MD T² Center

Maryland Transportation Technology Transfer Center
Local Technical Assistance Program (LTAP)
University of Maryland, College Park

Technotes

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In this issue:

Route TechNotes

Return/File

Announcing the TEST Program

The University of Maryland Transportation Technology Technology Transfer Program (T2) in conjunction with the Maryland State Highway Administration are happy to announce the official start of the TEST (Traffic Engineering Skills Training) Program. TEST provides a framework for the development of a cohesive coordinated traffic engineering training program in Maryland. This program coordinates with and builds upon existing SHA and T2 training programs, as well as training offered by other organizations.

Goals & Objectives

The goal of the TEST program is to raise the traffic engineering skills training level of State Highway Administration staff, local agencies, and consultants in the State of Maryland.

TEST's long term objectives are to:

- Develop and maintain curricula for highway and traffic engineers, planners, traffic technicians, and others who must understand transportation systems operations.
- Foster the development and delivery of instruction that provides the knowledge and skills described in these curricula to the Maryland SHA, local agencies, and consultants.
- Provide an organized source of information on traffic education and training available in the State of Maryland,
- Promote continuing education within the transportation community to improve the safety and efficiency of Maryland's surface transportation system.

TEST's shorter-term objectives are to:

- Rapidly implement traffic engineering skills training in Maryland.
- Develop and provide a framework that supports the development and delivery of traffic engineering training in Maryland over the longer term.

TEST Audience

The TEST program will address the needs of individuals in state and local agencies with transportation responsibilities, as well as those in private sector firms. TEST will include overview and introductory courses suitable for a broad audience, as well as more in-depth technical courses. Initially, the target audience will include:

- Highway and traffic engineers,

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Test Program (cont'd)

(cont'd from page 1)

- Highway and traffic engineers,
- Transportation and urban planners,
- Traffic technicians, and
- Others who must understand transportation systems operations.

While the initial program focuses on traffic operations, many of the overview courses will also be appropriate for local elected officials, incident responders, and other who are interested in transportation operations.

Key Elements

The TEST Program provides a framework for the development of a cohesive coordinated traffic engineering training program in Maryland. This program will coordinate with and build upon existing SHA training programs, as well as training offered by organizations such as the Institute of Transportation Engineers, the Maryland Municipal League, and the Consortium for ITS Training and Education (CITE).

The key elements of the program are:

A **Multiple-Track Curriculum** that defines the training needs of different audiences.

A **Traffic Training Information Clearinghouse** that serves as a coordinated source of information for those who wish to enroll in, develop or deliver traffic engineering training.

On-going Program and Course Evaluation to ensure high-quality training that is relevant to the needs of individual participants and the transportation community in Maryland.

A **"Quick Start" Program** to rapidly implement a series of existing training courses that support development of traffic engineering skills in Maryland.

Report explores causes of top-down cracking

Longitudinal, or top-down, cracking in the top asphalt concrete (AC) layer is frequently observed in flexible pavements. What causes this cracking isn't certain, but research funded by the Minnesota Local Road Research Board provides some clues.

The report, Investigation Of Factors Related To Surface-initiated Cracks In Flexible Pavements, was written by Jill M. Holewinski, See-Chew Soon, Andrew Drescher, and Henryk Stolarski of the University of Minnesota's Department of Civil Engineering (CE).

Longitudinal surface cracks are predominantly parallel to the asphalt concrete pavement centerline and located in the vicinity of the wheel paths. Unlike fatigue cracking at the bottom of the AC layer, inspections of core samples show that longitudinal cracks form from the surface and move downward. Forensic analyses also show that these cracks seldom reach the bottom of the AC layer.

At the Minnesota Road Research (Mn/ROAD) facility, longitudinal cracks have been observed to form perpendicular to the edge of the transverse cracks in the wheel paths, and then propagate away from the transverse cracks until they eventually meet and form one continuous crack the entire length of the pavement cell. At the early state of the distress, the cracks appear as hairline. The cracks are most visible in the spring and tend to heal over the course of the summer. Longitudinal cracking is now developing in all the Mn/ROAD mainline test cells and will likely continue to progress.

The conventional studies in pavement performance modeling are focused mostly on classical fatigue cracking initiated at the bottom of the AC layer. Several researchers have concluded that the conventional approach to analyzing pavement distress cannot explain surface-initiated top-down cracking, and have proposed various hypotheses in an attempt to explain this phenomenon.

One of the most widely accepted hypotheses is that surface cracking is wheel-induced cracking. This implies that the problem should be addressed in terms of contact mechanics, since the tire properties and geometry affect the induced stresses. Most important, there is a significant effect from the tire treads. The available analytical tools for pavement design and performance evaluation are based on the assumption of uniform pressure distributions exerted on the pavement surface by tires.

Recent research on the nature of near-surface stress distribution has shown that truck tires can impart significant tangential (frictional) forces to the pavement surface. Estimates of the magnitude of these forces suggest that they may be sufficient to cause large tensile/shear stresses and localized failure near the pavement surface, resulting in top-down propagating cracking.

With the increasing interest in the mechanistic/empirical design of flexible pavements, such as MnPave, information is needed to assess the distribution and magnitude of stresses and strains in the system's various layers. In particular, tensile stresses (or strains) in the AC layer, and compressive stresses (or strains) in the base or subgrade, often are viewed as critical input values.

The CE's team's research had two distinct yet related objectives: 1) identify potential mechanisms for the occurrence of top-down cracking, and 2) investigate stress patterns and stress concentrations due to surface load and pre-existing transverse (thermal) cracks in flexible pavement.

Their report provides information on surface stresses that derives from both theory and experiments. The results indicate a greater potential for tensile stresses outside the tire treads than in the middle of the treads. In addition, the researchers observed that the presence of a transverse crack in the AC layer significantly increases the vertical stresses in the base. It also has a noticeable effect on the horizontal stresses in the AC layer.

You may download a PDF of the report at http://www.lrrb.org/pdf/200307.pdf (3.98 MB). *This article was compiled from the report executive summary.*

(Article reprinted with permission from the Minnesota LTAP Program's Minnesota Technology Exchange newsletter)

Slope Stabilization with Recycled Plastic Pins

A new technique for stabilizing surficial slides in earth slopes and embankments has been developed for the Missouri Department of Transportation by investigators from the University of Missouri-Columbia. The technique uses reinforcing members, manufactured from recycled plastics and other by-products, to intercept potential shallow sliding surfaces and provide additional resistance to maintain the stability of the slope (Figure 1). The general feasibility of the technique was demonstrated previously at a "proof of concept" site located on Interstate 70 near Emma, Missouri.

Based on the successful implementation at the I70-Emma site, an expanded field testing program was undertaken in 2000 to evaluate the effectiveness of stabilization schemes in varied site conditions and to investigate whether an adequate margin of safety could be maintained using more widely spaced reinforcement schemes. These objectives were addressed by establishing instrumented test sections at five sites and monitoring the performance of each test section since installation.

Field Test Sites

The selected sites were chosen from a pool of over 50 candidate test sites located across the state. The sites include two embankment slopes located on Interstate 435 in southern Kansas City, an excavated slope on U.S. Highway 36 near Stewartsville, Missouri, an additional embankment slope at the I70-Emma site (designated Phase II), and an excavated slope on U.S. Highway 54 near Fulton, Missouri. Slope heights at the selected sites range from 15- to 46-ft; slope inclinations vary from 2.2:1 (H:V) to 3.2:1. Subsurface conditions for the different slopes also vary.

Extensive site investigation and laboratory testing programs were performed for each of the selected sites to establish the conditions that are believed to have led to previous failures at the sites. Stability analyses were then performed to evaluate the stability of the respective slopes for different potential stabilization schemes. Results of these analyses were then used to select the stabilization scheme(s) for the respective sites. Variable stabilization schemes were used at different sites, and within single sites (Figure 2), so that the technique could be optimized based on the costs and performance of each stabilized section. Stabilization schemes varied from schemes with closely spaced members (e.g. 3-ft by 3-ft uniform grid) that are very likely to be effective to schemes with relatively widely spaced members (e.g. 10-ft by 10-ft) that are not likely to provide long-term stabilization.

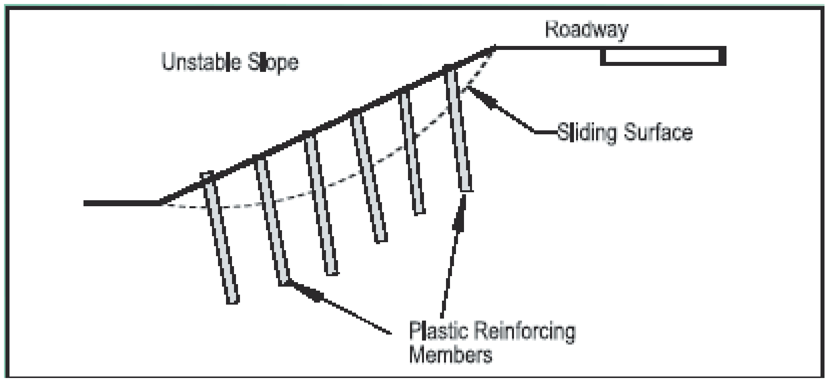

Figure 1: Stabilization of slope using recycled plastic reinforcement.

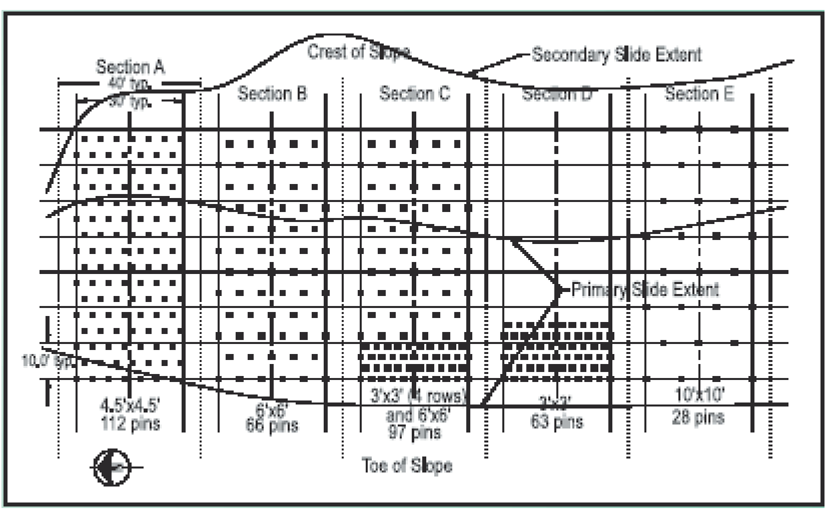

Figure 2: Plan view of the US 54-Fulton test site allowing alternative schemes utilized at the site.

Field Installation

Reinforcing members were installed using two different types of equipment (Figure 3). The vast majority of members were installed using a crawler-mounted pneumatic rock drill; however, a select number of members were installed using a simple drop-weight hammer mounted on a skid steer loader. Both types of equipment proved to be extremely effective for driving the reinforcing members. Installation rates generally averaged approximately 100 members per day for each type of equipment and peak installation rates exceeded 140 members per day. Installation at the I435-Kansas City sites was completed in December 2001; installation at the US36-Stewartsville site

(continued on page 8)

Pedestrian Safety in Maryland

Recommendations for Transportation Planners and Engineers

Maryland Bicycle and Pedestrian Advisory Committee Safety and Education Subcommittee

Pedestrians are legitimate users of the street network, and they should therefore be able to use the network safely and without unreasonable delay. With the exception of expressways and high-speed freeways, pedestrians have a right to walk along and to cross streets safely and, therefore, planners and engineers have a professional responsibility to plan, design, and install safe walking and crossing facilities. The first goal of the Maryland Department of Transportation's 20-Year Bicycle and Pedestrian Access Master Plan calls for the integration of pedestrian facilities into routine development policy. Pedestrians should be included as "design users" for all streets.

Pedestrian safety in Maryland is a pressing issue. Each year in Maryland, more than 100 pedestrians are killed and nearly 3,000 are injured. This accounts for 17% of total traffic fatalities in the State and places Maryland 13th for pedestrian fatalities in the U.S. (per population). Children and the elderly are disproportionately impacted by pedestrian-vehicle crashes. Nearly 30% of pedestrian-vehicle collisions involve children less than 16 years of age, yet this group makes up only 21% of the population. Further, while only 6% of pedestrian crashes involve the elderly, they account for 16% of all fatal pedestrian crashes.

A pedestrian safety objective of the Maryland State Highway Administration is to reduce the annual number of pedestrian fatalities on all roads in Maryland from 99 in 2001 to fewer than 90 by December 31, 2006 and to reduce the annual number of pedestrians injured on all roads in the State from 2,700 in 2001 to fewer than 2,400 by December 31, 2006.

Physical inactivity contributes to the risk and severity of numerous chronic diseases that can be reduced through regular lifestyle activity. Enhanced pedestrian safety can improve the quality of life by reducing barriers to walking as a mode of transportation and recreation.

It is a public responsibility to provide a safe, secure, and comfortable transportation system for all people who walk. Research in pedestrian safety has found the following planning, design and engineering measures useful for improving the safety of pedestrians:

1. Enhance pedestrian safety and mobility with sidewalks and walkways. This is a critical component of a pedestrian transportation network in urban and suburban areas. Rural roads should have shoulders for pedestrian travel. The permitting process for new construction and reconstruction of roadways should require that safe pedestrian access be included in plans as a condition for obtaining a permit.
2. Create substantial improvements at uncontrolled crosswalks (i.e., where there is no stop sign or traffic signal for the approach roadway) on multi-lane roads with traffic volumes above 12,000 vehicles per day. Consider adding traffic signals with pedestrian signals, providing raised median refuge islands, and/or initiating speed-reducing measures.
3. Provide raised median islands on multi-lane roads to provide a point of refuge and reduce pedestrian crash risk. Two-way left turn lanes and undivided highways present the highest crash risk for pedestrians.
4. Provide nighttime lighting to enhance pedestrian safety in certain situations.
5. Apply countermeasures that are effective in reducing identified pedestrian risks related to right-turn-on-red (RTOR), such as the use of no-turn-on-red (NTOR) signs, illuminated, if necessary.
6. Consider inclusion of innovative pedestrian and motorist warning signs and signals to reduce vehicle speeds or conflicts between pedestrians and motorists, such as countdown pedestrian signal heads, standard and fluorescent yellow-green pedestrian warning signs, YIELD TO PEDESTRIANS WHEN TURNING signs, PEDESTRIANS WATCH FOR TURNING VEHICLES signs. Use appropriate walking speeds in timing pedestrian signals.
7. Install textured tactile pavements, pedestrian signals with audible and vibrating detectors, larger signs and pedestrian signals, and wheelchair ramps to address the needs of pedestrians with disabilities.
8. Ensure that sidewalk access is not blocked by street furniture (e.g., utility poles, benches, utility boxes), encroaching vegetation, damaged pavement or the lack of suitable wheelchair ramps.

(continued on page 9)

FHWA Helps Deliver QuickZone to Transportation Agencies

Travelers increasingly view road construction activities as a major cause of delays and believe that improvements in work zone planning could enhance driver satisfaction. But project planners who make key decisions about the staging and duration of construction projects typically lack the tools needed to assess the hidden costs associated with traveler delay.

To help mitigate the traffic delays and costs associated with work zones, the Federal Highway Administration (FHWA) currently is providing training sessions on QuickZone, a user-friendly, computer-based application suitable for urban and interurban corridor analysis. The software enables planners, highway engineers, road owners, and contractors to compare various construction planning strategies, such as the effects of doing work at night or diverting traffic to alternate roads. Users can estimate the effects for time periods ranging from 1 day to the entire life of the project.

QuickZone Version 1.0 already has been used successfully for several completed projects. FHWA expects to release a new version of QuickZone in January 2005. In addition, the FHWA Resource Center is working to enable users to incorporate QuickZone into their project analyses more efficiently.

Although contractors have offered several 1-day QuickZone training sessions, FHWA is transferring responsibility for the sessions to its Resource Center, which will help States, contractors, and other attendees save money. A recent training session in Tennessee focused on a QuickZone case study of a highly politicized full closure of I-40 in Knoxville, TN, during a reconstruction project.

The sign shown above warns motorists about an upcoming work zone, which may cause traffic delays and detours. FHWA currently is providing training sessions on QuickZone, a software program that enables users to better manage work zone delays, detours, and other issues related to work zones.

In 2004, the Tennessee DOT (TDOT) determined that a section of I-40 located east of downtown Knoxville needed major rehabilitation, and the agency started evaluating various strategies for performing the work. Construction costs, project duration, and the potential impact of the project on road users were major considerations. One option was full closure, which entailed completing work on the freeway interchanges without maintaining through traffic. The advantages of this option were shorter project duration, improved worker safety, and potential cost savings. The impact on road users throughout the closure period was unknown, however, until TDOT used QuickZone to determine the potential delays. The QuickZone analysis indicated that several bottlenecks along a proposed diversion route would not support the combination of current and diverted traffic, and that queuing at these bottlenecks would, on most days, generate significant congestion during peak periods.

The FHWA Resource Center plans to offer additional QuickZone training sessions in the near future as demand necessitates. In addition, FHWA expects to release a report in 2005 that will capture the innovative uses of QuickZone in eight case studies, including the Knoxville study.

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What's Happening on the Web

Check Out the Newest Research Tool Available from the National Transportation Library

Coordinated by the National Transportation Library(NTL), the Transportation Libraries Catalogue (TransCat) enables the user to simultaneously search multiple transportation library collections held in Online Computer Library Center (OCLC). The union catalogue reflects the collections of fifteen libraries, including those of the Midwest Transportation Knowledge Network (MTKN) and others with significant collections. Institutions with transportation specific libraries are welcome to participate in TransCat.

TransCat provides access to a customized union catalogue of transportation libraries' bibliographic records. Researchers may search the collections of participating libraries in a single click, or they may limit their search to a specific group of transportation libraries; Government Transportation Libraries, University Transportation Libraries, and Midwest Transportation Libraries.

Guest access to TransCat is available at www.ntl.bts.gov

(Article reprinted with permission from Oregon T2 Center)

National Work Zone Awareness Week Statistics

National Work Zone Awareness Week Calls Attention to Increases in Fatalities, Injuries, Road Hazards and Dangers of Work Zones

By John R. McCarthy, Alabama T2 Center

The sixth annual National Work Zone Awareness Week (NWZAW) will be held from April 3 to April 9 of this year. The purpose of NWZAW is to educate the nation on work-zone related injuries and fatalities. Part of this education is informing the public of the hazards and dangers that can be encountered and avoided when driving through a roadway construction zone.

Data has been gathered on work zone crashes and fatalities by the National Work Zone Safety Information Clearinghouse (NWZSIC) to improve safety in highway work zones. The Clearinghouse is a part of the Texas Transportation Institute at Texas A&M University. Information on frequencies of work zone fatalities and fatal crashes are available on the NWZSIC website for the years 1994 to 2003, as shown in the table below.

Nationwide there were 1028 persons killed in construction and utility work zones in 2003. This figure is down from the previous year when 1186 persons were killed. However, it is noted that nationwide the number of work zone fatalities each year from 1999-2003 is higher than each year from 1994-1998. That is, the average number of deaths nationwide has increased from 760 per year to 1020 per year, based on these five-year analysis periods. Thus, the average number of work zone fatalities has increased 34 per cent in these five-year periods.

Year	# of Fatalities	# of Fatal Crashes
1994	828	721
1995	789	665
1996	717	635
1997	693	594
1998	772	681
1999	872	772
2000	1026	966
2001	989	877
2002	1186	1035
2003	1028	919

National Fatality Data

Another way to express these national figures is to note that from 1994-1998, a work zone fatality occurred once every 11.5 hours, while from 1999-2003, a work zone fatality occurred once every 8.6 hours.

The data is also presented by state. In Alabama, a similar trend can be seen where the last five years appear to be more severe than the previous five years. State specific frequency data can also be obtained from the NWZSIC website at: http://wzsafety.tamu.edu/crash_data/fatal.stm

To reverse this trend, a continued effort is needed to improve the safety of work zones. To respond to this need, the Alabama Technology Transfer Center has joined with the efforts of the other 56 Local Technical Assistance Program centers across the country to improve work zone awareness. Promoting National Work Zone Awareness Week is one step in this effort. Continued training on the standards and methods of traffic control through construction and maintenance work zones will be another part of this effort. This training is based on the standards and guidelines presented in the Manual on Uniform Traffic Control Devices (MUTCD).

The use of frequencies for this data does not take into account any increase in the lane miles of work zone activities or any increase in traffic volumes. Further research is needed to investigate the effect of these exposure variables.

Information on worker injures has been researched by the National Institute for Occupational Safety and Health (NIOSH). In the summary report of a past NIOSH workshop, injury prevention measures were noted as being the careful review of a traffic control plan and revising the Occupational Health and Safety Administration regulations to require adherence to the MUTCD. Data collection systems for non-fatal occupational injuries were also noted as providing insufficient detail to estimate the number of workers injured in work zones nationally. Better data collection to distinguish between injuries to motorists and injuries to workers was also recommended in the report.

To educate motorists about the hazards and dangers of work zones, the Federal Highway Administration has developed fact sheets about work zones. These sheets emphasize points such as:

- Work zone activity is significant
- Work zones cause delay
- There are more work zones in the summer
- Motorists are growing more frustrated
- Vehicle miles of travel grew at a greater rate than miles of roadway
- More work is being done on existing roads already carrying much traffic
- Night work is increasing as agencies try to manage work zone delays
- Work zone mobility and safety are linked

Further details about each of these points is available at the FHWA website: http://www.ops.fhwa.dot.gov/wz/resources/facts_stats.htm

Figure 3: Equipment used for installation of recycled plastic reinforcing members.

was completed in May 2002 and installations at the I70-Emma (Phase II) and the US54-Fulton sites were completed in January 2003. Following installation, each of the sites was heavily instrumented with a suite of slope inclinometers, instrumented reinforcing members, standpipe piezometers, and a variety of soil moisture sensors. Instrumentation at each site has been monitored regularly since installation.

Field Performance

To date, no failures have been observed in any of the test sections and all test sections continue to perform well, although test sections at the US36-Stewartsville, I70-Emma (Phase II), and US54-Fulton sites have yet to be subjected to conditions that are believed to have led to prior failure of the slopes. The behavior observed at each site has generally followed a consistent, three stage pattern of behavior (Figure 4). In the first stage, the slopes are observed to experience little movement as a result of favorable precipitation conditions at the site. In Stage 2, additional movement is observed to occur in response to additional precipitation at the site as the resistance in the reinforcing members is mobilized. The slopes are then observed to enter Stage 3, wherein movements in the slopes are observed to cease due to an equilibrium condition being reached as sufficient resistance is mobilized to maintain the stability of the slope. Slopes at the I435-Kansas City sites and the I70-Emma (Phase I) site have exhibited all three of these stages of behavior, while slopes at the remaining sites remain in either Stage 1 or Stage 2.Additional monitoring of these sites is ongoing to establish whether the stabilization schemes established at these sites are sufficient to provide long-term stabilization of the slopes.

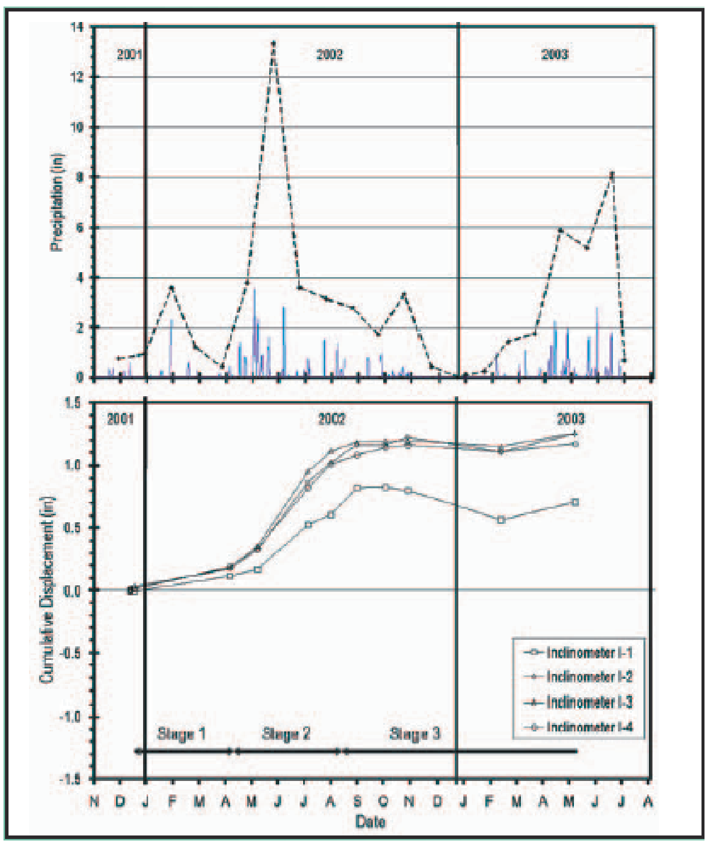


Figure 4: Precipitation and lateral deflections at I435-Wormall Road test site.

Conclusions

The principal conclusions derived from the performance of the field test sites include:

1. surficial slides can be effectively stabilized using recycled plastic reinforcing members placed in a 3-ft by 3-ft staggered arrangement over the entire slide area;
2. long-term stabilization may be possible with more widely spaced arrangements of reinforcing members (with substantial cost savings) but additional monitoring is necessary to more definitively establish minimum required reinforcement patterns;
3. the stabilized slopes follow a consistent, three-stage pattern of behavior in response to precipitation experienced at the site and mobilization of resistance in the reinforcement;
4. and unit costs for stabilization using recycled plastic reinforcing members vary substantially with the spacing of the reinforcing members ($4.50/ft2 of slope face to less than $1.00/ft2).

(Article reprinted with permission from Missouri LTAP's MOinfo newsletter)

Latest Library Resources

Publications

Application of Geophysical Methods to Highway Related Problems. Federal Highway Administration. Report #IF-04-021. Aug 2004.

Guide for Curing of Portland Cement Concrete Pavements Volume 1. Federal Highway Administration. Report #RD-02-099. Jan 2005.

Evaluation of LS-DYNA Soil Material Model 147. Federal Highway Administration. Report #HRT-04-094. Nov 2004.

Identifying and Assessing Key Weather Related Parameters and Their Impact on Traffic Operations Using Simulation. Federal Highway Administration. Report #HRT-04-131. Sept 2004

Incremental Costs and Performance Benefits of Various Features of Concrete Pavements. Federal Highway Administration. Report #HRT-04-044. April 2004

Enhanced Abutment Scour Studies for Compound Channels. Federal Highway Administration. Report #RD-99-156. Aug 2004

To obtain Library Resources contact the T² Center at (301) 403-4623 or send an email to ttc@eng.umd.edu

Pedestrian Safety in Maryland (cont'd)

9. Consider placing bus stops on the far side of an intersection and at locations with good sight distance and alignment (e.g., not on steep grades or on horizontal curves).
10. Carefully plan and design pedestrian overpasses and underpasses to encourage pedestrians to use the facilities and not continue to cross at street level. This will substantially improve safety for pedestrians needing to cross freeways or busy arterial streets at certain locations.
11. Convert two-way streets to one-way streets to greatly simplify the task of crossing a street, particularly if the one-way street conversion does not result in increased vehicle speeds.
12. Implement traffic-calming measures for neighborhood streets to reduce aberrant vehicle speeds and/or reduce cut-through vehicle traffic. Street closures, speed humps, chicanes, curbs extensions, diverters, and other measures are in use in various U.S. cities and have been found to be effective in improving safety for pedestrians and/or traffic as a whole based on reductions in crashes, vehicle speeds, and/or reductions in cut-through traffic on neighborhood streets.
13. Provide suitable alternative pedestrian access for persons with disabilities when existing pedestrian access is closed due to construction or maintenance activities.
14. Use channelizing devices such as median landscaping or appropriate fencing as well as signs, and/or curb markings to encourage crosswalk use by pedestrians.
15. Reduce the incidence of blocked pedestrian access to sidewalks during inclement weather (e.g. avoid placing the snow from roadways onto sidewalks during highway snow removal).

For further information on planning and engineering techniques to improve pedestrian safety, see:

A Review of Pedestrian Safety Research in the U.S. and Abroad, FHWA-RD-042, January 2004.

Manual of Uniform Traffic Control Devices for Streets and Highways, Federal Highway Administration, US DOT, 2003 Edition.

The Traffic Safety Toolbox: A Primer on Traffic Safety, Institute of Transportation Engineers, 1999.

Upcoming Courses for 2005

The following courses have already been scheduled for 2005. More classes are also being added on a regular basis. Act now to make sure that your or your constituents get a seat before they fill up!!!

For more information or to schedule a class call Janette Prince at 301-403-4623 or visit our website at http://www.ence.umd.edu/mdt2center

Currently Scheduled Courses for 2005

Intro to Temporary Traffic Control — *$50/150/175*
May 2, 2005 — ***College Park, MD***

Description: An introductory course to temporary traffic control in work zones, TTC is a one-day course designed to give participants a complete overview of traffic control in work zones, including applicable standards, devices used, component parts and their requirements, and installation/removal considerations.

Work Zone Design — *$125/375/395*
May 3-5, 2005 — ***College Park, MD***

Description: The course will give participants knowledge of the entire temporary traffic control (TTC) process: planning, design, review, installation, maintenance, and evaluation of proper maintenance of traffic (MOT) controls for work zones. While the functions of planning, design, review, and operation of temporary traffic control are covered in detail, issues concerning safety of pedestrians and highway workers, human factors, and legal responsibility are also addressed.

Retroreflectivity — *$50*
May 10, 2005 — ***College Park, MD***

Description: Since the retroreflective properties of signs deteriorate over time, road and street officials should assess their schedules for inspecting, cleaning and replacing signs to ensure that these maintenance activities meet the objectives of the MUTCD and, more importantly, the needs of drivers at night. This workshop will help practitioners gain a better understanding of sign retroreflectivity issues in order to improve the overall nighttime visibility of traffic signs.

Tort Liability & Risk Management — *$95*
May 11, 2005 — ***College Park, MD***

Description: This workshop provides an overview of the legal duties and responsibilities of roadway personnel. Key legal concepts relating to the liability of roadway agencies are reviewed from a risk management standpoint. Common types of claims/lawsuits brought against street departments and highway agencies are identified through examples/case studies.

Pedestrian & Bicycle Accomodation — *$95*
May 12, 2005 — ***College Park, MD***

Description: This workshop provides current information on the design, operation and maintenance of successful pedestrian and bicycle facilities. Emphasis is placed on making participants aware of the characteristics and needs of pedestrians and bicyclists and on the importance of an interdisciplinary approach to planning and implementing pedestrian and bicycle programs.

Traffic Sign Installation — *$50/150/175*
May 17, 2005 — ***College Park, MD***

Description: This one-day course will cover the basics of traffic signs: using the appropriate rules and regulations to select and apply appropriate traffic signs, as well as proper installation and maintenance techniques. Participants will learn the importance of and the basic rules for signing, inspection techniques for sign installations, and maintenance procedures for sign faces and supports.

Asphalt Resurfacing — *$50*
May 19, 2005 — ***College Park, MD***

Description: This course reviews the various asphalt mixes, their components and their uses. Asphalt resurfacing procedures are covered, including preperation, material, equipment, operation and safety. Special emphasis is placed on proper rolling and compaction of the asphalt overlay. Superpave mix design is discussed.

Access Management — *$75/275/295*
May 25-26, 2005 — ***College Park, MD***

Description: Management addresses the task of controlling the number, complexity, and spacing of events to which a driver must respond, which then improves traffic operation and reduces accidents. This course covers not only why, but also how to manage access, from policy, legal, and design perspectives.

Highway Capacity Analysis — *$75/275/295*
June 7-8, 2005 — ***College Park, MD***

Description: This course is offered to provide working knowledge on the basics of capacity analysis, and the use of the HCM and Highway Capacity Manual Software. Presentations will include a mix of lecture, sample problem analysis and hands-on computer use. The manual includes chapters covering a wide range of facilities and modes including freeways, weaving and ramps, multi-lane rural and suburban highway signalized intersections, unsignalized intersections, transit, pedestrians and bicycles.

Unpaved and Gravel Road Maintenance — *$50*
June 15, 2005 — ***College Park, MD***

Description: This course addresses basic maintenance techniques for unpaved and gravel roads. Topics include road materials, blading or dragging, reshaping or regrading for proper crown, regravelling, stabilization or full-depth reclamation, and dust control, with an introduction to road management techniques.

NOTE: When a class is listed with TWO prices, the first price is for MD Local and State Government, and the second price is for Out-of-State and Private organizations. When a class is listed with THREE prices, the first price is for MD Local Governments, the second price is for State Governments, and the third price is for Out-of-State and Private organizations.

Upcoming Courses for 2005, cont'd

Traffic Calming — *$75/175/195*
June 16, 2005 — ***College Park, MD***

Description: A one-day seminar introducing various traffic calming issues and the appropriateness and effectiveness of the traffic calming measures and techniques associated with these problems. Specific topics include devices (dis/advantages, cost, examples), study and approval system, and liability/legal issues. An interactive workshop will also be conducted.

Intro to Roundabout Design — *$45/95*
May 10, 2005 — ***College Park, MD***

Description: This one-day workshop will provide participants with an introduction to the planning and design of the modern roundabout. Topics covered in the roundabout course will include geometric design, signing, striping, safety, and accommodation of pedestrians and bicyclists.

NOTE: The $45 dollar price is for MD Local Gov't only.

Intro to Geosynthetics — *$50*
July 13, 2005 — ***College Park, MD***

Description: This course is an introduction to geosynthetics, beginning with a discussion of geosynthetics, what they are, how they are made and how they can be used in a rad maintenance program. The course then looks at other geosynthetics and their road system uses, including geogrids, geocells and geowebs, presenting new materials with new applications.

Traffic Engineering Short Course — *$150/650/700*
July 25-29, 2005 — ***Hanover, MD***

Description: This five day short course covers many aspects of traffic engineering, including design, data analysis, operation and management. Also, related factors, such as road use characteristics, public influence and traffic calming are addressed in the class. The course is designed for persons with an engineering background and/or traffic engineering responsibilities in a related field.

Construction Math — *$75*
August 16, 2005 — ***College Park, MD***

Description: Construction Inspectors may need to brush up on math skills specifically related to construction inspection, especially basic geometry, fractions, area, volume, and conversions. The class is a good refresher, and excellent preparation for the Construction Inspection class.

Construction Inspection — *$275/295*
August 17-19, 2005 — ***College Park, MD***

Description: An intermediate class focusing on the construction, inspection, measurement and testing of materials associated with road way construction. Includes real-life scenarios and problems faced on the job, and covers general practices and MD standards.

MUTCD Update — *$50/150*
August 17-19, 2005 — ***College Park, MD***

Description: The 1 ½ day course will cover the changes in Parts 1 through 10 as contained in the 2003 edition of the National MUTCD. Part 2 and Part 6 had the most changes from the 2000 edition of the MUTCD and will be prominently featured in the presentation.

NOTE: The $50 dollar price is for MD Local Gov't only.

Site Impact Analysis — *$75/275/325*
September 13-14, 2005 — ***College Park, MD***

Description: Participants will learn the standard techniques for estimating the traffic impacts of both small and large site developments. Materials will include procedures for land use forecasting, trip generation, trip distribution and assignment, and site impact layout design. Levels of service will also be covered. The workshop will be conducted with manual procedures, but computer software packages suitable for site impact analysis will also be demonstrated.

Winter Maintenance — *$50*
September 15, 2005 — ***College Park, MD***

Description: This course covers all aspects of winter operations - planning and organizing, methods of snow and ice control, salt usage, and winter equipment maintenance. Lesson will include usage of snow maps and formal snow plans.

Intersection Design — *$50/150/175*
October 5-6, 2005 — ***College Park, MD***

Description: Intersection design is a workshop covering planning, analysis, and design of at-grade intersections. Topics include accident characteristics, channelization, evaluation procedures, capacity analysis, and design procedures. The course includes lectures, case studies, group design exercises, and hands-on use of computer software, all with ample opportunity to interact with the instructors who are nationally known as experts in the subject matters.

Bicycle Planning & Design — *$95*
October 27, 2005 — ***College Park, MD***

Description: Forthcoming

Intro to Temporary Traffic Control — *$50/150/175*
November 7, 2005 — ***College Park, MD***

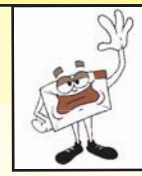
Description: An introductory course to temporary traffic control in work zones, TTC is a one-day course designed to give participants a complete overview of traffic control in work zones, including applicable standards, devices used, component parts and their requirements, and installation/removal considerations.

Work Zone Design — *$125/375/395*
November 8-10, 2005 — ***College Park, MD***

Description: The course will give participants knowledge of the entire temporary traffic control (TTC) process: planning, design, review, installation, maintenance, and evaluation of proper maintenance of traffic (MOT) controls for work zones. While the functions of planning, design, review, and operation of temporary traffic control are covered in detail, issues concerning safety of pedestrians and highway workers, human factors, and legal responsibility are also addressed.

NOTE: When a class is listed with TWO prices, the first price is for MD Local and State Government, and the second price is for Out-of-State and Private organizations. When a class is listed with THREE prices, the first price is for MD Local Governments, the second price is for State Governments, and the third price is for Out-of-State and Private organizations.

Address Update



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- ❑ TechNotes Newsletter
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- ❑ Temporary Traffic Control
- ❑ ITS
- ❑ Soils
- ❑ Structures
- ❑ Roadside Maintenance
- ❑ Training Announcements
- ❑ Traffic Engineering
- ❑ Lighting
- ❑ Road Safety
- ❑ Traffic Control Devices
- ❑ Water
- ❑ Pavement
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