SECTION 915

SUPPLY, INSTALLATION, AND SALVAGE OF BRIDGE RAIL

INDEX

915.01 SCOPE

The scope of this specification is related to the fabrication, supply, and installation of aluminum bridge railing and steel bridge railing as shown on the contract documents.

915.02 ALUMINUM BRIDGE RAIL

915.02.01 Scope

This covers the fabrication, supply, and installation aluminum bridge railing as shown on the contract documents. The number of rails on the railing shall be as per the contract documents.

915.02.02 Materials

a) The posts shall be permanent-mould cast from A444-T4 or accepted equal and be heat-treated according to ASTM B108 “Standard Specification for Aluminum-Alloy Permanent Mold Castings.”
b) The rails shall be extruded from 6061-T6, 6351-T6 or equal.
c) The rail plugs shall be cast from A356.0F or equal.
d) Type A307 or F3125 connecting bolts, nuts and washers shall be of hot dipped galvanized steel in accordance with CSA G164 “Hot Dip Galvanizing of Irregularly Shaped Articles.”
e) The set screws shall be stainless steel.
f) Type F3125 anchor bolts, nuts and washers shall be of hot dipped galvanized steel in accordance with CSA G164.
g) Black/Grey Neoprene Gaskets 50 Duro Hardness
h) Nylon Bushings
i) Miscellaneous materials shall be as noted on the contract drawings.

915.02.03 Fabrication

The railing shall be fabricated as per the contract documents. Alternative rail designs may be submitted for approval. The Department reserves the right to refuse alternative designs.

Fabrication of the railing shall be to CSA S6 “Canadian Highway Bridge Design Code.”

Before starting any work on the railing, the Contractor shall submit 1 hardcopy and 1 electronic copy of shop drawings including Bill of Materials to the Owner’s Representative for review, showing full details of the fabrication and erection of the railing.

For all bridge rehabilitation projects or as indicated on the drawings, prior to fabrication, the Contractor shall visit the site to confirm all measurements on the drawings are correct. By submitting fabrication drawings to the Owner’s Representative for acceptance, the Contractor is indicating they have visited the site to complete these measurements. No

additional payment will be made for any fabrication errors as a result of differences between the tender/construction drawings and actual site conditions.

915.02.04 Installation

For rehabilitation projects with existing aluminum rail, the aluminum rail shall be salvaged as per Section 915.04.

Unused anchor bolts or rebar from the existing bridge rail shall be removed to 70mm below the concrete surface and patched with a suitable patching material accepted by the Owner's Representative.

Railing and metal traffic barrier components shall be protected from damage and distortion during handling, transportation, storage, and installation. Aluminum alloys shall not be flame cut.

Railing shall be installed as indicated on the contract and shop drawings. Snug-tight bolts for slip joints shall be extra long and have double nuts which shall be torqued up against each other while still maintaining the slip joint.

Rail and posts shall be erected true to line and levels as shown on the drawings or as directed by the Owner's Representative. Rails are to be parallel to the top of the concrete, and the posts are to be perpendicular to the concrete.

Where shims are required for the alignment of the posts, they shall be made from fully annealed alloy known commercially as A1100 or equivalent.

Surfaces of aluminum in contact with concrete shall be given a heavy coat of alkali-resistant bituminous paint prior to the installation. The paint shall be applied as it is received from the manufacturer without the addition of any thinner.

A 6mm thick neoprene gasket shall be placed between the aluminum post and concrete. The gasket shall have pre-punched holes enabling it to properly fit over the anchors.

A prefabricated anchor insert of the type shown on the drawings or an accepted equal, shall be used to secure the bridge railing posts to the concrete.

If chemical anchors are used to secure the bridge rail posts then the anchor is to be accepted by the Owner's Representative. All chemical anchors shall be installed as per the manufacture's specifications.

Nylon bushings shall be used to prevent any electro-chemical reaction occurring between the aluminum posts and the bolts.

For accurately positioning the insert with the form, a setting template shall be furnished with the insert.

The aluminum bridge railing shall be thoroughly cleaned of all discolouration by accepted methods and all marks and scratches occurring during the fabrication shall be removed. The Contractor may at their own expense, apply a thin coat of clear non-yellowing lacquer to the cleaned surfaces, but they shall in any case ensure that the railings, when erected, have a clear surface of uniform appearance and texture.

915.03 STEEL BRIDGE RAIL

915.03.01 Scope

For new bridge construction this specification applies to the supply and installation of new steel bridge rail.

For the rehabilitation of existing structures, in addition to the supply and installation of new steel bridge rail, this specification applies the demolition of the existing concrete or metal barrier system required for installation of the new steel bridge rail.

915.03.02 Materials

Components of the Steel Bridge rail shall be as follows:

a) Rail bars. ..... HSS 350 WT, Class H
b) Rail posts and Base Plates. ..... 350 W
c) All other shapes and plates. ..... 300 W
d) Anchor studs, washers and nuts. ..... ASTM A449
e) All other bolts and nuts ..... ASTM A307
f) Black/Grey Neoprene Gasket… .....50 Duro Hardness

All steel shall be structural steels as per most recent edition of CSA G40.21.

Hot dip galvanizing shall be completed as per most recent edition of CSA G164.

All welding and weld inspection as per most recent edition of CSA W59 “Welded Steel Construction.”

Mill test reports shall be provided for all materials in English. Mill test reports shall be submitted to the Owner's Representative for review and acceptance 3 weeks prior to the commencement of fabrication.

Where mill test reports originate from a mill outside Canada or the United States of America, the Contractor shall have mill test reports verified by a certified laboratory in Canada by testing the material to the specified material standards, including boron content. The testing laboratory shall be certified to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories" by an organization accredited by the Standards Council of Canada for the tests required. Samples for testing shall be collected by personnel employed by the certified laboratory. A verification letter shall be provided by the certified laboratory that includes at a minimum, the applicable mill test reports, testing standards, date of verification testing, and declaration of material compliance with Contract requirements. The verification letter shall be signed by an authorized officer of the certified laboratory.

915.03.03 Fabrication

Prior to fabrication the Contractor shall submit fabrication drawings of the steel rails system for acceptance by the Owner's Representative. Drawings shall clearly indicate all information required for fabrication, the grade of components, and any other information requested by the Owner's Representative.

For all bridge rehabilitation projects or as indicated on the drawings, prior to fabrication, the Contractor shall visit the site to confirm all measurements on the drawings are correct. By submitting fabrication drawings to the Owner's Representative for acceptance, the Contractor is indicating they have visited the site to complete these measurements. No additional payment will be made for any fabrication errors as a result of differences between the tender/construction drawings and actual site conditions.

All exposed cut or sheared edges shall be broken and free of burrs. The inside weld flash of tubing shall be removed at splices and expansion joints.

All material shall be hot dipped galvanized in accordance with the most recent edition of CSA G164 with a minimum thickness of 85 micrometres. Steel shall be abrasive blast cleaned to SSPC SP-6 before galvanizing. If the protective galvanized coating is damaged prior to final acceptance, regardless of cause, the Contractor shall wire brush to clean the metal and hand paint with a cold galvanizing compound. The cleaned surface shall receive one application of metal conditioner to de-oxide, degrease and phosphatise the metal surface to be treated. Pre-mixed, ready-to apply, liquid cold galvanizing

compound should be applied to the prepared clean dry metal surface. The cold galvanizing compound must be of a type that imparts cathodic action against corrosion. The cold-galvanizing compound shall have a minimum 50 mm overlap of the surrounding galvanized metal. Both metal conditioner and cold galvanizing compound must be accepted by Underwriters Laboratories of Canada for component coatings (organic) and meet or exceed CGSB 1.181-99 “Ready Mixed Organic Zinc Rich Coating.” All materials must be applied in accordance with the manufacturer’s instructions.

Rail bars to be used on a radius of 300 m or less shall be curved before the application of any galvanizing. Bending tolerance from theoretical horizontal curvature shall be plus or minus 3 millimetres per metre and not to exceed 12 millimetres total.

Lengths of rail bar shall be attached to a minimum of 2 posts and at least 4 posts whenever possible. Rail bar expansion joints shall be provided in any rail bay spanning a superstructure expansion joint.

Rails shall be attached to posts using bolts inserted through the face of the rail bar. Bolts shall be round or dome head and may be rib neck, slotted, wrench head or tension control (TC or twist-off).

Holes in rail bars shall be field drilled and shall be coated with an accepted zinc rich paint prior to erection.

Bolts in expansion sleeves shall be tightened to a point that will still allow rail movement.

915.03.04 Transportation and Storage

Galvanized material shall be stacked or bundled and stored to prevent wet storage stain as per the American Hot Dip Galvanizers Association (AHDGA) publication “Wet Storage Stain”. Any evidence of wet storage stain shall be removed to the satisfaction of the Owner’s Representative.

Galvanized rail components shall be transported and stored in a manner that prevents the formation of wet storage stain.

Newly galvanized components shall be stored under cover in a dry and well ventilated area for a period of at least 48 hours. Components shall be raised from the ground and, if stacked, separated with untreated poplar, ash, or spruce wood spacers and spaced to allow for free air flow at all surfaces.

For outdoor storage and transportation after the initial 48 hour period, components shall be raised from the ground and, if stacked, separated with untreated poplar, ash, or spruce wood spacers and spaced to allow for free air flow at all surfaces. Components shall be inclined to ensure drainage of water.

915.03.05 Installation

For rehabilitation projects with existing aluminum rail, the aluminum rail shall be salvaged as per Section 915.04. Anchor bolts or rebar for the existing bridge rail shall be removed to 70mm below the concrete surface and patched with a suitable patching material accepted by the Owner's Representative.

Rail and posts shall be erected true to line and levels shown on the drawings or as directed by the Owner's Representative. Rails are to be parallel to the top of the concrete and the posts are to be perpendicular to the concrete.

A 6mm (1/4") thick neoprene gasket shall be placed between the galvanized steel posts and concrete. The gasket shall have the same footprint as the baseplate and have pre-punched holes enabling it to properly fit over the anchors. Neoprene shall be black or gray, specified for outdoor use, and have a duro hardness of 50A.

If, after installation, wet storage stain is present, it shall be removed to the satisfaction of the Department.

Nuts on the anchor studs shall be tightened to sung fit then given another ¼ turn. The anchor studs shall extend at least 6mm above the top of the tightened nut. Tops of the anchor studs shall not be cut or grinded in any way.

Once the nuts are tightened, the baseplate and neoprene shall be in full contact with the concrete curb. In the event that sufficient contact is not achieved, the post shall be removed and the concrete grinded to ensure full contact. The use of grouts or shims to achieve full contact is not permitted.

Washers or other items shall not be used to shim the baseplates.

915.03.06 Installation Using Chemical Anchors

For rehabilitation projects where chemical anchoring is specified, the Contractor shall measure the drilled holes to ensure the correct depth has been achieved. Anchor rods shall be a minimum of 425 mm long for an embedment depth of 350 mm, or as indicated on the Contract Drawings. Prior to installation, the anchor studs shall be measured and

the required embedment marked on them using yellow paint marker or another method accepted by the Owner's Representative.

The anchor studs shall be installed as per the chemical anchoring manufacturer's specifications using a level or another means to ensure plumb installation. A slight amount of epoxy shall come out of the drilled hole when the stud is fully inserted.

Chemical anchoring shall not be placed through the holes in the steel baseplate. Posts shall be placed onto the anchor studs until after the chemical anchor has fully cured.

The actual length of embedment shall be within 10 mm of the specified embedment. Anchor studs with embedment outside of this tolerance shall be rejected and replaced by the Contractor at the Contractor's expense.

915.04 SALVAGE OF EXISTING BRIDGE RAIL

When detailed on the contract drawings, existing bridge rail shall be salvaged.

Any rail deemed salvageable by the Owner's Representative shall be treated as per Section 901.04 and transported to the Department depot specified in the contract documents. Any materials deemed not salvageable by the Owner's Representative shall become the property of the Contractor and properly disposed of.

The Contractor is required to contact the Transportation and Infrastructure depot which will be receiving the salvaged material to be advised of the hours of operation and the location for storing salvage.

Contractor shall take care when salvaging the bridge rail and other components. Removal of the bridge rail posts will require concrete chipping at the base to expose the anchorages to a depth such that the anchorages can be cut and the posts removed without damage to the posts and their associated baseplates. Any rail components damaged as a result of the Contractor's operations shall be repaired or replaced at the Contractor's expense.

915.05 MEASUREMENT FOR PAYMENT

915.05.01 Aluminum Bridge Rail

The quantity of aluminum one-rail and four-rail bridge railing for which payment shall be made will be all railing as shown on the contract drawings and as accepted by the Owner's Representative to the nearest 0.1m.

Measurement shall be per metre of one or four-rail aluminum rail system installed and measured from end to end of the railing.

915.05.02 Steel Bridge Rail

The quantity of four-rail steel bridge railing for which payment shall be made will be all railing as shown on the contract drawings and as accepted by the Owner's Representative to the nearest 0.1 metre.

Measurement shall be per metre of steel rail system installed and measured from end to end of the railing.

915.06 BASIS FOR PAYMENT

915.06.01 Aluminum Bridge Rail

Payment at the contract price for "Supply And Install One-Rail Aluminum Bridge Rail" and "Supply and Install Four-Rail Aluminum Bridge Rail" in the Unit Price Table for shall be full compensation for all labour, equipment and materials required to fabricate, supply, deliver and install the railings, including posts, rails, rail sleeves, rail plugs, anchor inserts, nylon bushings, neoprene pads, nuts, bolts and washers and any other items required to supply and install the railing systems. Where existing concrete or metal bridge rail is to be demolished or salvaged, the cost of demolition, disposal or salvage shall be included in the unit price of the new railing.

For projects where salvaged rail is to be used, payment at the contract price shall include the supply and installation of any missing or damaged nuts, bolts, nylon bushings, bituminous paint, and neoprene pads. Costs for pick-up and delivery of the material from the Department depot specified in the contract shall be incidental to this item.

Payment will be made on delivery of all materials in good condition and with adequate storage on site up to the cost of material supplied as substantiated by invoices.

The remaining payment for installation will be made when the Owner's Representative is satisfied that installation in accordance with the contract has been carried out.

No additional payment will be made for any fabrication errors as a result of differences between the tender/construction drawings and actual site conditions.

915.06.02 Steel Bridge Rail

Payment at the contract price for "Supply And Install Four–Rail Steel Bridge Rail" in the Unit Price Table shall be full compensation for all labour, equipment and materials required to fabricate, supply, deliver, and install the railings, including posts, rails, rail sleeves, rail caps, neoprene gaskets, anchor inserts, nuts, bolts and washers and any

other incidental items. Where existing concrete or metal bridge rail is to be demolished or salvaged, the cost of demolition, disposal or salvage shall be included in the unit price of the new railing.

Payment will be made on delivery of all materials in good condition and with adequate storage on site up to the cost of material supplied as substantiated by invoices.

The remaining payment will be made when the Owner's Representative is satisfied that installation in accordance with the contract has been carried out**.**

No additional payment will be made for any fabrication errors as a result of differences between the tender/construction drawings and actual site conditions.

915.06.03 Salvage of Existing Bridge Rail

If existing bridge rail is to be salvaged, all costs associated with salvaging and delivery shall be included in the per metre cost of the new bridge rail to be installed on the structure.

10% of the bid price of the bridge rail shall be withheld until the bridge rail identified as salvage has been delivered as per Section 915.04.