

VEHICLE CRASH BARRIERS

02/15

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**PART 1 GENERAL.**

1.1 REFERENCES.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS  
(AASHTO)

AASHTO M 30	(2002; R 2010) Standard Specification for Zinc-Coated Steel Wire Rope and Fittings for Highway Guardrail
AASHTO M 180	(2012; R 2017) Standard Specification for Corrugated Sheet Steel Beams for Highway Guardrail
AASHTO MASH	(2016) Manual for Assessing Safety Hardware - Second Edition

ASTM INTERNATIONAL (ASTM)

ASTM A1	(2000; R 2018) Standard Specification for Carbon Steel Tee Rails
ASTM A27/A27M	(2020) Standard Specification for Steel Castings, Carbon, for General Application
ASTM A36/A36M	(2019) Standard Specification for Carbon Structural Steel
ASTM A47/A47M	(1999; R 2018; E 2018) Standard Specification for Ferritic Malleable Iron Castings
ASTM A123/A123M	(2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A242/A242M	(2013; R 2018) Standard Specification for High-Strength Low-Alloy Structural Steel
ASTM A307	(2014; E 2017) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength

ASTM A449	(2014) Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
ASTM A499	(2015, R 2020) Standard Specification for Steel Bars and Shapes, Carbon Rolled from "T" Rails
ASTM A563	(2015) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A563M	(2007; R 2013) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A568/A568M	(2019a) Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for
ASTM A588/A588M	(2019) Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi [345 MPa] Minimum Yield Point, with Atmospheric Corrosion Resistance
ASTM A615/A615M	(2020) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A706/A706M	(2016) Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A709/A709M	(2018) Standard Specification for Structural Steel for Bridges
ASTM A1035/A1035M	(2020) Standard Specification for Deformed and Plain, Low-carbon, Chromium, Steel Bars for Concrete Reinforcement
ASTM B695	(2004; R 2016) Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM D4956	(2013) Standard Specification for Retroreflective Sheeting for Traffic Control
ASTM F3125/F3125M	(2019) 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

## 1.2 SUBMITTALS.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the government officer that will review the submittal for the Government.

SD-03 Product Data

FHWA Acceptance Letter

SD-08 Manufacturer's Instructions

End Anchorage

Submit at least 14 days prior to installation.

Crash Cushion

Submit at least 14 days prior to installation.

## **PART 2 PRODUCTS.**

### 2.1 GUARDRAIL POSTS.

Guardrail posts must be either wood or steel and of the dimensions indicated. Unless otherwise indicated, use only one type of post throughout the project.

#### 2.1.1 Sawn Wood Posts and Offset Blocks

Posts and offset blocks must be of stress grade and capable of resisting a working stress of 1600 psi on the extreme fibers when subjected to bending. Posts and blocks must be double end trimmed with the mounting bolt hole in each being drilled 1/16 inch oversize and within 1/2 inch of the specified location on either side of the post or block. All wood posts and offset blocks must be rough, free of wane, squarecut, and fully sawn to the dimensions indicated. Drill post bolt holes before preservative treatment is applied. Unless otherwise approved, use only one preservative on the project.

#### 2.1.2 Steel Posts

Fabricate "H" beam sections from steel conforming to either ASTM A36/A36M, ASTM A588/A588M or ASTM A242/A242M and conforming to the size, weight and dimensions indicated. Use bolts must be of the diameters indicated. Bolts used with galvanized ASTM A36/A36M steel must conform to ASTM A307. ASTM F3125/F3125M, Type 3 bolts may be used with ASTM A588/A588M or ASTM A242/A242M steel without galvanizing. Galvanize bolts, posts, and all necessary hardware fabricated from ASTM A36/A36M steel in accordance with ASTM A123/A123M.

#### 2.1.3 Polymer and Polymer Composite Offset Blocks

Provide polymer and polymer composite offset blocks certified by the

Federal Highway Administration (FHWA) to meet the requirements of either NCHRP 350 or AASHTO MASH. Submit a copy of the FHWA Acceptance Letter.

2.2 W-BEAM GUARDRAIL.

Provide galvanized steel beam guard rail elements and fittings of the indicated design and details. The finished steel beam elements must be Class A (base metal nominal thickness 0.105 inch and conform to the requirements of AASHTO M 180. Galvanizing of steel beam elements must be Type 1 (zinc coated 1.80 ounces per square foot, minimum single spot) and must conform to the requirements of AASHTO M 180.

2.3 "W" BEAM END SECTION.

Provide "W" beam end sections of the same or greater thickness of metal and the same type as the beam to which it is attached.

2.4 GUARDRAIL HARDWARE.

All fittings (bolts, nuts, washers, etc.) for guardrail must conform to the requirements of AASHTO M 180.

Bolt Use	Bolt Size and Configuration	
Rival Splices	5/8 inch diameter	Button head type with oval shoulder conforming to alternative No. 1 or 2 configuration of AASHTO M 180
Fastening Rail to Steel or Timber Blocks	5/8 inch diameter	Button head type with oval shoulder conforming to alternative No. 1 or 2 configuration of AASHTO M 180
Rail Splices	1.25 inches long	
Fastening Rail to Steel Block	2 inches long	Minimum thread length of 1.5 inches
Fastening Rail to Timber Block and Post	18 inches long	Minimum thread length of 2.5 inches
Fastening Steel Block to Post	1.5 inches long	5/8 inch diameter hex head type

2.5 TERMINAL FOR W-BEAM GUARDRAIL.

Provide end terminal as specified in drawings for w-beam guardrail. Provide end terminal certified by the Federal Highway Administration (FHWA) to meet the requirements for Test Level 3 of NCHRP 350 or AASHTO MASH. Submit a copy of the FHWA Acceptance Letter.

2.6 CRASH CUSHION.

Provide redirective, non-gating, bi-directional type crash cushion as indicated. Crash cushion must be certified by the Federal Highway Administration (FHWA) to meet the requirements for Test Level 3 of NCHRP 350 or AASHTO MASH. Submit a copy of the FHWA Acceptance Letter.

2.7 RETROREFLECTIVE SHEETING.

Provide retroreflective sheeting conforming to ASTM D4956, Type III, IV,

V, VII, VIII, IX or XI. All retroreflective sheeting must have a precoated adhesive which will permanently adhere to the metal surface.

### **PART 3 EXECUTION.**

#### **3.1 POSTS.**

Posts may be placed by driving or by setting in excavated holes. Post holes for guardrail posts must be round and at least 4 inches larger, in diameter, than the greater dimensions (not the diagonal) of the posts, and must be backfilled around the posts with material removed or other suitable soil, placed in lifts not exceeding 4 inches, each lift thoroughly tamped. When placed by driving, drive the posts plumb, to the depth and in the position indicated. Remove posts which are broomed, split or damaged in any other way and replace with a sound post. Carry on driving operations in such manner that nearby structures, shoulders, or pavements are not damaged. Cuts and abrasions in preservative-treated posts and blocks must have the newly exposed surfaces treated with at least three applications of the same type of preservative with which the material was originally treated. Each application must be reasonably dry before the succeeding coat is applied. At the time a timber post is installed, any seasoning check which extends the full length of the piece cannot exceed 1/4 inch in width. Adjust posts used for vertical transition in length so that a minimum of 60 inches will be buried. Where guardrail cross buried structures and 60 inches of bury is not obtainable, install the guardrail post as deep as possible and with a 24 inch diameter concrete encasement for the full depth of bury.

#### **3.2 GUARDRAIL BEAM ELEMENTS.**

Place and fasten the beam elements, fittings, and other parts of the guardrail as indicated. Erect the elements to produce a smooth, even rail, closely conforming to a line and grade parallel to the pavement. Bolt the beam elements to each post, and make splices by lapping in the direction of traffic. Splice only at posts. Where the rail is on a curve, the beams at the splice must make contact throughout the area of the splice, forming a continuous beam before erection. On curves of 150 foot radius or less, install shop bent beam elements, bent to the radius indicated. Tighten all bolts in the finished rail.

#### **3.3 GUARDRAIL DELINEATOR REFLECTOR TABS.**

Clean, degrease and etch the face of metal tabs using methods recommended by the retroreflective sheeting manufacturer. After cleaning and degreasing, apply retroreflective sheeting material to the metal tabs as recommended by the manufacturer. Perform shearing, cutting and punching prior to preparing the blanks for application of reflective material.

#### **3.4 GUARDRAIL END ANCHORAGE.**

Install flared and non-flared end anchorages in accordance with the manufacturer's instructions. Submit a copy of the manufacturer's end anchorage installation instructions prior to installation.

#### **3.5 CRASH CUSHION.**

Assemble and install crash cushions as indicated and in accordance with the manufacturer's instructions. Submit a copy of crash cushion manufacturer's installation instructions.

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