High Friction Treatments Are Gaining Traction

A high friction surface treatment was added to the outside lane of this curve on K5 highway in 2009 in Leavenworth County.

All highway safety starts with the driver's ability to control the vehicle and keep it in the appropriate lane. Annually, over 25 percent of all highway fatalities in the United States occur at or near horizontal curves. In traversing a curve, an increased potential for crashes occurs because of the combination of: 1) the driving task of negotiating the curve, 2) pavement surface wear and polishing created by turning tires and 3) the higher friction demand of moving a vehicle through a curve compared to the rest of the road. Surface pavement treatments to increase friction at certain spot locations are an effective means to increase traffic safety and reduce crashes. This article will introduce readers to high friction surface treatments (HFSTs) and describe how they are being used in Kansas to date.

The treatment process

HFSTs can provide a long-lasting, higher level of pavement friction than traditional surfaces, resulting in keeping vehicles in their lane around curves and allowing vehicles to stop in shorter distances at intersections. The treatment, targeted to a problem section of road, is a thin layer of durable, high friction aggregates topping a specially-engineered resin or a polymer binder. The binder locks the aggregates firmly in place, creating an exceptionally durable surface capable of withstanding extreme roadway friction demands, such as heavy braking, severe horizontal curves, and steep grades, particularly when the grade is in a horizontal curve. This affords long-lasting traction, while

Continued on page 2

Kansas LTAP Celebrates Three Decades of Service

By Pat Weaver

It seems like just a few short months ago that Kansas LTAP was celebrating its 25th anniversary, but here we are at 30! For those of us who have seen a 30th birthday, we probably all agree it was a significant milestone. For those of you who have not, you may be dreading it. Your goals might have been to make your first million dollars, or maybe just to be trusted by those under 30. With experience comes the recognition that a lot can be accomplished in 30 years, even with a few mistakes along the way. But with that
experience, there's also a realization that there are still many opportunities for the future.

A milestone

What does turning 30 mean for LTAP? As we look back on our 30 years of the program, we reflect on the growth in our services, the partnerships we’ve formed and been a part of, all the technology advances, and the tremendous development of the workforce development opportunities that exist in the state and throughout the country. And, we recognize that even as resources are more available, the training and information needs are still great.

Our customers

Of all the public roads in Kansas, 92.5 percent—130,170 centerline miles—are owned by cities, counties and townships. Traffic on these roads account for about 43 percent of the total vehicle miles traveled in Kansas. Counties and cities are responsible for more than 20,000 bridges of all shapes and sizes: concrete boxes to lengthy structures with concrete piers, steel girders, concrete decks and guard rails.

Training needs and trends

Educational technology through the internet is growing at a rapid pace. While we are working to include distance learning in the “toolbox” for local agencies, feedback from our Advisory Committee has been to continue our tradition of face-to-face, hands-on training that allows participants to learn not only from instructors but also from their peers in the training—sharing issues and solutions. For many local agencies in Kansas, LTAP is the primary source of professional development for their administrators, supervisors and crews.

LTAP’s focus and flexibility

The LTAP network nationally includes 58 individual centers; one LTAP Center in each state and Puerto Rico, and seven regional “TTAP” Centers that serve tribal governments. LTAP is well known nationally for providing excellent value for the tax dollar. Services offered by LTAP vary from Center to Center, but the focus of the LTAP program, in Kansas and nationally, is to help local agencies address their needs related to infrastructure management, highway safety, worker and workplace safety, and other workforce development needs. Every state is different, and the one of the great characteristics of the LTAP program has been the flexibility for each Center to tailor the program to meet their customers’ specific needs.

Our advisors and partners

Kansas LTAP has an advisory board that helps identify specific needs (“hot topics”) in our state for training and information, and the ways to meet them, whether that is through face-to-face training, newsletter articles, Web site resources, or written material (glove-box manuals, posters, etc.). The advisory board includes members from cities, counties, and townships, along with KDOT and FHWA officials. (See page 16 for a list of members.) Kansas LTAP’s advisory board met this fall to update the program’s strategic plan and to provide input on the 2014 work plan. Another very essential element of the program has been the development over the years of strong organizational relationships. We value our relationships with KDOT staff across the bureaus that interact with local governments, with FHWA’s Kansas Division and national Resource Center, and the state associations representing local agencies like the Kansas County Highway Association, APWA Kansas Chapter, Kansas Association of Counties, and others.

LTAP has been proud to serve Kansas and its road and bridge needs for the last 30 years, we look forward to working with you to serve our citizens in the years to come.
making the surface much more resistant to wear and polishing.

A HFST can be applied by machine at a similar speed to other paving surface treatments or can be applied with hand tools. The treatment can be installed on either asphalt or Portland Cement concrete surfaces; however, the pavement must be in good structural condition, with no or few cracks or correctable by remedial sealing. Typically, projects are short in length and the materials cure very quickly. The treatments can often be applied in just hours with minimal impact on traffic.

The product installation cost is not insignificant at $20-25 per square yard, but the durability and effectiveness make the treatment an economical choice because it is only applied where needed. The life-cycle cost is excellent. The European experience and the oldest United States’ projects indicate that HFST service life is approximately 10 years. HFST projects to date have produced very good benefit-cost ratios because the crash reductions continue for many years.

Benefits of high friction treatments

HFSTs have several benefits in terms of crash reduction, life-cycle cost, efficient application, and driver comfort. See sidebar at right. The technology has been implemented overseas for some time, and is increasing in use in the United States. The United Kingdom experienced a 31 percent reduction in crashes for over 800 intersections and other potential problem locations following spot application of HFST. A report commissioned by Transit New Zealand showed a benefit-cost ratio of 40 and a follow-up study on the before-and-after crash data showed a reduction of wet crashes by 30 percent following spot application of HFST. Closer to home, preliminary review of crash data from before and after a demonstration installation in Wisconsin shows an overall 95-percent crash reduction in the first year.

The HFST is also safer for truck drivers and bicyclists. The increased friction allows for better control at higher speeds. The surface is smoother and more consistent than some other friction treatments, like grooved pavement. If bicyclists are riding on the shoulder in a curve, there is a better chance that adjacent vehicles will stay in their lane and not stray into the shoulder, endangering the bicyclists.

Benefits of high friction surface treatments:
- Proven significant crash reductions
- Can be targeted to specific high risk areas, such as curves and intersections
- Safer for motorists, truck drivers and bicyclists
- Fast application and minimal disruption to traffic
- Long service life

Surface Enhancements At Horizontal Curves (SEAHC) national demonstration program

The Federal Highway Administration (FHWA) is conducting a national demonstration program to determine the effect of high friction surfacing on reducing accident rates on horizontal curves. Crash data for the three years prior to and three years following the HFS installations is being collected at each demonstration site. Skid resistance, texture depth, and tire-pavement noise (if appropriate) data is also being collected at each site.

To date, there have been 23 installations in 10 States using six different HFST vendors on five pavement types. Crash data from the projects to date indicates significant benefit for crash reduction.

Experience with HFST in Kansas

Kansas is one of the states that participated in this demonstration program. High friction surface treatments were installed on curves at four locations in the state in 2009 (see map above). Steven Buckley, KDOT’s safety engineer, has been KDOT’s contact for these projects. Buckley also serves on a national committee to advance the use of HFST as part of FHWA’s Every Day Counts 2 (EDC2) initiative.

Two of the Kansas demo sites were on interchange ramps and two were on two-lane highways. The installation process for the treatment used a combination of manual and automated
The Manual on Uniform Traffic Control Devices (MUTCD) is the national standard governing the design and installation of traffic control devices for all streets, highways, bikeways, and private roads open to public travel. Once the devices are installed, however, common sense says they must be properly maintained to stay effective. How does the MUTCD address that? This article will explore this topic and will also point you to some useful guides for maintaining signs and traffic signals.

What does the MUTCD say about maintenance of traffic control devices?

Specific references to maintenance

Using a PDF of the most recent version of the MUTCD (2009 with Revisions 1 and 2), we searched for the words “maintenance” and “maintain.” These words appear in many places. We will highlight the principal MUTCD references to maintenance, most of which contain “should” guidance. That means that the guidance is to be followed at the discretion of the agency. It also means that not following the guidance will open you up to legal exposure unless you document reasons for not following the guidance.

Section 1A.02: Principles of Traffic Control Devices. This section in the MUTCD lays out the role of maintenance as one of the factors in supporting the five basic requirements (A through E below) of an effective traffic control device. It says:

To be effective, a traffic control device should meet five basic requirements:
A. Fulfill a need;
B. Command attention;
C. Convey a clear, simple meaning;
D. Command respect from road users; and
E. Give adequate time for proper response.

03 Design, placement, operation,
Section 1A.05: Maintenance of Traffic Control Devices. This guidance further clarifies the goals of maintenance.

Excerpted:

01 Functional maintenance of traffic control devices should be used to determine if certain devices need to be changed to meet current traffic conditions.

02 Physical maintenance of traffic control devices should be performed to retain the legibility and visibility of the device, and to retain the proper functioning of the device.

Support: 03 Clean, legible, properly mounted devices in good working condition command the respect of road users.

Section 1A.07: This section identifies who is responsible for traffic control maintenance. An excerpt:

The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction, or, in the case of private roads open to public travel, with the private owner or private official having jurisdiction.

Other references to maintenance

See the sidebar at right, above, for other specific references to maintenance in the MUTCD. This is not an exhaustive list. Always refer to the MUTCD itself.

This article provides an overview of the subject of maintenance in the MUTCD—the national standard on traffic control devices. Properly maintained traffic control devices are a significant public safety element of your community. Be sure to reference the MUTCD itself at the link below for the complete text.

### More MUTCD References to Maintenance

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### How to Maintain Traffic Control Devices

While the MUTCD contains many references to the what and why of maintaining traffic control devices, it does not provide guidance for how to maintain the devices. Below are some resources to consult for how to do proper maintenance of signs and traffic signals.

**Maintaining signs and sign supports.** For a refresher, download FHWA’s Maintenance of Signs and Sign Supports (free at http://safety.fhwa.dot.gov/local_rural/training/fhwasa09025/). This guidebook is written with local agencies in mind and has many photographs to illustrate the maintenance process.

**Maintaining traffic signals.** Two resources for traffic signal maintenance are:

- Traffic Signal Maintenance Handbook by ISMA and ITE ($100 at http://www.ite.org)

Source:

KDOT Hosts “Practical” RSA in Montgomery County

KDOT's Bureau of Local Projects conducted a pilot “practical” road safety audit (RSA) in Montgomery County in 2013 for a nine-mile segment of roadway between the cities of Independence and Liberty. The corridor was identified by the county as an RSA candidate for the High Risk Rural Roads (HRRR) Program earlier that year and was subsequently awarded. The RSA was conducted a few months later by KDOT, the county and other knowledgeable personnel.

The purpose of any RSA is to identify in a report measures a county could implement, depending on available resources, to reduce the potential for fatality or severe injury crashes on the corridor. The “practical” approach to RSAs is a lower-cost and streamlined alternative to the way KDOT approached RSAs in the past. The old approach required two engineering studies—one to determine if the county qualified for an RSA and another for the RSA itself. The new approach skips the first study and a team of volunteers conducts the RSA at no cost.

Ron Seitz, chief, Bureau of Local Projects, said the measures outlined in the RSA report “are considered suggestions and in no way should be considered mandates that changes be made.” Rather, the goal of this effort, he said, is to identify a variety of measures that could be taken, as resources permit, to make improvements to enhance the safety of the corridor.

In addition, the results provide the county documentation to support application for federal or state safety funding when those dollars are available.

Data review

The county’s project started with a review of five years of crash history and current traffic volume counts for the segment. There had been several run-off-road crashes for the time period reviewed (2008-2012). Ten of the 17 crashes involved animals. A few fixed object collisions and vehicles overturning made up the remaining crashes. All but one of the crashes were single-vehicle crashes and included one fatality and two injury crashes.

Traffic volumes on the segment ranged from about 500 to 600 vehicles per day.

During the data review it was pointed out by County personnel that there had been two fatal crashes in the past at the south approach to the bridge over the Verdigris River. [Those fatalities were not recorded in the State’s database because the bodies were not found and recovered from the river until months after the crash.]

Field review

The RSA team conducted a field visit of the roadway segment in May 2013. Participants began by driving the project in both directions to get a feel for the context of the roadway.

The segment of roadway analyzed is generally described as a nine mile segment of two lane highway commencing south of Independence to an intersection just south of Liberty. The route travels several different roads along its course.

The first mile of the corridor is posted at 40mph with rolling terrain and can be characterized as suburban with many driveways. The remaining 8 miles is posted at 55 mph and has both rolling and flat terrain with some horizontal curvature and can be characterized as rural with intermittent side roads, driveways and field entrances.

After the initial drive-through, the group identified a list of individual sites to investigate more thoroughly, some of which were previously identified by the county through observation and a review of citizen complaints received along the segment. The site issues were discussed as a group, and photos were taken for documentation. Low, medium and high cost strategies for the site issues were also discussed as a group and noted for inclusion in the RSA report. See example above.
Results of the field review

The RSA report addresses two route-wide issues: removing headwalls on entrance culverts and removing non-crashworthy mailboxes. The report also contains 18 site-specific issues related to sight distance, curves, pavement dropoffs, bridge rail and signing. The report identifies constraints to providing solutions, and low, medium and high cost suggestions of measures for the county to consider.

Robert Bever, public works coordinator for Montgomery County, said that the practical approach to the RSA was valuable in that it quickly put the information in the hands of the people who could make the decisions to make improvements. He views the process of a helpful set of second eyes for identifying safety issues and possible solutions. “Sometimes when you drive a road all the time, there may be an issue and you just don’t see it.” he said. Bever appreciated the opportunity for local participation. “There were certain areas we knew we wanted to address, and we did” he said. He could also share the information on fatalities that did not make it into the state crash database.

The county has already started on safety improvements. “We’re taking care of most of the low cost measures ourselves,” Bever said. They will also take on some of the medium measures. Some of the suggested improvements were already scheduled by the county but they were bumped up to a higher priority. Some of the higher cost measures may make their way into applications for safety funds.

If your city or county is interested in having a practical RSA conducted for a stretch of roadway or corridor, contact Ron Seitz at (785) 296-3861 or seitz@ksdot.org.

Sign Assessment Method #4: Expected Life

Sedgwick County will use the “expected life” method with an online inventory.

This is the last installment in our series highlighting the methods some Kansas counties are using to measure and track sign retroreflectivity to comply with requirements in the MUTCD. The deadline for having a method in place is June 13, 2014. We have covered the following methods: blanket replacement (Miami County) visual nighttime inspection (City of Burlington) and measured sign retroreflectivity (Lyon County). Sedgwick County will be using the expected life method. To our knowledge, the “control sign” method is not being used in Kansas. All of these methods are explained in our article “Let Me Count the Ways,” in our Spring 2010 issue. http://www.kutc.ku.edu/pdffiles/LTAP2010-Spring.pdf.

Sedgwick County has about 12,000 signs of all types, including regulatory, warning, street name and guide signs. Mark Borst, traffic engineer, said the county will be tracking and managing sign retroreflectivity using an expected life method with an online inventory. The county uses high intensity prismatic sheeting on nearly all its signs. They will be building their sign program around a life expectancy of 15 years. The sheeting has a 10-year warranty, but a history of providing good service after that, Borst said. To be on the safe side, the county will use its retroreflectometer to check south-facing signs on a regular basis to be sure they are maintaining sufficient retroreflectivity. If they are not, those signs will be replaced sooner.

If a sign that is replaced on schedule is deemed suitable for further use based on its measured retroreflectivity, it will be kept for interim or short-term use as needed. All other useable sign blanks will be re-faced with new sheeting for return to the field as needed.

The county will be contracting-out the development of their sign inventory, along with some of its inventory maintenance. It is currently out for proposal. They plan to purchase a package from 3M™, or a comparable vendor.

The package that will include a web-based sign inventory and a crew that will be contracted to come to the county to GPS-locate and collect and enter baseline information for all the signs. The database will be personalized for Sedgwick County, including having two ways to locate a sign: GPS coordinates plus the county’s own unique grid identification system used for bridge location identification and other location needs. The initial retroreflectivity levels of all the signs will be recorded at that time, using visual nighttime inspection.

Borst said the county expects to pay around $100,000 for the database development and a $3,000 annual fee for web-hosting the database in succeeding years unless the county’s GIS department creates a similar framework for housing the data. In-house hosting would save the annual web-hosting fee, but the initial data collection and formatting would still be contracted out. In either case, access to the data and the ability to modify the data will be allowed via multiple levels of password protected access.

The county chose this method for sign assessment for three reasons.

1) Cost-effectiveness. The method is the most cost-effective for the county over time, Borst said. “We’re not going to be doing much more work than we’re already doing, he said. “Most of our signs get replaced sooner than 15 years anyway, because of being knocked over, getting shot at, or whatever. We’ll just have a little more method in how we do things.”

Queries to the database will be able to tell which signs have reached the 15-year limit. “Theoretically a query would

Continued on page 9
High Risk Rural Roads are identified by KDOT as:

1. Roadways functionally classified as a rural major or minor collector or as a rural local road.
2. Roadways that have a crash rate for fatalities and incapacitating injuries exceeding the statewide average for those functional classes of roadways.
3. Roadways whereby future traffic volumes are projected to increase causing a projected increase in the crash rate for fatalities and incapacitating injuries exceeding the statewide average.
lead to fatalities and disabling injuries on Kansas’ non-state rural roads and proposed adding a systemic element to the program. Systemic improvements would be based on roadway characteristics and potential for crashes, not crash data. A provision in the HRRR language allows safety investments on rural roadways where it is expected that the severe crash rate will be above the statewide average in the future.

Crash data compiled for the years 2005-2008 indicated that the most common rural non-state fatality crash type was collision with a fixed object. In 2011, the Bureau of Local Projects (BLP) requested and was granted permission from FHWA to allow the use of a systemic approach for using HRRR funds to address to reduce the risk of a vehicle colliding with a fixed object when it leaves a roadway on rural collector roads.

The new approach has been successful. The following year, 2012, 14 projects were obligated totaling an obligation amount of $6.9 million.

With the recent passage of MAP-21, additional opportunities for HSIP funding have been opened (corridor-wide signing, pavement markings, and rumble strips for example). These have been incorporated into KDOT’s HRRR Program. This has resulted in a much higher number of HRRR project applications submitted when projects are solicited. To date, projects totaling an obligation amount of $1.7 million have been obligated with an additional $700K expected to be obligated before the 2013 FFY end.

Eighteen counties have been awarded HRRR funding for projects in the 2013 and 2014 funding cycles, to date. These include Atchison, Barton, Butler, Clay, Dickinson, Gray, Johnson, Kingman, Iowa, Miami, Montgomery, Morris, Pottawatomie, Riley, Rooks, Sedgwick, Saline, and Stafford. Several of these counties had more than one project funded.

For more information
KDOT’s HRRR Program supports strategies in the Kansas Strategic Highway Safety Plan (SHSP) to reduce crashes on local roads. The plan’s (new) local roads chapter will posted at the SHSP web site early in 2014 at http://www.ksdot.org/burtraffical/reports/shs.asp.

For more information on KDOT’s High Risk Rural Roads Program, consult KDOT’s Local Program Opportunities field guide, page 3, at http://www.ksdot.org/burlocalproj/BLPDocuments/LPOGuide2013.pdf, or if you have a specific question about project eligibility or anything else, contact Ron Seitz at (785) 296-3861 or seitz@ksdot.org.

Sign assessment method  

identify 1/15th of your signs to replace in a given year, but in reality it will be less than that, because some signs will be replaced sooner due to damage.” Any time a sign is replaced, the county will record the installation date, and that will re-set the 15-year countdown.

2) To save the county time. In creating the initial database, Borst said the vendor will work a few weeks in the field and a few months entering and fine-tuning the data. If county crews did that work, it would take a year or more, because the work would have to fit in around regular work. “There are other things I would rather have our crews be doing,” Borst said.

3) Ease of accessibility. The advantage to a web-based inventory is that it is accessible from anywhere. If there is an after-hours emergency call that a sign is down, an authorized staff member can look from home to see if it is a sign that needs immediate replacement or can be replaced the following work day. That will save the county money by reducing the number of emergency call-outs.

After the initial database is created, the county’s traffic operations and maintenance crews will take over collecting and keying-in information as signs are added and replaced. They will use electronic tablets in the field for recording the data. The tablets will synch with the database.

The county expects the project to begin as soon as possible after awarding the bid. In the end, Sedgwick County will have a MUTCD-compliant system that best meets their particular needs.

For more information on Sedgwick County’s sign management method, contact Mark Borst at (316) 660-1752 or mborst@sedgwick.gov.

Source:
Low Water Crossings — Build Them Right

By Lisa Harris

Two guidebooks provide tips for safer crossings.

A low water stream crossing (LWSC) can be a low cost and viable alternative to a culvert or bridge, in some cases. LWSCs are particularly suitable for low volume roads across streams where the normal volume of flow is relatively low. However, when water is present in the crossing, safety is an issue. These two guides that may be helpful to you in designing and signing your low water crossings.


This guidebook, pictured at right, provides well illustrated and detailed guidance on placing and designing low water stream crossings. As in Kansas, most Iowa counties maintain low volume roads with at least one bridge or culvert that is structurally deficient or obsolete, and oftentimes many such structures. Replacement with structures of similar size would require large capital expenditures that many counties cannot afford. Low water stream crossings (LWSCs) may be an acceptable low-cost alternative in some cases.

The most common types of LWSCs are unvented fords, vented fords, and low water bridges. LWSC sites, types, and designs need to be carefully selected because low water stream crossings will be flooded periodically, requiring the road to be temporarily closed to traffic.

This guide provides a simplified approach to LWSC selection and design. It covers site evaluation, selection of the type of LWSC, design and construction, inspection and maintenance, and traffic control measures.

Bob Sperry of Iowa LTAP gave a presentation at the MINK local roads conference in September 2013 on this topic, highlighting information from this design guide. Download at http://www.ctre.iastate.edu/pubs/lwscguide.pdf.

One of the 16 recommendations from the Texas report:

Use “Do Not Cross When Flooded” as an optional sign at crossing.

For crossings where only static signs are to be provided, the research team recommends using the DO NOT CROSS WHEN FLOODED static sign located at the crossing. This sign provides an unambiguous message to drivers. The research team recommends placing this sign 25 ft (minimum) to 50 ft (desirable) from the location of maximum water height in the crossing. This would allow drivers ample space to turn around before entering the crossing.

Signing Strategies for Low-Water and Flood-Prone Highway Crossings

It takes as little as 2 ft of water to float most cars. In Texas, approximately eight flood-related fatalities occur each year—and most of these involve motorists trapped in their vehicles or washed away. In many cases, victims, not wanting to take a lengthy detour, ignored barricades and tried to drive across a flooded street or low-water crossing—literally driving themselves into harm’s way.

Several districts in Texas have developed different signing strategies for warning motorists of low-water crossings. As part of this research, the Texas Transportation Institute (TTI) developed guidelines and recommendations for creating signing uniformity for low-water and flood-prone sections of roadways.

This report describes research conducted at TTI on driver comprehension of various types of signs and warnings at low water crossings. The researchers developed guidelines for the following situations: 1) roadway sections that have several low-water crossings where water flows over the roadway in wet conditions, 2) actual low-water crossings, and 3) temporary road closures due to high water.

TTI also developed criteria for when to implement active water level detection and advance warning systems at low-water crossings and flood-prone roadway sections.

Download this report at http://d2dtl5mnlpr0r.cloudfront.net/tti.tamu.edu/documents/0-6262-1.pdf.

Manual on Uniform Traffic Control Devices (MUTCD)

The MUTCD addresses the signing of flooded areas in a very brief section: Section 2C.35 (01 and 02). It includes guidance for using a ROAD MAY FLOOD sign and a standard to follow if a depth gauge is used. Be sure to consult the MUTCD when signing a low water stream crossing. It is the national standard for traffic control devices.

A Leg Up

Bike Facilities Guide Gets Major Tune-Up

An excellent resource on planning and constructing bicycle facilities is now even better. The *Guide for the Development of Bicycle Facilities, 4th Edition*, released in June 2012 by the American Association of State Highway and Transportation Officials (AASHTO), gives transportation designers and builders sound guidance on ways to incorporate bicyclists into the roadway environment.

Known as the AASHTO Bike Guide, this 200-page publication has undergone extensive revision and expansion since it was last released 14 years ago. It has grown from 75 pages to more than 200, and from four to seven chapters. The Guide provides comprehensive information and guidance to designers and planners on the facilities needed to accommodate bicycle travel. Safety and operational efficiency are emphasized. “Transportation engineers know that the entire system works more efficiently when we build streets, bridges, and highways that can accommodate bicyclists and pedestrians in the safest way possible,” said John Horsley, recently-retired AASHTO executive director.

What’s new?

One of the new chapters, *Bicycle Operation and Safety*, includes information on the critical physical dimensions and operations characteristics of bicyclists, traffic principles for bicyclists, and the causes of bicycle crashes.

Another new chapter, *Design of Shared-Use Paths*, covers the design of sidepaths, shoulders, and other shared-use facilities.

A third new chapter, *Bicycle Parking Facilities*, focuses on planning requirements for both short-term and long-term parking of bicycles.

The chapter on *Design of On-Road Facilities* was significantly revised to include guidance on shared lanes with various roadway configurations, as well as new sections on shared lane markings and signage. The chapter also covers retrofitting existing roadways to better accommodate bicycles.

Information included in the Guide on signs, signals and pavement markings for bicycles is consistent with the 2009 edition of the Manual on Uniform Traffic Control Devices (MUTCD).

Use of this guide in Kansas

Becky Pepper, statewide bicycling and pedestrian coordinator for Kansas (at KDOT), recommends the Guide to local communities working to make improvements to their bicycle and pedestrian facilities. The Guide provides information on what types of facilities fit best in various locations,” she said.

According to Pepper, KDOT uses the AASHTO standards provided by the Guide for their projects, and any communities receiving federal funding for bicycle and pedestrian project must also follow the standards.

Where to obtain the guide

The bicycle design guide is available in print or as a downloadable PDF from AASHTO. Call (800) 231-3475 or go to bookstore.transportation.org and search for publication “GBF-4.” The Guide is $120 for members and $144 for nonmembers.

For more information, the online Pedestrian and Bicycling Information Center has a seven-part webinar series on the AASHTO Bike Guide produced by AASHTO and the Toole Design Group. (http://www.walkinginfo.org/training/phbic/AASHTO_webinars.cfm.) The webinars are archived and are available for download. The first webinar in the series is an overview of the Guide’s content and changes. The remaining webinars provide details about the contents of specific chapters. They are well worth a look.

Sources:

- AASHTO Bike Guide Video. http://www.youtube.com/watch?v=WeE62AGXQZg
What are human factors and how do they affect roadway safety?

To reduce traffic crashes, you need to understand what causes them. A good way to start is by grouping the potential causes into three broad categories: road user, the vehicle, and the road and its environment. (See sidebar on next page.) The causes of most crashes will usually fall into one or more of these.

Studies show that road-user error is cited as the cause of most crashes (nearly 57 percent of the time), followed by roadway conditions (34 percent of the time) and vehicle defect or malfunction being the contributing factor only 12 percent of the time.

“Human factors” is a term used in transportation research for the application of knowledge about human abilities, limitations, and other human characteristics to the design of equipment and the driving environment.

When it comes to roadway safety, the road user is a key player. Consequently, human factors should be considered as an integrated part of the roadway and vehicle design process. Considering a combination of all contributing factors to crashes (road user, roadway, vehicle, and weather) allows for more thoughtful safety improvements.

Road-user expectancy

As drivers gain experience, they expect things to happen as they always have. For example, drivers expect that a green light on a traffic signal will be followed by a yellow light, then red. Or drivers adjust their speed as they look at an upcoming curve because it looks similar to other curves they have driven before. This is called driver’s expectancy.

The more experienced the driver, the greater the expectancy, which can be good and bad in terms of roadway safety. More driving experience leads to quicker and more accurate reactions as long as driver’s expectancy is met. However, a sudden change in road conditions violates this expectancy and increases the likelihood of driver error and increased reaction time because the driver takes longer to understand the situation and respond to it. If the extra time is not available, a crash may result. For example, if a signal changes from green to red, or a curve becomes suddenly tighter halfway through, driver expectancy is violated, and a driver may react in an erratic or incorrect way.

The driving task

Although most of us take it for granted, driving is hard work because it requires us to do several things at the same time. When we drive, we control the vehicle by slowing down and speeding up. We also guess what other road users might do and decide whether we need to do something to avoid them—all while steering the vehicle.

There are limits to how much information drivers can process at a time. When there is too much information for drivers to accurately or safely process, they make mistakes. To simplify the driving tasks to a certain degree, roadway elements should be designed and laid out in a way that give drivers enough time to make several easy decisions rather than forcing them to make one complex decision in a hurry.

Roadway information leads the road user to decide to do something. The results of that action provide more information, which then starts the process over again. What complicates this process are distractions for the driver both inside and outside the vehicle (e.g. using a cell phone, listening to the radio, weather conditions, etc.) Whatever draws the driver’s attention from the road should be minimized. It is the road department’s job to focus on the engineering aspect of this goal and minimize surprises on the road.

Information phase of driving

Driving involves noticing the information and recognizing its meaning. For example, signs have standardized shapes and colors to help drivers easily recognize their message.

Decision phase of driving

Road users combine the
information they gather from the roadway elements with their driving experience to make a decision. It takes skill and experience to make the right decision. Separating information and decision points for road users is the key to helping them reach the right decision.

**Action phase of driving.** For a road to be safe, the road user needs time to respond. Reaction time is the time it takes for the road user to notice a condition, decide what to do about it and then take an action. More complex situations require a longer reaction time.

**Examples of considering human factors in roadway design**
- Avoid designing roads with sharp curves just over the crest of a hill.
- Place signs at locations where drivers expect them and can see them.
- Install and use approved traffic control devices properly.
- Most drivers can read only three or four familiar words at a glance, so avoid overloading them with information.
- Always consider information needs of both older and novice drivers.

### Primary Causes of Vehicle Crashes

**Road users.** These are all people who use the roadway including drivers, motorists, bicyclists and pedestrian. Human factors refer to characteristics of road users and the actions they take, or otherwise fail to take, that cause a crash. Human factors may include road users who are inattentive, distracted, tired, ill, under influence of medications, intoxicated by alcohol or drugs, not restrained by seat belts, and etc. Age also affects a road user’s ability to be safe on the roadway.

**Vehicle factors.** These may be mechanical failures, such as bad brakes, worn-out tires, seat belt malfunction, and etc.

**Road-related factors.** These include limited sight distance, poorly marked roads, missing road signs, sudden changes in roadway alignment and widths, and etc.

**Weather.** Weather conditions affect not only the roadway environment but also vehicle performance and road users’ judgment.

This article is a brief introduction to the topic of human factors. For detailed, practical information on incorporating human factors in roadway design, consult the *Human Factors Guidelines for Road Systems—Second Edition*, recently updated. This is considered the most comprehensive resource for design practitioners on this topic. See sidebar on page 12.

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**Sources:**
- Road Safety 365, A Safety Workshop for Local Governments FHWA, October 2010.

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**New!!! Kansas LTAP Now Accepting Credit Cards and E-Checks**

Kansas LTAP now accepts credit cards and e-checks for your training registration fees. We have partnered with KanPay through Kansas.gov—an online payment processing system specifically designed for state and municipal governments. KanPay provides the most up-to-date security measures to protect your information. Credit cards or e-checks are accepted through on-line registrations only. All major credit cards are accepted.

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To get started using our new service, go to our regular workshop registration page at http://www.ksltap.org to register as usual. You still may register more than one person on a single registration form. You will see easy instructions to proceed with your payment options.

Registration for the Kansas Road Scholar Program (Levels I and II) can now be done online as well, and the application fee can be paid with a credit card. See http://www.ksroadscholar.org.

We hope that you will find this a helpful tool to process your payment for our LTAP training. As always, if you have any questions or concerns, contact Kristin Kelly, training coordinator, at (785) 864-2594 or kbkelly@ku.edu.
MORE

By Lisa Harris

See download/ordering information on next page.

Kansas Highway Safety Improvement Program 2013 Annual Report

This document outlining the various programs that are funded by federal HSIP funds in Kansas on both the state system and local roads. It includes information on the funding amounts for these programs as well as crashes experienced on state and local roads. 85 pages. Kansas DOT. 2013.

Maintaining Crushed Rock Roads: Tips and Techniques

Kansas LTAP has developed this new maintenance fact sheet, written by Norm Bowers. Topics include blading a crown, dry weather maintenance, windrows, rock specifications, high shoulders, ditches, potholes, washboarding and rutting. It also describes how to blade at railroad crossings and bridges. Available in hard copy or online. 4 pages. 2013.

Signalized Intersections—An Informational Guide (2nd Edition)

This guide is an introductory document that contains methods for evaluating the safety and operations of signalized intersections and tools to remedy deficiencies. The treatments in this guide range from low-cost measures such as improvements to signal timing or signing and markings, to high-cost measures such as intersection widening or reconstruction. 323 pages. FHWA.

COMING IN MARCH: Culverts and Drainage Workshop

This one day workshop includes the basics on drainage and selecting, sizing, and installing culverts. Topics will include drainage law in Kansas as it relates to backwater and changing the natural drainage pattern, factors that affect the amount of runoff and the sizing of culverts, and using common sense in culvert sizing. Information will be provided on types of culvert products available, including pros and cons, and proper installation techniques. Common causes of culvert failures will be discussed as well as culvert rehabilitation. Regulated environmental issues and permitting will also be discussed.

CALENDAR

Visit our website for even more training calendar listings and to register for workshops. Go to http://www.ksltap.org and click on “View the LTAP Calendar.”

TRAINING:

... 2014 ...

Asphalt Road Maintenance – ▲L1
February 11 in Hays
February 12 in Dodge City
February 13 in Wichita
February 18 in Ottawa – closed
February 19 in Seneca

Low-Cost Safety Improvements
February 25 in Salina

Workplace, Jobsite and Equipment Safety – ▲L1
February 26 in Great Bend
February 27 in Wichita
February 28 in Lawrence

Road Safety Assessment – ▲L3e
March 4 in Manhattan

Culverts and Drainage – ▲L1
March 10 in Oakley
March 11 in Dodge City
March 12 in Hutchinson
March 13 in Manhattan
March 14 in Olathe

MUTCD for Technicians – ▲L1
March 18 in Hutchinson

Local/State Project Coordination – ▲L3r
Webinar in April, date TBD

Traffic Impact Studies – ▲L3e
April 29 in Wichita

UPCOMING MEETINGS:

APWA-KS Roundtables
March 5 in Hutchinson
September 11 in Junction City
Call Ray Ibarra, (785) 238-7142

APWA Mid-Am Meeting
May 21-23 in Overland Park
http://kansas.apwa.net/

Kansas County Highway Association Spring Meeting
May 5-7 in Dodge City
Call Michel O’Hare at 785-524-4656

Become a Kansas Road Scholar!
http://www.ksroadscholar.org
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For information on calendar items or to suggest a topic for an LTAP workshop, contact: Kristin Kelly, LTAP Training Coordinator, 785/864-2594, kbkelly@ku.edu.

▲L1 = KS Road Scholar Program Level 1 — Technical skills required course.
▲L2 = KS Road Scholar Program Level 2 — Supervisory skills courses are provided by the Kansas Association of Counties. Go to http://www.kansascounties.org and click on “Education Program.”
▲L3-r = KS Road Scholar Program Level 3 — Master Road Scholar required course.
▲L3-e = KS Road Scholar Program Level 3 — Master Road Scholar elective course.
FREE ROAD & BRIDGE RESOURCES

Check off your selections, fill in the bottom portion, and return this form to:
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**TRAINING GUIDES & REPORTS**
You are free to keep these unless otherwise noted. Or you can download at the links provided.

**Kansas Highway Safety Improvement Program 2013 Annual Report**

**Maintaining Crushed Rock Roads: Tips and Techniques**
or ☐ request hard copy. Use form below.

**Signalized Intersections—An Informational Guide**

**EQUIPMENT LOANS**
We offer the following items for loan to local highway agencies. Contact mgivechi@ku.edu for counter boards and weaver@ku.edu for the Safety Edge shoe. There could be a waiting list for these items.

**Safety Edge Paving Shoe.** This Advant-Edge shoe attaches to a paver with a universal bracket, provided with the shoe.

**Turning Movement Counter Board DB-400, Jamar Technologies, Inc.** A basic model for recording turning movements at intersections. The board is lightweight and comes with its own case.

**Turning Movement Counter Board TDC-8, Jamar Technologies, Inc.** Can be used to do turning movement counts, classification counts, gap studies, stop-delay studies, speed studies, and travel time studies. The board is lightweight and comes with its own case.

Our library of free reports and training videos is searchable online. Visit http://www.ksltap.org. Click on the “Lending Library” to search the catalog and place your order.

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The Kansas Local Technical Assistance Program (LTAP) is an educational, technology transfer and service program of the Kansas University Transportation Center (KUTC), under the umbrella of the KU Transportation Research Institute. Its purpose is to provide information to local government highway departments and their personnel and contractors by translating into understandable terms the latest technologies in the areas of roads, highways and bridges.

The Kansas LTAP Newsletter is published quarterly and is free to counties, cities, townships, tribal governments, road districts and others with transportation responsibilities. Editorial decisions are made by Kansas LTAP. Engineering practices and procedures set forth in this newsletter shall be implemented by or under the supervision of a licensed professional engineer in accordance with Kansas state statutes dealing with the technical professions.

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