



U.S. Department of Transportation
Federal Highway Administration



FHWA Resource Center

FHWA Update
August 14, 2024

Dennis Dvorak
Pavement and Materials Engineer

Lisa McDaniel
Pavement and Materials Engineer

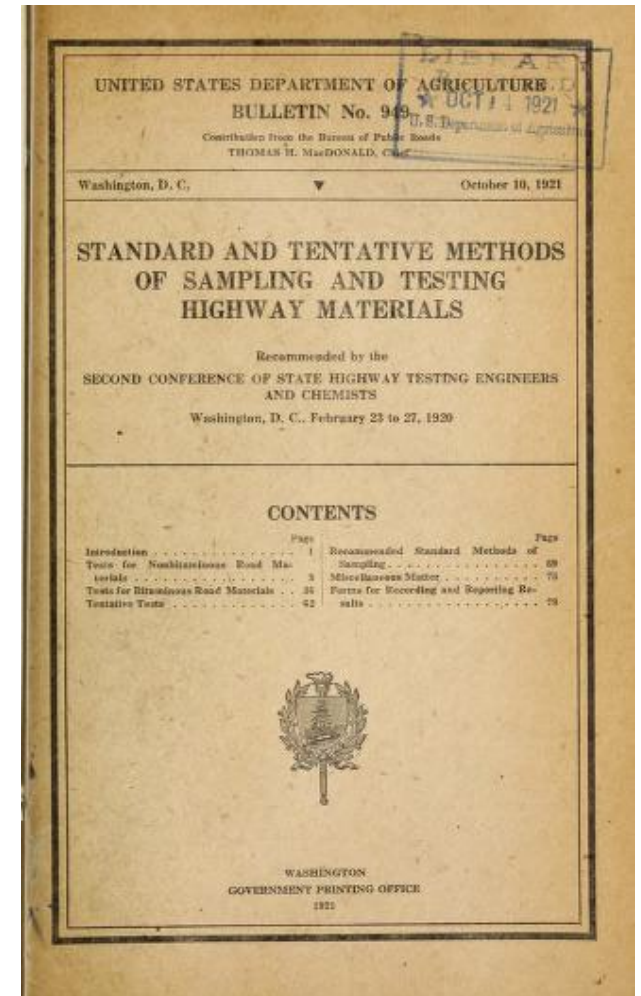
In the Beginning...

- In 1907 case *Wilson v. Shaw*, the Supreme Court found that Congress had the power "to construct interstate highways" under the constitutional right to regulate interstate commerce.
- Federal Aid Road Act of 1916
 - Required state highway agency by 1920
 - \$75,000,000/year
 - Apportioned to States by formula



Standard and Tentative Methods of Sampling and Testing (1921)

- Developed by Bureau of Public Roads (predecessor of FHWA) and State Materials Testing Engineers
- AASHTO published Materials Standards and Test Methods starting in 1931



23 Code of Federal Regulations (CFR) (1938)

Section 1.9 Construction

(b) Unless otherwise stipulated in writing by the Secretary or his authorized representative, materials for the construction of any project shall be tested, prior to use, for conformity with the specifications, according to methods prescribed or approved by the Bureau of Public Roads.

TITLE 23—HIGHWAYS CHAPTER I—BUREAU OF PUBLIC ROADS DEPARTMENT OF AGRICULTURE

Part	Part
1 Regulations under the Federal Highway Act ¹	20 Regulations relative to grade crossings under the Emergency Relief Appropriation Act of 1935
6 Regulations relative to public highway construction and related projects under the Emergency Relief Appropriation Act of 1935 ²	21 Regulations relative to grade crossings under the Act of June 16, 1936
10 Regulations relative to the improvement of secondary or feeder roads under the Act of June 10, 1930	25 Regulations under the Flood Relief Act for Vermont, New Hampshire, and Kentucky
15 Regulations for administering forest roads and trails	26 Regulations under the Flood Relief Act for Missouri, Mississippi, Louisiana, and Arkansas

CROSS REFERENCES

Federal Emergency Administration of Public Works: See Public Property and Works, 44 CFR Chapter II.
Forest Service, Department of Agriculture: See Parks and Forests, 36 CFR Chapter II.
Interstate Commerce Commission, regulations relating to block signals and train control devices at grade crossings: See Transportation and Railroads, 49 CFR Part 183.
Office of the Secretary of Labor and labor regulations, Department of Labor: See Labor, 29 CFR Part 1.
Panama Canal regulations relating to public roads, vehicles and vehicular traffic: See Panama Canal, 35 CFR Part 23.
Regulations concerning construction and maintenance of roads on Indian lands, Office of Indian Affairs, Department of Interior: See Indians, 25 CFR Part 261.
Regulations of the General Land Office concerning rights of way for roads and highways: See Public Lands: Interior, 43 CFR 241.1-244.0, 244.51-244.55.
Regulations relating to use of land for roads and trails of the Forest Service, Department of Agriculture: See Parks and Forests, 36 CFR 251.7.
United States Employment Service, Department of Labor: See Labor, 29 CFR Chapter I.
Works Progress Administration: See Public Works, 46 CFR Chapter III.

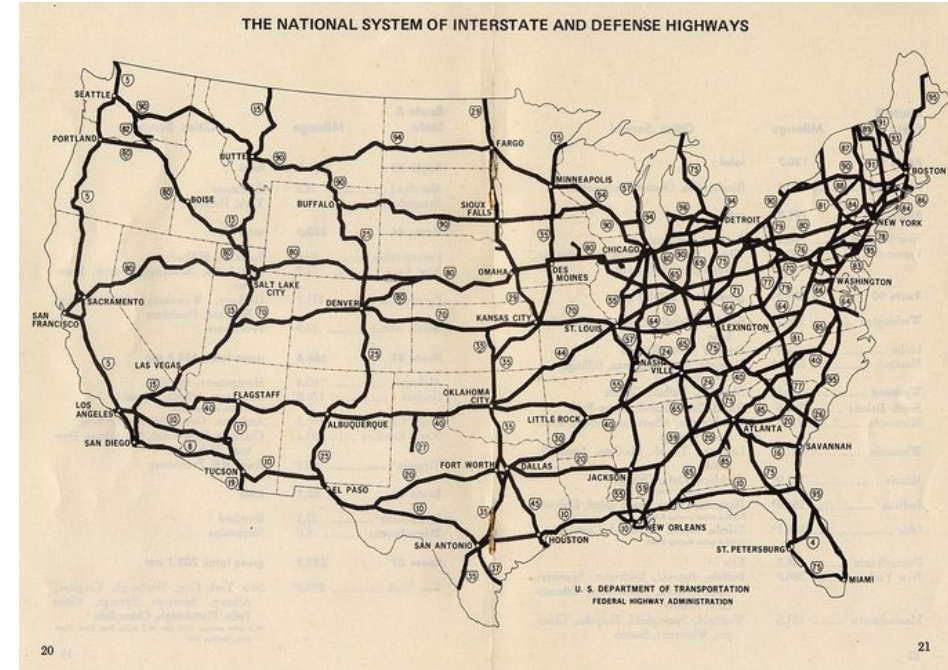
¹ Except the provisions thereof relative to forest roads.

² Except within or adjacent to national forests, national parks, national pathways, or other Federal reservations.



Federal –Aid Highway Act of 1956 (P.L. 84-627)

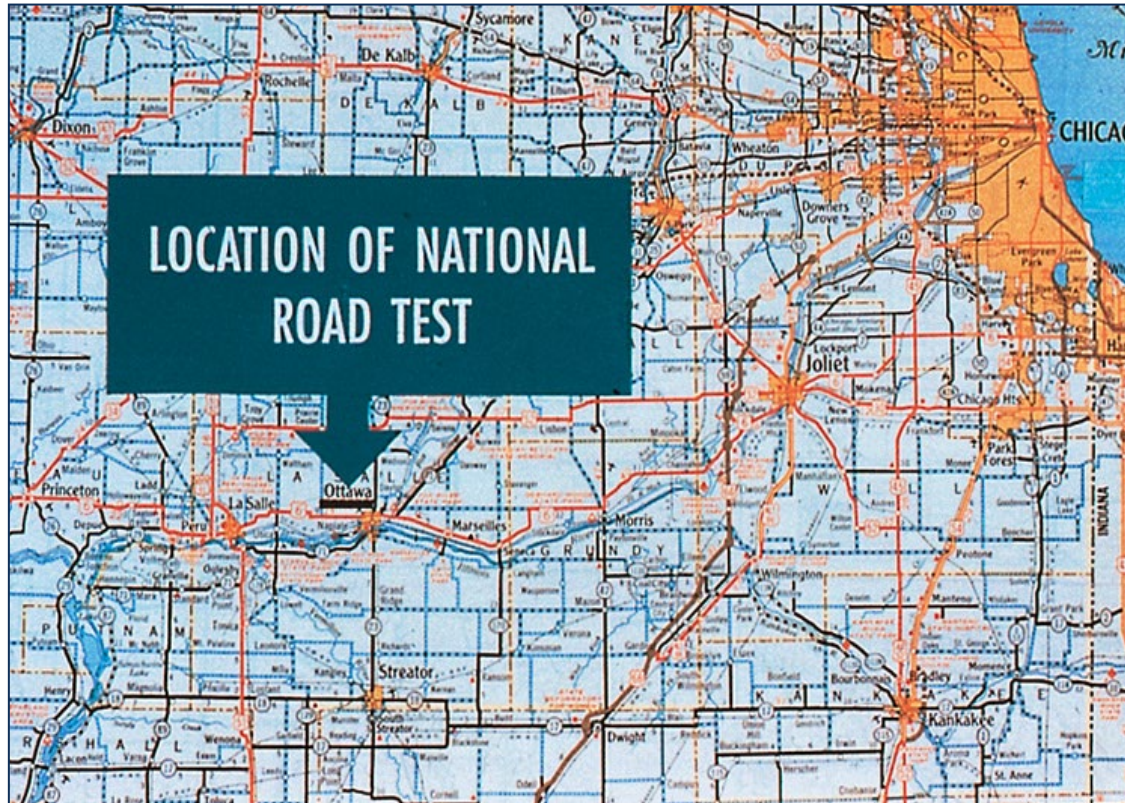
- Interstate Highway System
- Highway Trust Fund



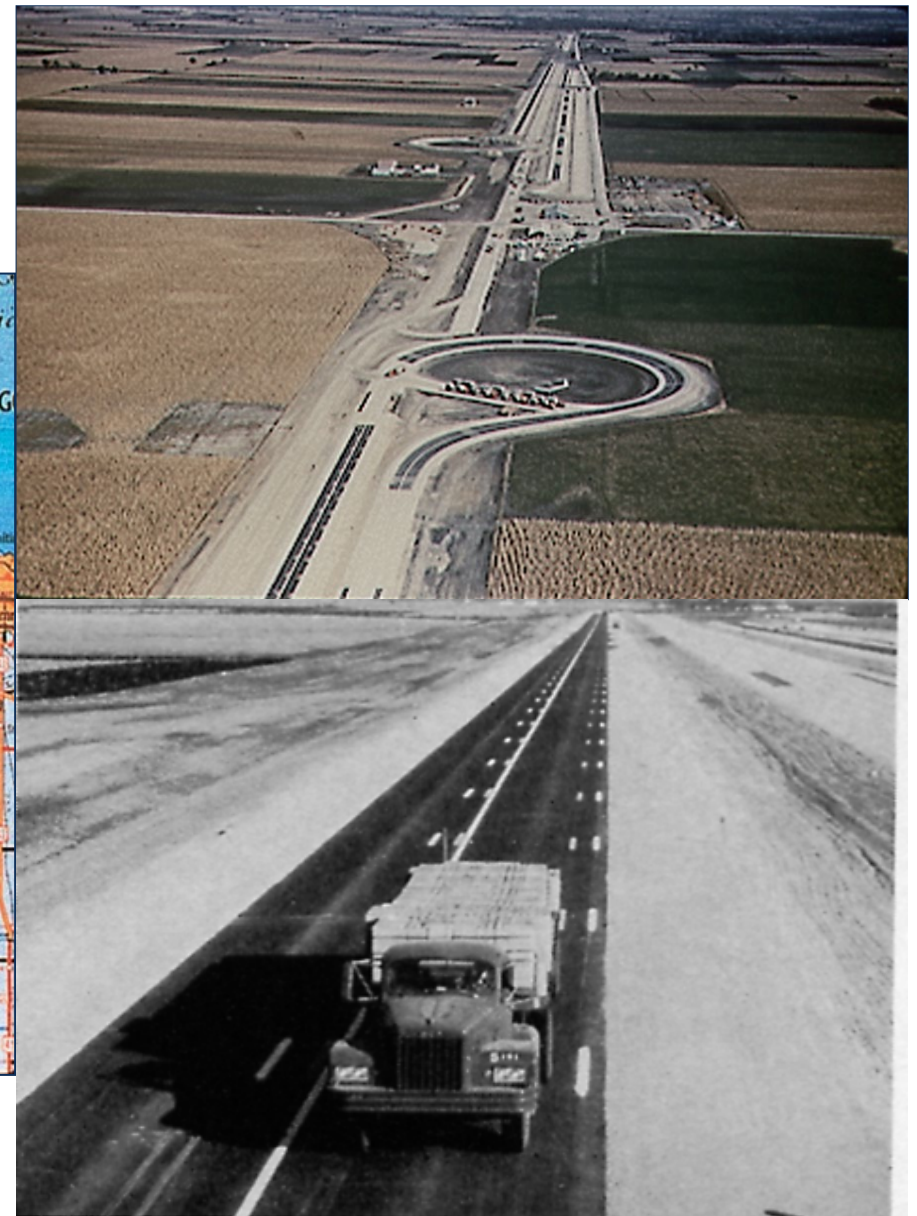
Source: FHWA



AASHO Road Test



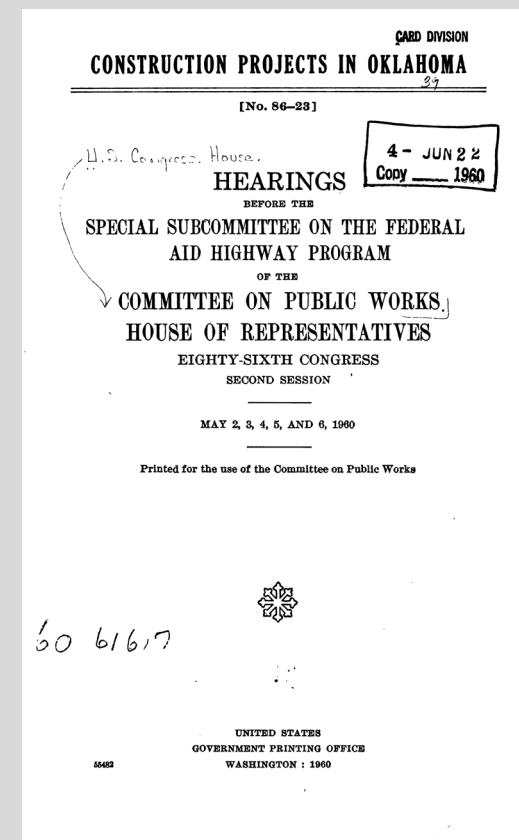
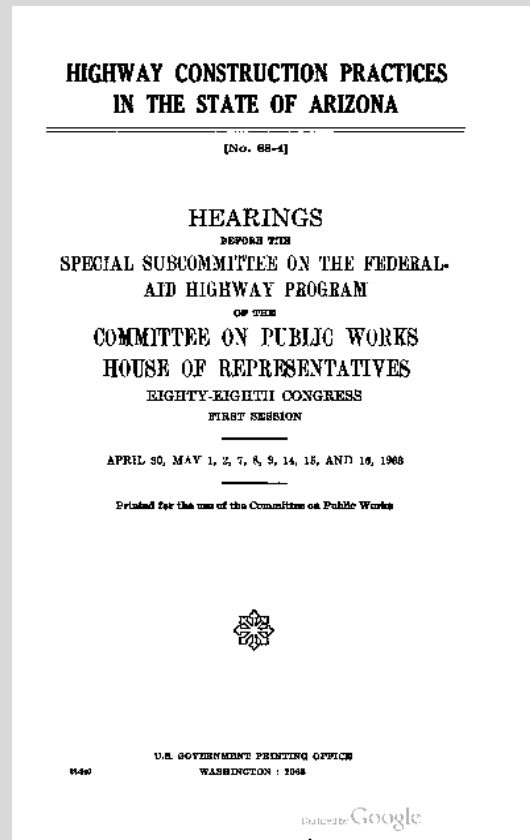
Source: FHWA



Special Committee on the Federal-aid Highway Program

House of Representatives Committee on Public Works

Commonly known as the Blatnik Committee



FHWA Policy and Procedures Memorandum (PPM) 20-6-2 (1972)

Inspection of Construction Projects - Sampling and Testing

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION POLICY AND PROCEDURE MEMORANDUM		Transmittal 235 20-6-2 April 4, 1972
INSPECTION OF CONSTRUCTION PROJECTS (SAMPLING AND TESTING)		

<p>Par. 1. Purpose</p> <p>2. Objective</p> <p>3. Classes of Samples and Tests</p> <p>4. Definition of Terms</p> <p>5. Taking and Testing Job Control Samples</p> <p>6. Taking and Testing Progress Record Samples</p> <p>7. Taking and Testing Final Record Samples</p> <p>8. Frequency of Sampling</p> <p>9. Acceptance of Small Quantities of Materials, exclusive of Portland Cement Concrete, Without Sampling and Testing</p> <p>10. Acceptance of Small Quantities of Portland Cement Concrete with Reduced Engineering Control, Sampling and Testing</p> <p>11. Records of Sampling and Testing</p> <p>12. Suspension of Progress Payments</p> <p>13. Application of Specification Requirements</p> <p>14. Area Engineer's Functions</p> <p>15. Materials Certification</p> <p>16. Application</p>	<p>3. <u>CLASSES OF SAMPLES AND TESTS</u></p> <p>Two different classes of samples and tests are required for each project. They are "job control samples and tests" and "record samples and tests." The latter class is subdivided into "progress record samples and tests" and "final record samples and tests."</p> <p>4. <u>DEFINITION OF TERMS</u></p> <p>For the purpose of this memorandum, the intent and meaning of the following terms are as follows:</p> <p>a. <u>Central Laboratory</u></p> <p>(1) When used in connection with projects constructed under State supervision the term "central laboratory" shall mean the State highway department central laboratory, or;</p> <p>(2) The division or district laboratories in States where materials control functions have been decentralized to such levels, it does not include materials control facilities under the supervision of the engineers in direct charge of the construction project. When the State uses the facilities of other public agencies or of private testing laboratories to supplement its own facilities, these will be considered as a part of the State's central laboratory.</p> <p>(3) When the term "central laboratory" is used in connection with projects constructed under direct FHWA supervision, it means whatever laboratory, other than one under supervision of project personnel, performs the testing for the project.</p> <p>b. <u>Central Laboratory Personnel</u>. The personnel assigned to the central laboratory who are not normally associated with the job control sampling and testing.</p> <p>c. <u>Project Engineer</u>. The individual who is directly responsible for the routine day-to-day engineering supervision of the project. (In some States this individual is</p>
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PPM 20-6-2

- Job control samples and tests
 - Used to determine quality and acceptability of materials incorporated in project
 - Sampled and tested by project personnel



PPM 20-6-2

- Required record samples and tests
 - Independent spot check of job control samples and tests
 - Record samples were taken by central lab staff in the presence of FHWA engineer or else project staff under supervision of central lab staff, district office staff or FHWA engineer with sample security requirements

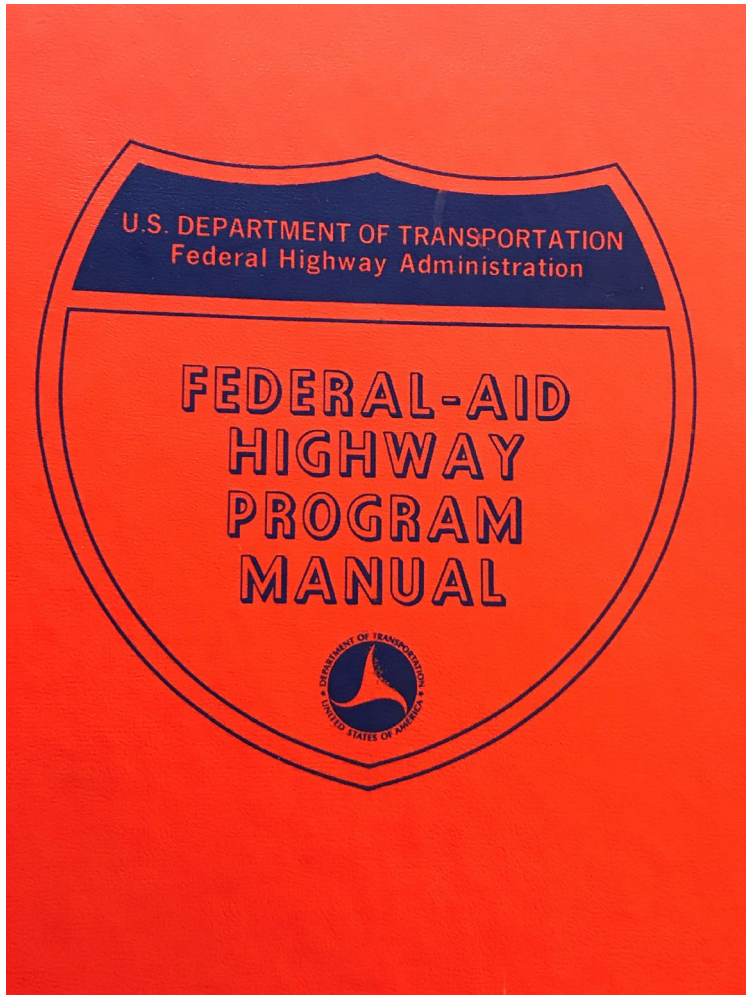


23 CFR 637 (1975)

- Subpart B – Sampling and Testing of Materials and Construction added to 23 CFR 637
- Each State DOT required to develop sampling and testing program including:
 - Acceptance samples and tests by State DOT
 - Independent Assurance (IA) samples and tests
 - Project materials certification for all Federal-aid construction projects



Federal-Aid Highway Program Manual (FHPM) (1974)



- Included both regulatory and nonregulatory material



FHPM 6-4-2-10 on Quality Assurance Program (1981)

- FHWA Regional Offices report to FHWA Headquarters annually on status of each state's implementation of QA program
- QA Program can include process control sampling and testing by contractor





Qualified/Certified Sampling and Testing Personnel

- **Notice of Proposed Rulemaking (Federal Register - July 12, 1994)**
- §637.203 Policy
 - *Qualified sampling and testing personnel.*
 - Personnel who are certified through appropriate programs defined by each State Highway Agency (SHA)
- **Final Rule (Federal Register - June 29, 1995)**
- §637.203 Policy
 - *Qualified sampling and testing personnel.*
 - Personnel who are capable as defined by appropriate programs established by each State Transportation Department (STD).



23 CFR 637 (1995)

- Subpart B revised to allow the use of contractor QC tests as part of acceptance
- Applies to National Highway System
- State QA Program required to be approved by FHWA (Approval delegated to Division Office)
 - Frequency guide schedule for sampling and testing
 - Independent assurance sampling and testing
 - Tester certification/qualification
 - State central labs accredited by AASHTO or comparable laboratory accreditation program approved by the FHWA
 - Laboratory qualification
 - Conflict of interest requirements for private laboratories
 - Materials testing dispute resolution



Material



Source: FHWA

Process



Source: FHWA

Sampling

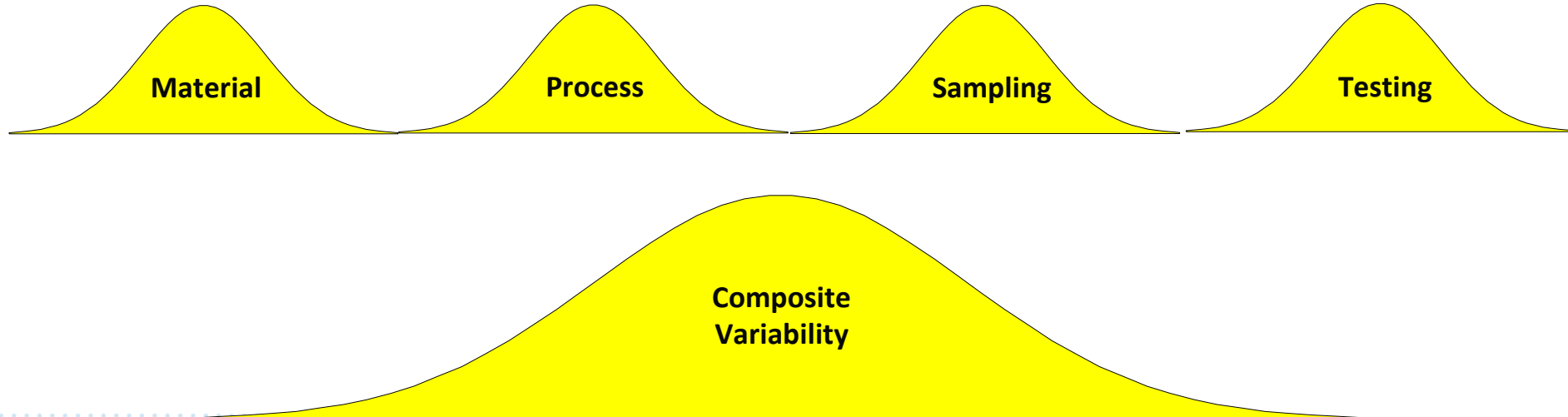


Source: FHWA

Testing



Source: FHWA



Technician Qualification/Certification

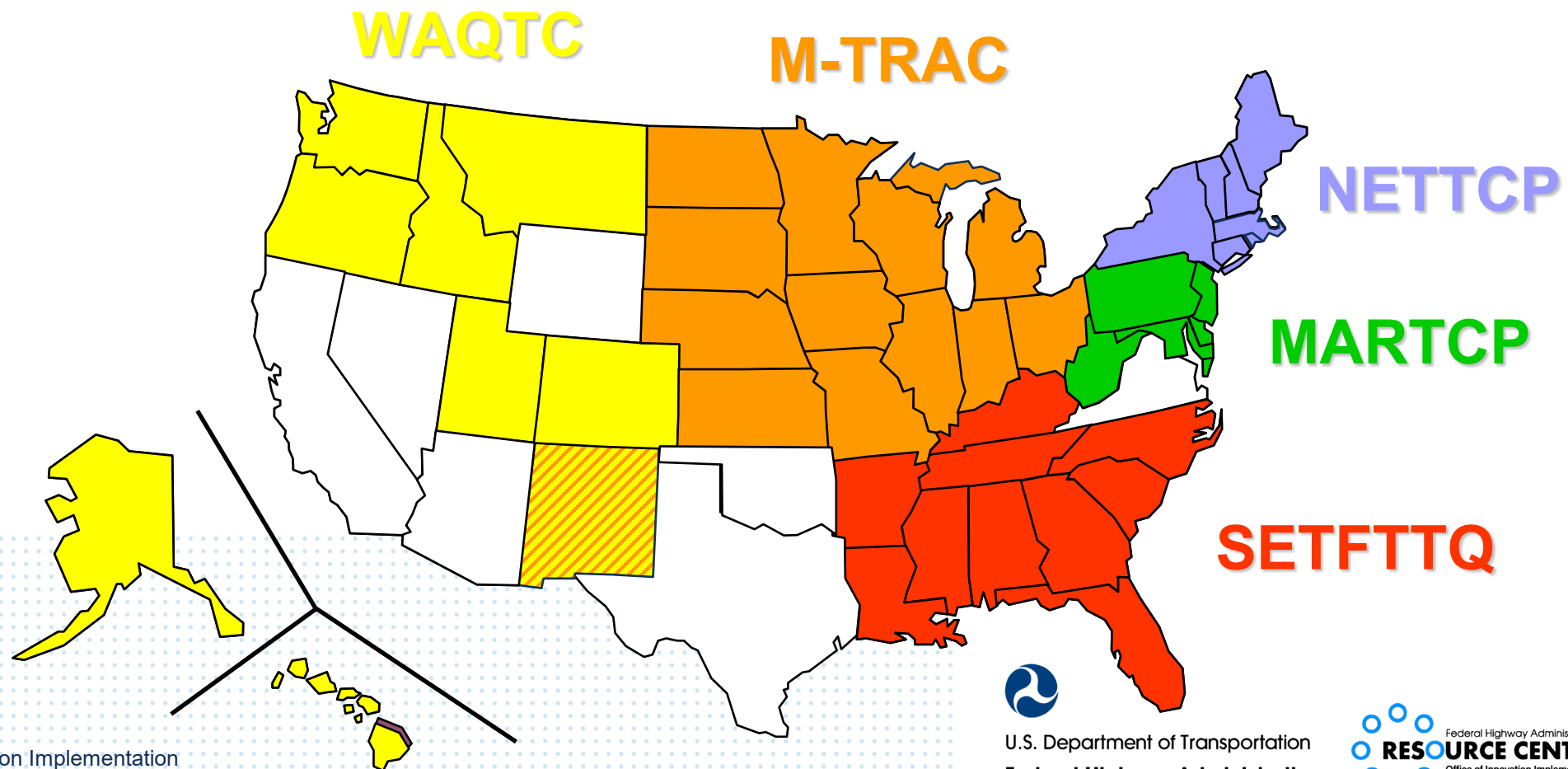
- 23 CFR 637.209(b).
 - Sampling and testing personnel. After June 29, 2000, all sampling and testing data to be used in the acceptance decision or the IA program shall be executed by **qualified sampling and testing personnel**.
- Required for all sampling & testing in acceptance decision
- Qualification/Certification programs
 - State programs
 - Regional partnerships
 - National programs



Source: FHWA



TC3 Regional Groups Inspector & Technician Qualification/Certification



FHWA July 17, 1998 Memo on Technician Qualification

(Superseded by [Non-Regulatory Supplement 23 CFR Part 637](#))



U.S. Department of Transportation
Federal Highway Administration

MEMORANDUM

Subject: **INFORMATION:** Technician Qualification
From: Chief, Highway Operations Division
To: Resource Center Directors
Division Administrators
Acting Federal Lands Highway Program Administrator

Date: July 17, 1998
Refer To: HNG-23

The purpose of this memorandum is to serve as a reminder that all sampling and testing of highway materials for Federal-aid projects on the National Highway System (NHS), subsequent to June 29, 2000, must be performed by qualified technicians. Suggestions for what constitutes a technician qualification program are also included.

The regulation for Quality Assurance Procedures for Construction was published as 23 CFR 637 on June 29, 1995. This regulation established a deadline of June 29, 2000 for having all sampling and testing used in the acceptance decision performed by qualified technicians.

The primary objective in establishing technician qualification programs is to assure that the technician is capable of performing the appropriate sampling and testing procedures correctly. In addition, it is likely that a technician will continue to perform the test correctly if they understand the importance of the test and the consequences of conducting improper sampling and testing procedures. The ultimate objective is to assure that maximum quality control and superior highway materials are incorporated into the finished highway infrastructure element.

Technician qualification programs can vary in format while achieving the primary objective of qualified technicians. Currently, several State departments of transportation (DOT) have combined to develop regional programs that promote reciprocity as well as establishing qualification requirements. Similarly, many individual State DOTs are pursuing their own programs.

While the State or regional flexibility for a technician qualification program format is readily supported, the following items are offered as suggested elements of a complete qualification program:

- Formal training of personnel including all sampling and testing procedures with instructions on the importance of proper procedures and the significance of test results,
- Hands-on training to demonstrate proficiency of all sampling and testing to be performed,
- A period of on-the-job training with a qualified individual to assure familiarity with State DOT procedures,
- A written examination and the demonstration of the various sampling and testing methods,
- Requalification at 2 to 3 year intervals (data from the Independent Assurance program can be used as one element of requalification), and
- The qualification program should have a documented process for removing personnel that perform the sampling and testing procedures incorrectly.

Grandfathering, the acceptance of a Professional Engineer or Engineer-in-Training certificate, or lifetime qualification are not considered to be appropriate criteria for achieving or maintaining qualification status.

Any regulation questions concerning technician qualification should be directed to Jason Dietz, Materials Group, at 202-366-8534. Questions concerning the development of a technician qualification program should be directed to George Jones, Quality Initiatives Group, at 202-366-1554.

/Original Signed by/
Donald P. Steinke



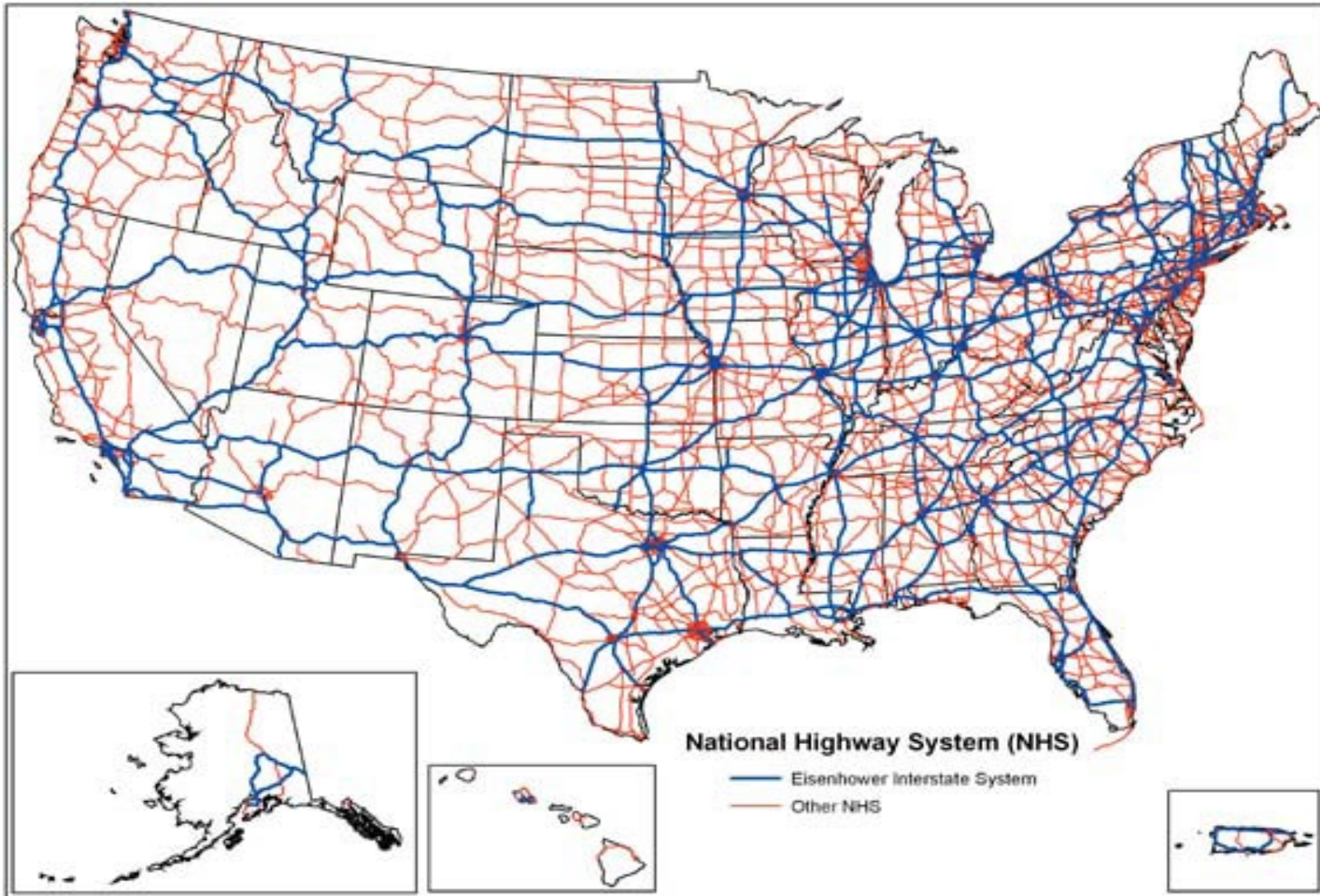
Recommended Program Guidelines for Technician Qualification/Certification

- Formal training; hands-on training
- On-the-job training
- Written and performance examinations
- Periodic re-qualification (typically 3-5 years)
 - Data from the IA program can be used to replace the performance exam
- Process to remove personnel performing procedures incorrectly

Source: Quality Assurance
Formerly Federal-aid Policy Guide Non-Regulatory
Supplement NS 23 CFR, Part 637B,
July 19, 2006, Transmittal 36
<https://www.fhwa.dot.gov/pavement/0637bsup.cfm>



National Highway System



Scope of IA Activities

Independent Assurance activities:

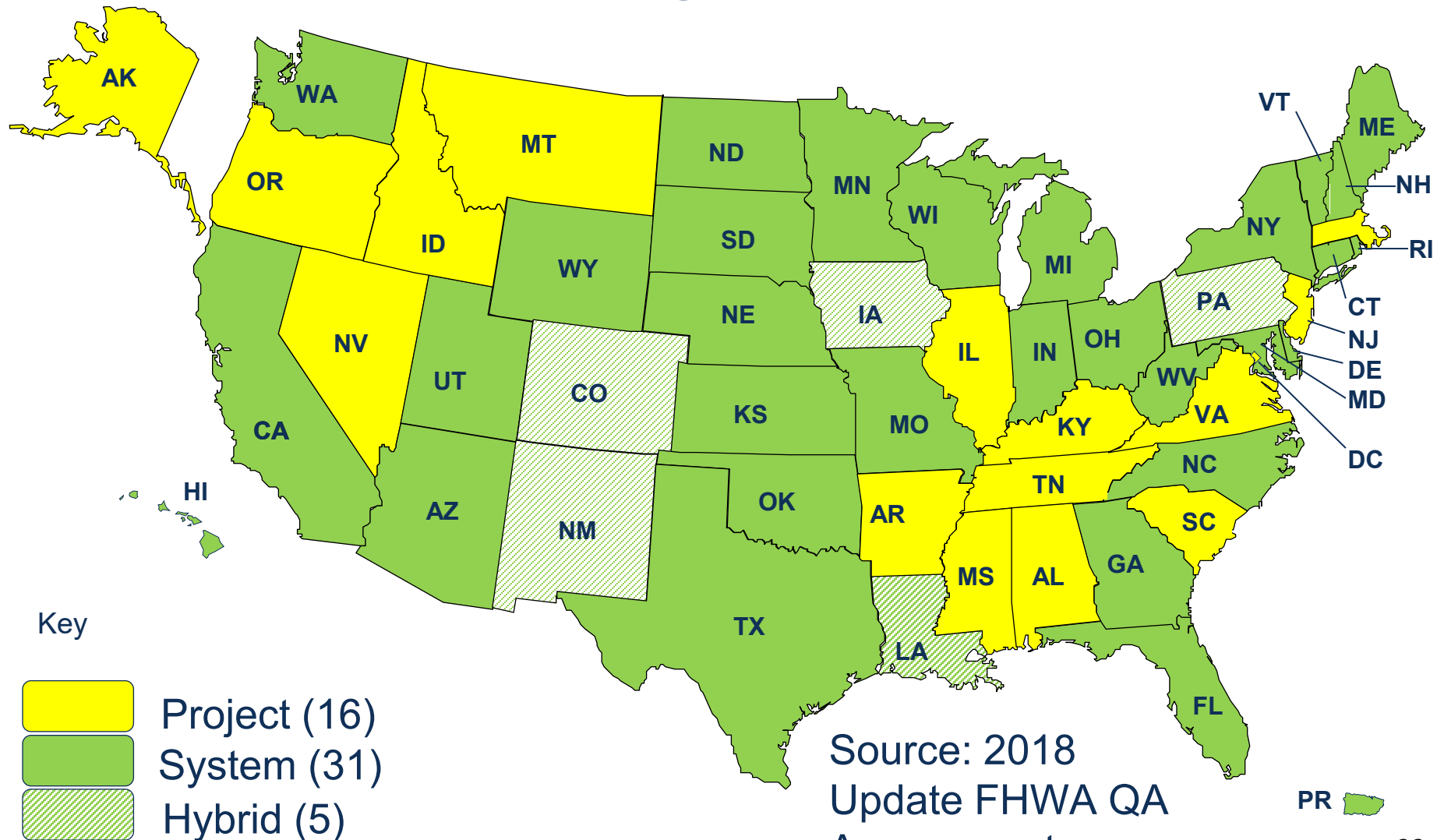
- Provide an assessment of personnel proficiency and equipment for both agency and contractor



Source: FHWA



Type of Independent Assurance Program Used



Source: 2018
Update FHWA QA
Assessment

Random Sampling

- 23 CFR 637.205(e)
- All samples used in the acceptance decision for quality control and verification sampling and testing shall be random samples
 - All materials will have an equal probability of being sampled
 - Removes Bias
 - Reduces potential for fraud



Boston Central Artery/Tunnel Project



US DOT OIG Audit of Construction Quality Assurance

- Documents included in Quality Assurance Program
- Quality Assurance Program for Local Agencies with projects on National Highway System





With the current volumetric mix design system, we have no way of knowing how these materials affect performance...



Fractionated RAP



Balanced Mix Design (BMD) Tests

- Rutting Tests
- Cracking Tests
- Moisture Damage Tests



Rutting Tests

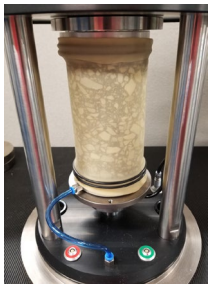
Fundamental Tests



E* and Fn
AASHTO T 378



iRLPD
AASHTO TP 116



Stress Sweep
Rutting
AASHTO TP 134



Shear Stiffness
AASHTO T 320

Empirical/Simulative Tests



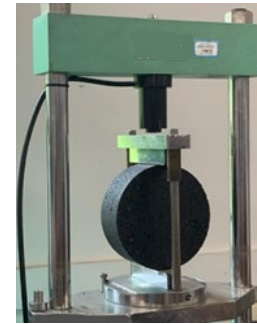
Hamburg
AASHTO T 324



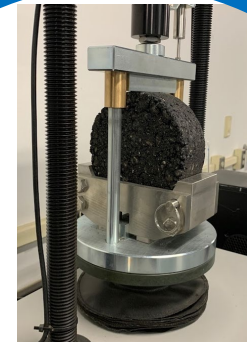
APA
AASHTO T 320

Empirical/Monotonic Tests

Source: NCAT



Hot IDT
No National Standard



IDEAL-RT
No National Standard

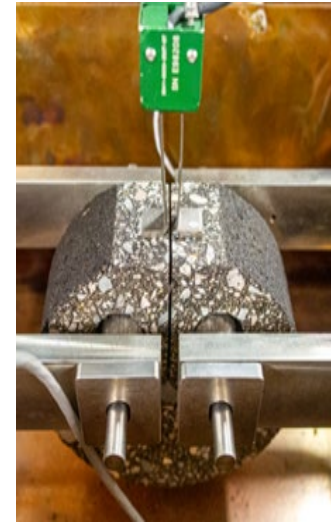
Cracking Tests



IDEAL-CT test

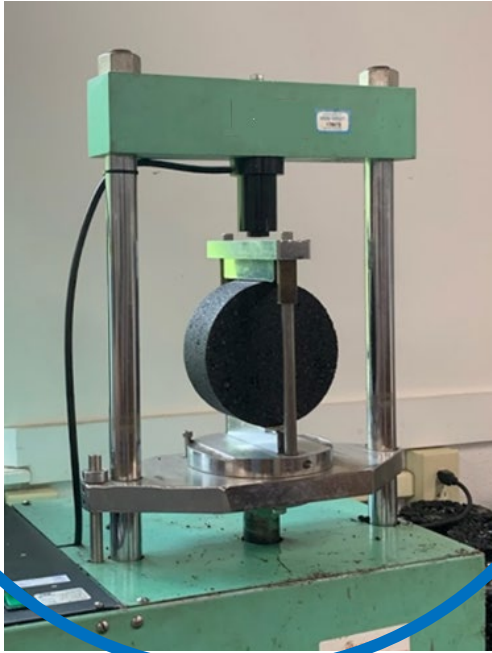


Overlay Test



Disk-shaped
compact tension
test

Durability/Moisture Damage Tests



Tensile Strength Ratio
AASHTO T 283



Hamburg Wheel Tracker
AASHTO T 324

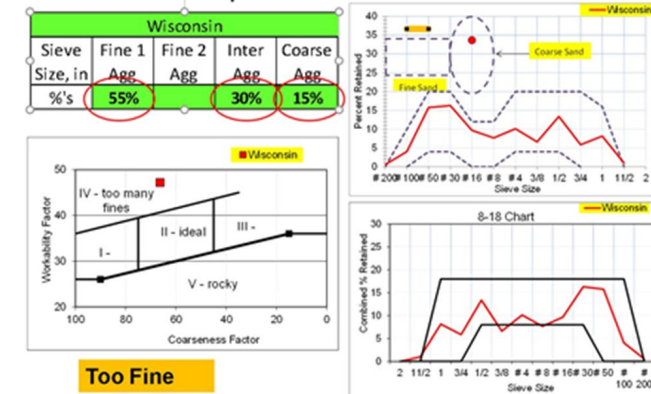
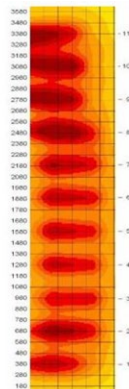


Boil Test
ASTM D 3625

Concrete Performance Engineered Mixtures

Durability Quality Measures

- Optimized Gradation Acceptance Test
- Dowel Placement and Alignment MIT Scan-2
- ~~Super Air Meter Acceptance Test~~
- Water/Cement Ratio Acceptance Test
- Surface Resistivity Acceptance Test
- Thickness MIT Scan T3
- Ride Quality
- Strength



Concrete Workability



FHWA Concrete Information

- [Technologies - MCTC - Concrete](#)
- [Resources - MCTC - Concrete](#)
- [Technologies - MCTC - Concrete](#)





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Office of Innovation Implementation