

54.24 SUPPLY AND INSTALL BOX BEAM GUARDRAIL AND POSTS

54.24.1 GENERAL

The Work consists of supplying and installing standard box beam or median box beam guardrail and posts for use as hazard avoidance barriers.

54.24.2 STANDARDS OF REFERENCE

All material supplied shall refer to the following standards, specifications or publications:

- Society of Automotive Engineers:
 - SAE J403 - Sept. 80 - Chemical Composition of SAE Carbon Steels
- Canadian Standard Association:
 - CAN/CSA G40.20-M87 - General Requirements for Rolled or Welded Structural Quality Steel
 - CAN/CSA G40.21-M87 - Structural Quality Steel
 - CSA W47.1-1983 - Certification of Companies for Fusion Welding of Steel Structures.
 - CSA W59-M1984 - Welded Steel Construction (Metal Arc Welding).
 - CSA G164-M1981 - Hot Dip Galvanizing of Irregularly Shaped Articles.
- American Society for Testing and Materials:
 - ASTM A307-86a - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - ASTM A325M-86 - High-Strength Bolts for Structural Steel Joints (Metric).

54.24.3 MATERIALS

The Contractor shall supply all materials necessary to complete the Work. Previously installed material may not be used.

The Contractor may be required to maintain an inventory of materials at storage locations within the Contract boundaries. The quantities of new barrier sections and posts which shall be readily available will be specified in the Special Provisions.

The Contractor shall supply the Engineer with the manufacturer's certification that the material conforms with the specifications.

All materials for standard box beam installations shall be supplied in accordance with drawings TEB 3.27, TEB 3.28, TEB 3.33, TEB 3.34, TEB 3.35, TEB 3.36, TEB 3.37, TEB 3.38, TEB 3.39, TEB 3.40, TEB 3.41, TEB 3.46 and TEB 3.47.

All materials for median box beam installations shall be supplied in accordance with drawings TEB 3.22, TEB 3.23, TEB 3.24, TEB 3.25, TEB 3.26, TEB 3.27A, TEB 3.28A, TEB 3.29 and TEB 3.30.

54.24.3.1 Steel Box Beam Barriers

- Rails
 - Rails shall be welded or seamless structural tubing (350 WT grade) and either class C or H conforming to CAN/CSA G40.21M.
 - The steel shall conform to a minimum standard impact energy requirement of 14 Joules (10.5 ft-lbs) for a half-size test specimen tested at 0° C and shall contain a manganese/carbon ratio, computed based on heat analysis values, of at least 4.5.
 - The above requirements and the mechanical and chemical properties shall be verified by test results, certified as outlined in CAN/CSA G40.20M, and verified as outlined in the Quality Assurance Section of the Road Authority specification.
- Posts, Ground Plates, Paddles, Brackets, Base Plates and Splice Plates.
 - Posts shall be American standard beam section. Posts, ground plates, paddles, brackets, and splice plates shall conform to CSA/CAN G40.21M, grade 230G.
- Bolts, Nuts and Washers.
 - Bolts, Nuts and Washers shall conform to ASTM A307-86A. Self-drilling, self-tapping fasteners shall be #12-24-1.50 indented hex washer head, cadmium plated.
 - Bolts, nuts and washers used for terminal end anchorage treatment shall conform to ASTM A325M-86.

54.24.3.2 Production

54.24.3.2.1 General Requirements

- Welding shall conform to CSA W59M and W47.1. No transverse welds are permitted on the rail sections.
- All components and associated hardware except for self-drilling, self-tapping fasteners shall be hot dip galvanized after fabrication and shall conform to CSA G164M.
- All dimensions are subject to manufacturing tolerances unless otherwise indicated. The individual components shall be capable of being assembled to conform to the finished structure as indicated on the drawings.

54.24.3.2.2 Fabrication

- Flame-cutting shall not be used to create the rounded ends of the slots for the post paddles. The slots may be fabricated in one of the following ways:
 - (1) Two holes each 40 mm in diameter shall be drilled at the two ends of the slot, and the material between may then be removed either by flame-cutting or saw-cutting.

(2) The entire slot may be punched.

- The distance from the end of the slot to the outside face of the nearest vertical side wall shall be no less than 13 mm, and cuts shall not extend past these rounded ends. Failure to comply with these requirements shall constitute grounds for rejection of the product. All slots are to be fabricated before hot dip galvanizing.
- An expansion joint shall be provided for at one end of the rails in accordance with drawings TEB 3.30 and TEB 3.40 when indicated in the material requirements.

54.24.3.2.3 Marking

- The name, brand or trademark of the steel producer, the year of production, and the heat number shall be stamped so as to remain legible after galvanizing.
- The stamped information shall appear on the underside of each rail.

54.24.4 EQUIPMENT

The Contractor shall supply all equipment necessary to complete the Work.

54.24.5 PROCEDURE

The Engineer will determine the areas requiring guardrail repairs or new installations.

All Work shall be performed during daylight hours only. No Work will be performed when the visibility is less than 700 metres.

Traffic control and signing shall be performed in accordance with Specification 55.1, Traffic Accommodation and Temporary Signing.

All standard box beam installations shall be in accordance with drawings TEB 3.27, TEB 3.28, TEB 3.33, TEB 3.34, TEB 3.35, TEB 3.36, TEB 3.37, TEB 3.38, TEB 3.39, TEB 3.40, TEB 3.41, TEB 3.46, and TEB 3.47. Installations at bridge approaches shall be in accordance with drawings TEB 3.41 and TEB 3.47 and construction shall always be started at the bridge.

All median box beam installations shall be in accordance with drawings TEB 3.22, TEB 3.23, TEB 3.24, TEB 3.25, TEB 3.26, TEB 3.27A, TEB 3.28A, TEB 3.29 and TEB 3.30. Installations at bridge approaches shall be in accordance with drawing TEB 3.29 and construction shall always be started at the bridge.

Posts shall be accurately set to the required depth and alignment in a smooth, continuous installation, as shown in the drawings or as directed by the Engineer. Permissible tolerance for plumb and grade of posts shall be 6 mm maximum.

Installations facing traffic shall not be left unfinished and open ended overnight.

54.24.6 TIME TO COMPLETE

In urgent situations, the Contractor shall complete the Work within 5 calendar days of the issuance of the Work Order. In all other cases, the Work shall be completed within 60 calendar days of the issuance of the Work Order.

54.24.7 MEASUREMENT AND PAYMENT

Measurement will be in metres of the length of box beam guardrail installed.

Payment will be made at the unit price bid per metre for "Supply and Install Box Beam Guardrail". This payment will be full compensation for supplying and installing all required guardrail sections and posts, traffic accommodation and signing, and all labour, materials, equipment, tools and incidentals necessary to complete the Work.

In urgent situations where the Contractor is required to complete any type of guardrail Work within 5 calendar days of the issuance of the Work Order, an additional payment will be made at the unit price bid per occurrence for "Guardrail - Premium". This payment will be full compensation for complying with the accelerated scheduling required to complete the Work. This payment will be made only once per Work Order, regardless of the different types of guardrail Work completed.

54.24.8 WARRANTY

The warranty period for this Work shall be 1 year. The permissible tolerance for plumb and grade of the posts at the end of the warranty period shall be 13 mm.