



NTPEP Model Deployment Handbook

Requested by:

**American Association of State Highway
and Transportation Officials (AASHTO)**

**Standing Committee on Highways
NTPEP Oversight Committee**

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AASHTO's
National Transportation
Product Evaluation
Program

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Executive Summary

Overview

The National Transportation Products Evaluation Program (NTPEP) *Model Deployment Handbook* encourages all DOTs to further incorporate the extensive resources produced through AASHTO into their product acceptance procedures. The handbook is particularly aimed at transportation agencies with limited experience of NTPEP. It summarizes program benefits and how to overcome challenges to implementation of NTPEP. It also provides a “best-in-class” template for deploying NTPEP. Appendices A through C provide an overview of findings from research conducted during preparation of the handbook, including vendors’ perspectives of the program.

Best-in-Class Template for Deploying NTPEP

Newcomer states can follow a template, based on advice from ten “best-in-class” state DOTs, for making best use of available resources to apply NTPEP in a practical and organized manner:

1. Pilot NTPEP deployment with a product category where staff learning curve is not steep.
2. Plan to expand NTPEP deployment one product category at a time.
3. Gather product-specific documents and other resources on NTPEP evaluation.
4. Talk to the lead-testing state or other participating states about NTPEP procedures.
5. If possible, attend NTPEP panel meetings.
6. Overhaul state product acceptance criteria to match NTPEP evaluation procedures.
7. Be willing to eliminate specific tests that NTPEP does not conduct.
8. Allow a phase-in period for vendors.
9. Expand the use of NTPEP data to additional product categories.

Benefits of NTPEP

States can benefit if they switch from in-house evaluation or manufacturer certification of new products to using NTPEP evaluation data for product acceptance. The extent to which benefits are achieved varies from state to state but are likely to include:

- **Cost Savings.** Relying on NTPEP evaluations for product acceptance in place of in-house evaluations usually generates cost savings for DOTs.
- **Quality Assurance.** NTPEP offers an independent, rigorous, accurate, and unbiased source of product information. This level of quality assurance is hard to replicate through in-state or manufacturer based evaluation methods.
- **More Sophisticated Testing.** Because states are able to pool their resources in NTPEP, the program can apply sophisticated testing procedures. In contrast, in-house testing sophistication at individual DOTs may be constrained by staff or equipment shortages.
- **Quick and Predictable Product Evaluation Schedules.** NTPEP reports are released on a regular and well-publicized schedule. Within individual agencies, however, staff and or equipment shortages may prevent timely and predictable evaluation of products; sometimes evaluations can be put aside until time is available or abandoned altogether.

- **Staff Time Savings.** Reviewing NTPEP evaluation results takes much less time than in-house evaluation of products. This frees up staff to focus on other duties.
- **Reduced Travel Lane Tie-Ups.** NTPEP provides time savings for the general public by reducing the need for product field tests on state roads that inconvenience transportation users.
- **Access to More Products.** Since NTPEP is a national program, product evaluations include a more comprehensive array of products than most states can evaluate. A NTPEP test deck may include products individual states would not otherwise hear about and, or products that they lack in-house equipment to evaluate.

Challenges to Use of NTPEP

Newcomers to NTPEP should be prepared for hurdles that threaten to hamper deployment of the program. Most of the commonly encountered barriers to use of NTPEP can be overcome:

- **Dedicating DOT Staff Time to NTPEP Start-Up.** State DOTs new to NTPEP are concerned that participation will take staff away from other assignments. Most states using NTPEP find that initial increases in staff time pay off in longer-term staff timesavings and in greater confidence about product acceptance processes.
- **Meeting NTPEP Travel Demands.** Attendance at product panel meetings is a great way for DOTs to gain familiarity with NTPEP. As the number of products included in NTPEP grows, however, many find they cannot travel to every panel meeting. States should give consideration to other ways to gather information, such as e-mail, printed materials, and phone calls.
- **Accommodating NTPEP Evaluation Turnaround Times.** The potential for lengthy turnaround times in completing NTPEP tests can be a deterrent for state DOTs seeking to add new products to their QPLs in a timely fashion. States can often get advance data from the testing state before final reports are published. States should be aware of evaluation schedules and plan around them.
- **Managing NTPEP Data Reporting Length and Format.** A frequent refrain heard from DOTs that make limited or no use of NTPEP data is that the amount and format of information in NTPEP reports makes extraction of meaningful data in a timely manner difficult. AASHTO's new "data mines" help make NTPEP data easier to navigate, but states must be prepared to familiarize themselves with NTPEP procedures in order to understand the reports.
- **Building NTPEP Awareness Among Senior Managers.** Senior manager support is likely to be key to making NTPEP work in any state, because senior managers can make the resource decisions necessary to support initial investment in NTPEP beyond annual fees. Senior management at the DOT should be made aware of the program and familiar with its benefits.
- **Overcoming Fear of Change.** Staff may be comfortable with existing product evaluation approaches and see no need to make greater use of NTPEP. This is often rooted in a fear of relinquishing control over their evaluation process and trusting data that they have had less input on. Attending panel meetings and influencing work plan development helps DOTs become invested in NTPEP.

What Is NTPEP? The National Transportation Product Evaluation Program, or NTPEP was established in 1994 by AASHTO as a collaborative partnership between state DOTs and vendors of manufactured products. It is designed to conduct lab testing and field performance evaluation on the most commonly used transportation products. In most instances, AASHTO member departments volunteer to host NTPEP evaluations. AASHTO member departments (state DOTs) receive NTPEP reports.

Yearly, the “NTPEP Report Series” includes between 12 and 15 reports on the many products under NTPEP evaluation (many of which are also available in electronic format). Each state DOT maintains the prerogative to use the test data as it suits their needs. NTPEP is supported through voluntary contribution from AASHTO member departments. Each member pays a fee of \$4,500 per year (2004 fee) that covers program administration costs. Testing service fees are collected from participating industry to cover the actual testing of their products and devices.

1.0 Introduction

Why Evaluate Transportation Products and Materials? The safety, convenience, and bottom-line cost of the nation’s highway system depends on the outstanding performance of transportation products and materials like pavement markings, geotextiles, and reflective sign sheeting that are routinely used by state Departments of Transportation (DOTs). To ensure the best mix of safety, cost effectiveness, durability, and functionality when buying these products, states often seek ways to validate their performance. Evaluation of new products using specially designed tests gives DOTs a high degree of comfort about expected product performance, but may be a time and resource intensive effort that requires specialized knowledge and equipment. Over the past 10 years, AASHTO’s National Transportation Product Evaluation Program (NTPEP) has reshaped the way DOTs evaluate and accept many safety, construction, and maintenance-related products for purchase.

NTPEP pools the physical and professional resources of state DOTs to objectively evaluate products of common interest and share results. (A complete list of products and materials currently considered by NTPEP for evaluation is included in Table 1.) The program supports cost-effective product selection choices by state DOTs, since agencies share the cost burden of evaluation and receive assurance that the products they use will meet performance expectations.

Why a NTPEP Model Deployment Handbook? Around the country, industry and state DOT partners agree that growing the NTPEP program is better for vendors and DOTs. Application of the principles described in the guide will help reduce duplication of effort by DOTs for product qualification and strengthen the function of NTPEP as a nationally-coordinated testing service for vendors of proprietary, engineering products. This handbook is intended to encourage all DOTs to make greater use of the extensive resources produced through NTPEP as part of their product acceptance procedures. It is particularly geared to transportation agencies with limited experience of NTPEP that are seeking to deploy the program and reduce their reliance on duplicate or alternate product evaluation approaches.

The core ingredient for success in deploying NTPEP is a network of champions for the program among the states. The primary audience for the handbook is DOT managers with responsibility for overseeing their agencies’ selection of transportation safety, operations, maintenance and construction-related products. Who will be the future champions for NTPEP?

Handbook Organization. This handbook is based on interviews with 20 states and 10 industry vendors. Using the information gathered in these interviews, the handbook describes key benefits of NTPEP; what states save by using the program; a simple, 10-step template for deployment; common hurdles; and industry perspectives on NTPEP. The handbook is organized around three building blocks for establishing an effective NTPEP program at any state DOT:

- **Building Block #1—*Awareness About the Benefits of NTPEP.*** The first section of the handbook describes in simple terms how using NTPEP resources can benefit DOTs. This section also includes simple worksheets for calculating the economic benefits of NTPEP for commonly used products.
- **Building Block #2—*A "Best-in-Class" Template for Deploying of NTPEP.*** The second section of the handbook provides practical start-up hints, based on the experiences of many DOTs, for agencies that are beginning to use NTPEP.
- **Building Block #3—*Challenges to Using NTPEP.*** The third section of the handbook gives guidance on overcoming common hurdles to greater use of NTPEP, drawing on lessons from experienced NTPEP users.

Throughout the handbook, key points are highlighted using actual examples from state DOTs and manufacturer-provided comments. Appendices to the handbook provide detailed information about findings from 30 interviews conducted during the research for this project. The appendices include a discussion of vendors’ attitudes towards NTPEP.

Table 1. NTPEP Product and Material Categories.

Category/ Product	Traffic Control and Safety Products	Construction Materials	Maintenance Materials
	<ul style="list-style-type: none"> • Drums/ delineators • Pavement markings • PCMS/flash panels • RPMs and adhesives • Sign-sheeting materials 	<ul style="list-style-type: none"> • Concrete admixtures • Reinforcing steel (Rebar) • Erosion control products • Geotextiles and geosynthetics • Concrete curing compounds • Plastic pipe 	<ul style="list-style-type: none"> • Joint-sealant materials • Structural steel coatings • Bridge deck polymer overlays • Rapid set concrete patch materials

2.0 Building Block #1—Awareness About the Benefits of NTPEP

States do not always use NTPEP to evaluate new products. Instead they may rely on alternative evaluation methods such as in-house testing or manufacturer-provided performance information. NTPEP offers multiple benefits over alternative methods, but lack of awareness in DOTs about these benefits, sometimes combined with a “we’ve always done it this way” attitude among staff and, or management often poses a hurdle to adoption of NTPEP in place of other product evaluation methods.

By educating their agencies about the benefits of using NTPEP compared to current practices, managers seeking to deploy NTPEP can lay the groundwork for switching. Senior management is more likely to support a switch to NTPEP with resources necessary to assure success if they recognize the benefits of the program. Staff is more likely to accept new evaluation methods if they understand the benefits.

This section describes the ways that states can benefit if they switch from in-house evaluation or manufacturer certification of new products to using NTPEP evaluation data for product acceptance. The extent to which the benefits described below are achieved will vary depending in part on the specific products for which a state DOT adopts NTPEP procedures, the type of evaluation procedures previously in place, and the degree to which they are replaced by NTPEP. Benefits include:

- **Cost Savings.** Relying on NTPEP evaluations for product acceptance in place of in-house evaluations usually generates cost savings for DOTs. Georgia DOT for example now uses NTPEP to evaluate raised pavement markers, reflective sheeting, traffic markings, and flexible delineators, and has eliminated in-house tests for these products. As Georgia DOT has found, switching to NTPEP means an agency can eliminate costs for purchase and maintenance of expensive equipment required to conduct testing in many NTPEP product categories, such as pavement markings and sign-sheeting materials. Staff time savings also generate cost savings because staff spends less time setting up, conducting, and reporting on tests. For pavement markings, PennDOT estimates that setting up and monitoring a single test deck costs between \$7,700 and \$10,500 per year. An addendum to this section provides a sketchbook methodology for calculating cost and timesavings associated with NTPEP.
- **Quality Assurance.** NTPEP offers an independent, rigorous, accurate, and unbiased source of product information that provides a level of quality assurance for DOTs’ product acceptance procedures which is hard to replicate through in-state or manufacturer based evaluation methods. States that rely on manufacturers’ self-certification of their products, or more limited in-house evaluations may not have the same degree of confidence in the performance of their products. States such as Ohio DOT that rely on NTPEP often cite the rigor of side-by-side product comparison as a particular strength of the program. NTPEP tests are often based on ASTM-specified tests or are developed by a consortium of state DOTs, giving them a high degree of credibility.
- **Sophisticated Testing.** Georgia DOT notes that because states are able to pool their resources in NTPEP, the program can apply sophisticated testing procedures. In contrast, in-house testing sophistication at individual DOTs may be constrained by staff or equipment shortages. Kansas DOT for example relies on NTPEP’s geotextiles data because they are not set-up to do in-house testing. Likewise, Washington State DOT reports that NTPEP’s plastic pipe tests use expensive equipment only available to specialized testing centers and such tests are not feasible in individual DOTs due to the cost of testing equipment. Without access to test results, however, DOTs have no way to judge the performance of different manufacturers’ plastic pipe products.

- ***Quick and Predictable Product Evaluation Schedules.*** Kentucky Transportation Cabinet (KYTC), like many DOTs, prefers to rely on NTPEP to evaluate products because it is quicker and more predictable than using other methods of product evaluation. Within individual agencies, staff and/or equipment shortages may prevent timely and predictable evaluation of products; sometimes evaluations can be put aside until time is available or abandoned altogether. In contrast, NTPEP reports are released on a regular and well-publicized schedule. For example, geotextiles products are evaluated every three years by NTPEP and agencies can build their product acceptance procedures around that schedule.
- ***Staff-Time Savings.*** In-house evaluation of products usually requires a significant amount of staff time. Tasks typically include identification of products for evaluation, setting up of tests, actual testing and monitoring activities, and reporting of results. As staff from Arkansas noted, staff resources in any DOT are spread thin and reviewing NTPEP evaluation results takes much less time than in-house evaluation of products. This frees up staff to focus on other duties. Mississippi DOT for example, which uses NTPEP's pavement markings data, reports that the incentive to rely on NTPEP is strong because it reduces staff time spent on testing and enables them to focus on other duties.
- ***Reduced Travel Lane Tie-Ups.*** NTPEP provides time savings for the general public by reducing the need for product field tests on state roads. Tests for products such as pavement markings may require periodic lane closures that inconvenience transportation users. If every state conducts its own tests, closures are more frequent than if a handful of states conduct tests that are shared via NTPEP.
- ***Access to More Products.*** Since NTPEP is a national program, product evaluations include a more comprehensive array of products than most states can evaluate. A NTPEP test deck may include products individual states have otherwise heard about and, or products that they lack in-house equipment to evaluate. For example, PennDOT's pavement markings test decks evaluate more than 200 products annually. If NTPEP is evaluating 100 products per testing cycle, participating states have access to evaluation results for all 100 products without doing their own testing. One state interviewed for this project noted that "we receive better products every year through NTPEP evaluation."

Several components are required to assure successful NTPEP deployment, however better awareness among staff *and* management about benefits should be the foundation on which these components are combined. The next section examines a template for deploying NTPEP.

Benefits of NTPEP Addendum: Worksheets for Calculating Economic Benefits of NTPEP

States that use NTPEP data generally report they are happy with the program. In a 2001 survey, a majority of states indicated they achieve cost and time savings by using NTPEP; most, however, do not keep track of actual cost and timesavings. Empirical review suggests that the amount of cost and timesavings a state can expect will vary by NTPEP product category and by state. Key variables that influence potential savings for DOTs include:

- ***Prior product acceptance approaches:*** If a state conducts in-house evaluation, but eliminates this testing after switching to NTPEP, cost and timesavings are likely to be great. If, however, a state relies on manufacturer self-certification of products, savings are likely to be low. Findings suggest that states may also receive an intangible benefit derived from a higher degree of assurance about product quality when using NTPEP evaluation data.

- ***Cost of capital equipment for evaluation tests:*** Capital equipment costs are a major component of total product evaluation costs, but are likely to be significant only if in-house testing is conducted. The cost of evaluation testing equipment varies across product categories. Some product tests require only rudimentary equipment, while others require complex and expensive equipment. Equipment lifetime and other uses for testing equipment should be considered when estimating apportionment of capital costs. As a rule of thumb, states see greatest savings by using NTPEP for evaluation of product categories that require costly testing equipment.
- ***Cost of labor for evaluation tests:*** Labor costs are a major component of total product evaluation costs, and are likely to be significant if in-house testing is conducted. Staff time is required to prepare product samples, to travel to test sites, to set-up and conduct tests, and to report and analyze results. The amount of staff time required for these activities can vary between product categories and also depends on the frequency and volume of testing. The cost of staff time includes salary, benefits, and overhead. As a rule of thumb, states see greatest savings by using NTPEP for evaluation of product categories that require extensive staff time for tests.
- ***Elimination of non-NTPEP evaluation methods:*** Maximum savings are only guaranteed if a state eliminates non-NTPEP evaluation methods.

This section includes a series of sketch worksheets that states can use to determine the benefits of switching to an exclusively NTPEP-based product acceptance system for selected product categories. The worksheets are intended to help states make an approximate estimate of the cost- and time-savings that can be achieved by using AASHTO's NTPEP evaluation reports to approve selected traffic safety, maintenance, and construction products and materials. Product category worksheets include:

- Pavement markings
- Raised pavement markers
- Geotextiles, and
- Sign sheeting materials

The worksheets rely on a standard in-house staff time cost for product evaluation. This assumes an hourly wage of \$17.43 (equivalent to a salary of \$34,000 per year) and a fringe benefits (health care, retirement, etc.) multiplier of 1.5. Note that overhead costs are not included in this figure.

NTPEP Benefits

Pavement Markings Worksheet

For new pavement marking products, do you usually rely on in-house evaluation tests as part of your process for determining product acceptance?

Yes—Go to line 1 to calculate potential cost and time savings.

No—You probably will not achieve cost and time savings because other product acceptance procedures (e.g., manufacturer provided data [a certification letter], discussions with manufacturer, or independent testing [e.g., university lab such as TTI] will not require more time or cost more than use of NTPEP.)

	Test Deck Set-Up		Examples
	Line 1. How many separate pavement marking test deck locations do you typically set up annually?	4	
	Line 2. Multiply your response in line 1 by a cost of \$2,168. This is the total annual cost for test deck set up. ¹	$4 \times \$2,168 =$ \$8,672	
	Line 3. Multiply your response in line 1 by 16 hours. This is the total annual staff time for test deck set up.	$4 \times 16 = 64$	
Test Deck Monitoring			Examples
	Line 4. How many times do you typically monitor each test deck annually?	2	
	Line 5. Multiply your response in line 4 by your response in line 1	8	
	Line 6. Multiply your response in line 5 by a cost of \$2,168. This is the total annual cost for test deck monitoring. ²	$8 \times \$2,168 =$ \$17,344	
	Line 7. Add \$2,450 to your response on line 6 to account for capital equipment costs. ³	$\$17,344 + \$2,450 =$ \$19,794	
	Line 8. Multiply your response in line 5 by 16 hours. This is the total staff time for test deck monitoring per year.	$8 \times 16 = 128$	
Total Cost and Time Savings			Examples
	Line 9. Combine totals in line 2 and line 7. This is total costs saved.	$\$8,672 +$ $\$19,794 =$ \$28,466	
	Line 10. Combine totals in line 3 and line 8 and divide by 40. This is weeks of staff time saved.	$64 + 128/40 =$ 4.8	

¹ Typical test deck set-up costs are assumed to include cost of 1) one day of workzone safety set up/take down at \$1,750, and 2) one day of salary for two senior engineering technicians at \$17.43 per hour plus benefits at \$17.43 × 1.5 multiplier (\$418). Total equals \$2,168. Note that this cost assumes the product manufacturer conducts initial application of markings.

² Typical test deck monitoring costs are assumed to include cost of 1) one day of workzone safety set up/take down at \$1,750; 2) one day of salary for two senior engineering technicians at \$17.43 per hour plus benefits at \$17.43 × 1.5 multiplier (\$418). Total equals \$2,168.

³ Cost of testing equipment is \$2,450 per year (based on following costs: \$2,100 per year for \$21,000 retroreflectometer with 10-year lifespan, used 100 percent for pavement marking tests. \$350 for \$7,000 for color meter with 10-year lifespan that is used 50 percent for pavement marking tests.)

Raised Pavement Markers Worksheet

For new raised pavement marker (RPM) products, do you usually rely on in-house evaluation tests as part of your process for determining product acceptance?

Yes—Go to line 1 to calculate potential cost and time savings.

No—You probably will not achieve cost and time savings because other product acceptance procedures (e.g., manufacturer provided data (a certification letter), discussions with manufacturer, or independent testing (e.g., university lab such as TTI) will not require more time or cost more than use of NTPEP.

Examples

	Line 1. How many new RPM products do you test annually? (As a guide, NTPEP evaluates about 8 RPM products per year.)	4
Lab Testing		Examples
	Line 2. Do you conduct a “coefficient of luminous intensity” test using a light tunnel? If yes, multiply your response in line 1 by \$2,168.	$4 \times \$2,168 =$ \$8,672
	Line 3. How many other separate tests (e.g., compression strength, lens cracking, temperature resistance, etc.) do you conduct for each product?	4
	Line 4. Multiply your response on line 3 by \$28.36 and add to the figure in line 2 (or zero). This is the lab testing cost savings. ⁴	$4 \times \$28.36 =$ \$113.44
	Line 5. Multiply your response on line 3 by 0.75. This is your lab testing staff time savings in hours.	$4 \times 0.75 = 3$
Field Testing		Examples
	Line 6. Enter \$3,328 on line 6. ⁵	\$3328
	Line 7. Enter 128 hours on line 7. ⁶	128
Total Cost and Time Savings		Examples
	Line 8. Add line 2, 4, and line 6. This is your cost savings.	$\$8,672 + \113.44 $+ \$3328 =$ \$12,113.44
	Line 9. Add line 5 and line 7 and divide the result by 40. This is your staff time savings in weeks.	$(3 + 128)/40 =$ 3.3

⁴ Labor costs: 45 minutes of staff time to log products, set up machine, and record and report results at \$26 per hour direct plus indirect labor rate for senior technician. Capital costs: \$8.75 (based on NTPEP test protocol that requires three pieces of equipment each costing \$150 and a lifespan of 10 years, and a \$25,000 compression strength tester used less than one percent for RPMs testing).

⁵ Field tests require four, two-day field visits by two staff at \$26 per hour.

⁶ Field tests require four, two-day field visits by two staff at \$26 per hour.

NTPEP Benefits

Geotextiles Worksheet

For new geotextile products, do you usually rely on in-house evaluation tests as part of your process for determining product acceptance?

Yes—Go to line 1 to calculate potential cost and timesavings.

No—You probably will not achieve cost and time savings because other product acceptance procedures (e.g., manufacturer provided data (a certification letter), discussions with manufacturer, or independent testing (e.g., university lab such as TTI) will not require more time or cost more than use of NTPEP.

Examples

	Line 1. How many new geotextile products do you test annually? (As a guide, NTPEP evaluates 20 geotextile products per quarter.)	5
	Line 2. How many separate tests (e.g. tensile strength, permeability, etc.) do you conduct for each product? (As a guide, NTPEP conducts six different materials property tests such as permeability, tensile, and soil retention tests per product.)	6
	Line 3. Multiply your response on line 2 by \$211. This is your cost savings per product tested. ⁷	$6 \times \$211 =$ \$1,266
	Line 4. Multiply your response on line 2 by 4. This is your testing staff time savings in hours per product tested. ⁸	$4 \times 6 = 24$
	Line 5. Multiply your response on line 3 by your response on line 1. This is your total cost savings.	$5 \times \$1266 =$ \$6330
	Line 6. Multiply your response on line 4 by your response on line 1 and divide by 40. This is your total staff time savings in weeks.	$120/40 =$ 3

⁷ This assumes a \$107 cost per test for equipment (as estimated by NYDOT) and a \$104 cost per test for labor (four hours per test \times \$26 per hour for direct and indirect labor costs).

⁸ This assumes four hours per test for each product tested.

Retroreflective Sign Sheeting Worksheet

For new retroreflective sign sheeting products, do you usually rely on in-house evaluation tests as part of your processes for determining product approvals for Qualified Products Lists?

Yes - Go to Line 1 to calculate potential cost and timesavings

No - You probably will not achieve cost and time savings because other product acceptance procedures (e.g. manufacturer provided data such as a certification letter, discussions with manufacturer, or independent testing through private or university laboratory) will not require more time or cost more than using NTPEP data.

Line 1	How many new sign sheeting products do you test annually for QPL approval? (As a guide, NTPEP evaluates an average of 50 products per year.)	E.g. 10
Line 2a	Laboratory testing time per product using tests specified in ASTM D4956 (hours) (considers multiple samples prepared / tested simultaneously)	10
Line 2b	Field testing time per product using tests specified in ASTM D4956 (hours) (considers multiple samples prepared / tested simultaneously over 3 years)	6
	Travel time (including preparation time) to test site (round trip) (hours) (includes collecting and returning panels to site)	E.g. 4
	Number of visits to the test site per year	E.g. 2
Line 2c	Multiply Travel time by site visits per year. This is the total travel time saved per year for field testing.	E.g. 8
Line 3a	Multiply your response on Line 1 by Line 2a. This is your testing staff time savings in hours for laboratory testing per year.	E.g. 10x10 = 100
Line 3b	Multiply your response on Line 1 by Line 2b and add Line 2c. This is your testing staff time savings in hours for field testing per year.	E.g. 10x6 + 8 = 68
Line 3c	Add Lines 3a and 3b. This is your total time savings per year in hours.	E.g. 168
Line 4	Multiply your result on Line 3c by \$26.14. This is your testing cost savings per year. (see Note 1).	E.g. 168 x \$26.14 = \$4,395.52
Line 5	Equipment calibration and maintenance costs per year (See Note 2).	E.g. \$3,600
Line 6	If you require weathering as per ASTM D4956 and do not already have an outdoor weathering site, add \$200 per year (see Note 3).	E.g. \$200
Line 7	Add Lines 4 through 6. This is your total cost savings per year by using NTPEP data.	E.g. \$8,195.52

Note 1 Technician hourly wage is based on \$17.43 (equivalent to \$34,000 per year) and a fringe benefits factor (health care, retirement, etc.) multiplier of 1.5, equating to a total cost of \$26.14 per hour. Overhead costs and indirect salaries (managers, etc.) are not included in this figure.

Note 2 Equipment costs for purchasing new equipment are not included.

Equipment calibration and maintenance costs based on:

\$1,200 per instrument x 3 instruments = \$3,600 per year.

Note 3 Outdoor weathering rack costs based on \$1,000 for materials and labor to build a test rack with a 10 year life and \$100 per year in maintenance costs for a total cost of \$200 / year.

3.0 Building Block #2—A “Best-in-Class” Template for Deploying NTPEP

The NTPEP program provides an extensive array of product evaluation information for a variety of traffic control and safety products, construction materials, and maintenance materials. Electronic and print format reports provide detailed information on the performance of vendors’ products and materials under test conditions. Many states are already using this information to support their product acceptance processes. For states that are not using NTPEP data, the amount of information can easily be overwhelming. Even if its benefits are understood, deploying NTPEP can be a daunting prospect.

Every states’ product evaluation needs are different and there is no one-size-fits-all “cook book” approach for deploying NTPEP. This section offers a template for states that gives general guidance on how to make use of available resources in a practical and organized manner. It is based on advice from ten “best-in-class” state DOTs that make extensive use of NTPEP. (Appendix B contains a memo describing interview results used to prepare this section) The template is organized as a series of 10 steps applicable to any product category and relevant for any NTPEP newcomer.

Step 1. Pilot NTPEP deployment with a product category where staff learning curve is not steep.

Complexity of product evaluation techniques varies from category to category. Ohio DOT and many other regular users of NTPEP report that they started out by selecting a product category for which they had familiarity with basic testing and evaluation practices. This approach helps ease the initial transition to use of NTPEP data, since the user can more readily identify how well NTPEP testing approaches and results meet their needs and adjust their state product acceptance criteria accordingly.

Case Study: Ohio DOT. Ohio DOT first began use of NTPEP by incorporating NTPEP’s pavement markings data into its specifications. They have gradually begun using NTPEP for other traffic control products including RPMs, and sign sheeting. Ohio DOT still has some product categories where specifications do not require the vendor to submit their product for NTPEP testing. For Ohio, switching to NTPEP has primarily been an issue of finding time to re-write the state’s product acceptance procedures to match those of NTPEP. While there are instances where Ohio’s evaluation procedures differ from NTPEP, Ohio DOT has attempted to align procedures wherever possible.

With a little homework, Ohio DOT has found NTPEP easy to use. A key to their success is that staff frequently talks with other DOTs about NTPEP evaluation processes and has even taken a field trip to Florida to learn more about NTPEP evaluation processes. This type of research and information sharing is particularly helpful when they are writing product specifications or interpreting test results.

To help vendors, Ohio DOT posts its product specifications on the internet at www.dot.state.oh.us.

Step 2. Plan to expand NTPEP deployment one product category at a time. The list of product categories evaluated within NTPEP continues to grow, but NTPEP deployment is not an “all or nothing” proposition. In fact, long-time users of NTPEP caution newcomers to begin using NTPEP for only one or two product categories, particularly if staff availability is limited. The primary reason for this recommendation is that getting up to speed with NTPEP evaluation procedures in each product category and subsequently adjusting state product acceptance procedures to match requires staff commitment. It also has the benefit of allowing underlying changes in staff attitudes and expertise to take place without full-scale upheaval of established procedures that might derail progress.

Step 3. Gather product-specific documents and other resources on NTPEP evaluation. Arkansas DOT reports that understanding evaluation tests is a critical precursor to setting specifications. The AASHTO/NTPEP web site (www.ntpep.org) has a wealth of product category-specific information resources in addition to evaluation results including product panel contact information, test states/locations/and schedules, product work plans, panel meeting summaries, and even test photographs and reports. Lead testing states may also be able to provide additional documents and resources (see step 4). Review of these materials will provide the background necessary to enable a state to ascertain the applicability of NTPEP to their needs.

Step 4. Talk to the lead testing state or other participating states about NTPEP

procedures. The fastest way to learn about NTPEP is to engage in discussions with the lead testing state or other participating states. Commonly expressed concerns about issues such as timing and frequency of testing, parameters of tests, testing conditions, and interpretation of results, can usually be resolved through informal conversations with lead test states. This can help eliminate the frustration that comes from attempting alone to understand testing procedures or NTPEP data.

Tennessee DOT. Tennessee DOT is a lead state for NTPEP evaluation of flexible delineators and work zone drums. They also play an active role in NTPEP evaluation of erosion control products and bridge deck overlays. They rely exclusively on NTPEP for evaluation of delineators, work zone drums, pavement marking materials (thermoplastic tapes), and sign sheeting. They are working on NTPEP-aligned state specs for message boards, and plans are in the works to introduce other product categories. For these products, Tennessee recognizes that NTPEP evaluations are more efficient, faster, and, or more sophisticated than in-house testing. As Tennessee adopts new NTPEP product categories, they are allowing vendors a phase-in period to get their products tested.

Tennessee establishes specifications for each product based on the tests conducted by NTPEP. Specifications are set based on their own experience as well as looking at what other states do, and in some cases studying the NTPEP reports to see what's done. Vendors must demonstrate that their products fall within specifications.

For products where Tennessee has incorporated NTPEP evaluation processes, they do no testing, they just take the NTPEP results. There are still some products where they do in-house testing, for example, concrete patching materials, but they do not use NTPEP data for those at all. In this instance, Tennessee feels they can get faster results for this product, when a vendor submits the product Tennessee can get it tested in about a month or two. With NTPEP they would have to wait for over a year for the test report to come out.

Step 5. If possible, attend NTPEP panel meetings. AASHTO hosts an annual NTPEP meeting at which working sessions for each product category are held. These sessions provide a great opportunity to learn more about evaluation protocols, work plans, and other issues. Attending the NTPEP panel meetings can be an invaluable short cut for gaining a complete understanding of how NTPEP evaluations are conducted. As examples, Mississippi DOT reports that they usually send three people, while Louisiana DOTD and Georgia DOT usually send two people each. If at all possible, the person responsible for writing product specifications should attend the NTPEP annual meeting. This meeting is also a good place to meet with manufacturers and develop relationships, as well as to talk with other states about successes in NTPEP evaluation and get updates on NTPEP developments.

Step 6. Overhaul state product acceptance criteria to match NTPEP evaluation procedures. Once a new NTPEP user has selected one or two product categories, reviewed appropriate documents, spoken with key states, and even attended a panel working session, they should be prepared to change their state's existing product acceptance criteria. Current criteria may rely on product specifications or tests that have been around for years or certification documents from a manufacturer. They are unlikely to match NTPEP evaluation factors, and some adjustments may need to be made. For states unfamiliar with NTPEP this can be a daunting task, but by following steps 1 through 5 it can be made manageable.

Step 7. Be willing to eliminate specific tests that NTPEP does not conduct. A major deterrent to more universal NTPEP use is that some states highly value testing that NTPEP may not conduct. For example, one state requires testing on a particular pavement marking bead that NTPEP does not test. While this state uses NTPEP data for its pavement marking evaluation, it also requires manufacturers to demonstrate their products using this individual bead. Examples such as these are prevalent among non-participating DOTs and are a major factor in determining why some states do not use NTPEP data or use a combination of NTPEP and other methods.

States that use NTPEP for a majority of their products suggest pushing AASHTO to incorporate specific testing needs, but if unsuccessful they feel states must be willing to drop additional testing if feasible. Careful evaluation of what is really important to product evaluation can help in this process.

Step 8. Allow a phase-in period for vendors. As a courtesy to vendors, some of whom may have previously been pre-approved to sell their products under old acceptance procedures, allow a phase-in period for manufacturers to get their products evaluated through NTPEP during which they can still get products approved through the state's pre-existing approach.

Case Study: Louisiana DOTD. Louisiana Department of Transportation and Development (DOTD) uses NTPEP for sign sheeting, raised pavement markers, traffic barrels, and pavement marking tapes and thermoplastics. With careful education, senior management within the agency now recognizes that NTPEP is usually more effective than using private testing labs or in-house testing. Vendors are also accustomed to providing NTPEP evaluation results whenever they submit products to LADOTD. They must complete a Qualified Product List (QPL) submittal form that demonstrates that their product has been evaluated by NTPEP. LADOTD posts qualification information on its web site.

The LADOTD relies on the NTPEP meetings and the personal contacts they have established with technical staff from DOTs all over the country to make the switch to NTPEP with ease. Participating in some of the NTPEP evaluations has also helped them get acquainted with the program.

The NTPEP program has helped LADOTD select better products with greater efficiency. They report that side-by-side product comparisons are helpful, while regular and predictable scheduling of NTPEP evaluations helps LADOTD maximize staff efficiency. Time saved by using NTPEP enables staff to concentrate on other areas and shift resources to those areas. If NTPEP does not test a product attribute that LADOTD is interested in, they will ask the relevant product panel to consider additional testing.

Step 9. Include qualification guidelines on the DOT web site. A number of states have attempted to improve the way they communicate with manufacturers by providing product qualification processes and approved product lists on their web sites. This strategy has helped reduce the confusion that many manufacturers experience when attempting to locate the proper product evaluation staff person and differentiate between approval processes for different product categories.

Step 10. Expand the use of NTPEP data to additional product categories. As comfort is gained with use of NTPEP, expand the number of product categories for which NTPEP data is used. This will result in further savings in time and cost.

4.0 Building Block #3—Overcoming Challenges to Using NTPEP

Newcomers to NTPEP should be prepared for hurdles that threaten to hamper deployment of the program. This section identifies several of the barriers to use of NTPEP most commonly encountered by states and gives hints on how they can be overcome.⁹

- **Dedicating DOT Staff Time to NTPEP Start-Up.** Many state DOTs that are new to NTPEP are concerned that participation will take staff away from other important assignments; this can be a genuine barrier to greater NTPEP participation.

Most states that are using NTPEP find that an initial increased investment of staff time is required, but it pays off in longer-term staff time savings as well as in greater confidence about product acceptance processes. They report that extra time is required primarily for staff to familiarize themselves with NTPEP evaluation procedures and to adapt state product acceptance processes to NTPEP. Common activities include conversations with lead test state staff, review of testing protocols, and revision of QPL approval criteria. It may include travel to NTPEP panel meetings or test sites. Once this initial familiarization phase is complete, states report that they spend much less time in evaluating products because NTPEP data is easy to review.

TIP

Remember that investing extra staff time in NTPEP start-up saves time in the long run.

- **Meeting NTPEP Travel Demands.** Attendance at product panel meetings convened by lead test states is a great way for state DOTs to gain familiarity with NTPEP and make the switch from other methods for product acceptance. They offer the chance to meet with peers and discuss evaluation procedures in detail. As the number of products included in NTPEP grows, however, many states may find they do not have sufficient staff or travel funds to attend every panel meeting. Even if one or two staff from the DOT are able to attend the NTPEP annual meeting, overlapping panel schedules make covering all panel meetings impossible. States often have to pick which meetings are the most important to attend based on their particular needs or the knowledge of the selected representatives.

In-person attendance at panel meetings is not a prerequisite for making NTPEP work. States should give consideration to other ways to gather information, such as E-mail, printed materials, and phone calls.

TIP

If travel budgets are tight, seek other ways to become familiar with NTPEP procedures, e.g., phone or E-mail contact with lead states, or review of print/web resources.

- **Accommodating NTPEP Evaluation Turnaround Times.** The potential for lengthy turnaround times in completing NTPEP tests and publishing final results can be a deterrent for state DOTs seeking to add new products to their QPLs in a timely fashion. Lead test states usually initiate test cycles when they have a sufficient selection of products to review, and testing timeframes vary across product categories with longer test cycles required for some products.

To mitigate this problem, states can often get advance data from the testing state before final reports are published. Also states should be aware of evaluation schedules and plan around them.

⁹ The challenges identified in this section are based on information collected from detailed interviews with a sample of states. Full descriptions of those interviews are provided in Appendix B.

TIP

Call lead states to see if advance data is available if a full report has not been published for the product of concern.

- **Managing NTPEP Data Reporting Length and Format.** A frequent refrain heard from DOTs that make limited or no use of NTPEP data is that the amount and format of information in NTPEP reports makes extraction of meaningful data in a timely manner difficult. Reports are put on the shelf and staff use other, more familiar, methods to add products to their QPLs.

For many NTPEP product categories, the complexity of the sophisticated testing procedures used to provide the best possible information to DOTs means that reports are lengthy, and potentially confusing to readers unfamiliar with NTPEP evaluation procedures. AASHTO's new "Data Mine modules" help make NTPEP data easier to navigate, but states must be prepared to familiarize themselves with NTPEP procedures in order to understand the reports.

TIP

Become familiar with NTPEP evaluation processes before jumping into reports!

- **Building NTPEP Awareness Among Senior Managers.** Senior manager support is likely to be key to making NTPEP work in any state, because senior managers can make the resource decisions necessary to support initial investment in NTPEP beyond annual fees.

Senior management at the DOT should be made aware of the program and familiar with its benefits. Section 2 of this guide provides some suggestions for communicating benefits to management

- **Overcoming Fear of Change.** Staff may be comfortable with existing product evaluation approaches and see no need to make greater use of NTPEP. This is often rooted in a fear of relinquishing control over their evaluation process and trusting data that they have had less input on. They perceive that internal product evaluations, performed in a state-specific testing environment, provide sufficient value to forgo the potential time and money savings of reliance on NTPEP product evaluations.

Only by attending panel meetings and influencing work plan development and/or revisions can DOTs become invested in NTPEP and help build trust and familiarity needed to make staff support it.

- **Addressing Gaps in NTPEP Evaluation Criteria.** Six out of the nine DOTs interviewed indicated that inapplicability of, or potential gaps in evaluation criteria used for NTPEP are a barrier to increasing their reliance on NTPEP product evaluation results. Climactic and/or geographic differences in product testing are generally cited as a key problem. Some northern states are concerned that the performance of products tested in the southeast may not be adequate when exposed to harsher winter weather in the north. One state indicated that NTPEP pavement marking test results are not applicable to them because traffic volumes experienced in states performing NTPEP testing are not sufficiently heavy.

Another state uses NTPEP data as a reference in their product evaluation program, but they have decided not to use NTPEP data for product qualification. In the case of pavement marking materials, the DOT has decided not to use NTPEP data because NTPEP procedures do not address the amount of pressure caused by snowplows during the winter. The state's experience with pavement markings has shown them that heavy wear on the products reduces their visibility. Instead the DOT evaluates pavement markings in-house.

Appendix A: Best Practices in NTPEP—Interview Results Memo

Identification of NTPEP Best-in-Class Practices/Benefits

Task 2: Technical Report to Project Panel

NCHRP 20-07 (165)

1/20/04

Introduction

Greater awareness among state DOTs about practical approaches and best practices for using NTPEP evaluation results would likely help to increase use of NTPEP. At present, however, help resources for DOTs that seek to learn more about general principles and best-in-class practices for using NTPEP are limited. In this task, TransTech has identified general principles and best practices for use of NTPEP results, based on phone interviews with selected states that are recognized as leaders in the use of NTPEP data. The interview results described in this technical memo will be expanded into an AASHTO Model Deployment guidebook that supports further expansion of the program.

Methodology for Interviews

For Task 2, TransTech asked 10 state DOTs about how they make use of NTPEP data and the associated benefits of the program, including measurable economic benefits. Interview candidates with greatest experience with NTPEP were selected based on the results of NCHRP study 20-07 (143), which examined use of NTPEP by states. A set of questions was used to guide each interview; the NCHRP project panel reviewed the questions prior to the interviews. A copy of the interview guide is included in Appendix A. The information gathered from these states can reasonably be assumed to provide general insights on best-in-class practices.

The states interviewed for Task 2 are listed below. Most of the states we interviewed made extensive or even exclusive use of NTPEP evaluation data in adding products to their QPLs.

- Arkansas
- Georgia
- Kansas
- Kentucky
- Louisiana
- Mississippi
- New York
- North Carolina
- Ohio
- Tennessee

The state DOTs we interviewed provided information on the benefits of using NTPEP, ways to start using NTPEP, and strategies for improving use of NTPEP.

Benefits of NTPEP for States

State DOTs interviewed for this research were asked to describe the benefits they achieve by using NTPEP data to evaluate their products in place of other evaluation methods, such as in-house testing. As significant users of the program, these states can be presumed to best understand the benefits of NTPEP for DOTs and the benefits they experience can be presumed to illustrate the potential of NTPEP in other states. The benefits cited by participating states can be grouped into seven categories:

- **Evaluation Cost Savings.** Nine out of the ten states interviewed indicate that using NTPEP evaluation as a requirement for product acceptance provides cost savings for their DOTs. The major source of

cost savings, according to the DOTs interviewed, is that by using NTPEP data instead of doing their own in-house testing, state DOTs can use their personnel for other tasks, thus accomplishing a more efficient use of staff and resources. All of the states, however, struggled to quantify how much they save by using NTPEP. One state also noted that NTPEP provides cost savings for the general public by reducing the need for product tests on state roads. Product tests may require tape readings and lane closures that inconvenience transportation users.

Note: State DOTs interviewed for this research were asked to quantify the cost of using NTPEP data versus other approaches. Only limited information was provided by states on this topic. Follow-up discussions will be held with selected states to develop a NTPEP Economic Benefits Worksheet as outlined in the scope of work.

- ***Access to a Wider Array of Products.*** Nine out of ten states interviewed claim that NTPEP enables them to evaluate more products than they could using other forms of product evaluation. This includes products they may not have otherwise heard about and, or products that they lack in-house equipment to evaluate. As one state respondent noted, if NTPEP is evaluating 100 products per testing cycle, participating states have access to evaluation results for all 100 products without doing their own testing.
- ***Quicker Product Evaluation.*** Six out of ten states interviewed suggest that using NTPEP data to evaluate products is quicker than using other methods of product evaluation because states do not have to conduct the testing themselves. Limited staff and, or equipment may prevent states from evaluating products as quickly as they would like; staff shortages often cause evaluations to be put aside until time is available or abandoned altogether.
- ***More Comprehensive Product Evaluation.*** Four out of ten states interviewed indicated that NTPEP product evaluations consider more product criteria than in-house evaluations, which may be constrained by staff or equipment shortages. Some states also believe that side-by-side testing has raised the bar for manufacturers because their products are compared to others from around the country. One state noted that they receive better products every year through NTPEP evaluation.
- ***Accurate and Predictable Data.*** Four out of the ten states interviewed believe that the high degree of accuracy of NTPEP data makes it valuable to state DOTs. These states point to side-by-side product testing among manufacturers as a key to ensuring accurate results. States that participate in NTPEP have access to independent, unbiased evaluation results performed by fellow state DOTs as opposed to handling in-house testing or relying on a certification by a manufacturer. These states also feel that products evaluated by NTPEP are more reliable than those evaluated by other methods because the evaluation is done on a regular basis. The DOT knows when the evaluation will occur and can expect the information at a specific time, allowing the DOT to prepare for the results and inform manufacturers when products will be approved.
- ***Improved Relationship with Product Manufacturers.*** Four out of ten states interviewed feel that their relationships with manufacturers have improved since the creation of NTPEP because establishing a product evaluation program around NTPEP makes it easier for manufacturers by providing them a single place to take their product, do the evaluation, and give the results to state DOTs. However, two state DOTs mentioned relationships with manufacturers vary depending on whether the manufacturer's products perform well in NTPEP evaluations. These states feel that manufacturers clearly would like the program more if every state participated.

Template for Starting to Use NTPEP

States that do not use NTPEP data to assist their QPL decisions may struggle as they get started with the program. (The Task One memo summarizes common barriers to greater use of NTPEP.) A critical component of the best-in-class practices research is to provide insights on the ingredients for a “template” for helping these states make better use of the program. In the interviews, states were asked what advice they would give to states new to NTPEP. A basic set of steps for adopting NTPEP emerged from this research:

- 1. Expand use of NTPEP one product category at a time.** Most states we interviewed suggested that new users of NTPEP should begin by working with one or two product categories and expand gradually. States must ensure their QPL approval practices are aligned with NTPEP procedures, and as several interviewees observed this can be a complex effort. A measured approach—one product category at a time—helps make the complexity of NTPEP product evaluation processes and results more manageable and also allows underlying changes in staff attitudes and expertise to take place. This is particularly true where staff availability for materials testing is at a premium.
- 2. Do not start by using NTPEP for product categories where learning curve is steep.** Several states suggested that new NTPEP users should start working with a product category in which they have a reasonable familiarity with basic testing and evaluation practices. This helps to ease the initial transition to use of NTPEP data, since states can more readily identify how well NTPEP testing approaches and results meet their needs and adjust their QPL approval criteria accordingly.
- 3. Talk to the lead testing state or other participating states about NTPEP procedures.** Four states recommended engaging in discussions with the testing state or other NTPEP-participating states as the preeminent way to understand NTPEP testing criteria, and navigate the results. This can help eliminate the frustration that can come from attempting alone to understand testing procedures or NTPEP data. State DOTs that are considering using NTPEP data should be encouraged to contact lead testing states and ask questions about evaluation procedures.

Note: Some NTPEP users that participated in this research indicated that they are willing to talk to other states, set up an implementation plan, and describe how a NTPEP program can be successful. One state has even made presentations to others on how they have developed a NTPEP program and feels that doing this is a way AASHTO can market the program. This state mentioned that instead of conducting general presentations about the program, AASHTO should instead deliver product category-specific presentations to interested states.

- 4. Attend NTPEP panel meetings.** AASHTO hosts annual meetings for each product category where evaluation protocols are discussed and developed and existing work plans are reviewed and revised if necessary. Nearly all of the states interviewed, indicated that attending the NTPEP panel meetings is an essential component of understanding how NTPEP evaluations are conducted. One state recommended that DOTs send the person responsible for writing product specifications so he/she has the opportunity to see how NTPEP evaluation works. Another state recognized the benefit of being able to meet with manufacturers and develop relationships. These meetings also provide an opportunity for states to talk to one another about successes in NTPEP evaluation as well as get updates on NTPEP developments.

Note: For many states, unfortunately, there are two significant barriers to getting the most out of the NTPEP panel meetings: 1) the cost of attending meetings out-of-state and 2) conflicting times of product category meetings. In addition, for those states that are able to send representatives to the meetings, they tend only to be able to send one to three people. These states feel that a small group

makes it difficult for a state to attend all of the meetings that are offered or ensure that its representatives have the technical knowledge to take advantage of the discussions. States often have to pick which meetings are the most important to attend based on their particular needs or the knowledge of the selected representatives.

- 5. Overhaul state QPL approval criteria to match NTPEP evaluation procedures.** Non-NTPEP states adding products to their QPLs may rely on product specifications or tests that have been around for years or certification documents from a manufacturer, and which differ from NTPEP evaluation criteria. Getting started with NTPEP usually means a major overhaul of state product selection criteria to ensure they are compatible with NTPEP evaluation procedures. For states unfamiliar with NTPEP this can be a daunting task. The sheer number and complexity of NTPEP tests conducted per product category and the detail of NTPEP reports can make adopting NTPEP both challenging and time-consuming for many states. After comparing NTPEP's testing criteria for that particular product category with its own, these states say the DOT must be willing to change its specifications to incorporate NTPEP's evaluation procedures. Steps 1 through 4 help ensure that states are able to overhaul their QPL approval criteria.
- 6. Allow a phase-in period for manufacturers.** Two states noted that when they decide to begin using NTPEP data for a particular product category, they allow a phase-in period for manufacturers to get their products evaluated through NTPEP. This allows manufacturers that may already be on a state's QPL to have the opportunity to apply for NTPEP evaluation and get their products on the test decks. At least one state has set a deadline whereby all manufacturers must provide their products to NTPEP before they can get on the state's QPL. Until this deadline manufacturers can still get products approved through the state's pre-existing approach.

Improving the Use of NTPEP

The state DOTs interviewed for this research have implemented a number of changes designed to improve the way they use NTPEP data and make the process more efficient for themselves as well as for manufacturers.

- 1. Require the use of certification/QPL forms.** Some states have developed forms that manufacturers are required to submit before their products can go on the state's QPL. These forms are used both as a method for compiling information about the manufacturer as well as to prevent them from using NTPEP as a way to sell to other states. States that use the form as an information resource may require manufacturers to list their company name, contact name, product cost, applicable specifications, and whether other states are using the product. These forms can be used for products where states accept self-certification or where they require NTPEP evaluation.

At least one state uses a QPL form in part to prevent manufacturers from using NTPEP to sell products to other states. For example, states that do not use NTPEP as a requirement for product approval may ask a manufacturer if their products have gone through the program and been approved by other states. This request can help these states determine the quality of a product if it was approved by another state using NTPEP, particularly if done in a neighboring state with a similar climate. Requiring the submittal of a QPL form that can be used to provide proof of product approval may prevent manufacturers from using NTPEP to convince non-participating states that the product has been approved in another state.

Example. The Louisiana Department of Transportation and Development has developed a QPL submittal form that all interested manufactures must complete in addition to any NTPEP forms. Maintaining this form enables Louisiana DOTD to decide whether the product is ready to be marketed to the State and establishes a legal precedent that the manufacturer will market the product under the specified name.

Manufacturers must reference the NTPEP submittal number on the form so Louisiana can verify it went through the program. The DOT then reviews the information and decides whether it will go on the QPL.

2. **Include qualification guidelines on the DOT web site.** A number of states have attempted to improve the way they communicate with manufacturers by providing product qualification processes and approved product lists on their web sites. This strategy has helped reduce the confusion that many manufacturers experience when attempting to locate the proper product evaluation staff person and differentiate between approval processes for different product categories.

Providing qualification information on an agency's web site can also help minimize the time spent by DOT staff in explaining to manufacturers how its product approval process works. The web site can be a one-stop shop for information about what manufacturers need to do in order to get their products evaluated and approved.

Example. The North Carolina Department of Transportation web site outlines the major steps in its product approval processes for most of the typical products used in traffic control, pavement marking, and delineation. Users are able to select from a group of product categories and access instructions on how to get their products approved. NCDOT provides links to specifications that must be met, whether products need to go through NTPEP evaluation, and if additional demonstrations are necessary to gain approval.

3. **Expand the use of NTPEP data to additional product categories.** State DOTs that are using NTPEP data for product qualification recognize that the most effective change that can be made is to expand the use of the program into other product categories. These states understand that after using NTPEP for several of their product categories, they can attain further savings in time and cost by requiring NTPEP evaluation for other types of products. Several states that have a tradition of using NTPEP are in the process of expanding their use of the program into other categories or into categories that NTPEP is just beginning to evaluate.
4. **Be willing to eliminate specific tests that NTPEP does not conduct.** A major deterrent to more universal NTPEP use is that some states highly value testing that NTPEP may not conduct. For example, one state requires testing on a particular pavement marker bead that NTPEP does not test. While this state uses NTPEP data for its pavement marker evaluation, it also requires manufacturers to demonstrate their products using this individual bead. Examples such as these are prevalent among non-participating DOTs and are a main factor in why some states do not use NTPEP data or use a combination of NTPEP and other methods.

Some states that use NTPEP for a majority of their products suggest eliminating tests on those criteria that NTPEP does not evaluate. These states advocate pushing AASHTO to incorporate the testing, but if unsuccessful they feel states must be willing to drop the additional testing. Several of these states are committed to reevaluating what is really important to their product evaluation and are capable of dropping some testing if it is not done by NTPEP.

Appendix B: Barriers to NTPEP—Interview Results Memo

Identification and Assessment of Barriers to Greater Use of NTPEP Task 1: Technical Report to Project Panel NCHRP 20-07 (165)

1/20/04

Introduction

The success or failure of the National Transportation Products Evaluation Program (NTPEP) ultimately depends in large part on whether states rely on NTPEP evaluation data in their Qualified Product List (QPL) approval processes. Recent research indicates that use of NTPEP results varies significantly between states, with exclusive reliance on NTPEP data for product selection concentrated in states east of the Mississippi. In this Task, TransTech investigated the main barriers to greater use of NTPEP results by states west of the Mississippi and how they can be overcome, based on phone interviews with selected states that do not use NTPEP data in their product selection processes. The interview results described in this technical memo will be expanded into an AASHTO Model Deployment guidebook that supports further expansion of the program.

Methodology for Interviews

For Task 1, TransTech asked nine state Departments of Transportation (DOTs) why they make only limited, or no use of NTPEP. Interview candidates were selected based on the results of NCHRP study NCHRP 20-07 (143), which examined use of NTPEP by states. A set of questions was used to guide each interview; the NCHRP project panel reviewed the questions prior to the interviews. Interviewees were asked to identify external and internal barriers to expanding the use of the NTPEP program in their state’s product evaluation program. External barriers include factors that are beyond the DOT’s control (e.g., state laws that require in-house evaluation) and internal barriers include factors that are within a DOT’s control (e.g., agency policy). A copy of the interview guide is included in Appendix A. The information gathered from these states can reasonably be assumed to provide general insights on why some states do not make greater use of NTPEP.

Table 2 lists the states interviewed for Task 1. Most states interviewed made limited or no use of NTPEP, but actual use varied among the states. Several do not use NTPEP data at all for product evaluations and others use it only as a reference to validate in-house product evaluation or certification. Two states interviewed are making efforts to use NTPEP evaluation data more extensively; their perspectives on past barriers to use are, however, helpful.

Table 2. NTPEP Barriers Interview States

NTPEP Use	State
None	Illinois
	Montana
	South Dakota
As a Reference	California
	Idaho
	Michigan
	Vermont
Making greater use of NTPEP	New Jersey
	Washington

State DOT Interview Results

To aid summarization of states' responses, we have grouped them by barriers due to external factors and barriers due to internal factors. Seven major barriers to greater NTPEP use were identified from our interviews. Table 3 summarizes major barriers identified in the interviews.

Table 3. Frequency of NTPEP Barrier Responses

External Barriers	Number of Responses (out of nine interviews)
Inapplicability of, or gaps in NTPEP evaluation criteria	Six states
NTPEP data reporting length and format	Four states
Turnaround time for NTPEP evaluations and reports	Three states
Internal Barriers	Number of Responses (out of nine interviews)
DOT staffing shortages	Four states
Satisfaction with existing product evaluation	Three states
Poor awareness of NTPEP among senior managers.	Three states
NTPEP travel requirements	One state

Example. Michigan DOT uses NTPEP data as a reference in their product evaluation program, but they have decided not to use NTPEP data for product qualification. In the case of pavement marking materials, the DOT has decided not to use NTPEP data because NTPEP procedures do not address the amount of pressure caused by snowplows during the winter in Michigan. The state's experience with pavement markings has shown them that heavy wear on the products reduces their visibility. Instead the DOT evaluates pavement markings in-house.

External Barriers

Inapplicability or gaps in NTPEP evaluation criteria. Six out of the nine DOTs interviewed indicated that inapplicability of, or potential gaps in evaluation criteria used for NTPEP are a barrier to increasing their reliance on NTPEP product evaluation results. Climactic and/or geographic differences in product testing are generally cited as a key problem. Some northern states are concerned that the performance of products tested in the southeast may not be adequate when exposed to harsher winter weather in the north. One state indicated that NTPEP pavement marking test results are not applicable to them because traffic volumes experienced in states performing NTPEP testing are not sufficiently heavy.

Example. South Dakota does not use NTPEP data and identified the format of the reports as a significant obstacle to greater use of the NTPEP program. South Dakota DOT pays NTPEP dues and receives the reports but identifies the length and detail of the reports as one factor that has resulted in continued reliance on other approaches for adding products to their QPL.

South Dakota recognizes the value of NTPEP data but has had difficulty in distributing the reports and convincing others to use them because of the amount of information that is given. In most cases reports get put on the shelf.

NTPEP data reporting length and format. Four out of the nine DOTs interviewed have made limited use of NTPEP data in part because of concerns about the format and length of the reports. Staff in these DOTs, which tend to have little experience with the NTPEP program, observe that the amount and format of information in the reports makes it difficult to extract meaningful data in a timely way. Internal staffing shortages and a lack of familiarity with the report structure makes it hard to dedicate the necessary resources needed to integrate the NTPEP reports with their product evaluation programs. In addition, one state mentioned they found NTPEP data too confusing, limiting their use of NTPEP as a way to evaluate products. This state pointed to the coding of data and their difficulty in comparing products as a key factor in their decision to continue their own evaluation. A few states also have problems distributing NTPEP reports to staff and tracking their use of the information. These states feel that the length and/or format of the reports may deter staff from taking the time necessary to understand them.

Several states interviewed in this research effort are familiar with AASHTO's effort to develop electronic "data mines" for NTPEP evaluation reporting. All of these states commented that the data mines will be a welcome improvement to retrieving relevant information and a few states that do not use NTPEP because of the reports indicated that the data mines would help make NTPEP more user-friendly.

Turnaround time for NTPEP evaluations and reports. Three out of the nine states interviewed suggest that the turnaround time between initiating NTPEP tests and sharing results is a barrier. Delays appear to be the result of test timeframes and time required to prepare results. Lengthy testing cycles are required for certain product categories. Some states feel that it is unfair to make manufacturers wait upwards of two years to get on a test deck if they missed a testing deadline. Most states recognize that testing cycles need to be long for some product categories to ensure product quality but will either conduct their own additional testing or product certification to evaluate more products. NTPEP test states also may take a long time to synthesize and release test data because NTPEP evaluation is an add-on to existing DOT work while DOT budgets and staff time are increasingly constrained and AASHTO must review the results before they are released. Although some states realize they can usually get advance data from the testing state, others feel that it is unfair to manufacturers or inefficient to wait long periods of time for information they may be able to provide themselves.

Internal Barriers

DOT staffing shortages. Four out of nine states indicate that staffing shortages are a barrier to greater NTPEP participation. One of these states noted that its DOT does not have staff dedicated to product evaluation, which is part of its research division. Any additional expansion of the division's responsibilities is unlikely given the current staffing and workload. States citing similar constraints may recognize that an established NTPEP program should help reduce the resources necessary to evaluate products but feel that the initial time and effort required to fully understand the program, including discussing testing criteria with the lead state, attending NTPEP panel meetings, and reviewing evaluation

results is too great in their current operating environment. In addition, some states are in the midst of budget cuts that may affect the number of personnel available to evaluate products. These states may perceive the implementation of a NTPEP program as a low priority compared to other job responsibilities.

Satisfaction with existing product evaluation. Three out of nine states are sufficiently satisfied with existing product evaluation approaches that they see no need to make greater use of NTPEP. Some of the states interviewed have a cultural/managerial preference for in-house testing and do not want to relinquish control over their evaluation process. They perceive that internal product evaluations, performed in a state-specific testing environment, provides sufficient value to forgo the potential time and money savings of reliance on NTPEP product evaluations. Additionally, one of the states interviewed contends that while the state is moving towards using NTPEP more, there are particular divisions within the DOT that object to NTPEP evaluation because they feel that the DOT should continue to do its own evaluation. State DOTs may have to deal with internal struggles over product evaluation control before they can use NTPEP data more extensively for evaluating products.

Example. Montana DOT does not have a QPL to accept transportation-related products. In fact, the State does not have a standard process for evaluating new products. The department allows the districts to control what products are used and enables them to use experimental tests on new products at their discretion.

Montana DOT management has decided to place the burden of product evaluation on the contractor that is performing the project. While districts have the ability to test products, in most instances they allow contractors to use whatever products have been successful in the past and holds the contractors liable if the products do not perform.

States that are comfortable with doing their own product evaluation may be opposed to relinquishing control of the process and trusting data that they have had less input on. Those that have used NTPEP data for a long time, are able to attend panel meetings, and have influence in work plan development and/or revisions have bought into the system and are willing to trust the data for most product categories. However, those states that are unfamiliar with the program or perceive that they do not have a role in how the testing is done are less likely to participate.

Poor awareness of NTPEP among senior managers. All of the states interviewed have at least heard about NTPEP and nearly all understand its benefits. However, three out of the nine states interviewed feel that AASHTO should spend more effort promoting the NTPEP to state DOT senior managers. One state noted that while AASHTO promotes the NTPEP program, it is unclear whether the effort is strengthening executive level awareness about the program. Another state is unsure whether senior management at the DOT is even aware of the program or familiar with its benefits. States that perceive the inclusion of NTPEP in their product evaluation as a significant change tend to believe that reorganizing their evaluation process must be spearheaded at the management level. Support for this position was provided by comments captured during the NTPEP best-in-class practices research, which indicated that programs such as NTPEP are most successful when initiated with the overt support of DOT senior-level personnel.

One state raised the point that there are NTPEP success stories available that can promote the program but that these stories do not get shared with others. Strategies such as targeting executive level management with newsletters or other sources of information is seen as a NTPEP marketing gap by this particular state.

NTPEP travel requirements. Most of the states interviewed in the best-in-class practices research agree that a key to implementing the NTPEP program is to attend the NTPEP annual meeting and the

accompanying product category panel meetings. One state interviewed in the barriers research indicated that many states have difficulty attending the annual meeting because of budgetary restrictions and may send less people than they would prefer. In addition, some states feel they do not have enough people to send to ensure that they attend all of the appropriate panel meetings.

Appendix C: Vendors' Perspectives—Interview Results Memo

Vendors' Perspectives of the Economic Impacts of NTPEP Task 3 Technical Report to Project Panel NCHRP 20-07 (165)

04/13/04

Introduction

The objective of the NTPEP program is “to achieve the highest level of implementation...by providing reports that are timely, credible, and easy to assimilate into business processes.” In today’s business environment, “business processes” should encompass the operations of all stakeholders, including the vendors who manufacture and sell products evaluated by NTPEP.

The attitudes of vendors who participate in the NTPEP program range from mildly supportive to adamantly opposed. Reactions within a given product category tend to be similar but vary significantly among product categories. Vendors’ viewpoints are inversely linked to their perceived total cost of participating in NTPEP and are closely linked to the economic impact of the program.

This section focuses on the economic impacts of NTPEP for vendors, based on conversations with eleven vendors that produce sign sheeting, pavement markings, flexible delineators and geotextile products.

“Economics 101” for NTPEP

Economic theory helps explain how vendors react to the NTPEP program.

Order qualifiers impose added costs for vendors. In the market for products and materials evaluated in NTPEP, vendors must typically have their products listed on a state DOT’s Qualified Product List (QPL) before they can sell them. In economic terms, this is called an “order qualifier.” Order qualifiers are customer requirements that do not generate sales, but incur costs for vendors. Return on investment (ROI) cannot be calculated for order qualifiers because they are not linked directly to revenues or profits. In response to order qualifiers, vendors will attempt to maintain profit margins by passing on any costs they incur to customers.

Price elasticity and market competition determine impact on sales and profits. If all competing vendors incur similar costs, no competitive advantage results. The ability of vendors to recover any increased costs depends on the price elasticity of their products and the degree of competition within the market. In a highly competitive market for products that are perceived as interchangeable, price tends to be the major competitive factor and prices are considered to be elastic. If one vendor raises prices unilaterally, sales will tend to flow to other vendors with lower-priced products. Naturally, vendors may attempt to cut costs in other areas to compensate, such as in research and development. They may also attempt to avoid order qualifier costs by reducing the number of new products brought to market. In a competitive market, however, such strategies may reduce their competitiveness as customers may expect new and improved products.

Firms that are not, and do not have the potential to become the low-cost producer ultimately must either abandon the market or attempt to differentiate their products in a way that avoids competing solely on price. Under these circumstances, they can pass on increased costs as higher prices.

Vendors employing a differentiation strategy typically encourage customers to focus on unique product needs that can only be met by their product. Customer-driven initiatives to compare vendors' products are counter-intuitive to a product differentiation strategy.

Vendor Behavior. Actual vendor practices will vary depending on the extent to which the principles described above hold true. But the “economics 101” theories have merit. For most NTPEP product categories, several to many vendors compete. Therefore product prices are not likely to be inelastic and vendors must absorb some or all cost increases associated with NTPEP evaluation requirements. Costs are likely to vary depending on evaluation requirements, and the magnitude of these costs is likely to influence vendor behavior. Vendors of product categories with higher order qualifier costs will experience greater negative effects. They are likely to oppose activities such as NTPEP that restrict product differentiation.

How NTPEP Increases Vendor Costs

The “one-stop-shop” philosophy espoused by NTPEP suggests that order qualifier costs could be reduced as vendors eliminate multiple evaluation requirements among the states.

Qualitative interviews with a small sample of vendors in different product categories suggest that this benefit has not materialized, and that NTPEP often represents an added cost for vendors rather than a cost reduction. Furthermore, interviews suggest that costs of NTPEP vary from category to category and that costs are incurred for a variety of reasons.

Evaluation fees. Evaluation fees vary from product to product, but vendors generally view fees as a minor cost of doing business, particularly when compared to other costs of NTPEP evaluation.

Other costs associated with evaluation. Vendors in some product categories, such as thermoplastic pavement marking products, usually send at least three people to each testing deck in addition to transporting product application machinery worth over \$100,000 to apply products. Such trips frequently involve several days of total travel and test deck application time and represent significant costs beyond the evaluation fee.

“There are two kinds of time—DOT time and private sector time. DOTs think in terms of years in the future while private sector firms focus on the next 30 days.” (Interview paraphrase)

Length of NTPEP evaluation. Products cannot be marketed until they have been evaluated and results reported to states. A lengthy evaluation process translates into higher costs for vendors as they forgo sales. Vendors acknowledge that tests must follow appropriate timeframes, but are often frustrated when information is not rapidly disseminated once evaluation is completed. Even the new NTPEP DataMine service does not address the turnaround time for states to report initial data. Some vendors also report a growing tendency for product evaluation tests to continue to run beyond the required testing period. Testing products beyond standard usage periods may provide information of questionable value and tends to encourage ever-increasing testing periods, further slowing the product introduction process.

Lack of reliance by states on NTPEP in place of other evaluation results. When NTPEP evaluation is required in addition to state requirements, vendors bear increased costs. Duplicative or unique state-level testing requirements are reportedly widespread according to vendors.

Evaluation cycles versus product development cycles. Once-a-year testing cycles inevitably do not correspond with vendor product lifecycles, resulting in firms either rushing products to meet a NTPEP schedule (often incurring additional expense) or delaying product evaluation until the next testing opportunity, which means delaying product sales. In such instances, vendors may not be able to sell their products for multiple years if they miss a NTPEP evaluation.

Evaluation Errors. If products submitted for evaluation are misplaced, incorrectly evaluated, or results are not reported vendors may experience reduced sales. While such problems are rare, the impacts to individual vendors can be significant.

Benefits of NTPEP for Vendors

NTPEP Is a Barrier to Entry. Vendors suggest that the DOT markets for their products are fixed in size. This means that if one vendor increases sales, other vendors' sales decrease. The complexity of getting products approved for sale to a DOT makes it difficult for new products and vendors to enter the market but rewards successful vendors with a relatively stable competitive environment, a market condition commonly referred to as a "high barrier to entry." If it is easier to get products approved for use, either by eliminating or modifying NTPEP, competition from new vendors might increase.

Summary

The costs of NTPEP to industry cannot easily be quantified and financial information was not made available from industry interviewees. Qualitative assessment suggests that vendors are likely to bear additional costs as a result of NTPEP. The extent to which any new costs are recouped from customers is unknown. Particularly problematic are costs that are not borne equally, therefore reducing the competitiveness of individual vendors.

The NTPEP program has yet to fully deliver on promised efficiencies for either DOTs or industry suppliers. The result is that vendors are very frustrated and products sold to DOTs inevitably reflect some degree of additional cost from NTPEP participation. However, the market for DOT-based products is sufficiently large that most manufacturers will meet whatever barriers to sales that exist, whether related to NTPEP product evaluations or otherwise. Therefore, as long as DOTs perceive the value of the product testing to exceed the increased product costs that such testing inevitably incurs, the NTPEP evaluation program will continue.

However, simply continuing the NTPEP program will not result in achieving a stated goal of "...achieve(ing) the highest level of implementation of program results, by providing reports that are timely, credible, and easy to assimilate into business processes." To accomplish this, NTPEP product evaluation results must not be just another checkbox that firms must complete in order to sell products in a given DOT market.

Achieving greater business process efficiency requires that DOTs have greater consensus for accepting NTPEP product evaluation results in lieu of (rather than in addition to) state level testing. Reaching such consensus will require a concerted effort by AASHTO and its member states to raise this visibility of this issue, especially in today's economic environment where travel by state employees tends to be highly constricted. Accordingly, it will likely require soliciting the support of the state DOT leaders to accomplish this goal. While such efforts cannot expect to be accomplished immediately, concerns about the current slow pace of NTPEP adoption suggest the need for some systematic review to determine if the program should be continued, revised or discontinued, including establishing appropriate performance measures for expanding/improving the program.

Appendix C

While firms would not welcome increased testing fees, if such fees supported on-demand testing and a more systematic reporting and measuring of results, firms would likely accept such an increase. Should DOTs be unwilling or unable to accommodate such a testing schedule, NTPEP should consider contracting for testing services via some other means, whether private firm or public sector entity.



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