

NCAT Report 13-10



**WESTERN WORKSHOP ON  
ASPHALT MIXTURE PERFORMANCE TESTER**

*Summary Report*



November 2013



277 Technology Parkway ■ Auburn, AL 36830

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16. Abstract To continue supporting the implementation of the AMPT for Superpave mix design and for asphalt pavement design and analysis, a western workshop on the AMPT was organized by the Federal Highway Administration (FHWA) and the National Center for Asphalt Technology (NCAT) at the Nevada Department of Transportation (NDOT) headquarters in Carson City, Nevada on September 24 and 25, 2013. This workshop was specifically organized for state DOT representatives from the Rocky Mountain Asphalt User and Producer Group (RMAUPG) and the Pacific Coast Conference on Asphalt Specifications, who were not able to attend the national AMPT workshop in Atlanta, Georgia in September 2012. Since many of the participants of the western workshop were not familiar with the AMPT, the workshop included both (1) a discussion of the development and implementation of AMPT and relevant test procedures, and (2) a hands-on demonstration of the testing equipment in the NDOT materials laboratory. This report summarizes the information presented at the workshop and the challenges, potential solutions, and future needs discussed in the round table discussion sessions for implementing the AMPT.			
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***Summary Report***

By

Nam H. Tran, PhD, PE, LEED GA  
Adam J. Taylor, PE

National Center for Asphalt Technology  
Auburn University, Auburn, Alabama

And

Jeffrey N. Withee, PE

Federal Highway Administration

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## EXECUTIVE SUMMARY

To continue supporting the implementation of the AMPT for Superpave mix design and for asphalt pavement design and analysis, a western workshop on the AMPT was organized by the Federal Highway Administration (FHWA) and the National Center for Asphalt Technology (NCAT) at the Nevada Department of Transportation (NDOT) headquarters in Carson City, Nevada on September 24 and 25, 2013. This workshop was specifically organized for state DOT representatives from the Rocky Mountain Asphalt User and Producer Group (RMAUPG) and the Pacific Coast Conference on Asphalt Specifications, who were not able to attend the national AMPT workshop in Atlanta, Georgia in September 2012. Since many of the participants of the western workshop were not familiar with the AMPT, the workshop included both (1) a discussion of the development and implementation of AMPT and relevant test procedures, and (2) a hands-on demonstration of the testing equipment in the NDOT materials laboratory.

There were nine presentations that covered a wide range of topics, from the importance of performance testing and development of the AMPT to the users' experiences, applications of AMPT testing results, and ongoing research relevant to the AMPT. All slides from the presentation made at the workshop are included in a separate document (<http://www.eng.auburn.edu/center/ncat/SEAUPG/2013meeting.pdf>).

There was a break-out group round table discussion session organized during the workshop to encourage the participants to discuss challenges, potential solutions, and future needs for implementing the AMPT. A summary of the main topics discussed for AMPT implementation follows.

- There is a need to document benefits and successes of implementing the AMPT. Executive level briefs documenting quantified benefits and unified implementation efforts between AASHTO, FHWA and other organizations were suggested to get the attention of management for addressing the challenge of agency allocation of resources.
- It is important to continue to provide training opportunities for technicians and engineers. This includes both making the NHI training course videos available online on demand and organizing on-site training for agency and contractor personnel in states that plan to implement the AMPT in the near future.
- The RMAUPG was mentioned as a potential parent organization for a western AMPT user group. Web meetings were suggested as the best way to update agency implementation status, share implementation experience, and identify future needs.
- Further guidance on use of test results in a DOT's operations is needed. In addition, increased capabilities of the AMPT make it a more attractive purchase for user agencies.
- To potentially address the challenge of limited resources allocated for implementing the AMPT, plant mixtures and/or constituent materials may be sampled in advance for AMPT testing in the off-season.
- A database with dynamic modulus and flow number test results, such as those from the FHWA Mobile Lab, could be used as a reference point for new AMPT users to get a sense of reasonableness for their data.

In summary, through the workshop, the participants were able to (1) obtain information regarding the AMPT development, capabilities, and current national implementation activities; (2) participate in a hands-on demonstration of the AMPT test equipment and data analysis approaches for dynamic modulus and flow number test results; (3) discuss their challenges and potential solutions in implementing the AMPT; (4) and identify agency needs to support AMPT implementation.

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## 1. INTRODUCTION

The Asphalt Mixture Performance Tester (AMPT), formerly known as the Simple Performance Tester (SPT), is a servo-hydraulic testing device developed under National Cooperative Highway Research Program (NCHRP) Project 9-29 (1). The AMPT can be used to conduct three mixture performance tests, including dynamic modulus ( $E^*$ ), flow number ( $F_n$ ), and flow time ( $F_t$ ), in accordance with AASHTO TP 79, *Standard Method of Test for Determining the Dynamic Modulus and Flow Number for Asphalt Mixtures Using the Asphalt Mixture Performance Tester (AMPT)*.

The dynamic modulus test is being implemented for determining the viscoelastic properties of asphalt mixtures over a wide range of temperatures and frequencies. The test results can be analyzed according to AASHTO PP 61, *Standard Practice for Developing Dynamic Modulus Master Curves for Asphalt Mixtures Using the Asphalt Mixture Performance Tester (AMPT)*, to generate primary asphalt mixture inputs for the AASHTOware® Pavement ME Design software (formerly known as the Mechanistic Empirical Pavement Design Guide (MEPDG) and DARWin-ME™).

The flow number test has been adopted for evaluating the resistance of asphalt mixtures to permanent deformation. A set of testing parameters and criteria for the flow number test has been incorporated in AASHTO TP 79-13. Even though the AMPT can be used to conduct the flow time test, this test currently is not widely used.

In an effort to support the implementation of the AMPT for Superpave mix design and for asphalt pavement design and analysis, a national workshop on the AMPT was organized in Atlanta, Georgia on September 11 and 12, 2012 as part of Pooled-Fund Study TPF-5(178). The workshop provided a forum to discuss the development and implementation of the AMPT and relevant test procedures for evaluating the performance of asphalt mixtures and providing inputs for MEPDG pavement design. Since then, several main topics discussed during the workshop have been considered for further research as time and funding permit.

To continue supporting the implementation effort, a western workshop on the AMPT was organized by the Federal Highway Administration (FHWA) and the National Center for Asphalt Technology (NCAT) at the Nevada Department of Transportation (NDOT) headquarters in Carson City, Nevada on September 24 and 25, 2013. This workshop was specifically organized for state DOT representatives from the Rocky Mountain Asphalt User and Producer Group (RMAUPG) and the Pacific Coast Conference on Asphalt Specifications, who were not able to attend the national AMPT workshop in Atlanta, Georgia. Since many of the participants of the western workshop were not familiar with the AMPT, the workshop included both (1) a discussion of the development and implementation of AMPT and relevant test procedures, and (2) a hands-on demonstration of the testing equipment in the NDOT materials laboratory.

## 2. AGENDA

Figure 1 shows the final agenda of the western AMPT workshop, which includes the following:

- Overview of AMPT development, capabilities, and current national implementation activities.

- Demonstration of the AMPT test equipment and data analysis approaches for dynamic modulus and flow number test results.
- Round table discussions for participants to share their experiences with the AMPT and to identify agency needs to support AMPT implementation.

**Tuesday, September 24, 2013**

**Session 1 (Nam Tran, NCAT, Moderator)**

- 8:00–8:15 Introduction and Welcome. *Jeff Withee, FHWA*
- 8:15–8:45 AMPT Pooled Fund Project and Activities. *Jeff Withee, FHWA*
- 8:45–9:15 Why Performance Testing. *Ray Bonaquist, AAT*
- 9:15–10:00 AMPT Development. *Ray Bonaquist, AAT*
- 10:00–10:15 Break
- 10:15–10:45 Pooled Fund ILS Results. *Nam Tran, NCAT*
- 10:45–11:15 Overview of Equipment Setup, Calibration & Maintenance. *Adam Taylor, NCAT*
- 11:15–11:45 Overview of Specimen Preparation and Testing. *Adam Taylor, NCAT*
- 11:45–1:15 Lunch

**Session 2 (Jeff Withee, FHWA, Moderator)**

- 1:15–2:15 User’s Experience with AMPT  
 - NVDOT AMPT Implementation. *Nathan Morian, NDOT*  
 - AMPT Testing and Data Management. *Michael Stanford, CDOT*
- 2:15–2:30 Break / Split for rotations
- 2:30–3:30 AMPT Lab Testing and Results Analysis {Rotation 1}
- 3:30–3:45 Break / Groups rotate
- 3:45–4:45 AMPT Lab Testing and Results Analysis {Rotation 2}  
 { Rotation Topic A – AMPT Specimen & Equipment - Lab Demonstration}  
 { Rotation Topic B – Data Analysis and Results - Presentation}
- 4:45–5:00 Review and Charge for Day 2 Round Table Discussions

**Wednesday, September 25, 2013**

**Session 3 (Adam Taylor, NCAT, Moderator)**

- 8:00–10:30 Round Table Discussion (2 groups). *Jeff Withee & Nam Tran, Facilitators*
- 10:30–11:00 Break
- 11:00–11:15 Reports on Round Table Discussion. *Facilitators*
- 11:15–11:30 Additional Questions and Wrap-up. *Jeff Withee & Nam Tran*
- 11:30 Adjourn

**FIGURE 1 Agenda for Western AMPT Workshop at NDOT Headquarters, Carson City, Nevada**



### 3. PARTICIPANTS

There were 19 participants, of which 14 attendees were from 10 state transportation agencies, four participants from the University of Nevada at Reno, and one attendee from the FHWA office in Carson City, Nevada. A list of participants and speakers is provided in Appendix A.

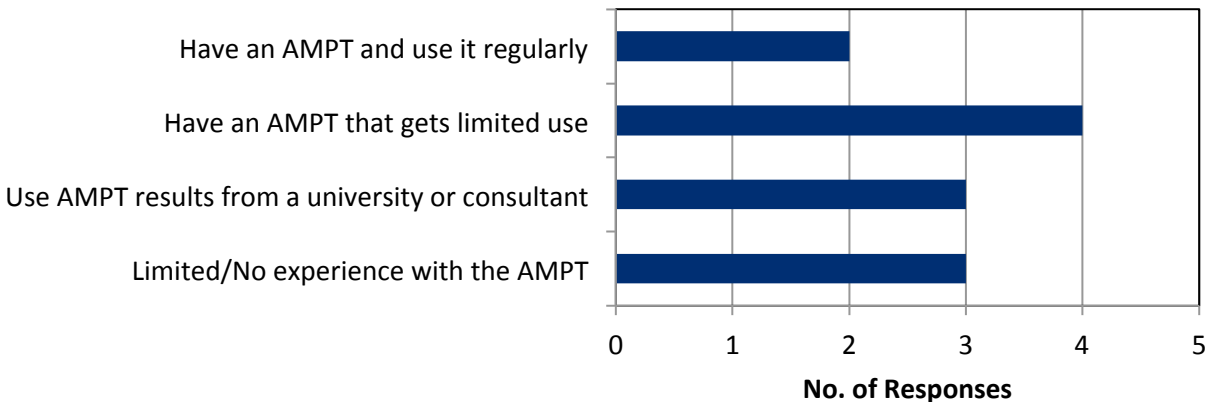
### 4. PRESENTATIONS

As shown in Figure 1, there were nine presentations made during the workshop. The presentations covered a wide range of topics, from the importance of performance testing and development of the AMPT to the users' experiences, applications of AMPT testing results and ongoing research relevant to the AMPT. All slides from the presentation made at the workshop are included in a separate document (<http://www.eng.auburn.edu/center/ncat/SEAUPG/2013meeting.pdf>).

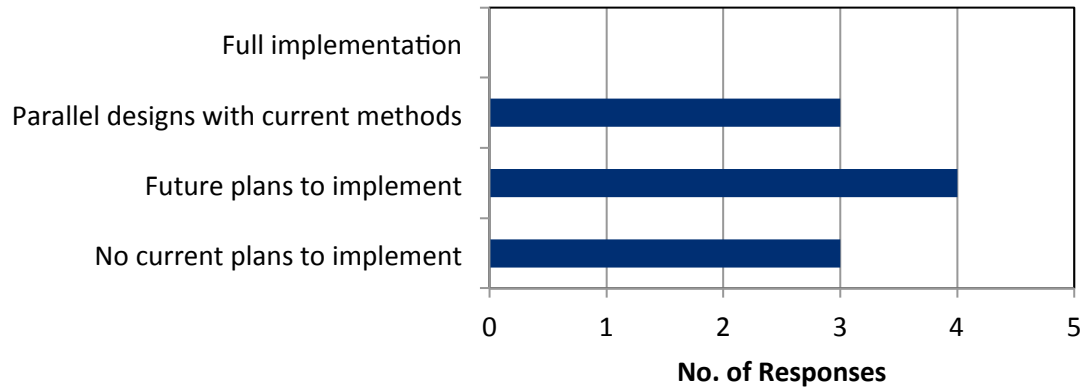
### 5. ROUND TABLE DISCUSSION

In Day 2, the attendees of the workshop were divided into two groups for round table discussion. During the discussion, the participants were encouraged to (1) discuss hurdles in implementing the AMPT, share strategies to address existing issues with equipment, test procedures and acceptance criteria, and (2) identify future needs. Below is a summary of the main challenges and possible solutions discussed in the two groups during the round table discussion. More information about the round table discussion is included in Appendix B.

- Figures 2 and 3 show the number of responses when the participants were asked to respond to questions regarding the status of implementing the AMPT and Pavement ME Design, respectively.



**FIGURE 2 Current AMPT Implementation Status**



**FIGURE 3 Current Pavement ME Design Implementation Status**

- Challenges and needs
  - Potential changes in test procedures and criteria, especially the flow number test and rutting model in the Pavement ME Design. There is a risk of implementing a new test method that may be changed or updated in the future.
  - Significant coordination and education efforts. Implementing a new test method requires not only coordination and education within the state agency but also with industry partners.
  - Limited resources (funding and staffing). Laboratory staff is responsible for quality assurance testing and performance testing in the current specifications. There are not enough people in the laboratory to implement a new test method. In some cases, there is no funding for purchasing new equipment and/or no space in the laboratory for new equipment.
  - Scarce aggregate resources. In some states, aggregate pits are not established but open depending on paving projects. It is difficult to develop a plan for determining typical material properties in the state.
  - Database of mix properties and field performance data. While resources are limited, there is still a need to develop or update databases of laboratory performance properties and field performance data for materials.
- Potential Solutions
  - Documented benefits and successes. Executive level briefs documenting quantified benefits of implementing AMPT and unified implementation effort between AASHTO, TRB, FHWA and other organizations were suggested to get the attention of higher management for addressing the challenge of agency allocation of resources.
  - AMPT User Group. The RMAUPG was mentioned as a potential parent organization for a western AMPT user group. Web meetings were suggested as the best way to update agency implementation status and share implementation experience.
  - Training Technicians and Engineers. There was significant discussion about how best to have an ongoing training opportunity specific to the AMPT. It includes

both making the NHI training course videos available online on demand and organizing on-site training for agency and contractor personnel in states that plan to implement the AMPT in the near future.

- Further guidance on use of results. Additional information on how AMPT test results can be applied in a DOT's operations would be beneficial.
- Other tests for AMPT. Increased capabilities of the AMPT make it a more attractive purchase for user agencies.
- Conducting AMPT testing in the off-season. While QA and performance testing must be conducted during the construction season, mixtures may be sampled in advance for AMPT testing in the off-season to avoid further straining limited resources.
- Common database of test results. A database with dynamic modulus and flow number test results, such as those from the FHWA Mobile Lab, could be used as a reference point for new AMPT users to get a sense of reasonableness for their data.

## **6. SUMMARY**

Through the workshop, the participants were able to (1) obtain the information regarding the AMPT development, capabilities, and current national implementation activities; (2) participate in hands-on demonstration of the AMPT test equipment and data analysis approaches for dynamic modulus and flow number test results; (3) discuss their challenges and potential solutions in implementing the AMPT; (4) and identify agency needs to support AMPT implementation.

## REFERENCES

1. Bonaquist, R. *Refining the Simple Performance Tester for Use in Routine Practice*. NCHRP Report 614, National Cooperative Highway Research Program, Washington, D.C., 2008.

**APPENDIX A  
PARTICIPANT LIST**

<b>ID</b>	<b>Agency Name</b>	<b>First Name</b>	<b>Last Name</b>
1	Advanced Asphalt Technologies, LLC	Ramon	Bonaquist
2	Alaska Department of Transportation	Stephan	Saboundjian
3	Arizona Department of Transportation	Janet	Doerstling
4	California Department of Transportation	Frank	Chavez
5	Colorado Department of Transportation	Michael	Stanford
6	Federal Highway Administration-HIF	Jeffrey	Withee
7	Federal Highway Administration-NV	Iyad	Alattar
8	Idaho Department of Transportation	Mike	Santi
9	Montana Department of Transportation	Ross	Metcalfe
10	Montana Department of Transportation	Devin	Roberts
11	National Center for Asphalt Technology	Nam	Tran
12	National Center for Asphalt Technology	Adam	Taylor
13	Nevada Department of Transportation	Changlin	Pan
14	Nevada Department of Transportation	Nathan	Morian
15	Nevada Department of Transportation	Ryan	Polish
16	Nevada Department of Transportation	Kelly	Walsh
17	Oregon Department of Transportation	Mike	Stennett
18	University of Nevada -Reno	Cheng	Zhu
19	University of Nevada -Reno	Nick	Weitzel
20	University of Nevada -Reno	Saroj	Thapa
21	University of Nevada -Reno	Rukesh	Maharjan
22	Utah Department of Transportation	Clark	Allen
23	Washington Department of Transportation	Steve	Davis

## APPENDIX B ROUND TABLE DISCUSSION NOTES

### B.1. Group 1

#### *B.1.1 Current Status Survey*

##### AMPT

- 0 – Have an AMPT and use it regularly
- 3 – Have an AMPT that gets limited use
- 2 – Use AMPT results from a university or consultant
- 1 – Limited/No experience with the AMPT

##### Pavement ME Design

- 0 – Full implementation
- 2 – Conducting parallel design with current pavement design methods
- 0 – Future plans to implement
- 2 – No current plans to implement

Note – the different number of responses relates to no UNR response for MEPDG and one state not sure of current MEPDG status.

#### *B.1.2 Implementation Challenges and Needs*

- Update and Expand MEPDG Materials Library
  - States that have already developed an initial materials library for MEPDG implementation will continue to have a need to update their libraries with new mixtures and materials used in their states.
- Lack of Performance Data for New Mixtures
  - As new materials and mixtures are used in states, there typically will not be long-term performance data available to support local calibration of the MEPDG for these new materials and mixtures.
- Resources and Priorities (Staffing)
  - {3 votes for this as a top challenge} Most states have limited resources (staff and funding) so evaluation of new equipment such as the AMPT must compete for those resources with other priorities such as routine QA operations. In addition, many states are currently performing or implementing other performance related testing such as the Hamburg or APA which is further straining the same staff resources that would be involved in AMPT implementation.
- Consistency of Test Procedures and Criteria (Flow Number; rutting model inputs)
  - {4 votes for this as a top challenge} Some states noted the risk in undertaking a large materials testing program to develop baseline material properties, when new testing technologies or new nationally accepted standards may be introduced in the future that could differ from the states' current practices. The result would be less useful data or the need to attempt a data conversion or retesting of materials. This risk was also discussed in terms of

emerging/proposed MEPDG design models that may become accepted in the future and require new or different material input data.

- Agency Policy Shift (& Industry Coordination/Education)
  - {4 votes for this as a top challenge} It was discussed that it typically takes public agencies (with many different staff, stakeholders, and organizational levels) a significant amount of time to fully implement new technologies and approaches. Advancement of these types of technologies takes a significant level of effort for explanation and education to various management levels and industry members.

### *B.1.2 Potential Solutions*

- AMPT User Group (agency status updates; web meetings)
  - The RMAUPG was mentioned as a potential parent organization for a western AMPT user group. It was noted that web meetings may be the best way to facilitate the user group communication considering travel limitations and the fact that current RMAUPG annual meeting agendas are usually already very full.
- Documented Benefits/Successes (executive level; AASHTO/TRB/FHWA/Asphalt Institute, etc. tie-ins & unified efforts; quantified benefits)
  - In addressing the challenge of agency allocation of limited resources, executive level briefs clearly defining quantified benefits of AMPT implementation were suggested. A unified effort between AASHTO, TRB, FHWA and other organizations was also mentioned as important to move forward these types of implementation efforts.
- Common Database of Test Results (with basic mix information)
  - A database with dynamic modulus and flow number test results was suggested as a reference point for AMPT users to compare their data to other similar mixtures. The idea would be for new users to get a sense of reasonableness for their data. In order to be useful to a broad range of agencies across the country, the FHWA Mobile Lab data was mentioned as a potential source for data from its many site visits.
- Training Technicians and Engineers
  - There was significant discussion about how best to have an ongoing training opportunity specific to the AMPT. The previous NHI course was noted as a good baseline for much of the content to use. Consideration was given to having a general overview session for all participants and then splitting the training into two simultaneous tracks where technicians would focus on the specimen fabrication and hands-on operation of the equipment while engineers would focus on the analysis of data quality, evaluation of results, and application of the data such as for MEPDG inputs. The past NHI course format of using two AMPTs at one specific location was seen as limiting. Preferably it could be modified to a one AMPT format that could be hosted at various locations around the country where the lab had an existing AMPT and appropriate classroom space. It was also noted that there was a general session question about adapting the current NHI course video content into a web based training format that is available on-demand. There was an idea to have a minilab trailer with the AMPT to travel

around for training. It was discussed that if the trailer had just the AMPT it would be much less expensive than the FHWA Mobile Lab; however it was noted that costs may still be a limiting factor to this approach.

- Use of Results – Explanation and Guidance
  - Some participants noted that additional information on how AMPT test results can be applied in a DOT’s operations would be beneficial.
- Other Tests for AMPT
  - Information on the use of fixtures for overlay testing and/or indirect tension test geometries were discussed as needs. It was noted that increased capabilities of the AMPT make it a more attractive purchase for user agencies.

## **B.2. Group 2**

### *B.2.1 Current Status Survey*

#### AMPT

- 2 – Have an AMPT and use it regularly
- 1 – Have an AMPT that gets limited use
- 1 – Use AMPT results from a university or consultant
- 2 – Limited/No experience with the AMPT

#### MEPDG

- 0 – Full implementation
- 1 – Conducting parallel design with current pavement design methods
- 4 – Future plans to implement
- 1 – No current plans to implement

### *B.2.2 Implementation Challenges and Needs*

- Staffing
  - Four of the six agencies identify this as a challenge. State agencies currently do not have funding to hire a new technician or engineer dedicated for this testing. They are concerned that current laboratory testing personnel do not have technical knowledge to conduct this testing.
  - In three state agencies, the pavement design position has been vacant for a while, and they are in the process of hiring a new engineer for this position.
- Testing Time
  - Two of the six agencies are concerned that this testing may be too long and/or complicated for routine testing.
- Capital Investment
  - Three of the six agencies do not have funding for purchasing equipment or reconfiguring the laboratory for new equipment.
- No established aggregate pits.
  - In two states, aggregate sources are not established (but based on projects), so it may be difficult to develop a plan for determining typical material inputs.



### *B.2.3 Potential Solutions*

- Staffing
  - State agencies may have down time in the winter. Thus, it is possible to conduct some AMPT testing during the winter, but it may require some planning in advance.
- User Group
  - If there is enough interest within each user/producer group, an AMPT user group may be established to exchange information and user's experience and to provide continuing technical training.
- Continuing Training Opportunities
  - In addition to the training within the user's group, state agencies may work with industry partners to organize further training within the state for agency and contractors personnel.
- Justification for Implementation
  - Some of the staffing and funding problems may be solved if the AMPT is in one of the FHWA initiatives, such as the Every Day Counts program, to get the attention of higher management.