



U.S. Department of Transportation  
**Federal Highway Administration**

# Quality Assurance: Risks, Resources, and Future Needs

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# Abbreviations and Acronyms

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- AASHTO = American Association of State Highway Transportation Officials
- AI = Asphalt Institute
- COMP = Committee on Materials and Pavements
- DPS = Dielectric Profile System
- EPD = Environmental Product Declaration
- IA = Independent Assurance
- NCAT = National Center for Asphalt Technology
- NDT = Nondestructive Testing
- M-Trac = Multi-Regional Training and Certification

NETTCP = Northeast Transportation Training And Certification Program

OC = Operating Characteristic

PMTP = Paver-mounted thermal profiler

QA = Quality Assurance

QC = Quality Control

PD = Percent defective

PWL = Percent within limits

TRB = Transportation Research Board

WAQTC = Western Alliance for Quality Transportation Construction

# Risk Management

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Testing and  
Inspection Costs

Material Quality and  
Performance Risk



*Image: Pixabay*

# Quality Assurance Program



Graphic: FHWA

# Sources for: Risks, Resources and Future Needs

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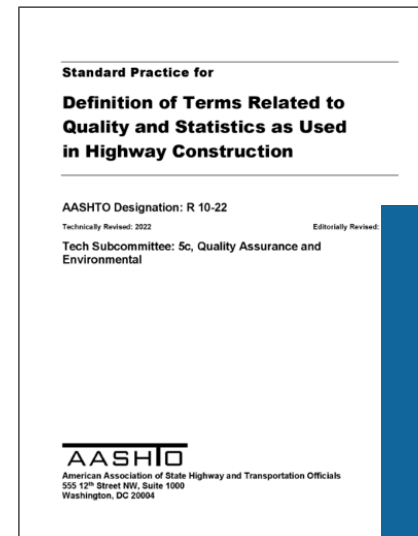
- FHWA Quality Assurance Stewardship Reviews.
  - 4-5 reviews per year.
  - 86 reviews since 2003.
- FHWA Quality Assurance Assessment.
  - Every 4 years.
- TRB Committee on Quality Assurance Management (AKC30).
- AASHTO COMP, Technical Subcommittee 5c: Quality Assurance and Environmental.



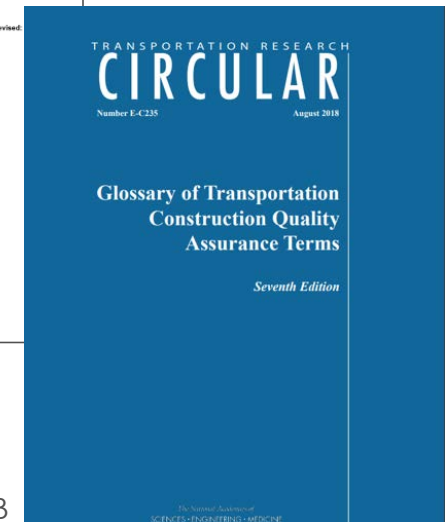
Source: TRB

# Setting the Stage

- AASHTO R 10-22.
  - Definition of Terms Related to Quality and Statistics as Used in Highway Construction.
- TRB E-circular 235.
  - Glossary of Transportation Construction Quality Assurance Terms, Seventh Edition.



Source: AASHTO



Source: TRB

# Setting the Stage

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## Training:

- NHI 131141: Quality Assurance for Highway Construction Projects.
- TRB E-circular 249: Key Elements of Construction Quality Assurance Implementation.
- TRB E-circular 274: Quality Assurance: Past, Present and Future.
- QA 101, on-demand training (internal and external versions).



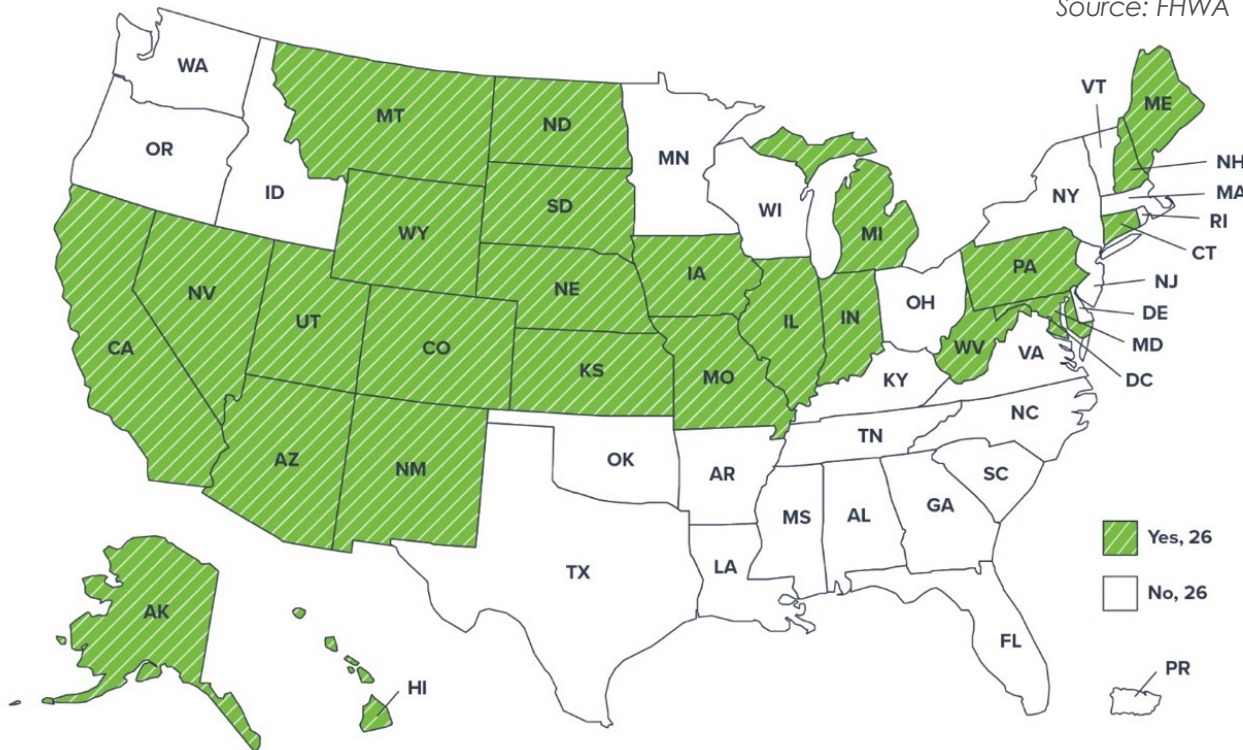
# Topics

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- Acceptance
- Quality Control
- Independent Assurance Program
- Dispute Resolution
- Laboratory Qualification Program
- Technician Qualification Program
- Future Needs

# Asphalt Mixture Sampling (2022)

Source: FHWA



Asphalt paving mixture sampled after discharge from the hauling vehicle (before or after the paver)

# Quality Assurance Stewardship Reviews Acceptance Sampling

## Common Observations:

- Sampling at the paver.
- Sample security.
- Random sampling.

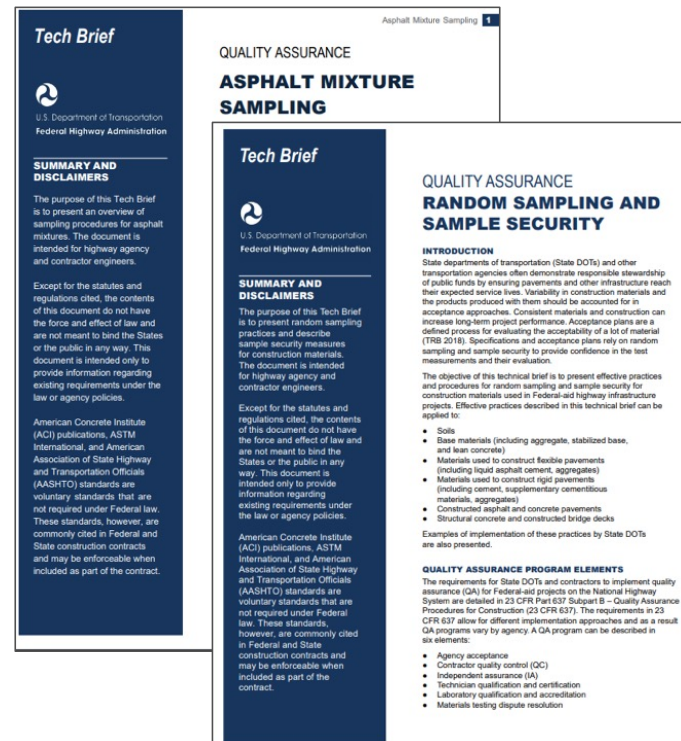


Source: FHWA

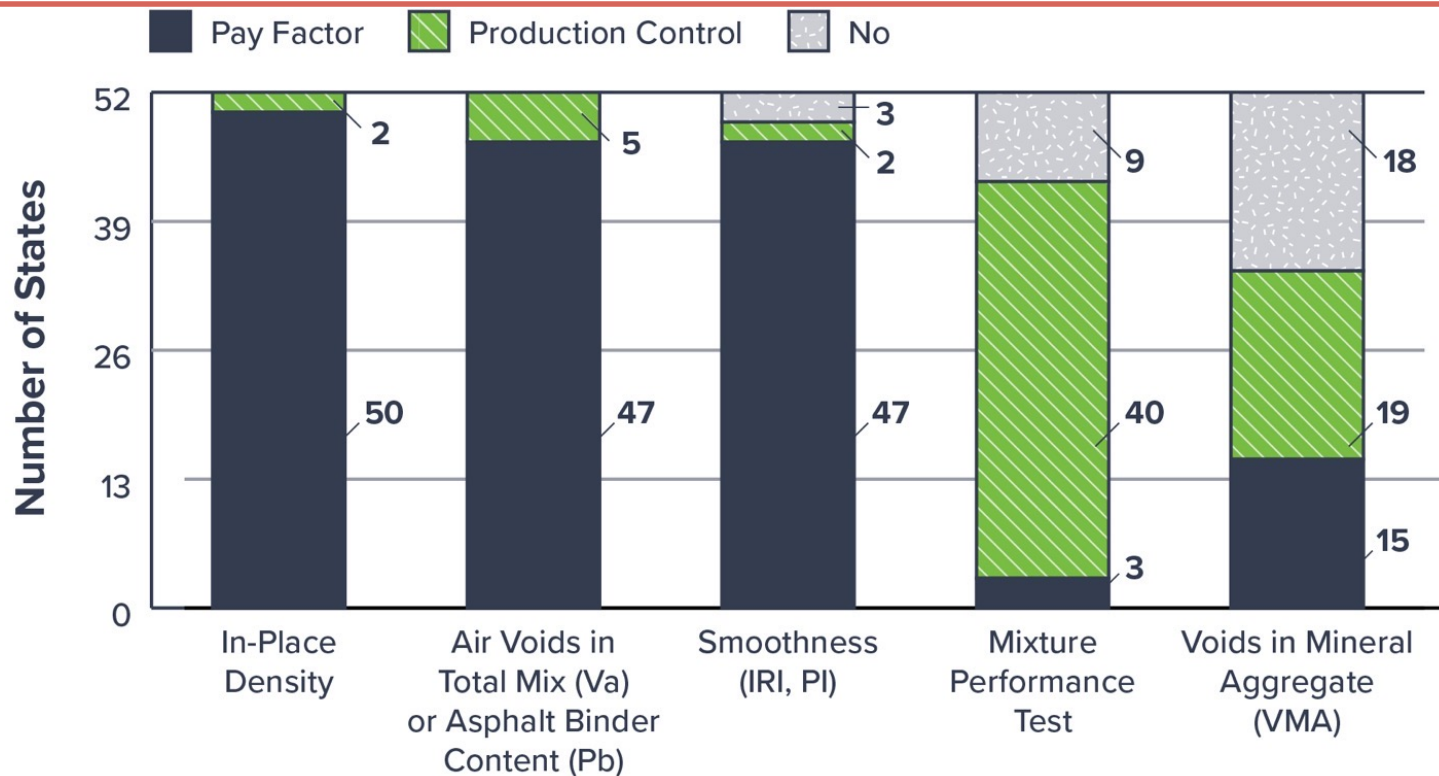
# Resources for Acceptance Sampling

FHWA Tech Briefs with videos:

- Asphalt Mixture Sampling.
  - FHWA-HIF-24-071:  
<https://www.fhwa.dot.gov/pavement/materials/hif24071.pdf>
- Random Sampling and Sample Security.
  - FHWA-HIF-24-022:  
<https://www.fhwa.dot.gov/pavement/materials/hif24022.pdf>

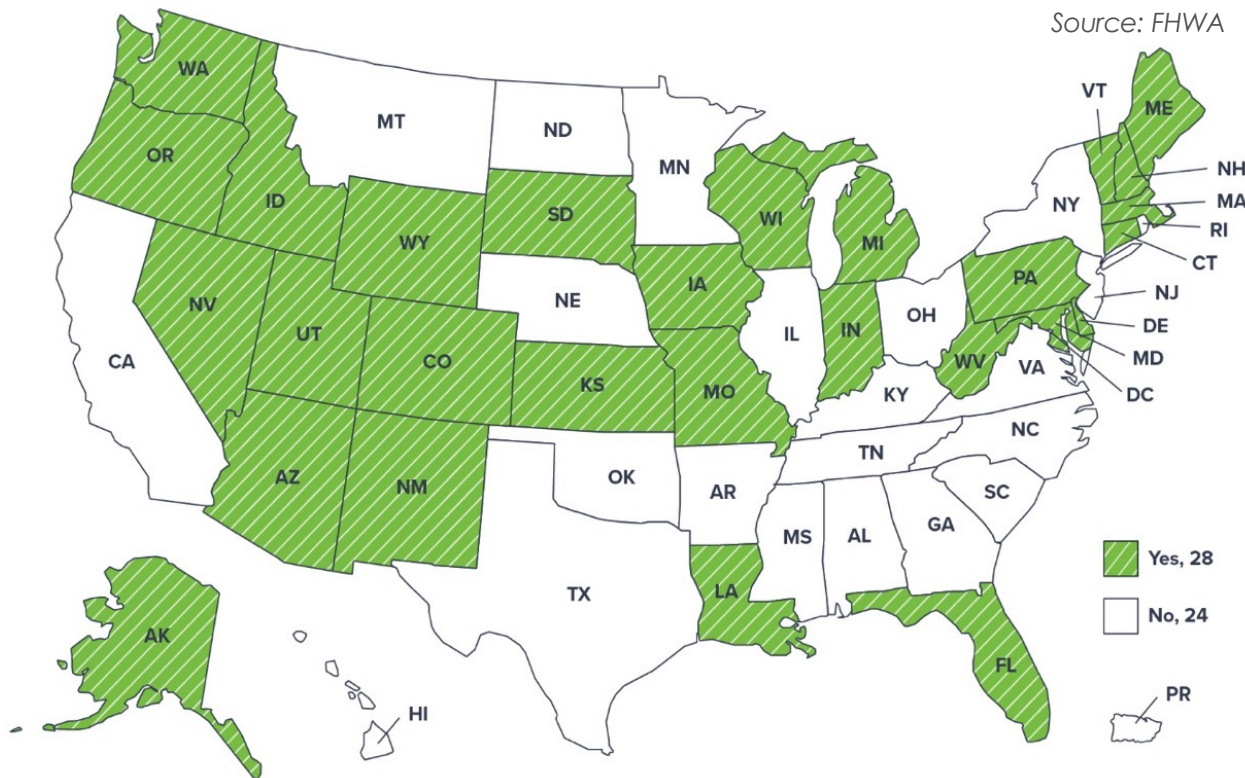


# Asphalt Pavement Quality Characteristics (2022)



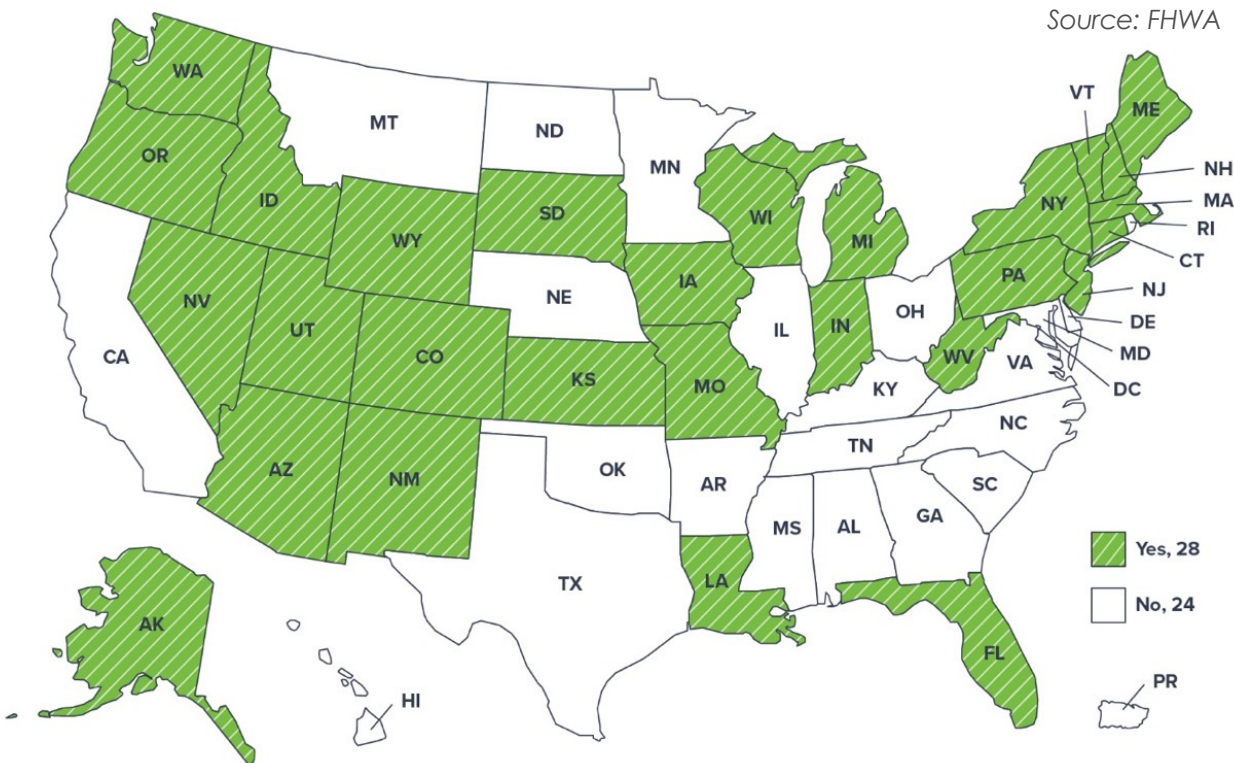
Source: FHWA

# Asphalt Mixture – PWL/PD (2022)



States that used percent within limits (PWL) or percent defective (PD) to determine the acceptability of the asphalt mixture

## Asphalt Pavement Density – PWL/PD (2022)



States that used PWL or PD to determine the acceptability of the asphalt pavement density

# Quality Assurance Stewardship Reviews Acceptance Quality Measure

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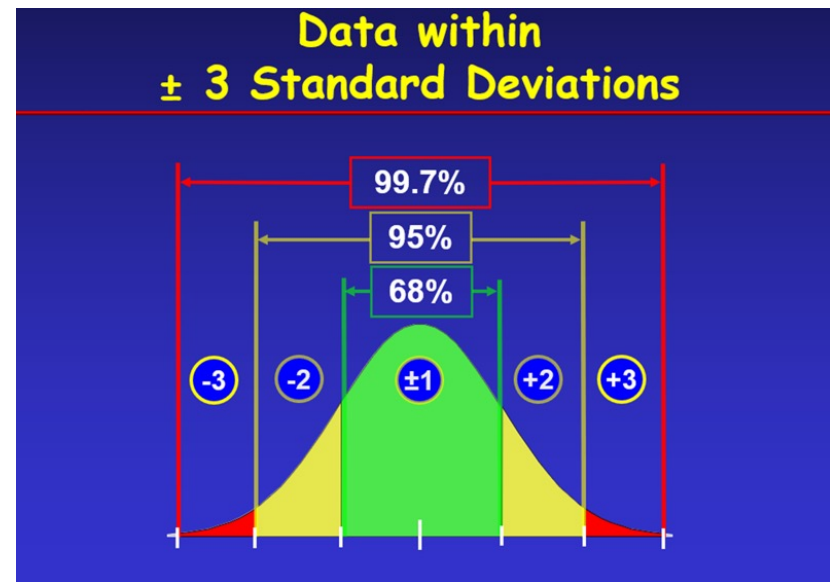
Common Observations:

- Percent Within Limits (PWL) specifications.
- 28 State DOTs.



# Resources for Acceptance Quality Measure

- FHWA Training:
  - Introduction to Percent Within Limits: The Quality Measure of Choice.
  - 1-day Workshop.
  - <https://www.fhwa.dot.gov/construction/pubs/hif07012/07.cfm>



Source: FHWA



# Quality Assurance Stewardship Reviews Acceptance with Contractor Testing

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Common Observations:

- QC data validation with F&t statistical test.
- Independent verification sampling and testing.
  - Design-Build quality firm hired by Contractor.

# Asphalt Acceptance “Positive” Practices

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- Agency mix design verification testing.
- Mixture performance testing.



Source: FHWA

# Asphalt Acceptance Concerns

- Ignition furnace correction factors verification.
- Aggregate specific gravities.
- Acceptance on asphalt content & gradation only.



Source: FHWA



# Resources for Asphalt Acceptance

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## FHWA Tech Briefs:

- FHWA-HIF-20-033: Asphalt Materials Quality Assurance Practices.

## AASHTO Standard Practices:

- R 9-05 (2022): Acceptance Sampling Plans for Highway Construction.
- R 38-10 (2022): Quality Assurance of Standard Manufactured Materials.
- R 42-06 (2020): Developing a Quality Assurance Plan for Hot Mix Asphalt (HMA).

# Research for Acceptance

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## NCHRP:

- 10-123: Incorporating Quality Assurance into Green Public Procurement Practices (\$350,000 - proposals).
- 9-69: Recommended Procedures for Verifying Material Quantities at Asphalt Mix Plants (\$400,000 – active).
- 10-116: Variability in Pavement Materials and Construction (\$500,000 - proposals).
- 10-108: Manual for Incorporating NDT in Quality Assurance of Highway Pavement Construction (\$250,000 – completed 2023).
- 10-107: Guide for Implementing Performance Specifications (\$600,000 – expired 2022).
- 10-102: A Guidebook for Risk-Based Construction Inspection (\$450,000 – completed 2022).
- 10-100: Procedures and Guidelines for Validating Contractor Test Data (\$300,000 – completed 2019).
- Synthesis 50-09: Performance-Based Pavement Warranty Practices (\$45,000 – completed 2020).

# Topics

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- Technician Qualification Program
- Future Needs



# Resources for Quality Control

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## FHWA Publications:

- FHWA-HIF-24-???: Asphalt Plant Process Control Plan Template.
- Memo, March 30, 2023: Use of Quality Price Adjustments in Federal-Aid Highway Construction.
- FHWA-HIF-23-007: A Practice for Including Intelligent Construction Equipment in Quality Assurance Programs.

## TRB:

- Webinar: Real-Time Quality Control with DPS and PMTP (May 2023).

## AASHTO Standard Practices:

- R 110-22: Continuous Thermal Profile of Asphalt Mixture Construction.
- R 111-22: Intelligent Compaction Technology for Embankment and Asphalt Pavement Applications.

# Research for Quality Control

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## NCHRP:

- Synthesis 52-06: Agency Use of Quality Control Plans for Administering Quality Assurance Specifications (\$45,000 – completed 2021).
- 10-144: Rightsizing Pay Factors to Incentivize Quality Highway Construction (\$500,000 – just starting).

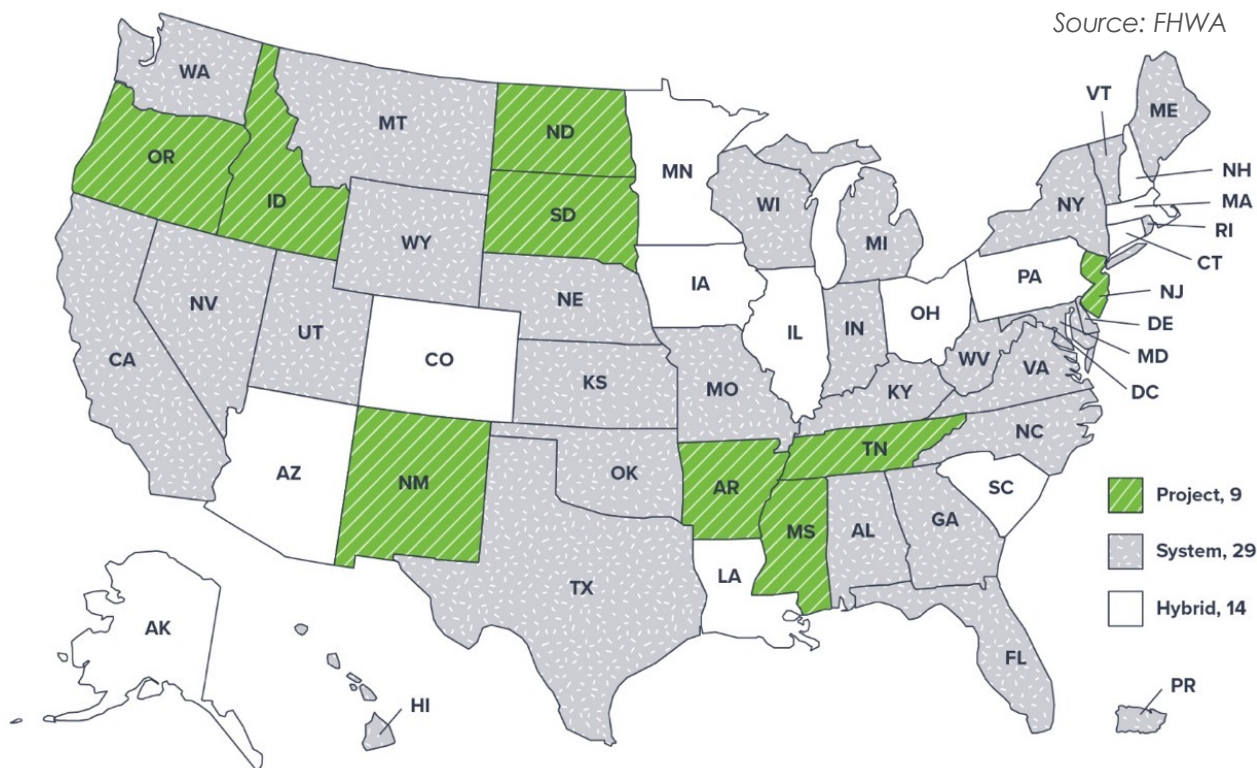
# Topics

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# Independent Assurance (2022)

Source: FHWA



States'  
approach to  
independent  
assurance

# Quality Assurance Stewardship Reviews Independent Assurance

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## Common Observations:

- IA trends analysis.
- IA tolerances.
- Potential conflicts of interest – consultants.



Source: FHWA

# Resources for Independent Assurance

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FHWA Tech Brief:

- FHWA-HIF-12-001: Independent Assurance Programs.

AASHTO Standard Practice:

- R 44-07 (2022): Independent Assurance (IA) Programs.

# Topics

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# Quality Assurance Stewardship Reviews Laboratory Qualification

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- Laboratory accreditation.
  - Region/district labs.
  - Mix design labs.
- Lab qualification processes.



Source: FHWA



# Resources for Lab Qualification

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AASHTO Standard Practices:

- R 18-18 (2022): Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories.
- R 65-14 (2022): Establishing Requirements for Equipment Calibrations, Standardizations, and Checks.
- R 89-18 (2022): Accreditation Bodies Operating in the Fields of Construction Materials Testing and Inspection.

# Topics

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# Resources for Technician Qualification

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FHWA:

- Quality Assurance website.

Regional Groups:

- NETTCP, WAQTC, M-Trac.

Industry Resources:

- NCAT, AI.

AASHTO Standard Practices:

- R 25-22: Technician Training and Certification Programs.

NCHRP:

- Synthesis 55-06: State DOT Certification Programs for Materials Sampling and Testing Personnel (\$55,000 - ongoing).

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# Future Needs

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1. Updating FHWA's web page.
2. Improving validation understanding.
3. Providing examples for using incentives.
4. Documenting quality control processes.
5. Describing dispute resolution processes with examples.

# Questions

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**Quality Assurance:  
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**Federal Highway Administration**



Source: FHWA