

## EQUIPMENT CALIBRATION AND VERIFICATION

Equipment and apparatus used in testing materials must be calibrated or verified for accuracy on a regular basis to assure the equipment is giving reliable results.

Requirements for the calibration and verification of apparatus can be found in AASHTO R 18, "Establishing and Implementing a Quality System for Construction Materials Testing Laboratories". The Construction & Materials Group, Quality Assurance Section, has developed a listing of requirements, frequency, and the applicable test methods for the calibration and verification of additional types of equipment not listed in AASHTO R 18. The listing provided is not intended to address the calibration or verification of all equipment. Appendix A3 contains the following figures:

Figure Number	Figure Title
1	General Laboratory Testing Equipment
2	Aggregates Testing Equipment
3	Asphalt Binder/Cutback Asphalt/Emulsified Asphalt Testing Equipment
4	Asphalt Mixtures Testing Equipment
5	Soils Testing Equipment
6	Soils Testing Equipment (Continued)
7	Portland Cement Concrete Testing Equipment
8	Metal Testing Equipment
9	Equipment Maintenance

Test methods and standards referenced in the figures contained in Appendix A3 are identified as follows:

AZ	Arizona Test Methods
T, M, and R	AASHTO Test Methods and Standards
C, D, and E	ASTM Test Methods and Standards

Maximum frequency intervals shown in the following figures may be reduced based on specific laboratory conditions, deterioration of equipment, frequency of use, and other contributing factors.

Equipment and apparatus that may be affected by movement must be recalibrated after relocation.

**GENERAL LABORATORY TESTING EQUIPMENT**

<b>EQUIPMENT</b>	<b>REQUIREMENT</b>	<b>MAX. INTERVAL (Months)</b>
Thermometers, including Digital Thermistors	Standardize	12
Tape Measures and Rulers	Standardize	12
Constant Temperature Baths	Check Temperature Settings.	12

**FIGURE 1**

**AGGREGATES TESTING EQUIPMENT**

EQUIPMENT	REQUIREMENT	MAX. INTERVAL (Months)	TEST METHOD
Refer to AASHTO R 18 for Aggregate Equipment Calibration Frequencies			

**FIGURE 2**

**ASPHALT BINDER/CUTBACK ASPHALT/EMULSIFIED ASPHALT TESTING EQUIPMENT**

<b>EQUIPMENT</b>	<b>REQUIREMENT</b>	<b>MAX. INTERVAL (Months)</b>	<b>TEST METHOD</b>
Elastic Recovery Apparatus	Check Speed of Travel.	12	T 301, D 6084
Kinematic Viscometer Tubes	Calibrate with Reference Fluid	36	T 201, D 2170

**FIGURE 3**

**ASPHALT MIXTURES TESTING EQUIPMENT**

EQUIPMENT	REQUIREMENT	MAX. INTERVAL (Months)	TEST METHOD
Marshall Compaction Hammers, Breaking Heads	Check Critical Dimensions, Check Mass of Hammer.	12	AZ 410, AZ 815, T 245, T 283, D 4867, D 6926, D 6927
	Monitor Through Proficiency Sample Program.	Per proficiency sample frequency	
Marshall Stability/Flow Testing Machine	Check Speed of Travel, Verify Load Cell.	12	AZ 410, AZ 422, AZ 815, T 245, T 283, D 4867, D 5581, D 6926, D 6927
Nuclear Asphalt Content Gauge	Check Variability using 3 - Point Calibration.	12	AZ 421

**FIGURE 4**

**SOILS TESTING EQUIPMENT**

EQUIPMENT	REQUIREMENT	MAX. INTERVAL (Months)	TEST METHOD
Mechanical Compactor	Check Rammer Face Diameter and Height of Drop.	12	AZ 225, AZ 226, AZ 232, AZ 245, AZ 246, T 99,
	Monitor Through Proficiency Sample Program.	Per proficiency sample frequency.	T 134, T 135, T 180, D 558, D 559, D 698, D 1557

**FIGURE 5**

**SOILS TESTING EQUIPMENT (CONTINUED)**

EQUIPMENT	REQUIREMENT	MAX. INTERVAL (Months)	TEST METHOD
Resistivity Apparatus	Check Resistivity.	12	AZ 236
Flat and Elongated Proportional Caliper Device	Check Critical Dimensions.	12	D 4791
Flakiness Index Slotted Sieves	Check Critical Dimensions.	12	AZ 233
Fine Aggregate Specific Gravity Flask	Calibrate Volume.	12	AZ 211, T 84, C 128
Coarse Aggregate Specific Gravity Apparatus	Check Wire Diameter, Basket Type, and Water Tank.	12	AZ 210, T 85, C 127
Speedie Moisture Tester	Verify Scale and Gauge.	6	T 217
Standard Sand	Check Each New Shipment for Conformance to C 778.	---	C 778
Sand Cone Density Apparatus	Standardize	12	AZ 229, AZ 230

**FIGURE 6**

**PORTLAND CEMENT CONCRETE TESTING EQUIPMENT**

<b>EQUIPMENT</b>	<b>REQUIREMENT</b>	<b>MAX. INTERVAL (Months)</b>	<b>TEST METHOD</b>
Cylinder Capping Plates	Check Critical Dimensions.	12	T 231, C 617
Autoclave Apparatus	Check Critical Dimensions, Calibrate Valve and Gauge.	12	T 107, M 210, C 151
Rebound Hammer (Swiss Hammer)	Standardize	6	C 805
Moist Room (Fog Room)	Verify Temperature and Humidity with Recording Thermometer.	6	M 201, C 511
Cube Modes and Tampers	Check Critical Dimensions and Physical Condition	30	T 106, C 109

**FIGURE 7**



**METAL TESTING EQUIPMENT**

<b>EQUIPMENT</b>	<b>REQUIREMENT</b>	<b>MAX. INTERVAL (Months)</b>	<b>TEST METHOD</b>
Rockwell Hardness Tester	Standardize	12	E 18

**FIGURE 8**

**EQUIPMENT MAINTENANCE**

EQUIPMENT	MAX. INTERVAL (Months)	TEST METHOD
Performance-Graded Binder Equipment	12	R 58, T 240, T 313, T 314, T 315, D 2872, D 6521, D 6648, D 6723, D 7175
Ductilometers	12	T 51, T 300, T 301, D 113, D 6084
Mechanical Marshall Compactors	12	T 245
California Kneading Compactors	12	T 247, T 190, D 1561, D 2844
Gyratory Compactors	12	T 312, D 6925
Mechanical Compactors	12	T 99, T 180, D 698, D 1557
Mechanical Shakers	12	Where Applicable
<p>NOTE: There may be more items added to the laboratory's list of equipment that require maintenance. Maintenance activities will typically involve lubricating, tightening fittings, cleaning, replacing fluids, checking and replacing damaged or worn parts, etc. These activities will vary based on the type of equipment, how often the equipment is used, the manufacturer's recommendations, etc.</p>		

**FIGURE 9**