

# Slurry Systems Quality Assurance Guide

## ***Description: Slurry Systems***

Slurry systems are pavement preservation surface treatments that encompass micro surfacing, slurry seal, and polymer modified slurry seal. Each treatment type is designed to extend the life of asphalt pavements in good condition by providing skid resistance, restricting moisture intrusion, and protecting the pavement surface from oxidation and raveling. Micro surfacing is a designed mixture that allows a return to traffic in one hour or less after placement. Slurry seal is a designed mixture, which may be polymer-modified, that allows traffic to return from one to four hours after placement.

## ***Quality Assurance (QA)***

AASHTO R 10 provides standard definitions for terms used in quality assurance procedures

QA is defined as all those planned and systematic actions taken by the Agency and Contractor to provide the necessary confidence that the procured material and workmanship will satisfy the quality requirements of the contract.

QA includes Quality Control (QC), Acceptance and Independent Assurance (IA).

QC is the system used by the Contractor to monitor, assess and adjust production and placement processes to ensure that the material and workmanship will meet the specified quality. QC is the responsibility of the Contractor.

Acceptance is the system used by the Agency/Engineer to measure the degree of compliance of the quality of the materials and workmanship with the Contract requirements. Acceptance is the responsibility of the Agency/Engineer and will be conducted in accordance with these Specifications.

IA is an unbiased and independent system used to assess all sampling, testing and inspection procedures used for QA. IA is the responsibility of the Agency/Engineer and is conducted in accordance with these Specifications.

### ***I. Quality Control (QC)***

- 1. General.** The slurry systems contractor (the Contractor) shall establish, implement and maintain a QC program to control all equipment, materials, production, workmanship, and associated processes during construction. The Contractor's QC program shall include preconstruction activities including slurry system mix design, site preparation, material handling and transportation, and stockpiling. The program shall include

procedures required for sampling, testing, inspection, monitoring, documentation, and corrective action during transport, stockpiling, placement and finishing operations.

A written Quality Control Plan shall be developed which details the Contractor's QC program that meets the requirements of these specifications. The QC Plan shall be contract specific and signed by the Contractor. Slurry system construction shall not proceed without Agency acceptance of the QC Plan and QC personnel present on the job. Failure to comply with the provisions of this provision will result in shutdown of the operation until such time as the Contractor's operations are in compliance.

## **2. Reference Documents.**

- a. AASHTO R 10 Standard Practice for Definition of Terms Related to Quality and Statistics as Used in Highway Construction
- b. AASHTO R 18 Standard Recommended Practice for Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- c. AASHTO R 38 Standard Practice for Quality Assurance of Standard Manufactured Materials
- d. AASHTO R77 Standard Practice for Certifying Suppliers of Emulsified Asphalt
- e. AASHTO R 90 Sampling Aggregates Products
- f. AASHTO T 11 Standard Method of Test for Materials Finer Than 75-micro m (No. 200) Sieve in Mineral Aggregates by Washing
- g. AASHTO T 27 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates
- h. AASHTO R 66 Standard Practice for Sampling Asphalt Materials
- i. AASHTO T 49 Standard Method of Test for Penetration of Bituminous Materials
- j. AASHTO T 53 Standard Method of Test for Softening Point of Bitumen
- k. AASHTO T 59 Standard Method of Test for Emulsified Asphalts
- l. AASHTO T 96 Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- m. AASHTO T 104 Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
- n. AASHTO T 176 Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
- o. AASHTO M 316 Standard Specification for Polymer-Modified Emulsified Asphalt
- p. AASHTO MP 28-17 Standard Specification for Materials for Micro Surfacing
- q. AASHTO MP 32-17 Standard Specification for Materials for Slurry Seal
- r. AASHTO PP 83-16 Provisional Standard Practice for Micro Surfacing Design
- s. AASHTO PP 87-17 Provisional Standard Practice for Slurry Seal Design
- t. ISSA A143 Recommended Performance Guideline for Micro Surfacing
- u. ISSA A105 Recommended Performance Guideline for Emulsified Asphalt Slurry Seal
- v. ISSA A115 Recommended Performance Guideline for Polymer Modified Slurry Seal

w. Title 23 CFR Part 637 Construction Inspection and Approval

### **3. Definitions.**

- a. Agency – a state highway agency, other agency or owner responsible for the final acceptance of the project.
- b. Calibration – any calibration, standardization, check or verification as required by the test method standard or production equipment.
- c. Contractor – the prime contractor who has ultimate control of the project.
- d. Supplier – one who produces the materials (i.e. aggregates, asphalt emulsion, additives, and mineral filler) used on the project.
- e. Standard – any standard, specification, test method, practice, etc. utilized to achieve compliance with the contract.
- f. Testing Lab – the laboratory conducting quality control tests (contractor or supplier) and acceptance tests (agency).

### **4. Personnel.**

- a. Responsibilities and Requirements of QC Staff - at a minimum, provide the name of the person responsible for each position listed below, including their telephone number, email, and their qualifications/certifications.
  - i. QC Plan Manager. The person responsible for the execution of the QC Plan and liaison with the Agency. This person shall be on the job, and have the authority to stop, suspend, or make changes to the construction operation.
  - ii. QC Technicians. The person(s) responsible for conducting QC tests and inspection to implement the QC Plan. QC Technicians shall have Level 2 Aggregate Testing certification from the American Concrete Institute (ACI), or other certification program approved by the agency.
- b. Certified Contractor Staff - at a minimum, the contractor's superintendent, project foreman and placement machine operator shall possess a valid AASHTO TSP-2 slurry systems certification. The foreman and placement machine operator shall always be on the job while the slurry system is being constructed. The superintendent may oversee the construction operation of up to 3 projects at any one time.

### **5. QC Testing Laboratories and Equipment.**

- a. The mix design laboratory that is accredited. The Contractor shall provide the name of the lab formulating the mix design. This lab shall maintain accreditation by the AASHTO Accreditation Program (AAP) or other accrediting body.
- b. The laboratory that performs the QC for production can be either qualified or agency approved. The Contractor shall provide the name of an agency approved lab for all tests within the relevant scope of testing.
- c. Testing and sampling equipment and measuring devices shall meet the requirements of the specified standards and test methods. The lab shall maintain records of the calibration and maintenance of all sampling, testing, and

measuring equipment, and all documents required by the accreditation or agency program.

- d. Placement machine calibration – prior to the commencement of work, the production equipment shall be calibrated in the presence of the Agency representative utilizing the materials to be used on the project. Calibration will be performed consistent with procedures in FHWA-HIF-19-036, Slurry Seal Checklist, 2019 or FHWA-HIF-19-031, Micro Surfacing Checklist, 2019 .

**6. QC Activities.** QC activities shall include monitoring, inspection, sampling and testing. The Contractor’s QC activities shall cover all aspects that affect the quality of the materials and workmanship of the slurry system. If there is no agency requirement, the minimum QC activities and frequencies required are listed as follows:

- a. Component materials
- b. Transportation material handling
- c. Mix Design by an accredited lab
- d. Test strip construction and assessment
- e. Placement and Finishing
- f. Performance
- g. Review of material certifications supplied by vendors and suppliers.

<b>MINIMUM AGGREGATE QC REQUIREMENTS</b>				
<b>Process Control Test</b>	<b>Test Method</b>	<b>Min. Test Frequency</b>	<b>Point of Sampling</b>	<b>Sampling Method</b>
Gradation*	AASHTO T27 or T11	Once per day	Stockpile	AASHTO R 90
Hardness (LA Abrasion)	AASHTO T 96	Source	Source	AASHTO R 90
Soundness	AASHTO T 104	Source	Source	AASHTO R 90
Sand Equivalency	AASHTO T 176	Source	Source	AASHTO R 90
* Aggregate samples will be taken at the project stockpile site using AASHTO R 90 Method B. Gradation test results should be provided within 24 hours.				

<b>MINIMUM ASPHALT EMULSION QC REQUIREMENTS</b>					
<b>Property</b>	<b>Test Procedure</b>	<b>Lot Size</b>	<b>Min. Test Frequency</b>	<b>Point of Sampling</b>	<b>Sampling Method</b>
<b>Tests on Emulsion</b>					
Emulsion Properties	AASHTO M 208 or AASHTO M 316	Per Batch (max. 30,000 gal)	1 per Lot	Tanker	AASHTO R 66
Distillation of Emulsified Asphalt*	AASHTO T 59	Per Batch (max. 30,000 gal)	1 per Lot	Plant	AASHTO R 66

Settlement and Storage Stability of Emulsified Asphalts, 24-hr	AASHTO T 59	Per Batch (max. 30,000 gal)	1 per Lot	Plant	AASHTO R 66
<b>Tests on Residue</b>					
Penetration of Bituminous Materials at 77°F (25°C)	AASHTO T 49	Per Batch (max. 30,000 gal)	1 per Lot	Plant	AASHTO R 66
Elastic Recovery for AASHTO M 316	AASHTO T 301	Per Batch (max. 30,000 gal)	1 per Lot	Plant	AASHTO R 66
* Emulsified asphalt samples for residue content will be taken at the point of delivery from the delivery tanker using AASHTO R 66 and shall be determined by either AASHTO T59 or agency approved method. Verify residue binder content of mix is consistent within $\pm 0.3\%$ of mix design.					

**7. Contractor's Quality Control Plan.** The Contractor shall submit a written project specific, signed QC Plan to the Agency for approval at least 15 days prior to placement. The QC Plan shall detail the Contractor's plans, policies, procedures, and organization deemed necessary to measure and control materials, equipment, and slurry system placement operation.

The QC Plan shall be maintained to reflect the current status of the operations. Changes must be approved by the agency prior to implementation.

At a minimum, the QC Plan shall detail the following:

- a. **Scope and Reference Documents.** Reference all applicable standards, guidelines, technical bulletins, standard specifications, and project special provisions.
- b. **Definitions.** Terms used in the QC Plan shall be clear and distinct.
- c. **Quality Control Personnel.** Company personnel, subcontractors responsible for QC testing. Material suppliers reporting test results.
- d. **Quality Control Testing Facilities and Equipment.** Accredited laboratories used for mix designs. Agency approved or accredited laboratories for QC activities, including facilities and equipment used for material sampling and testing.
- e. **Materials Control.** Identify all materials and sources used in the treatment, plus handling, storage requirements and stockpiling provisions.
- f. **Quality Control Sampling and Testing.** Lot size defined for sampling, sampling identification system, sampling methods, test procedures, test frequency, storage and retention procedures.
- g. **Production Equipment.** Identify all equipment to be used for construction and provide specification sheets for major equipment.
- h. **Pre-Production Activities.** Equipment calibration procedure and frequency, equipment checks and inspection frequencies, pavement surface preparation procedures, and related production activities (e.g., traffic control, tack coat, etc.)
- i. **Placement and Workmanship.** Identify protocols for proper workmanship, production QC activities, test frequencies, breaking time, inspection methods,

yield checks to verify application rates, and cleanup responsibilities (daily and at end of project)

- j. **Documentation.** Describe testing procedures and determine when corrective action is required. The contractor will provide examples of reporting forms, production QC test results, daily production records, non-conformance reports, and document retention details.
  - k. **Non-Conformance and Corrective Action.** Establish and maintain an effective and positive system for controlling non-conforming materials as indicated by inspection and test results. Investigate the cause of any non-conformance to prevent recurrence and take prompt corrective action to correct conditions that have resulted, or could result, in the incorporation of non-conforming materials into the work. All non-conforming materials shall be positively identified to prevent use and intermingling with conforming materials. Include procedures and personnel responsible for directing corrective action including suspension of work and disposal or reworking of non-conforming materials. Detail how the results of QC inspections and tests will be used to determine corrective actions, define rules to gauge when a process is out of control and associated corrective action to be taken. At minimum establish corrective action procedures for each control requirement listed above.
- 8. Records and Documentation.** The Contractor shall maintain complete records of all QC tests and inspections.

All QC test results shall be submitted to the Agency within 24 hours or upon request. A material certification shall be submitted from each supplier for each batch of material delivered to the jobsite, including test results.

The QC records shall contain all test and inspection reports, forms and checklists, equipment calibrations, supplier material certificates, and non-conformance and corrective action reports. The QC records shall indicate the nature and number of observations made, the number and type of deficiencies found, the quantities conforming and non-conforming, and the nature of corrective action taken as appropriate for materials as well as workmanship. The QC records shall always be available to the Agency and shall be retained for the life of the contract. The Contractor's documentation procedures will be subject to approval by the Agency prior to the start of work, and to compliance checks by the Agency during the progress of the work.

- 9. Compliance with Specifications.** At the conclusion of the project, the Contractor shall attest in writing to the Agency that the slurry system has been constructed in accordance with and meets the requirements of the specifications.

## **II. Agency Acceptance**

1. **General.** As the owner of the final micro surface, slurry seal, or polymer modified slurry seal, the Agency must ensure the contractor has constructed the project in accordance with the specifications. The Agency will conduct acceptance sampling, testing, and inspections consistent with AASHTO R 10. The agency may conduct verification testing should the QC results be used for Acceptance.

2. **Acceptance Activities**

- a. Assure the Contractor has followed the approved QC Plan.
  - b. Materials – Monitor the Contractor QC testing.
  - c. Agency to sample and test:
    - i. Aggregate – Gradation and deleterious materials, once per day or at the discretion of the Agency.
    - ii. Asphalt Emulsion – Once per project or at the discretion of the Agency.
- Note: Actual frequency and lot size will be per each Agency's Frequency Guide Schedules for Verification, Sampling and Testing.
- d. Traffic control conforms to plans and specifications and complies with the Manual on Uniform Traffic Control Devices.
  - e. Surface Preparation – Monitor pre-treatment activities, verify surface has been swept clean, pavement is dry, utility castings are protected, and drainage inlets are covered.
  - f. Placement Machine(s) Calibration – Witness the calibration of equipment.
  - g. Production Inspection:
    - i. Monitor and verify correct application rates of material placed.
    - ii. Monitor workmanship for even joints, straight lines, and uniform texture free of drag marks or unsightly appearance.

**III. Independent Assurance Program (IA)**

1. The IA program shall follow Tech Brief: Independent Assurance Programs, FHWA-HIF-12-001 2011 and shall be the responsibility of the Agency or Owner. The IA Program consists of activities that are an unbiased and independent evaluation of all the observations, sampling and testing procedures and equipment used in the acceptance program. The IA Program is staffed by qualified agency personnel or an accredited laboratory not involved with acceptance testing. It ensures the sampling and testing is performed correctly and the testing equipment used in the program is operating correctly and remains calibrated. It involves a separate and distinct schedule of sampling, testing, and observation. The results of the IA testing shall not be used for material acceptance.