

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 21 – Construction / Demolition Waste Management and Disposal
- .2 Section 32 11 16.01 – Granular Sub-base.

1.2 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO M180-2011, Corrugated Sheet Steel Beams for Highway Guardrails.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A307-12, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-080 Series-08 (R2012), Wood Preservation
 - .2 CAN/CSA-S136, Cold Formed Steel Structure Members
 - .3 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles
- .5 Nova Scotia Department of Public Works (NSPW)
 - .1 Standard Specifications Highway Construction and Maintenance

1.3 DEFINITIONS

- .1 Steel W-Beam Guide Rail shall consist of single W-beam guide rail with posts spaced at 3.81 m intervals and off-set blocks at each post.
- .2 Steel W-Beam Guide Rail – Bridge Approach shall consist of single W-beam guide rail and single Channel rail between posts spaced at 1.905 m intervals except for the first length of rail extending from the end of the bridge which shall have posts spaced at 0.953 m intervals. All posts to have off-set blocks at each post.

1.4 SAMPLES

- .1 At least 4 weeks prior to commencing work, inform Departmental Representative of proposed sources of guide rail and components, and provide access for sampling.

Part 2 Products

2.1 MATERIALS

- .1 Steel W-beam guide rail:

- .1 Steel rail and terminal sections: to AASHTO M180, Class A, Type 1 zinc coated.
- .2 Bolts, nuts and washers: to ASTM A307, hot dip galvanized to CSA G164.
- .2 Channel:
 - .1 Channel shall be cold rolled steel section, manufactured from base metal with a minimum thickness of 3.8 mm and conforming to CSA-S136 and providing at least 345 MPa yield strength.
 - .2 Sections shall be hot-dipped galvanized according to CSA-G164-M a minimum of 763 g/m³ of zinc is required on the surface of all galvanized sections.
- .3 Timber post and offset block:
 - .1 Well seasoned, straight and sound, free from loose knots or other defects, dressed four sides.
 - .2 Sizes: posts to be 200 mm x 200 mm x 2.1 m in length; blocks to be 200 mm x 200 mm x 440 mm in length.
 - .3 Acceptable species of wood: Jack Pine or Eastern Hemlock.
 - .4 Treat posts and blocks to CSA 080 commodity standard 080.14-M, pressure preserved wood for highway construction Table 1 and its references. Standard minimum retention of CCA preservative 6.4 kg/m³.
 - .5 Reflector strips shall be 70 mm x 75 mm on metal backing.
- .4 Fasteners:
 - .1 Spikes: to CSA B111 with spiral shank. Spikes to be hot dip galvanized after manufacture with 40 g minimum weight of zinc coating, to CSA G164.

Part 3 Execution

3.1 ERECTION

- .1 Install posts and rails in accordance with NSPW standard drawings or directed by the Departmental Representative.
 - .1 Bury end treatment in accordance with NSPW standard drawings.
- .2 Install posts plumb at locations and with minimum embedment of 1320 mm in road embankment or directed by Departmental Representative.
- .3 Excavation of post holes shall be by auger with diameter of hole to be approximately 360mm. Trench excavation is not permitted.
- .4 Bottom of each post hole to be compacted to provide firm foundation. Set post plumb and square in hole, backfill in 150 mm layers and compact each layer before placing succeeding layer.
- .5 Cutting of posts is not permitted without approval of the Departmental Representative.
- .6 Treat cut with two coats of same type of wood preservative used to pressure treat posts.
- .7 Erect steel W-beam components to details indicated. Lap joints in direction of traffic. Tighten nuts to 100 N.m. torque. Maximum protrusion of bolt 6 mm beyond nut.
- .8 Offset blocks to be fastened to timber post with two 100 mm long spikes.

- .9 Once the W-beam rail is properly installed, new reflective strips shall be placed immediately on every second post and on each end post.
 - .1 White reflector shall be placed facing the approaching traffic in the immediately adjacent driving lane and yellow reflector on the opposite side of the same post facing traffic in the other direction.

3.2 TOUCH-UP

- .1 Clean damaged surfaces with brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas in accordance with manufacturer's instructions.

3.3 REMOVAL

- .1 Wooden posts and steel guide rail systems shall be removed where and as directed by the Departmental Representative.
- .2 Components which are considered salvageable by the Departmental Representative shall be removed with care, delivered and stacked in neat piles at the site or at a location to be designated by the Departmental Representative;
 - .1 Every effort shall be made to avoid damage to reusable guide rail system components during the removal operation.
 - .2 The use of heat to remove bolts and the cutting of rail sections and bolts shall be not permitted unless approved by the Departmental Representative.
 - .3 Contractor must provide 48 hour notice to Departmental Representative to arrange drop off.
- .3 Remaining non-salvageable components shall be removed and disposed of in accordance with Section 01 74 21 – Construction / Demolition Waste Management and Disposal.
- .4 Post holes to be backfilled and compacted with Sub-Base Granular material.
- .5 Area to be graded to match surrounding shoulder elevation.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 This section details the requirements for the fabrication and erection of metal railings for structures, including posts, anchors, fasteners and ancillaries.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .3 Section 03 30 51 – Concrete for Bridge Decks
- .4 Section 05 50 00 – Metal Fabrications

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM F3125/F3125M-21, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Head Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating
- .3 Canadian Standards Association (CSA)
 - .1 CSA G40.20/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA S6-19, Canadian Highway Bridge Design Code (CHBDC).
 - .4 CAN/CSA S16-14(R2019), Design of Steel Structures.
 - .5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W47.1-19, Certification of Companies for Fusion Welding of Steel.
 - .7 CSA W59-18, Welded Steel Construction, (Metal Arc Welding).

1.4 SUBMISSIONS AND DESIGN REQUIREMENTS

- .1 One month prior to the start of fabrication, submit to the Departmental Representative the following information in respect to the Fabricator:
 - .1 Verification of CSA W47.1 certification.
 - .2 Proposed welding procedures to be stamped and approved by Canadian Welding Bureau.
 - .3 General outline of schedule for fabrication.
 - .4 Material test reports for all materials.

- .5 Valid Canadian Welding Bureau certification for each welder and welding operator for the positions and processes intended.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .3 Shop drawing review by the Departmental Representative is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Fabricator submitting the shop drawings, and such review shall not relieve the Fabricator of the responsibility for meeting all requirements of the contract documents. The Contractor shall be responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or construction and for the installation of work.
- .4 Each drawing submitted to bear signature and stamp of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada.
- .5 Indicate shop and erection details including shop splices, cuts, copes, connections, holes, bearing plates, threaded fasteners and welds. Indicate welds by CSA W59 welding symbols
- .6 The Contractor shall submit four complete sets of shop drawings showing full details and erection/assembly of all components of the railings to the Departmental Representative for approval at least two weeks prior to commencing fabrication.

Part 2 Products

2.1 METAL TRAFFIC BARRIER

- .1 Materials shall be according to the barrier specified on the Contract Documents. Modification of the barrier material shall not be made without the written permission of the Departmental Representative.

2.2 BARRIER WALL RAILING

- .1 TL-4 Steel Barrier:
 - .1 Steel, unless otherwise approved, shall be according to CSA G40.21.
 - .2 Posts and plates shall be Grade 350 W.
 - .3 HSS rails shall be ASTM A500, Grade C.
- .2 Welding materials: to CSA W59.
- .3 Welding electrodes: to CSA W48 Series.
- .4 High strength Type 1 bolts, nuts and washers: to ASTM A325M. Bolts to ASTM A490M approved by Departmental Representative. Bolt assemblies to be galvanized.
- .5 Anchor bolts: to ASTM F1554 Grade 55 or better.
- .6 Stud shear connectors: to CSA W59, Clause 5.5.6 and Appendix H, or better.
- .7 All steel surfaces shall be protected by hot dipped galvanizing. Hot dip galvanizing: to CAN/CSA G164, minimum zinc coating of 763 g/m².

2.3 ANCHORAGE ASSEMBLY

- .1 Anchor bolts and anchorage plates shall be as specified on the Contract Documents. The anchorage shall be hot dipped galvanized according to CSA G164. The anchorage assembly shall be supplied with the bolts installed in a template.

2.4 GROUT

- .1 Grout shall be non-staining, non-shrink cement based grout or non-staining, non-shrink epoxy based grout as specified in the Contract, or as approved by the Departmental Representative.

2.5 ZINC-RICH COATING

- .1 Zinc-rich coating shall be according to CAN/CGSB 1.181.

Part 3 Execution

3.1 GENERAL

- .1 Railing components shall be protected from damage and distortion during handling, transportation, storage and installation.
- .2 When bedding grout is placed under post bases to obtain the proper grade and alignment, the grout shall have a minimum thickness of 5 mm and a maximum thickness of 15 mm. The mixing, surface preparation, installation and curing shall be according to the manufacturer's written instructions. A rubber pad as indicated on the Contract Drawings shall also be provided beneath each barrier post.
- .3 The work shall include installation of the anchorage assemblies.

3.2 ALIGNMENT

- .1 The railing shall be installed to the elevations and alignment shown on the Contract Drawings and approved shop drawings with a tolerance of ± 6 mm and with no kinks or other visible breaks in alignment throughout the length of the installation.
- .2 After construction is complete, barrier posts to be plumb in transverse direction of bridge and perpendicular to deck/curbs in longitudinal direction.

3.3 ANCHORAGES

- .1 General: Anchorages shall be accurately and securely located.
- .2 Anchorages Installed Before Concrete Placement:
 - .1 Anchorage assemblies as shown on the Contract Drawings shall be used to secure the bridge railing posts to the concrete. Components shall be installed prior to placing concrete and shall be securely tied to reinforcing steel. Anchorage assemblies shall be positioned with templates and installed securely in the formwork to maintain the position of the anchors during placement of concrete.
 - .2 Properly sized and detailed plate washers are required to safely transfer anchor tension loads across the slotted hole in the barrier post base plate. Plate washers

for barrier posts anchorages are to be fabricated as per the details provided on the Contract Drawings.

- .3 Ensure that adequate thread extension is detailed for the anchor bolt assemblies such that the base plate, plate washer and nut can be fully installed at each barrier post location. The anchor bolt nuts shall be capable of being fully threaded onto the anchor bolts.

3.4 FABRICATION OF RAILINGS

- .1 General:
 - .1 The railing system components shall be fabricated according to the details specified. Field modification shall only be done when approved by the Departmental Representative.
 - .2 When welding is required, the fabricator shall be certified according to CSA W47.1 for steel railings.
- .2 Steel Components:
 - .1 Unless otherwise specified in the contract, fabrication and welding shall be according to Section 05 50 00 – Metal Fabrications.
 - .2 All flame cut edge shall be as smooth and regular as those produced by edge planing and shall be free of slag.
 - .3 When galvanized surface is damaged, the exposed steel shall be immediately cleaned of all rust, oil and grease and coated with a 75 µm maximum thickness of zinc-rich paint. After erection, the surface shall be given a second coating of zinc-rich paint of the same thickness.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Measurement procedures.
- .2 Waste management and disposal.
- .3 Materials.
- .4 Installation.
- .5 Removal and salvage.
- .6 Cleaning.

1.2 RELATED SECTIONS

- .1 Section 01 35 00 – Traffic Regulation
- .2 Section 01 35 43 – Environmental Procedures

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A276-91a, Specification for Stainless and Heat-Resisting Steel Bars and Shapes.
 - .2 ASTM B209M-92a, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .3 ASTM B210M-92a, Specification for Aluminum-Alloy Drawn Seamless Tubes.
 - .4 ASTM B211M-92a, Specification for Aluminum and Aluminum-Alloy Bar, Rods and Wire.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB1-GP-12c-65, Standard Paint Colours:
 - .2 CAN/CGSB-1.28-M89, Alkyd, Exterior House Paint.
 - .3 CAN/CGSB-1.59-M89, Alkyd, Exterior Gloss Enamel.
 - .4 CAN/CGSB-1.94-M89, Xylene Thinner (Xylol)
 - .5 CAN/CGSB-1.99-92, Exterior and Marine Phenolic Resin Varnish.
 - .6 CAN/CGSB-1.104-M91, Semigloss Alkyd Air Drying and Baking Enamel.
 - .7 CAN/CGSB-1.132-M90, Zinc Chromate Primer, Low Moisture Sensitivity.
 - .8 CGSB 1-GP-189M-78, Primer, Alkyd, Wood, Exterior.
 - .9 CGSB 31-GP-3M-88, Corrosion Preventative Compound, Cold Application, Soft Film.
 - .10 CGSB 62-GP-9M-80, Prefabricated Markings, Positioning, Exterior, for Aircraft Ground Equipment and Facilities.
 - .11 CGSB 62-GP-11M-78, Marking Materials, Retroreflective, Enclosed Lens, Adhesive Backing.
- .3 Canadian Standards Association (CSA)

- .1 CAN/CSA-G40.21-M92, Structural Quality Steels.
 - .2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-080 Series-M89, Wood Preservation.
 - .4 CSA 0121-M1978, Douglas Fir Plywood.
 - .5 CSA W47.2-M1987, Certification of Companies for Fusion Welding of Aluminum.
 - .6 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped
- .4 Nova Scotia Department of Public Works (NSPW)
- .1 Standard Specification, Highway Construction and Maintenance

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 35 43 – Environmental Procedures.
- .2 Divert unused metal and/or plastic materials to recycling facility approved by Departmental Representative.
- .3 Damaged signs and posts from any removals to be transported to recycling facility approved by the Departmental Representative.

Part 2 Products

2.1 SIGNS

- .1 Signs as indicated on the drawings.

2.2 MATERIALS

- .1 All materials shall be in accordance with NSPW Standard Specification Highway Construction and Maintenance.

Part 3 Execution

3.1 INSTALLATION

- .1 The Contractor shall load, haul and install posts and existing signs (see detail sheet for typical sign) and bases in the following manner:
 - .1 The Contractor is responsible for locating power/telephone/gas lines/services/utilities at all proposed sign locations.
 - .2 The Contractor is responsible for layout and measurements to ensure signs are installed as per drawings and as directed by the Departmental Representative.
 - .3 Sign bases: Excavate hole for the post at the location and depth provided by the Departmental Representative. Using some of the excavated materials, level and compact bottom of hole. Place post with one side parallel to the edge of asphalt and level.
 - .4 Adjust the post height by using a cut off saw. All post cuts will be determined in the field by the Departmental Representative. The Departmental Representative

will measure existing elevations at each site and calculate the cuts needed. The Contractor is required to provide the Departmental Representative with a minimum of 48 hours notice in order to perform the calculations.

- .5 Assemble the signs on the forks on the ground. Slide forks onto posts and place the cap.
- .6 Drill 1 hole in the base sleeves and posts for ½” bolts, as shown in the detail sheet and as verified by the Departmental Representative, and shim to plumb if necessary.
- .7 Bases must be perfectly plumbed. Vertical and horizontal tolerances for the base are 0.075m. Tolerance for the plumb of the posts is 0.01 m per 1.0 m or ¼” on a two foot carpenters level. Tolerances for the signs are 0.075 m for distance from asphalt and 0.075 m for height above white line.
- .8 The Contractor is responsible for hauling all materials to and from each work site.
- .9 Landscape so the top of the base is flush or 25 mm above finished grade.
- .10 Remove all excess material on site including, boulders larger than 100 mm.
- .11 All signs are to be covered until the Departmental Representative advises to uncover.
- .12 Payment for this item shall be based on the number of signs installed and shall include all material, labour and equipment required to satisfactorily complete this item of work.

3.2 CLEANING

- .1 Upon completion of installation remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION