

COMMITTEE ON MATERIALS AND PAVEMENTS

Meeting (<i>Annual or Mid-Year</i>)	Annual
Date	August 8, 2019
Scheduled Time	10:30 am
Technical Subcommittee & Name	5C Quality Assurance and Environmental
Chair Name and (State)	Curt Turgeon
Vice Chair Name and (State)	Sejal Barot
Research Liaison Name and (State)	Rick Bradbury

I. Introduction and Housekeeping

II. Call to Order and Opening Remarks

A. Brief Summary of Activities

III. Roll Call of Voting Members

Present	Member Name	State	Present	Member Name	State
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Quorum Rules Met?

Annual Meeting: Simple majority of voting members (☐y/ ☐n) | Mid-Year Meeting: Voting members present (☐y/ ☐n)

A. Review of Membership (*New members, exiting members, etc.*)

IV. Approval of Technical Subcommittee Minutes

Attachment A.

V. Old Business

- A. R8 Evaluation of Transportation – Related Earthborn Vibrations Ohio, negative on reconfirmation, would like to add information. Chair needs to follow up.
- B. Update of R 18 coming from Brian Johnson, re:source.
- C. COMP ballot – see midyear minutes
- D. TS Ballot – none.
- E. Reconfirmation ballot – see midyear minutes

F. Task Force Reports

Task Force #	Title	Members	Status/Update
	R-42 Update	Maine- Rick Bradbury; Connecticut; Virginia; , Kansas- Rick Barezinsky; and Texas – Brett Haggerty	

VI. New Business

- A. AASHTO re:source/CCRL/NTPEP (*Observations from assessments, as applicable.*)
- B. Presentation by Industry/Academia
 - 1. FHWA Pavement Sustainability Technical Working Group
- C. Revisions/Work on Standards for Coming Year
 - 1. Asphalt mixture dielectric measurements using standard gyratory samples.
 - a. Appendix: practice for establishing dielectric vs. density relationship using gyratory samples.
 - b. Appendix: mixture uniformity and verification of dielectric vs. density relationship during mixture production.
 - 2. Revise PP-80 and PP-81 removing redundant GPS and file creation language
 - 3. Revisions to R 025
- D. Review of Stewardship List

From the midyear meeting: items for 2019 reconfirmation: R10- Rick ME, R42 Rick-ME, R18 Brian- resource(?)

Items for 2020 reconfirmation will be discussed at the midyear meeting. Stewards/Reviewers will be volunteered at that time.
- E. Proposed New Standards
 - 1. Create standalone Intelligent Construction GPS and file creation language.
- F. NCHRP Issues
- G. Correspondence, Calls, Meetings
- H. Proposed New Task Forces (*Include list of volunteers to lead and/or join TF.*)
- I. New TS Ballots
 - 1.

VII. Open Discussion

- A.
- B.

VIII. Adjourn

TS Meeting Summary

Meeting Summary		
Items Approved by the TS for Ballot <i>(Include reconfirmations.)</i>		
Standard Designation	Summary of Changes Proposed	Ballot Type
		<input type="checkbox"/> TS <input type="checkbox"/> COMP <input type="checkbox"/> CONCURRENT
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New Task Forces Formed		
Task Force Name	Summary of Task	TF Member Names and (States)
Research Proposals <i>(Include number/title/states interested.)</i>		
Other Action Items		



COMMITTEE ON MATERIALS & PAVEMENTS
2018 - 2019 Mid Year Meeting (Webinar)
Monday November 19, 2018
11 am – 12 pm EST

TECHNICAL SECTION 5c
Quality Assurance and Environmental

I. Introduction and Housekeeping - Casey

II. Call to Order and Opening Remarks

III. Roll Call – email Casey for attendance

Andrus	Scott	scottandrus@utah.gov
Arasteh	Michael	Michael.arasteh@dot.gov
Babish	Andy	andy.babish@vdot.virginia.gov
Benson	Michael	michael.benson@ardot.gov
Boisvert	Denis	Denis.Boisvert@dot.nh.gov
Bradbury	Rick	richard.bradbury@maine.gov
Burch	Paul	pburch@azdot.gov
Dvorak	Dennis	dennis.dvorak@dot.gov
George	Scott	georges@dot.state.al.us
Heiser	Steven	steve.heiser@dot.ny.gov
Johnson	Brian	bjohnson@ashtoresource.org
Jones	Cecil	cecil.jones@nc.rr.com
Lauzon	Bob	robert.lauzon@ct.gov
Lenker	Steven	slenker@ashtoresource.org
McCuistion	Curt	cmccuistion@utah.gov
Miner	Misty	mminer@mt.gov
Nussbaum	L. Scott	snussbaum@utah.gov
Pfeifer	Brian	brian.pfeifer@illinois.gov
Ruelke	Timothy	timothy.ruelke@dot.state.fl.us
Trautman	Brett	Brett.Trautman@modot.mo.gov
Turgeon	Curt	curt.turgeon@state.mn.us
Welter	Jim	jim.welter@dot.ohio.gov

Withee	Jeff	jeff.withee@dot.gov
Barot	Sejal	sbarot@sha.state.md.us

IV. Approval of Technical Section Minutes

The 2018 summer meeting minutes were approved with a motion from AL and a second from FL. There was no discussion.

V. Old Business

A. COMP Ballot Items

1. Item 22 New Standard on Determining Constant Mass (37 Affirmative, 0 Negative)
2. Item 23 Dielectric Profiling System (37 Affirmative, 0 Negative)
3. Item 24 File Format for Intelligent Construction Data (37 Affirmative 0 Negative)
4. Item 25, WAQTC updates for R 25 (36 Affirmative, 1 Negative from California)
 1. Phantom missing sections and words in the California comments, they are in the document that was sent in to AASHTO. 3.1.1 and 5.3.2 & words at the end of two lines.
 - It's possible that the comment from bullet 4 may have had a corrupted file. FL has a motion to find this non-persuasive based on publishing with the "missing" information that was reported as well as deleting out the extra words at the end of the lines. There were no other reports of such issues with anyone else that submitted responses. CT second – motion to find non-persuasive carries.

B. Reconfirmation Ballots

1. R8 Evaluation of Transportation – Related Earthborn Vibrations. (18 Affirmative, 1 Negative (OH) "Section 3.1 The last sentence should be revised as follows: Specialists in vibration monitoring shall have expertise in 1: conducting structural surveys by video methods, 2: monitoring vibrations with a seismograph or with other appropriate instrumentation, 3: assessing sites for potential damage that may occur as a result of the proposed construction."
 - Ohio would like to add more valuable information to the standard, essentially expanding the section on what vibration monitoring is all about. Boisvert from NH weighed in that option 3 (below) may be problematic with the word "shall" that would change the technical meaning. VA agrees with NH. May be better to go to option 2. Motion from VA; second from NH to find non-persuasive and add a TS ballot in the spring. R 8 is reconfirmed without changes and Curt will reach out to OH to discuss the decision and steps moving forward
 1. Find Non persuasive
 2. Find non persuasive but 2019 TS Ballot to include in next year ←
 3. Find Persuasive, direct Chair to make changes within editorial discretion.
2. R21 Drilling for Subsurface Investigations – Unexpectedly Encountering Suspected Hazardous Material (19 Affirmative, 0 Negative)



3.R22 Decommissioning Geotechnical Exploratory Boreholes (19 Affirmative, 0 Negative)

- C. Task Force Reports. From 2017 “Dennis Dvorak suggested to update R-42 for QA program through a task force. He is looking for volunteers as specification needs to be corrected and updated. Maine, Connecticut and Virginia are willing to help. Subsequent to the meeting Kansas – Rick Barezinsky and Texas – Brett Haggerty also volunteered. “
- Because the FHWA’s role changed, Dennis can no longer lead this TF. Rick Bradbury (ME) will take over as the lead of this task force. CT, VA, KS will also help out. Dennis can still participate and contribute but can no longer be the leader of the TF.

VI. New Business

A. Research Proposals

- none

B. Revisions/Work on Standards for Coming Year

1. R 10 Definitions of Terms Related to Quality and Statistics as Used in Highway Construction
 - The Chair asked for volunteers to review. Rick (ME) volunteered to look at this one and has been involved in a related TRB group.
2. R 42 Developing a Quality Assurance Plan for Hot Mix asphalt (HMA)
 - Rick (ME) will also look at R 42
3. Establishing Requirements for Equipment Calibrations, Standardizations, and Checks.
 - Brian Johnson (re:source) volunteered to look at this standard
1. LOOKING FOR VOLUNTEERS TO REVIEW EACH
 - a. GOOD AS IS – reconfirm
 - b. Needs minor updates – here my suggestions (or need a task force)
 - c. Delete.

VII. Open Discussion

- Brian Johnson (re:source) let the group know that he is working on an update for R 18. If anyone would like to send Brian suggestions for updates he will include those suggestions in a ballot. Just send him an email with any suggestions at bjohnson@ashtoresource.org.

VIII. Adjourn

**AASHTO STANDING COMMITTEE ON RESEARCH
AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS**

NCHRP Problem Statement Outline

I. PROBLEM NUMBER

To be assigned by NCHRP staff.

II. PROBLEM TITLE

Recommended Minimum Qualifications for Transportation Project Quality Roles

III. RESEARCH PROBLEM STATEMENT

Effective quality management is a critical part of the successful delivery of transportation projects. Owner agencies, designers, contractors and material suppliers all require certain key quality roles to assure that the final product meets requirements. Typical roles include quality assurance engineers/managers; project resident engineers; project quality managers; design quality managers; construction quality managers and quality control managers. These roles can vary depending on project delivery method used or by agency organizational structure. People filling these roles must have relevant design and construction education and experience, but also require a minimum level of understanding of quality management principles.

Currently, there are no national guidelines for minimum qualifications for personnel filling quality roles on public transportation projects. Several certification programs exist, including:

- NorthEast Transportation Training and Certification Program (NETTCP) Quality Assurance Technologist course.
- Construction Quality Management for Contractors certification developed by the U.S. Army Corps of Engineers (USAEC) and U.S. Naval Facilities Engineering Command (NAVFAC).
- American Society for Quality Certified Manager of Quality/Organizational Excellence, Quality Engineer, and Quality Auditor.
- ISO Lead Auditor.

However, most agencies do not require certification for quality roles, instead relying on minimum educational and experience levels that may or may not include quality management training or experience. Increased knowledge of quality management principles will lead to improved outcomes on transportation projects, including less rework, extended facility life, reduced operating costs, and fewer traffic delays.

IV. LITERATURE SEARCH SUMMARY

Several published reports and articles discuss quality management approaches on transportation projects (many specific to design-build contracting). However, none discuss in detail the qualifications needed to effectively conduct various quality roles.

Kraft, E. and Molenaar, K.: “Fundamental Project Quality Assurance Organizations in Highway Design and Construction” – ASCE Journal of Management in Engineering, July 2014.

Gransberg, D., Molenaar, K.: “Analysis of Owner's Design and Construction Quality Management Approaches In Design/Build Projects” – American Society of Civil Engineers, 2004.

Baabak Ashuri, Ph. D., Yashovardhan Jallan, Jung Hyun Lee: “Materials Quality Management for Alternative Project Delivery” - Georgia Department of Transportation, May 2018.

Ghada M. Gad, Simon A. Adamtey, Douglas D. Gransberg: “Trends in Quality Management Approaches to Design–Build Transportation Projects” - Transportation Research Record: Journal of the Transportation Research Board, No. 2504, Transportation Research Board, Washington, D.C., 2015, pp. 87–92.

Gransberg, D., and K. Molenaar: “Analysis of Owner’s Design and Construction Quality Management Approaches in Design/Build Projects” - Journal of Management in Engineering, Vol. 20, No. 4, 2004, pp. 162–168.

Gransberg, D., Datin, J., and Molenaar, K. (2008). NCHRP Synthesis 376: Quality Assurance in Design-Build Projects, Transportation Research Board, Washington, DC.

V. RESEARCH OBJECTIVE

Develop recommended minimum qualifications for design and construction quality management roles on public transportation projects.

Possible tasks include:

Task 1 – Literature review. Include public transportation agency specifications related to quality management for design and construction.

Task 2 – Survey of public transportation agencies to determine current requirements for quality management roles (including agency, designer and contractor roles), for both traditional delivery and alternative delivery projects.

Task 3 - Identify existing training/certification programs for quality management related to transportation project delivery, or other related industry sectors. Review the prerequisites, course content, intended audience guidelines, examination process, and recertification requirements.

Task 4 – Develop suggested minimum qualifications for various quality management roles, including education, certification, and experience requirements. Consider both traditional and alternative project delivery methods.

Task 5 – Publish a guide for agencies to use to develop minimum qualification/certification requirements for various quality management roles on transportation projects.

VI. ESTIMATE OF PROBLEM FUNDING AND RESEARCH PERIOD

Recommended Funding:

\$250,000.00

Research Period:

18 months

VII. URGENCY AND POTENTIAL BENEFITS

Ineffective quality management in the transportation project delivery process can lead to project delays and cost escalation due to constructability problems, rework, and disputes, as well as reduced service life and increased maintenance costs of completed facilities. Published reports have estimated that rework on construction projects can amount to seven to eleven percent of total project cost. Given the total cost of delivering public transportation projects in the United States, improved quality management in design and construction could result in millions of dollars in annual savings to taxpayers.

VIII. IMPLEMENTATION PLANNING

Implementation of the guidelines will be accomplished through presentations at the AASHTO Committee on Materials and Pavements, AASHTO Committee on Construction, and through presentation at various regional and national meetings and conferences (including the TRB annual meeting), as well as a TRB webinar. Potential challenges will be similar to those encountered when organizations worked to improve safety; it may require a shift in cultural beliefs for agencies and industry to invest in additional education and/or certification of their staff. Inconsistent terminology related to QA will present challenges by inhibiting effective communication at the national level.

IX. PERSON(S) DEVELOPING THE PROBLEM STATEMENT

Rick Bradbury, Director of Materials Testing and Exploration, Maine Department of Transportation
Tel: (207) 624-3482
Richard.bradbury@maine.gov

Elizabeth Kraft, National Quality Director, Atkins
Tel: (720) 352-4216
Elizabeth.Kraft@atkinsglobal.com

X. AASHTO MONITOR

XI. SUBMITTED BY

Rick Bradbury, Director of Materials Testing and Exploration, Maine Department of Transportation
Tel: (207) 624-3482
Richard.bradbury@maine.gov

Please submit completed problem statement at:

<http://bit.ly/NCHRP2018Submittal>

Questions on the process can be directed to chedges@nas.edu.

Standard Practice for

**Technician Training and
Certification Programs**

AASHTO Designation: R 25-19¹

**Tech Subcommittee: 5c, Quality Assurance
and Environmental**

Release: Group 1 (April)



**American Association of State Highway and Transportation Officials
444 North Capitol Street N.W., Suite 249
Washington, D.C. 20001**

Standard Practice for

Technician Training and Certification Programs

AASHTO Designation: R 25-19¹



Tech Subcommittee: 5c, Quality Assurance and Environmental

Release: Group 1 (April)

1. SCOPE AND LIMITATION

- 1.1. This document provides a guideline for establishing evaluation and certification procedures for personnel engaged in sampling and testing of soils, aggregates, asphalt mixture, and portland cement concrete in accordance with AASHTO test methods. The guideline is intended for use by organizations providing certification of sampling and testing technicians at the basic testing level for acceptance of materials and independent assurance testing.
- 1.2. The terms used in this standard regarding “technician” or “certification” are meant to be generic descriptions. The term “qualification” is equivalent to “certification” within this standard. Each state will need to use appropriate terminology consistent with state law and practices.
- 1.3. This guideline does not purport to address all possible events and procedures inherent in the administration and use of a technician certification program (TCP).

2. REFERENCED DOCUMENTS

- 2.1. *AASHTO Standards and Publications:*
 - R 47, Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
 - R 76, Reducing Samples of Aggregate to Testing Size
 - R 90, Sampling Aggregate Products
 - T 11, Materials Finer Than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
 - T 19M/T 19, Bulk Density (“Unit Weight”) and Voids in Aggregate
 - T 22, Compressive Strength of Cylindrical Concrete Specimens
 - T 23, Making and Curing Concrete Test Specimens in the Field
 - T 27, Sieve Analysis of Fine and Coarse Aggregates
 - T 30, Mechanical Analysis of Extracted Aggregate
 - T 44, Solubility of Bituminous Materials
 - T 84, Specific Gravity and Absorption of Fine Aggregate
 - T 85, Specific Gravity and Absorption of Coarse Aggregate
 - T 89, Determining the Liquid Limit of Soils
 - T 90, Determining the Plastic Limit and Plasticity Index of Soils

- T 99, Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
- T 113, Lightweight Particles in Aggregate
- T 119M/T 119, Slump of Hydraulic Cement Concrete
- T 121M/T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- T 152, Air Content of Freshly Mixed Concrete by the Pressure Method
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens
- T 168, Sampling Bituminous Paving Mixtures
- T 176, Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
- T 180, Moisture–Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
- T 196M/T 196, Air Content of Freshly Mixed Concrete by the Volumetric Method
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Hot Mix Asphalt (HMA)
- T 245, Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus
- T 255, Total Evaporable Moisture Content of Aggregate by Drying
- T 265, Laboratory Determination of Moisture Content of Soils
- T 269, Percent Air Voids in Compacted Dense and Open Asphalt Mixtures
- T 272, Family of Curves - One Point Method
- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage
- T 304, Uncompacted Void Content of Fine Aggregate
- T 308, Determining the Asphalt Binder Content of Asphalt Mixtures by the Ignition Method
- T 309, Temperature of Freshly Mixed Portland Cement Concrete
- T 310, In-Place Density and Moisture Content of Soil and Soil–Aggregate by Nuclear Methods (Shallow Depth)
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyrotory Compactor
- T 329, Moisture Content of Asphalt Mixtures by Oven Method
- T 335, Determining the Percentage of Fracture in Coarse Aggregate
- T 355, In-Place Density of Asphalt Mixtures by Nuclear Methods
- *Implementation Manual for Quality Assurance*, Joint Construction Quality Assurance Task Force, 1995
- *Quality Assurance Guide Specification*, Joint Construction Quality Assurance Task Force, 1995

2.2. *ASTM Standard:*

- D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

3. INTRODUCTION

3.1. *This guideline is provided to:*

- Help individual states, and where desired, combinations of states and other public agencies develop a TCP for use in conjunction with quality assurance (QA) specifications as described in the *Implementation Manual for Quality Assurance* and the *Quality Assurance Guide Specification*.

- Describe the activities and organizational needs for the development and operation of a TCP that provides an flexible and effective means for ensuring qualified personnel perform sampling and testing.
- Identify the commonly used tests performed to ascertain material or product characteristics, for acceptance and/or payment under project contracts incorporating soils, aggregates, portland cement concrete (PCC), and asphalt mixture. Examples of these tests are shown in Appendix X1.

- 3.1.1. A successful TCP requires the full support and commitment from agencies and industry that have a vested interest in technician training and certification. Involvement of those with a common interest in technician training and certification helps in understanding the multiple perspectives of the team members, and this, in turn, helps develop policies and procedures that will be supported by their respective organizations.
- 3.1.2. Development of an agreement at the program inception, and before major changes, is recommended as the best means for gaining the needed understanding and support for the program.
- 3.1.3. Consideration of reciprocal agreements between states, and where feasible, regions, regarding materials technician certification acceptance is a means of addressing economy and business process efficiencies and should be an integral part of all TCPs.
- 3.2. *Background:*
- 3.2.1. Historic roles and responsibilities of industry and agencies have changed for sampling and testing activities under QA specifications. QA specifications allow the use of contractor test results in the acceptance decision, and the use of consultants in independent assurance and verification sampling and testing programs.
- 3.2.2. Certification programs and associated training have been shown to be an effective tool for improving the quality of highways and bridges by verifying essential knowledge and skills are possessed by agency or industry personnel who monitor, inspect, and control construction operations. Certification programs for personnel have proven to be useful, common “yardsticks” for measuring expertise and performance among public transportation agencies, private construction contractors, and independent materials laboratories.
- 3.2.3. As the use of QA specifications increases, the need for TCPs as an equitable means for test result comparison and credibility between contract parties has become apparent. Each state using QA specifications should have provisions requiring the use of certified technicians involved in construction project testing and inspection activities.

4. PROGRAM ORGANIZATIONAL STRUCTURE AND MANAGEMENT

- 4.1. *Joint Sponsorship, Key to Success*—A successful TCP works best with the full support and commitment from all parties (i.e., agency and industry) that have a vested interest in technician training and certification. Developing a partnership agreement at program inception, and before major changes, is recommended as the best means for gaining needed understanding and support for a TCP.
- 4.2. *TCP Oversight Committee*—State laws and state DOTs’ policies may dictate a state or regional TCP structure, and restrictions on the language of the program charter and operation. Therefore, each state DOT should coordinate with its legal staff when developing their charter and bylaws for TCP governance and organizational structure.

Note 1—When developing a state or regional program whose bylaws will include rules that *require* certification, recertification, and/or provision for decertification, legal review is needed. The identification of legal restrictions and identification of the TCP charter or franchise requirements, based on applicable state laws, will help the TCP manager and oversight committee in their duties to administer the program.

- 4.2.1. A TCP should have an oversight committee to provide TCP governance. Several alternatives are recommended for establishing an oversight committee:
- Establish a joint venture between public and private industry;
 - Have the state DOT take the lead; or
 - Have an educational institution or industry group take the lead.
- 4.2.2. Oversight committee members typically include representatives from the following areas: state DOT personnel, contractors, suppliers, producers, independent laboratories, academia, private consultants, and the Federal Highway Administration (FHWA). Because these programs will impact contract requirements, an agency manager should chair the oversight committee. Program oversight should be a joint effort of the entities represented on the oversight committee.
- 4.2.3. If the organization is a joint venture between agency and industry or between states, it may be incorporated as a nonprofit organization in order to receive and disburse funds on a regular basis.
- 4.3. *TCP Manager*—The oversight committee should identify a TCP manager as a single contact point. The TCP manager may coordinate training activities (e.g., course development and curriculum; instructors and hands-on trainers; test development and certification; training locations; manual development; class registration; provision of supplies).
- 4.4. *Location*—A centralized administration at a regional or state level should be established to provide program oversight (e.g., management, record keeping, scheduling). Certification and training may also be done at the local level to better meet the customers' needs.
- 4.5. *Funding*—Start-up funds will be needed immediately for a variety of start-up tasks (e.g., facilitate meetings, travel, printing). Possible start-up and developmental funding sources may include the following:
- State;
 - Industry contributions;
 - State Planning and Research (SP&R) Funds;
 - Federal Highway Administration;
 - Contributed time, facilities or equipment from industry, consultants, and academia; or
 - Other innovative funding mechanisms (e.g., loans paid back from generated income for courses).
- 4.5.1. Multi-state or regional involvement may result in additional funding sources and a decrease in costs to the individual participants.
- 4.5.2. Course fees should be reasonable, but adequate, to enable the program to become self-sufficient. It is necessary to make a long-term commitment and conduct the program as if it were a business, knowing that the program may lose money initially but should become self-sufficient after several years of operation. Areas where operational support may be available include the following:
- Manuals developed for certification and training may be sold publicly provided copyright laws are followed;
 - Continued financial support from the agency and industry;
 - Continued use of contributed items (e.g., facilities, equipment) from the agency and industry.

- 4.6. *Task Groups*—A task group for each certification area (i.e., asphalt mixture, portland cement concrete, soils, and aggregates):
- To develop requirements for training and certification programs;
 - To establish experience and hands-on performance requirements;
 - To establish course outlines; and
 - To establish examinations criteria.
- 4.7. *Development of Options for TCP*—Options for leading the development, administration, and implementation of TCP certification programs have been developed and implemented through cooperative partnerships among public agencies, private sector organizations, and educational institutions. Options should be considered when determining who will be asked to lead the development, administration, and implementation of a state or regional TCP.
- 4.7.1. *Agency In-House*—Agency in-house TCPs usually assign responsibilities for developing, administering, and implementing a TCP into technical services, personnel/human resources, or product quality management areas.
- 4.7.1.1. The main advantages of an in-house TCP are:
- Lower costs to contractors;
 - No cost to DOT employees;
 - Trainers knowledgeable of subject matter and familiar with specifications;
 - Control of material being instructed; and
 - In-house knowledge of TCP requirements for technician's skills, experience, certification or qualifications, recertification, and decertification.
- 4.7.1.2. The main program disadvantages are:
- Turnover of instructors;
 - Fewer employees available to be instructors; and
 - Fiscal and manpower costs to the state DOT.
- 4.7.2. *Consultants*—Using a third-party consultant to develop, administer, and implement a state or regional TCP is similar to outsourcing other non-core tasks within an agency. The third-party consultant may be designated as a program director responsible for the day-to-day operations reporting directly to the oversight committee. Advantages of a third-party consultant include the availability of time and commitment to organizational needs, independence from interested parties, and facilitating and overseeing the development of various programs to provide consistency between programs. A third-party consultant may also bring expertise and focus to the organization and provide the necessary staffing to expedite the product delivery schedule.
- 4.7.3. *University/College*—The advantages of using a university or college to develop, administer, and implement a state or regional TCP are:
- Access to the diverse expertise found at a university or college; and
 - Support facilities and services (e.g., mail, guest housing, meals, printing, janitorial, accounting, classrooms, laboratories, computers, fleet vehicles, student workers, administration support staff).
- 4.7.4. *Public/Private*—State and regional certification programs have been developed and implemented through cooperative partnerships among public agencies, private sector organizations, and educational institutions. These types of programs foster a cooperative relationship between industry groups and state agencies that will be very beneficial to everyone involved in this field. The partners can contribute their expertise to people from industry and agencies. This training to mixed groups will assure greater understanding and cooperation when constructing the project.

- 4.7.5. *Private National Engineering and Technical Organizations*—Several national engineering and technical organizations have created certification programs available to personnel from agencies and industry.
- 4.7.6. *Conflict of Interest*—The TCP Oversight committee, TCP Manager, and program director should avoid the appearance of a conflict of interest.

5. TRAINING AND CERTIFICATION POLICIES

- 5.1. In developing state and regional TCPs, the following guiding principles should be followed:
- Develop the TCP using AASHTO sampling and testing procedures whenever possible. A state may require an additional endorsement to the TCP to cover unique or additional procedures in their state;
 - Address soils, aggregates, asphalt mixture, and portland cement concrete as the primary certification topics; and
 - Address a technician certification level involving basic sampling procedures and test methods initially, with additional certification levels developed as the scope of the TCP progresses.
- 5.2. *Focus*—In order to support the overall objective of improving highway construction quality through the improved work performance of those involved with the construction project, the TCP *must be directly work-related*. The scope and content of certification testing must be based on realistic and practical work needs. Because the TCP focuses on work performance, everyone involved should treat qualification activities as natural extensions of their work duties and responsibilities.
- 5.3. *Leveraging and Aligning Activities and Programs between States and Regions*—There is a wide variation in the development and implementation of TCPs between states and regions. No single “best way” to implement a TCP has emerged. The following regional technician certification programs have been developed to promote certification reciprocity among member states:
- Western Alliance for Quality Transportation Construction (WAQTC)
 - NorthEast Transportation Training and Certification Program (NETTCP)
- 5.3.1. Consideration should be given to developing state technician certification requirements by participating in a regional TCP. Participating in a regional program has the positive benefit of pooling and leveraging state resources and also of allowing qualified technicians to work across state boundaries without having to retrain and requalify. Gaining these benefits will lower the states’ and contractors’ cost of doing business while still ensuring high-quality testing is performed.
- 5.3.2. The state DOT should have a written policy regarding reciprocity. The policy should be clear to applicants seeking reciprocity. Any requirements for classroom training, performance, or written examinations should be identified. Conducting regional meetings or conferences to discuss the best practices for policies and procedures is an effective means for streamlining and improving TCP implementation.
- 5.3.3. Once policies and procedures for developing a TCP are established, the next challenge is implementation. Given the experiences of states and regions that have already implemented TCPs, it is recommended that program elements be tested using a pilot process before fully implementing them as an integrated program. Well-designed pilots will maximize feedback and learning and help gain the support of those in government and industry who will be affected by the changes.

- 5.4. *Consideration of Prerequisites*—In addition to the required training, work experience may be used as an integral part of the certification process to ensure technicians have the required knowledge, skills, and abilities. This assurance may be accomplished by establishing prequalification-relevant work experience or education requirements, and establishing work experience criteria prerequisites for participation in advanced certification levels.
- 5.4.1. The TCP should consider if prerequisites are necessary for entry-level training. Demographics and the characteristics of the labor pool available to the state may need to be considered as a starting point. Minimum requirements in reading level and math skill capabilities may need to be identified as an entry-submittal gateway. If applicants' reading and math skills would hinder their performance, establishment of training to correct these deficiencies is advisable.

6. TRAINING

- 6.1. A well-planned and supportive training program is the basis for a successful certification program. A good training program will ensure qualified technicians and testers will be performing inspection, sampling, and testing on construction projects.
- The training program should be offered to individuals, including those from state DOTs, local agencies, contractors, producers, or consultants. The program should be administered similarly for everyone.
- 6.1.1. Training should be structured to fit the certification test criteria. Since the program is directed toward highway construction, AASHTO test procedures should be used to the maximum extent.
- 6.1.2. Development and maintenance of a training program may be handled by:
- State DOT;
 - University or vocational-technical school;
 - Consultants; or
 - Public/private consortium.
- 6.1.3. The program administration requires the following resources:
- Funding and fees;
 - Staffing (e.g., instructors, coordinators, proctors);
 - Training facilities;
 - Materials (i.e., manuals and equipment);
 - Record keeping;
 - Governing board/advisory committee; and
 - Organizational task groups.
- 6.1.4. The above resources need to be considered when choosing who will handle the development and maintenance of the program.
- 6.1.4.1. Training materials may be developed solely for the state or developed with another state/region. There are also existing training manuals and aides available for use.
- 6.1.4.2. Training may include lecture, hands-on training, or self-study methods. Inclusion of hands-on training will help to ensure the technician is competent and should raise his or her comfort level in performing materials sampling and testing.

- 6.1.4.3. Certified technicians will need to be kept aware of test procedures, specification, equipment, or administration changes in the training program. This need may be satisfied by recertification training, update courses, or special training efforts.
- 6.1.4.4. Trainers need to have the technical knowledge and presentation skills necessary to instruct the courses. Competence and conduct criteria for the instructors, examiners, and proctors need to be defined and enforced.
- Note 2**—The AASHTO Transportation Curriculum Coordination Council (TC3) Instructor Development Course for Technician Training provides instructors with the knowledge and skills to deliver more effective training using essential adult learning principles.

7. EXAMINATION AND METHODS

- 7.1. A successful certification program must have documented policies and procedures for examination methods to ensure consistent and fair administration by examiners and proctors.
- 7.1.1. The program oversight committee should empower and formally task an individual (e.g., TCP manager) to direct and coordinate all certification examination activities (e.g., scheduling of examinations; registration of applicants; maintaining and ensuring the security of examination materials; notifying participants of their success or failure in their examination; maintaining the completed examination materials).
- 7.1.2. Written and performance examinations should be given to determine if the applicants possess the knowledge and skills necessary to satisfy the established certification requirements. “Grandfathering” technicians and testers, or a waiver of training and testing in lieu of certification examination, is not recommended. A licensed professional engineer should follow the same written and performance examination requirements as other applicants.
- 7.2. *Examination Controls and Integrity*—To avoid conflicts of interest, the examiner should not be the immediate supervisor **or subordinate** of those being certified. Examination procedures should be documented. The documentation should include procedures to:
- Develop and revise certification exams;
 - Establish examination pass-fail criteria;
 - Determine examination duration;
 - Determine disciplinary action for cheating;
 - Document examination security procedures;
 - Develop the detailed plan for conducting examinations;
 - Develop retesting policy and procedures;
 - Design a process to notify individuals of examination times and results;
 - Develop procedures to ensure the confidentiality of score reporting;
 - Establish requirements for examiners and proctors; and
 - Establish a procedure to update or change tests when there is a change in a test method or specification.
- 7.3. *Examination Methods*—Written and performance examinations should be given to ensure applicants have a complete understanding of the materials and calculations as well as the ability to perform test procedures. Care and good judgment are needed in developing fair and impartial written and performance examinations.
- Before the examinations, the proctors should thoroughly explain to the applicants:
- The examination process and rules;
 - What the exams will be comprised of;

Commented [DAB1]: Legal opposite of supervisor.

- Minimum scores necessary to pass; and
- The retesting policy.

7.3.1. *Written Examination*—The written examination may be closed- or open-book and should have a designated time limit. Examinations may consist of various types of questions, including true/false, multiple choice, essay, fill-in-the-blank, word problems, and calculations.

A large database of questions for use in the written examination of each certification area should be developed and a set of questions randomly selected for each examination given. The use of randomly selected questions will assist in ensuring the credibility of the process by providing a different set of questions for each examination. Using multiple exams reduces the potential for sharing answers to test questions among applicants. To protect examination integrity, course participants should not retain a copy of their completed written examinations.

7.3.2. *Performance Examination*—Performance examinations measure the applicants' ability to properly perform the prescribed test methodology. Proctors and examiners should evaluate each applicant's proficiency by using standardized checklists that identify specific test method steps or tasks. The degree of detail of the performance checklists will be influenced by whether the performance examination is open- or closed-book. Time limits can be set for the complete performance of each test method. The examinee may be asked to explain various steps of the procedure to reduce the test time.

7.4. *Re-Examination Policy—Written/Performance*—When a participant fails a written/performance certification examination, some allowance should be provided for retesting. A policy should be established to address the following areas:

- Maximum number of retests allowed;
- When retesting will be permitted;
- Maximum time limit for retaking the written/performance examination; and
- Guidelines if the applicant fails the retest.

7.4.1. The number of retests allowed and the time limits are needed to avoid frivolous, trial-and-error attempts and encourage the participants to properly prepare for testing. The re-examination policy will also influence the size of the test question database needed for written examinations.

7.5. *Notification of Results*—Notification of an applicant's successful or unsuccessful completion of the certification requirements should be provided to the applicant promptly after completion of the examination. If the applicant is unsuccessful, the procedure for re-examination should be explained.

7.6. *Confidentiality of Records*—Personal information and records of the examination are generally considered to be confidential and not to be released publicly. Confidential information includes:

- Personal and professional information provided by the participants applying for testing and certification; and
- Specific test results and scores for participants.

7.7. *Examination Materials Security*—The certification training program should provide specific procedures and precautions for establishing and maintaining the security of examination materials at all times. Violation of security compromises the integrity and validity of the certification process. Applicants should not retain a copy of the written examination. After the performance test, examiners and proctors may inform the applicants of incorrect procedures and the details of proper procedures.

- 7.8. *Examiner and Proctor Qualifications*—Examiners and proctors should complete an orientation or training session. Examiners for the performance examination must be qualified in that examination area. Examiners may be employees of agencies, contractors, or industry associations.
- 7.9. *Examination Appeals*—An applicant wishing to register a complaint or protest regarding an examination or examiner must do so in writing to the TCP manager within a specified period of time. The written complaint must specify the examination date, the examiner, and the nature of the complaint or protest.
- 7.9.1. Complaints and protests should be reviewed and a recommendation made to the oversight committee. All complaints and protests should be promptly answered in writing.
- 7.10. *Continuous Improvement*—Course evaluations should be used to identify improvements that can be made in the TCP. Audits of certification training and examinations may be used to ensure that procedures are being followed.

8. CERTIFICATION

- 8.1. Each qualifying agency that issues the status of certification through its TCP must maintain a written TCP administration policy.
- 8.2. Each agency must maintain a registry of trained technicians who have successfully completed a training program. The registry should include:
- Name, certification identification number, and address;
 - Courses, and dates completed; and
 - Course content:
 - Test methods included;
 - Lecture or laboratory;
 - Written examination; and
 - Performance examination.
- 8.3. The qualifying agency will provide the qualified technician with documentation of the certification. This documentation may be in the form of a registration card, email, listing on an accessible database, or letter. The document should include appropriate expiration dates.
- 8.3.1. The agency may require the registered technician to maintain a current address on file as a condition of registration.
- 8.4. Establishing a registration policy is the TCP manager's responsibility. A registration application should include:
- Program administration and information contact(s);
 - Listing of certification training courses and examinations and fee schedule;
 - Refund policy;
 - Payment policy;
 - Enrollment and lodging information;
 - Participant and employer information; and
 - Resume application.
- 8.5. Enrolling and scheduling course participants and collecting fees can become a tedious and cumbersome task. Developing a database or website to expedite the registration and record-keeping process is recommended.

- 8.6. The agency must adopt a policy to protect the privacy of certified technician's records.
- 8.6.1. The TCP should establish a time period for which the certification remains valid.
- 8.7. The TCP should include a recertification policy. The recertification process may include refresher courses, written examinations, and performance examinations.
- Note 3**—A number of states use independent assurance sampling and testing to replace the performance examination requirement as part of recertification. The independent assurance program should evaluate testers by observation and the results of testing split samples or proficiency samples, when used as part of recertification, and be performed within 12 months of the recertification.
- 8.8. The TCP should include a written policy regarding the removal of certification status or disciplinary measures regarding technician performance. Progressive levels of discipline that lead up to decertification may be provided.

9. TECHNICIAN TEST METHODS

- 9.1. Each state or region should develop a set of test methods to support a TCP. These test methods depend, to some extent, upon the specifications and materials requirements. The list of tests in Appendix X1 represents the tests commonly used by states in their TCPs.

10. SUMMARY

- 10.1. Training and certification programs can result in significant improvements in the quality of the American transportation system. TCPs can improve the abilities of technicians and help ensure validity of their testing, thereby resulting in fewer claims, legal disputes, and less adversarial relationships among the parties (i.e., agency, industry, and consultants). Improved worker skills reduce the risks to both the owner/agency and contractor/producer and better identify the quality of each component and the final product. Training will improve the quality standards of highway workers, giving them more confidence and pride in their job performance. TCPs can be used to establish a career path for state DOT and industry employees, providing promotional opportunities based on merit. Improved worker performance should lead to longer-lasting roads and a more effective use of taxpayer dollars, while providing an improved infrastructure for the traveling public.

11. KEYWORDS

- 11.1. Technician certification; technician qualification; technician training.

APPENDIXES

(Nonmandatory Information)

X1. QUALIFYING TESTS—SOILS AND AGGREGATES

- X1.1. *Recommended Test and Corresponding AASHTO Test or Other Test:*
- X1.1.1. *Gradation:*
- T 27, Sieve Analysis of Fine and Coarse Aggregates

- T 84, Specific Gravity and Absorption of Fine Aggregate
- T 85, Specific Gravity and Absorption of Coarse Aggregate
- T 176, Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test

- X1.1.2. *Liquid Limit, Plastic Limit, and Plasticity Index:*
- T 89, Determining the Liquid Limit of Soils
 - T 90, Determining the Plastic Limit and Plasticity Index of Soils

- X1.1.3. *Compaction/Density:*
- T 99, Moisture–Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop
 - T 180, Moisture–Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop
 - [T 272, Family of Curves - One Point Method](#)
 - T 310, In-Place Density and Moisture Content of Soil and Soil–Aggregate by Nuclear Methods (Shallow Depth)

- X1.1.4. *Moisture Content:*
- [T 255, Total Evaporable Moisture Content of Aggregate by Drying](#)
 - [T 265, Laboratory Determination of Moisture Content of Soils](#)

- X1.1.5. *Sampling and Splitting:*
- R 76, Reducing Samples of Aggregate to Testing Size
 - T 2, Sampling of Aggregates

- X1.1.6. *Lightweight Pieces:*
- T 113, Lightweight Pieces in Aggregate

- X1.1.7. *Dry Rodded Unit Weight:*
- T 19M/T 19, Bulk Density (“Unit Weight”) and Voids in Aggregate

- X1.1.8. *Soil Preparation:*
- R 58, Dry Preparation of Disturbed Soil and Soil–Aggregate Samples for Test

- X1.1.9. *Quality and Statistics Terms:*
- R 10, Definitions of Terms Related to Quality and Statistics as Used in Highway Construction

X2. QUALIFYING TESTS—PORTLAND CEMENT CONCRETE

- X2.1. *Recommended AASHTO or Other Test Designations:*

- X2.1.1. *Sampling:*
- R 60, Sampling Freshly Mixed Concrete

- X2.1.2. *Aggregate Gradations:*
- T 27, Sieve Analysis of Fine and Coarse Aggregates

- X2.1.3. *Moisture Content of Coarse and Fine Aggregate:*
- T 121M/T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
 - T 255, Total Evaporable Moisture Content of Aggregate by Drying

- X2.1.4. *Aggregate Specific Gravity:*

- T 84, Specific Gravity and Absorption of Fine Aggregate
 - T 85, Specific Gravity and Absorption of Coarse Aggregate
- X2.1.5. *Air Content by Pressure Method:*
- T 152, Air Content of Freshly Mixed Concrete by the Pressure Method
- X2.1.6. *Air Content by Volume Method:*
- T 196M/T 196, Air Content of Freshly Mixed Concrete by the Volumetric Method
- X2.1.7. *Slump and Temperature:*
- T 119M/T 119, Slump of Hydraulic Cement Concrete
 - T 309, Temperature of Freshly Mixed Portland Cement Concrete
- X2.1.8. *Fabrication and Curing of Compressive Strength Specimens (Cylinders and Beams):*
- T 23, Making and Curing Concrete Test Specimens in the Field
- X2.1.9. *Capping and Testing Cylinders:*
- T 22, Compressive Strength of Cylindrical Concrete Specimens

X3. QUALIFYING TESTS—ASPHALT MIXTURE

- X3.1. *Recommended AASHTO or Other Test Designation:*
- X3.1.1. *Aggregate Gradation:*
- T 27, Sieve Analysis of Fine and Coarse Aggregates
 - [T 30, Mechanical Analysis of Extracted Aggregate](#)
- X3.1.2. *Asphalt Content (Ignition, Solvent, Nuclear):*
- T 308, Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method
- X3.1.3. *Bulk Specific Gravity of Compacted Specimens:*
- T 166, Bulk Specific Gravity (G_{mb}) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens
- X3.1.4. *Sampling Methods and Techniques:*
- R 47, Reducing Samples of Hot Mix Asphalt (HMA) to Testing Size
 - T 168, Sampling Bituminous Paving Mixtures
- X3.1.5. *Voids and VMA:*
- T 269, Percent Air Voids in Compacted Dense and Open Asphalt Mixtures
- X3.1.6. *Maximum Theoretical Specific Gravity:*
- T 209, Theoretical Maximum Specific Gravity (G_{mm}) and Density of Hot Mix Asphalt (HMA)
- X3.1.7. *Specific Gravity of Aggregates:*
- T 84, Specific Gravity and Absorption of Fine Aggregate
 - T 85, Specific Gravity and Absorption of Coarse Aggregate
- X3.1.8. *Percent Passing 75- μ m (No. 200) Sieve:*
- T 11, Materials Finer Than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
- X3.1.9. *Moisture Content:*

- T 255, Total Evaporable Moisture Content of Aggregate by Drying

■ T 265, Laboratory Determination of Moisture Content of Soils

- T 329, Moisture Content of Asphalt Mixtures by Oven Method

X3.1.10.

Sand Equivalent:

- T 176, Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test
- T 245, Resistance to Plastic Flow of Asphalt Mixtures Using Marshall Apparatus
- T 312, Preparing and Determining the Density of Asphalt Mixture Specimens by Means of the Superpave Gyratory Compactor

X3.1.11.

Fine Aggregate Angularity:

- T 304, Uncompacted Void Content of Fine Aggregate

X3.1.12.

Coarse Aggregate Angularity:

- ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
- T 335, Determining the Percentage of Fracture in Coarse Aggregate

X3.1.13.

Moisture Susceptibility:

- T 283, Resistance of Compacted Asphalt Mixtures to Moisture-Induced Damage

X3.1.14.

Density:

- T 355, In-Place Density of Asphalt Mixtures by Nuclear Methods

¹ This full standard was first published in 2000.