Standard Practice for

NTPEP Evaluation of Epoxy Resin Based Adhesive Bonding Systems.

NTPEP Designation: [ERB-18-01]
Standard Practice for
Evaluation of Epoxy Resin Adhesive Bonding Systems.
NTPEP Designation: ERB-18-07

INTRODUCTION

The National Transportation Product Evaluation Program (NTPEP) was established to minimize the amount of duplicative testing of transportation materials performed by AASHTO member states by providing a process where manufacturer/suppliers submit their products to NTPEP for laboratory and/or field testing. The results of the testing are then shared with member Departments for their use in product quality verification.

1. SCOPE

1.1. This standard practice covers the requirements and testing criteria for the National Transportation Product Evaluation Program (NTPEP) evaluation of Epoxy Resin Adhesive Bonding Systems (ERBs). The National Transportation Product Evaluation Program serves the member departments of the American Association of State Highway and Transportation Officials (AASHTO).

1.2. The results of this program may be used for product quality verification by individual member Departments. If used for quality verification, a letter of certification from the ERBs manufacturer indicating testing was conducted by the NTPEP that supports published values may be required by member Departments.

1.3. The values generated from the test protocols referred to in this plan are intended for use in conformance only. These values should not be used to design a project or installation. The NTPEP tests are currently index tests and do not reflect site and/or field conditions to which these materials are typically subjected.

1.4. This standard practice does not purport to address all the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

- ASTM E573, Standard Practices for Internal Reflection Spectroscopy

NOTE: The most current approved version at the time of testing will be used

3. SIGNIFICANCE AND USE

3.1. This standard practice utilizes laboratory tests to determine properties and evaluate the performance of adhesives for concrete. This protocol does not address the effects of creep on epoxy resin base
bonding systems while under load or the potential for creep rupture. Additional testing is required for applications where creep and creep rupture are critical.

4. FORM SUBMITTAL, SCHEDULING OF TESTING AND SAMPLING

4.1. Submittal of Product Evaluation Form(s) and Acceptance of Products for Testing

4.1.1. The manufacturer shall submit program payment and a Product Evaluation Form (PEF) for each product planned for NTPEP testing to the NTPEP Manager. For each PEF, the manufacturer will identify the Type(s), Grade(s), and Temperature Range in accordance with ASTM C881/C881M. After review of the PEF(s) for completeness and accuracy, the NTPEP Manager shall assign a test number to each product. The test number shall indicate the year and month of submission, and a sequential sample number. (i.e., ERB-2012-01-007 (Year-Month-Sample Number) The manufacturer/supplier shall be notified within two weeks by the NTPEP Manager as to approval of the product evaluation form(s).

Note 1 – Epoxy Resin Adhesive Bonding System numbers assigned to a Manufacturer’s product will not change for the life of the test. Product name changes will be considered a new product and will be assigned a new number.

4.2. Scheduling of Testing and Product Submittal

4.2.1. All complete PEFs and fees must be received from the manufacturer/supplier prior to sampling taking place. After payment is received, the manufacturer/supplier shall work with the NTPEP Lead State Member to schedule testing.

4.2.2. The lead state contact person shall make arrangements to have the products sampled by the manufacturer, witnessed by a participating member of NTPEP. At least 256 fluid ounces of sample adhesive shall be provided. Samples shall be representative of a production lot, not specially prepared for test purposes. The witnessing member of NTPEP shall select mark the random sample(s) at the point of manufacture, or domestic distribution point. The sample shall be an “off-the-shelf” unit that is packaged as marketed. The manufacturer/supplier shall provide a copy of the product/material literature, safety data sheets (SDS) and the PEF to be enclosed with the samples. All collected samples and documentation shall be packaged and labeled to show the manufacturer’s product code and manufacturer name and shall be shipped at the manufacturer’s expense via a carrier with a package tracking system. All samples shall be shipped within twenty-four hours of sample selection. Samples shall be shipped to the designated NTPEP testing laboratory, labeled by the manufacturer with a prepaid shipping label and include the NTPEP test number. The packaging and labeling shall be witnessed by the NTPEP participation member, this NTPEP member will then be responsible for transportation of the samples to the appropriate shipping facility.

5. TESTING CRITERIA

5.1. Determine properties in accordance with ASTM C881/C881M.

5.2. Obtain Infrared Spectra for Qualitative Analysis referencing ASTM E573 as described below:

5.2.1. Analyze each individual liquid component of the ERB by Fourier Transform Infrared Spectroscopy (FTIR), using the Horizontal Attenuated Total Reflectance (HATR) method. FTIR spectra shall be collected at 32 scans from 4000cm⁻¹ to 400cm⁻¹ using a Germanium (Ge) or Diamond crystal.
5.2.2. Prepare and collect each spectrum in duplicate. Acceptable duplicate spectra shall have a minimum similarity index of 0.90 as calculated by algorithmic spectral analysis. Label each spectral file with the corresponding ERB submission number, component identification, and duplicate designation.

5.2.3. Report each spectra, in the collected spectral file format and PDF format, include the crystal used for collection, and the similarity index of the duplicate spectra.

5.3. Perform testing in accordance with ASTM C881/881M Table 1, Type and Grade. Testing will be performed at 73°F ± 2°F (23° C ± 1° C). (See Note 2)

5.3.1. Type I and IV
   a) Viscosity (Grade 1 and 2)
   b) Consistency (Grade 3)
   c) Gel time
   d) Bond Strength, Hardened Concrete to Hardened Concrete – 2 and 14 days
   e) Absorption
   f) Heat Deflection – 7 days (Type IV Only)
   g) Linear Coefficient of Shrinkage
   h) Compressive Yield Strength and Modulus – 7 days
   i) Tensile Strength and Elongation at Break – 7 days

5.3.2. Type II and V
   a) Viscosity (Grade 1 and 2)
   b) Consistency (Grade 3)
   c) Gel time
   d) Bond Strength, Freshly Mixed Concrete to Hardened Concrete –14 days
   e) Absorption
   f) Heat Deflection – 7 days (Type V Only)
   g) Linear Coefficient of Shrinkage
   h) Compressive Yield Strength and Modulus – 7 days
   i) Tensile Strength and Elongation at Break – 7 days

5.3.3. Type III
   a) Viscosity (Grade 1 and 2)
   b) Consistency (Grade 3)
   c) Gel time
   d) Bond Strength, Hardened Concrete to Hardened Concrete –14 days
   e) Absorption
   f) Thermal Compatibility - 5 cycles
   g) Compressive Modulus – 7 days
   h) Tensile Strength and Elongation at Break – 7 days

5.3.4. Type VI or VII
   a) Consistency (Grade 3)
   b) Gel Time
   c) Bond Strength, Hardened Concrete to Hardened Concrete (2 days for VI for 14 days for VII)
   d) Heat Deflection – 14 days
   e) Compressive Yield Strength (24 hr & 48 hr for Type VI or 36 hr & 72 hr for Type VII)
   f) Contact Strength (2 days for Type VI or 14 days for Type VII)

Note 2 - Requests for the evaluation of additional classes (temperature ranges) would require the repeat of the following test methods at the different temperatures; Viscosity/Consistency, Gel Time, Bond Strength, Compressive Yield Strength and Modulus, Tensile Strength and Elongation. Therefore, each category above will require additional fees for testing of additional classes.
5.4. The testing agency shall complete all testing within 12 weeks from receipt of a satisfactory test sample and all required supporting documentation. Any delays shall be immediately reported to the lead state contact and the NTPEP manager.

6. TEST REPORT REVIEW AND TEST RESULT APPEALS

6.1. The testing agency shall submit a draft report to the lead state contact person and the NTPEP Manager within 20 business days after completion of all testing. Each submitting organization shall receive a copy of the portion of the report dealing with their specific products. The submitting organization may appeal the results of the testing program in accordance with the AASHTO/NTPEP appeals procedures. Re-testing of the materials will be performed by the testing agency, and only on the relevant sample forwarded for testing. No additional sample material will be received for re-testing. Prior to re-test, the manufacturer/supplier making the appeal shall submit a fee to NTPEP to cover the costs of re-testing. Should the results of the re-test uphold the appeal, the fee shall be reimbursed to the submitting organization. Upon agreement between the organization appealing the test results and the NTPEP Manager, either the original set or re-test set of data shall be published.

7. REPORTING OF TEST DATA

7.1. Evaluation data will be compiled and made available to all participating states and testing companies through the AASHTO/NTPEP DataMine. This report will include data only. No judgment as to a product’s acceptability will be made in this report. End user participants will establish individual criteria for product acceptability.

8. TESTING FREQUENCY

8.1. Following the initial testing and reporting of a product, it must be re-tested every-three-years to remain published in the test report.

9. TESTING FEES

9.1. The fees designated by NTPEP for testing are to be paid at time of application.

Note 3 - A re-test fee for challenged results shall be refundable if retesting upholds the challenge. To be paid only if test results are challenged.