The requirements relating to steelwork are described in subsection 6.41 *Steelwork*.

6.42.2 MEASUREMENT UNITS

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

Measurement Unit	Designation	Symbol
length	millimeter	mm
length	micrometer	µm
volume	liter	L
temperature	Celsius degree	°C

6.42.3 REFERENCE STANDARDS

6.42.3.1 The **Contractor** shall perform all painting work in accordance with the requirements of the following standards and documents, to which the provisions of this Contract are added:

6.42.3.1.1 ACNOR(CSA) Canadian Standards Association:

- CAN/CSA-Z94.4 *Selection, Use and Care of Respirators.*

6.42.3.1.2 (ASTM) ASTM International:

- ASTM B117 *Standard Practice for Operating Salt Spray (Fog) Apparatus*;
- ASTM B499 *Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals*;
- ASTM D185 *Standard Test Methods for Coarse Particles in Pigments*;
- ASTM D521 *Standard Test Methods for Chemical Analysis of Zinc Dust (Metallic Zinc Powder)*;

- ASTM D523 *Standard Test Method for Specular Gloss*;
- ASTM D562 *Standard Test Method for Consistency of Paints Measuring Krebs Unit (KU) Viscosity Using a Stormer-Type Viscometer;*
- ASTM D609 *Standard Practice for Preparation of Cold-Rolled Steel Panels for Testing Paint, Varnish, Conversion Coatings, and Related Coating Products*;
- ASTM D610 *Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces*;
- ASTM D714 *Standard Test Method for Evaluating Degree of Blistering of Paints*;
- ASTM D1210 *Standard Test Method for Fineness of Dispersion of Pigment-Vehicle Systems by Hegman-Type Gage*;
- ASTM D1475 *Standard Test Method for Density of Liquid Coatings, Inks, and Related Products*;
- ASTM D1640 *Standard Test Method for Drying, Curing, or Film Formation of organic Coatings at Room Temperature*;
- ASTM D1654 *Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments*;
- ASTM D2244 *Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates*;
- ASTM D2369 *Standard Test Method for Volatile Content of Coatings*;
- ASTM D2371 *Standard Test Method for Pigment Content of Solvent-Reducible Paints*;
- ASTM D2621 *Standard Test Method for Infrared Identification of Vehicle Solids from Solvent-Reducible Paints*;
- ASTM D2697 *Standard Test Method for Volume Nonvolatile Matter in Clear or Pigmented Coatings*;
- ASTM D3359 *Standard Test Methods for Measuring Adhesion by Tape Test*;
- ASTM D3960 *Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings*;
- ASTM D4214 *Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films*;
- ASTM D4414 *Standard Practice for Measurement of Wet Thickness by Notch Gages*;
- ASTM G154 *Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials*.

6.42.3.1.3 <u>(FED-STD) Federal Standards</u>:

- FED-STD-595B *Colors Used in Government Procurement.*

6.42.3.1.4 (CGSB) Canadian General Standards Board:

- CGSB 1-GP-71 *Methods of Testing Paints and Pigments*

6.42.3.1.5 (ISO) International Organization for Standardization:

- ISO 3549 Zinc d*ust pigments for paints - Specifications and test methods*

6.42.3.1.6 (SSPC) The Society for Protective Coatings:

- SSPC-PA 1, *Shop, Field and Maintenance Painting of Steel*;
- SSPC-PA 2, *Measurement of Dry Coating Thickness with Magnetic Gages*;
- SSPC-SP 1, *Solvent Cleaning;*
- SSPC-SP 2, *Hand Tool Cleaning*;
- SSPC-SP 3, *Power Tool Cleaning*;
- SSPC-SP 5/NACE No. 1, *White Metal Blast Cleaning*;
- SSPC-SP 6/NACE No. 3, *Commercial Blast Cleaning*;
- SSPC-SP 7/NACE No. 4, *Brush-Off Blast Cleaning;*
- SSPC-SP 10/NACE No. 2, *Near-White Blast Cleaning*;
- SSPC-SP 11, *Power Tool Cleaning to Bare Metal*;
- SSPC-SP 15, *Commercial Grade Power Tool Cleaning*;
- SSPC-Paint 20, *Zinc-Rich Primers (Type I Inorganic and Type II Organic)*;
- SSPC-Paint 29, *Zinc Dust Sacrificial Primer, Performance-Based*;
- SSPC-VIS 1 *Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning;*
- SSPC-VIS 3 *Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning.*

6.42.4 MATERIALS

6.42.4.1 GENERAL

6.42.4.1.1 Paints used in a given multiple coat system shall be supplied by the same manufacturer.

6.42.4.1.2 All products shall be lead and chromate free, with the exception of traces in driers or other additives contained in paint.

6.42.4.1.3 The colour of the topcoat of the system applied shall be the same as the colour of the existing paint on the structure, namely:

6.42.4.1.3.1 24300 green color compliant with standard FED-STD-595B for the Champlain and Jacques Cartier bridges;

6.42.4.1.3.2 16329 grey color compliant with standard FED-STD-595B for the Honoré Mercier Bridge.

6.42.4.1.4 Unless otherwise indicated on the drawings, the steel surfaces of the existing bridge members that come into contact with new steel plates shall be primed with a product whose technical data sheets clearly indicates that the product is “Class B slip and creep coefficient, suitable for use on bolted connections”. The product shall come from the same manufacturer and shall be compatible with the paint products of the subsequent coats, such as the intermediate and reinforcing coats and the topcoat.

6.42.4.2 GALVANIC/EPOXY RESIN/POLYURETHANE RESIN PAINT SYSTEM

6.42.4.2.1 Primer

6.42.4.2.1.1 The primer shall be organic zinc (Type II) compliant with standard SSPC-Paint 20 or organic zinc (Type II, Level 2) compliant with standard SSPC-Paint 29. The following primers, among others, meet these requirements:

MANUFACTURER	PRODUCT NAME	COLOUR
Ameron Canada	Amercoat 68HSC	Standard colour (green)
International Paint	Interzinc 52	Standard colour (grey green)
Pittsburgh Paints	UC65383/UC65384	Standard colour (grey green)
Sherwin-Williams	Zinc Clad 200	Standard colour (grey green)
Stoncor Group	Carbozinc 859	0300 (green)

6.42.4.2.2 Intermediate, reinforcing and sealing coats

6.42.4.2.2.1 The intermediate and the reinforcing coats shall be a two-component epoxy paint.

6.42.4.2.2.2 The two-component sealing coat shall be used around the angles, plates, splices or any other non-watertight assembly that could cause rust streaks after application of the final coat. One of the following products, or equivalent authorized by the Engineer, shall be used:

MANUFACTURER	PRODUCT NAME	COLOUR
Ameron Canada	Amerlock Sealer	Transparent
International Paint	Interplus 256	Aluminum
Sherwin Williams	Macropoxy 5000	Transparent

6.42.4.2.2.3 One of the following products, or equivalent authorized by the Engineer, shall be used when the intermediate and reinforcing coats are applied and cured at temperatures above 10°C:

MANUFACTURER	PRODUCT NAME	COLOUR
Ameron Canada	Amercoat 385	Intermediate coat: WH-1 (white) Reinforcing coat: 7821 (red)
International Paint	Intergard 475HS	Intermediate coat: 71020 (beige) Reinforcing coat: 71003 (red)
Pittsburgh Paints	Pitt-Guard 97-946/97-949	Intermediate coat: standard colour (white)
	Pitt-Guard 97-948/97-949	Reinforcing coat: standard colour (grey)
Sherwin-Williams	Macropoxy 646 Fast Cure Epoxy	Intermediate coat: SW4036 (white) Reinforcing coat: SW4014 (beige)
Stoncor Group	Carboguard 893	Intermediate coat: 0800 (white) Reinforcing coat: 0500 (red)

6.42.4.2.2.4 One of the following products, or equivalent authorized by the Engineer, shall be used when the intermediate and reinforcing coats are applied and cured at temperatures below 10°C and down to the minimum temperature specified by the manufacturer for each product:

MANUFACTURER	PRODUCT NAME	COLOUR
Ameron Canada	Amercoat 370	Intermediate coat: WH-1 (white) Reinforcing coat: 7821 (red)
International Paint	Intergard 670HS	Intermediate coat: 71020 (beige) Reinforcing coat: 71003 (red)
Pittsburgh Paints	Pitt-Guard 97-946/97-949	Intermediate coat: standard colour (white)
	Pitt-Guard 97-948/97-949	Reinforcing coat: standard colour (grey)
Sherwin-Williams	Macropoxy 846 Winter Grade Epoxy	Intermediate coat: SW4036 (white) Reinforcing coat: SW4014 (beige)

MANUFACTURER	PRODUCT NAME	COLOUR
Stoncor Group	Carbomastic 242	Intermediate coat: C901 (aluminum) Reinforcing coat: M500 (red)

6.42.4.2.3 Topcoat

6.42.4.2.3.1 The topcoat shall be two-component acrylic urethane and shall be supplied by the same manufacturer as that of the primer and intermediate coats. The topcoat shall not be applied if the temperature is below 5°C. One of the following products, or equivalent authorized by the Engineer, shall be used for the topcoat:

MANUFACTURER	PRODUCT NAME
Ameron Canada	Amercoat 450HS
International Paint	Interthane 990HS
Pittsburgh Paints	Pitthane 95-8000/95-819
Sherwin-Williams	Sherthane 2K
Stoncor Group	Carbothane 134HG

6.42.4.3 EPOXY RESIN AND ALUMINUM PIGMENT/POLYURETHANE RESIN PAINT SYSTEM

6.42.4.3.1 Intermediate, primer and sealing coats

6.42.4.3.1.1 The intermediate and primer coats shall be two-component epoxy and aluminum paint.

6.42.4.3.1.2 One of the following products, or equivalent authorized by the Engineer, shall be used to apply and cure the intermediate and primer coats:

MANUFACTURER	PRODUCT NAME
Ameron Canada	Amercoat 400AL
International Paint	Interseal 670HS

6.42.4.3.1.3 The two-component sealing coat shall be used around angles, plates, splices or any other non-watertight assembly that could cause rust streaks after application of the final coat. One of the following products shall be used:

MANUFACTURER	PRODUCT NAME	COLOUR
Ameron Canada	Amerlock Sealer	Transparent
International Paint	Interplus 256	Aluminum
Sherwin Williams	Macropoxy 5000	Transparent

6.42.4.3.2 Topcoat

6.42.4.3.2.1 The topcoat shall be two-component acrylic urethane and shall be supplied by the same manufacturer as that of the primer and intermediate coats. The topcoat shall not be applied if the temperature is below 5°C. One of the following products, or equivalent authorized by the Engineer, shall be used for the topcoat:

MANUFACTURER	PRODUCT NAME
Ameron Canada	Amercoat 450HS
International Paint	Interthane 990HS

6.42.4.4 THINNERS AND SOLVENTS

6.42.4.4.1 The thinners and solvents used by the **Contractor** shall meet the paint manufacturer's requirements.

6.42.4.5 ABRASIVES

6.42.4.5.1 Unless otherwise indicated on the drawings, the abrasives shall, on average, produce a steel surface with no irregularities exceeding 65 µm.

6.42.4.5.2 The abrasives used shall not contain crystalline silica or iron oxide.

6.42.5 DELIVERY, HANDLING AND STORAGE

6.42.5.1 No paint product shall be ordered without authorization from the Engineer.

6.42.5.2 The **Contractor** shall submit to the Engineer, for review, the technical data sheets and Material Safety Data Sheets of the paints, thinners, solvents, abrasives and any other cleaning products needed under this Contract.

6.42.5.3 All paint materials shall be delivered to the worksite in their original sealed container bearing a label containing the following information:

6.42.5.3.1 name of the manufacturer;

6.42.5.3.2 name of the product;

6.42.5.3.3 volume of the containers in litres;

6.42.5.3.4 production batch number;

6.42.5.3.5 type, colour and colour number;

6.42.5.3.6 date of filling of the container;

6.42.5.3.7 mixing and application instructions;

6.42.5.3.8 quantity and type of thinners;

6.42.5.3.9 WHMIS (Workplace Hazardous Materials Information System) requirements.

6.42.5.4 The samples to be submitted to the Engineer shall be placed in sealed 1 L high-density polyethylene containers.

6.42.5.5 All paint materials shall be stored and used in the manner and under the conditions recommended by the manufacturer.

6.42.5.6 The storage temperature shall be that specified by the manufacturer or, if no temperature is specified, it shall range between 5°C and 40°C.

6.42.5.7 After mixing, each paint shall meet the requirements of these specifications.

6.42.5.8 The requirements of paragraphs 6.42.5.1 to 6.42.5.7 also apply to the products delivered at the **Contractor**'s workshop or that of its subcontractor, if applicable.

6.42.6 EQUIPMENT AND TOOLS

6.42.6.1 GENERAL

6.42.6.1.1 All equipment needed to clean and paint the structure shall meet the requirements of the present specifications and the instructions from the manufacturer of the paint products to be applied.

6.42.6.1.2 All equipment shall meet the minimum requirements set out in the standard applicable to the paint system used.

6.42.6.2 VENTILATION SYSTEM

6.42.6.2.1 The ventilation system shall be appropriate for the surface preparation, cleaning and painting works.

6.42.6.2.2 To ensure ventilation of the space inside the enclosures during cleaning and surface preparation, the **Contractor** shall install an initial ventilation system that meets the following requirements:

6.42.6.2.2.1 the system shall comprise fans and dust collectors with filters;

6.42.6.2.2.2 the system capacity shall ensure that the air inside the enclosures is changed at least four (4) times an hour; additional capacity shall be contemplated for the air brought inside the enclosures by the air hoses used to clean the steel;

6.42.6.2.2.3 the system shall create negative pressure inside the enclosures;

6.42.6.2.2.4 the system shall reduce the concentrations of contaminants released inside the enclosures to levels below the thresholds permitted by the applicable legislation and federal and provincial government regulations in force and shall minimize the emissions of contaminants into the external atmosphere;

6.42.6.2.2.5 the system filters shall be cleaned and changed regularly so as to maintain the effectiveness of the system.

6.42.6.2.3 To ensure ventilation of the space inside the enclosures during painting, the **Contractor** shall install a second ventilation system that meets the following requirements:

6.42.6.2.3.1 the system shall comprise fans, vacuums and filters;

6.42.6.2.3.2 the system capacity shall ensure that the air in the confined space inside the enclosures is changed at least twice an hour;

6.42.6.2.3.3 the system shall create negative pressure inside the enclosures;

6.42.6.2.3.4 the system shall reduce the concentrations of paint fumes and particles inside the enclosures to levels below the concentrations permitted and shall minimize emission thereof into the external atmosphere;

6.42.6.2.3.5 the system filters shall be cleaned and changed regularly in order to maintain the effectiveness of the system.

6.42.6.3 DEHUMIDIFIER

6.42.6.3.1 The **Contractor** shall supply and install humidity control (drying) equipment inside the enclosures if required according to the Engineer's instructions and so as to meet the paint manufacturer's requirements.

6.42.6.4 BREATHABLE COMPRESSED AIR SYSTEM

6.42.6.4.1 The **Contractor** shall install a fixed network of rigid breathable compressed air pipes inside each enclosure with a sufficient number of air intakes. The intakes shall be positioned so that all parts of the worksite are accessible by the Engineer and the **Contractor**. Each intake shall be fitted with a breathable compressed air hose not more than 5 m long.

6.42.6.4.2 The **Contractor** shall supply three (3) breathable compressed air lines to the Engineer for the entire period of work. These breathable air lines shall comply with standard CAN/CSA-Z94.4.

6.42.6.4.3 The **Contractor** shall supply its stripping and painting workers with a sufficient number of breathable air lines and respirators in accordance with standard CAN/CSA-Z94.4.

6.42.7 EXECUTION OF WORK

6.42.7.1 GENERAL

6.42.7.1.1 The **Contractor** shall supply all the labour, machinery, equipment, tools and temporary structures needed to perform the cleaning and painting work in accordance with the drawings.

6.42.7.1.2 The **Contractor** shall further paint, in the workshop, the steel components to be installed at the worksite. These components shall be painted before transport thereof at the storage site designated by the **Owner**. It is the responsibility of the **Contractor** to ensure the integrity of the components to be assembled during handling, storage and installation.

6.42.7.2 PLANNING

6.42.7.2.1 At least twenty-one (21) days prior to the start of the painting work, the **Contractor** shall submit to the Engineer, for review, colour samples of each coat of paint.

6.42.7.2.2 At least fourteen (14) days before starting the installation of the temporary access devices and enclosures, the **Contractor** shall submit to the Engineer, for review, the drawings and design notes for the temporary access devices and enclosures and the technical data sheets for all components, such as the cables and trusses used to construct them, all in accordance with the requirements of subsection 6.15 *Temporary Structures*.

6.42.7.2.3 At least fourteen (14) days prior to the start of the steel cleaning work, the **Contractor** shall submit to the Engineer, for review, the technical data sheets and Material Safety Data Sheets for the paints and thinners and the cleaning and abrasive products it plans to use.

6.42.7.2.4 At least fourteen (14) days prior to the start of the painting work, the **Contractor** shall submit to the Engineer, for review, the following samples:

6.42.7.2.4.1 for one-component paints and for thinners, two (2) 1 L samples of each;

6.42.7.2.4.2 for two-component paints, two (2) samples of each component, unmixed and collected in the proportions recommended by the paint manufacturer;

6.42.7.2.4.3 when the paint system consists of one-component moisture cured polyurethane paints, the paint manufacturer shall provide to the Engineer, through the **Contractor**, for each batch, with two (2) 1 L samples of each paint and thinner in original containers that have not been previously opened.

6.42.7.2.5 At least fourteen (14) days prior to the start of cleaning and painting work, the **Contractor** shall submit to the Engineer, for review, the list of the materials and specialized equipment it plans to use.

6.42.7.3 PROTECTION OF EXISTING ELEMENTS

6.42.7.3.1 Before starting the cleaning and painting work, the **Contractor** shall tightly cover and protect, without limitation, the following: all moving parts of all expansion elements and the mobile bearings, as well as the equipment and control panels near the work site in order to prevent them from coming into contact with abrasives, dust, dirt or paint.

6.42.7.3.2 The **Contractor** shall thoroughly clean all parts, elements and equipment referred to in paragraph 6.42.7.3.1 in the event that they are contaminated by the work.

6.42.7.4 SURFACE PREPARATION

6.42.7.4.1 Galvanizing/epoxy resin/polyurethane resin paint system

6.42.7.4.1.1 The **Contractor** shall clean, by means of abrasive blasting, all steel components that are to be painted in order to remove all dust, rust and existing paint to the Engineer's satisfaction and so that the cleaned surfaces comply with standards SSPC-SP 5/NACE Nº 1 and SSPC-VIS 1. Salt, oil and grease shall be removed with a solvent to the Engineer's satisfaction and so that the cleaned surfaces comply with standard SSPC-SP1.

6.42.7.4.1.2 The **Contractor** shall clean the surfaces that cannot be reached by dry abrasive blasting so as to obtain a minimum degree of preparation that complies with standard SSPC-SP 11 as well as to the satisfaction of the Engineer. Only the Engineer can authorize a preparation that complies with standard SSPC-SP 11 rather than with standard SSPC-SP 5/NACE Nº 1. Where applicable, the **Contractor** shall use mechanical and hand tools as well as solvents to remove all salt, oil, grease, dust, rust, rust scale and all existing paint. The **Contractor** shall use needle-scalers, scissors and other equipment approved by the Engineer to remove rust from cracks.

6.42.7.4.1.3 Dust and other dirt on surfaces to be repainted following stripping and on the floors, walls and joints of containment structures shall be removed using a vacuum or compressed air.

6.42.7.4.2 Epoxy resin and aluminum pigment/polyurethane resin paint system

6.42.7.4.2.1 The **Contractor** shall clean, by means of abrasive blasting, all steel components that are to be painted in order to remove all dust, rust or existing paint to the Engineer's satisfaction and so that the cleaned surfaces shall comply with standards SSPC-SP 6/NACE Nº 3 and SSPC-VIS 1. Salt, oil and grease shall be removed with a solvent to the Engineer's satisfaction and so that the cleaned surfaces comply with standard SSPC-SP1.

6.42.7.4.2.2 Only the Engineer can authorize a preparation that comply with the indications on the drawings. Where the surfaces to be painted are smaller than 10 m^2 in total and subsequent to approval by the Engineer, the **Contractor** may clean the surfaces of the steel components to be painted using mechanical and hand tools as well as solvents to remove all salt, oil, grease, dust, rust, rust scale and all existing paint so that the cleaned surfaces comply with standards SSPC-SP 11 and SSPC-VIS 3 and are to the complete satisfaction of the Engineer.

6.42.7.4.3 Just before painting, the **Contractor** shall remove any loose particles from the stripped surfaces by means of dry compressed air.

6.42.7.4.4 The quality of the surface preparation of the metal to be painted shall be approved by the Engineer prior to the start of painting work. The **Contractor** shall provide the Engineer with access and sufficient time to inspect the cleaning work. In the event of non-conformity, the **Contractor** shall resume the work, to the satisfaction of the Engineer, at no additional cost to the **Owner**.

6.42.7.4.5 For the purposes of surface preparation, the ambient conditions inside the enclosures in respect of heat, light, humidity and ventilation shall meet the requirements of the present specifications and the paint manufacturer's recommendations and are at all times subject to approval by the Engineer.

6.42.7.5 APPLICATION CONDITIONS

6.42.7.5.1 The paint shall be applied in accordance with the requirements of the present specifications and those indicated in the paint manufacturers' technical data sheets. Any deviation from a requirement of these specifications shall be approved by the Engineer in writing prior to the start of work.

6.42.7.5.2 For the purposes of paint application, the ambient conditions inside the enclosures in respect of heat, light, humidity and ventilation shall meet the requirements of present specifications and those indicated in the paint manufacturer's recommendations and are at all times subject to approval by the Engineer. In case of contradiction between the requirements of the two (2) documents, the requirements or specifications that are the most stringent and in the **Owner**'s advantage shall prevail.

6.42.7.5.3 All cleaned surfaces shall be covered with a first coat of paint as soon as possible following surface preparation and before surface rust appears, and in all cases within six (6) hours.

6.42.7.5.3.1 At temperatures below 5°C, the corrosion process is null. The application may therefore be delayed by more than six (6) hours after the surface preparation as long as the temperature inside the enclosure and that of the steel comply with those indicated in paragraphs 6.42.7.5.5.1 and 6.42.7.5.5.2 when the paint is applied. The **Contractor** shall, however, apply the first coat in accordance with the manufacturer's requirements.

6.42.7.5.4 Any surface rust that appears between the completion of cleaning and the application of the first coat of paint shall be removed by light abrasive blasting, to the satisfaction of the Engineer.

6.42.7.5.5 The **Contractor** shall apply each coat that is part of the paint system when:

6.42.7.5.5.1 the temperature of the air and of the surfaces to be covered is above 5°C;

6.42.7.5.5.2 the temperature of the steel surface to be covered is above the dew point plus 3°C;

6.42.7.5.5.3 the surface to be covered is dry;

6.42.7.5.5.4 the coat of paint applied previously is sufficiently cured.

6.42.7.5.6 If necessary, the **Contractor** shall heat the enclosures to maintain the surfaces to be painted and the inside of the enclosures at a minimum temperature of 5°C while the paint is being applied and until the paint has cured. The temperature shall be adjusted upwards in function of the application time specified in the manufacturer's technical data sheets or according to the work schedule. Temperatures that are too cold delay the curing of the coat applied and the application of the subsequent coats of paint.

6.42.7.6 PAINTING OF SURFACES

6.42.7.6.1 General

6.42.7.6.1.1 The **Contractor** shall mechanically stir each paint component, according to the manufacturer’s recommendations, in order to ensure the homogeneity of the product prior to mixing.

6.42.7.6.1.2 The **Contractor** shall subsequently mix and mechanically stir the components of the paint to be applied, according to the manufacturer’s recommendations, in order to ensure a homogenous mixture prior to application.

6.42.7.6.1.3 The **Contractor** shall, for the paint spray gun, use the minimum air pressure needed to obtain a suitable spray.

6.42.7.6.1.4 The **Contractor** shall mix the paint thoroughly and run it through a sieve when pouring it into the spray gun containers or paint cans.

6.42.7.6.1.5 Once applied, the dry paint film shall be free of runs, coarse particles and craters.

6.42.7.6.1.6 The appearance of the dry paint film shall be even in terms of texture, colour and shine.

6.42.7.6.1.7 The application and curing of the paints shall meet the requirements of the paint manufacturer.

6.42.7.6.1.8 The **Contractor** shall not apply a new coat until any dust that may have adhered to the previous coat has been removed.

6.42.7.6.1.9 The **Contractor** shall, immediately after the application of each coat, take all necessary precautions to prevent dust, abrasives or any other foreign matter from falling onto the freshly painted surfaces.

6.42.7.6.1.10 The **Contractor** shall implement the appropriate fire protection measures such as fire extinguishers or other to prevent the risk of fire caused by flame or any other potential sources of heat.

6.42.7.6.2 Zinc-based /epoxy resin/polyurethane resin paint system

6.42.7.6.2.1 Before applying the first coat of the system, the bolts and nuts shall be completely covered with paint applied with a brush. The paint applied shall be the same as that used for the first coat.

6.42.7.6.2.2 An organic zinc-based paint shall however be applied on the bolts if a zinc and inorganic binder paint is used as the first coat.

6.42.7.6.2.3 The **Contractor** shall paint in the workshop all elements to be delivered to the worksite and all specified steel surfaces with a coat of organic zinc primer which shall have a minimum dry film thickness of 75 µm and be applied with a spray gun using multiple criss-crossing passes in order to obtain an even film thickness.

6.42.7.6.2.4 The contact surfaces of the parts to be assembled by bolting shall not be painted, except over a distance of 5 mm around one of the parts to be assembled, so that all visible steel surfaces of the assembly are coated after assembly. In addition, the surfaces of steel components to be welded at the worksite shall be free of paint over a minimum width of 50 mm and the surfaces to be painted shall be protected from sparks and flame.

6.42.7.6.2.5 For the components fabricated at the factory, the intermediate coat of two-component epoxy paint shall be applied at the factory to all surfaces, taking care to protect the contact surfaces of the components to be assembled, as specified in paragraph 6.42.7.6.2.1. The intermediate coat shall have a dry film thickness of at least 150 µm. The **Contractor** shall apply, at the factory, a reinforcing coat of two-component epoxy paint on the edges of the members and welds of all elements to be delivered to the worksite. The epoxy reinforcing coat on the assemblies already existing on the worksite also applies to cracks, rivets, bolts, nuts and washers.

6.42.7.6.2.6 The **Contractor** shall subsequently apply, on the assemblies already existing on the worksite, a reinforcing coat of two-component epoxy paint on the edges of members, rivets, bolts, welds, nuts and washers. The reinforcing coat shall be applied with a brush and/or spray gun. In addition, a sealing coat shall be applied in the corroded areas of cracks located between the surfaces that come into contact on members that are reinforced by overlapping, such as deck girders, deck stringers, truss diagonals, top and bottom members of trusses, truss studs and the bracing, in accordance with the manufacturer's recommendations and as indicated on the drawings.

6.42.7.6.2.7 The reinforcing and sealing coats shall be applied so as to ensure complete coverage and penetration of the paint in and around the components referred to in paragraph 6.42.6.6.2.6. The reinforcing coat shall extend at least 40 mm beyond the perimeter of the component to be covered, as indicated on the drawings.

6.42.7.6.2.8 The two-component acrylic urethane topcoat shall be applied after the epoxy paint has cured and shall have a minimum dry film thickness of 50 µm.

6.42.7.6.2.9 The topcoat shall be applied as specified by the manufacturer's technical data sheets, without exceeding the seven (7) day maximum delay allotted after the first coat of paint is applied.

6.42.7.6.3 Epoxy resin and aluminum pigment/polyurethane resin paint system

6.42.7.6.3.1 The **Contractor** shall apply to all specified steel surfaces, using a brush or a spray gun, a coat of two-component epoxy resin and aluminum pigment primer which shall have a minimum dry film thickness of 100 µm.

6.42.7.6.3.2 The **Contractor** shall subsequently apply, using a brush or spray gun, a second coat of two-component epoxy resin and aluminum pigment paint with a minimum dry film thickness of 100 µm to all surfaces.

6.42.7.6.3.3 The two-component acrylic urethane topcoat shall be applied after the second coat of epoxy paint has cured and shall have a minimum dry film thickness of 50 µm.

6.42.7.7 TOUCH-UPS

6.42.7.7.1 The **Contractor** shall take every precaution to minimize the need for surfaces to be touched up.

6.42.7.7.2 The painted surfaces damaged during the work shall be cleaned so as to remove, to the satisfaction of the Engineer, any damaged paint and any other contaminant. After cleaning, dust and other dirt on the surface to be touched up shall be removed, recovered and disposed of.

6.42.7.7.3 The touch-ups shall be done on all surfaces damaged during the work period by applying the original paint system.

6.42.7.7.4 The existing painted surfaces damaged during work to modify or repair a steel structure or metal member shall be touched up using an epoxy resin and aluminum pigment/polyurethane resin system.

6.42.7.8 PAINTING METALLIZED AND GALVANIZED STEEL SURFACES

6.42.7.8.1 The surfaces to be covered shall be treated with chromate, cleaned by hand using a wire brush and a solvent in order to remove the glossy appearance, without however damaging the zinc coating, in accordance with the paint manufacturer's requirements or by abrasive sandblasting in accordance with standard SSPC-SP7/NACE 4 to create adhesion properties.

6.42.7.8.2 The epoxy resin and polyurethane resin paints used to paint freshly metallized and galvanized steel surfaces shall be one of the products specified in paragraphs 6.42.4.2.2 and 6.42.4.2.3 or equivalent authorized by the Engineer.

6.42.7.8.3 For the first coat of paint, a tack coat shall be applied. This tack coat consists of a mist made from the epoxy resin paint used for the first coat, thinned according to the manufacturer's recommendations.

6.42.7.8.4 The first coat shall consist of a coat of epoxy resin paint with a minimum dry film thickness of 100 µm.

6.42.7.8.5 The topcoat shall consist of a coat of polyurethane resin paint with a minimum dry film thickness of 50 µm.

6.42.7.8.6 All metallized surfaces shall be covered, to the satisfaction of the Engineer, with a first coat of paint as soon as possible after the metallization of the surfaces.

6.42.7.8.7 The topcoat shall be applied as specified by the manufacturer's technical data sheets, without exceeding the seven (7) day maximum delay allotted after the first coat of paint is applied.

6.42.7.8.8 If there is moisture in the pores of the metallized coating, the steel shall be heated to a temperature of 120°C so as to remove the moisture before the paint is applied.

6.42.7.9 DISPOSAL OF MATERIALS

6.42.7.9.1 The **Contractor** shall collect and dispose of contaminated paint and abrasive residues resulting from abrasive blasting so as to prevent the contamination of persons, surrounding properties and the natural environment.

6.42.7.9.1.1 The **Contractor** shall consider other solid residues including, without however being limited to, dust collector filters, respirator cartridges, soiled clothing, rags, empty cans of paint, solvents and thinners, and the soils contaminated accidentally.

6.42.7.9.1.2 The **Contractor** shall also consider that the paint and abrasive residues have a lead and zinc content, thus characterizing them as hazardous materials, and the **Contractor** shall dispose of them in accordance with subsection 6.13 *Environmental Protection*, at no additional cost to the **Owner**.

6.42.7.9.2 The **Owner** will not accept any discharge of abrasives or other stripping materials from enclosures, platforms and scaffolding.

6.42.7.9.3 The **Contractor** shall recover the contaminating residues, in accordance with subsection 6.13 *Environmental Protection*, in sealed containers and store them on the worksite temporarily.

6.42.7.9.4 The **Contractor** shall collect representative samples of cleaning residues and characterize them. The characterization analyses indicating concentrations of contaminants in the residue leachate shall be carried out by a laboratory, member of the *Association des firmes de genie-conseil - Québec (AFG),* retained by the **Contractor**, and the results shall be submitted to the Engineer in writing before the residues are removed from the worksite.

6.42.7.9.5 The materials to be disposed of under this Contract and characterized as hazardous materials shall be removed from the **Owner**'s property in accordance with the applicable environmental protection statutes and regulations in force and in accordance with subsection 6.13 *Environmental Protection.*

6.42.7.9.6 To monitor contaminated abrasives, the **Contractor** shall periodically submit to the Engineer, on the worksite, a mass balance of the abrasives at the entrance and exit of the worksite.

6.42.8 QUALITY CONTROL

6.42.8.1 GENERAL

6.42.8.1.1 The **Contractor** shall develop, implement and maintain a quality control system for surface preparation, cleaning and painting works. The **Contractor**'s quality control system shall be developed so as to meet the requirements described in the present specifications, the rules of good practice and the Engineer's instructions.

6.42.8.1.2 The cleaning and painting work will be marked by staging points. A staging point is a point beyond which an activity conducted by the **Contractor** must not continue without the written authorization from the Engineer. A minimum of seven (7) staging points is to be expected, namely one after each activity listed in paragraphs 6.42.8.1.7.1 to 6.42.8.1.7.7.

6.42.8.1.3 At each staging point, the **Contractor** shall submit to the Engineer, who will acknowledge reception, a quality control sheet of the work done, which shall be completed. The control sheet shall include all information and surveys related to the quality control of the work carried out during the work phase. The control sheet shall also clearly indicate the extent of the work zone covered within that phase, in accordance with Appendix 6.42-I *Control Sheet – Paint* of this subsection.

6.42.8.1.4 The acknowledgment of receipt of the control sheets by the Engineer in no way means that the Engineer has double checked the data and surveys recorded on the control sheet and in no way relieves the **Contractor** of its obligation to perform the work in accordance with the requirements of this Contract.

6.42.8.1.5 Notwithstanding the fact that the Engineer will monitor the quality of the work and, to that end, designate painting inspectors who will be assigned to this task, the **Contractor** is still responsible for the quality control of the works. The **Contractor** shall provide the necessary assistance to ensure that the required monitoring is carried out effectively. To that end, the **Contractor** shall meet the following requirements without, however, being limited thereto:

6.42.8.1.5.1 the **Contractor**, shall, in parallel with the painting inspectors or with the Engineer, conduct an inspection of each phase of work in order to ensure that the work meets the requirements of this Contract. The **Contractor** shall, at all times, allow the painting inspectors or the Engineer to access the painting workshops, the factory and the worksite to validate the quality of the work. The **Contractor** shall notify the Engineer, within a reasonable time, that the work is ready for inspection;

6.42.8.1.5.2 the **Contractor** shall leave the scaffolding, access walkways and other access devices in place for at least seventy-two (72) hours after application of the topcoat to allow the painting inspectors or the Engineer to validate the quality of the work. This period may occasionally be extended if weather conditions so require;

6.42.8.1.5.3 the **Contractor** shall interrupt the stripping work for twenty (20) minutes, three (3) times a day, to allow the painting inspectors or the Engineer to inspect the stripping of the steel surfaces. The schedule of such inspections shall be set jointly by the Engineer and the **Contractor**, to the satisfaction of the Engineer, prior to the start of work;

6.42.8.1.5.4 if painting work is being carried out simultaneously in two (2) separate enclosures, the **Contractor** shall plan the interruptions of the stripping so as to make it possible to conduct the inspection of the two (2) enclosures during two (2) separate interruption periods.

6.42.8.1.6 The Engineer may decide to forgo one or more inspections. The **Contractor** remains responsible for the quality control of the work and, therefore, is solely responsible for any failure in the paint system, any disruption in the **Contractor**'s activities or any additional costs incurred to redo the work in areas where the work has already been completed but has been deemed non-compliant by the Engineer.

6.42.8.1.7 For all surfaces to be cleaned and painted, the inspections by the painting inspectors or by the Engineer shall be conducted after each of the following phases of work:

6.42.8.1.7.1 surface preparation according to the drawings and measurement of the surface profile (Testex-Gage);

6.42.8.1.7.2 cleaning of surfaces prior to starting the application of the primer;

6.42.8.1.7.3 application of the primer;

6.42.8.1.7.4 application of the intermediate coat after visual inspection and measurement of the primer coat thickness (SSPC-PA 2);

6.42.8.1.7.5 application of a two-component epoxy paint coat, a reinforcing coat, with a brush, to all edges, cracks, rivets, bolts, nuts, washers and welds, where applicable, in the case of the system described in article 6.42.4.2 *Galvanic/epoxy resin/polyurethane resin paint system*. The **Contractor** shall apply a sealing coat around the angles, plates, splices or any other non-watertight assembly that could cause rust streaks after application of the final coat;

6.42.8.1.7.6 application of topcoat after visual inspection and measurement of the primer coat thickness in accordance to SSPC-PA 2 standard;

6.42.8.1.7.7 correction of defects.

6.42.8.1.8 The Engineer may conduct additional inspections as needed to validate the quality of the work. In such cases, the **Contractor** shall provide all the assistance required to ensure that the inspections are conducted effectively.

6.42.8.1.9 The **Contractor** shall measure the wet film thickness (wet film thickness gauge) as application proceeds to ensure that the stipulated dry film thickness will be obtained after drying.

6.42.8.1.10 The wet film thickness of the various coats of paint shall be determined based on the requirements of standard ASTM D4414.

6.42.8.1.11 The wet film thickness corresponding to the stipulated dry film thickness is determined by the following formula:

$$H = T \bullet \left(\frac{100 + D}{B} \right)$$

H: wet film thickness (µm);

T: stipulated dry film thickness (µm);

D: volume percentage of thinner added, if necessary;

B: volume percentage of non-volatile matters in undiluted material.

6.42.8.1.12 The dry film thickness of the various coats of paint shall be determined in accordance with the requirements of standard SSPC-PA 2.

6.42.8.1.13 Depending on the type of measuring device used to verify the dry film thickness, one of the following methods shall be used:

6.42.8.1.13.1 SSPC-PA 2 Type 1 for magnetic pull-off gauges;

6.42.8.1.13.2 SSPC-PA 2 Type 2 for fixed-probe electromagnetic gauges.

6.42.8.1.14 The system's paint film shall have a minimum adhesion of 3A when tested by *Test Method A – X Cut Tape Test* described in standard ASTM D3359.

END OF SUBSECTION

APPENDIX 6.42-I
CONTROL SHEET – PAINT
(2 PAGES)

Ponts JACQUES CARTIER + CHAMPLAIN Bridges
Canada

FICHE DE CONTRÔLE
PEINTURE

N° Contrat : 6XXXX
N° Projet : XXXXXXX

Laboratoire du Propriétaire :

Étendue de la zone [enceinte de					
N° fiche(s) de contrôle de					
CONDITIONS D'APPLICATION					**CONFORME / N.C.**
Date :					
Heure inspection :					
Décapage au jet d'abrasif Profil de surface mesuré :					(Choix)
Type de couche :	**(Choix)**	**(Choix)**	**(Choix)**	**(Choix)**	
Température ambiante intérieur enceinte (°C) :					(Choix)
Température de l'acier / surface à recouvrir (°C) :					(Choix)
Température produit à appliquer (°C) :					(Choix)
Température du point de rosée (°C) :					(Choix)
Humidité relative (%) :					(Choix)
Heure fin de préparation surface (si applicable) :					
Heure d'application de la couche d'apprêt (maximum 6 heures après décapage) :					(Choix)
Vérifications à inscrire au rapport journalier (liste non exhaustive)	- *Conditions d'entreposage du produit à appliquer*				
	- *Étanchéité de l'enceinte*				
	- *Protection du matériel existant*				
	- *Nettoyage de la poussière avant l'application de chaque couche*				
	- *Évacuation des matériaux et résidus avant démantèlement de l'enceinte*				

Ponts JACQUES CARTIER + CHAMPLAIN Bridges
Canada

FICHE DE CONTRÔLE
PEINTURE

N° Contrat : 6XXXX
N° Projet : XXXXXXX

MESURES D'ÉPAISSEURS					
ÉPAISSEURS	**FEUIL HUMIDE**	**FEUIL HUMIDE**	**FEUIL HUMIDE**	**FEUIL HUMIDE**	**FEUIL SEC**
Critères de conformité :					
Épaisseur minimale mesurée (µm) :					
Épaisseur maximale mesurée (µm) :					
Épaisseur moyenne calculée (µm) :					
Nombre de mesures prises :					

REMARQUES

CROQUIS
Insérer le croquis *(S'assurer de bien localiser la zone / phase concernée par les travaux sous-axe(s) concerné(s), élément(s) concerné(s) (corde supérieure / inférieure, montant, diagonale, contreventement horizontal,etc.), côté(s) (intérieur / extérieur))*

Nom du Surveillant et signature : _____

Date de signature :