

**Tennessee Department of Transportation
Division of Materials and Tests**

Laboratory Qualification Requirements (SOP 1-4)

- Purpose- The purpose of this document is to establish the minimum qualifications for field laboratories used for the control, design, acceptance, verification, and/or assurance of materials and products.
- Background- Federal regulations (23 CFR 637B) require that all laboratories used in the acceptance decision process be performed by qualified laboratories.
- Policy-
- Regional Laboratories
Regional materials laboratories will fall under the auspices of the AASHTO Accredited Central Laboratory. The regional laboratories will be inspected and reviewed annually. The central laboratory will conduct the regional inspections similar to the AASHTO Materials Reference Laboratory (AMRL) program. Lab equipment will be checked for proper tolerances and condition. Technician testing procedures will be reviewed for accuracy to the specified AASHTO test methods. The regional laboratories must keep current records of technician qualifications and training histories. The laboratories must also document all equipment calibrations, correlations, and checks to establish a permanent record. Round Robin/proficiency samples will be distributed for comparison and analysis of results.
- Upon completion of the laboratory inspection, the Central laboratory will complete a report of findings to the regional laboratories. The regional laboratory shall then respond with the proposed corrective actions.
- Field Laboratories
Contractor and material suppliers field laboratories must meet the minimum requirements specified in Subsection 106.06 of the Standard Specifications for Road and Bridge Construction, and all other applicable contract provisions.
- In addition to the annual hot mix asphalt plant, concrete plant, and aggregate producing plant inspections conducted by the regions, all field laboratories must be inspected, as a minimum, every two years for a qualification determination. The Regional laboratories, with cooperation from the central laboratory, will be responsible for conducting and qualifying the field laboratories. All test equipment will be thoroughly reviewed and checked to assure proper tolerances and operability exists.
- The Independent Assurance program will also serve as a routine opportunity to inspect the field lab test equipment and compare the test results to properly calibrated equipment. As specified in Circular Letter B-3, when comparing test results between acceptance and assurance samples, deviations exceeding the “normal” acceptable range must be reviewed.
- When laboratory equipment does not perform as required proper corrective action will be necessary, which may include the repair, replacement, or re-calibration of equipment. The field laboratory must maintain a log of all equipment calibrations, correlations, and/or repair work. Field laboratory equipment should also be maintained in accordance with manufactures recommendations, or as necessary. The Contractor will be issued an inspection report at the completion of the laboratory inspection. The Contractor must make all corrective actions and reply in writing to the Regional Materials Supervisor what actions have been taken to rectify the finding. All corrective actions and written

notification must be completed within 30 days of the inspection or the laboratory will be considered non-compliant with section 106.06 of the Standard Specifications.

As a minimum, the field laboratory equipment that shall be inspected by the regional laboratories for laboratory qualification is:

TYPE A LABORATORIES

Equipment	Reference	Requirement	Results/Acceptance
Scales	SS 106.06 AASHTO M-231	Accuracy within 0.2 % of known weights at 5 points through the scale range	
Sieves and Screens	SS106.06 AASHTO M-92	Worn and torn screens need to be repaired or discarded	
Mechanical Sieve Shakers	SS 106.06 AASHTO T-27, T-30	Approved by the Engineer	
Ovens (or stove tops and hot plates when applicable)	SS 106.06 AASHTO Test Methods	Oven must maintain constant temperature of ± 9 degrees F at 3 ranges (125, 230, and 300)	
Thermometers	SS 106.06 ASTM E 1 ASTM E 77	Thermometers should be checked against regional calibrated thermometers at 3 different temperature ranges, difference should be less than 2%	

TYPE B LABORATORIES

Equipment	Reference	Requirement	Results/Acceptance
Scales	SS 106.06 AASHTO M-231	Accuracy within 0.2 % of known weights at 5 points through the scale range	
Sieves and Screens	SS106.06 AASHTO M-92	Worn and torn screens need to be repaired or discarded	
Ovens	SS 106.06 AASHTO Test Methods	Oven must maintain constant temperature of ± 9 degrees F at 3 ranges (125, 230, and 300)	
Thermometers	SS 106.06 ASTM E 1 ASTM E 77	Thermometers should be checked against regional calibrated thermometers at 3 different temperature ranges, difference should be less than 2%	
Compaction equipment (Marshall and Gyratory) And Water bath	SS 106.06 Marshall: AASHTO T-245 Gyratory compactor: AASHTO TP-4 ,	Marshall Equipment – Molds- 4 ± 0.005 ", Hammer 10 ± 0.05 lbs. with free fall of 18 ± 0.1 ", pedestal, loading jack, load dynamometer, flowmeter, and breaking heads as per T-245, water bath shall be capable of maintaining a constant temperature of 140 ± 2 °F. Gyratory shall meet all requirements of AASHTO TP-4 and be calibrated as per the manufacturers literature	

Ignition Ovens	SS 407.20 AASHTO TP-53 or T-308	Equipment shall meet TP-53 or T-308 requirements and be maintained per manufacturers recommendations	
Mechanical Sieve Shakers	SS 106.06 AASHTO T-27, T-30	Approved by the Engineer	
Vacuum extractors with adequate ventilation	SS 106.06 AASHTO T-164	Apparatus as per T-164	
Suspension Apparatus and Water Bath	SS 106.06 AASHTO T-166	Approved by the Engineer to meet AASHTO T-166 requirements, water bath must be capable of maintaining a temperature of $77\pm 1.8^{\circ}\text{F}$	
Maximum Theoretical Gravity (Rice) determination	SS 106.06 AASHTO T-209	Vacuum, with manometer or vacuum gauge, capable of maintaining 3.7 ± 0.3 kPa (25.5 –30 mm Hg) of pressure, mechanical shaker capable of releasing entrapped air	
LOI muffler furnace and Assayer's fire clay crucible with cover	SS 407.03, SS 411.10	The furnace shall be capable of maintaining a constant temperature of 950°C for the entire 8 hr. test cycle	
Miscellaneous-mixing tools, bowls, beakers, pans, pycnometers, flasks, etc...		Clean of material build up, debris, cracks, excessive wear, etc...	
Hot plates		Capable of maintaining a temperature between 200-300°F	
Sampling and quartering equipment		Shall be clean of deleterious buildup	
Brookfield Viscometer and Dynamic Shear Rheometer (when applicable)	SS 904.01 ASTM D 4402 AASHTO TP-5 AASHTO TP-48	Asphalt testing equipment must comply with TP 5 and 48, be in satisfactory condition, and capable of producing accurate test results. This equipment shall be calibrated and maintained in accordance with the manufactures literature	
Moisture Susceptibility (Root –Tunnecliff)	ASTM-4876	Water bath capable of maintaining $140\pm 1.8^{\circ}\text{F}$ for 24 hrs. and $77\pm 1.8^{\circ}\text{F}$. Vacuum for specimen saturation , tensile splitting head, loading device	

Concrete Testing Equipment
(Per Section 501, 604, and 615 of the Standard Specifications and
The Sampling and Testing Schedule)

Equipment	Reference	Requirement	Results/Acceptance
Slump Cone	AASHTO T-119	The cone shall be 12" H, 4" D top opening, and a 8" D bottom opening, allowable tolerances $\pm 1/8"$, the top and bottom openings shall be parallel to each other, no material buildup, surfaces shall be smooth with no dents	
Volumetric Air meter (lightweight aggregate)	AASHTO T-152 AASHTO T-196	The meter shall conform to those identified in T-152, bowl shall be machined smooth, and have pressure tight flanges	
Yield /unit weight	AASHTO T-121	Apparatus shall conform to T-121	
Cure boxes/water baths	AASHTO T-23 AASHTO M-201	When applicable, cure boxes or water baths shall be capable of maintaining a relative humidity of at least 95%, and temperatures of $73.4 \pm 3^{\circ}\text{F}$	
Mallets	AASHTO test methods	Head shall be rubber or rawhide, 1.25 ± 0.50 lbs.	
Thermometer	AASHTO test methods	Shall be capable of accurately measuring within 2%	
Tamping rods	AASHTO test methods	Shall be a straight, 5/8" D, with a hemispherical tip, and at least 16" long	
Wheelbarrows/ sampling buckets		Equipment shall be clean and free of concrete buildup	
Compression Machines	AASHTO T-22 AASHTO T-67 AASHTO M-170 AASHTO T-280	Shall meet the requirements of AASHTO T-22 and be capable of maintaining a constant pressure loading of 20-50 psi/sec, or if screw type, a movement of 0.05in/min. RCP- Compression machines for three edge bearing tests ,shall be capable of applying a uniform linear load	

Revision November 7, 2002: Included language in the 4th paragraph under section Field Laboratory that require Contractors to make corrective actions and respond within 30 days.