

This specification outlines the requirements for the supply and installation of various guide rail installation types together with the accompanying posts. Unless the type of guide rail installation is specified in the MERX Schedule of Quantities and Prices, the type of guide rail shall be in accordance with the applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents. Where TI, Highway Specifications Book Standard Drawings are referenced in the Standard Drawings Table of Contents, guide rail shall be installed as per the corresponding Highway Standard Drawing.

PART 1 REFERENCES

This specification refers to the following standards, specifications, or publications. This specification shall be read in conjunction with applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents.

ASTM International

A123/A123M	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153/A153M	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A307	Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 psi Tensile Strength
A780/A780M	Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft ³ (600 kN·m/m ³))
F3125/F3125M	Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength
CSA Group	
G164	Hot Dip Galvanizing of Irregularly Shaped Articles
O80	Wood Preservation

PART 2 GENERAL

2.1 SUBMITTALS

- .1 Submit in accordance with Section 01340 – Shop Drawings, Samples and Submissions.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for guide rail, wood, and coatings and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used.
 - .1 Submit WHMIS - SDS - Safety Data Sheets.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Newfoundland and Labrador, Canada.

2.2 ENVIRONMENTAL REQUIREMENTS

- .1 Guide rail posts located in Protected Water Supply areas but outside the buffer zones indicated on the Section 39 Permit issued by ECC, Water Resources Management Division shall only be chromated copper arsenate (CCA) treated type.
- .2 Guide rail posts located in Protected Water Supply areas but inside the buffer zones indicated on the Section 39 Permit issued by ECC, Water Resources Management Division shall be untreated.

PART 3 PRODUCTS

3.1 MATERIALS

.1 Guide Rail

- .1 Guide rail parts furnished under these specifications shall be interchangeable with similar parts, regardless of their source of manufacture.
- .2 The rail elements shall consist of a corrugated steel W-beam with corrugations symmetrical about the horizontal axis and such that the edges and centre of the rail element may contact each post.
- .3 The individual rail elements shall be of the Standard Type (W-beam) consisting of 2.75 mm thick (12 gauge) rail of length not less

than 4125 mm, having post bolt slots 3810 mm apart centre to centre for Standard Type Guide Rail; and 1905 mm apart centre to centre for Guide Rail with Additional Posts.

- .4 The rail metal shall be open hearth oxygen furnace or electric furnace steel having an elongation of not less than 12 per cent in 50 mm and shall withstand a cold bend, without cracking, or 180 degrees around a mandrel of a diameter equal to 2.5 times the thickness of the plate.
 - .5 The rail elements shall be hot-dip galvanized before or after fabrication. In accordance with ASTM A123/A123M or CSA G164.
 - .6 Rail element joints shall be capable of withstanding a tensile load of not less than 350 kN without failure. The rail element shall not deflect more than 140 mm when tested as a simple beam with the traffic face up and with a 8.9 kN load applied at the centre of a 3650 mm span through a 76 mm wide flat bearing.
 - .7 The quality of the work shall be equivalent to good commercial practice and all edges, bolt holes and surfaces shall be free of torn metal, burns, sharp edges and protrusions.
 - .8 Rail sections shall be supplied by the Contractor.
 - .9 Two (2) certified copies of mill test reports of each batch from, which the rail element is formed, shall be furnished to the Owner, if so required.
- .2 Sloped and Buried Rail Section
- .1 Angled rail sections shall be in accordance with the dimensions identified on the applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents. The sections shall be shop fabricated from rail sections conforming to the requirements. No punching, cutting or welding will be permitted in the field.
 - .2 The weld shall be cleaned, pre-treated and coated with cold galvanizing compound as outlined.
 - .3 Where corrugated steel beam is cut with a saw, drilled, or welded, the beam shall be thoroughly cleaned with a wire brush to remove scale, rust, slag residue, weld splatter, etc. and wiped clean. The cleaned surface shall receive at least one application of metal conditioner to de-oxidize, de-grease and phosphatize the metal surface to be treated if the surface is oily. Pre-mixed, ready-to-apply, liquid-zinc 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 should have a minimum 50 mm overlap of the surrounding undamaged galvanized metal.

- .4 Both metal conditioner and cold-galvanized compound must be approved by Underwriters Laboratories Inc. for component coatings - organic and shall be in accordance with ASTM A780/A780M. All materials must be applied in accordance with the manufacturer's instructions.
- .5 The Contractor shall supply the angled sections.
- .3 Rail Terminal Section
 - .1 Rail terminal sections shall be of the standard type, and in accordance with the applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents. The metal and galvanizing shall be of the same thickness and quality as is stipulated for the rail sections.
 - .2 The Contractor shall supply the terminal sections.
- .4 Fasteners
 - .1 All bolts, nuts and washers shall be in accordance with ASTM A307, hot dipped galvanized to ASTM A123/A123M- or F3125/F3125M, except that rail splice bolts shall be button headed.
 - .2 Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slot in the rails and thus prevent the bolt from turning.
 - .3 Post bolts shall be 16 mm diameter and 200 mm long for use with standard 150 mm x 150 mm posts, or 16 mm diameter and 250 mm long for use with 200 mm x 200 mm posts. The Contractor shall pay particular attention that post bolts be of sufficient length to accommodate the offset blocks as required.
 - .4 Post bolt washers for the back of posts shall be 45 mm in diameter and 4 mm thick.
 - .5 Bolts for anchors shall be 16 mm diameter and 350 mm long for use with standard 150 mm x 150 mm posts and anchors, or 16 mm diameter and 450 mm long for use with 200 mm x 200 mm posts and anchors. Washers shall be 45 mm round and 4 mm thick.
 - .6 Spikes for anchors shall be 125 mm galvanized spikes.
 - .7 Bolts, nuts, washers and other fittings shall be hot-dip galvanized in accordance with ASTM A153/A153M.
 - .8 The Contractor shall supply the bolts, nuts, washers and spikes.
- .5 Signal Reflectors
 - .1 Silver signal reflectors and yellow signal reflectors shall be of size 75 mm x 100 mm. The contractor shall supply both types of signal reflector.
 - .2 Nails for securing signal reflectors, shall be supplied by the Contractor and shall consist of 30 mm galvanized flat head nails.

.6 New Posts and Anchors

- .1 Timber for posts and anchors shall be sound, well-seasoned structural grade lumber.
- .2 Only birch wood will be acceptable for 150 mm x 150 mm guide rail posts. Hemlock or other approved species will be acceptable for 200 mm x 200 mm guide rail posts.
- .3 Posts shall have minimum dimensions of 150 mm x 150 mm x 2400 mm for "Guide Rail Standard Installation Type Guide Rail" and for "Standard Type Guide Rail with Additional Posts".
- .4 Anchors shall consist of either one piece of guide rail post cut 150 mm x 150 mm x 450 mm long, or two pieces of 38 mm x 140 mm x 450 mm lumber.
- .5 After cutting to size, posts and anchors shall be pressure treated with wood preservation in accordance with CSA O80 Wood Preservation. The minimum weight of preservative retained per cubic metre of timber shall be 130 kg with empty cells.
- .6 The Contractor shall supply all the required wood preservative treated posts and anchors.

.7 Wood Preservative

- .1 Wood Preservative for use in treating field cut ends of posts shall be of the same type and chemical composition as that used in the original treatment.
- .2 The Contractor shall supply the wood preservative.
- .3 The minimum required depth of penetration of wood preservative shall be 13 millimetres. To determine penetration, a borer core shall be taken from 20 pieces in each charge. If 80 % of the borings meet the penetration requirements, the charge shall be accepted.
- .4 Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.
- .5 If requested by the Owner's Representative, the Contractor shall provide penetration and retention test reports for the guide posts and guide rail posts supplied for the project.

PART 4 EXECUTION

4.1 EXAMINATION

- .1 Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for guide rail installation in accordance with manufacturer's written instructions.

- .1 Inform the Owner of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the Owner.
- 4.2 INSTALLATION
- .1 Galvanized materials shall be loaded, hauled and handled in such manner that galvanizing will not be damaged. All bare, abraded, and damaged surfaces shall be cleaned, pre-treated if required and coated with cold galvanizing compound as outlined above.
 - .2 Guide rail shall be placed to the lengths, lines and grades set by the Owner. Except where directed otherwise by the Owner, the guide rail shall be installed in accordance with the applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents.
 - .3 A sloped and buried rail section shall be placed at each end of a run of guide rail unless directed otherwise by the DepartmentOwner.
 - .4 On divided highways, a buried end section shall be placed at the approach end of a run of guide rail and a terminal section shall be placed at the other end unless directed otherwise by the Department.
 - .4.5 The end post at an angled rail section shall have an anchor secured to the bottom of the post.
 - .5.6 Where a 150 mm x 150 mm x 450 mm timber anchor is used it shall be secured to the post by means of a galvanized nut and 16 mm diameter bolt 350 mm long together with two 45 mm round 4 mm thick galvanized washers.
 - .6.7 Where a double 38 mm x 140 mm x 450 mm lumber anchor is used it shall be secured to the post by means of four 125 mm galvanized spikes.
 - .7.8 Field boring and cutting to length of anchors will be permitted, provided that the hole is treated with two (2) coats of wood preservative before driving the bolts and provided that the cut end is treated with two (2) coats of wood preservative before burying.
 - .8.9 The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1500 mm below the ground surface.
 - .9.10 Posts shall be set plumb and to the established lines and grades and shall be placed at 3810 mm intervals, unless directed otherwise by the Owner.
 - .10.11 The posts shall be firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 100 mm. Each layer

shall be thoroughly compacted before the next layer is placed. Should the backfill be dry then each layer shall be moistened before tamping.

.11.12 All backfill shall be compacted to a minimum of 95 % maximum dry ~~Standard Proctor D~~ density in accordance with (ASTM D698).

.12.13 All excavated waste material shall be disposed of along the sides of fill, or in other locations as directed by the Owner.

.13.14 The rails shall be secured to even lines such that the centre of the rail is 635 mm above the edge of pavement or road surface.

.14.15 The Contractor shall bore holes in the posts for the post bolts and treat the holes with two (2) coats of wood preservative before driving the bolts.

.15.16 Rail elements and terminal sections shall be lapped so that the exposed ends will not face approaching traffic.

.16.17 The bolted connections of the rail element to the post shall be capable of withstanding a 22.5 kN pull at right angles to the lines of the railing.

.17.18 When the attachment of the rail elements to the posts has been completed, the tops of the posts shall be cut to a point 75 mm above the top of the rail as shown in the applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents. The tops of the posts shall be treated with two (2) coats of wood preservative after cutting.

.18.19 Signal reflectors shall be attached to posts at terminal sections, posts at the sloped and buried ~~welded angled~~ sections, and to every fourth post in a length of guide rail. Silver reflectors shall be placed facing oncoming traffic and yellow reflectors shall be placed on the opposite side except for on divided highway.

.19.20 On divided highway, silver reflectors shall be placed facing oncoming traffic on the outside shoulder and yellow reflectors shall be placed facing traffic on the median shoulder.

.20.21 The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and secure the reflectors with 30 mm galvanized flat head nails as shown in the applicable standard drawings for guide rail installation as outlined in the Standard Drawings Table of Contents.

4.3 PAINTING AND TOUCH-UPS

.1 Galvanized steel touch-ups:

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings.

- .1 Apply two (2) coats of organic zinc-rich paint to damaged areas.
 - .2 Pre-treat damaged surfaces in accordance with manufacturer's written recommendations for zinc-rich paint.
 - .3 Painted steel:
 - .1 Apply one (1) coat of primer and two (2) coats of finish paint to exposed surface.
 - .4 Painted posts and any offset blocks:
 - .1 Apply two (2) coats of paint to exposed surfaces of posts and any offset blocks.
- 4.4 CLEANING
- .1 Progress Cleaning: Clean in accordance with Section 01710 – Reinstatement and Cleaning.
 - .2 Final Cleaning: Upon completion, remove surplus materials, rubbish, tools and equipment in accordance with Section 01710 – Reinstatement and Cleaning.
- PART 5 PAYMENT
- 5.1 MEASUREMENT FOR PAYMENT
- .1 Standard Type Guide Rail with Additional Posts (Type "A"):
- .1 Measurement for payment for the supply and installation of Standard Type Guide Rail, Guide Rail with Additional Posts, or Type "A" Guide Rail, as the case may be, shall be the length of that type of guide rail placed within the limits specified or designated by the Owner, measured in metres, rounded to one decimal place, measured end to end along the face of the straight railing and straight terminal sections, but not including the sloped and buried section.
- .2 Standard Type Guide Rail (Type "B"):
- .2 Measurement for payment for the supply and installation of Type "B" Guide Rail shall be the length of rail and terminal sections placed within the limits specified or designated by the Owner, measured in metres, rounded to one decimal place, measured straight end to straight end along one side only, but not including the sloped and buried section.
- .3 Payment by the metre shall include in accordance with this specification:
- .1 excavation of post holes,

- ~~.2 supply and install of all posts, rail sections, straight rail terminal sections, bolts, nuts, washers, spikes and nails, reflectors,~~
~~.3 the backfill of post holes, compaction of backfill,~~
~~.4 the disposal of waste material,~~
~~.5 the trimming of posts, the supply and application of wood preservative, and~~
~~.6 the cleaning, pre-treatment, and coating of steel rail with cold galvanizing compound where so required.~~
- .3 Measurement for payment for buried end sections will be by means of the number of buried end sections placed as directed by the Owner.
- .4 Sloped and Buried Guide Rail Section:
- ~~.1 Measurement for payment for the supply and installation of the sloped and buried guide rail section associated with the Types "A" or "B" Guide Rail Systems above shall be by the each and include in accordance with this specification:~~
- ~~.1 excavation of post holes,~~
~~.2 supply and install of all posts, anchors, rail section, angled rail sections, bolts, nuts, washers, spikes and nails,~~
~~.3 the backfill of post holes, compaction of backfill,~~
~~.4 the disposal of waste material,~~
~~.5 the trimming of posts,~~
~~.6 the supply and application of wood preservative, and~~
~~.7 the cleaning, pre-treatment and coating of steel rail with cold galvanizing compound where so required.~~

.5.4 Where the guide rail structure is a composite of more than one type of guide rail installation, then measurement for payment shall be by the metre of each type of guide rail installation making up the composite.

~~.6.1 Measurement for payment for buried end sections will be by means of the number of buried end sections placed as directed by the Owner.~~

5.2 BASIS OF PAYMENT

- .1 All costs associated with the work outlined in this specification shall be deemed to be included in the appropriate unit and lump sum prices quoted as outlined in the Measurement for Payment subsection of this section and as included in the MERX Schedule of Quantities and Prices.
- .2 Payment at the contract price for the Supply and Installation of Guide Rail of a particular type shall be compensation in accordance with this specification in full for all labour, materials, and equipment to:
- .1 -excavate post holes,

- .2 -supply and install all posts, anchors, rail sections, rail terminal sections, modified end shoes, standard hazard markers, bolts, nuts, washers, spikes and nails,
 - .3 -bend rail sections where required to a uniform radius,
 - .4 -backfill post holes, compact backfill,
 - .5 -dispose of surplus excavation material,
 - .6 -trim posts, supply and apply wood preservative,
 - .7 -install reflectors,and
 - .2.8 -clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, ~~all in accordance with this specification~~.
- .3 Payment at the contract price for the Supply and Installation of Sloped and Bburied Eend Ssections shall be compensation in accordance with this specification in full for all labour, materials, and equipment to:
- .1 -excavate post holes,
 - .2 -supply and install posts, anchors, buried end sections, bolts, nuts, washers, spikes and nails,
 - .3 -backfill post holes, compact backfill,
 - .4 -dispose of surplus excavation material,
 - .5 -trim posts, supply and apply wood preservative,
 - .6 -install reflectors,and
 - .3.7 -clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, ~~all in accordance with this specification~~.