NTPEP Committee Work Plan for

Evaluation of Plain and Laminated Elastomeric Bridge Bearing Manufacturers

NTPEP Designation: EBB-18-01
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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 Plain and Laminated Elastomeric Bridge Bearing 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 Elastomeric Bridge Bearings.

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 M251 Standard Specification for Plain and Laminated Elastomeric Bridge Bearings
- ASTM D0412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension
2.2 NTPEP Documents:
- SP01 Qualification of Highway Product Manufacturers Through the Use of NTPEP Audits

3. TERMINOLOGY


3.2 Auditor – A NTPEP representative to review submittals, coordinates 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 Conformance Testing of Products – Sample(s) selected from the manufacturing line or stockyard to be tested by the NTPEP designated laboratory. The results of testing are then shown on the NTPEP website.

3.5 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.

3.6 Initial Audit – The first audit conducted at a Manufacturer, which has not had an audit conducted by another independent agency.

3.7 Manufacturer – An individual producer of plain or laminated Elastomeric Bridge Bearings. The corporate name (actual location) will be included in the NTPEP program.

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 Elastomeric Bridge Bearing 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 Chairman and a Co-Chairman.

3.10 Quality Management System (QMS) – The documented process used by the Manufacturer for quality control/quality assurance.

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.

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

4.2.1 Elastomer – Each shipment of raw elastomer will be identified by source, type of polymer, (polychloroprene or natural polyisoprene) product name, if applicable, and any testing data used by the polymer supplier to identify the product.

4.2.2 Steel – Steel delivered to the bearing pad manufacturer’s facility must be marked in accordance with the steel specification used. The bearing pad manufacturer must maintain mill test reports and documentation. The QMS will include a written procedure for documenting traceability of steel and iron materials. This procedure will indicate the responsible individuals and how the steel (either foreign or domestic) is 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.

4.2.3 Finished Product - As a minimum the QMS will describe the Manufacturer’s inspection process to conduct and record visual inspections of the workmanship (finish and appearance) and marking of the bearing pads, per M251.

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workmanship</td>
<td>continuously, recorded at least twice per shift</td>
</tr>
<tr>
<td>Marking</td>
<td>twice per shift</td>
</tr>
</tbody>
</table>

4.3 Quality Control Inspection - The QMS will include an example of a quality control test report form. The QMS will reference the AASHTO, ASTM, or in house procedures and calibrations. The QMS will describe any Manufacturer procedure used.

*Note 1* - The Manufacturer’s procedures are subject to review. The Manufacturer’s test procedures which pertain to the tests providing useful information to evaluate the product are included in this requirement.

4.3.1 The QMS will include a description of the Manufacturer’s statistical process control plan. The plan will use methods such as statistical control charts to monitor production facility quality control test results for the purpose of identifying trends and being able to make production adjustments as necessary. The plan will monitor each production plant separately and total Manufacturer product quality trends.

4.3.2 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.
Measurements

<table>
<thead>
<tr>
<th>Measurements</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Design Thickness</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Horizontal Dimensions</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Thickness of Individual Layers *</td>
<td>one per day</td>
</tr>
<tr>
<td>• Check for Parallel Top and Sides</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Position of Exposed Connection Members (as applicable)</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Edge Cover of Embedded Laminates</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Size of Holes, Slots, or Inserts (as applicable)</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Position of Holes, Slots, or Inserts (as applicable)</td>
<td>two per work shift</td>
</tr>
</tbody>
</table>

* at any point within the bearing

4.3.3 The QMS will require that the Manufacturer perform and record the results of at least the following quality control tests for elastomer at the minimum frequency indicated.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Shear Modulus</td>
<td>once per year per compound</td>
</tr>
<tr>
<td>• Tensile Strength</td>
<td>once per year per compound</td>
</tr>
<tr>
<td>• Ultimate Elongation</td>
<td>once per year per compound</td>
</tr>
<tr>
<td>• Low Temperature Brittleness</td>
<td>once per year per compound</td>
</tr>
</tbody>
</table>

*Note 2: A compound is defined for QC testing by the combination of rubber type (neoprene or natural) durometer hardness, and supplier. QC testing may be performed on molded specimens or specimens cut from pads.*

4.3.4 The QMS will require that the Manufacturer perform and record the results of at least the following quality control tests on the finished pad at the minimum frequency indicated.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Compression Strain at Maximum Design Load</td>
<td>each sampled bearing (when a maximum value for compressive strain is specified)</td>
</tr>
<tr>
<td>• Compression Load ((1.5DL + LL))</td>
<td>each sampled bearing</td>
</tr>
<tr>
<td>• Creep and Shear Bond Strength</td>
<td>minimum of one sampled bearing per lot</td>
</tr>
<tr>
<td>• Shear Modulus Testing for Elastomer Grades 2 – 5</td>
<td>once per year per compound</td>
</tr>
</tbody>
</table>

4.3.5 The QMS will include how the Manufacturer performs and documents the results of the following optional quality control tests on the finished pad.
4.4 **Labeling and Storage of Finished Product** - The QMS will include a written procedure describing how finished product is labeled, packaged and stored to include:

- The Manufacturer’s method for permanently marking the bearings in accordance with the minimum requirements of AASHTO M251 and any customer-specific requirements;
- Detailed explanation of any coding used to mark the bearings; 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 may also select three random weeks (within the previous 12 months) of test reports for raw materials and finished bearing produced in accordance with AASHTO M251 to review.

5.2 **Testing of Products** – The auditor(s) will select samples of elastomeric bridge bearing pads (plain and/or laminated) available at the time of the audit for testing in accordance with SP01, Section 8, “Annual Testing of Products”. The auditor(s) will select pads from the production lots designated by the Manufacturer. All testing will be as shown in Table 1 and in accordance with the applicable AASHTO/ASTM Designation Standard(s). All samples will be for testing at the NTPEP Designated Laboratory.

**Note 3:** 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 The NTPEP Auditor will select bearing pads during each annual Manufacturer audit for conformance testing by the NTPEP Designated Laboratory.

6.1.1 Prior to annual audit visit, the Manufacturer may identify lots of bearing pads and make extra pads for those lots. These lot(s) will be used as the lot(s) designated for obtaining sample pads related to the audit. The selected lot(s) should be, as much as practical, typical of the type and general design most often produced. The general characteristics of the sampled lot(s) should be discussed with the Auditor prior to selection. The NTPEP Auditor will randomly select samples from these production lots.

6.1.2 Each sample will consist of a finished bearing pad of suitable size for testing (and to provide additional test specimens for failure verification).

6.1.3 Product conformance tests to be conducted are shown in Table 1:
Table 1: Test Requirements

<table>
<thead>
<tr>
<th>Test Property</th>
<th>Test Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory Tests</td>
<td></td>
</tr>
<tr>
<td>Shear Modulus</td>
<td>ASTM D4014 (See notes in AASHTO M 251, Section 8.8.4)</td>
</tr>
<tr>
<td>Tensile Strength</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Ultimate Elongation</td>
<td>ASTM D412</td>
</tr>
<tr>
<td>Low Temperature Britteness</td>
<td>ASTM D746, Procedure B, Temperatures as per AASHTO M 251, Table 1</td>
</tr>
<tr>
<td>Bond Strength</td>
<td>AASHTO M 251, Appendix X2</td>
</tr>
<tr>
<td>Optional Tests *</td>
<td></td>
</tr>
<tr>
<td>Compression Stiffness</td>
<td>AASHTO M 251, Annex A3</td>
</tr>
</tbody>
</table>

* when requested by the Manufacturer to be performed

6.2 NTPEP Designated Laboratory Samples:

6.2.1 The NTPEP Auditor will instruct the Manufacturer on the proper shipment of the NTPEP Designated Laboratory samples. The Manufacturer will be responsible for sending (freight paid by the Manufacturer) the samples to the NTPEP Designated Laboratory for testing.

6.2.2 Once the NTPEP Auditor posts the Manufacturer the results from the NTPEP Designated Laboratory testing, the Manufacturer is provided the opportunity to offer an explanation of any failing 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 Bearing pads (of a suitable size for testing and to provide additional test specimens for failure verification) will be obtained from the same lot and sent to the NTPEP Designated Laboratory for use in the testing and confirmation of any failing test results. New test samples will obtained in the event the originally sampled pad(s) do not meet the minimum specification requirements.

6.3.2 If during the testing portion of the audit, 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 the governing QMS during manufacturing, the nonconformance will be addressed as outlined in SP01.

6.4 Shipment of Samples:

6.4.1 The Manufacturer is responsible for the shipment of the bearing 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.

6.5 Testing of Samples:

6.5.1 The results of all testing on the bearings will be posted on the NTPEP website.
7. **DELIVERABLES – EVALUATION RESULTS AND DATA**

7.1 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:

7.1.1 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.

7.1.2 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 to the product manufacturer and the end state user participants for review.

7.1.3 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.

7.2 The DataMine database can be accessed through the AASHTO/NTPEP website link at http://data.ntpep.org/.

8. **KEYWORDS**

8.1 NTPEP; Elastomeric Bridge Bearings; Manufacturer
ANNEX (MANDATORY INFORMATION)

X1. NTPEP QA PROGRAM FOR PLAIN AND LAMINATED ELASTOMERIC BRIDGE BEARING PADS - 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 plain and laminated Elastomeric Bridge Bearing Pads. 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 Bridge Bearing Pads 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**
- Resolved Findings
- Unresolved Findings
- Most Current Quality Manual

**Manufacturing Line Walk Through**
- Record Product Information for Traceability Purposes
- Process and Conditions
- Collect Bearing Pad Samples for Testing of Products

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

**Quality Control Testing**
- Demonstration of In-House Testing Methods
- Inspection of Equipment

**Audit Summary Close-Out Meeting**
- Review of Audit Findings
- Questions/Concerns?
- Closing Remarks