

Availability of the Highway Performance Monitoring System (HPMS) Report

In June 1995, the Office of Highway Systems of the Puerto Rico Highway and Transportation Authority (PRHTA) completed the annual report of the Highway Performance Monitoring System (HPMS). The responsibility of submitting this report annually to the Federal Highway Administration (FHWA) is outlined in the regulations for administration of FHWA State Planning and Research (SPR) funded work programs (23 Code of Federal Regulations (CFR), Part 420).

The HPMS furnishes FHWA adequate information on all public roads, summary and detailed sample data for rural, small urban, and urbanized areas within the Island. It provides, by highway functional system, essential data on roadway physical, operational, pavement condition and performance, and usage (travel) as well as analytical products, all tied together serving as an essential element of the FHWA's program evaluation process at the National level.

The HPMS can be used by Federal, State and local governments or municipalities, State Legislature, institutions of higher learning, industry, consultants, professional organizations, other institutions, and the public. To date, the HPMS data have been used by consultants hired by municipalities to prepare territorial plans, and also by those hired by the Department of Transportation and Public Works / Puerto Rico Highway and Transportation Authority to conduct the Puerto Rico Islandwide Transportation Study.

The latest HPMS data reporting enhancements, implemented since 1993, are focused on new program requirements mandated by the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), the 1990 Clean Air Act Amendments (CAAA), and expanded transportation community needs. Graphical examples of the products of the HPMS simulation model that resulted from the analytical process are incorporated.♦

For further information, contact: Office of Highway Systems PRHTA PO Box 4200 San Juan PR 00940-2007

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New Technology for Measuring Pavement Layer Thickness

State Highway Agencies have traditionally measured the thickness of pavement layers by taking cores at 305 m (1000 ft) intervals per traffic lane. This method is time-consuming, labor-intensive, and costly. Cores must be removed and measured and the resulting holes must then be patched. A promising new device, known as the impact-echo device, is now available for the nondestructive measurement of pavement layer thickness. It is based on technology that is at least 50 years old. However, a Strategic Highway Research Program (SHRP) Project, conducted by Cornell University, has made the device eminently more practical by developing easier and faster procedures for analyzing the data collected.

The device sends a low-frequency stress pulse into concrete which travels until it reaches either the boundary of the concrete or an internal flaw, such as a crack or a void, at which point it is reflected. A transducer on the surface of the concrete measures the wave displacement and sends the data to a portable computer where it is converted to a frequency spectrum. The results displayed on the computer screen, accurately pinpoint the location of the defect. Each reading takes less than 10 seconds, and the data can be saved for later retrieval and analysis. The device can also be used to detect cracks, voids, and, poorly consolidated concrete in plain and reinforced concrete slabs, beams, and columns, as well as delaminations in slabs with and without asphalt concrete overlays. At a cost of about \$25,000, the device can pay for itself in a very short time.

After evaluating the device, the Federal Highway Administration (FHWA) purchased five more for loan to States. So far, 10 States have experimented with the device, using it to measure pavement thickness. Virginia and California are also using the device to predict impending problems in existing pavement

before the symptoms become visible at the surface. *(continues on page 4)*

Use of Rumble Strips to Enhance Safety

Rumble strips are grooved patterns in the pavement that produce a rumbling noise when in contact with vehicle tires. They have been used in Ontario, Canada in the past on approaches to stop signs or intersections. Problems such as ponding in the grooves, and damage to maintenance equipment, led to their being phased out.

In the U.S. rumble strips are used along paved highway shoulders.

Last year, during scheduled resurfacing inverted strips were placed along 18 km of Hwy. 400, north of Barrie in Ontario. The U-shaped grooves measured 2.5 cm deep and 6 cm wide. They were spaced 20 cm apart and were placed 5 cm from the edge of the granular material. This section of highway experiences approximately 10 run-off-the-road accidents every year.

A second set of trial rumble strips with slightly different dimensions will be laid along Hwy. 401 near Tilbury. While the spacing of the grooves will not be changed, they will be offset 10 cm from the edge of the pavement. The contractor installing the grooves will also be given the option of using a V-shaped groove instead of the rounded U-shape previously tried, or continuing to use the U-shape with a change in the depth to 2 cm. Driver reaction, improvement in safety, and cost-effectiveness will be assessed over a two-year period. A saving in maintenance costs may occur if regrading costs brought on by vehicles running off the road are reduced.

Possible Application to Puerto Rico

In Puerto Rico, this technique could be used on primary rural roads, on significantly long segments, where a motorist may become distracted due to tiredness, such as PR-2 in Yauco or PR-30 in Humacao.



There may be an increase in costs due to premature cracking of the shoulders although a reduction in costs is expected due to the decrease in the number of accidents. The benefit of the grooves ultimately will give an advance warning that may keep motorists from leaving the road at all, thus reducing the number of accidents.♦

Are You a Boss or a Leader

The *boss* drives people.
The *leader* coaches them.

The *boss* inspires fear.
The *leader* inspires enthusiasm.

The *boss* says "Get here on time."
The *leader* gets in ahead of time.

The *boss* never has enough time.
The *leader* makes time for things that count.



The *boss* is concerned with things.
The *leader* is concerned with people.

The *boss* lets people know where he or she stands.
The *leader* lets people know where they stand.

The *boss* takes the credit.
The *leader* gives it.

The *boss* uses people.
The *leader* develops them.

10 Source: *Oklahoma Local Government News*, Fall 1993

(New Technology continued from page 2)

Several State Highway Agencies were scheduled to begin field-testing the updated device in July. At each site where the device is being used, the highway agency will take core samples, and the pavement thickness will be compared with those from the device. Cornell University and the National Institute of Standards and Technology (NIST) have received additional funding from the National Science Foundation (NSF) to further enhance the data analysis software and to develop a test procedure for measuring pavement layer thickness. The procedure will then be submitted to the American Society for Testing and Materials (ASTM).♦

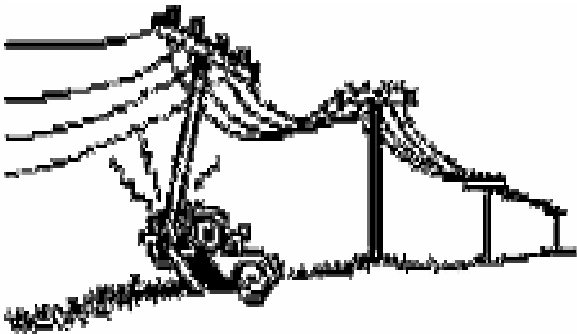
Source: *Road Talk*, Vol. 1 No. 3

Highway Safety is No Accident

Did You Know?

Nearly 40,000 people lose their lives in traffic crashes each year in the United States! It is hard to comprehend this horrendous statistic. Put in a different light, the same death toll would result if a fully loaded 110-passenger jetliner crashed **every day of the year**, killing everybody on board. While these statistics are truly staggering, many Americans view them simply as expected results of the more than 3 trillion km (2 trillion miles) driven in this country each year. Highway safety officials, however, are working continuously to reduce this toll:

- ✧ New legislation and public awareness campaigns are resulting in increased use of safety belts.
- ✧ The number of drunk drivers on the road is being reduced.
- ✧ Law enforcement officials are cracking down on speeders, red-light runners and other traffic law violators.



In spite of these efforts, there are too many casualties as a result of Americans' demand for increased highway mobility. One reason may be that drivers and pedestrians don't understand some of the highway design and operation features intended to reduce the number and severity of crashes. Further, they don't always heed warnings of special dangers on the highway.

For example:

- ✧ Approximately 700 people are killed each year as a result of traffic crashes in work zones.
- ✧ Pedestrians account for about 15 % of all traffic fatalities.

Highway safety officials are initiating new education programs to make drivers and pedestrians more aware of the safety features built into highway systems. If you understand these features, you should be a safer highway user.

Some of these features are highlighted in the true/false quiz on the next page. Take the quiz and test your knowledge of highway safety.

(continues on page 6)

H i g h w a y S a f e t y Q u i z

Questions

1. In a highway work zone, if a flagger uses a sign or flag to stop traffic, you must come to a complete stop and not proceed until you determine it is safe.

True? False?

2. If you are crossing a street with a WALK pedestrian signal and a flashing DON'T WALK appears, you must return to the curb and wait for the WALK to reappear before it is safe to cross.

True? False?

3. The large plastic, sand filled barrels placed in clusters at various highway locations are for storage of sand used in the construction project.

True? False?

4. A solid double yellow line in the center of a two-lane highway indicates "no passing", but you may cross these lines if you need to turn left into a driveway.

True? False?

Answers.

1. *False.* You may not proceed through the work zone until the flagger signals it is safe to go. While it may appear to you the way is clear, the flagger is aware of construction activity down the road and often is in contact by two-way radio with other project personnel who advise when traffic may safely pass. A flagger has the authority to control traffic at these locations, and you can be cited for a traffic violation if you willfully fail to comply with the order to stop.

2. *False.* If the flashing DON'T WALK appears after you begin crossing the street, you may continue to cross. Enough signal time has been provided to allow you to complete the crossing safely. But, you should never begin to cross the street on a flashing DON'T WALK.

3. *False.* More than 12,000 deaths occur each year as a result of out-of-control vehicles striking a fixed object (bridge pier, utility pole, etc.) along the roadside. Clusters of large, sand-filled, plastic barrels ("crash cushions") often are placed in front of a fixed object. If an errant vehicle hits the cluster of barrels head on, the barrels shatter but the sand absorbs the energy of the moving vehicle and brings it to a safe stop before it hits the fixed object. These highway safety devices save hundreds of lives each year.

4. *True.* While the solid, double yellow line indicates that passing other vehicles is not permitted, you are permitted to cross the solid yellow lines to make a turn into a

driveway or to turn from a driveway onto the highway.

How Did You Do?

If you answered all the questions correctly, you have a good knowledge of highway operations and safety features. If you didn't get all the answers right (most people don't), your highway safety "awareness" is not what it should be. Go back over the quiz and make sure you fully understand the correct answers. You can be a safer driver and/or pedestrian if you increase your knowledge of these fundamental aspects of safety.♦

Source: US. Department of Transportation, *Office of Highway Safety Publication No. FHWA-SA-93-OS1*. Request these pamphlets from FHWA and distribute in your area to promote a safer transportation environment.

HOW TO CONDUCT AN EFFECTIVE WORKSHOP

How can you help your department to work smarter, together, to achieve higher efficiency and productivity? Training can help! Training helps people know how to get the most out of their equipment, to understand why things are done a certain way, and to know what is important. Even experienced employees can benefit from learning what is new, or learning about what is being done in other areas that have similar problems.

As a supervisor, it is up to you to provide training for your personnel if you want to improve their performance. You may want to conduct this training yourself, or use available training programs provided by the Transportation Technology Transfer Center or you may want to call upon

outside consultants to help. In any case there are certain things you should keep in mind.

THE ADULT STUDENT

You will be teaching or training adults. Adult students have certain things in common. You want participants to learn and to go back to the job using their new competency. Keeping the following things in mind as you prepare for a workshop will help you become most effective:

- √ **Build upon experience.** Adults have a good deal of first hand experience. They usually have a good sense of what will or will not work based on their common sense and experience. It helps to explain why new methods or procedures will work, and how they will improve performance.
- √ **Provide information and skills relevant to their needs.** Adult learning needs are real and specific. They have real problems to solve and real decisions to make. Material you use should have a "present" orientation. It should be material your students can use now.
- √ **Motivation is an essential ingredient.** If adults can identify how the material will directly relate to their jobs, this will generally provide the needed motivation.
- √ **Don't waste their time.** Adults have a great many other concerns outside of the learning situation.
- √ **Give them feedback.** Adults prefer to be self directed, but they

need to have feedback on how they are doing. It is not enough to test them over workshop material. If what you are looking for is a change in their

(continues on page 8)

(How to Conduct an Effective Workshop)

practices on the job, then you must check their work performance.

- ✓ **Reward improved behavior.** Adults have real things to gain and lose. Back at the job, reward improved behavior to reinforce what your personnel have learned. Often a word of praise, the realization that you have noticed and approve the change, is enough reward.

DECIDING ON YOUR OBJECTIVES

Objectives provide a sense of direction for all concerned with the learning experience. Before you start planning your workshop decide specifically what you hope to accomplish. It often helps to write out your objectives.

Your next problem is how to meet these objectives. Consider your audience. What is their level of interest? Can you raise their level of interest by showing them how this training will directly affect their job performance? Consider the skills of your students. How can you best get the information across to each one of them? Every activity in your training session should contribute directly and effectively to meeting your written objectives.

As you preview any training materials you are planning to use, ask yourself how the training video, the film, the slides, or the written materials are going to help you meet your objectives. How will they be received by your audience? Will they be easily understood, or will you have to provide additional information? Sometimes it is necessary to use only parts of the prepared materials to get your ideas across. Tailor your material to meet the needs of your audience and to meet your objectives.

SETTING UP A WORKSHOP

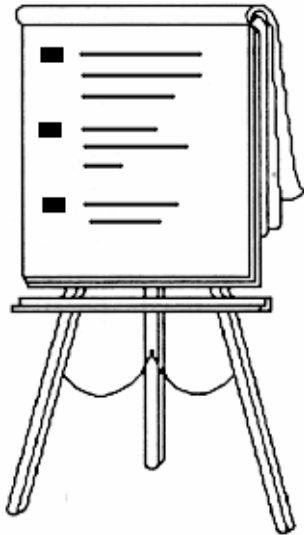
After you have determined your objectives, thought about and prepared your material to meet the needs of your audience, and previewed your material, there are some specific things you need to do. Even if you have a guest speaker in the presentation, you will need to take care of the following aspects:

1. Select a date, time and meeting place.
2. Notify all the people you want to attend.
3. Gather and organize all your training materials.
4. Locate and check the operation of all audio-video equipment.
5. Develop an agenda for the meeting.
6. Prepare yourself for your presentation, or prepare an introduction to the material if someone else is presenting.
7. Set up the training room.
8. Be ready to answer questions.

THINGS TO REMEMBER

The first few minutes of the workshop are the most crucial. If they are interesting, relevant, and pleasant they set the stage for learning.

It is important at the beginning that the learning objectives are obvious to every-one. Explain what the objectives are and why they are important so that participants know what to expect. Explain what you want participants to learn, and how this will directly apply to their job. Explain how you want them to use their new competency.



Use questions to get participants actively involved in the training. **Questions are a way to get the audience started thinking about the training topic.** If people are actively involved, your training will be more effective.

Flexibility is important. If you are not getting through to your audience you should be aware of the fact, and try a different direction, or substitute other material which they will more easily understand. In order to do this you will have to be prepared.

During training be as specific as possible. Try to give timely information about your subject. Focus your remarks and be sure you direct discussion so that you don't wander from the specific topic. Check that

everyone understands. You can do this using questions. Listen to what the group is saying. This will give you an idea of their grasp of the information.

USING OFF-THE-SHELF TRAINING PACKAGES

If you use pre-prepared training packages you still need to prepare your presentation carefully. Putting a video tape into the machine and telling your audience to watch it will not provide effective training. You need to do the following things:

1. Read all the material including the training exercises.
2. Make sure you understand the purpose and objectives of the material. Are these the same as your purpose and objectives? If not, how could the material be modified to accomplish what you have in mind?
3. Prepare a **checklist** of the purpose, activities, and teaching tools you need for each workshop. This will help you organize the material.
4. **Rehearse and practice your presentation.** Even if you use packaged training materials, you must add additional material on how this relates to your audience if you want your training to be effective.
5. **Develop a brief synopsis of the entire training package.** This will help you in organizing other materials, and will provide an introduction so your students will know what to look for.

6. **Check the on-the-job performance of your personnel to determine how effective your workshop has been.** Did they actually incorporate what they learned from the training into their job performance? This should be the goal of every training session.

(continues on page 10)
(How to Conduct an Effective Workshop)

OUR TECHNOLOGY TRANSFER CENTER CAN HELP

Our office has video and written materials that you can use in your training program. After you have determined what your objectives are, you can use our printed material catalog and our video catalog to find out if we have material you can use. Perhaps we don't have an entire video, book, or pamphlet to meet your needs. Sometimes we can suggest segments of these materials which will apply. Call our office at (809) 834-6385 and let us help you find the materials you need.

Remember it is up to you to lay the ground work. You must determine your objectives and set the stage for learning activities, and you must reward changed behavior in order for your workers to realize the importance of your in-house training sessions.

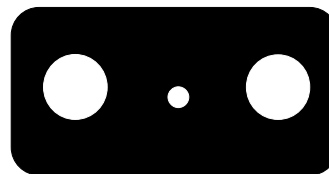
If you feel you need more training to be an effective instructor, we have a video you might want to see. It is called Essential Skills for Trainers and was made by LTAP to help you do a better job with in-house training. It comes with a self directed workbook so you can lead yourself through this training course. Call our office if you would like to have this video and the workbook materials on loan for two weeks. It can help you become a more effective instructor. ♦

Source: *Special Bulletin #14*, South Dakota Technology Transfer Service

Know of any new Publications or Videotapes that might be of interest to the Center?

Send in your entries and where they can purchased or requested from along with your name and organization.

We'll acknowledge your contribution in the next newsletter.



VIDEOTAPES

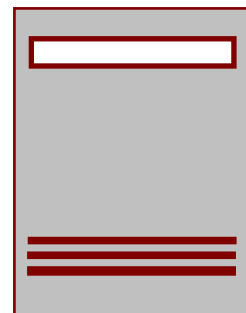
Now available as part of the Center's SHRP collection are:

- Bridge Deck Overlays (19:00 min), Concrete Pavement Overlays (22:00 min), Quality Control of Concrete on Site, Parts One through Four (67:00 min), Alkali-Silica Testing (20:00 min), Freeze-Thaw Testing (25:00 min), Introduction to Rehabilitation of Highway Concrete (10:00 min), Full-Depth Repair of Jointed Concrete Pavement (18:00 min), and Partial-Depth Repair of Concrete Pavement (15:00 min).
- Rutgers University, in conjunction with FTA and FHWA, have produced the May 4th, 1995 Tele-conference on Major Investment Studies. This video may be of interest in regard to the *Tren Urbano* Project; currently the most important transportation project in the San Juan Metropolitan Area.
- FHWA recently put out a five-part series on topics ranging from

Problems with Gravel Roads to Sign Maintenance and Installation. Other topics included in the series are Asphalt Roadway Rehabilitation, Chip Seal Applicant, and Asphalt Paving Inspection. There is one videotape per topic. The complete series runs for approximately 2 hours and 8 minutes.



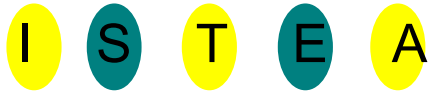
TECHNICAL PUBLICATIONS



Available from TRB: 1995 Transportation Research Records. Numbers in the collection include:

- 1472 Transportation-Related Air Quality
- 1473 Strength and Deformation Characteristics of Pavement Sections and Pavement
- 1475 Rehabilitation Environmental Issues: Energy, Water, Noise, Waste, and Natural Resources
- 1476 Steel, Concrete, and Wood Bridges
- 1477 Statewide Travel Surveys, Traffic Data Collection, and Urban Travel Patterns
- 1480 Public-Sector Aviation Issues: Graduate Research Award Papers 1993-1994
- 1481 Environmental Moisture Effects on Transportation Facilities and Nonearth Materials' Thermal Effects on Pavements
- 1485 Human Performance and Safety in Highway, Traffic, and ITS Systems
- 1486 Environmental Testing and Evaluation of Stabilized Wastes, Performance of Stabilized Materials, and New Aggregate Tests
- 1492 Hot-Mix Asphalt Design, Testing, Evaluation, and Performance
- 1493 Travel Demand Forecasting, Travel Behavior Analysis, Time-Sensitive Transportation, and Traffic Assignment Methods
- 1494 Traffic Operations, Traffic Signal Systems, and Freeway Operations 1995
- 1512 Safety Effects of Roadway Design Decisions

For a copy of the Center's latest video catalog or inquiries about the publications collection, call us at (809) 834-6385, fax us (ISTEA at (809) 265-5695 or e-mail us at t2pr1@rmce02.upr.clu.edu



National Highway System (NHS) Designation Act Signed

The delay in the passage of the proposed National Highway System (NHS) has created concerns for many states as the fate of \$6.3 billion, reserved for federal highway construction, hangs in the balance. If Congress had failed to enact the required NHS designation by the September 30, 1995 deadline, the elimination of NHS and interstate maintenance funding to the states would have had a major impact on the nation's surface transportation system.

The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA), a federal-aid authorization bill for highways and public transit, called for the development of a National Highway System. This system includes the Interstate Highway System, the Strategic Highway Network, congressionally designated high-priority corridors, and other rural and urban principal arterial routes that provide access to major ports, airports, international border crossings, public transportation facilities, and inter-modal transportation facilities which serve interstate and interregional travel. It will also serve as a focal point for future federal highway investments.

The Federal Highway Administration (FHWA) worked with the states to develop a NHS consisting of nearly 254,400 km (159,000 miles) of the nation's busiest, most important roads. The proposed NHS would be comprised of:

Existing Interstate System	72, 800 km (45,500 miles)
Strategic Highway Corridor Network	25, 120 km (15,700 miles)
Major Connectors	3, 040 km (1,900 miles)

ISTEA High Priority Corridors	7,200 km (4,500 miles)
Selected Regional Arterial Highways	145, 760 km (91,100 miles)

The proposed system was presented to Congress for Designation in December 1993. Although it will comprise only 4 percent of the nation's roads, it will carry 40 percent of auto travel and 75 percent of truck traffic. The NHS connects 95 percent of the businesses and 90 percent of the households in the United States with the rest of the nation. It is a strategic system for which federal transportation investment provides many benefits for the nation including economic growth, national security, intermodal and highway connectivity, safety, the ability to accommodate and expand trade, and to sustain a growing tourism industry.

The legislation was enacted November 28, 1995 designating almost 260,000 km (160,955 mi) of roads as the National Highway System.

In Puerto Rico, approximately 700 km (438 mi) of rural and urban roads form part of the National Highway System. Until the system was designated, the law prevented future NHS and Interstate Maintenance (IM) funds from being released to the states and Puerto Rico. With the enactment of the NHS legislation, \$5.4 billion of Fiscal Year 1996 funds, which have been withheld since Oct. 1, can be distributed to the states and Puerto Rico.

The newly enacted law establishes innovative ways to attract new forms of investment in transportation and gives states greater flexibility and more options to utilize limited federal transportation funds effectively. This will enable federal transportation officials to focus their efforts on the most useful and cost-effective ways of achieving important safety aims and increase states' discretion to implement their highway programs in ways best suited to their own circumstances. ♦

Source: *Illinois Interchange*, Fall 1995 and *Public Roads*, Winter 1996

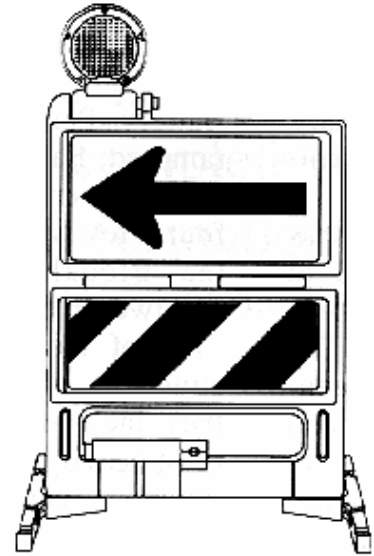
SHRP PRODUCT SERIES

Multidirectional Indicator Barricades

The multidirectional indicator barricade is based on a design developed and tested under the Strategic Highway Research Program (SHRP). The barricade is a type II barricade that features a 60-centimeter by 30-centimeter horizontal arrow panel on the upper portion and a 60-centimeter by 20-centimeter chevron panel on the lower portion. The large arrow on the upper portion clearly points the way for motorists traveling in construction zones.

On the 1-55 project near Springfield, Illinois, the barricades were used where one lane of a bridge was closed for reconstruction. The other lane had been converted to a temporary two-way, two-lane operation. Approximately two dozen multidirectional indicator barricades were used to direct motorists safely through the taper zone and into the temporary travel lane. "The multidirectional indicator barricades did the job of clearly telling motorists what we want them to do. The arrows provide motorists with more positive guidance," says Ken Wood, Traffic Operations Engineer for the Illinois Department of Transportation. Other officials indicated that it was a low cost modification with big benefits. ♦

Source: FHWA *Focus*, September 1994



Pavement Repair Manuals

The **Asphalt Pavement Repair Manuals of Practice** developed through **SHRP** help answer some common questions concerning pavement repair. Questions such as: Which material works better for different weather repairs? Which pothole repair procedure works best? How do you determine cost effectiveness of the repair? The use of the manual will help solve the common pavement problems of pothole repair and crack sealing.

The **Concrete Pavement Repair Manuals of Practice** addresses spall repair and joint sealing of Portland cement concrete pavements. The manual describes procedures and materials recommended for partial-depth spall repair utilizing rapid-setting materials.

Detailed guidelines on design, construction and inspection are presented in this manual. Proper use of joint sealing compounds is also described within the manual. The manual was prepared for use by maintenance engineers, field supervisors, crew persons, contractors and inspectors as an easy reference guide that can complement state highway agency specifications.

Both the asphalt and concrete manuals present new maintenance materials and methods to save valuable crew time, produce more durable pavement surfaces, minimize traffic disruption, and reduce worker exposure to traffic hazards. The manuals will help in the selection of the best maintenance materials for

the job, considering climatic conditions, traffic volume, cost and useful life of the repair.

The manuals are available as loan publications through the Puerto Rico T² Center.

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A Research-to-Practice Symposium on Repair and Rehabilitation of Bridges and Pavements

May 1-3, 1996 Warwick, Rhode Island

Contact: Dr. Benjamin Colucci/Dr. Houssam Toutanji (809) 834-6385 FAX (809) 265-5695
e-mail bcolucci@rmce02.upr.clu.edu or h_toutanji@rumac.upr.clu.edu

13th Annual International Bridge Conference

June 3-5, 1996 Pittsburgh, Pennsylvania

Contact: ASTM (215) 299-5400 FAX (215) 977-9679

1996 Annual LTAP Conference

August 4-7, 1996 New Orleans, Louisiana

Contact: Louisiana LTAP Center (504) 767-9136

66th ITE Annual Meeting and Exhibit

September 15-18, 1996 Minneapolis, Minnesota

Contact: ITE (202) 554-8050

ITE District 10 Meeting

November 6-8, 1996 Jacksonville, Florida

Contact: Bob Hill (904) 281-1121

Eighth International Conference on Asphalt Pavements

August 10-14, 1997 Seattle, Washington

Contact: University of Washington Engineering Professional Programs (206) 543-5539



SEMINAR PROGRAM

P U E R T O R I C O

Project Management

Prof. José F. Lluch

March 15 & 29, 1996, San Juan, Puerto Rico

Effective Supervisory Skills for Transportation Officials

Engr. Ismael Castillo-Bernal

March 20-21, 1996, San Juan, Puerto Rico

Practical Guidelines for Technical Writing in English

Prof. Edith Algreen

April 18-19, 1996, San Juan, Puerto Rico

Total Quality Management for Transportation Officials

Prof. Frederick R. Brodzinski

May 30-31, 1996, San Juan, Puerto Rico

V I R G I N I S L A N D S

Repair and Rehabilitation of Concrete Structures

Prof. Houssam Toutanji

April 2, 1996, St. Croix, Virgin Islands

An Introduction to Environmental Consideration in Transportation Activities and Projects

Prof. Roque A. Román

May 17, 1996 St. Croix, Virgin Islands