TENDER DOCUMENTS

SUBSECTION 6.42

PAINTING WORK

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SOUS-SECTION 6.42 PAINTING WORK

6.42.1 GENERAL

6.42.1.1 This subsection describes requirements for steel surface painting work to be performed under this Contract. The requirements apply to work performed both in the shop and at the worksite.

6.42.1.2 Where applicable, specific requirements for steel surface painting work to be performed under this Contract are specified on the plans and in Section 4 – *Special Technical Conditions*.

6.42.1.3 Requirements for temporary structures are described in subsection 6.15 – *Temporary Structures*.

6.42.1.4 Requirements for steelwork are described in subsection 6.41 – *Steelwork*.

6.42.2 UNITS OF MEASURE

6.42.2.1 The units of measure and their respective symbols used in this subsection are as follows:

Unit of Measure	Designation	Symbol
length	millimetre	mm
length	micrometre	µm
volume	litre	L
temperature	degree Celsius	°C

6.42.3 REFERENCE STANDARDS

6.42.3.1 The Contractor shall carry out all work in accordance with the requirements set out in the following standards and documents, in addition to the provisions of this Contract:

6.42.3.1.1 CSA Group (CAN/CSA)

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

6.42.3.1.2 ASTM International (ASTM)

- ASTM B499 *Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals*
- ASTM D1186 *Standard Test Methods for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base*
- ASTM D7091 *Standard Practice for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to Ferrous Metals and Nonmagnetic, Nonconductive Coatings Applied to Non-Ferrous Metals*

- ASTM D4417 *Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel*
- 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 D3359 *Standard Test Methods for Measuring Adhesion by Tape Test*
- ASTM D4214 *Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films*
- ASTM D4285 *Standard Test Method for Indicating Oil or Water in Compressed Air*
- ASTM D4414 *Standard Practice for Measurement of Wet Film Thickness by Notch Gages*

6.42.3.1.3 Federal Standards (FED-STD)

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

6.42.3.1.4 Northeast Protective Coatings Committee (NEPCOAT) "Acceptance Criteria List A, B, C, D"

6.42.3.1.5 Canadian General Standards Board (CGSB)

6.42.3.1.6 International Organization for Standardization (ISO)

6.42.3.1.7 The Society for Protective Coatings (SSPC)

- 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 as part of the same multi-coat system shall be supplied by the same paint product manufacturer.

6.42.4.1.2 All products shall be free of lead and chromate, except for trace amounts in driers or other paint additives.

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 Green 24300, as specified in FED-STD-595B, for the Jacques Cartier Bridge, its A, B, DE and DW viaducts, as well as its upstream and downstream ramps

6.42.4.1.3.2 Grey 16329, as specified in FED-STD-595B, for the Honoré Mercier Bridge

6.42.4.1.3.3 Slate grey 26132, as specified in FED-STD-595B, for the Québec Bridge

6.42.4.1.3.4 Grey 26408, as specified in FED-STD-595B, for the steel pier caps of the Clément Bridge

6.42.4.1.3.5 White 37733, as specified in FED-STD-595B, for the Bonaventure Expressway

6.42.4.1.3.6 The colour codes listed below shall be verified with the Engineer before colour samples are supplied, in accordance with paragraph 6.42.7.2.1.

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

6.42.4.2 GALVANIZING / EPOXY RESIN / POLYURETHANE RESIN PAINT SYSTEM

6.42.4.2.1 Primer and reinforcing coats

6.42.4.2.1.1 An organic zinc product (Type II, Level I) shall be used for the primer and reinforcing coats, in accordance with SSPC-Paint 20. The following primers, among others, meet these requirements:

MANUFACTURER	PRODUCT NAME	COLOUR
PPG	Amercoat 68HSC	Standard colour (green)
Sherwin-Williams	Zinc Clad 4100	Standard colour (grey green)
International Paint (AkzoNobel)	Interzinc 52	Standard colour (grey green)
Carboline	Carbozinc 859	Standard colour (grey green)

6.42.4.2.2 Intermediate and reinforcing coats

6.42.4.2.2.1 A two-component epoxy paint shall be used for the intermediate and reinforcing coats.

6.42.4.2.2.2 One of the following products, or equivalent as approved 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
PPG	Amercoat 385	Intermediate coat: WH-1 (white) Reinforcing coat: 7821 (red)
International Paint (AkzoNobel)	Intergard 475HS	Intermediate coat: 71020 (beige) Reinforcing coat: 71003 (red)
Sherwin-Williams	Macropoxy 646 Fast Cure Epoxy	Intermediate coat: SW4036 (white) Reinforcing coat: SW4014 (beige)
Carboline	Carboguard 893	Intermediate coat: 0800 (white) Reinforcing coat: 0700 (grey)

6.42.4.2.2.3 One of the following products, or equivalent as approved by the Engineer, shall be used when the intermediate and reinforcing coats are applied and cured at temperatures below 10°C (but at no less than the minimum temperature specified by the manufacturer for each product):

MANUFACTURER	PRODUCT NAME	COLOUR
PPG	Amercoat 370	Intermediate coat: WH-1 (white) Reinforcing coat: 7821 (red)
International Paint (AkzoNobel)	Intergard 670HS	Intermediate coat: 71020 (beige) Reinforcing coat: 71003 (red)
Sherwin-Williams	Dura-Plate 235	Intermediate coat: SW4036 (white) Reinforcing coat: SW4014 (beige)
Carboline	Carbomastic 615 AL	Intermediate coat: C901 (aluminium)
	Carboguard 635	Reinforcing coat: C703 (grey)

6.42.4.2.3 Topcoat

6.42.4.2.3.1 A two-component acrylic urethane paint, supplied by the same paint product manufacturer as that used for the primer and intermediate coats, shall be used for the topcoat. The topcoat shall not be applied at temperatures below 5°C. One of the following products, or equivalent as approved by the Engineer, shall be used for the topcoat:

MANUFACTURER	PRODUCT NAME
PPG	Amercoat 450HS
International Paint (AkzoNobel)	Interthane 990HS
Sherwin-Williams	Acrolon 218
Carboline	Carbothane 134HG

6.42.4.3 ALUMINUM PIGMENT EPOXY RESIN / POLYURETHANE RESIN PAINT SYSTEMS

6.42.4.3.1 Primer and intermediate coats

6.42.4.3.1.1 A two-component epoxy and aluminium paint shall be used for the primer and intermediate coats.

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

MANUFACTURER	PRODUCT NAME
PPG	Amercoat 400AL
International Paint (AkzoNobel)	Interseal 670HS
Sherwin-Williams	Epoxy Mastic Aluminum II
Carboline	Carbomastic 90

6.42.4.3.2 Topcoat

6.42.4.3.2.1 A two-component acrylic urethane paint, supplied by the same paint product manufacturer as that used for the primer and intermediate coats, shall be used for the topcoat. The topcoat shall not be applied at temperatures below 5°C. One of the following products, or equivalent as approved by the Engineer, shall be used for the topcoat:

MANUFACTURER	PRODUCT NAME
PPG	Amercoat 450HS
International Paint (AkzoNobel)	Interthane 990V
Sherwin-Williams	Acrolon 218
Carboline	Carbothane 134 HG

6.42.4.4 SEALING COAT

6.42.4.4.1 A two-component sealing coat shall be applied around angles, plates, splices or any other non-watertight assemblies that could cause rust streaks after application of the primer coat. One of the following products, or equivalent as approved by the Engineer, shall be used:

MANUFACTURER	PRODUCT NAME	COLOUR
PPG	Amerlock Sealer	Clear
International Paint (AkzoNobel)	Interplus 256	Aluminum
Sherwin-Williams	Macropoxy 5000 / Macropoxy 920 Pre-Prime	Clear
Carboline	Rustbond PS	Clear

6.42.4.5 THINNERS AND SOLVENTS

6.42.4.5.1 Thinners and solvents used by the Contractor shall comply with the paint product manufacturer's recommendations.

6.42.4.6 ABRASIVES

6.42.4.6.1 If the technical data sheets do not specify a roughness profile for the steel and unless otherwise specified on the plans, the roughness profile shall be between 38 and 75 microns.

6.42.4.6.2 The abrasives used shall not contain crystalline silica or iron oxide, and shall not be made from recycled materials.

6.42.5 DELIVERY, HANDLING AND STORAGE

6.42.5.1 No paint products shall be ordered without prior authorization by the Engineer.

6.42.5.2 The Contractor shall submit to the Engineer, for review, the technical and safety data sheets for the paints, thinners, solvents, abrasives and any other cleaning products required under this Contract.

6.42.5.3 All paint products shall be delivered to the worksite in their original sealed containers, labelled with the following information:

6.42.5.3.1 Name of paint product manufacturer

6.42.5.3.2 Name of product

6.42.5.3.3 Volume of container 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 container was filled

6.42.5.3.7 Mixing and application instructions

6.42.5.3.8 Quantity and type of thinning solvent

6.42.5.3.9 Workplace Hazardous Materials Information System (WHMIS) requirements

6.42.5.4 All paint products shall be stored, prepared and used in accordance with the manufacturer's recommendations.

6.42.5.5 No paint products other than those authorized by the Engineer shall be present at the worksite.

The storage temperature shall correspond to that specified by the paint product manufacturer or, if no storage temperature is specified, it shall range between 5°C and 40°C. Once mixed, each paint shall meet the requirements of this subsection. The requirements described in paragraphs 6.42.5.1 to 6.42.5.7 of this subsection also apply to any products delivered to the Contractor's facilities or those of a subcontractor.

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 this subsection and follow the paint product manufacturer's recommendations.

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 selected based on the surface preparation, cleaning and painting work being executed.

6.42.6.2.2 To ensure that the interior of each enclosure is properly ventilated while cleaning and surface preparation are underway, the Contractor shall install a first ventilation system that meets the following requirements:

6.42.6.2.2.1 The system shall include fans and dust collectors with filters.

6.42.6.2.2.2 The system shall be capable of ensuring at least four (4) air changes per hour inside each enclosure. Additional capacity shall be considered for the air supplied to the enclosures by air hoses used for steel cleaning.

6.42.6.2.2.3 The system shall create negative pressure inside each enclosure.

6.42.6.2.2.4 The system shall reduce concentrations of contaminants released inside each enclosure to levels below the thresholds set by federal and provincial authorities in applicable laws and regulations. The system shall also minimize the release of contaminants into the atmosphere.

6.42.6.2.2.5 System filters shall be cleaned and changed regularly to maintain system efficiency.

6.42.6.2.3 To ensure that the interior of each enclosure is properly ventilated while painting work is underway, the Contractor shall install a second ventilation system that meets the following requirements:

6.42.6.2.3.1 The system shall include fans, aspirators, and filters.

6.42.6.2.3.2 The system shall be capable of ensuring at least two (2) air changes per hour inside each enclosure.

6.42.6.2.3.3 The system shall create negative pressure inside each enclosure.

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 System filters shall be cleaned and changed regularly to maintain system efficiency.

6.42.6.3 MOISTURE CONTROL

6.42.6.3.1 The Contractor shall supply and install moisture control (drying) equipment within each enclosure as directed by the Engineer and in accordance with the paint product manufacturer's recommendations.

6.42.6.4 COMPRESSED BREATHING AIR SYSTEM

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

6.42.6.4.2 The Contractor shall supply the Engineer with three (3) compressed breathing air lines for the entire duration of the work. These breathing air lines shall comply with 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 labour, machinery, equipment, tools and temporary structures required to perform cleaning and painting work in accordance with the plans.

6.42.7.1.2 The Contractor shall also execute, in the shop, all painting work on any new steel components to be installed at the worksite. These steel components shall be painted before being transported to the storage site designated by the Engineer. 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 before the start of painting work, the Contractor shall submit to the Engineer, for review, colour samples for each coat of paint.

6.42.7.2.2 At least fourteen (14) days prior to commencement of work to install temporary access devices and enclosures, the Contractor shall submit to the Engineer, for review, the plans and design notes for such devices and enclosures, along with technical data sheets for all components, such as cables and trusses, used in their construction, all in accordance with subsection 6.15 – *Temporary Structures*.

6.42.7.2.3 At least fourteen (14) days prior to commencement of steel cleaning work, the Contractor shall submit to the Engineer, for review, technical and safety data sheets for the paints, thinners, cleaning products and abrasives the Contractor plans to use.

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

6.42.7.3 PROTECTION OF EXISTING FEATURES

6.42.7.3.1 Before the start of cleaning and painting work, the Contractor shall cover and seal features including, without being limited to, the following: all moving parts on control joints and expansion joints, bridge bearings, sliding plates, equipment, and control panels near work locations, so as 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, components and equipment referred to in paragraph 6.42.7.3.1 of this subsection.

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 use abrasive blasting to clean all steel components to be painted, removing all dust, rust and existing paint to the satisfaction of the Engineer. The cleaned surfaces shall comply with SSPC-SP 5 / NACE No. 1 and SSPC-VIS 1. Salt, oil and grease shall be removed with a solvent so that the cleaned surfaces comply with SSPC-SP 1 and to the satisfaction of the Engineer.

6.42.7.4.1.2 Surfaces that cannot be reached by dry abrasive blasting shall be cleaned to a minimum preparation level that complies with SSPC-SP 11 or to the satisfaction of the Engineer. Only the Engineer may authorize the use of a preparation that meets SSPC-SP 11 instead of 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 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 debris on surfaces to be coated after stripping, as well as on floor, wall and joint surfaces of containment structures, shall be removed using compressed air or a vacuum.

6.42.7.4.2 Aluminium pigment epoxy resin / polyurethane resin paint system

6.42.7.4.2.1 The Contractor shall use abrasive blasting to clean all steel components to be painted, removing all dust, rust and existing paint to the satisfaction of the Engineer and in compliance with SSPC-SP 6 / NACE No. 3 and SSPC-VIS 1. Salt, oil and grease shall be removed with a solvent so that the cleaned surfaces comply with SSPC-SP 1 and meet the satisfaction of the Engineer.

6.42.7.4.2.2 Only the Engineer may authorize the use of a steel surface preparation method other than the one indicated in the plans and specifications. Where the surfaces to be painted cover a total area of less than 10 m^2 and subject to the Engineer's authorization, the Contractor may clean the surfaces of the steel components to be painted using mechanical and hand tools, as well as solvents, to ensure the complete removal of any salt, oil, grease, dust, rust, rust scale or existing paint. The cleaned surfaces shall comply with SSPC-SP 11 and SSPC-VIS 3, and meet the full satisfaction of the Engineer.

6.42.7.4.3 Immediately before painting, the Contractor shall use dry compressed air to remove any loose particles from the stripped surfaces.

6.42.7.4.4 Painting work shall not begin until the Engineer has accepted the quality of the surface preparation of the metal to be painted. The Contractor shall provide the Engineer with access and sufficient time to conduct a proper inspection of the cleaning work. In the event of non-conformity, the Contractor shall resume work and complete it to the satisfaction of the Engineer and at no additional cost to the Owner.

6.42.7.4.5 For the purposes of surface preparation, the ambient conditions inside each enclosure (with respect to heat, light, humidity and ventilation) shall meet the requirements of this subsection and follow the paint product manufacturer's recommendations, and shall at all times be subject to the approval of the Engineer.

6.42.7.5 APPLICATION CONDITIONS

6.42.7.5.1 Paint shall be applied in accordance with the requirements of this subsection and the paint product manufacturer's technical data sheets. Any deviation from the requirements of this subsection shall be approved in writing by the Engineer before painting work begins.

6.42.7.5.2 For the purposes of paint application, the ambient conditions inside each enclosure (with respect to heat, light, humidity and ventilation) shall meet the requirements of this subsection, shall follow the paint product manufacturer's recommendations, and shall at all times be subject to the approval of the Engineer. During paint application and the inspection of painting work, lighting levels shall meet or exceed the minimums specified in SSPC Guide 12 – *Guide for Illumination of Industrial Painting Projects – Table 1*. In case of a contradiction between the requirements of these two (2) documents, the more stringent requirements or specifications shall prevail for the benefit of the Owner.

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 always within six (6) hours.

6.42.7.5.3.1 The corrosion process slows down at temperatures below 5°C. Under these conditions, application may occur more than six (6) hours after surface preparation, provided that the temperatures inside the enclosure and that of the steel comply with those specified in paragraphs 6.42.7.5.5.2 and 6.42.7.5.5.3 of this subsection at the time the paint is applied. However, the Contractor shall always apply the first coat in accordance with the paint product manufacturer's recommendations.

6.42.7.5.4 Any surface rust that appears after cleaning but before the application of the first coat of paint shall be removed by means of light abrasive blast-cleaning and to the satisfaction of the Engineer.

6.42.7.5.5 The Contractor shall apply each coat of the paint system under the following conditions:

6.42.7.5.5.1 The quality of the surface to be covered meets the requirements of the paint product manufacturer's technical data sheet.

6.42.7.5.5.2 The air temperature and that of the surfaces to be covered is above 5°C.

6.42.7.5.5.3 The temperature of the steel surface to be covered is 3°C above the dew point.

6.42.7.5.5.4 The surface to be covered is dry.

6.42.7.5.5.5 The previously applied coat of paint has been allowed to cure in accordance with technical data sheet requirements.

6.42.7.5.6 If necessary, the Contractor shall heat the enclosures to maintain the surfaces to be painted and the interior of each enclosure at a minimum temperature of 5°C, while the paint is being applied and until the paint has cured. The temperature shall be increased based on the recoat times specified in the paint product manufacturer's technical data sheets or according to the work schedule. Excessively low temperatures will delay the curing of each coat applied and the application of subsequent coats of paint.

6.42.7.6 PAINTING OF SURFACES

6.42.7.6.1 General

6.42.7.6.1.1 To ensure a uniform product prior to mixing, the Contractor shall mechanically stir each paint component according to the paint product manufacturer's recommendations.

6.42.7.6.1.2 To ensure a uniform mixture prior to application, the Contractor shall then mix and mechanically stir the components of the paint to be applied, according to the paint product manufacturer's recommendations.

6.42.7.6.1.3 Prior to surface preparation, the Contractor shall perform the blotter test to verify the cleanliness of air compressors and spray guns.

6.42.7.6.1.3.1 The test shall be performed at least once per shift on each air compressor.

6.42.7.6.1.3.2 The blotting paper shall be free of stains, or else the equipment shall be deemed non-compliant.

6.42.7.6.1.4 When painting with a spray gun, the Contractor shall use the minimum air pressure needed to obtain a suitable spray.

6.42.7.6.1.5 The Contractor shall mix the paint thoroughly and run it through a strainer when pouring it into the spray gun cups or paint cans.

6.42.7.6.1.6 To ensure proper paint thickness, each coat shall be applied in overlapping strips 0.3 metres in length.

6.42.7.6.1.7 Once application is complete, the dry paint film shall be free of runs, coarse particles and craters.

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

6.42.7.6.1.9 Paint coats shall be applied and allowed to cure according to the paint product manufacturer's recommendations.

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

6.42.7.6.1.11 Immediately after each coat is applied, the Contractor shall take all necessary precautions to prevent dust, abrasives and other foreign matter from falling onto the freshly painted surfaces.

6.42.7.6.1.12 The Contractor shall implement the appropriate fire protection measures, such as by making fire extinguishers available, to reduce the risk of fire caused by flame or any other potential heat source.

6.42.7.6.2 Galvanizing / epoxy resin / polyurethane resin paint system

6.42.7.6.2.1 Before the first coat of the paint system is applied, all bolts, washers and nuts shall be fully covered with a reinforcing coat applied by brush. The paint used for this reinforcing coat shall be the same as that used for the primer coat.

6.42.7.6.2.2 Where new steel components are added to an existing structure, the Contractor shall apply a coat of organic zinc primer with a dry film thickness of 75 µm to all such components in the shop, before they are delivered to the worksite, as well as to all specified steel surfaces. The primer shall be applied with a spray gun, using multiple overlapping passes to obtain an even film thickness, and allowed to fully cure.

6.42.7.6.2.3 The contact surfaces of parts to be bolted shall not be painted, except for a 5 mm section along the perimeter of one of the parts to be assembled, so that all visible steel surfaces of the assembly will be 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.

6.42.7.6.2.4 In the case of prefabricated parts used for repair, reinforcement or replacement, the intermediate coat of two-component epoxy paint shall be applied in the shop to all surfaces, taking care to protect the contact surfaces of the parts to be assembled, as specified in paragraph 6.42.7.6.2.4 of this subsection. The intermediate coat shall have a dry film thickness of 150 µm and be allowed to fully cure. In the shop, the Contractor shall apply a reinforcing coat of two-component epoxy paint on the edges of the members and welds of all components before they are delivered to the worksite. The epoxy reinforcing coat on existing assemblies at the worksite shall also be applied to cracks, rivets, bolts, nuts and washers.

6.42.7.6.2.5 On the existing assemblies at the worksite, the Contractor shall then use a brush and/or spray gun to apply a reinforcing coat of two-component epoxy paint on the edges of members, rivets, bolts, welds, nuts and washers. In addition, a sealing coat shall be applied to the corroded areas of cracks located between contacting surfaces on members that are reinforced by overlapping (e.g., deck girders, deck stringers, truss diagonals, top and bottom members of trusses, truss studs and bracing), in accordance with the paint product manufacturer's recommendations and as indicated on the plans.

6.42.7.6.2.6 The reinforcing and sealing coats shall be applied so as to ensure full coverage and penetration of the paint in and around the components referred to in paragraph 6.42.7.6.2.6 of this subsection. The reinforcing coat shall extend at least 40 mm beyond the perimeter of the component to be covered.

6.42.7.6.2.7 The two-component acrylic urethane topcoat shall be applied after the second coat of epoxy paint has cured or according to the paint product manufacturer's specified recoat time. The topcoat shall have a minimum dry film thickness of 50 µm and be allowed to fully cure.

6.42.7.6.2.8 The topcoat shall be applied in accordance with the instructions on the paint product manufacturer's technical data sheets, but no later than seven (7) days after the first coat of paint is applied.

6.42.7.6.3 Aluminum pigment epoxy resin / polyurethane resin paint systems

6.42.7.6.3.1 The Contractor shall use a brush or spray gun to apply a coat of two-component aluminium pigment epoxy resin primer with a dry film thickness of 100 µm to all specified steel surfaces, and allow the primer to fully cure.

6.42.7.6.3.2 The Contractor shall then use a brush or spray gun to apply a second coat of two-component aluminium pigment epoxy resin paint with a dry film thickness of 100 µm to all surfaces, and allow the paint to fully cure.

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

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 Painted surfaces damaged during execution of work shall be cleaned so as to remove any damaged paint or other contaminants, to the satisfaction of the Engineer. 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 Touch-ups shall be done on all surfaces damaged during the work period, using the original paint system.

6.42.7.7.4 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 aluminium pigment/polyurethane resin system.

6.42.7.8 PAINTING METALLIZED AND GALVANIZED STEEL SURFACES

6.42.7.8.1 Surfaces to be coated shall be treated with chromate and then cleaned by hand using a wire brush and solvent to remove gloss, taking care not to

damage the zinc coating, in accordance with the paint product manufacturer's requirements. Alternatively, the desired adhesion properties may be achieved by sandblasting, in accordance with SSPC-SP 7 / NACE No. 4.

6.42.7.8.2 One of the epoxy resin or polyurethane resin paints specified in paragraphs 6.42.4.2.2 and 6.42.4.2.3 of this subsection, or an equivalent as approved by the Engineer, shall be used on freshly metallized and galvanized steel surfaces.

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 paint product manufacturer's recommendations.

6.42.7.8.4 The first coat shall consist of an epoxy resin paint with a dry film thickness of 250 µm, and be allowed to fully cure.

6.42.7.8.5 The topcoat shall consist of a polyurethane resin paint with a dry film thickness of 250 µm, and be allowed to fully cure.

6.42.7.8.6 A first coat of paint meeting the satisfaction of the engineer shall be applied to all metallized surfaces as soon as possible after the metallization of those surfaces.

6.42.7.8.7 The topcoat shall be applied in accordance with the instructions on the paint product manufacturer's technical data sheets, but no later than seven (7) days after the first coat of paint is applied.

6.42.7.8.8 If moisture is present 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 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 produced as a result of 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 being limited to, dust collector filters, respirator cartridges, soiled clothing, rags, empty containers (used for paint, solvents and thinners) and accidentally contaminated soils.

6.42.7.9.1.2 The Contractor shall also treat paint and abrasive residues as hazardous materials due to their lead and zinc content, and the Contractor shall dispose of them in accordance with subsection 6.13 – *Environmental Protection* and 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 or scaffolding.

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

6.42.7.9.4 The Contractor shall collect and characterize representative samples of cleaning residues. Characterization analysis to determine concentrations of contaminants in the residue leachate shall be carried out by an ISO 17025 certified laboratory selected by the Contractor. Testing results shall be submitted to the Engineer in writing before the residues are removed from the worksite.

6.42.7.9.5 Any hazardous materials to be disposed of under the terms of this specification shall be removed from the worksite in accordance with applicable environmental protection laws and regulations, and in accordance with subsection 6.13 – *Environmental Protection*.

6.42.7.9.6 For the purposes of tracking contaminated abrasives, the Contractor shall periodically provide the Engineer with a mass balance of the abrasives entering and exiting the worksite.

6.42.8 QUALITY CONTROL

6.42.8.1 GENERAL

6.42.8.1.1 For each paint delivery, the Contractor shall provide the Engineer with a statement of conformity signed by the paint product manufacturer's authorized representative or distributor, and containing the following information on each production batch:

- Name of paint product manufacturer
- Name of paint
- Production batch number

6.42.8.1.1.1 Each production batch has a corresponding batch number. In the case of zinc powder, each production batch has a corresponding paint product manufacturer code.

6.42.8.1.2 The Contractor shall develop, implement and maintain a quality control system for surface preparation, cleaning and painting work. The Contractor shall develop its quality control system in such a way as to ensure compliance with the requirements of this subsection, industry best practices and the Engineer's instructions.

6.42.8.1.2.1 At the Engineer's request, the Contractor shall have the work inspected by an AMPP (Association for Materials Protection and Performance) certified inspector (Certified Coating Inspector level or higher) to ensure compliance with the requirements of this subsection, industry best practices and the Engineer's instructions.

6.42.8.1.3 Hold points will be established for cleaning and painting work. A hold point is a location beyond which an activity carried out by the Contractor shall not proceed without written authorization from the Engineer. Typically, seven (7) hold points are established, one for the end of each activity listed in paragraphs 6.42.8.1.8.1 to 6.42.8.1.8.7 of this subsection.

6.42.8.1.4 Upon reaching each hold point, the Contractor shall submit a quality control sheet to the Engineer for the duly completed work. The Engineer will provide an acknowledgement of receipt. The control sheet shall contain all quality control information and readings relevant to the corresponding stage of work. Each control sheet shall also clearly indicate the corresponding work area, in accordance with Appendix 6.42-I – *Control Sheet – Paint* of this subsection.

6.42.8.1.5 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 set out in the plans and specifications.

6.42.8.1.6 The Engineer will oversee monitoring of work quality and assign painting inspectors. Nevertheless, the Contractor shall remain responsible for quality control. The Contractor shall provide the necessary assistance for the required monitoring to be carried out effectively. To that end, the Contractor shall meet requirements including, without being limited to, the following:

6.42.8.1.6.1 Alongside the painting inspectors or the Engineer, the Contractor shall inspect each phase of work meets the requirements of the plans and specifications. 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. Within a reasonable time, the Contractor shall notify the Engineer that the work is ready for inspection.

6.42.8.1.6.2 The Contractor shall leave scaffolding, walkways and other access devices in place for at least 72 hours after the topcoat has been applied, to allow painting inspectors or the Engineer to verify quality of work. Upon written request by the Engineer, this minimum period may be extended due to weather conditions or other worksite constraints.

6.42.8.1.6.3 The Contractor shall interrupt stripping for a sufficient period, based on the surface area concerned, to allow paint inspectors or the Engineer to inspect the stripping carried out on steel surfaces. Such inspections shall be scheduled jointly by the Engineer and the Contractor, to the satisfaction of the Engineer, prior to commencement of work.

6.42.8.1.6.4 Where painting work is performed simultaneously in two (2) separate enclosures, the Contractor shall interrupt stripping according to a schedule that allows for the two (2) enclosures to be inspected at two (2) separate times.

6.42.8.1.7 The Engineer may decide not to conduct one or more inspections. The Contractor shall remain responsible for quality control and shall therefore be solely responsible for any paint system failures, any disruptions to the Contractor's activities and any additional costs incurred to redo the work in areas where the work already completed has been deemed non-compliant by the Engineer.

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

6.42.8.1.8.1 Surface preparation in accordance with plans and specifications, and measurement of the surface profile (Testex-Gage); if the paint product manufacturer's technical data sheets do not specify a roughness profile for the steel, the roughness profile shall be between 38 and 75 microns

6.42.8.1.8.2 Cleaning of surfaces before the start of primer application

6.42.8.1.8.3 In the case of the system described in article 6.42.4.2 – *Galvanizing / Epoxy Resin / Polyurethane Resin Paint System* of this subsection, brush application of a reinforcing coat of two-component epoxy paint to all edges, cracks, rivets, bolts, nuts, washers and welds, as required

6.42.8.1.8.4 Application of the primer coat, visual inspection and measurement of primer coat thickness, in accordance with SSPC-PA 2

6.42.8.1.8.5 In the case of the system described in article 6.42.4.2 – *Galvanizing / Epoxy Resin / Polyurethane Resin Paint System* of this subsection, brush application of a reinforcing coat of two-component epoxy paint to all edges, cracks, rivets, bolts, nuts, washers and welds, as required; the Contractor shall apply a sealing coat around angles, plates, splices or any other non-watertight assemblies that could cause rust streaks after application of the primer coat

6.42.8.1.8.6 Application of the intermediate coat, visual inspection and measurement of the intermediate coat thickness, in accordance with SSPC-PA 2

6.42.8.1.8.7 Topcoat application

6.42.8.1.8.8 Correction of defects

6.42.8.1.9 The Engineer may conduct additional inspections as needed to verify quality of work. In such cases, the Contractor shall provide the necessary assistance for the inspections to be carried out effectively.

6.42.8.1.10 As work progresses, the Contractor shall measure the wet film thickness with a wet film thickness gauge during paint application to ensure that the specified dry film thickness will be obtained after drying.

6.42.8.1.11 The wet film thickness for the various coats of paint shall be determined in accordance with ASTM D4414.

6.42.8.1.12 The wet film thickness corresponding to the specified dry film thickness is determined using the following formula:

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

H: wet film thickness (µm)

T: specified dry film thickness (µm)

D: percentage by volume of thinner added, as required

B: percentage by volume of non-volatile matter in the undiluted material

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

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

6.42.8.1.14.1 SSPC-PA 2 Type 1, for magnetic pull-off gauges

6.42.8.1.14.2 SSPC-PA 2 Type 2, for fixed-probe electromagnetic gauges

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

END OF SUBSECTION

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

Ponts JACQUES CARTIER + CHAMPLAIN Bridges Canada

DAILY CONTROL SHEET PAINT

Contract No.: 6XXXX
Project No.: XXXXXXX

Owner's Laboratory:

Client:					
Project:				**Mandate/Project:**	
Location (Section/Span/Truss/Bay):				**Internal project:**	
				Report No.:	
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Date:					
Weather conditions:	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Component/Intervention					
	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
SKETCH					
Insert sketch *(Clearly identify the area / phase affected by the work* *affected sub-axis(es), affected components(s) (high/low chord, vertical member, diagonal, horizontal bracing, etc.), side(s) (inner/outer))*					

1-CONTRACTUAL REQUIREMENTS					
Specification:		**Plans/Drawings:**			
Intervention 1	**Description:**				
Surface preparation (SSPC / NACE):		**Paint products**			
Surface profile (µm / mils):					
Primer coat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Reinforcing coat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Intermediate coat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Topcoat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Intervention 2	**Description:**				
Surface preparation (SSPC / NACE):		**Paint products**			
Surface profile (µm / mils):					
Primer coat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Reinforcing coat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Intermediate coat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			
Topcoat thickness (µm / mils):		**Supplier:**		**Colour No.:**	
		Product:			

DAILY CONTROL SHEET PAINT

Contract No.: 6XXXX
Project No.: XXXXXXX

2-APPLIED PAINT PRODUCTS						
Intervention 1					**Products used meet requirements**	**Product storage temp. (°C) per technical data sheet**
Description:						
Primer coat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Reinforcing coat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Intermediate coat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Topcoat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Intervention 2					**Products used meet requirements**	**Product storage temp. (°C) per technical data sheet**
Description:						
Primer coat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Reinforcing coat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Intermediate coat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Topcoat paint					(Selection)	(Selection)
Supplier:		**Colour No.:**				
Product:		**Batch No.:**				
Time before application						
After surface preparation (max. 8 h):	(Selection)	**Comment:**				

3-SURFACE PREPARATION PARAMETERS			
Abrasive cleaning		**Water/solvent cleaning**	
Verified/Unverified:	(Selection)	**Verified/Unverified:**	(Selection)
Equipment:	(Selection)		
Type:	(Selection)		

NOTES

Ponts JACQUES CARTIER + CHAMPLAIN Bridges
Canada

DAILY CONTROL SHEET PAINT

Contract No.: 6XXXX
Project No.: XXXXXXX

4-SURFACE PREPARATION ASSESSMENT				
Abrasive blast-cleaning:	☐	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)
Verified/Unverified:	☐	SSPC-SP 10 / NACE No. 2 (Near-White Metal Blast Cleaning)	☐	SSPC-SP 11 (Power Tool Cleaning to Bare Metal)
	☐	SSPC-SP 6 / NACE No. 3 (Commercial Blast Cleaning)	☐	SSPC-SP 15 (Commercial Grade Power Tool Cleaning)
(Selection)	☐	SSPC-SP 7 / NACE No. 4 (Brush-Off Blast Cleaning)	☐	SSPC-SP 16 (Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel)
Water blasting / Solvent cleaning:	☐	WJ-1 (Clean to Bare Substrate)	☐	WJ-3 (Thorough Cleaning)
Verified/Unverified:	☐	WJ-2 (Very Thorough or Substantial Cleaning)	☐	WJ-4 (Light Cleaning)
(Selection)	☐	Other:		

Method for determining surface profile:	(Selection)	**Supplier:**	
		Model:	
		Serial No.:	
Required surface profile (µm / mils):		**Measured surface profile**	(Selection)
Presence of corrosion	(Selection)	**Presence of oil or grease**	(Selection)

Chloride ion content below 7 µg/cm² (ppm)			
Method:	**Type of intervention required** (Selection)	**Result (ppm):**	
	Chloride ion content compliance	(Selection)	

5-APPLICATION CONDITIONS															
	Monday			**Tuesday**			**Wednesday**			**Thursday**			**Friday**		
Date:															
Time:															
Reinforcing/primer coat															
Relative humidity (%)															
Ambient temperature (°C)															
Surface temperature (°C)															
Dew point (°C)															
Surface Temp. – Dew Point Temp.															
Reinforcing/intermediate coat															
Relative humidity (%)															
Ambient temperature (°C)															
Surface temperature (°C)															
Dew point (°C)															
Surface Temp. – Dew Point Temp.															
Topcoat															
Relative humidity (%)															
Ambient temperature (°C)															
Surface temperature (°C)															
Dew point (°C)															
Surface Temp. – Dew Point Temp.															

Measuring device used:		**Weather conditions meet paint technical data sheet requirements**
Supplier:		
Model:		
Serial No.:		(Selection)

Ponts JACQUES CARTIER + CHAMPLAIN Bridges Canada

DAILY CONTROL SHEET PAINT

Contract No.: 6XXXX
Project No.: XXXXXXX

6-THICKNESS MEASUREMENT PER REQUIREMENTS (SSPC-PA 2 METHOD) AND POST-APPLICATION ASSESSMENT					
Measuring device used:					
Supplier:					
Model:					
Serial No.:					
	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
Date:					
Primer coat					
Verified/Unverified	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Visual defects	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Defect type if applicable					
DFT (µm / mils)					
Compliant/Non-compliant	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Details if non-compliant					
Intermediate coat					
Verified/Unverified	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Visual defects	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Defect type if applicable					
DFT (µm / mils)					
Compliant/Non-compliant	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Details if non-compliant					
Topcoat					
Verified/Unverified	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Visual defects	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Defect type if applicable					
DFT (µm / mils)					
Compliant/Non-compliant	(Selection)	(Selection)	(Selection)	(Selection)	(Selection)
Details if non-compliant					
Visual assessment of applied coats:					
7-FINAL ASSESSMENT					
Compliant/Non-compliant	(Selection)				
NOTES					

Supervisor's name and signature: _____

Date of signature: _____