Finally — New Retroreflectivity Requirements

Public Agencies Must Implement New Requirements by January 2012

One of the Federal Highway Administration’s (FHWA) primary missions is to improve safety on the nation’s roadways. More than 42,000 people have been killed on American roads during each of the past eight years. While only one quarter of all travel occurs at night, about half of the traffic fatalities occur during nighttime hours. To address this disparity, the FHWA has adopted new traffic sign retroreflectivity requirements that are included as Revision 2 of the 2003 MUTCD.

To comply with the new requirements, public agencies must implement an assessment or management method that is designed to maintain traffic sign retroreflectivity at or above the minimum levels specified by January, 2012, and such must be maintained. Public agencies will have until January 2015 to replace any regulatory, warning, or post-mounted guide (except street name) signs and until January 2018 to replace any street name signs and overhead guide signs that are identified by the assessment or management method as failing to meet the minimum retroreflectivity levels.

Provided that an assessment or management method is being used, an agency would be in compliance with the requirements of the new provisions even if there are some individual signs that do not meet the minimum retroreflectivity levels at a particular point in time. Instead of using one or more of the five designated assessment or management methods, agencies are permitted to develop and use other methods based on engineering studies.

Because of the seven to 10-year compliance period that has been adopted for replacing signs that have insufficient retroreflectivity, highway departments will be able to implement improved sign inspection and management procedures and subsequently replace the signs in a time frame that is consistent with the typical sign replacement cycle. Cost increases involved in upgrading materials and/or processes might be offset by the long term savings resulting from the longer life of the higher performance sheeting products.

For additional information on this rulemaking and sign retroreflectivity, please visit the FHWA retroreflectivity Web site, www.fhwa.dot.gov/retro.
Eugene Discovers More Miles in Its Roads

By Jim Huddleston
Asphalt Pavement Association of Oregon

Though engineers and contractors didn’t realize at the time, Eugene, OR, was making groundbreaking advances in road construction during the 1960s and 1970s. Ironically, it took more than 20 years for the discovery to surface.

“We became aware that our full-depth pavements were acting as long-lasting pavements in the early 1990s, when we hired a consultant to evaluate a main arterial [road],” said Paul Klope, P.E., principal engineer for Eugene. “We expected an extensive repair, given all the popouts and raveling on the surface,” he said, “but it turns out the pavement was 10-12 inches thick, requiring only two inches of milling and overlay. It’s the first time I witnessed pavement failing from the top down, rather than the bottom up.”

More examples of long-lasting pavements were discovered in Eugene when a pavement preservation program was initiated in 2002. Though the hard numbers are not available, Klope says there are several full-depth pavements within the city’s jurisdiction, proving that early discoveries of pavements that cracked from the top down were not isolated incidents. One of the city’s streets originally constructed in 1952 is still in service and has had only one structure overlay (in 1969). While the base is 55 years old, it is still functioning like new, with no signs of deterioration.

Long-lasting or “perpetual pavements” are defined as those “built for long life without requiring major structural rehabilitation or reconstruction and needing only periodic surface renewal in response to distresses confined to the top of the pavement.” As defined, the “perpetual” label could easily be applied to these aging, full-depth pavements in Eugene, most of which received no overlay treatments within their first 25 years of use.

According to Klope, the city of Eugene had several reasons for building full-depth pavements in the ‘60s and ‘70s. First, it was faster. Constructing full-depth pavement required one operation rather than two, since multiple paving layers were not involved. This minimized traffic disruption and other impacts.

Full-depth pavements often require less excavation as well. This reduces the potential for disruption of utility services and lowers construction costs.

Finally, full-depth pavements were found to be less costly to construct — not only over the life of the pavement when lower maintenance costs are factored but also at original installation (referred to as “first cost”).

Klope said no hard figures have been calculated at the city of Eugene to quantify the cost benefits of...
constructing full-depth pavements, but notes that “milling and filling” the surface typically averages about one fourth of the cost of the complete reconstruction that would be required in pavements demonstrating full-depth failures.

Advantages of Full-Depth Pavements

Beyond the fact that full-depth installations outlast traditional structures and cost less to rehabilitate, several other points came to light upon further examination. One was that traditional gauges may not be the best method for assessment of pavement condition. The pavement condition index (PCI), for example, is based on surface deficiencies like cracking, rutting, raveling, and shoving. Klope said that PCI is a fine method of assessment for applications involving traditional pavement structures that fail from the bottom up but can falsely signal poor conditions beneath the surface when pavement fails from the top down.

Some pavements in Eugene that showed typical surface distress such as age-related cracking, required only surface rehabilitation, though the PCI figures based on these distress marks pointed to deficiencies beneath the surface that were not there. Upon further inspection, the bases were found to be in “like new” condition with no signs of distress, even after more than 30 years of service.

The lesson showed the value of testing to obtain accurate assessments of a pavement’s true structural condition. Core samples and other methods are used to accomplish such, rather than relying too heavily on the conditions that surface appearances might imply.

As for future construction, will the city of Eugene intentionally make full-depth pavements the structure of choice? “That’s where I’m starting the discussion for debate,” Klope said. “We should consider full-depth pavements because of how they’ve performed in the past, especially if first cost is competitive with that of other paving options.” The city is also discussing changes to its design standards based on what’s been learned. “We’ve been making practical changes along the way,” Klope said, “but the concept of changing design standards has not been on the table until now.”

As an aside, Klope mentioned the poor quality of soils in Eugene. Most “r values” — measuring relative strength of the soil — fall in the “poor to very poor” range.

“Because the soils are so poor in Eugene, our inclination might be to avoid full-depth pavement,” Klope said. “But with the addition of some sub-base material, the method actually worked quite well. If it worked here, it should work even better in locations with more conducive soils.”

Gravel roads can be less expensive to maintain than asphalt (hard-surfaced) roads, but there is a limit to its cost effectiveness.

Many people might think that anyone living near a gravel road would be anxiously waiting for it to be covered with asphalt. For bedroom communities in rural areas, such might be true.

For farmers or those driving heavy loads, as frost moves out of the asphalt surface, the resulting damage and, over time, results in higher maintenance, and tax costs, gravel may continue to be their surface of choice.

Paved roads can provide alternatives to gravel in ways that are hard to quantify with dollars, including: improved winter surfaces; superior safety from better signage and delineation, safer surfaces with higher skid resistance, smoother surfaces that increase some users’ satisfaction, reduced road and vehicle maintenance costs, redistribution of traffic away from gravel roads, and an increase tax base on adjacent property.

Nearly half of our nation’s four million miles of roadways are unpaved, meaning that we have about 1.5 milion miles of unpaved roads.

So, how can engineers and road authorities decide when to upgrade a gravel road to a paved one?

**Resources**

Maintenance logistics and costs are part of the decision making process. Two key questions should be answered when developing a gravel road maintenance plan:

1) **What is the best way to maintain a gravel road?**

2) **When should the roadway be upgraded to a paved surface?**

Many factors affect the answers. Two newly published research reports, one by Minnesota’s Local Road Research Board and one from the South Dakota Department of Transportation, provide some direction and assistance.

*Economics of Upgrading an Aggregate Road (2005-2009)*, published by Minnesota’s Local Road Research Board, offers an analysis of county maintenance costs, practices, and traffic volumes for individual roads. This information helps to determine when to upgrade a road, based on cumulative maintenance costs. The data presented in the report can be used by other states and localities, or it can be used as a resource to develop a similar methodology with local data.

The initial data collection included 16 Minnesota counties, broken into four regions around the state. It contained maintenance costs for both bituminous (or asphalt) and gravel roads as well as data regarding the volume of traffic traveling over the roads. Baseline data was obtained from the annual reports submitted to the Minnesota DOT’s State Aid Division from 1997 to 2001.

Four of the counties were analyzed further to devel-
Adapting the Data

Local authorities can use the data from the Minnesota study to create a formula that can be used for their own roads. The study can also be used to calculate maintenance costs by the mile and is available online at www.lrrb.org/pdf/200509.pdf.

The report advises users to “review the historical costs of maintaining paved roads, and if those costs are not available, review data for one of the counties analyzed in the report to get an idea of what the costs may be.”

By using the information presented in this report, an agency can evaluate its typical maintenance and construction costs, can identify the annual maintenance costs for a given type of roadway (whether it’s paved or unpaved), and can calculate the typical construction costs for a variety of surface projects.

Surfacing Criteria

The main objective of a second report published by the South Dakota Department of Transportation was to create a process comparing maintenance requirements for different surface types. The resulting data can help agencies pick the most economical alternative under a given set of conditions. Surface types include hot-mix asphalt, blotter, gravel, and stabilized gravel roads.

Many of the project elements were similar to the Minnesota project. However, the South Dakota project developed an easy to use computerized tool that lets an agency input local costs and treatments to fit its own conditions.

This tool provides output that is easy to generate and understand. Costs can be computed for several alternatives. The program helps the user select appropriate input variables for a typical agency. Results are objective and help make a clear comparison for a variety of roadway surface types.

The Computerized Tool

Like many agencies, South Dakota is willing to share. Its computerized tool is available for download from the South Dakota Department of Transportation’s Web site at www.state.sd.us/Applications/HR19ResearchProjectsi project reports.asp.

The user’s guide outlines all steps required to download the software and populate the required fields with local data.

Making the Choice

With the computer tool, the user inputs actual local costs for maintenance and construction activities. He or she also supplements those costs with road user costs, such as crash data and quality-of-life considerations, as well as other non economic factors. The computer program, once run, provides ratings for each surface type, based on input variables. The user then selects one surfacing alternative over another based on ratings and local priorities.

Traffic is a primary factor in deciding to pave or not to pave in many locations. The Minnesota study found that gravel road maintenance costs per mile appear to increase considerably after roads start carrying over 200 vehicles per day. The South Dakota study found that paved roads are most cost-effective at Average Daily Traffic (ADT) levels above 150 vehicles per day.

This article was primarily drawn from information from Kathryn Knutson O’Brien at the SRF Consulting Group, Minneapolis, Minnesota.
Natural Drainage Systems

Adapted from the City of Seattle Web site (www.seattle.gov)

The city of Seattle, Washington, and the surrounding areas are a hotbed of environmental activism, and one major concern for its citizens was the continued polluting of Puget Sound from stormwater runoff. The city of Seattle, in cooperation with the University of Washington’s Department of Civil and Environmental Engineering, looked for innovative ways to address this problem, and the result was natural drainage systems (NDS).

Elements of Natural Drainage Systems

Street Redesign comprises the first element of NDS and consists of four components:
- Narrower curvilinear streets reduce impervious surfaces but allow two vehicles to pass each other slowly.
- Altered curb and shoulder on each side accommodate vehicle loading. The edge of the roadway has no curb and two feet of grass shoulder which will allow wider and emergency vehicles to pass safely. The two-foot concrete border defines a stream-like alignment, serving both a safety and functional purpose. It provides tight control of final paving elevations, which is necessary for the drainage system and visually defines the roadway edge.
- Curvilinear sidewalks on only one side of the street reduce impervious surfaces.
- Angle and parallel parking stalls are grouped between swales and driveways. The number of parking spaces provided was determined by owners to meet their needs.

Drainage Improvements comprise the second element of NDS and consist of two components:
- Hydraulic engineering requires strict control of elevations using various aggregates and soil mixes below grade.
- Drainage improvements combine contoured swales with traditional drainage infrastructure to regulate the flow and discharge of storm water.

Improved Water Quality uses a combination of soils and plants to filter rain water and allow it to seep into the ground as it washes off the roadway and parking spaces.

After two years, the pilot NDS project shows a 99% reduction in runoff volume.

Traditional drainage system (TDS) pipes and ditches carry runoff with traces of everyday contaminants, such as oil, paint, fertilizer, and heavy metals, directly into creeks, lakes, and other waterways. A TDS also erodes stream channels because of the speed and volume of water coming out of pipes. These problems decrease water quality, disrupt marine food chains, and negatively impact wildlife habitat.

The NDS mimics how the land would drain prior to urban development and offers an innovative alternative to TDS. NDS limits the negative impact of stormwater runoff by redesigning residential streets to take advantage of vegetation to clean runoff and manage stormwater flows.
New Publications in the LTAP Library

Reports

Compilation of Pedestrian Safety Devices in Use at Grade Crossings
Federal Railroad Administration, 2008
The Federal Railroad Administration has worked to gather information on any signs, signals, pavement markings, or other devices used to enhance the safety of pedestrians at grade crossings. State DOTs and rail transit operators have made several submissions, which have included background information and illustrations. These are presented so that the larger grade crossing safety community might benefit from the work of others in this important area.

Guidance on the use of Traffic Channelizing Devices at Highway-Rail Grade Crossings
Federal Railroad Administration, 2008
This brochure features a description of the various types of channelized devices in use. Barrier wall systems, wide raised medians, non-traversable curb islands, and traversable raised curb systems are discussed.

Federal Highway Administration, 10/2006, FHWA-HRT-06-108 (Volume I)
Federal Highway Administration, 10/2006, FHWA-HRT-06-139 (Volume II)
The objective of this handbook is to provide a comprehensive resource for selecting, designing, installing, and maintaining traffic sensors for signalized intersections and freeways.

Download the Traffic Detector Handbook at
www.tfhrc.gov/its/pubs/06108 (Volume 1) or

DVDs

Highway Safety and Trees: The Delicate Balance
Federal Highway Administration, 2006
This DVD stresses that the design of highway projects should be a cooperative effort involving the highway agency and concerned communities, organizations, and individual citizens. It discusses many solutions, from roadway relocation and the use of guardrail to the removal of trees from the most hazardous locations.

CD-ROMs

Application of Ground Anchors and Soil Nails in Roadway Construction
Federal Highway Administration, 2007, FHWA- WFLITD-07-002
This CD includes five multimedia presentations that describe and explain the principles of science and engineering related to the construction of ground anchors and soil nail systems: (www.wfl fhwa.dot.gov/td).
Upcoming Events

**Herbicide/Vegetation Management Workshops**
April 1, 2008 – Bossier City, LA
April 2, 2008 – Ruston, LA
April 3, 2008 – Alexandria, LA
April 8, 2008 – Lake Charles, LA
April 9, 2008 – Crowley, LA
April 10, 2008 – Port Allen, LA
April 22, 2008 – Madisonville, LA
April 23, 2008 – Jefferson

**LPESA Spring Conference**
May 8–9
TTEC Building, Baton Rouge, LA

Gravel Road Class

Recently, LTAP conducted two classes for Motorgrader Operation and Gravel Road Maintenance. The first course was conducted in Desoto Parish on January 8–9 with De Soto, Sabine, and Natchitoches Parishes in attendance. Course two was conducted in Jackson Parish with Jackson, Lincoln, and Tensas Parish in attendance.

The first day, participants learned Motorgrader safety and components as well as the components of a good gravel road as part of their classroom instruction. The second day, participants received hands-on training in motorgrader operation from James Kincaid, Caterpillar Certified Dealer Instructor, and practiced techniques for gravel road maintenance under the guidance of Terry Dial, National Center for Construction Education and Research HE Instructor.

*Photos from the class can be found on the LTAP Web site at www.ltrc.lsu.edu/ltap.*

Need Technical Help?
Contact LTAP

(225) 767-9117
(800) 595-4722 (in state)
(225) 767-9156 (fax)
www.ltrc.lsu.edu/ltap/cu.html

Dr. Marie B. Walsh
Director

T.J. Dunlevy
Student Worker

Dr. Marie B. Walsh
Director

T.J. Dunlevy, P.E.
Local Road Safety (contractor)

Dr. Marie B. Walsh
Director

T.J. Dunlevy

LPESA Spring Conference
May 8–9
TTEC Building, Baton Rouge, LA

Need Technical Help?
Contact LTAP

(225) 767-9117
(800) 595-4722 (in state)
(225) 767-9156 (fax)
www.ltrc.lsu.edu/ltap/cu.html

Dr. Marie B. Walsh
Director

T.J. Dunlevy
Student Worker

LTAP Center
Louisiana Transportation Research Center
4099 Gourrier Ave.
Baton Rouge, Louisiana 70808

Publication Statement

*Technology Exchange* is published quarterly by the Louisiana Transportation Research Center. It is the newsletter of the Louisiana Local Technical Assistance Program. Any findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect those of LSU, LADOTD, or FHWA.

Newsletter Staff

Jenny Speights, Public Information Director

Alainna Giacone, Editor

T.J. Dunlevy, Publisher

The Louisiana Local Technical Assistance Program was established at the Louisiana Transportation Research Center on the LSU campus in 1986. The purpose of the center is to provide technical materials, information, and training to help local government agencies in Louisiana maintain and improve their roads and bridges in a cost-effective manner. To accomplish this purpose, we publish a quarterly newsletter; conduct seminars, workshops, and mini-workshops covering various aspects of road and transportation issues; provide a lending library service of audio/visual programs; provide technical assistance through phone and mail-in requests relating to transportation technology; and undertake special projects of interest to municipalities in Louisiana. LTAP also coordinates the Louisiana Local Road Safety Program.