



6-25.1 General

This section covers the construction of steel plate beam guard, cable guard fence, anchors, and marker posts. Construction details relating to post spacing and location, dimensions, and other pertinent information are shown on standard detail drawings included in the plans for the project. The locations and lengths of the installations are described on the plans also.

The engineer should check the proposed locations of the work as shown on the plans against the actual field conditions when staking out the work. Such installations should be made only when clearly justified. Where beam guard or barrier installations are indicated, the roadway should be examined to determine whether flattening an embankment slope or adjusting other site features might eliminate need for the installation. If, after consideration of all factors, doubt as to need for the installation exists, the proposed location should be examined by the team leader. Any subsequent required revisions in length and location should be noted and staked accordingly.

6-25.2 Marker Posts and Marker Posts for Right-of-Way

Right-of-way marker posts are erected during the early construction operations unless previously placed. Generally, they are placed at each right-of-way monument to mark its location. On most urban work, right-of-way marker posts are not erected.

Changes in right-of-way requirements may occur after the plans have been drawn; therefore, the right-of-way as shown on the field set of plans should be checked against that shown on the latest official right-of-way plat in the region office before any staking is done.

Marker posts for right-of-way should be set so their outermost surface is on the property line. Refer to Standard Detail Drawing [SDD 15A1](#). Upon completion of the work, all marker posts should be checked and all damaged or tipped posts should be replaced, repainted, or straightened.

Installing the metal right-of-way marker sign is not required on wooden right-of-way marker posts.

6-25.3 Steel Plate Beam Guard

6-25.3.1 General

Particular attention should be given to placement of posts for beam guard. The posts must be erected true to line. The posts must have a firm foundation to minimize future settlement and the backfill around the posts must be thoroughly compacted. After the posts have been erected on a firm foundation, a string line grade is established, inspected, and approved, after which the beam guard, offset blocks, and hardware must be attached to the post at the correct elevation and the tops of the posts cut off the proper grade. Before acceptance, all beam guard should be checked for line and grade and any nonconforming posts reset or straightened. The fill slopes should be constructed to provide adequate support for the posts and anchors when offset as shown on the standard detail drawing.

Care should be exercised when aligning and installing posts, and especially when driving, to preclude interference with and damage to underground facilities such as lighting and signal cables, under-drains, etc. These have to be located and marked in advance of construction.

Posts are usually placed by driving with a machine. They must be driven to plumb, to the required depth and alignment, with adequate lateral stability, and without damage to the shoulders and adjacent slopes from the driving operations. Any post that fails to meet the above requirements or is damaged below cutoff during driving should be removed and replaced with a sound post. The contractor should be reviewing the driving equipment and technique if damage continues.

Cut wood surfaces are to be treated with two coats of the same type of preservative used originally to treat the posts, in accord with [standard spec 614.3.3](#). Cutoff bolt ends and damaged galvanized areas on the beams must be painted with two coats of zinc-rich paint.

Details for installing reflectors are shown on [SDD 14B15](#).

6-25.3.2 Timber Terms

Following are the definitions along with examples of lumber and timber terms to understand the surface characteristics of wood defects:

Check A separation of the wood along the direction of the fibers. Checks usually extend across the rings of annual growth and commonly result from stresses set up during

seasoning.

Green Wood Freshly sawed wood that has received no drying. Green wood is also said to be "unseasoned."

Knot Portion of a branch or limb that has been surrounded by subsequent growth of the wood of the tree. The size of the knot is its smallest measured diameter.

Seasoning The process of removing moisture from wood, or drying, to achieve moisture content appropriate for the performance expected of the final product. Dried wood is referred to as "seasoned."

Shake The longitudinal separation along the grain of the wood. Generally, two forms of shake are recognized: heart shake starts at or near the center of the log and extends radially 45 degrees; ring shake occurs along the annual growth rings.

Split A separation of the wood parallel to the fiber direction, due to the tearing apart of the wood cells. A split extends through the piece from one surface to another.

Wane Bark, or lack of wood from any cause, on an edge or corner of a piece.

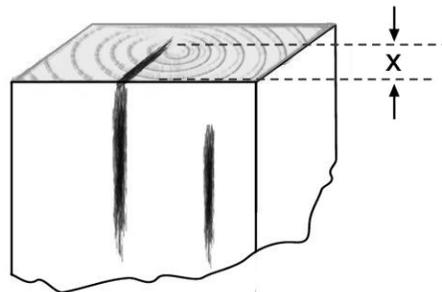
6-25.3.3 Measurement of Post Defects

The examples below illustrate various post defects, and how the engineer is to measure them. The measured defects should be checked against the specification requirements provided in the table in [standard spec 614.2.4.2](#).

6-25.3.3.1 Checks

Checks may or may not go to the faces of the piece. Checks go across the annual rings. The engineer should measure checks perpendicular to the face of the piece, as shown in [Figure 1a](#), [Figure 1b](#), and [Figure 1c](#). Both of the checks in Figure 1a can be measured by inserting a device into the crack to measure penetration of the crack (depth), if the checks are perpendicular to the piece face.

Figure 1a Measuring Check Depth



Always measure perpendicular to the 8-inch face of the post if check is on the 6-inch face, not the actual length of the crack.

Figure 1b Measure Checks Perpendicular to Face

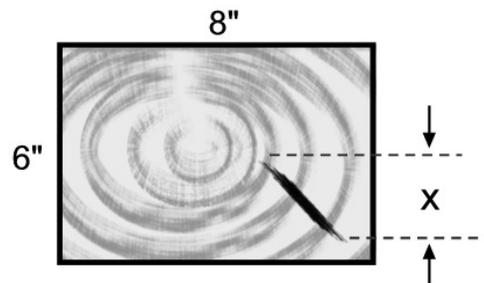
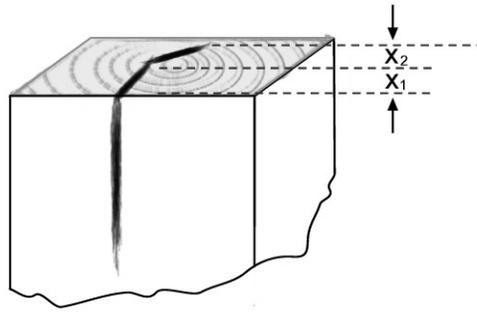


Figure 1c illustrates a form of a double check. In this case, add X_1 and X_2 together. Measure across the grain and perpendicular to the grain to the opposite face.

A split could appear the same but would just follow the grain or fiber path through the post (see split examples).

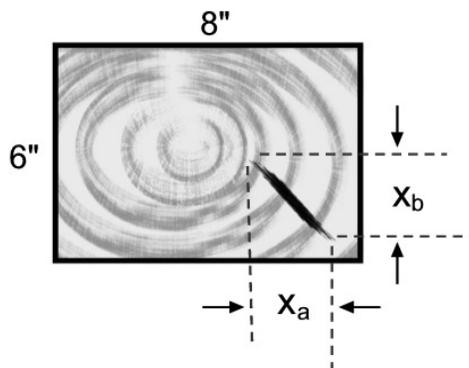
Figure 1c Double Check



6-25.3.3.2 Shakes

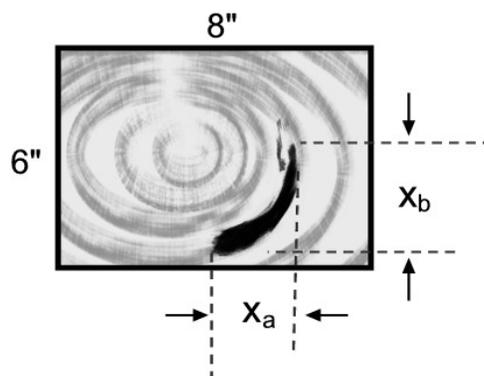
Measure heart shake on the end of the post with perpendicular lines to the face(s). The least dimension (X_a for the example) is to be compared with the specification maximum. See [figure 2a](#) below.

Figure 2a Heart Shake



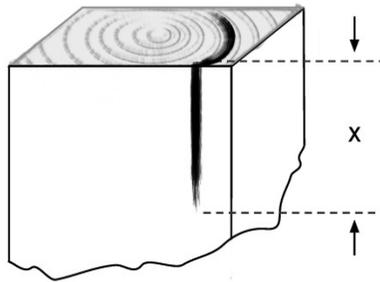
Ring shake follows the growth ring. Measure as outlined in [Figure 2b](#) with perpendicular lines to the face(s). The least dimension, X_b is to be compared with the specification maximum.

Figure 2b Ring Shake

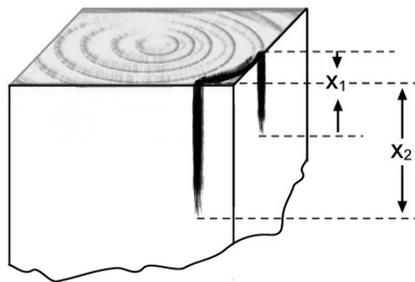


6-25.3.3.3 Splits

Notice in [Figure 3a](#) that the split follows the grain of the wood through the post. Measure the split on the face as shown by the "X" in the diagram. Measure the length of the split on the back side too, and compare the larger of the two measurements with the specification maximum.

Figure 3a Split through Post

Notice in [Figure 3b](#) that the split follows the annual ring to an adjacent face of the post. Measure the lengths of both of the facial splits and compare the larger length (X_2 in this example) with the specification maximum.

Figure 3b Split to Adjacent Face

6-25.3.4 Replacement and Adjustment of Beam Guard

6-25.3.4.1 Posts and Blocks

Posts and blocks that are out of alignment are to be straightened. [Figure 4](#) and [Figure 5](#) show posts and blocks that are out of plumb and should be straightened. Damaged and rotten posts and blocks as shown in [Figure 6](#), [Figure 7](#), and [Figure 8](#) should be replaced.

Figure 4 Twisted Block

Figure 5 Post out of Plumb



Figure 6 Damaged Post



Figure 7 Rotten Block



Figure 8 Rotten Posts



6-25.3.4.2 Rail Damage

[Attachment 1](#) provide examples of flattened, kinked, and torn rails, which will require repair or replacement.

6-25.3.5 Project Acceptance Procedure

Steel plate beam guard manufacturer must be on the department Pre-Qualified Steel Plate Beam Guard Manufacturers List. Procedure for manufacturer prequalification is listed in a separate section below.

6-25.3.5.1 Certification of Compliance:

A Certification of Compliance shall be furnished (for each contract) by the guardrail installer for each manufacturer of beam guard for the contract. The certification needs to be have the date, signature and title of the person certifying the product. Information on the certificate shall include the following:

- State Project ID
- Highway Number
- Project Description
- County
- Name or Brand of Manufacturer
- Product Identification Number (i.e.: AASHTO M180 Class A Type II)
- Signed Buy America Certification Statement*

*Certification statement needs to state where the steel/iron has been melted, molded, galvanized, epoxy coated etc. A signature is required on the Buy America certification. Also, mill and manufacturer certification is expected to be on file and provided upon request. Buy America is a mandate of the Federal Highway Administration, enacted in 1983.

Figure 16 Example Certificate of Compliance

Complete Landscaping

333 Pleasant Ridge Road
Madison, WI

Phone: (608) 555-1000 Fax: (608) 555-2000

Date: 09/19/2013
To: Wisconsin DOT
2101 Wright Street
Madison, WI 53704
Attn: Project Leader's Name
Project ID: 5210-02-87
Highway: USH 18
Description: Mt. Horeb – Madison
County: Dane

Certificate of Compliance

Complete Landscapers, LLC certifies that all beam guard materials and associated components meet or exceed the requirements of the Wisconsin Department of Transportation Standard Specifications Section 614 and AASHTO M180 Class A Type II.

Certification to "Buy America" Requirements

Complete Landscapers, LLC certifies that the iron and steel used in the products supplied to this project were:

- melted and manufactured in the US;
- coated, galvanized, or painted in the US;
- fabricated, such as rolling, bending, forming, drilling, machining, extruding etc. in the US

Mill and manufacturer certification is on file and will be provided upon request.

Manufacturer of Beam Guard: Gregory Highway Products, Inc. Canton, Ohio
Product Identification Number: GH M180 A 2 J R597 25 14.

Authorized Signature,

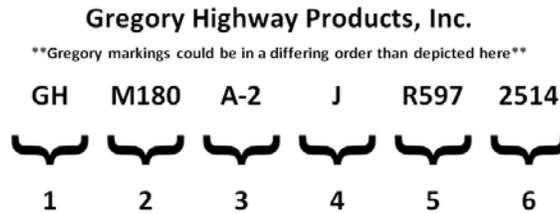
John Doe
Quality Assurance Manager
Complete Landscaping, LLC

All guardrail materials and associated guardrail components are to meet the material requirements of standard spec 614 and AASHTO Specification M180. Any guardrail material not in conformance with specifications will be removed and replaced at no cost to the Wisconsin Department of Transportation.

The engineer will verify that the Certification of Compliance Product Identification number is on the shipment of beam guard delivered to the project site.

Figures 17a-f depict the typical stamped markings for each manufacturer on the steel beam.

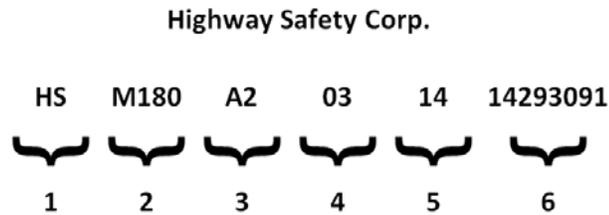
Figure 17a Key for Gregory Highway Products, Inc. Guardrail Stamp



Legend:

- 1 = Gregory Highway Products, Inc.
- 2 = AASHTO Specification
- 3 = Class-Type (Class A = 12 gauge, Base metal nominal thickness) –
(Type 2 = Zinc coated, 3.6 ounces per sq. ft., minimum single spot)
- 4 = Operator Identification / First letter of operator's last name
- 5 = Heat Number Code (4-digit, alpha-numeric)
- 6 = Coating Lot (Week: one of two digits between 1 thru 52, Year: two digits, e.g. 14 = 2014)

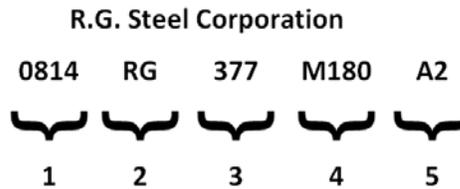
Figure 17b Key for Highway Safety Corp. Guardrail Stamp



Legend:

- 1 = Highway Safety Corp.
- 2 = AASHTO Specification
- 3 = Class-Type (Class A = 12 gauge, Base metal nominal thickness) –
(Type 2 = Zinc coated, 3.6 ounces per sq. ft., minimum single spot)
- 4 = Coating Lot (Week: one of two digits between 1 thru 52)
- 5 = Year (two digits, e.g. 14 = 2014)
- 6 = Heat Number (purchase order number)

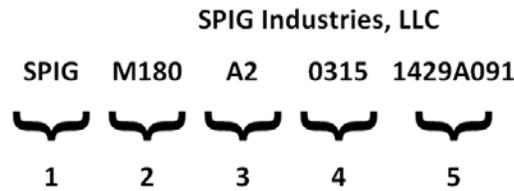
Figure 17c Key for R.G. Steel Corporation. Guardrail Stamp



Legend:

- 1 = Week (one of two digits between 1 thru 52) and Year (two digits, e.g. 14 = 2014)
- 2 = R.G. Steel Corporation
- 3 = Heat Number
- 4 = AASHTO Specification
- 5 = Class-Type (Class A = 12 gauge, Base metal nominal thickness) –
(Type 2 = Zinc coated, 3.6 ounces per sq. ft., minimum single spot)

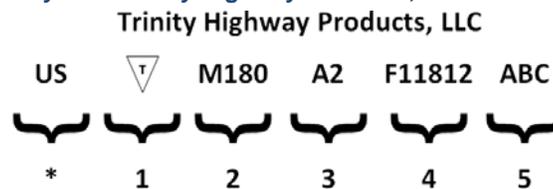
Figure 17d Key for SPIG Industries. Guardrail Stamp



Legend:

- 1 = SPIG Industries, LLC
- 2 = AASHTO Specification
- 3 = Class-Type (Class A = 12 gauge, Base metal nominal thickness) –
(Type 2 = Zinc coated, 3.6 ounces per sq. ft., minimum single spot)
- 4 = Coating Lot (Week: one of two digits between 1 thru 52, Year: two digits, e.g. 14 = 2014)
- 5 = Heat Number (6-10 digits, alpha-numeric)

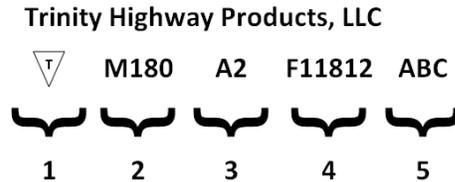
Figure 17e Key 1 for Trinity Highway Products, LLC.. Guardrail Stamp



Legend:

- * = US Melted and Manufactured in the USA
- 1 = Trinity Brand Trademark
- 2 = AASHTO Specification
- 3 = Class & Type as per AASHTO M180
- 4 = Heat Code, the first letter defines which plant the beam is manufactured from.
(Trinity has both a Heat CODE and a Heat NUMBER. Trinity's Heat CODE = WisDOT Heat NUMBER.)
G = Girard, OH Plant
L = Lima, OH Plant
- 5 = Lot Identification

Figure 17f Key 2 for Trinity Highway Products, LLC.. Guardrail Stamp

**Legend:**

1 = Trinity Brand Trademark

2 = AASHTO Specification

3 = Class & Type as per AASHTO M180

4 = Heat Code, the first letter defines which plant the beam is manufactured from.

(Trinity has both a Heat CODE and a Heat NUMBER. Trinity's Heat CODE = WisDOT Heat NUMBER.)

F = Fort Worth, TX Plant

K = Kosciusko, MS Plant

O = Orangeburg, SC Plant

C = Centerville, UT Plant

5 = Lot Identification

6-25.3.5.2 Coating Thickness, Quality Verification

Annually, each WisDOT Regional Technical Services Section (TSS) shall visit projects where Beam Guard has been installed. Randomly select a rail and test using PosiTector Model 6000 F coating thickness gauge or equivalent to verify the minimum mean (average) for the rail is at least 80 microns (which has been tested in the Truax laboratory to be equivalent to the [standard spec 614](#), coating thickness requirement of 3.6 ounces per square foot.) If the mean of the rail measurements is deficient, randomly select two additional rails from that heat/lot number and take a batch of measurements at each end of the two rails. The mean coating thickness for all four of the batches must meet or exceed the specification of 80 microns (3.6 oz/sf). If the rails do not meet the specification, have the vendor cut three standard two-foot samples from the original failing rail for Truax laboratory testing. Also, mark the two retest rails in the field for future reference. If the test at Truax laboratory confirms deficient coating thickness, all of the beam guard provided for the contract will be removed and replaced at no cost to the Wisconsin Department of Transportation.

Beam guard coating thickness verification may be waived if less than 500 linear feet is placed on a contract. Beam guard coating thickness quality verification testing must be performed for any contract that has 500 linear feet or more of beam guard installed, regardless of the number of beam guard manufacturers or the length of beam guard provided by each manufacturer. Test beam guard coating thickness for each manufacturer.

Annually WisDOT will complete Round Robin Verification Testing to validate Region's Positector calibration and consistency.

Positectors found to be outside of verification tolerances shall be repaired or replaced. Replaced Positectors shall test verification panel prior to use.

6-25.3.5.3 Department Documentation

All beam guard Coating Thickness Quality Verification testing as described above shall be reported on a material tracking/material information tracking (MTS/MIT) prefix 155 Miscellaneous Materials Report.

Figure 18 Example Beam Guard 155 Materials Report

Test Number: 9D - 155 - 0001 - 2015	Labsite:	
Materials Laboratory Testing System Tests On:	Training and Testing Site	
Miscellaneous Materials	District Tests	
Type: V - VERIFICATION	1st Avenue	
	Anytown, WI 56789	
Main Project ID: 9999-99-99		
MTS Training and Test Project		
Date Sampled:	Date Requested / Received:	Date Entered:
01/13/15	01/13/15	01/13/15
By: KEITH LUNDIN	By: NC-WIS. RAPIDS	By: JEFF MICHALSKI
Source:	Legal Description: , , Section: , T: N, R: ,	County:
Manufacturer: GREGORY HIGHWAY PRODUCTS	Other Associated Projects:	
Material: BEAM GUARD		
Supplier: ARBOR GREEN, INC.		
Remarks: Y		
Description		
Project quantity of Beam Guard: 750 L.F.		
Manufacturer Name: Gregory Highway Products		
Certification of Compliance Received? Yes		
QV Test Information		
Heat Number(s): R597		
Panel Length: 25.0 ft		
Product Identification Number: GH M180 A 2 J R597 25 14		
Average Reading(s): 110.2		
Tested By: Jeff Michalski		
Date: 01/13/15		
Complete Stamped Marking(s) for each Beam on the Project:		
GH M180 A 2 J R597 25 14		
GH M180 A 2 K J603 30 14		
GH M180 A 2 K J511 30 14		
GH M180 A 2 J R209 25 14		
Bid Items on Project:		
614.0200 Steel Thrie Beam Structure Approach		
614.0355 Steel Plate Beam Median Guard		
614.2300 MGS Guardrail 3		

Certifications of Compliance shall be referenced on a MTS/MIT prefix 900 or 905 reference report. (Contact your region materials section for documentation preference.)

The complete marking stamped on the beam needs to be recorded in a MTS/MIT prefix 155 reference report. Create one MTS/MIT prefix 155 report for each manufacturer.

Figure 18 shows a combined 155 report for Coating Thickness Verification and the complete stamped markings. A combined 155 report is acceptable provided the Coating Thickness Verification Test and the markings recorded are from the same manufacturer. If you have multiple manufacturers, create a separate prefix 155 reference report for the other manufacturer. A template of the prefix 155 Beam Guard reference report can be found in the statewide pantry.

6-25.3.5.4 Manufacturer Pre-Qualification Requirements

Only materials from the manufacturers listed on the department Pre-Qualified Steel Plate Beam Guard Manufacturers List will be accepted for use on state projects.

Pre-qualification is based on Brand Registration and Guarantee in accordance with AASHTO M180. Submit Brand Registration and Guarantee annually to the WisDOT Division of Transportation Development-Bureau of Technical Services-Materials Management Section for approval.