T3S

Are We There Yet?

Winter 2010
Volume 21, Number 1

South Carolina Transportation Technology Transfer Service

In This Issue...

An Innovative Green Solution for Urban Street Renewal

The Community

The Village of Canal Winchester is a vibrant Central-Ohio community with about 6,000 residents that take pride in their unique cultural resources including local historic residential districts and the remnants of the notable 19th century Ohio-Erie Canal system that once passed through the center of town. Like many older yet progressive communities, Canal Winchester faces the typical challenges of rehabilitation of aged streets, while in the process striving to minimize negative impact to established treelined neighborhoods.

With increasing regulatory control over such issues of stormwater quality and interest in the "greening" of communities, it's hard to know where to start… especially in times of fiscal stress. Any community improvement project can be a funding challenge and the addition of green design to the mix can be met with resistance. How can "green" design balance with budget? How will regulatory control affect the bottom line? All these are common questions that a community must attend to—and Canal Winchester did just that.

The Project

In 2008, the Village undertook the reconstruction of West Columbus Street, one of the community's oldest streets in a historic residential district that provides a vital link between collector roads that serve area schools, businesses, churches, and a government center. West Columbus Street, prior to its renewal,

Finished street: Pervious paved parking bays integrate well into newly reconstructed travel lanes. (Photo: Stephen Farst, EMH&T, Inc.)

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was 33 feet wide at its west end and nearly 38 feet wide at its eastern end. While displaying many of the virtues of an older charming neighborhood, West Columbus Street was in poor condition. Older elements of this street corridor, while including many aged and desired trees, also included broken sidewalks, deteriorated pavement and curbs, and inadequate storm sewerage. Composed entirely of asphalt, it accommodated on-street curbside parking along its length. The separation between travel lanes was unclear and, when cars were parked along both sides, drivers were forced to slow down or pull over to allow opposing traffic to pass.

The Village looked to its residents for input and a survey yielded comments that centered around four issues: safety, saving trees, parking and streetlighting. It was clear that the community desired to rejuvenate the streetscape and rebuild roadway travel lanes and upgrade essential utilities and services, while preserving the historic and cultural nature of the treelined corridor. Staff worked with the Village's Street Tree Advisory Board to develop a concept to preserve the desirable mature street trees. Once trees to be saved had been identified, travel lanes were set to 10½ feet in width providing an excess of 13 feet of tree lawn for the selected trees. In areas where there were no trees, bump-outs were devised to provide safe, well defined on-street parking for the residents and churches located along the street. Village staff advanced this streetscape concept into a preliminary layout for Council review and then partnered with EMH&T, an engineering, surveying, planning and environmental firm based in Columbus, Ohio, as the project civil engineer, to evolve the concept into a final layout and design.

To help reduce the financial burden on the community, the Village sought and received financial assistance for this project from Ohio's State Capital Improvement Program Fund through the Ohio Public Works Commission. EMH&T assisted the Village in securing funding and also completed the design, prepared construction plans and documents, and provided construction consultation services for the project.

The Design and Green Solution

Typical street rehabilitation projects often include removal of existing trees and result in significant disturbance to the street landscape. This project included an innovative approach and an emerging technology for reconstruction that limited impact to the street landscape while meeting the goals of the corridor makeover that included new street pavement, retention of streetside parking, new curb and gutter and storm sewerage, sidewalks, streetlighting, improved traffic control infrastructure, upgraded utility lines and creation of streetside green space. "Green" planning resulted in a design that preserved mature trees, provided expanded tree lawn areas, and included new parking areas and well-defined, newly-lighted and safe travel lanes.

Technological innovation and strategic planning was employed to achieve a green solution. The design layout of the bump-out parking adjacent to the reconstructed roadway allowed many trees that would have been removed under conventional design to be saved, providing well-defined and safe parking areas, improved flow of traffic, and comfortable and expanded tree lawn areas. New and expanded stormwater collection was a

Before construction: Pavement, gutters and sidewalks were seriously deteriorated. (Photo: Stephen Farst, EMH&T, Inc.)

necessary component of the project, and a limited existing downstream storm outlet was a factor. The Village, being mindful of their NPDES stormwater quality program goals, sought to include in the project a modern stormwater treatment method to serve as an example of responsible design and to demonstrate what local government public works can accomplish to meet broad environmental goals of reducing impervious areas. In support of these objectives, the design included use of a pervious concrete pavement system for the streetside parking areas between bump-out tree lawn areas, to reduce the "footprint" of the impervious paved surfaces. The Village selected this system due to the reported benefits outlined by the Ohio Ready Mix Concrete Association:

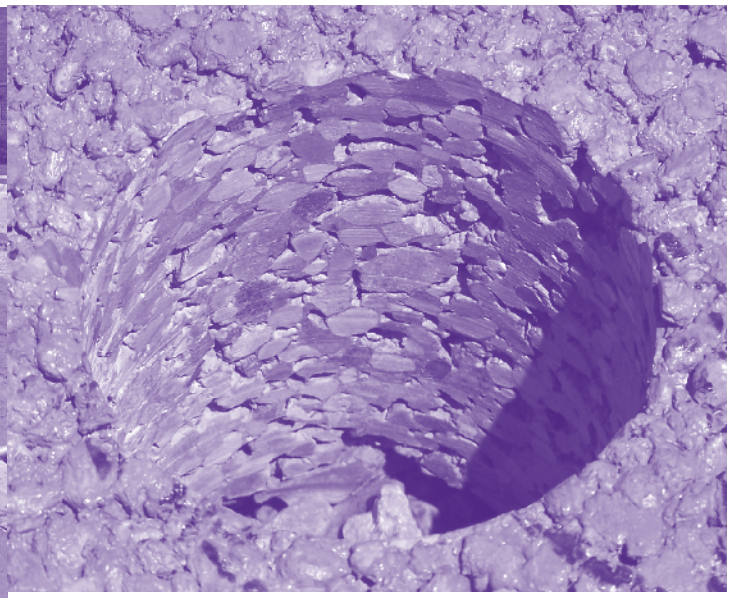
- Detention: The pervious concrete functions as a dry detention basin and reduces capacity requirements for downstream drainage facilities.
- Pollution: Pervious pavement provides a measure of water pollution control through a natural biological process that occurs in the porous pavement structure.
- Groundwater: Pervious pavement allows for recharges of the local groundwater aquifer.
- Heat Island: Pervious pavement benefits the urban climate by reducing the heat island effects normally associated with darker colored pavements.

The Ohio Ready Mix Concrete Association provided technical assistance related to the pervious concrete pavement system throughout design and construction. The pervious concrete system involved a seven-inch thick pavement structure used in conjunction with an 11-inch aggregate base detention layer that collects, cleans, stores and transfers stormwater runoff from road surface into the subsurface media and into the local adjacent storm collection system. The pervious concrete pavement surfaces were harmoniously integrated into the streetscape, tinted in color to provide an attractive and softened look while maintaining a clear separation between travel and parking lanes.

The West Columbus Street project represents the first significant use of pervious concrete in a public right-of-way with approximately 1,000 square yards being placed. It is estimated that through the savings of the trees and use of pervious concrete, there was about a thirty percent reduction of impervious area in the project segment where pervious pavement was applied. The final result is an attractive streetscape, a fully functional and effective parking and drainage system that is kind to the environment and demonstrative.

In 2009, Canal Winchester public works staff gained valuable experience regarding maintenance of the pervious pavement. Road salt was applied during winter months, only when necessary onto the main travel lanes but not directly onto the pervious surfaces. Only following the heavier snows did crews find it necessary to plow the pervious pavement, using a narrow-gauge plow mounted on a three-quarter-ton pickup truck. In July, eleven months after the pavement was installed, street department personnel utilized fire hoses and a Tymco 435 Air Sweep street sweeper to brush and vacuum the pervious pavement over a two-day operation. Crews observed that in the dirtiest sections, being those blocks with larger mature

Construction in progress
(Photo: Stephen Farst, EMH&T, Inc.)



Pavement core on "test" section: Core reveals the pervious concrete pavement section that rests atop an aggregate-base detention layer that provides a filtering mechanism to clean storm runoff and allows it to percolate into subgrade soils.
(Photo: Stephen Farst, EMH&T, Inc.)

evergreens overhead, cleaning efforts significantly improved the rate of permeability by a factor of almost two, over an uncleaned surface. This learning exercise allowed the Village to forecast a cleaning regimen of about once every six months in the heavier treelined areas, and less frequently for other areas.

The Impact

Water resource engineers and public works officials can fully appreciate the application of an emerging technology within a typical capital improvement project planning and design process to achieve street system renewal. This project demonstrates in a very real way how the public interest in green solutions can be served within the cost constraints and historical constraints that often accompany capital improvement programs. Without compromising public tax dollars, communities can apply this technology to their typical projects, making them anything but typical for the environment. Every project that accommodates innovation is a success for the community and the region. The design elements of this street rehabilitation project can be replicated in communities statewide. The rewards for the community come in many forms, not the least of which is an enhanced reputation for environmental stewardship. The Village of Canal Winchester dedicated themselves to this project and in doing so made an impact on the community that reaches much farther than the limits of Columbus Street.

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The authors gave a presentation on this topic at the 2009 APWA Congress in Columbus. Their session was entitled "An Innovative Green Solution for Urban Street Renewal" and took place on Monday, September 14. Stephen J. Farst can be reached at (614) 775-4203 or sfarst@emht.com; Matthew Peoples can be reached at (614) 834-5100 or mpeoples@canalwinchesterohio.gov; and Bill Sims can be reached at (614) 834-5109 or wsims@canalwinchesterohio.gov.

FHWA Launches Information Exchange for Bridges

Come join the Federal Highway Administration's (FHWA) new online Information Exchange for Bridges (IEB) at knowledge.fhwa.dot.gov/cops/ep.nsf/home. Launched by FHWA's Highways for LIFE program and Office of Bridge Technology, the site offers information on innovative products and processes for bridge construction, including details on preparing project descriptions, specifications, and construction drawings. Also featured are the text and construction drawings from FHWA's recently released *Connection Details for Prefabricated Bridge Elements and Systems* manual (see June 2009 *Focus*).

As the IEB is designed to be an electronic sharing library, visitors to the site are encouraged to submit their own documents for posting. Documents can be submitted in the topic areas of fabrication/construction, joints, substructure, and superstructure, as well as various subtopics (select the topic area and then click on "Submit a Reference"). Each document is peer reviewed before posting and assigned a rating indicating its general acceptance by industry reviewers.

"The information sharing aspect of the IEB is a great way for innovative designs and technologies to gain exposure and be refined," says Charlie Goodspeed, Associate Professor of Civil Engineering at the University of New Hampshire in Durham, New Hampshire.

"The world of accelerated construction is evolving from day to day. Each year, more departments of transportation are developing designs for prefabricated bridge elements and systems," notes Mike Culmo, Vice President of Transportation and Structures at CME Associates, Inc., in East Hartford, Connecticut. "The IEB will be a fluid resource that can provide practicing engineers with up-to-the-minute information on bridge technology. It has the potential to be a living version of the FHWA *Connection Details* manual, which will be beneficial to engineers as this technology evolves."

For more information on the IEB, contact Robert Strobel at the University of New Hampshire Technology Transfer Center, 603-862-4348 (email: robert.strobel@unh.edu). To download a copy of *Connection Details for Prefabricated Bridge Elements and Systems* (Pub. No. FHWA-IF-09-010), visit www.fhwa.dot.gov/bridge/prefab. For more information about the *Connection Details* manual, contact Vasant Mistry in FHWA's Office of Bridge Technology, 202-366-4599 (email: vasant.mistry@fhwa.dot.gov). To learn more about Highways for LIFE, visit www.fhwa.dot.gov/hfl.]

Prioritizing Prevention Practices

The Triple Crown of Pavement Preservation: Right Treatment. Right Road. Right Time.

by Daniel Brown

For several years now, pavement preservation techniques have been making steady progress in states across the country. "Pavement preservation has become a household word," says Mike Krissoff, executive director of the International Slurry Surfacing Association. Indeed, the road manager and the contractor have an abundance of maintenance tolls form which to choose.

For the road manager, experts put it simply: use the right treatment on the right road at the right time. If an agency can take money from its budget for reconstruction, and use that money instead for preventive maintenance, those dollars will provide more lane-mile-years of life – dollar-for-dollar – than money spent on "worst-first" fixes.

This article will take a closer look at several preventive maintenance techniques:

- Fog seals
- Crack sealing and crack filling
- Chip seals
- Slurry seals (see sidebar)
- Micro Surfacing
- Thin asphalt overlays

Fog seals are inexpensive treatments that typically involve spreading a diluted asphalt emulsion on the roadway. No aggregate is added. Normally an emulsion is about 35 percent water. With a fog seal, that emulsion is diluted even further, by about 50 percent, says Chuck Ingram, sales manager for Slurry Pavers Inc., a contractor based in Glen Allen, VA.

The purpose of a fog seal is to seal the pavement, inhibit raveling and enrich the hardened, oxidized asphalt. Upgrades to polymer-modified fog seals are available. "And in the fog seal family there can be rejuvenators that penetrate into the asphalt and add life," says Ingram. He says the typical life of a fog seal is one to two years, depending on traffic and climate.

Crack filling should only be used on non-working cracks, says Ingram. Non-working cracks are age related, and usually no routing is needed. Crack sealing can be used on working or thermal cracks. With crack sealing, it is recommended to rout the crack before applying the sealant. "That way you can get a consistent width and depth of the crack, so that the sealant will expand and contract evenly in the crack," says Ingram. "You can dictate what the climatic effect is."

It's important to clean out cracks before applying sealant. If the crack is not clean and dry, the sealant will not bond to the substrate. Cimline Inc., a manufacturer of hot crack sealing equipment, publishes a 40-page booklet called the Guide to Crack Sealing, which is an excellent reference on the subject (go to www.cimline.com).

The Strategic Highway Research Program recommends that cracks be treated with a heat lance, or hot air lance, before sealant installation. Hot air lances are designed to mix propane and compressed air to produce hot air. Depending on the manufacturer, heat lances output flames or flame-free heat. These devices generate upwards of 2,000 deg. F. to remove moisture and provide additional cleaning.

"There are some good cold-applied sealants and some good hot ones," says Ingram. "For performance, the hot-applied sealants are proven to outperform the cold-applied sealants." He puts the basic cost of crack sealing at $0.50 per linear foot – and the added life at four years.

A chip seal is the uniform application of asphalt binder to a prepared surface followed by the application of a cover aggregate that is seated by a roller. Chips seals apply to

sound pavement, usually to more rural routes. A chip seal is ideal for pavements with the loss of surface texture.

Chips seals seal pavement from water intrusion, improve surface friction, create a durable wearing course, and upgrade non-paved roads. Chips seals can be applied in multiple layers, Ingram points out. If you do that, the coarser aggregate goes down first. Years ago, Ingram says he recalls the state of North Carolina placing a 1-inch rock, followed by a 3/8-inch stone to fill in the gaps.

He says polymerized emulsions in recent years "have gone a long ways toward improving the performance of chips seals." Polymers help hold the rock in place; surface raveling is reduced. "The typical life of a chip seal is five to seven years, and with multiple applications they can last 10 years," says Ingram. "Chips seals are one of the most cost-effective preventive maintenance treatments."

Slurry surfacing systems include slurry seals and micro-surfacing. Typically a slurry seal is a blend of crushed aggregate and asphalt emulsion, mixed together in a pugmill attached to the back of a truck. Slurry seals offer no structural value, but they can extend the life of a pavement by five to seven years.

Micro-surfacing is similar to slurry sealing, except micro-surfacing typically uses a polymer-modified emulsion and is applied to higher-volume roads such as urban arterials. Slurry seals are for lower-volume roads. "When people ask me what the breakpoint is between the two treatments, I tell them it's ten to fifteen thousand cars per day," says Ingram. "But that's only a round number, not a hard-and-fast rule."

With micro-surfacing, you can place multiple lifts; you can level out consolidation rutting. "It's important to determine the cause and type of rut that you're attempting to level," says Ingram. "A consolidation rut or rutting from the top down with no base or subbase failure can be effectively leveled with micro-surfacing. Plastic deformation such as shoving and rutting at intersections, are not good rut-filling candidates for micro-surfacing. There is too much movement for the micro-surfacing to be an effective tool."

Micro-surfacing can allow traffic back onto the pavement within an hour, says Vic Gawith, a salesman for Bergkamp Inc., an equipment manufacturer. "Once the chemical reaction starts, the water is being pushed out and the emulsion sucks in around the aggregate," says Gawith. "You may want to add a retarder so that the material doesn't break (set up) in the machine or in the spreader."

Thin asphalt overlays can be used on any pavement with minor distresses such as raveling or very light cracking, says Dave Newcomb, vice president of research and technology for the National Asphalt Pavement Association. For overlays of 1.5 inches thick, one uses 3/8-inch topsize aggregate; for overlays of 1 inch thick you use quarter-inch aggregate.

Thin overlays bring some structural benefit, Newcomb says; they also restore ride quality and skid resistance, and they can be used to quiet a noisy pavement. Thin overlays don't require much adjustment in terms of grade corrections – you can mill the pavement lightly at the curb and feather the overlay into the curb. A thing overlay will typically last 10 to 15 years, Newcomb says.

Seat Belt Use in 2009–Overall Results

Seat belt use in 2009 stood at 84 percent, a gain from 83 percent use in 2008. This result is from the National Occupant Protection Use Survey (NOPUS) which is the only survey that provides nationwide probability-based observed data on seat belt use in the United States. The NOPUS is conducted annually by the National Center for Statistics and Analysis of the National Highway Traffic Safety Administration.

Seat belt use has been increasing steadily since 1994, accompanied by a steady decline in the percentage of unrestrained passenger vehicle occupant fatalities during daytime (Figure 1).

The 2009 survey also found the following:

- Seat belt use for occupants traveling during weekends increased to 86 percent in 2009 (83% in 2008), which shows a significant annual increase (Figure 2).
- Seat belt use continues to be higher in the States in which vehicle occupants can be pulled over solely for not using seat belts ("primary law" States) as compared with the States with a weaker enforcement law ("secondary law" States) (Figure 3).

Survey Methodology

The National Occupant Protection Use Survey is the only nationwide probability-based observational survey of seat belt use in the United States. The survey observes usage as it actually occurs at randomly selected roadway sites, and thus provides the best tracking of the extent to which passenger vehicle occupants in this country are buckling up.

The survey data is collected by sending to probabilistically sampled roadways trained observers who observe passenger vehicles between the hours of 7a.m. and 6p.m. Observations are made either while standing at the roadside or, in the case of expressways, while riding in a vehicle in traffic. Observers do not stop vehicles or interview occupants, so that the NOPUS captures the untainted behavior of occupants. The 2009 NOPUS data was collected between June 1 and June 20, 2009, while the 2008 data was collected between June 2 and June 22, 2008.

Sites, Vehicles, and Occupants* Observed			
Numbers of	2008	2009	Percentage Change
Sites Observed	1,865	1,823	-2%
Vehicles Observed	116,000	100,000	-14%
Occupants Observed*	147,000	127,000	-14%

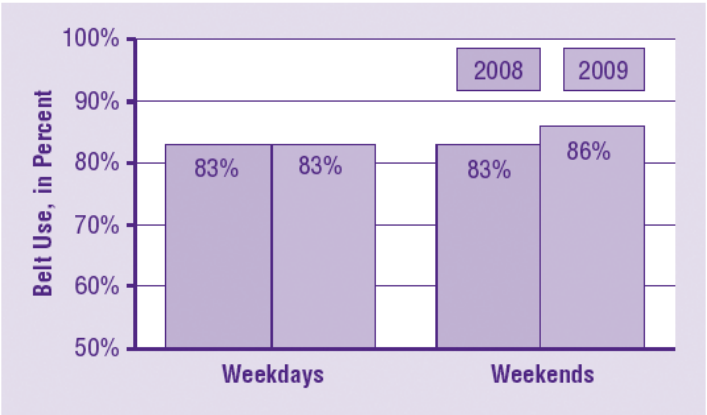
*Drivers and right-front passengers only.

Because the NOPUS sites were chosen through probabilistic means, we can analyze the statistical significance of its results. Statistically significant increases

Figure 1: NOPUS Seat Belt Use Rate and Daytime Percentage Unrestrained Passenger Vehicle Occupant Fatalities

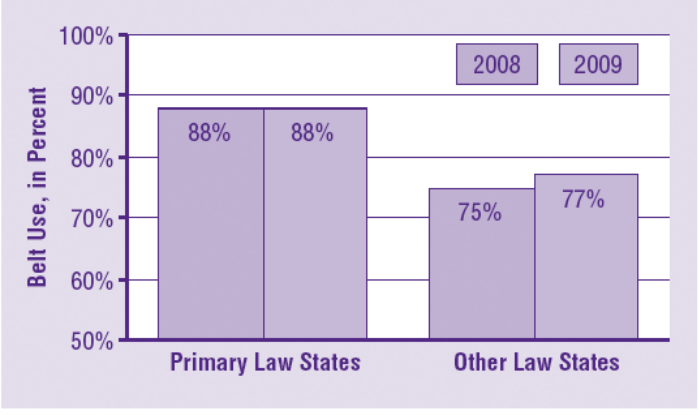
Source: NOPUS and FARS, NHTSA's National Center for Statistics and Analysis

Figure 2: Seat Belt Use by Weekday/Weekend



Source: National Occupant Protection Use Survey, NHTSA's National Center for Statistics and Analysis, 2008, 2009

Figure 3: Seat Belt Use by Law Type



Source: National Occupant Protection Use Survey, NHTSA's National Center for Statistics and Analysis, 2008, 2009

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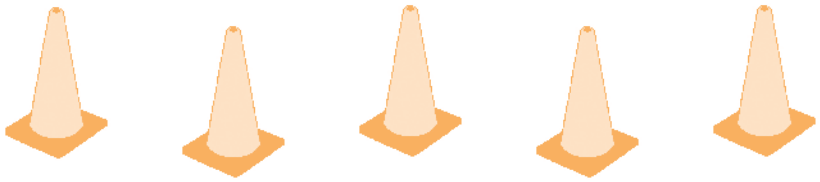

More Safety For Them, More Risk For You?

By Matthew Barnett

A look at whether participating in the Safe Routes to School Program increases liability.

For anyone interested in implementing the Safe Routes to School (SRTS) program in their community, liability is certainly an issue that will need to be talked about. A recent SRTS Liability Webinar is a helpful resource for considering the legal implications of the program.[1]

One of the first questions that come to mind is, "Does liability increase with SRTS?" Programs like SRTS that promote student walking and biking over riding in cars or buses to school put more children near traffic. The Webinar suggests that, overall, SRTS does not increase liability, but that every situation is unique and, for each stakeholder in the program, the answer is closer to a maybe.

The Federal Highway Administration and their legal staff believe that SRTS redistributes liability among the stakeholders involved—schools, transportation/public works departments, and some nonprofit organizations—but it doesn't necessarily increase it overall. All transportation modes have inherent risks and potential liability. SRTS, however, provides an opportunity to evaluate the entire student travel "system" of environment, policies, and travel modes.

The SRTS program has several key stakeholders as mentioned above, and each has unique liability issues that will vary depending on the role of the agency or organization. It is suggested that each entity address their own specific liability issues to cover all bases.

One common allegation in issues of liability is the failure to make capital improvements for reasonable accommodation of the traveling public. Some communities are finding that doing nothing is a good way to get sued. Helmboldt also warns that, "Failure to provide transportation choices and accommodations for all users increases the likelihood of settlements of judgments in favor of those who are excluded."

Strategies and tools to reduce potential liability

The National Center for SRTS has developed these tips to reduce your agency's potential liabilities:

- Work with your school district's administrative and legal staff to understand the relevant liability issues and to develop appropriate policies. Be aware of local laws, regulations, and school policies.
- Take steps to fix problems. Bike/walk-ability audits are a good way to determine the potential hazards and needed improvements along a walking or biking route. Road safety assessments (RSAs) can be used to identify potential roadway safety problems and propose measures to eliminate or mitigate them. Multi-disciplinary teams conduct RSAs, so several points of view are considered, not just the engineering. (See page 14 for information on upcoming RSA workshops in Kansas.)
- Document your efforts. Keep records of potential problems and steps made to fix them.
- Be uniform, systematic, and consistent in undertaking safety improvements. Having consistently enforced policies is a must, because failure to enforce policies or laws that contribute to student safety can create safety problems and risk for your government entity.
- Develop a plan. Use qualified and knowledgeable people in putting together your SRTS plan. It seems like an obvious precaution, but many people dealing with SRTS issues may not be aware of current best practices, guidelines, etc, relating to bicycle and pedestrian safety education, planning, engineering, and accessibility accommodations. Decreased safety and subsequently increased liability can result from people assuming what is "safe."
- Employ the five E's (Education, Encouragement, Enforcement, Engineering, and Evaluation). Doing so will help ensure your programs are comprehensive and provide a complete set of tools and solutions to preempt potential problems.
- Show safer routes on a map. Depict sidewalks, crosswalks, stop signs, speed limits, etc. Using this map will allow parents and students to make an informed choice on which routes to use.
- Inform and involve parents. Encourage the parents to

form walking school buses and bike trains. These can be formal or informal adult-supervised walking or biking groups of students, but when they are formally organized, it is a good idea for schools to get background checks for participating adults. For more information on walking school busses, visit http://www.walkingschoolbus.org.

Officially-sponsored walking or bicycling activities such as a walking school bus or bike train, come with greater responsibilities. Just like other school-sponsored forms of transportation. To avoid liability for negligence, exercise "reasonable care". SRTS-recommended procedures for a walking school bus are outlined in the National Center for SRTS publication, The Walking School Bus: Combining Safety, Fun and the Walk to School (http://www.saferoutesinfo.org/guide/walking_school_bus/index.cfm).

- Provide training. Training for crossing guards and employees is helpful in keeping school liability at a minimum. Your agency could consider sharing some expertise in a presentation.

Conclusion

Safe Routes to Schools programs could increase liability, but usually just redistributes it among the stakeholders in the program—the school, local government, and sometimes nonprofit agencies. In fact, SRTS programs have the potential to decrease overall liability through identifying and addressing problems in the student travel environment. It's important to remember that all travel modes have inherent dangers and liabilities, and the entire process and environment in which students travel to and from school needs to be evaluated and addressed.

Always question the basis for declaring that kids walking and biking is "unsafe." It may uncover an assumption or identify an issue that can be addressed. Remember to consult with your agency's legal counsel to discuss specific concerns because issues of liability can rarely be answered in absolute terms. It is often addressed through a mix of laws addressing specific entities.

Sources

Liability Tip Sheet: Safe Routes to School. June 6, 2008. Document Accessed July 25, 2009. http://www.saferoutesinfo.org/resources/collateral/liabilitytipsheet.pdf.

Webinar: The National Center for Safe Routes to School partners with America Walks. Webinar presented by: Jakob Helmboldt, VDOT and Tamberly Sufi, Toole Design Group. November 10, 2008. Accessed July 25, 2009. http://www.saferoutesinfo.org/training/can_webinar_11182008.cfm.

[1]The presenter, Jakob Helmboldt of the Virginia Dept. of Transportation, is quick to point out he is not a lawyer and advises to always seek the advice of your agency's legal counsel for specific issues in your situation.

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Seat Belt Use by Major Characteristics

Occupant Group[1]	2008		2009		2008-2009 Change	
	Belt Use[2]	Confidence That Use Is High or Low in Group[3]	Belt Use[2]	Confidence That Use Is High or Low in Group[3]	Change in Percentage Points	Confidence in a Change in Use[4]
All Occupants	83%		84%		1	68%
Drivers	84%	**100%**	85%	**100%**	1	69%
Right-Front Passengers	81%	**100%**	82%	**100%**	1	65%
Occupants in States With[5]						
Primary Enforcement Laws	88%	**100%**	88%	**100%**	0	51%
Secondary Enforcement Laws or No Belt Use Law	75%	**100%**	77%	**100%**	2	75%
Occupants on						
Expressways	90%	**100%**	89%	**100%**	-1	49%
Surface Streets	80%	**100%**	81%	**100%**	1	77%
Occupants Traveling in						
Fast Traffic	87%	**100%**	88%	**100%**	1	63%
Medium-Speed Traffic	83%	55%	83%	78%	0	29%
Slow Traffic	79%	**100%**	78%	**100%**	-1	22%
Occupants Traveling in						
Heavy Traffic	97%	**100%**	92%	NA*	-5	NA*
Moderately Dense Traffic	85%	68%	83%	60%	-2	24%
Light Traffic	83%	85%	84%	57%	1	73%
Occupants Traveling Through						
Light Precipitation	81%	75%	83%	78%	2	33%
Light Fog	80%	62%	78%	**90%**	-2	16%
Clear Weather Conditions	83%	76%	84%	85%	1	72%
Occupants in						
Passenger Cars	84%	**98%**	86%	**100%**	2	84%
Vans and SUVs	86%	**100%**	87%	**100%**	1	56%
Pickup Trucks	74%	**100%**	74%	**100%**	0	10%
Occupants in the						
Northeast	79%	**93%**	82%	81%	3	80%
Midwest	79%	**96%**	81%	**93%**	2	79%
South	81%	86%	82%	82%	1	42%
West	93%	**100%**	93%	**100%**	0	33%
Occupants in						
Urban Areas	84%	71%	83%	60%	-1	40%
Suburban Areas	85%	**99%**	86%	**100%**	1	65%
Rural Areas	79%	**100%**	81%	**100%**	2	71%
Occupants Traveling During						
Weekdays	83%	66%	83%	**99%**	0	2%
Weekday Rush Hours	84%	**90%**	84%	**96%**	0	1%
Weekday Non-rush Hours	82%	**90%**	82%	**96%**	0	6%
Weekends	83%	66%	86%	**99%**	3	**96%**

[1] Drivers and right-front passengers of passenger vehicles with no commercial or government markings.
[2] Use of shoulder belts observed between the hours of 7 a.m. and 6 p.m.
[3] The level of statistical confidence that use in the occupant group (e.g., occupants in urban areas) is higher or lower than use in the corresponding complementary occupant group (e.g., occupants in suburban and rural areas). Confidence levels that meet or exceed 90 percent are formatted in boldface type. Confidence levels are rounded to the nearest percentage point, and so levels reported as "100 percent" confidence are between 99.5 percent and 100.0 percent.
[4] The degree of statistical confidence that the 2009 use rate is different from the 2008 rate.
[5] Use rates reflect the laws in effect at the time data was collected.

NA: Estimates cannot be computed since all observations were done in a single Primary Sampling Unit.
Source: National Occupant Protection Use Survey, National Highway Traffic Safety Administration, National Center for Statistics and Analysis

in belt use between 2008 and 2009 are identified in the table "Seat Belt Use by Major Characteristics" by having a result that is 90 percent or greater in the table's column 7. Statistical confidence levels that use in a given occupant group, e.g., occupants in the Midwest, is higher or lower than in the complementary occupant group, e.g., occupants in the Northeast, South, and West, are provided in columns 3 and 5. Such comparisons are made within categories, such as road type, delineated by changes in row shading in the tables. The exception to this is the grouping "Occupants Traveling During …," in which weekdays are compared to weekends, and weekday rush hour to weekday non-rush hour.

The NOPUS uses a complex multistage probability sample, statistical data editing, imputation of unknown values, and complex estimation and variance estimation procedures. The 2009 NOPUS continued the transition to the newly designed sample of observation sites, which was implemented in 2006. The 2009 results reflect the partial incorporation of a set of observation sites from the new design (about 65%) and a set of the observation sites from the old design (about 35%). Data from 2005 and prior years was obtained from the old observation sites only.

Data collection, estimation, and variance estimation for the NOPUS are conducted by Westat, Inc., under the direction of the National Center for Statistics and Analysis in NHTSA under Federal contract number DTNH22-07-D-00057.

Definitions

Under NOPUS observation protocols, a driver or right-front passenger is considered "belted" if a shoulder belt appears to be across the front of the body.

States With Primary Enforcement Seat Belt Laws*		
Alabama	Alaska	California
Connecticut	Delaware	District of Columbia
Georgia	Hawaii	Illinois
Indiana	Iowa	Kentucky
Louisiana	Maine	Maryland
Michigan	Mississippi	New Jersey
New Mexico	New York	North Carolina
Oklahoma	Oregon	South Carolina
Tennessee	Texas	Washington

*States with laws in effect as of May 31, 2009.

A jurisdiction that can enforce traffic laws, such as a State or the District of Columbia, has a "primary enforcement law" if occupants can be ticketed simply for not using their seat belts. Under a "secondary enforcement law" occupants must be stopped for another violation, such as an expired license tag, before being cited for seat belt nonuse. As of May 31, 2009, primary laws were in effect in 26 States and the District of Columbia, 23 States had secondary laws, and 1 State (New Hampshire) effectively has no belt law for adults. (In New Hampshire, it is legal for occupants over age 18 to ride unbelted.) Primary enforcement seat belt laws in Arkansas, Florida, and Wisconsin did not take effect until June 30, 2009. Minnesota's primary law took effect on June 9, 2009. Seat belt use rates reflect the State laws in effect at the time of data collection.

"Expressways" are defined to be roadways with limited access, while "surface streets" comprise all other roadways. "Rush hour" is defined to comprise the time periods 7 – 9:30 a.m. and 3:30 – 6 p.m.

A roadway is defined to have "fast traffic" if during the observation period the average speed of passenger vehicles that passed the observer(s) exceeded 50 mph, with "medium-speed traffic" defined as 31 - 50 mph and "slow traffic" defined as 30 mph or slower.

A roadway is defined to have "heavy traffic" if the average number of vehicles per lane mile on the roadway during the observation period exceeded 45, with "moderately dense traffic" defined as 26 - 45 vehicles per lane mile and "light traffic" having at most 25 vehicles per lane mile.
The survey uses the following definitions of geographic regions, which are defined in terms of the States contained in the region below:

Northeast: CT, MA, ME, NH, NJ, NY, PA, RI, VT
Midwest: IA, KS, IL, IN, MI, MN, MO, ND, NE, OH, SD, WI
South: AL, AR, DC, DE, FL, GA, KY, LA, MD, MS, NC, OK, SC, TN, TX, VA, WV
West: AK, AZ, CA, CO, HI, ID, MT, NM, NV, OR, UT, WA, WY

Seat belt use rates reflect the State laws in effect at the time of data collection.

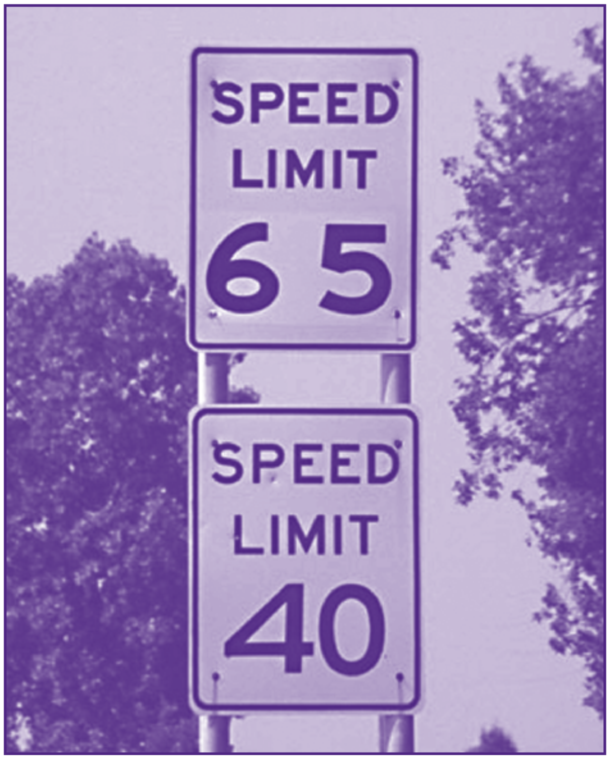
For More Information

This research note was written by Timothy M. Pickrell, a mathematical statistician in the Mathematical Analysis Division, National Center for Statistics and Analysis, NHTSA, and by Tony Jianqiang Ye, a contractor employed by URC Enterprises, Inc., working with the Mathematical Analysis Division, National Center for Statistics and Analysis, NHTSA. For questions regarding the information presented in this document, please contact timothy.pickrell@dot.gov.

Additional data and information on the survey design and analysis procedures will be available in upcoming publications to be posted at the Web site www-nrd.nhtsa.dot.gov/CMSWeb/index.aspx in 2009.

Research has found that lap/shoulder seat belts, when used, reduce the risk of fatal injury to front-seat passenger car occupants by 45 percent and the risk of moderate-to-critical injury by 50 percent. In 2008 alone, seat belts saved an estimated 13,250 lives (Traffic Safety Facts: 2008 Data, NHTSA, DOT HS 811153). For more information on the campaign by NHTSA and the States to increase seat belt use, see www.nhtsa.dot.gov/link/ciot.htm.

The NOPUS also observes other types of restraints such as child restraints and motorcycle helmets, and observes driver electronic device use. This publication is part of a series that presents overall results from the survey on these topics. Please see other notes in the series such as "Motorcycle Helmet Use in 2009 – Overall Results" for the latest data on these topics.



Are We There Yet? is published by the South Carolina Transportation Technology Transfer Service (T^{3}S) for the benefit of county and municipal government agency personnel in South Carolina. T^{3}S, administered by the Clemson University Civil Engineering Department, is the Local Technical Assistance Program (LTAP) center for SC. T^{3}S is part of a nationwide network of LTAP centers established by the Federal Highway Administration (FHWA) in cooperation with state transportation agencies. T^{3}S is jointly funded by FHWA and the South Carolina Department of Transportation (SCDOT). The views, opinions, and recommendations contained in the newsletter do not necessarily reflect the views of the FHWA or the SCDOT.

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