Part 1 General

1.1 RELATED REQUIREMENTS

.1 Refer to Alberta Infrastructure and Transportation Roadside Design Guide – latest version.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA):

- .1 CSA G40.20 and G40.21-M87 - Structural Quality Steels
- .2 CSA G164-M - Hot Dip Galvanizing of Irregularly Shaped Articles
- .3 CSA W59-M - Welded Steel Construction (Metal Arc Welding)

.2 American Society for Testing and Materials (ASTM):

- .1 ASTM A307 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- .2 ASTM D4956 - Retroreflective Sheeting for Traffic Control
- .3 ASTM E316.3 - Magnetic gauge testing of galvanizing coating

.3 American Association of State Highway and Transportation Officials (AASHTO):

- .1 AASHTO Standard Designation M-180 of the latest edition "Corrugated Sheet Steel Beams for Highway Guardrail"
- .2 Task Force 13 report “A Guide to Standardized Highway Barrier Hardware”

.4 American Road and Transportation Builders Association (ARTBA):

- .1 ARTBA Technical Bulletin No. 268-B

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for guiderail, steel post, and coatings and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect guide rails from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Steel W-beam guide rail and Terminal Elements as indicated and as follows:

.1 Guardrail shall consist of rail sections fabricated to develop continuous beam strength with the necessary safety end feature components.

.2 All rail sections and other components shall match the design profiles and dimensions of the AASHTO/ARTBA hardware requirements for full interchangeability of similar components regardless of the manufacturer.

.3 The name or trademark of the Manufacturer, the metal thickness and the year of production shall be clearly and permanently stamped on each component clear of the splicing overlap and on the face opposite the traffic side.

.4 The rails and terminal elements shall be manufactured from open hearth, electric furnace or basic oxygen semi-spring steel sheet and hot dip galvanized after fabrication, all in general accordance with the AASHTO Standard Designation M180 of the latest Edition.

.5 Rails shall be punched for splice and post bolts in strict conformity with the AASHTO Standard to the designated number and centre-to-centre spacing of posts. No punching, cutting or welding will be permitted on site except for special details in unforeseen and exceptional cases with the prior approval of the Consultant.

.6 The rails and terminal elements shall be manufactured according to the following standards:

.1 Metal properties of the base metal for the rails shall conform to the following requirements:

.1 Minimum Yield Point: 345 MPa

.2 Minimum Tensile Strength: 483 MPa

.3 Minimum Elongation: 12% in 50 mm length

.2 Sheet Thickness shall be in accordance with Table 2 (Class A, Type 2) of AASHTO Standard M180 of the latest edition with a nominal thickness of 2.82 mm (2.59 mm minimum). The base metal nominal thickness shall be 2.67 mm (2.44 mm minimum).

.3 Sheet width for the W-beam rail shall be 483 mm, with a permissible tolerance of minus 3.2 mm.

.7 Welding for the fabrication of terminal elements shall conform to the requirements of CSA-W59M. Only welders, welding operators and tackers approved by the Canadian Welding Bureau in the particular category may be permitted to perform weldments.

.8 Rails and terminal elements shall be hot dip galvanized after fabrication, in accordance with CSA-G164M.

.9 Bolts, nuts and washers shall conform to ASTM-A307, and shall be hot dip galvanized in accordance with CSA-G164M.

.10 The strong post W-Beam guardrail shall meet NCHRP 350 Test Level 2 or higher Test Level.

.11 Install an SKT crashworthy end treatment with deep steel posts that meets NCHRP 350 Test Level 2 or higher Test Level.

.2 Steel Posts

.1 Steel for posts shall conform to CSA Standard G40.21 Grade 350W or ASTM Standard A36 and shall be hot dip galvanized after fabrication conforming to ASTMA123/A123M.

.2 Posts and blocks shall be cut with holes drilled to the finished dimensions shown in the standard drawings. The length of the deep steel posts shall be 2.74 m for strong post W-Beam installations. The steel post spacing is 1.905 m. The bottom of the post shall be installed 2 m below the adjacent edge of pavement running surface elevation.

.3 Enhanced deep posts shall have a standard galvanized steel section size W200 x 46, and an overall length of 3.66 m. The bottom of the post shall be installed 2.93 m below the adjacent edge of pavement running surface elevation.

.4 Posts shall be date stamped at the top of either side of the post not used for rail attachment with the last two digits of the year of fabrication. The stamp shall be 50 mm x 50 mm and have an indentation of 3 mm.

.5 HDPE, Pressure Treated Wood and Steel spacer blocks are acceptable.

.3 Guardrail Reflectors

.1 Solid guardrail reflectors shall be supplied for installation on guardrail posts. Reflectors shall have minimum dimensions of 108 mm x 76 mm. Reflective sheeting meeting the requirements of ASTM D4956 for Type IX or XI sheeting shall be installed on both sides of the reflector. The colour of the reflector shall be either white or fluorescent yellow to match the colour of the nearest painted roadway edge line.

.4 Type 1 Gravel

.1 25 mm minus Alberta Transportation Designation 2 Class 25 specification

Part 3 EXECUTION

3.1 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 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent wilderness, properties and walkways.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 ERECTION

.1 Set posts by instrument for alignment, and locations as indicated and as directed by Departmental Representative.

.2 Excavate post holes to depths as indicated.

.1 Compact bottom to provide firm foundation.

.2 Set post plumb and square in hole.

.3 At steep slope locations, as directed by the Departmental Representative, standard deep posts shall by substituted for ‘enhanced deep posts’.

.4 Holes shall be excavated in a manner that does not impact the road structure or the slope adjacent to the hole. Equipment capable of drilling through the very rocky soils, including bedrock, talus and boulders, will be required in some locations. Diamond Drill bits may be required in some sections. The use of excavators for the installation of the posts is not permitted, unless directed otherwise by the Departmental Representative. Augers, pile drivers and vibratory means of installing the posts can be attempted, at the contractors risk and expense; however, rock may prevent such means and methods of construction in some areas. Drilled and augured holes shall be sufficiently large to allow for pneumatic tamping.

.5 Backfill around posts using imported granular material (25 mm minus Alberta Transportation Designation 2 Class 25 specification also referred to as Type 1 gravel) material and compact in uniform layers not exceeding 150 mm compacted thickness to a minimum dry density of 98 percent of Standard Proctor Maximum Dry Density using pneumatic tamping. Pile driving or vibrator construction methods may eliminate the need for backfill around posts, at the discretion of the Departmental Representative.

.6 As an alternative, the contractor can install the steel posts using a vibratory driver, provided that the posts can be installed plumb, square and at the desired location to the satisfaction of the Departmental Representative.

.7 All equipment larger than hand-operated equipment shall be rubber track or wheel-mounted, and operated from the existing roadway surface. No equipment access into the ditches will be permitted without special departmental approval.

.8 Leave or make depression approximately 150 mm deep around posts until painting is completed, then fill and compact to ground elevation.

.9 Cut off tops of posts as indicated in the manufacturer's instructions and data sheets, with tops parallel to grade of pavement edge.

.10 Worker protection: ensure workers wear gloves, respirators, dust masks, long sleeved clothing, eye protection, protective clothing when handling, drilling, sawing, cutting or sanding and applying preservative materials.

.11 Treat cut tops with 2 coats of organic zinc-rich paint.

.12 Construct anchorages to details as indicated in the manufacturer's instructions and data sheets.

.1 Place and compact backfill for anchors as directed by Departmental Representative.

.13 Erect steel W-beam components to details as indicated in the manufacturer's instructions and data sheets. Lap joints in direction of traffic.

.1 Tighten nuts to 100 N.m torque.

.1 Maximum protrusion of bolt 12 mm beyond nut.

.14 Grade the shoulder between the post and the edge of pavement to achieve a maximum 10 H:1 V slope between the edge of pavement and post. Moisture condition gravel to within three percent of optimum (D698) and compact to minimum 95 percent of Standard Proctor Maximum Dry Density.

3.4 PAINTING

.1 Galvanized steel-touch up:

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

.1 Apply 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.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by guide rail installation.

END OF SECTION