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WEST VIRGINIA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
MATERIALS CONTROL, SOILS AND TESTING DIVISION

MATERIALS PROCEDURE

QUALITY ASSURANCE OF GUARDRAIL BEAMS,
STEEL GUARDRAIL POSTS AND HARDWARE

1.0 PURPOSE

To provide the procedures for the quality assurance of guardrail beams, steel guardrail posts, and hardware.

2.0 SCOPE

This procedure shall apply to the guardrail classes and types as defined in Section 3 of AASHTO M180.

3.0 APPLICABLE SPECIFICATIONS

All items under this procedure shall meet the requirements of Section 607 of the West Virginia Division of Highways Standard Specifications for Roads and Bridges, the West Virginia Standard Detail Book Volume I, and the West Virginia Standard Bridge Plans.

4.0 APPLICABLE DOCUMENTS

AASHTO M180
AASHTO M183
Industrial Fastener Institute Technical Report Number IFI-122

5.0 PROCEDURE

Fabricators who will provide guardrail beams, posts, and ancillary hardware for use on Division projects will be identified as Approved or Nonapproved Fabricators as outlined below.

5.1 Approved Fabricator

5.1.1 To be considered as an approved fabricator, the fabricator shall do the following:

5.1.2 The fabricator will file with the Division a brand registration and guarantee as stipulated in AASHTO M180.

5.1.3 The fabricator will submit to Materials Control, Soils and Testing Division a Quality Control Plan detailing how the product will be controlled. As a minimum, the plan must include the following:

- 1) Name of company officer responsible for quality control.
- 2) Tests to be completed and their minimum frequencies (see Attachment Number 1).
- 3) Procedure for disposition of nonspecification fabrication.

5.1.4 The fabricator will engage an acceptable independent inspection agency to sample and test each component to be supplied to Division project(s). Testing and evaluation will be by applicable specification. All test data will be submitted to Materials Control, Soils and Testing Division for evaluation.

5.1.5 A fabricator who has been supplying Division project(s) will be exempt from Section 5.1.4.

5.1.6 Upon approval of the fabricator's Quality Control Plan, brand registration and independent tests, the fabricator will be assigned a laboratory number and be placed on the approved list. On at least a yearly basis thereafter, the Division or its representative will perform an inspection of the fabricator's facility. The Division inspection may consist of the following:

5.1.6.1 An in-depth review of the fabricator's quality control procedures to assure compliance with the approved Quality Control Plan.

- 5.1.6.2 Random samples will be selected of materials supplied by the fabricator. Samples of each item group should be as follows:
- 1) Guardrail Element and Backup Plates - One section at least 584 mm in length of the completed guardrail, after galvanizing from each gauge of material.
 - 2) Guardrail Post - Two samples at least 457 mm in length will be selected, one each from two different completed posts after galvanizing.
 - 3) Splice and Post Bolts and Nuts - Random samples of splice bolt, and post bolt (any length in stock) and nut shall be selected.
 - 4) Standard End Sections, Buffer End Sections, Return End Sections, Terminal Connectors - Random samples of end sections manufactured or supplied by the fabricator.
 - 5) Breakaway Cable Terminal Assembly (BCT) - One complete assembly will be selected at random to include all components fasteners and hardware.
 - 6) Ancillary Items such as Miscellaneous Fasteners, Washers, Pipe Sleeves - Random samples will be selected from all materials the fabricator may supply. To facilitate this sampling, the fabricator will prepare a list of all ancillary hardware items which he may supply to Division projects. Selection of samples will be at the discretion of the Division's representative.
- 5.1.6.3 All samples will be tested by the Division to determine compliance with applicable specification requirements.
- 5.1.7 If the documentation of quality control data is not maintained to the satisfaction of the Division, or if inspection or tests reveal noncompliance with the specifications, the fabricator may be removed from the approved list.

- 5.1.8 Approval may be reinstated at the discretion of the Division, when correction of all deficiencies can be documented and the fabricator has reestablished his quality control to the satisfaction of the Division.
- 5.1.9 The fabricator and the Division's District Materials offices will be notified of all changes in the status of a fabricator's certification.
- 5.1.10 Approved fabricators will furnish a bill of material or shipping document (Section 7.0).
- 5.2 Nonapproved
 - 5.2.1 A fabricator defined as nonapproved may supply guardrail items to Division projects from approved LOTS.
 - 5.2.2 Each LOT must be inspected, tested and approved by an independent inspection agency acceptable to the Division. The inspection and testing will be paid for by the fabricator.
 - 5.2.3 Upon completion of the independent inspection agency's inspection, a copy of the report will be submitted to Materials Control, Soils and Testing Division for evaluation.
 - 5.2.4 If any individual piece from a LOT fails to meet the specification requirement, two additional pieces can be tested. If either of these pieces fail, the LOT will be rejected.
 - 5.2.5 When a LOT has been tested and found to meet all specification requirements, the Division will assign the fabricator a laboratory number for the LOT approval.
 - 5.2.6 When shipments are made from approved LOTS, the fabricator must provide documentation as outlined in Section 7.0 to the project.

6.0 MARKINGS

Each guardrail beam must be marked in accordance with AASHTO M180.

7.0 SHIPPING DOCUMENTATION (Approved or Nonapproved)

7.1 The fabricator will furnish to the project with each shipment a bill of material or shipping document. This document must include the following information (whichever is applicable):

- 1) Date of shipment
- 2) Federal or State project or Division of Highways purchase order number
- 3) Fabricator's order number
- 4) Consignee
- 5) Number and length of guardrail pieces
- 6) Shape (W-beam or Other Beam)
- 7) Class of guardrail
- 8) Gauge of material
- 9) Heat number
- 10) Type of guardrail
- 11) Quantity and heat number of steel posts
- 12) Number and type of end sections
- 13) Quantity of breakaway terminal assemblies
- 14) Size and quantity of splice and post bolts
- 15) Quantity of splice plates and steel offset blocks
- 16) Division assigned laboratory number
- 17) Description and quantity of any items not listed above

8.0 PROCEDURES AT THE DELIVERY SITE

8.1 Division personnel will visually inspect each shipment and review information on the shipping document for proper quantities. All shipments that are damaged, incomplete, or otherwise considered nonspecification will be rejected.

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9.0 DIVISION DOCUMENTATION

- 9.1 For project accepted shipments the bill of material or shipping document indicating acceptance will be forwarded to and retained by the District Materials Section.
- 9.2 The laboratory number assigned to the fabricator (either approved or nonapproved) will be entered on all project records as material acceptance.



Gary L. Robson, Director
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and Testing Division

GLR:c

Attachments

MINIMUM QUALITY CONTROL PLAN REQUIREMENTS

A1.0 GUARDRAIL, BEAMS, BACKUP PLATES AND END SECTIONS

- A1.1 The fabricator will verify quality of the base metal by maintaining on file, copies of certified mill test reports from the steel producer. Mill test reports must contain all test data required by AASHTO M180 and shall include the applicable heat number identification. The fabricator will verify that test data is available for all heats used to manufacture guardrail and end sections.
- A1.2 Heats for which proper mill test reports are not available will be sampled by the fabricator for testing by an independent testing laboratory acceptable to the Division.
- A1.3 Sampling and testing is to be performed in accordance with AASHTO M180. The fabricator will verify dimensions, zinc coating thickness (weight) and workmanship in accordance with the following minimum frequency:
 - A1.3.1 Guardrail beams - 1 sample (inspection) for each 1/2 day production for each heat of steel.
 - A1.3.2 Guardrail Backup Plates - Same as above.
 - A1.3.3 End Sections - 1 sample (inspection) for each 50 pieces manufactured for each heat of steel.
- A1.4 Results of all dimensional, zinc coating and visual inspections will be documented on forms prepared by the fabricator. Sample forms will be attached to the Quality Control Plan.

A2.0 GUARDRAIL POSTS

- A2.1 The fabricator will verify quality of the base metal by maintaining on file, copies of certified mill test reports from the steel producer. Mill test reports must contain all test data required by AASHTO M183 and shall include the applicable heat number identification. The fabricator will verify that test data is available for all heats used to manufacture guardrail posts.
- A2.2 Heats for which proper mill test reports are not available will be sampled by the fabricator for testing by an independent testing laboratory acceptable to the Division. Sampling and testing is to be performed in accordance with AASHTO M183.
- A2.3 Upon completion of hot dip galvanizing, the fabricator will maintain copies of properly executed galvanizing certifications from the galvanizing plant for each LOT of post.
- A2.4 The fabricator's quality control inspection will verify dimensions, zinc coating thickness (weight) and workmanship in accordance with the following minimum frequency:
- A2.4.1 Physical dimensions and workmanship prior to galvanizing - 1 sample (inspection) for each 10 posts from each heat of steel.
- A2.4.2 Zinc coating thickness (weight) and workmanship after galvanizing - 1 sample (inspection) for each 50 posts from each galvanizing LOT. A LOT is defined as all posts from a fabricator's order or shipment which were galvanized using the same technique within five consecutive working days of galvanizing production.

- A2.5 Results of all dimensional, zinc coating and visual inspections will be documented on forms prepared by the fabricator. Sample forms will be attached to the Quality Control Plan.

A3.0 GUARDRAIL SPLICE BOLTS, POST BOLTS AND NUTS

- A3.1 The fabricator will purchase the fasteners from domestic manufacturers in compliance with the requirements of AASHTO M180. The fasteners will be marked with the manufacturers identification marks as per the applicable material specifications. The manufacturers identification mark must be registered with and published in the Industrial Fasteners Institute Technical Information Report Number IFI-122.
- A3.2 The fabricator will obtain from the fastener manufacturer certified mill test reports for each LOT of fasteners purchased. The fabricator will verify that the mill test report contains all required test data and will maintain LOT identification of the fasteners at his plant.
- A3.3 LOTS for fasteners for which mill test reports are not available will be sampled by the fabricator and tested for specification compliance by an independent testing laboratory acceptable to the Division.
- A3.4 The fabricator will make random inspections of all fastener LOTS to assure compliance with the visual, dimensional, zinc coating (weight) and marking requirements of the applicable specifications. The fabricator will record results of the inspections. Sample forms will be attached to the Quality Control Plan.

A4.0 BREAKAWAY CABLE TERMINAL ASSEMBLIES (BCT)

- A4.1 The fabricator will maintain in his files certified mill test results for all components used to manufacture the assemblies to include proper galvanizing certifications. Individual components of the assembly for which mill test reports are not available will be sampled by the fabricator and tested by an independent testing laboratory acceptable to the Division.
- A4.2 The fabricator will select at random one complete terminal assembly from each 50 assemblies from each LOT for visual, dimensional, and zinc coating thickness (weight) inspection. Results of the inspection will be documented by the fabricator. Sample forms will be attached to the Quality Control Plan.

A5.0 ANCILLARY ITEMS

- A5.1 The fabricator will maintain in his files certified mill test reports and/or certifications for all miscellaneous components to be supplied with the guardrail. Individual components for which mill test reports and/or certifications are not available from the producer will be sampled by the fabricator and tested by an independent testing laboratory acceptable to the Division.
- A5.2 The fabricator will make random inspections of all LOTS of miscellaneous components to assure compliance with the visual, dimensional, and zinc coating (weight) requirements of the applicable specifications. The fabricator will record results of the inspections. Sample forms will be attached to the Quality Control Plan.