

## **SECTION 640**

### **SUPPLY AND INSTALLATION OF GUIDE RAIL**

#### **INDEX**

- 640.01 SCOPE**
- 640.02 ENVIRONMENTAL REQUIREMENTS**
- 640.03 MATERIALS**
  - 640.03.01 Rail Sections**
  - 640.03.02 Buried End Sections**
  - 640.03.03 Rail Terminal Sections**
  - 640.03.04 Bolts, Nuts, Washers and Spikes**
  - 640.03.05 Signal Reflectors**
  - 640.03.06 Standard Hazard Markers**
  - 640.03.07 Posts and Anchors**
  - 640.03.08 Wood Preservative**
- 640.04 INSTALLATION**
- 640.05 MEASUREMENT FOR PAYMENT**
- 640.06 BASIS OF PAYMENT**

#### **640.01 SCOPE**

This specification covers 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 otherwise in the contract documents, the type of guide rail shall be the standard type shown on Form 1280.

“Guide Rail with Additional Posts” shall be as shown on Form 1282-1. The extent of “Guide Rail with Additional Posts” will be as per the extent shown in the contract documents.

“Guide Rail – Structures” shall be as shown on Form 1282-2. The extent of “Guide Rail - Structures” will be within 11527 millimetres of the structure approach and 7717 millimetres of the structure exit. Any guide rail past these limits will be considered "Guide Rail

Standard Installation" unless noted otherwise in the contract documents. If there is no guide rail shown past these limits there shall be a 'buried guide rail section' as shown on Form 1280-1 or a terminal fin as shown on the contract documents.

The supply, installation, measurement for and basis of payment for modified special end shoes is considered incidental.

Standard hazard markers, 2 each of WE-1 and WE-2, shall be supplied by the Department to the Contractor at no expense. The Contractor is responsible for posts, mounting hardware and the erection of hazard makers as per contract drawings. Posts for mounting the hazard markers shall be treated timber, a nominal 100 millimetres x100 millimetres, length as required.

## **640.02 ENVIRONMENTAL REQUIREMENTS**

Guide rail posts located in Protected Water Supply areas shall only be chromated copper arsenate (CCA) treated type.

## **640.03 MATERIALS**

Guide rail parts furnished under these specifications shall be interchangeable with similar parts, regardless of their source of manufacture.

### **640.03.01 Rail Sections**

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.

For "Guide Rail Standard Installation" and "Guide Rail with Additional Posts", the individual rail elements shall be of the Standard Type (W-beam) consisting of 2.75 millimetre thick rail. The length shall not be less than 4125 millimetres, having post bolt slots 3810 millimetres apart centre to centre for "Guiderail Standard Installation"; and 1905 millimetres apart centre to centre for "Guide Rail with Additional Posts".

For "Guide Rail – Structures" the individual rail elements shall be of the Standard Type (W-beam) consisting of 3.5 millimetre thick for one length of rail not less than 4125 millimetre at structure approach and exit and attached to each end block with the modified special end shoes. It shall have post bolt slots for each post as shown on Form 1282-2.

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 millimetre and shall withstand a cold bend,

without cracking, of 180° around a mandrel of a diameter equal to 2½ times the thickness of the plate.

The rail elements shall be hot-dip galvanized before or after fabrication. In accordance with the specifications of ASTM A123 or CSA G164M. 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 millimetres when tested as a simple beam with the traffic face up and with an 8.9 kN load applied at the centre of a 3650 millimetre span through a 76 millimetre wide flat bearing.

Workmanship shall be equivalent to good commercial practice and all edges, boltholes and surfaces shall be free of torn metal, burns, sharp edges and protrusions.

Rail sections shall be supplied by the Contractor.

2 certified copies of mill test reports of each batch from which the rail element is formed, shall be furnished to the Owner's Representative, if requested by the Department Representative

#### **640.03.02 Buried End Sections**

Buried end sections shall be manufactured to meet the dimensions as shown on Form 1279 and Form 1280. The sections shall be shop fabricated from rail sections conforming to the requirements of Section 640.03.01. No punching, cutting or welding will be permitted in the field.

The weld shall be cleaned, pre-treated and coated with cold galvanizing compound as outlined.

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 shall 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 millimetre overlap of the surrounding undamaged galvanized metal.

Both metal conditioner and cold-galvanizing compound must be approved by Underwriters Laboratories Inc. for component coatings-organic and meet or exceed

ASTM A780 requirements All materials must be applied in accordance with the manufacturer's instructions.

The Contractor shall supply the angled sections.

### **640.03.03 Rail Terminal Sections**

Rail terminal sections shall be of the standard type, as illustrated on Form 1279 and Form 1280. The metal and galvanizing shall be of the same thickness and quality as is stipulated for the rail sections in Section 640.02.01. The Contractor shall supply the terminal sections.

### **640.03.04 Bolts, Nuts, Washers and Spikes**

All bolts, nuts and washers shall conform to the specifications of ASTM A307 or A325, except that rail splice bolts shall be button headed.

Post bolts and splice bolts shall have shoulders of such shape and size that they fit into the bolt slots in the rails and thus prevent the bolt from turning.

Post bolts shall be 16 millimetre diameter and 200 millimetres long for use with standard 150 millimetre x 150 millimetre posts, or 16 millimetre diameter and 250 millimetre long for use with 200 millimetre x 200 millimetre posts. The Contractor shall pay particular attention that post bolts be of sufficient length to accommodate the offset blocks as required.

Post bolt washers for the back of posts shall be 45 millimetres in diameter and 4 millimetres thick.

Bolts for anchors shall be 16 millimetre diameter and 350 millimetres long for use with standard 150 millimetre x 150 millimetre posts and anchors, or 16 millimetre diameter and 450 millimetres long for use with 200 millimetre x 200 millimetre posts and anchors. Washers shall be 45 millimetres round and 4 millimetres thick.

Spikes for anchors shall be 125 millimetre galvanized spikes.

Bolts, nuts, washers and other fittings shall be hot-dip galvanized in accordance with ASTM A153 "Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware."

The Contractor shall supply the bolts, nuts, washers and spikes.

### **640.03.05 Signal Reflectors**

Silver signal reflectors and yellow signal reflectors shall be of size 75 millimetre x 100 millimetre. The Department will supply both types of signal reflector free to the Contractor at the following district depots: White Hills in St. John's, Clarenville, Grand Falls, Deer Lake, and Goose Bay.

Nails for securing signal reflectors shall be supplied by the Contractor and shall consist of 30 millimetre galvanized flat head nails.

### **640.03.06 Standard Hazard Markers**

Standard hazard markers, 2 each of WE-1 and WE-2, shall be supplied by the Department to the Contractor at no expense. The Contractor is responsible for posts, mounting hardware and the erection of hazard makers as per contract drawings. Posts for mounting the hazard markers shall be a nominal 100 millimetre x100 millimetre, length as required.

Connections for the hazard markers shall be supplied by the Contractor and shall consist of two 80 millimetre long, 10 millimetre diameter galvanized lag bolts with a galvanized washer.

### **640.03.07 Posts and Anchors**

Timber for posts and anchors shall be sound, well-seasoned structural grade lumber. Only birch wood will be acceptable for 150 millimetre x 150 millimetre guide rail posts. Hemlock or other approved species will be acceptable for 200 millimetre x 200 millimetre guide rail posts.

Posts shall have minimum dimensions of 150 millimetre x 150 millimetre x 2400 millimetre for "Guide Rail Standard Installation", and for "Guide Rail with Additional Posts."

"Guide Rail – Structures" posts shall have minimum dimensions of 200 millimetre x 200 millimetre x 2400 millimetre.

"Guide Rail with Additional Posts" and "Guide Rail – Structures" shall have offset blocks on all posts.

Anchors shall consist of either one piece of guide rail post cut 450 millimetres long, or two pieces of 38 millimetre x 140 millimetre x 450 millimetre lumber.

Posts and anchors shall be pressure treated with an acceptable wood preservative.

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.

The minimum retention of preservative shall be as follows:

PRESERVATIVE	MINIMUM RETENTION	METHOD OF DETERMINATION
PENTACHOROPHENOL	6.4 kg/m <sup>3</sup>	BY ASSAY
CHROMATED COPPER ARSENATE	6.4 kg/m <sup>3</sup>	BY ASSAY
OTHER	IN ACCORDANCE WITH CSA 080M	

Incising will normally be required. However, this requirement will be waived if specifications for both penetration and retention are satisfied.

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.

The Contractor shall supply all the required wood preservative treated posts and anchors.

**640.03.08 Wood Preservative**

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.

The Contractor shall supply the wood preservative.

**640.04 INSTALLATION**

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.

Guide rail shall be placed to the lengths, lines and grades set by the Owner’s Representative. Except where directed otherwise by the Owner’s Representative, the guide rail shall be installed in accordance with the requirement of Forms 1279, 1280, 1282-1, or 1282-2, as the case may be.

A buried end section shall be placed at each end of a run of guide rail unless directed otherwise by the Owner’s Representative.

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 Owner's Representative.

The end post of a buried end section shall have an anchor secured to the bottom of the post.

Where a 150 millimetre x 150 millimetre x 450 millimetre timber anchor is used, it shall be secured to the post by means of a galvanized nut and 16 millimetre diameter bolt 350 millimetre long together with two 45 millimetre round, 4 millimetre thick galvanized washers.

Where a double 38 millimetre x 140 millimetre x 450 millimetre lumber anchor is used, it shall be secured to the post by means of four 125 millimetre galvanized spikes.

Field boring and cutting to length of anchors will be permitted, provided that the hole is treated with two coats of wood preservative before driving the bolts and provided that the cut end is treated with two coats of wood preservative before burying.

The Contractor shall excavate holes for the posts such that when placed in the holes the bottom of the posts are at least 1500 millimetres below the ground surface.

Posts shall be set plumb and to the established lines and grades and shall be placed at 3810 millimetre intervals, unless directed by the Owner's Representative.

The posts shall be firmly backfilled with selected material, free of large rock, placed in layers of thickness not greater than 100 millimetres. 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.

All backfill shall be compacted to 95% of Standard Proctor Density (ASTM D698).

All surplus excavated material shall be disposed of along the sides of fill, or in other locations as directed by the Owner's Representative.

The rails shall be secured to even lines such that the centre of the rail is 635 millimetres above the edge of pavement.

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

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

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.

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 millimetres above the top of the rail as shown by Form 1279 and Form 1280. The tops of the posts shall be treated with two coats of wood preservative after cutting.

Signal reflectors shall be attached to posts at terminal sections, posts at the buried end 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 of the post except for divided highway. On divided highways, silver reflectors shall be placed facing oncoming traffic on the outside shoulder and yellow reflectors shall be placed facing oncoming traffic on the median shoulder.

The Contractor shall drill nail holes in the reflectors, bend the reflectors to the required shape and secure the reflectors with 30 millimetre galvanized flat head nails as shown as shown on Form 1281.

#### **640.05 MEASUREMENT FOR PAYMENT**

Measurement for payment for the supply and installation of Standard Type Guide Rail, "Guide Rail with Additional Posts", "Guide Rail – Structures", or Type "A" Guide Rail, as the case may be, shall be the length of that type of guide rail placed within the limits designated by the Owner's Representative, measured in metres, rounded to one decimal place, measured end to end along the face of the railing and terminal sections regardless of the type and kind of installation excluding the modified special end shoes.

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 designated by the Owner's Representative, measured in metres, rounded to one decimal place, measured end to end along one side only.

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 length of each type of guide rail installation making up the composite.



Measurement for payment for buried end sections will be by means of the number of buried end sections placed as directed by the Owner's Representative.

#### **640.06 BASIS OF PAYMENT**

Payment at the contract price for the Supply and Installation of Guide Rail of a particular type shall be compensation in full for all labour, materials, and equipment to: excavate post holes, supply and install all posts, anchors, rail sections, rail terminal sections, modified end shoes, standard hazard markers, bolts, nuts, washers, spikes and nails, bend rail sections where required to a uniform radius, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, all in accordance with this specification.

Payment at the contract price for the Supply and Installation of buried end sections shall be compensation in full for all labour, materials, and equipment to: excavate post holes, supply and install posts, anchors, buried end sections, bolts, nuts, washers, spikes and nails, backfill post holes, compact backfill, dispose of surplus excavation material, trim posts, supply and apply wood preservative, install reflectors, clean, pre-treat, and coat steel rail with cold galvanizing compound where so required, all in accordance with this specification.