State of Illinois
Department of Transportation
Bureau of Materials and Physical Research

POLICY MEMORANDUM

Revised: July 1, 2015	21-08.1
This Policy Memorandum supersedes number 21-08.0 dated January 1, 2008	

TO: REGIONAL ENGINEERS AND HIGHWAY BUREAU CHIEFS

SUBJECT: MINIMUM REQUIREMENTS FOR CONSTRUCTION MATERIALS TESTING LABORATORIES - DEPARTMENT OPERATED LABORATORIES

1.0 SCOPE

1.1 This policy governs the minimum qualifications for materials testing laboratories operated by the Department. It applies to soils, aggregate, hot-mix asphalt (HMA), and portland cement concrete (PCC) laboratories. Federal regulations require the use of "qualified laboratories" for acceptance testing.

2.0 REFERENCED DOCUMENTS

A. IDOT Standard Specifications for Road and Bridge Construction.
B. IDOT Manual of Test Procedures for Materials.
C. IDOT QC/QA Specifications for Hot-Mix Asphalt and Portland Cement Concrete.
D. AASHTO, ASTM, and IDOT Test Procedures.
E. Code of Federal Regulations (23 CFR Part 637).
F. Department Policy MAT-15, “Quality Assurance Procedures for Construction.”

3.0 DEFINITIONS

AASHTO R 18 - The AASHTO Standard for "Establishing and Implementing a Quality System for Construction Materials Laboratories." The principles of AASHTO R18 are used by the Bureau of Materials and Physical Research (BMPR) to administer the qualified laboratory program for district and private laboratories.

BMPR LABORATORY - The Department's central laboratory maintained and operated by the Bureau of Materials and Physical Research (BMPR). The BMPR Laboratory administers the qualified laboratory program for district and private laboratories. The BMPR Laboratory shall maintain AASHTO accreditation through AMRL and CCRL.

DEPARTMENT – Illinois Department of Transportation (IDOT), including its Districts and Central Bureau offices.

DISTRICT LABORATORY - A state operated laboratory used for design, quality control, quality assurance, independent assurance, or acceptance testing. This includes soils, aggregate, HMA, and PCC testing facilities. District laboratories are required to be "qualified" (see following definition). The BMPR laboratory shall administer the qualified laboratory program for District and branch laboratories.

QUALIFIED LABORATORIES - Laboratories that are inspected and approved by the Department. FHWA's construction regulations (23 CFR 637.203) define these as laboratories that are capable as defined by appropriate programs established by each state transportation department. As a minimum, the qualification program shall include provisions for checking test equipment and the laboratory shall keep records of calibration checks.

QUALIFIED PERSONNEL - Personnel with demonstrated and documented capability to perform the applicable tests. The minimum requirement for testing personnel for aggregate, PCC, or HMA projects is successful completion of the appropriate QC/QA Trained Technician classes.

4.0 DISTRICT AND BRANCH LABORATORY REQUIREMENTS

4.1 PERSONNEL QUALIFICATIONS

4.1.1 Each laboratory shall have a technical manager (however named) who has overall responsibility for the technical operations of the laboratory.

4.1.2 All testing related to contractor pay, quality assurance, and independent assurance, shall be performed by technicians trained under the Department's Trained Technician Program. Training information is available from the Department's Trained Technician Data Base.

4.2 TESTING CAPABILITY

4.2.1 Each District shall maintain qualified laboratories. The District's main laboratory shall have the capability to perform each required test identified in Table 1. If a District operates branch laboratories, it is not necessary that all tests be performed at each branch facility.

4.2.2 Each District may have additional testing capabilities, including those optional tests listed in Table 1.

4.2.3 All test procedures shall be performed as specified in the current Manual of Test Procedures for Materials.

4.3. EQUIPMENT CALIBRATION & VERIFICATION

4.3.1. All equipment shall be calibrated and/or verified by the laboratory at a minimum frequency. Table 2 includes a suggested frequency for most laboratory equipment. Heavy use or specific test requirements may justify more frequent checks.

4.3.2 Documentation of calibration shall be maintained for a minimum period of three years. Certain test procedures may require extended records retention.

4.3.3 Calibration records shall include the following minimum information:

1. Description.
2. Model & Serial Number.
3. Name of person who did calibration.
4. Calibration equipment used (e.g., standard weights, proving rings, thermometers).
5. Last date calibrated & next due date.
6. Reference procedure used.
7. Results of calibration /verification.
8. Maintain documentation.

4.4 DISTRICT LABORATORY INSPECTIONS

4.4.1 BMPR will conduct inspections of District and branch laboratories on a biennial basis. The inspections will include:

- Facilities - An evaluation of the physical and environmental condition of the facility.
- Equipment - An inspection of test apparatus for specification compliance.
- Documentation - A review of calibration and verification records.
- Personnel - A review of the credentials of the technicians in each laboratory.
- Observation - The District may be required to demonstrate all "required" tests as well as any “optional” tests, if performed (See Table 1). Some test procedures, such as field tests, may be evaluated through discussion with District materials personnel.
- Report - The District will be provided with a report listing those tests for which the District is approved. The inspection report will note if a "required" test is not performed by all laboratories in a District. In that case, the laboratory should not perform the test for design or construction purposes.
- Deficiencies - The BMPR report will also note deficiencies. District and branch laboratories shall correct documented deficiencies. Any uncorrected deficiencies may be waived only with the written approval of the Engineer of Tests within BMPR.

4.5 PROFICIENCY TESTING

4.5.1 Laboratory qualifications may include round-robin proficiency testing conducted by BMPR. Results of proficiency testing shall be considered in the overall evaluation of the laboratory to conduct specific tests. (e.g., the superpave gyratory compactor and binder ignition oven may be approved through round robin proficiency testing.)

5.0 LABORATORY INSPECTION DATA BASE

5.1 BMPR will maintain a computer data base to monitor the approval status of state and private testing laboratories. The information will include the following information:

1. Laboratory Codes (State, Producer, Independent, etc.)
2. Responsible District
3. Type of Laboratory (Agg, HMA, PCC, Soils, Other)
4. Demographics (Address, etc.)
5. Contact Name and Title
6. Date Inspected
7. Date Approved

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Attachments

TABLE 1 MINIMUM DISTRICT LABORATORY TESTS

STANDARD (IL Modified)	REQ'D	Optional	TITLE
AGGREGATE TESTS			
Illinois Test Procedure 2	✓		Sampling of Aggregates
Illinois Test Procedure 11	✓		Materials Finer Than No. 200 (75-µm) Sieve in Mineral Aggregates by Washing
Illinois Test Procedure 19		✓	Bulk Density ("Unit Weight") and Voids in Aggregate
Illinois Test Procedure 27	✓		Sieve Analysis of Fine and Coarse Aggregate
AASHTO T 37		✓	Sieve Analysis of Mineral Filler for Hot Mix Asphalt (HMA)
Illinois Test Procedure 84[1]		✓	Specific Gravity and Absorption of Fine Aggregate
Illinois Test Procedure 85[1]		✓	Specific Gravity and Absorption of Coarse Aggregate
Illinois Test Procedure 248	✓		Reducing Samples of Aggregate to Testing Size
Illinois Test Procedure 255	✓		Total Evaporable Moisture Content of Aggregate by Drying
HOT MIX ASPHALT TESTS			
AASHTO T 30 (IL)	✓		Mechanical Analysis of Extracted Aggregate
AASHTO T 164 (IL)	✓		Quantitative Extraction of Asphalt Binder from Hot Mix Asphalt (HMA)
AASHTO T 166 (IL)	✓		Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
AASHTO T 209 (IL)	✓		Theoretical Maximum Specific Gravity (Gmm) and Density of Hot Mix Asphalt Paving Mixtures
AASHTO T 245 (IL)		✓	Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus
AASHTO T 283 (IL)	✓		Resistance of Compacted Hot Mix Asphalt (HMA) to Moisture-Induced Damage
AASHTO T 287 (IL)		✓	Asphalt Binder Content of Asphalt Mixtures by the Nuclear Method (Prior HMA QC/QA stand-alone document)
AASHTO T 308 (IL)	✓		Determining the Asphalt Binder Content of Hot-Mix Asphalt by the Ignition Method
AASHTO T 312 (IL)	✓		Preparing and Determining the Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor
AASHTO T 324 (IL)	✓		Hamburg Wheel-Track Testing of Compacted Hot Mix Asphalt (HMA)
ASTM D 2950 (IL)	✓		Density of Bituminous Concrete in Place by Nuclear Methods
SOILS TESTS			
AASHTO R 45		✓	Installing, Monitoring, and Processing Data on the Traveling Type Slope Inclinometer
AASHTO R 58	✓		Dry Preparation of Disturbed Soil and Soil-Aggregate Samples for Test
AASHTO T 88	✓		Particle Size Analysis of Soils
AASHTO T 89	✓		Determining the Liquid Limit of Soils
AASHTO T 90	✓		Determining the Plastic Limit and Plasticity Index of Soils
AASHTO T 99 (IL)	✓		Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12 in.) Drop

Note 1 Districts with slag producers are required to perform Illinois Test Procedure 84 and Illinois Test Procedure 85.

TABLE 1 MINIMUM DISTRICT LABORATORY TESTS (CONTINUED)

STANDARD (IL Modified)	REQ'D	Optional	TITLE
SOILS TESTS CONTINUED			
AASHTO T 100		✓	Specific Gravity of Soils
AASHTO T 134 (IL)		✓	Moisture-Density Relations of Soil-Cement Mixtures
AASHTO T 135		✓	Wetting-and-Drying Test of Compacted Soil-Cement Mixtures
AASHTO T 136		✓	Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures
AASHTO T 146		✓	Wet Preparation of Disturbed Soil Samples for Test
AASHTO T 180 (IL)		✓	Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
AASHTO T 191 (IL)		✓	Density of Soil In-Place by the Sand-Cone Method
AASHTO T 208		✓	Unconfined Compressive Strength of Cohesive Soil
AASHTO T 216		✓	One-Dimensional Consolidation Properties of Soil
AASHTO T 217 (IL)		✓	Determination of Moisture in Soils by Means of a Calcium Carbide Gas Pressure Moisture Tester
AASHTO T 223		✓	Field Vane Shear Test in Cohesive Soils
AASHTO T 224 (IL)	✓		Correction for Coarse Particles in the Soil Compaction Test
AASHTO T 265 (IL)	✓		Laboratory Determination of Moisture Content of Soils
AASHTO T 296		✓	Unconsolidated, Undrained, Compressive Strength of Cohesive Soils in Triaxial Compression
AASHTO T 297		✓	Consolidated, Undrained Triaxial Compression Test on Cohesive Soils
Illinois IBR		✓	(Refer to Geotechnical Manual)
PORTLAND CEMENT CONCRETE TESTS			
AASHTO R 39 (IL)		✓	Making and Curing Concrete Test Specimens in the Laboratory
AASHTO R 60 (IL)	✓		Sampling Freshly Mixed Concrete
AASHTO T 22 (IL)	✓		Compressive Strength of Cylindrical Concrete Specimens
AASHTO T 23 (IL)	✓		Making and Curing Concrete Test Specimens in the Field
AASHTO T 97		✓	Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
AASHTO T 119 (IL)	✓		Slump of Hydraulic Cement Concrete
AASHTO T 121 (IL)	✓		Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
AASHTO T 152 (IL)	✓		Air Content of Freshly Mixed Concrete by the Pressure Method
AASHTO T 177 (IL)	✓		Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
AASHTO T 196 (IL)		✓	Air Content of Freshly Mixed Concrete by the Volumetric Method
AASHTO T 197		✓	Time of Setting of Concrete Mixtures by Penetration Resistance
AASHTO T 231 (IL)		✓	Capping Cylindrical Concrete Specimens
AASHTO T 318 (IL)		✓	Water Content of Freshly Mixed Concrete Using Microwave Oven Drying
ASTM C 1064 (IL)	✓		Temperature of Freshly Mixed Hydraulic Cement Concrete
ASTM C 1231 (IL)		✓	Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders
Illinois Test Procedure 301		✓	Fine Aggregate Moisture Content by the Flask Method
Illinois Test Procedure 302		✓	Aggregate Specific Gravity and Moisture Content by the Dunagan Method
Illinois Test Procedure 303		✓	Fine or Coarse Aggregate Moisture Content by Pycnometer Jar Method
Illinois Test Procedure 306		✓	Voids Test of Coarse Aggregate for Concrete Mixtures

TABLE 2 EQUIPMENT CALIBRATION SCHEDULE[1]

EQUIPMENT	REQUIREMENT	INTERVAL (MONTHS)
AGGREGATE & GENERAL		
Unit Weight Measures	Standardize	12
General Purpose Balances, Scales	Commercial Service or Verification using standardized NIST traceable Masses	12
Standard Masses	Standardize	60
Timers	Check Accuracy	12
Mechanical Shakers	Check Sieving Thoroughness	12
Ovens	Standardize Thermometric Device	12
Coarse Sieves (Openings ≥4.75 mm)	Check Physical Condition and Dimensions of Openings	12
Fine Sieves (Openings <4.75 mm)	Check Physical Condition	12
Working Thermometers	Standardize with calibrated NIST traceable Reference Thermometer	12
Reference Thermometer	Calibrate	60
Calipers and Micrometers	Standardize	12
HOT MIX ASPHALT		
Gyratory Compactor	Verify Angle, Pressure, Height	Once a month during use
	Verify Angle using a DAV-2	12
Plates, Ram Faces, and Molds	Check Critical Dimensions	12
Ignition Furnace	Standardize	Each mix
Marshall Hammer	Check Physical Condition	12
	Standardize	36
Vacuum Pump	Check Pressure	12
Tensile Strength Machine	Standardize	12
Breaking Heads	Check Critical Dimensions	12
Pycnometers	Standardize Volume	12
Mixers	Check Physical Condition	12
Water Baths	Standardize	12
Extraction Equipment	Check Physical Condition	12
Bore Gauge	Standardize	Each use
Master Ring	Calibrate	When concern of damage
Hamburg Wheel Tracking Machine:		
Water Temperature	Verify	12
Speed	Verify	12
Wheel Weight	Verify	24
LVDTs	Verify	12
SOILS		
Compression Loading Device	Standardize	12
Mechanical Compactor	Standardize	12
Vacuum System	Check Pressure	24
Molds	Check Critical Dimensions	12
Manual Hammer	Check Weight and Critical Dimensions	12
Liquid Limit Device	Check Wear and Critical Dimensions	12

TABLE 2 EQUIPMENT CALIBRATION SCHEDULE[1] (CONTINUED)

EQUIPMENT	REQUIREMENT	INTERVAL (MONTHS)
SOILS CONTINUED		
Grooving Tool	Check Critical Dimensions	12
Hydrometers	Check Critical Dimensions	24
	Determine Composite Correction	12
Straightedge	Check Planeness of Edge	12
Specific Gravity Pycnometers	Calibrate	Initial use
CBR Annular and Slotted Weights	Check Mass	12
CBR Penetration Piston	Check Diameter	12
Field Proctor Molds	Check Critical Dimensions	12
Dynamic Cone Penetrometer	Check Physical Dimensions	12
Static Cone Penetrometer	Check Physical Condition	12
Rimac	Standardize	24
PORTLAND CEMENT CONCRETE		
Air Meters (Pressure Type)	Standardize During Use	3 (Type B)
	Standardize	12 (Type A)
Air Meters (Volumetric Type)	Standardize	12
Compression & Flexural Testing Machine	Standardize	12
Capping Material	Check Strength	3 or New Shipment
Slump Cones	Check Critical Dimensions	12
Metallic Reusable Molds	Check Critical Dimensions	12
Single Use Molds	Check Dimensions	Each Shipment
Metal Stem Thermometers	Standardize with calibrated NIST traceable Reference Thermometer	12
Neoprene Pads	Check Physical Properties	Track Usage
Metal Retainers	Check Critical Dimensions	3
Moist Room/Storage Tanks Recording Thermometer or Max/Min Thermometer	Standardize with calibrated NIST Traceable Reference Thermometer	12

Note 1: See AASHTO R18 for equipment calibration terminology definitions.