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## 1.0 GENERAL

### 1.1 DETAIL DRAWINGS

- .1 The following detail drawings are appended hereto and form part of this section.

<u>Number</u>	<u>Title</u>
[ ]	[ ]
[ ]	[ ]

### 1.2 REFERENCES

- .1 Provide box-beam guardrail in accordance with the following standards (latest revision) except where specified otherwise.
- .2 American Society for Testing and Materials (ASTM)
- .1 ASTM A325M Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).
- .2 ASTM D4956 Standard Specification for Retroreflective Sheeting for Traffic Control.
- .3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.181 Ready-Mixed Organic Zinc-Rich Coating.
- .4 Canadian Standards Association (CSA)
- .1 CSA-G40.20 General Requirements for Rolled or Welded Structural Quality Steel.
- .2 CSA-G40.21 Structural Quality Steel.
- .3 CAN/CSA-G164 Hot-Dip Galvanizing of Irregularly Shaped Articles.
- .4 CAN/CSA-S16 Limit States Design of Steel Structures.
- .5 CSA-W47.1 Certification of Companies for Fusion Welding of Steel Structures.
- .6 CSA-W59M Welded Steel Construction (Metal Arc Welding) (Metric Version).

### 1.3 SUBMITTALS

- .1 Provide the following submittals.
- .2 Shop drawings of the guardrail, including material specifications, dimensions, finishes, and other details, at least 20 days prior to fabrication.

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- .3 Manufacturer's affidavit including mechanical and chemical test results certifying in accordance with CSA-G40.20, that the posts and rail materials meet the specified requirements prior to delivery to the Site.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Inspect each shipment of material and timely replace any damaged materials.
- .2 Unload, handle, and store rails and posts according to the manufacturer's recommendations to prevent damage to the galvanized coating and the material.
- .3 Manufacturer's written instructions for unloading, handling, and storing guardrail and for repairing damaged galvanized coating prior to performing the work.

### **2.0 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Provide materials in accordance with the following.
- .2 Box-beam guardrail:
  - .1 Welded or seamless structural tubing, 350 WT Grade, Class C or H in accordance with CSA-G40.21, and as specified in the Contract Documents.
  - .2 Fabricate guardrail from steel having a minimum standard impact energy requirement of 14 Joules for a half-size test specimen tested at 0°C, and containing a manganese/carbon ratio, computed based on heat analysis values, of at least 4.5, in accordance with CSA-G40.20.
  - .3 Do not transverse weld any rail sections.
  - .4 Stamp the name, brand or trademark of the steel producer, year of production and heat number on the underside of each rail. Stamp to remain legible after galvanizing.
- .3 Anchor bolts, nuts, and washers: In accordance with ASTM A307, galvanize finish.
- .4 Bolts for structural joints: In accordance with ASTM A325M, galvanize finish.
- .5 Fasteners: Cadmium-plated, self-drilling, self-tapping #12-24-1.50 indented hex washer head.
- .6 Posts, Ground Plates, Paddles, Brackets, Base Plates, and Splice Plates In accordance with CSA-G40.21, Grade 230G, and as specified in the Contract Documents.
- .7 Reflectors: Solid guardrail reflectors with a minimum dimension of 108 mm by 76 mm. Reflector sheeting to consist of double sided sheeting in accordance with ASTM D4956 Type IX or XI. Colour to be either fluorescent white or yellow as determined by the Minister.
- .8 Fill Concrete for Terminal End Anchor Blocks: Minimum compressive strength of 20 MPa at 28 days, with Type HS or HSb Sulphate Resistant Cement, air content between 4% and 7%, and a maximum slump of 100 mm.

## **2.2 SHOP FABRICATION OF STEEL COMPONENTS**

- .1 Welding: In accordance with CSA-W47.1 and CSA-W59.
- .2 Fabricate in accordance with CAN/CSA-S16.
- .3 Accurately fabricate metal fabrications true to line and free from warps, twists, bends, and open joints. Reject metal fabrications that have sharp kinks or bends.
- .4 For slots for the post paddles, drill 2 holes at the 2 ends of the slots and remove the material between by flame-cutting or saw-cutting or punching the entire slot. Maintain a distance of 13 mm from the end of the slot to the nearest vertical side, and do not cut past the rounded ends. Fabricate slots prior to galvanizing.
- .5 Galvanizing: Hot-dip galvanize guardrail, plates, bolts and other steel components, except for the cadmium-plated fasteners, in accordance with CAN/CSA-G164.

## **3.0 EXECUTION**

### **3.1 INSTALLATION**

- .1 Accurately set guardrail posts at the locations, and to the alignment, spacing, and heights in the Contract Documents. Maintain plumb and grade of posts within a tolerance of +/- 6 mm.
- .2 For posts, auger holes of sufficient diameter to allow pneumatic tamping. Remove unsuitable soils, as determined by the Minister, at the bottom of the hole and replace with granular material. Compact the base of the hole.
- .3 Place the post directly and solidly on compacted material.
- .4 Place compact backfill material in layers not exceeding 150 mm for the full depth of the hole. Crown the compacted fill slightly to provide drainage away from the post.
- .5 Install the guardrail in accordance with the manufacturer's written instructions and as specified.
- .6 Provide splices and expansion joints along the guardrail as specified in the Contract Documents.
- .7 Attach reflectors to every third post.
- .8 For the terminal end anchor blocks, auger holes as specified in the Contract Documents. Install and rigidly support embeddings prior to placing concrete. Cast concrete directly against the in situ soils.

### **3.2 REPAIR OF DAMAGED GALVANIZED COATING**

- .1 Repair damaged galvanized surfaces with a zinc-rich paint that is in accordance with CAN/CGSB-1.181.

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- .2 Power tool clean surfaces to be repaired to a bright metal surface. Apply multiple coats of zinc-rich paint in accordance with the manufacturer's written instructions to obtain a minimum dry film thickness of 50 microns or greater where required by the paint manufacturer.

**END OF SECTION**