
NTPEP Committee Work Plan for Evaluation of Highway Guardrail/Guiderail Manufacturers

NTPEP Designation: GRL-18-01



**National Transportation Product Evaluation Program
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Evaluation of Highway Guardrail/Guiderail Manufacturers



1. SCOPE

- 1.1 The National Transportation Product Evaluation Program (NTPEP) serves the member departments of the American Association of State Highway and Transportation Officials (AASHTO).
- 1.2 This NTPEP Committee Work Plan (hereafter referred to as the “work plan”) covers the requirements, auditing and testing criteria for the NTPEP evaluation of Highway Guardrail/Guiderail Manufacturers. This work plan is intended to be utilized with NTPEP document SP01, *Qualification of Highway Product Manufacturers Through the Use of NTPEP Audits*, to provide a comprehensive audit program for Highway Guardrail/Guiderail.
- 1.3 The purpose of the program is to provide audit information from manufacturing plants that comply with the quality control and product testing requirements of this program. AASHTO member departments can then use this information in their quality assurance program for Manufacturer/product acceptance. This may include utilizing this information to establish a qualified Manufacturer list, a qualified products list, or both. By participating in this program, the Manufacturer agrees to produce product that meets or exceeds the requirements in applicable AASHTO/ASTM Designation Standard(s) and follow the minimum quality control provisions of their quality program.
- 1.4 Testing of the Manufacturer’s product(s) against the applicable standard(s) and auditing the Manufacturer’s in-plant quality control facilities and procedures are included in this program. The Manufacturer agrees that NTPEP may use the test results and audit reports along with other relevant information for review and verification of compliance with this NTPEP program and the applicable AASHTO/ASTM Designation Standard(s).
- 1.5 *This standard practice may involve hazardous materials, operations, and equipment. It does not purport to address all safety problems associated with its use. It is the responsibility of the user of this standard practice to establish the appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. REFERENCED DOCUMENTS

- 2.1 AASHTO/ASTM Standards:
- AASHTO M 111 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - AASHTO M 180 Corrugated Sheet Steel Beams for Highway Guardrail
 - AASHTO M 30 Zinc-Coated Steel Wire Rope and Fittings for Highway Guardrail
 - AASHTO T 65 Mass of Coating on Iron and Steel Articles with Zinc
 - AASHTO T 244 Mechanical Testing of Steel Products Controlled Environment

- ASTM A123 Standard Specification for Zinc Coatings on Iron and Steel Products
- ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated or Zinc-Iron Alloy-Coated by the Hot-Dip Process
- for Highway Guardrail
- ASTM B6 Standard Specification for Zinc

2.2 NTPEP Documents:

- SP01 Qualification of Highway Product Manufacturers Through the Use of NTPEP Audits

3. TERMINOLOGY

- 3.1 *AASHTO/ASTM Designation Standard* – Referenced AASHTO Standard Specification, AASHTO Standard Method of Tests, ASTM Standard Specification, or ASTM Standard Test Method.
- 3.2 *Auditor* – A NTPEP representative to review submittals, coordinate auditing and testing, and report audit findings.
- 3.3 *Audits* – Documented reviews of a Manufacturer’s plant and associated test facilities by a NTPEP Auditor and any AASHTO member department co-auditor that wishes to participate.
- 3.4 *Independent Laboratory* – An outside laboratory that performs raw material or finished product tests for the Manufacturer. NTPEP reserves the right to audit the independent laboratory for the tests that are being performed for the Manufacturer.
- 3.5 *Initial Audit* – The first audit conducted at a Manufacturer, which has not had an audit conducted by another independent agency.
- 3.6 *Lot* – The amount of product produced per type per machine per production run or as described in AASHTO M180.
- 3.7 *Manufacturer* – An individual producer of guardrail/guiderail. The corporate name and physical location will be included in the NTPEP program listings.
- 3.8 *NTPEP Designated Laboratory* – A laboratory qualified by NTPEP to perform the specific tests as outlined in the Standard Practice and has an on-site qualified technician(s) and equipment necessary to perform the tests per the applicable AASHTO/ASTM Designation Standard(s).
- 3.9 *NTPEP Highway Guardrail/Guiderail Technical Committee* – The NTPEP Technical Committee that includes member departments of the AASHTO and members of Industry. The members are volunteers who are interested in the advancement of the product. The Technical Committee appoints a Chair and a Vice Chair.
- 3.10 *Quality Management System (QMS)* – The documented process used by the Manufacturer for quality control/quality assurance.
- 3.11 *Testing of Products* – Sample(s) selected from the manufacturing line or stockyard to be tested by the NTPEP designated laboratory. The results are shown for use by the AASHTO member department.
- 3.12 *Zinc Lot* – A lot of zinc for a manufacturing facility is a railcar or truckload.
Additional terminology can be found in applicable AASHTO/ASTM Designation Standard(s) as well as the NTPEP Standard Practice SP01.

4. ADDITIONAL QUALITY MANAGEMENT SYSTEM (QMS) REQUIREMENTS

4.1 The QMS will include a written procedure for documenting traceability of steel and iron materials to comply with “Buy America” requirements.

Note 1- Buy America requirements may vary from state to state and it is the responsibility of the manufacturer to comply with the requirements for each state transportation agency to whom the manufacturer provides product.

4.1.1 This procedure will indicate the individual(s) responsible for implementing and monitoring this procedure and how the steel items are identified and tracked through each manufacturing step. In addition, the QMS will include how foreign steel products (if used) are identified, tracked and documented for the manufacturing steps performed by the Manufacturer.

4.1.2 Additionally, the procedure will include a description of the processes and examples of the documentation used to prove compliance with “Buy America” requirements of the furnished products.

4.2 *Handling Raw Materials and Finished Product* - The QMS will include a written procedure for handling raw materials and finished product.

4.2.1 Metal – Metal delivered to the guardrail/guiderail manufacturer’s facility must be identified in accordance with the referenced specification. The identity of the metal must be traceable throughout the manufacturing process. The manufacturer must maintain mill test reports and documentation for all metal products.

4.2.1.1 The highway guardrail/guiderail manufacturer must maintain all documentation (mill test reports, certifications, etc.) for the steel purchased and used in highway guardrail/guiderail.

4.2.2 Coatings – For manufacturers performing their own coatings, the QMS will include origin, traceability and testing for this process.

4.2.2.1 The highway guardrail/guiderail manufacturer must maintain all documentation for the zinc for galvanizing and any additional coating (paint, powder, etc.) materials purchased for use in highway guardrail/guiderail. This procedure will indicate the responsible individuals and how the coating materials are identified and tracked through each manufacturing step.

4.2.2.2 In addition, the QMS will describe the Manufacturer’s inspection process to conduct inspections of the steel raw materials and coated finished products in accordance with AASHTO M 180 and M 30. The QMS will require the Manufacturer to perform at least the following items of inspections on a continuous basis during production, and to record the results of such inspections at the minimum frequency indicated in Table 1.

Table 1: Finished Product Inspection Requirements

Inspection	Frequency
Coating thickness measurements on galvanized product (per ASTM A123)	ASTM A123 frequency (batch dip) Each coil (continuous galvanization)
Adherence of Coating	ASTM A123 frequency
Surface Finish of Final Product - visual	ASTM A123 frequency

Repair of damaged coating - surface preparation, materials, application, thickness verification	100 % of repaired materials
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4.3 *Quality Control Inspection* - The QMS will include an example of all quality control test reporting forms and reference the AASHTO, ASTM, or in house procedures utilized for inspections.

4.3.1 The QMS will describe the calibration/verification methods (specification, Manufacturer’s procedure, etc.) used to maintain all inspection equipment. The methods will include, at a minimum: types of standards used, frequency, examples of documentation used to record results, and procedures utilized.

4.3.2 The QMS will also describe the Manufacturer’s inspection process and forms used to conduct inspections of the steel raw materials and finished products in accordance with AASHTO M 180 and M 30. The QMS will require the Manufacturer to perform at least the following items of inspections on a continuous basis during production, and to record the results of such inspections at the minimum frequency indicated in Table 2.

Table 2: Production Inspection Requirements

Inspection	Frequency
Steel sheet or coil thickness (per AASHTO M 180)	Two per heat
Workmanship (per AASHTO M 180 and M 30)	Continuous, recorded once per shift
Marking (per AASHTO M 180 and M 30)	Once per shift
Product dimensions*	Once per production shift per product
Hole Placement (Corrugated Sheet)	Once per production shift per product
Surface Finish - visual	10 % of production
Construction (Wire Rope)	Once per shift per machine
Joints and Splicing (Wire Rope)	Once per shift per product

*Product dimension checks should be performed on rail, backup plates, flared ends, buffer ends, etc. Dimensions need not be verified for installation hardware (such as nuts, bolts, and washers).

4.4 *Labeling and Storage of Finished Product* - The QMS will include a written procedure describing how finished products are labeled, packaged, and stored to include:

- The Manufacturer’s method for permanently marking the guardrail/guiderrail components in accordance with the minimum requirements of AASHTO M 180.
- Detailed explanation of any marking used to mark the products; and
- The procedures used to ensure that product handling, storage, and shipping processes will not adversely affect the material composition, characteristics, or product quality.

5. NTPEP ON-SITE AUDITS

5.1 *Quality Control Testing Evaluation* - Each Manufacturer will be asked to demonstrate the quality control tests they perform as stated in their QMS. While performing each test, the most current AASHTO or ASTM test methods will be referenced. The equipment used for each test will be examined and applicable records will be reviewed. The auditor will also select three random weeks (within the previous 12 months) of test reports for raw materials and finished guardrail/guiderrail produced in accordance with AASHTO M 180 and M 30 to review.

5.1.1 *Testing of Products* – The auditor(s) will select samples of guardrail materials available at the time of the audit for testing in accordance with SP01, Section 8, “Annual Product Conformance Testing”. The auditor(s) will select samples from the production lots available during the audit. All sampling and testing will be in accordance with the applicable AASHTO/ASTM Designation Standard(s). The samples will be for testing at the NTPEP Designated Laboratory.

Note 1- If major deficiencies are noted during an on-site audit, a follow-up audit will be required to be completed.

6. ANNUAL PRODUCT TESTING

6.1.1 The NTPEP Auditor will select samples during each annual Manufacturer audit for conformance testing by the NTPEP Designated Laboratory.

6.1.2 Each sample will consist of enough material for testing and to provide additional test specimens for failure verification in accordance with AASHTO M 180 and M 30.

6.1.3 Product conformance tests to be conducted are shown in Table 3.

Table 3: Test Requirements

Test Property	Test Designation
Corrugated Sheet Steel Beams	
Coatings: <ul style="list-style-type: none"> • Galvanizing • Paint 	<ul style="list-style-type: none"> • A653, M 111, M 180 • M 180
Base Metal for Beams: <ul style="list-style-type: none"> • Yield Point • Tensile Strength • Elongation 	M 180
Bolts and Nuts	Review manufacturer’s supplier(s) certifications
Washers and Backup Plates	Review manufacturer’s supplier(s) certifications
End or Buffer Sections: <ul style="list-style-type: none"> • Yield Point • Tensile Strength 	Review manufacturer’s supplier(s) certifications
Zinc-Coated Steel Wire Rope	
Base Metal for Wire Rope	Review manufacturer’s supplier(s) certifications
Zinc	B6
Zinc-Coated Wire Rope: <ul style="list-style-type: none"> • Breaking Strength • Construction • Ductility • Mass of Zinc Coating • Adherence of Coating 	<ul style="list-style-type: none"> • M 30/T 244 • M 30 • M 30 • M 30/T 65 • M 30
Fittings: <ul style="list-style-type: none"> • Coatings 	Review manufacturer’s supplier(s) certifications

- 6.2 NTPEP Designated Laboratory Samples:
- 6.2.1 The NTPEP Auditor will instruct the Manufacturer on the proper labeling of the NTPEP Designated Laboratory samples. The Manufacturer will send (freight paid by the Manufacturer) the samples to the NTPEP Designated Laboratory for testing.
- 6.2.2 After the NTPEP Manufacturing Auditor posts the results from the NTPEP Designated Laboratory testing, the Manufacturer is provided the opportunity to offer an explanation of any significant differences between the NTPEP designated laboratory and Manufacturer test results, including any corrective actions found necessary in the manufacturing process or testing procedures. The manufacturer will notify NTPEP within 15 calendar days of receiving results if they intend to offer an explanation.
- 6.3 Retest Samples:
- 6.3.1 Guardrail/guiderail material samples (of a suitable size for testing and to provide additional test material for failure verification) will be obtained and sent to the NTPEP Designated Laboratory for use in the testing and confirmation of any failing test results.
- 6.4 If during the NTPEP Designated Laboratory testing, at least one tested sample fails to meet specification requirements or when the Manufacturer is found during an audit to have neglected one or more aspects of their governing QMS, a nonconformance will be issued and addressed as outlined in SP01.
- 6.5 Shipment of Samples:
- 6.5.1 The Manufacturer is responsible for the shipment of the guardrail/guiderail samples. Proper care (packaging, identification, tracking, etc.) to limit damage or loss of the sample shipment is the responsibility of the Manufacturer. Loss or damage of the samples will require re-sampling and testing at the Manufacturer's expense.
- 6.6 Testing of Samples:
- 6.6.1 The NTPEP Designated Laboratory will complete all testing on the samples and send test results to AASHTO within 45 days of the receipt of the samples.

7. FINISHED PRODUCT DOCUMENTATION

- 7.1 Documentation used to prove compliance with "Buy America" shall be included with the finished products as required by the specifying DOT.

8. DELIVERABLES – EVALUATION RESULTS AND DATA

- 8.1 Audit results (in the form of an Audit Report, a Conformance Report for the tested samples, and any Corrective Action Reports) will be located in the web-based database – DataMine, as follows:
- 8.1.1 Once the test data is reported to the Auditor by the NTPEP Designated Laboratory, the Auditor will review the data to ensure completeness. The Conformance Report will be posted to DataMine and will be available to the product manufacturer and the end state user participants for review.

- 8.1.2 All other audit documents (Audit Report, Manufacturer QMS, and Corrective Action Report – *if applicable*) will be uploaded by the Auditor, as completed, and made available for review.
- 8.1.3 Audit results will be made available to all participating states through the AASHTO/NTPEP DataMine website. No judgement as to a product’s acceptability to any state DOT requirement is made in DataMine. End state user participants are responsible for establishing their criteria for product acceptability.
- 8.2 The DataMine database can be accessed through the AASHTO/NTPEP website link at <http://data.ntpep.org/>.

9. KEYWORDS

- 9.1 NTPEP; highway guardrail/guiderail; Manufacturer

ANNEX (MANDATORY INFORMATION)

X1. NTPEP QA PROGRAM FOR HIGHWAY GUARDRAIL/GUIDERAIL - PARTICIPANT RESPONSIBILITIES

- X1.1. **Background:** This section summarizes the responsibilities for the different parties.
- X1.2. **Manufacturers' Responsibilities:** Participating Manufacturers will develop and implement a Quality Management System (QMS) outlining their quality control testing program for production of highway guardrail/guiderrail. In addition, the manual will address the following general program, testing facilities, personnel qualification, and record keeping requirements.
- X1.2.1. **General Requirements:**
- X1.2.1.1. Each Manufacturer will be prepared to accommodate Manufacturer and testing facility audits (scheduled and follow-up) by NTPEP representatives when submitting its initial QMS, or updated QMS in the case of the annual re-evaluation, to NTPEP.
- X1.2.1.2. Each Manufacturer's facility is responsible for ensuring continuous compliance with all NTPEP quality control requirements. Failure to do so may result in revocation of the listing and certificate on the NTPEP website.
- X1.2.2. **Testing Facilities:**
- X1.2.2.1. The Manufacturer's quality control manager will be responsible for quality control testing at all facilities and will assure that all sampling and testing is done by qualified technicians.
- X1.2.2.2. The testing facilities will maintain current versions of all AASHTO, ASTM, and Manufacturer test procedures for all tests performed and a current version of the Manufacturer's QMS.
- X1.2.2.3. The facilities will adequately house and allow proper operation of all required testing equipment.
- X1.2.2.4. The testing equipment will be calibrated/verified/checked in accordance with the Manufacturer's recommendations at least to the specified intervals (Ref.: SP01, Annex A.1) by personnel customarily involved in such work as documented in the QMS.
- X1.2.2.5. The testing facilities will maintain records of all test results and all NTPEP reviews and actions taken to resolve any noted deficiencies.
- X1.2.2.6. Records of equipment calibration and verification will be maintained and available to NTPEP and AASHTO member departments upon request.
- X1.2.3. **Testing Personnel**
- X1.2.3.1. The Manufacturer's quality control manager will meet the requirements established by the Manufacturer for the position.
- X1.2.3.2. Documentation will show that the technician has been trained in the test procedures to be performed.

- X1.2.3.3. Documentation will show that the technician has satisfactorily demonstrated competency to perform the required testing and that this demonstration is repeated annually.
- X1.2.3.4. Documentation will show that technician training has been updated when revisions in test methods occur.
- X1.2.3.5. Review of reports will show the technician can properly perform test procedure calculations and properly record information.
- X1.2.3.6. Technicians-in-training may perform sampling and testing at qualified facilities provided they are working under the direct supervision of a technician fully qualified under NTPEP requirements.
- X1.2.3.7. If requested, technicians will perform sampling and testing for NTPEP observers.
- X1.2.4. **Testing Documentation**
- X1.2.4.1. All quality control test results for highway guardrail/guiderail will be documented in reports of the same format as the sample forms submitted in the QMS and will be kept for a minimum of five years.
- X1.2.4.2. The reports will document the actions taken in the event of product test failures.
- X1.2.4.3. The reports will show the manufacture location, date of manufacture, and test results. Identification will be such that the test reports for any product can be located.

X2. AUDIT AGENDA



On-Site Audit

Opening Meeting

- Introductions
- Address Any Safety or Security Concerns
- Address Confidentiality
- Questions, Comments, or Concerns?

Summary of Desktop Review (every 5 years)

- Resolved Findings
- Unresolved Findings
- Most Current Quality Manual

Manufacturing Line Walk Through

- Manufacturing and Inspection Processes
- Record Product Information for Traceability Purposes
- Designate Highway Guardrail/guiderrail Samples for Testing

Review of Documentation

- Review and Collect Documentation
- AASHTO and ASTM Standards
- Training and Competency Evaluations
- Internal Audits
- Management Reviews
- Equipment Records

Quality Control Testing

- Demonstration of In-House Inspection Methods
- Review of Inspection of Equipment

Audit Summary Close-Out Meeting

- Review of Audit Findings
- Questions/Concerns?
- Closing Remarks