NCHRP Project 20-07/Task 340

# NATIONAL TRAINING: CHALLENGES AND OPPORTUNITIES

*Requested by:*

American Association of State Highway and Transportation Officials (AASHTO)
Standing Committee on Highways
Subcommittee on Maintenance

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## DISCLAIMER

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# INTRODUCTION

State Highway Agencies (SHA) face significant challenges across a broad range of issues in light of the current financial, administrative and technical trends and realities. One significant challenge facing agencies involves issues related to developing and maintaining a well trained workforce. The emphasis of transportation related agencies is shifting from being an organization primarily involved with building and maintaining highways towards an organization with a focus on operating highways as part of a transportation network, protecting and enhancing their investment in the transportation assets, only adding capacity as required. Because of this shift in roles and missions of agencies, the transportation engineers and technicians in agencies today require a broader range of knowledge, skills and abilities than those of the past.

Transportation agencies have been facing severe financial challenges in recent years. These financial challenges are putting pressures on the ability to recruit and maintain employees even as they are facing expanding program growth and asset management needs. Many agencies are facing flat or decreasing staffing levels forcing them to reorganize and combine responsibilities in order to meet their performance requirements to the public. There is a corresponding increase in the retirement of experienced staff due to the general aging of the “baby boom” generation that comprises much of the workforce. Many agencies have put hiring freezes in place due to the financial challenges faced that preclude the replacement of those retiring employees, resulting in the loss of skilled and experienced personnel. Because of the financial challenges that exist, agencies have also reduced the funds available for education and training.

State Highway Agencies are continuing to expand the use of contractors to address current workforce shortages. This creates a training need to assure that the contractors have the necessary skill sets required to perform the work and causes the agency to shift their focus away from engineering skills and move towards training employees to perform as contract managers and administrators with the ability to verify work performed and assure accountability of funds spent.

In response to the challenges outlined above, the American Association of State Highway and Transportation Officials (AASHTO) initiated this project, administered through The National Academies. The objective of this project was to identify ideas, for consideration by AASHTO and others, to facilitate meeting training needs of state agency personnel.

# PROJECT APPROACH

To accomplish the project objective, a special meeting was held on June 24 and 25, 2013 with participants having familiarity with the relevant technical areas and individuals involved in training and education in state highway agencies across the nation. Appendix A lists the meeting participants which was held at the National Academies' Arnold and Mabel Beckman Center in Irvine, California.

Prior to the meeting, a background paper was developed and submitted to participants. This document is included as Attachment B of this report. This paper was intended to assist the meeting participants in their preparation for the special meeting. It provides information about the changing roles of state highway agencies and their personnel training needs. Published literature offered insight into the reasons behind the changes in the roles and responsibilities of employees engaged in transportation. As briefly discussed in the introduction, and discussed in detail in the background document, several issues are moving agencies into a perfect storm scenario related to training. Large numbers of experienced employees retiring, fewer people choosing transportation as a career path, financial challenges causing agencies to reduce staff and the changing roles and responsibilities for those remaining employees have created significant challenges related to agencies ability to provide knowledge necessary to maintain the competencies of their workforce.

The background paper also identified the existing training strategies used by state highway agencies. A variety of strategies are typically used to accomplish an individual agency's needs. Some agencies utilize local universities and community colleges to help deliver training, while others have developed their own courses and deliver them in a variety of manners. FHWA offers training through several different mechanisms that are described in the briefing paper. Training is also available through numerous industry associations and other private entities that support transportation related subjects.

Two surveys of state agency personnel were conducted to better understand the familiarity and utilization of existing training resources and to evaluate if these resources are meeting their needs. The results of these two surveys were also presented and discussed. Preliminary results of the first survey that focused on the Transportation Curriculum Coordination Council (TC3) was made available to the participants and briefly discussed in the background paper. Another survey developed as a part of this project was distributed to state Construction, Design, Maintenance, and Materials engineers seeking to learn more about how training is developed and delivered in their states, their satisfaction level about available training, their challenges related to the ability to provide needed training, their perspective about priorities for training that is

needed, and specific actions that would make a positive impact on training. The details of that survey are included in Appendix C.

Part of the meeting was devoted to breakout sessions to allow the participants to discuss specific issues and challenges and develop ideas for improving national training efforts. Each group gave a presentation of their discussions followed by a facilitated group discussion seeking to develop a consensus about the breakout topic. The groups first identified the issues and challenges facing SHAs related to knowledge management and training. After reaching a consensus on these topics, the next breakout session challenged the participants to identify what ideas they had and what opportunities exist to have a positive impact on the issues and challenges identified earlier. Once again, the findings were further discussed to reach a consensus of their collective findings.

The issues and challenges that exist and the ideas and opportunities that could improve national training efforts were further reviewed and the groups then reconvened and identified ideas and future actions that could have a positive impact on the ability of state highway agencies to meet the needs of knowledge management and training in the future.

## CHALLENGES

The first task was to identify and clarify the issues and challenges facing SHAs in light of current dynamic financial, administrative and technical times. Identified issues related to training included the following:

- Knowledge management – The need to transfer both technical and corporate knowledge within agencies is not being met causing a knowledge gap when retirements, promotions or transfers occur, or when reorganization changes the roles and responsibilities of existing employees. Employees should not only understand the technical details from participating in training, but should develop an understanding about the reasons why activities are carried out the way they are. A system should exist that prepares employees for future roles that can ease the transition when vacancies happen.

- Awareness of the availability – There is no consistent way for agencies to be aware of what training is available globally, resulting in duplication of efforts. Training is available nationally, regionally, and locally from a variety of sources for the same subject matter. Embracing the transportability of available training across state lines would also increase efficiency, reduce costly duplication of developmental efforts, and unify the level of knowledge across the nation. An efficient way to find and have an understanding of the quality of the different courses would benefit agencies from both a knowledge management and financial perspective. Gaps in training availability can exist in several forms. Training may be desired which does not exist (but may exist elsewhere), courses may be available elsewhere but not in the desired format, or courses may not exist and need to be developed. Some way to "connect the dots" to link and synchronize training needs, training availability, and the accessibility of that training is needed to help resolve this issue.

- Management support (Immediate supervisor and upper management) - Management at all levels supporting and facilitating career development training improves morale and provides a pathway for success in both existing and future roles of employees. Management support for an organizational culture supporting the value of training is critical. An understanding how to quantify the return on investment for training is needed, because training funds are easy to cut and there may not be an immediate impact on the organization. The consequences of not training should be documented. An example given was when accident rates and severity increase, safety training typically is increased, but had adequate training been in place prior, the accident rates and severity may not have increased.

- Contract employee training – Different expectations about the skills, knowledge and experience may exist for contract employees and some agencies do not support training for them.

- Funding support for training – Successful organizations adequately fund training. A system of risk assessment and analysis is needed to show the value of training and to calculate the true cost of not facilitating training.

- How training is delivered – Training can be provided many ways, including mentoring, formalized on the job training, cross training, and formal training. Training is available in face to face classroom settings, web conferencing with a real time instructor, web based that is recorded and instructor guided, webinar based, tailgate or rainy day one-on-one training, and other methods. Individuals have different learning preferences and an effective knowledge management system recognizes that fact and supports what is the best fit for employees. Understanding the best delivery approaches and instructional design practices during training development is critical to their effective use in the future.

A general consensus was reached about the critical issues and challenges faced by SHAs related to training. The broad details of those issues and challenges are discussed below:

- The identification of what knowledge is actually required is needed, along with consensus about what competencies are required to accomplish the required knowledge. Successful practices in existence should be acknowledged and a mechanism developed to document the risk of not investing in needed training.

- Knowledge about what training is available nationally is critical to the ability to "connect the dots" between what is needed, what is available, where it is available, and how it is available. Overcoming this issue could standardize training across the nation, reduce costly duplication of efforts and help assure the knowledge exists when experienced staff retires, or when people move from one geographic location to another.

- Management emphasis for knowledge management within organizations encourages employee participation resulting in effective transitions from roles as individuals advance in their career. The existence of a means to document return on investment for training costs could result in the desire for management to embrace and fund a culture that supports and encourages effective training.

# OPPORTUNITIES

The next session addressed the ideas and opportunities that exist to address the issues and challenges identified in the first session. The results of the group breakout sessions are shown below:

- Some type of matrix is needed to categorize existing training resources, regardless of where it resides, that will help match needs to availability. The need to identify and market the range of training resources available would assist SHAs decision making and allow users to identify training that would not only benefit their current responsibilities, but to develop a training plan that could lead to a future career path.

- Conducting a national needs analysis would help determine and gain consensus identifying what competencies are needed, and what is being offered to meet the training needs for those competencies.

- The development of a best practices guide for different delivery systems could help agencies take advantage of technology to streamline how training is offered. This needs to recognize that different approaches may be needed, or multiple approaches for the same set of training materials, considering the fact that people have different learning preferences. For example, stand alone web based training may be very effective for some people while some others may find it intimidating.

- Management of organizations can show support for training by providing adequate funding and emphasizing it in their strategic plans. Taking this step will emphasize that the culture of the organization recognizes the importance of an effective knowledge management system. The development of a method to clearly identify the benefits of training would support and clarify the value of investing in training for both employees and the organization.

- Case studies of effective training programs at both the state and national level would be useful guides for agencies. National examples include NCHRP Reports 685 and 693.

A general consensus was reached about ideas and opportunities that exist to address critical issues and challenges faced by SHAs related to training. The broad details of those ideas and opportunities are discussed in the following paragraphs.

- The need to identify what training is needed on a national level exists. Before knowledge management within an organization can be effectively established, a clear understanding of the required competencies must be known.

- Once the training needs and associated competencies are known, determining what training currently exists and a means to evaluate if the offerings match the needs must be established. Ideally, a central repository of all available training resources should exist, along with some type of user populated evaluation system.

- Using the needs assessment and inventory of existing offerings, development of additional courses and refinement of existing courses can begin. Taking this action will produce a robust inventory of training opportunities allowing agencies to meet their knowledge management goals.

- A system to document and market the benefits of training to achieve knowledge management goals needs development. This system should include a reliable means to document the risk associated with not training, and the return on investment associated with funding an effective knowledge management system.

## IDEAS FOR IMPROVING TRAINING

Based on the deliberations of the participants, the groups broke into separate discussions to draw conclusions about opportunities felt to be worthy of pursuit in the future. The following action items were identified as appropriate steps for improving national training opportunities.

- Conduct a national needs analysis – A clear understanding about the scope of what knowledge is required for SHAs to be in a position to meet their performance goals is an essential first step. A large pool of training materials and course offerings exists, but a national focus on what is actually needed will allow agencies to effectively target training resources and assist employees by making available tailored training programs. Agencies should be encouraged to
  use consensus competencies in order to optimize a national focus resulting in the knowledge base being more portable as employees and contract employees move across state lines. This could result in significant efficiencies for both agencies and contractors by reducing the duplication of effort that currently
  exists. Recognizing the fact that there are geographical and climatic differences, add on modules may be required at times to include additional knowledge required, but the core competencies would likely be the same regardless of location.

- Identify an inventory of existing training – Training is currently offered in many different forms and through different organizations for the same topic. The development and effective management of who is providing what training, where it is available, and what format is being offered would first clearly identify duplication that exists today, and give the opportunity to maximize the use of those offerings deemed effective by the users. This comprehensive inventory should allow existing offerings to be discovered by a wide range of search functions, such as job function, task needs, competencies, delivery methods, etc., such that users could obtain uniform output including meaningful data. This should be a cooperative process that includes providers of training and have some manner to rate the effectiveness of the various training modules available in an unbiased manner. The model used by the National Transportation Training Resource (NTTR) is an example of how this could be accomplished and managed. Comparing a central repository of all available training with the results of a national needs analysis discussed above would help identify the gaps in existing training and give a clear path towards the development of new training offerings targeted towards meeting an acknowledged need that exists.

- Management of corporate knowledge and marketing the benefits of training – The benefits of training should be raised to a higher awareness throughout

SHAs and national organizations. Effective tools to identify and document the risk of not investing in training should be developed and targeted towards management personnel. Not only does the risk need to be clearly documented, but the return on investment needs to be documented. Training is a long term investment that may not immediately present a clear financial benefit. Therefore the value of the investment in training needs to be documented. Successful organizations do invest in training leading to the conclusion that a contributing factor in their success is the return on the investment in training. The commitment of management at all levels towards training leads towards a more knowledgeable and therefore more efficient workforce.

# SUMMARY AND FUTURE DIRECTIONS

The results of the special meeting about the challenges and opportunities for national training are described in the body of this report. Specific actions that could be taken to prepare state highway agencies to meet the training needs for both now and in the future was reflected by the consensus of the participants are as summarized below:

1. Conduct a national needs assessment to determine what specific competencies and training needs exist. The comprehensive assessment should be directed to state highway agencies to capture the complete scope of needs that are needed for agencies to meet their knowledge management goals. This could be accomplished through either a synthesis project or a NCHRP 20-07 project.

2. Determine what and where training currently exists. Capturing details about what training is available, where it resides, what format it is being offered, etc., would allow agencies to tailor training to their needs and move towards eliminating duplication of efforts that exists currently. This could be accomplished through the use of a synthesis project, or perhaps through a pooled fund effort.

3. Upon completion of items 1 and 2, identify the gaps between what is needed and what is available to allow for development of new training that meets the needs identified by the agencies. The development of new training should be pursued in an organized manner to discourage the duplication of effort and could be accomplished through research efforts, an individual state taking the initiative, or through an existing organization such as TC3 or NHI.

4. Establish a central repository for all training offerings that could be populated by the owners of the training. This effort would require significant detail about the range of content and learning objectives, and should include some information from past participants related to feedback about the training. The benefit of having access to this information empowers agencies to select training that best meets their needs. A system similar to the NTTR web based system for this repository was envisioned. Funding to manage and support the central repository could be addressed through a pooled fund effort.

5. Once the above tasks are in place, some type of marketing would be needed to promote the information and encourage agencies to take advantage of the benefits possible. In addition to the dissemination of information, some means to validate the return on investment realized through effective training would need to be developed. This could be accomplished through FHWA, AASHTO, or other organizations.

6. Prepare best practices guide as a means to showcase the effectiveness of training based upon successes realized by agencies. The guide could include examples from states or more formalized case studies similar to NCHRP Reports 685 and 693.

The meeting participants believe that implementing these action items would allow agencies to establish knowledge management systems to accomplish their training goals. It will also help agencies develop and maintain a qualified workforce capable of meeting the demands of current challenges they face.

# APPENDIX A

## SPECIAL MEETING PARTICIPANTS

# Participants in the Special Meeting on
# National Training: Challenges and Opportunities
# The National Academies' Arnold and Mabel Beckman Center
# Irvine, California
# June 24 - 25, 2013

- Dr. William Barnard, Maryland State Highway Administration
- Mr. Keith L. Beard, Louisiana Department of Transportation and Development
- Mr. Richard L. Bradbury, Maine Department of Transportation
- Ms. Jennifer Brandenburg, North Carolina Department of Transportation
- Mr. Mark Chaput, Michigan Department of Transportation
- Dr. Brian E. Cronin, ICF International
- Mr. James Feda, South Carolina Department of Transportation
- Dr. Elie Y. Hajj, University of Nevada-Reno
- Mr. David Peshkin, Applied Pavement Technology, Inc.
- Mr. Douglas A. Sherman, South Dakota Department of Transportation
- Mr. Timothy Sturm, Arizona Department of Transportation
- Mr. Thomas S. Elliott, Federal Highway Administration (FHWA Liaison)
- Dr. Amir N. Hanna, NCHRP/Transportation Research Board (NCHRP Responsible Staff Officer)
- Mr. Cecil L. Jones, Diversified Engineering Services, Inc. (Meeting facilitator/Project Consultant)

# APPENDIX B

## Background Paper for June 24 – 25, 2013 Special Meeting

# NCHRP 20-07/Task 340
# National Training: Challenges and Opportunities

Background Information for June 24 & 25, 2013 Special Meeting
Prepared by Cecil L. Jones, Diversified Engineering Services, Inc.

**Introduction**

The AASHTO Subcommittee on Maintenance developed a Research Needs Statement that was endorsed by the AASHTO Standing Committee on Highways to address challenges and opportunities related to training. NCHRP initiated Project 20-07/Task 340 with the objective of identifying ideas for consideration by AASHTO and others, to facilitate meeting training needs of state highway agency (SHA) personnel. This will be accomplished through a special meeting with invited participants who are familiar with the relevant technical areas and involved in training and education.

**Background**

State highway agency workforces are facing changing needs. The emphasis is shifting from building and maintaining highways to operating those highways as part of a transportation network, protecting and enhancing the highway investment and adding capacity as needed. (TRB, 2003) This shift in roles and missions of a SHA requires new skills beyond what was required of the typical highway engineer of several decades ago. Today's transportation engineers and technicians require a broader range of knowledge, skills and expertise than before.

Another factor facing agencies is the fact that expanding program growth is coupled with flat or decreasing staffing levels. The trend towards reorganizing to reduce staff results in the individual worker needing to have a broader range of knowledge, skills and abilities (TRB, 2003). In addition, the aging of the nation's population is also reflected in the aging of the transportation agency workforce (TRB, 2003). One recent study estimated that 40-50% of the transportation workforce will retire in the next 10 years (Lucero, 2011). Because of difficult financial issues faced by many SHAs, hiring freezes preclude replacing those employees retiring. This creates an experience gap within agencies that can result in not having sufficient midlevel employees to replace the retiring senior level employees across all skill levels.

Workforce challenges including large numbers of experienced employees retiring, the fact that fewer people going into key transportation fields, expanded skill requirements are required for employees, and competition for workers from other industries have created the "Perfect Storm" for agencies (Lucero, 2011). Many states have expanded the use of contractors to meet current workforce needs, but this requires the SHAs to change their focus less on engineering and more on contract administration and management of contractors. The shift to the expanding use of contractors also requires the SHAs to expand their focus on verification and accountability for the funds being paid to the contractors (TRB, 2003). Because of funding issues many agencies are also scaling back on the funding dedicated to training. TRB Special Report 275 concluded that workforce training expenditures are insufficient, noting that benchmark studies indicate that successful organizations spend an average of 2% of salaries on training which is at least four times more than transportation agencies (TRB, 2003). Understanding these and other challenges faced by SHAs will be explored in detail during the workshop. The remainder of this document will investigate the current state of training in the states.

**Existing Training Strategies**

State Highway Agencies use a variety of strategies to address their individual training needs. Some agencies have developed relationships with local Universities and Community Colleges to assist with training programs, while others have developed in-house courses and offer them either in a central location, or at regional locations. Some agencies and organizations develop training materials but do not actually conduct the training. One example of this is NCHRP 20-25, Training Needs for Highway Construction Personnel. This effort developed course descriptions and lesson plan outlines for a total of 57 courses and comprehensive training packages were developed for teaching 15 of these courses (NCHRP, 1994).

The Federal Highway Administration (FHWA) offers various training venues, most notably through the National Highway Institute (NHI) which offers instructor led training, web-conference training and web-based training in a wide range of program areas. FHWA is also a partner, along with the SHAs, and the transportation industry, in the Transportation Curriculum Coordination Council (TC3). The TC3 offers training primarily through web-based learning. Various industry organizations also offer educational and training products that are used by the SHAs, some of which are incorporated into certification programs.

The Federal Highway Administration supports training through several different means. The FHWA Resource Center website provides information about a wide range of training courses available that are designed to meet the needs of FHWA Division Offices, SHAs, Metropolitan Planning Organizations (MPOs), local agencies, and others. The Resource Center's technical teams offer tailored workshops, briefings, and seminars based upon customer requirements (FHWA). Technical service teams are available for many topics including, but not limited to Air Quality, Construction & Project Management, Finance Services, Hydraulics, Operations, Pavement & Materials, Planning, Safety & Design, and Structures. Individual courses include

topics such as “Financial Management Boot Camp” and “American Disabilities Act.” Many of the courses are offered through the NHI.

Another comprehensive document prepared by FHWA is a catalog of transportation related education, training and workforce development programs. This catalog is updated periodically and is designed to be an informational resource that brings together transportation-related education, training, and professional development programs offered by the US Department of Transportation, in addition to professional associations and organizations (Transportation, 2010).

The National Highway Institute was established in 1970 to provide transportation training resources and training courses to national and international partners. NHI delivers more than 700 courses to more than 16,000 participants annually (Transportation, 2010). The mission of NHI is composed of the following goals (NHI):

- Training the current and future transportation workforce
- Transferring knowledge quickly and effectively to and among transportation professionals
- Providing training that addresses the full life cycle of the highway transportation system

NHI courses are offered in a wide variety of transportation-related subject areas and formats. Instructor-led training are conducted in person and led by an instructor. Web-conference training has an instructor or facilitator and can be accessed from almost any location, they are held at a specific time and are considered “live” events. Web-based training is self paced and are not led by an instructor. Students can sign into Web-based training at any time and return to it as desired, although a final exam can only be completed once. NHI has the ability to create blended courses combining different facets of the above formats to meet the needs. The training program areas offered by NHI, and a full course catalog can be found at the NHI website http://www.nhi.fhwa.dot.gov/training/training_programs.aspx.

The Transportation Curriculum Coordination Council was established in 2000 as a partnership between FHWA, SHAs, and the transportation industry to provide training to construction personnel (Transportation, 2010). The TC3 mission is to “Develop and maintain a quality training curriculum to enhance the competency of the nation’s transportation Construction, Maintenance, and Materials technical workforce” (TC3, Mission statement and vision). TC3 originally utilized instructor-led courses, but has since selected online learning as the primary delivery method. Over 80 online training courses are now available, in addition to the instructor-led courses in the areas of construction, maintenance, and materials (TC3, Strategic Plan, 2012). Course descriptions and other related information can be found at http://tccc.gov/webcourse.aspx. On May 7, 2013, the AASHTO Board of Directors recommended the establishment of the Transportation Curriculum Council (TC3) as a voluntary AASHTO Technical Service Program for the development and maintenance of high quality training for the transportation technical workforce, and that the AASHTO Member Departments will be asked to sponsor this Technical Service Program annually (AASHTO, 2013). This is a

significant step that if embraced by the states could lead to a dramatic expansion of the courses available.

In summary, SHAs utilize many different strategies to address their training needs. A survey of Maintenance, Construction and Materials Engineers focusing on TC3 courses was recently conducted. The preliminary responses were made available through the National Academies with the following observations noting that a more detailed analysis is expected to be forthcoming:

- Approximately two thirds of those responding were familiar with TC3 and their courses, while approximately one third were not.
- Approximately 90% of the responses from construction and materials indicated that TC3 courses are not a part of their state's technical training program, while approximately 70% of the maintenance responses stated they were not a part of their training program.
- Approximately two thirds of all responders use web-based technical training for less than 25% of their total training approach.
- The majority of responses indicated a desire for instructor-led courses to be converted to a web-based format. Some specific courses are shown below.
    - Construction – Specification and specification training; Paving, Earthwork, Bridge Construction, Project management; Quality management
    - Materials – Basic information to supplement instructor-led courses; Soils & aggregate compaction; Specification preparation and understanding
    - Maintenance – Traffic safety; QC/QA; Pavement preservation; Bridge Maintenance; First aid; Winter maintenance; Maintenance supervision; OSHA compliance
- Good technical training resources were difficult to find for the following topics:
    - Construction – Alternative project delivery methods; ITS construction; Construction administration; Bridge construction; Pipe construction; Leadership for the field engineer; Communication skills
    - Materials – Specification development from perspective of inspector; Precast QC/QA for individuals; Prestressed concrete; Laboratory management; High Strength Bolts; Microsurfacing and slurry seals; Radiation safety; NPDES field inspector
    - Maintenance – Snow plow driver training; Equipment operator training; Safety for equipment operators

A very brief survey was distributed to Construction, Design, Maintenance and Materials engineers in June 2013. A detailed summary of the responses received during the first week of the survey are shown in Attachment I. Initial findings include:

- The majority of states offered training by DOT personnel, and lesser percentages through NHI courses, through national organizations and partnerships with industry associations, with a smaller percentage utilizing Universities, Community Colleges, LTAP centers and TC3.

- Certifications were issued for some courses and series of courses, with the majority being for construction and materials training for technicians.
- Approximately two thirds of the responders were satisfied with the training options available, and 80% felt that their training needs were providing the required knowledge to participants.
- Desired training that is currently not available included Value Engineering, budget management, leadership training, culvert installation, construction inspection, specialty equipment, general highway maintenance training, data management, more national certification training and programs in lieu of state specific training.
- Challenges related to training include funding, travel restrictions and costs, time away from work, management support, trainer qualifications, and logistics of getting the people to training locations.
- The highest priority of training needed was basic technical training, closely followed by "how to" training and specialty training, with management training and training for new and emerging technologies having lesser priorities.
- Actions that would make positive impact on training include having a comprehensive approach to training, management support, adequate funding provided, more web-based training, standardized national certifications with reciprocity between states, one stop shopping for information about training opportunities, and making training available when needed.

More detailed analysis of the survey responses will be presented at the special meeting on June 24 and 25, 2013. At this meeting we will delve deeper to address the challenges facing our training needs and discuss opportunities about how these challenges can be met now and in the future.

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# APPENDIX C

## Survey on Training Results Sent to State Construction, Design, Maintenance & Materials Engineers June 2013

## 1. How is technical training offered in your area of expertise? (Please choose all that apply)

| | Response Percent | Response Count |
|---|---|---|
| **By DOT Personnel** | **98.3%** | **59** |
| Through local Universities | 40.0% | 24 |
| Through local Community Colleges | 20.0% | 12 |
| Through LTAP Centers | 40.0% | 24 |
| NHI Courses | 78.3% | 47 |
| TC3 online courses | 28.3% | 17 |
| National Organizations (such as Asphalt Institute, ACI, ...) | 70.0% | 42 |
| Other (please specify) | | 21 |
| **answered question** | | **60** |
| **skipped question** | | **0** |

## 2. Are certifications required to document successful completion of training courses?

| | Response Percent | Response Count |
|---|---|---|
| **Yes** | **78.3%** | **47** |
| No | 21.7% | 13 |
| Comments | | 26 |
| **answered question** | | **60** |
| **skipped question** | | **0** |

## 3. Are a series of courses required to acheive the desired level of training or certification

| | Response Percent | Response Count |
|---|---|---|
| Yes | 65.0% | 39 |
| No | 35.0% | 21 |
| Comments | | 20 |
| answered question | | 60 |
| skipped question | | 0 |

## 4. Are you satisfied with the training options available to you in your area of expertise?

| | Response Percent | Response Count |
|---|---|---|
| Yes | 66.7% | 40 |
| No | 33.3% | 20 |
| answered question | | 60 |
| skipped question | | 0 |

## 5. Are the training courses available meeting your needs by providing the required knowledge to participants?

| | Response Percent | Response Count |
|---|---|---|
| Yes | 78.3% | 47 |
| No | 21.7% | 13 |
| answered question | | 60 |
| skipped question | | 0 |

## 6. Please identify desired training that is currently not available either locally or nationally.

| | Response Count |
|---|---|
| | 60 |
| answered question | 60 |
| skipped question | 0 |

## 7. Please identify the largest challenge you face in providing training for those in your area of expertise

| | Response Count |
|---|---|
| | 60 |
| answered question | 60 |
| skipped question | 0 |

## 8. Please prioritize the type of training that is needed (1 being the highest rank)

| | 1 | 2 | 3 | 4 | 5 | Rating Average | Rating Count |
|---|---|---|---|---|---|---|---|
| Basic Technical Training (Understanding of concepts) | **28.3% (17)** | 25.0% (15) | 25.0% (15) | 8.3% (5) | 13.3% (8) | 2.53 | 60 |
| Basic "How To" Training (Learning details of how to perform specific tasks) | 15.0% (9) | **31.7% (19)** | 23.3% (14) | 18.3% (11) | 11.7% (7) | 2.80 | 60 |
| Management Training | 18.3% (11) | 13.3% (8) | 21.7% (13) | 20.0% (12) | **26.7% (16)** | 3.23 | 60 |
| Specialty Training (Bridge Inspection, Asphalt Testing, Ice & Snow Removal, etc.) | **25.0% (15)** | 20.0% (12) | 18.3% (11) | **25.0% (15)** | 11.7% (7) | 2.78 | 60 |
| Training for New and Emerging Technologies | 13.3% (8) | 10.0% (6) | 11.7% (7) | 28.3% (17) | **36.7% (22)** | 3.65 | 60 |
| | | | | | **answered question** | | **60** |
| | | | | | **skipped question** | | **0** |

## 9. Please identify your affiliation

| | | Response Percent | Response Count |
|---|---|---|---|
| Construction | | 15.0% | 9 |
| Design | | 20.0% | 12 |
| **Materials** | | **35.0%** | **21** |
| Maintenance | | 20.0% | 12 |
| Other (please specify) | | 10.0% | 6 |
| | **answered question** | | **60** |
| | **skipped question** | | **0** |

## 10. Please identify one action that would make a positive impact on training in your area of responsibility

| | Response Count |
|---|---|
| | 60 |
| **answered question** | **60** |
| **skipped question** | **0** |

| Q1. How is technical training offered in your area of expertise? (Please choose all that apply) | |
|---|---|
| 1 | Through online options, such as RedVector.com |
| 2 | AASHTO/Clear Roads CBT classes |
| 3 | Also have materials testing offered through the state asphalt and concrete associations |
| 4 | By DOT Representatives (consultants). |
| 5 | The LTAP center in the DOT also contracts training with SMEs on various topics. |
| 6 | Consultants |
| 7 | Other state agencies Vendors Contract trainers Professional training companies |
| 8 | Consultants |
| 9 | Includes engineering and technician training |
| 10 | Local Organizations -- NJ Society of Asphalt Technologist, Local Chapter of ACI |
| 11 | Besides TC3 online courses, Iowa has several of their own online courses. |
| 12 | We may, but I'm not sure that we use TC3 online. |
| 13 | The state trade organizations for Asphalt and Concrete provide training and certification services for the DOT. |
| 14 | All of the above through our tech transfer section, and research |
| 15 | Consultants/SME Experts |
| 16 | Local organizations such as state asphalt pavement association, etc. |
| 17 | Regional Organizations (such as NETTCP) |
| 18 | Northeast Transportation Training and Certification Program; loacl industry groups |
| 19 | Private Vendors |
| 20 | Construction Management Association of America |
| 21 | in Partnership with local industry associations. |

| Q2. Are certifications required to document successful completion of training courses? | |
|---|---|
| 1 | Only if necessary to maintain a professional license (e.g PE, LS, LA) or certificate (e.g. PMP) |
| 2 | A minority of courses are considered certification courses. These are typicaly material technician certifications (aggregate, asphalt field and plant, cement concrete field. Other training does not offer a certification only a certificate of completion. |
| 3 | in some cases |
| 4 | But we do require a testing process to show competence |
| 5 | For some courses. |
| 6 | Only in some special areas, such as materials testing |
| 7 | Only for stormwater inspection program. |
| 8 | Only sometimes, but not common. |
| 9 | There may be certain topics that would required certifications. |
| 10 | For some training such at NETTCP |
| 11 | Not on all subjects, but training completion is documented in our Learning Management System |
| 12 | Particularly technician certifications |
| 13 | Only for courses that are required by CFR 23 and Iowa's certification program |
| 14 | In some cases such as ICS and water and waste water |
| 15 | Not all courses require documentation |
| 16 | To some degree. In other cases, subject matter awareness. |
| 17 | Yes, but not for all trainings |
| 18 | QC/QA Testers require certification, otherwise no |
| 19 | Depends on the course and desired outcome |
| 20 | Not in all cases |
| 21 | some, but not always |
| 22 | For specific functions, and for documentation of Professional Development Hours. |
| 23 | VDOT specifications require certifications for personnel performing material sampling and acceptance testing. Thus VDOT administers a VDOT certification program that takes resources. This program is also used to satisfy the requirements Title 23 CFR 637. |

| Q2. Are certifications required to document successful completion of training courses? | |
|---|---|
| 24 | Some training requires certifications, others don't |
| 25 | For Construction Inspection and Materials testing |
| 26 | Onlky for testing related certifications. Other construction and non-testing courses do not requjire certification |

| Q3. Are a series of courses required to achieve the desired level of training or certification | |
|---|---|
| 1 | Only hours, typically 30 every 3-years. |
| 2 | Yes, in a very minor amount of certifications (e.g., Asphalt Level 2 Plant Technician) |
| 3 | in some cases |
| 4 | As part of a competency based pay program |
| 5 | Again in special areas such as Avalanche mitigation and explosives handling. |
| 6 | Only in the case of ATSSA TCS. |
| 7 | In some cases there are prerequisites |
| 8 | Not necessarily |
| 9 | ACI prior to NETTCP cert. training |
| 10 | Sometimes depending on the level of certification |
| 11 | In some cases such as ICS and water and waste water certification |
| 12 | This is very much true on the technician side. |
| 13 | Depends on critical nature, i.e., engineering, environmental, for operating special equipment, proficiency-progression is used, etc. |
| 14 | Sometimes |
| 15 | not yet |
| 16 | Potentially developing project management training program that will include multiple courses and may result in certification |
| 17 | Not in most areas but in some it may. For some NETTCP courses you need prerequisites. I think you need them for the different levels in ACI and PCI. |
| 18 | The agency (state DOT) has training requirements for each level |
| 19 | In VDOT's technician certification program, there are multiple levels of certification for various certifications such as Asphalt Field Level I and Level II where Level I is a prerequisite to Level II. In addition, our Construction Inspection and Materials Technician staff are required to have multiple certifications to reach the desired level of training and experience. |
| 20 | In many cases yes, but not in all. |

| Q6. Please identify desired training that is currently not available either locally or nationally. | |
|---|---|
| 1 | Training is available for all directly related material. |
| 2 | I am satisfied with the training options available |
| 3 | Agency specific processes or procedures; and, recently completed research products. |
| 4 | unknown |
| 5 | I am not aware of any |
| 6 | Asphalt production and common refining additives (sulfur, recycled petroleum products, etc) used during refining and production and their affect on the final asphalt product. Statistical analysis training related to paired t-test, or F-test or other comparitive analysis techniques for analyzing two sets of data from same population. Proper equipment, procedures, and QC of blending various additives at both asphalt mixture plants and ready-mixed cement concrete plants. Comprehensive training related to asphalt mixture moisture sensitivity analysis and what can influence the test results and evaluation of additives improve moisture resistance. |
| 7 | Real Estate services is lacking in all disciplines. |
| 8 | The NDDOT has recently gone to contract with UGPTI to develop the training needed. |
| 9 | None |
| 10 | none |
| 11 | Would like to see a more structured offering of courses with career development plans |
| 12 | Training for a VE Study leader or coordinator |
| 13 | N/A |
| 14 | training that could be accepted between the states |
| 15 | None |
| 16 | None that I am aware of |
| 17 | budget management on a highway project |
| 18 | An affordable and portable leadership program for state DOTs. |
| 19 | Supervision Project Management Strategic thinking and planning Settimg management goals |
| 20 | Basic road design - determining best alignments and grading options (without the computer) Cost estimation certification specific to highway construction |
| 21 | NA. |

| Q6. Please identify desired training that is currently not available either locally or nationally. | |
|---|---|
| 22 | None |
| 23 | It may be available, but not always feasible due to location and expense. Often difficult to dig out information and/or get approvals if out of state travel is required. |
| 24 | NA |
| 25 | N/A |
| 26 | Electrical inspection Traffic control inspection |
| 27 | PCI training is only offered nationally. This is both expensive and inconvenient, as training is not generally located in New England. |
| 28 | None |
| 29 | Most training areas are covered, but the materials are outdated or instructor led. We don't have the people to put on a number of instructor led courses. If more courses where converted to WBT's, then more just in time training would be available to our technicians. |
| 30 | We develop our training programs to include specifics about our specifications and Quality Control requirements. Currently we are working on a training program to include QC/QA Soil Embankment specifications and Intelligent Compaction of soils |
| 31 | Having a course similar to the NHI Maintenance Academy for the frontline maintenance employee. |
| 32 | Training is available but funds are not |
| 33 | Access to emergency management and first responder training. Most of this is online and difficult to get our personnel to complete. |
| 34 | ?? |
| 35 | Unaware at this time. Appears training has kept pace with changing times, programs, and technology for the workforce. |
| 36 | Pipe/culvert installation |
| 37 | N/A |
| 38 | Basic construction inspection training. |
| 39 | Specialty equipment training |
| 40 | Geometrict Design (The "Green Book". ) |
| 41 | Your survey is problematic as you demand yes or mo. cetainly manyvof out courses are old and are being updated and we are not perfect. |
| 42 | no sure |

| Q6. Please identify desired training that is currently not available either locally or nationally. | |
|---|---|
| 43 | General Highway Maintenance Training at the State level is needed as our ability to send participants out of state for training is not available at this time. |
| 44 | None |
| 45 | None |
| 46 | We are working to develop comprehensive DOT project management training program. National programs and training exists, but they appear to focus on passing a test, rather than developing people through use of good project management tools. In other words, we don't just want participants to focus on the class, but also develop means to ensure the skills are used in every day work. |
| 47 | None |
| 48 | Not sure. |
| 49 | Question is not germane to my area. |
| 50 | There is no training that is not available. |
| 51 | ?? |
| 52 | Data management. |
| 53 | More web based on demand training is needed to reduce cost and scheduling difficulties. Training on performing the AASHTO Materials Testing Standards. |
| 54 | none come to mind |
| 55 | There are more training opportunities than there is funding. |
| 56 | I would like to see a national certification in the area of Asphalt Mix and Field Placement for DOT's to use in leiu of developing and administering their own. Similar to what ACI and PCI has. This could free up DOT resources needed to administer in house training. |
| 57 | Dealing with contractors and contract enforcement. |
| 58 | None. |
| 59 | I believe we have the training we need. It could be improved by making it available on line. |
| 60 | Training on good construction practices and material issues, including new and state-of-the-art constituents, as well as quality control follow-up procedures |

| Q7. Please identify the largest challenge you face in providing training for those in your area of expertise | |
|---|---|
| 1 | Completion of the course. |
| 2 | Making training a priority and committing the time to training. |
| 3 | Travel and registration budget approval. |
| 4 | Achieving minimum level of expertise for new employees |
| 5 | Making sure that our training developes adequate technicians that can go out in the field and do the work that we need on our state projects |
| 6 | Getting the training course developed. |
| 7 | Budget |
| 8 | Dedicated time to get the training implemented and accomplished. |
| 9 | None |
| 10 | none |
| 11 | Time, funding, upper management support. In tight budget times training is always the first thing to get cut. |
| 12 | Large number of new employees that need training with budgets always limited. Need the next level of training for supervisors and management., |
| 13 | Funding all of the training to meet all of the workforce's needs. |
| 14 | time to review, prepare, teach, and take courses |
| 15 | Keeping good quality instructors |
| 16 | Logistics of training a 1500 employee workforce. |
| 17 | being careful not to have people experience training overload |
| 18 | Overhead funding to pay for student time in class. |
| 19 | Lack of time Too much national training not specific enough to be relevant |
| 20 | Lack of resources to develop and put on the training, particularly in the area of experienced staff (they are too busy getting work out the door to be able to dedicate time to developing training materials) |
| 21 | It is difficult to provide all the training that is important considering the complexities of the work; staff time and expense is the challenge. |
| 22 | Training class times for availability. |
| 23 | Finding a qualified trainer, finding a way to pay for the training and coordinating the trainer with the work loads/schedules of the employees. |
| 24 | Finding people that are motivated to successfully complete the training and then |

| Q7. Please identify the largest challenge you face in providing training for those in your area of expertise | |
|---|---|
| | keeping them once they are trained and certified. |
| 25 | N/A |
| 26 | Keeping the training courses up-to-date. Just-in-time training |
| 27 | Cost and travel. |
| 28 | None |
| 29 | Supervisors/Owners not wanting to give the time and expense to employees for training. |
| 30 | Maintaining sufficient training funds |
| 31 | Time and funding, as well as an established curriculum for frontline highway maintenance workers. |
| 32 | Funding |
| 33 | Our maintenance personnel are spread across a large state, so providing in person training requires a lot of travel. Also getting time set aside for personnel to attend adequate training. |
| 34 | The problem is the "basic training"; it's getting personnel to a higher level of understanding. |
| 35 | Updating, transferring learning materials and tools to electronic formats.<br>Materials and tolls are there, the positions to accomplish this is not. |
| 36 | Resources - personnel, time, funding |
| 37 | Time and money |
| 38 | Having the internal staff and resources to accomplish the training. |
| 39 | Money and time. |
| 40 | Small training budget |
| 41 | Timecand money |
| 42 | funding |
| 43 | Getting the training locally. |
| 44 | Cost |
| 45 | Travel |
| 46 | I know it said "challenge" but I'm going to make it plural. Prioritization of needs, available time and budget given workload, actual use of skills learned in training. |
| 47 | Since we use so many consultants, we don't have many people left in house with |

| Q7. Please identify the largest challenge you face in providing training for those in your area of expertise | |
|---|---|
| | a great deal of technical knowledge. In house people would be very helpful in giving organization-specific training in certain technical areas. |
| 48 | We now have a full time training officer which will help in all areas of course/training opportunities. This will help a great deal in not only offering courses to our people but making them aware of these opportunities. |
| 49 | Finding the time, finances, and rrsources to develop the the necessery training. |
| 50 | The high cost of some training. |
| 51 | funding courses, getting training to new hires in a timely manner. |
| 52 | Available time. |
| 53 | Travel and time away from work. |
| 54 | For those courses administered by agency personnel, this added duty can be taxing to an already overworked staff. |
| 55 | Funding |
| 56 | Resourcing training with instructors. Providing instructional training in our certification programs is typically provided by experienced Materials Division staff always in competition with other core duties. |
| 57 | There's a wide range of needs from entry level to advanced training that is needed and most training available is not agency specific so the training is simply teaching the concepts and not implementation. |
| 58 | Time. We have to pull off production in order to do the training. But, without training, production is not efficient. So, it is a circular trap. |
| 59 | Finding time to get training developed in a professional manner at a reasonable cost. |
| 60 | Since training in construction and materials related courses in not mandated nor are certicates of completion required, most who desparately need exposure to this information are not attending the training opportinites that are presented. |

| Q9. Please identify your affiliation | |
|---|---|
| 1 | Design and Construction |
| 2 | LTAP Center ( in the DOT) |
| 3 | Construction and Materials |
| 4 | Construction and Materials |
| 5 | Pavements and Research |
| 6 | Professional Development |

| Q10. Please identify one action that would make a positive impact on training in your area of responsibility | |
|---|---|
| 1 | Reward for training and completion |
| 2 | Developing a formal training program |
| 3 | "Just-in-time" delivery based upon a clear need. |
| 4 | shared training materials among various states |
| 5 | If we had better coordination to make sure that our certifications/training were applicable in other states that we regularly see technicians from |
| 6 | A one stop Internet location of available recorded webinars or links to recorded webinars from various technical organizations on technical topics/subjects. |
| 7 | Affordable training that doesn't require a humanly presence. |
| 8 | The department has madet the committement to improve with its hiring of UGPTI |
| 9 | None |
| 10 | none |
| 11 | comprehensive approach to training |
| 12 | Shorten the Procurement Process. |
| 13 | More funding. |
| 14 | endorsement from senior staff |
| 15 | A more comprehensive approach. |
| 16 | Capacity to provide more than 32 hours of training per employee per year. |
| 17 | Just in time training - the ability to learn about a topic as a designer is about to use it. |
| 18 | If Alaska DOT employees had electronic individual training plans through an LMS. |
| 19 | Training on supervison/management/project mgmt |
| 20 | Availability of course materials that are easy to customize for specific DOT practices |
| 21 | DOT specific training materials/course/examples |
| 22 | Allow training in certain areas during the week, not weekends. |
| 23 | Master list of what is available, what the level of intended students are and options for date/place of training |
| 24 | Training must be interesting and motivate the trainee. |

| Q10. Please identify one action that would make a positive impact on training in your area of responsibility | |
|---|---|
| 25 | N/A |
| 26 | Year round national inspection courses |
| 27 | Cost reduction |
| 28 | None |
| 29 | Web based exams when identity can be secured for the person taking the exam |
| 30 | Funding |
| 31 | Require national certifications for maintenance employees the same way we do for construction inspectors. |
| 32 | Buy in by Executive Office |
| 33 | A streamlined and effective online training process through webinar, gotomeeting, etc. |
| 34 | See #7. |
| 35 | Increase staffing |
| 36 | National Certifications for materials testing that would make state to state reciprocity achievable |
| 37 | More hands-on activities as part of training. |
| 38 | Standardized certification providing basic knowledge of various subject mater. |
| 39 | Support for an equipment rodeo |
| 40 | Enought budget to fullfill the training plans that we have set up. |
| 41 | Simple youtube hands on demo of test procedures or inspection requiements |
| 42 | More funding |
| 43 | More maintenance training for the technicians. |
| 44 | Additional budget for training |
| 45 | Better web courses |
| 46 | Need good vision for how our organization is anticipated to look in 5 or ten years. We can then clearly identify a comprehensive training program and skill sets needed for advancement to various organization levels. Next step would be to perform training needs gap analysis understanding ultimate vision and identify available classes and/or class development needs. |
| 47 | Have a centralized person in each discipline (Construction, Materials, Design, etc.) to map out statewide training requirements for all sections across a given discipline. |

| Q10. Please identify one action that would make a positive impact on training in your area of responsibility | |
|---|---|
| 48 | Having one website/location where all training opportunities can be reviewed by subject/date/time/cost/etc from all known entities in Question 1 above. |
| 49 | Reassesment and revision of our construction inspection program. We are in this process right now. |
| 50 | Lower costs. |
| 51 | Needed courses available on demand. |
| 52 | Improved math, science and writing skills for new employees. |
| 53 | More collaboration on development among states would reduce cost and redundancy. |
| 54 | availability of more resources for updating course curriculum and manuals |
| 55 | Adequate Funding |
| 56 | Nationally recognized and supported certification in Asphalt Mix Testing made available to DOT's similar to ACI for Concrete or NICET for soils. Prefer this program be an AASHTO program though. |
| 57 | Additional in-house training staff |
| 58 | The commitment of time to training needs. In other words, the time for training would be directly included in production schedules. |
| 59 | Getting our training available on line. |
| 60 | Recognition and instruction related to the unique geographic, environmental and local materials characteristics addressed in the training. |