T3S

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South Carolina Transportation Technology Transfer Service

Are We There Yet?

In This Issue...

National Web Site Shows Fatal Crashes in the U.S. — Including Your Community

Researchers in the Center for Excellence in Rural Safety (CERS) in Minnesota have mapped out every fatality in the nation with details on each death, so now you, your citizens, and elected officials can see the "dead man's curve" and those high-crash intersections in your community. To view a video about the mapping feature, go to http://www.saferoadmaps.org and click on "Tutorials."

CERS officials hope the tool will educate the public about road fatalities, especially those that live in rural areas. U.S. Census figures show that 21 percent of Americans live in rural areas and the Federal Highway Administration has found that 57 percent of highway deaths happen on rural roads.

"When drivers type in their most common routes, they're shocked how much blood is being shed on it," said Tom Horan, research director for CERS. "When it's the route you or your loved ones use, the need to buckle up, slow down and avoid distractions and drinking suddenly becomes much more personal and urgent."

To use the site, enter an address at http://www.saferoadmaps.org and you will see a map or satellite image of all of the road fatalities that have occurred in the area. Plus, users have the ability to narrow down their search to see the age of the driver, whether speeding or drinking was a factor, and if the driver was wearing a seat belt.

One of the most important aspects of the new tool also illustrates which life-saving public policies, such as strong seat belt laws, are in the chosen area.

"This tool sheds light on the importance of strong public policy that helps save lives in states across the nation," said Lee Munnich, director of CERS. "When you can visually see how many lives can be saved, it really changes how the public and policy makers see our roads."

For more information, visit http://www.saferoadmaps.org or contact Gina Baas, Center for Transportation Studies at the University of Minnesota, (612) 626-7331.

Adapted by the Kansas University Transportation Center from a UMNews release: "University of Minnesota researchers map out America's deadliest roads," July 23, 2008. Article appeared in the Winter 2009 issue of the KUTC Newsletter.

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Improve Intersection Sight Distances

Good visibility at highway intersections is an important element of roadway safety. Obstructed views where two roads meet increase the chance for vehicle crashes. Local road officials need to maintain sight triangles at these intersections that meet safety standards.

The method described here for determining minimum sight distances at stop-controlled and uncontrolled intersections comes from guidelines in *Geometric Design of Streets and Highways 2004* published by the American Association of State Highway and Transportation Officials (AASHTO). Often called "The Green Book," the guidelines refer to new construction. Local policies related to sight distance requirements might justify lesser minimums for cost/ benefit reasons. But the Green Book likely will be used as a defacto standard in a court case if no local policy exists.

The procedures in this article can be used to determine the recommended intersection sight distance for an intersection, measure the distances in the field, and identify maintenance actions and low cost improvements to address poor intersection sight distance.

These procedures are based on a passenger car approaching an intersection with approach grades of 3 percent or less and an angle near 90 degrees. See the Green Book to adjust for grades greater than 3 percent, angled intersections or significant truck traffic.

Uncontrolled intersection sight triangles

Highway workers and engineers determine sight triangles by calculating an intersection sight distance (ISD) for each leg of an intersection at intersecting roads. The ISD depends on the configuration of the road and existing traffic control at the intersection.

For uncontrolled intersections—those without stop signs, yield signs or other traffic controls—calculate the minimum ISD along two legs of the intersection to establish an "approach sight triangle." (Fig. A) This is the area to keep clear of visual obstructions so approaching drivers have adequate time to identify hazards and respond safely. Determine the distance of each leg of an ***approach*** sight triangle from Table 1 using the design speed for each intersecting road.

Stop-controlled intersection sight triangles

Stop-controlled legs of intersections use a "departure sight triangle" (Fig. B) to establish the area with unobstructed views so stopped drivers can judge when to enter or cross the intersection.

The length of the short leg of a ***departure*** sight triangle (along the stop-controlled leg of the intersection) is 14.5 feet plus the distance from the edge of the pavement to the center of the lane traveled by a vehicle approaching on the uncontrolled leg of the intersection. Determine the length of the long leg of the sight triangle (along the uncontrolled leg) from Table 2 using the design speed of the uncontrolled street.

ISD for yield-controlled intersections is a more complex case. It requires taking measurements of the approach and

FIG A – Left and right approach triangles at an uncontrolled intersection. Examples show distances taken from Table 1 based on design speeds of intersecting roads.

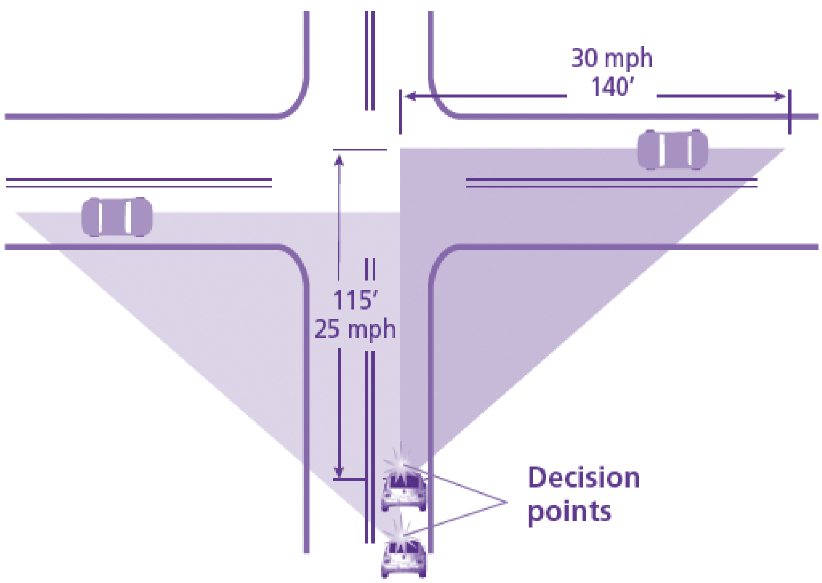

TABLE 1 – Intersection sight distances: UNCONTROLLED INTERSECTION

Design speed (mph)	20	25	30	35	40	45	50	55	60
Intersection sight distance (ft)	90	115	140	165	195	220	245	285	325

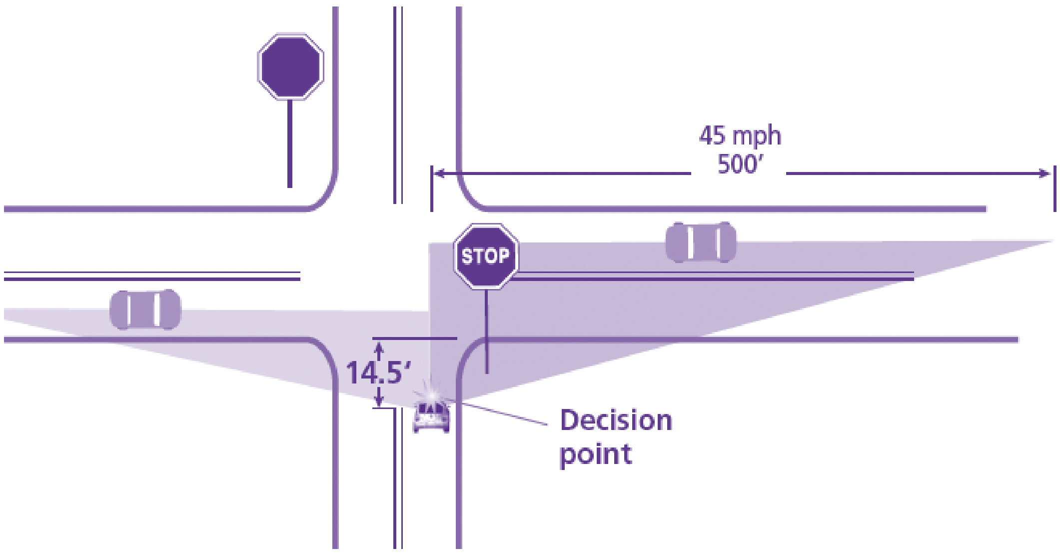

FIG B – Left and right departure sight triangles at stop-controlled intersection. Example shows required sight distance taken from Table 2 based on the design speed of uncontrolled leg of intersection.

TABLE 2 – Intersection sight distances: STOP-CONTROLLED INTERSECTION

Design speed (mph)	20	25	30	35	40	45	50	55	60
Required sight distance (ft)	225	280	335	390	445	500	555	610	665

departure sight triangles, with lengths different from those presented here. Consult the Green Book for details.

Estimating design speed

It helps to know the design speed of a road when establishing sight triangles. Different from the speed limit, design speed is related primarily to the road's horizontal and vertical curve geometry.

Keith Knapp, Director of Transportation Safety Engineering at the Center for Excellence in Rural Safety at the University of Minnesota, suggests that when information on design speed is not available, local agencies use a design speed 5-to-10 mph above the posted speed limit to determine the minimum sight distance required.

Actions to improve sight lines

Where sight distances do not meet the minimum ISD requirements, the next step is to identify and reduce the obstructions that interfere with sight lines or compensate by changing traffic controls.

Generally, objects that stand higher than 3.5 feet or hang lower than 7.6 feet are considered obstructions in the sight triangle. Some agencies use 2.5 or 3 feet as the lower number and 8.5 feet for the higher number, basing these expanded vertical zones on variations in vehicle height. The expanded vertical zone also helps compensate for vegetation that fills in again after being cut back.

Common sight obstructions include: trees, bushes and crops, fences, signs, buildings, parked vehicles, and roadway pavement or embankment. Although property owners may object, trim or remove vegetation within the right-of-way. For obstructions outside the right-of-way but inside the sight triangle, find out if private property owners must remove them by ordinance. If not, communicate the safety issues and work with property owners to gain voluntary compliance.

When removing an obstruction is impossible or cost prohibitive, local governments can address the sight distance issue with other actions. Installing a stop sign at an uncontrolled intersection (when MUTCD stop sign warrants are met) can reduce the size of the sight triangle. In some cases the way to improve sight lines is to make changes to grades, curves and embankments adjacent to the intersection.

If it is not possible to improve sight distance by removing obstructions, changing intersection control or making geometric changes, consider posting advance warning signs and advisory speed limits to make drivers more aware of the intersection.

Safety in season

Summer is a good time to check intersections for adequate and safe sight distances while vegetation is thick and full. The fieldwork to check intersection sight distance is not costly or complicated, and many of the remedies for inadequate sight distance can be done at low cost. Improving sight distances at intersections goes a long way toward reducing crashes and keeping local roadways safe.

Link to American Association of State Highway Transportation Officials site and the organization's bookstore, a source for the AASHTO Green Book: http://www.transportation.org/.

Lights and Stripes
Proper Use Could Save Your Life

by Howard McCann, P. E., Robert Averitt, and Elmer Williams

The highway is one of the most dangerous environments in which emergency responders work, and many responders and motorists have been killed or injured in secondary crashes.

It is essential that every effort be made to quickly clear an incident scene, while also protecting the lives of both responders and the traveling public.

The visibility of emergency vehicles is an important factor to consider. Vehicle lights and reflective stripes allow emergency vehicles to be seen, through both active and passive visual warnings.

The key is to use them effectively. As stated in the U. S. Fire Administration's 2008 report, Traffic Incident Management Systems, "while it is clear that some lighting is necessary in order to warn approaching motorists of the presence of emergency responders, it is also suspected that too much or certain types of lighting can actually increase the hazard to personnel operating on the scene, particularly during nighttime operations." (1)

Light discipline

Responders must understand the importance of light discipline. Just because responders have many lights available doesn't mean they have to use all of them. Responders should be aware of the following:

1. Emergency vehicle headlights should be deployed in a manner that is not blinding to motorists

Headlights shining directly into oncoming traffic can result in drivers passing the incident scene in a temporarily blinded condition. It takes drivers from three to six seconds to recover from the effects of glare. (1) At 65 miles per hour, vehicles travel over 95 feet per second. In just three seconds at that speed, a driver will travel almost the length of a football field in a temporarily blinded condition. This puts everyone at risk, including emergency responders. On-scene responders may be in a position to see oncoming traffic well, but that does not mean that oncoming drivers can see responders well. If emergency vehicle headlights are shining directly at oncoming traffic, drivers may not be able to see responders at all.

2. Emergency warning lights should be minimized as conditions warrant

There comes a point where more is not always better. Evidence suggests that strong stimuli – such as the combination of lights and flashes – attract central gaze which can cause drivers to steer in the direction of that gaze. This has been termed the "moth effect" and could have dangerous consequences for on-scene responders. It is generally believed that this visual attraction is further accentuated when the driver is under the influence of drugs and alcohol. (1) As stated in the Texas Manual on Uniform Traffic Control Devices, "The use of emergency-vehicle lighting can be reduced if good traffic control has been established at a traffic incident scene. This is especially true for major traffic incidents that might involve a number of emergency vehicles." (2)

Retroreflective Stripes

Retroreflective stripes enhance the visibility of emergency response vehicles and work by reflecting light from the headlights of approaching vehicles back to the driver. Whereas lights provide an active visual warning (require electric power), retroreflective stripes provide a passive visual warning (no need for power).

Several years ago, the Texas Department of Transportation (TxDOT) implemented a chevron pattern of retroreflective stripes on the back of its work vehicles. Why? To increase the visibility of these vehicles at a greater distance and lessen the chance for rear-end crashes.

In 2008, the National Fire Protection Association (NFPA) adopted revised standard NFPA 1901 calling for the use of a chevron pattern of retroreflective striping on the rear of automotive fire apparatus. (3) This standard calls for the following:

- "At least 50 percent of the rear-facing vertical surfaces, visible from the rear of the apparatus, excluding any pump panel areas not covered by a door, shall be equipped with retroreflective striping in a chevron pattern sloping downward and away from the centerline of the vehicle at an angle of 45 degrees."
- "Each stripe in the chevron shall be a single color alternating between red and either yellow, fluorescent yellow or fluorescent yellow-green."
- "Each stripe shall be 6 inches (150 mm) in width."

When it comes to lights at the scene of an accident, remember, more is not always better. Keep the passing motorists in mind . . . it may save your life.

About the Authors

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Emergency warning lights should be minimized as conditions warrant. More is not always better.

year veteran of the Houston Fire Department.

Special thanks to Assistant Chief Ricky Van (Bryan Fire Department), Training and Safety Officer Ron Moore (McKinney Fire Department), and Jerral Wyer (TxDOT).

About the Texas Engineering Extension Service
The Texas Engineering Extension Service, or TEEX, is a member of The Texas A&M University System and offers hands-on, customized first-responder training, homeland security exercises, technical assistance and technology transfer services impacting Texas and beyond. TEEX programs include fire services, homeland security, law enforcement, public works, safety and health, search and rescue, and economic development.

References:

(1) Traffic Incident Management Systems, April, 2008, U. S. Fire Administration, Federal Emergency Management Agency (FEMA), prepared with the cooperation of the Federal Highway Administration.

(2) Section 61.05, Use of Emergency-Vehicle Lighting, Texas Manual on Uniform Traffic Control Devices, 2006.

(3) NFPA 1901 Standard for Automotive Fire Apparatus, 2009 edition (effective date July 18, 2008).

Note: Article reprinted with permission from Issue 5, 2008, of TEEX Lone Star Roads, the Texas LTAP newsletter. Visit the Texas Engineering Extension Service (TEEX) at: www.teex.org. Visit Texas LTAP at: http://teexcit.tamu.edu/texasltap/.

Retroreflective chevron pattern striping on Bryan Fire Department apparatus.

Retroreflective chevron pattern striping on TxDOT work truck.

Porous Asphalt Pavements

An environmentally friendly tool for stormwater management

By Kent Hansen, P.E

Porous pavements are highly effective in reducing pollution in stormwater runoff from pavements. Cahill reports that, although sampling on porous pavement systems has been limited, the available data indicate a high removal rate for total suspended solids (TSS), metals, and oil and grease.[2] Table 1 shows the pollution removal efficiency for a porous parking lot constructed at the University of New Hampshire (UNH) in 2004.[3] The University reports that "The water quality treatment performance of the porous asphalt lot generally has been excellent. It consistently exceeds EPA's recommended level of removal of total suspended solids, and meets regional ambient water quality criteria for petroleum hydrocarbons and zinc. Researchers observed limited phosphorus treatment and none for nitrogen, which is consistent with other non-vegetated infiltration systems."

They also observed that the system did not remove chloride, but since it drastically reduced the salt needed for winter maintenance, it may prove effective at reducing chloride pollution. They reported that winter maintenance requires "between zero and 25 percent of the salt routinely applied to impervious asphalt to achieve equivalent, or better, deicing and traction."

Pavement structure

From the bottom up, the standard porous asphalt pavement structure consists of:

- An uncompacted subgrade to maximize the infiltration rate of the soil.
- A geotextile fabric that allows water to pass through, but prevents migration of fine material from the subgrade into the stone recharge bed.
- A stone recharge bed consisting of clean, single-size crushed large stone with about 40 percent voids. This serves as a structural layer and also temporarily stores stormwater as it infiltrates into the soil below.
- A stabilizing course or "choker course" consisting of a clean single-size crushed stone smaller than the stone in the recharge bed to stabilize the surface for paving equipment.
- An open-graded asphalt surface with interconnected voids that allow stormwater to flow through the pavement into the stone recharge bed.

Design

The design of a porous pavement can be broken down into location, hydrology and structural design. This article will not address hydrologic design, as this should be performed by a licensed engineer proficient in hydrology and stormwater design. The general guidelines for the porous asphalt pavement design are:

- Consider the location for porous pavements early in the site design process.
- Soil infiltration rates of 0.1 to 10 inches/hour work best.
- Minimum depth to bedrock or seasonal high water should be greater than two feet.
- Look for opportunities to route runoff from nearby impervious areas to the infiltration bed to minimize stormwater structures. Pretreatment may be required.
- Spread out the infiltration. The maximum ratio of impervious to pervious area should be 5:1. For carbonate soils where there is a risk of sinkholes, the maximum ratio should be 3:1. Do not place porous pavements over known sinkhole areas.
- The design should provide for an alternate path for stormwater to enter the stone recharge bed in the event that the pavement surface becomes plugged or experiences extreme storm events.
- An overflow system should be included to prevent water in the stone bed from rising into the pavement surface during extreme storm events.

Figure 1: Typical Porous Pavement Cross Section

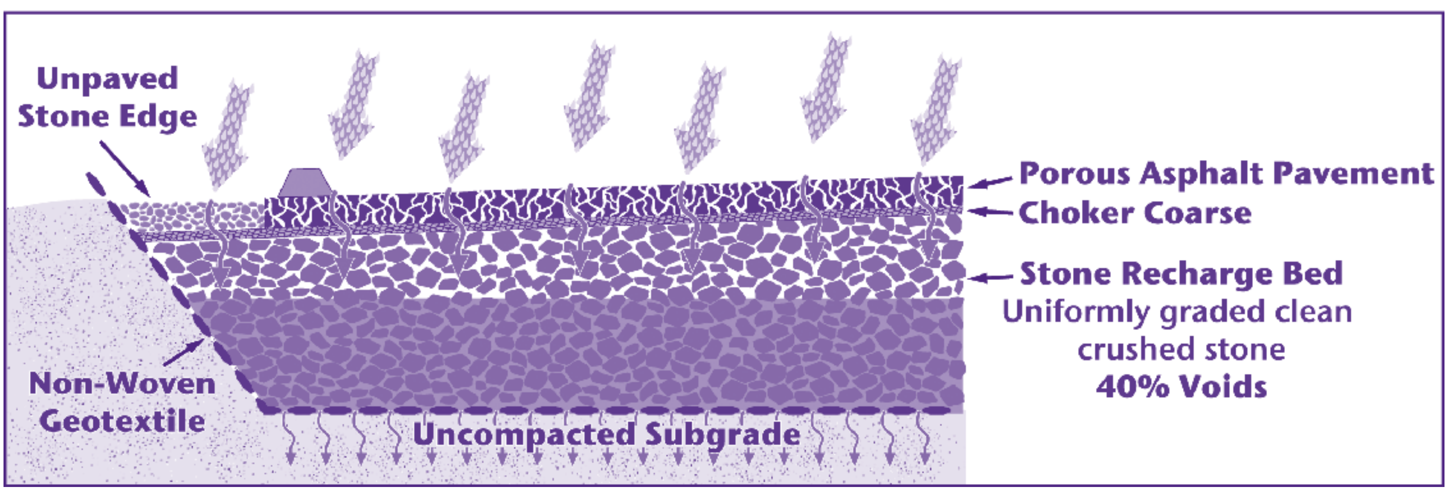


TABLE 1
Pollution removal efficiencies (University of New Hampshire)

Treatment system	Total suspended solids (% removed)	Total phosphorus (% removed)	Total zinc (% removed)	Total petroleum hydrocarbons in the diesel range (% removed)
Porous pavement	99	38	96	99

- The stone recharge bed should be able to drain within 12 to 72 hours.
- The bottom of the infiltration bed should be flat to maximize the infiltration area and reduce the amount of stone required.
- The slope of the surface of the porous pavement should not exceed 5 percent. For parking on sloping areas, consider terracing the parking areas with berms separating the parking bay.

Frost

In the past it has been recommended that the bottom of the recharge bed should exceed the depth of frost penetration in the region where the porous pavement is to be installed. More recently this has come into question, since a number of porous pavements have been installed in freezing climates with total depths much shallower than this. These include pathways at Swarthmore College, Pennsylvania, and a parking lot at Walden Pond Visitor Center, Massachusetts, both with a bed depth of 12 inches. None of these pavements have shown damage due to frost heave. The only research on frost depth has occurred at UNH, where the frost depth is 48 inches. While the porous pavement at the site extends to below the frost depth, their data from 2006 show frost penetration in the recharge bed of less than one foot. UNH conservatively recommends the depth of the bed be 65 percent of the frost depth in their design specifications.[3]

Routing stormwater from impervious areas

Using the stone recharge bed for stormwater management for adjacent impervious areas such as roofs and roads can reduce project costs. This will reduce or eliminate the need for a detention basin and reduce stormwater structures and pipes. To achieve this, stormwater can be conveyed directly into the stone bed, where perforated pipes in the stone bed can distribute the water evenly. Use of a sediment control device is recommended.

Provide alternate path for stormwater to enter stone recharge bed

Often, the designer will provide an alternate means for stormwater to enter the stone recharge bed if the pavement surface should ever become plugged or sealed, or for extreme storm events. For pavements without curbs, this can be a two-foot-wide stone edge connected to the bed.

Porous pavements are not normally designed to store and infiltrate all stormwater from all storms. Therefore, it will be necessary to include overflow devices to prevent the water from rising into and over the porous asphalt surface.

Materials

Geotextile (filter fabric)

Non-woven geotextiles are typically used to prevent fines in the subgrade from migrating into the stone recharge bed.

Stone recharge bed and choker course

Aggregate for the stone recharge bed needs to be clean, crushed stone. In many cases AASHTO No. 3 stone is specified; however, other aggregate gradations such as AASHTO No. 1, No. 2, and smaller have also been used successfully.

Porous Asphalt

Porous asphalt pavements are fast and easy to construct. With the proper information, most asphalt plants can easily prepare the mix and general paving contractors can install it. While modified asphalts are often used, these are not always necessary or practical.

There are a number of guides and specifications available for porous asphalt mixes. These include NAPA publication IS-115, *Design, Construction, nd Maintenance of Open-Graded Asphalt Friction Course*. The following key properties should be included as part of the specification:

- Air voids: 16 percent minimum. This assures permeability of the mix.
- Asphalt content: A good guideline is to require 5.75 percent minimum by weight of total mix. Adequate binder content is important for the durability of the mix.
- Draindown test: 0.3 percent maximum. This test is important to make sure that the asphalt binder does not drain down during storage, transportation and placement.
- Moisture susceptibility: Because porous asphalt surfaces do not hold water, they have very low risk of moisture-related damage.

Construction Guidelines

The following are some general guidelines for construction of porous pavements:

- The site area for the porous pavement should be protected from excessive heavy equipment running on the subgrade, compacting soil, and reducing permeability.
- Excavate the subgrade soil using equipment with tracks or oversized tires. Avoid narrow rubber tires as they compact the soil and reduce its infiltration capabilities.
- As soon as the bed has been excavated to the final grade, the filter fabric should be placed.
- Install drainage pipes if required.

(cont. on page 10)

Safety Zone

2008 Traffic Safety Annual Assessment

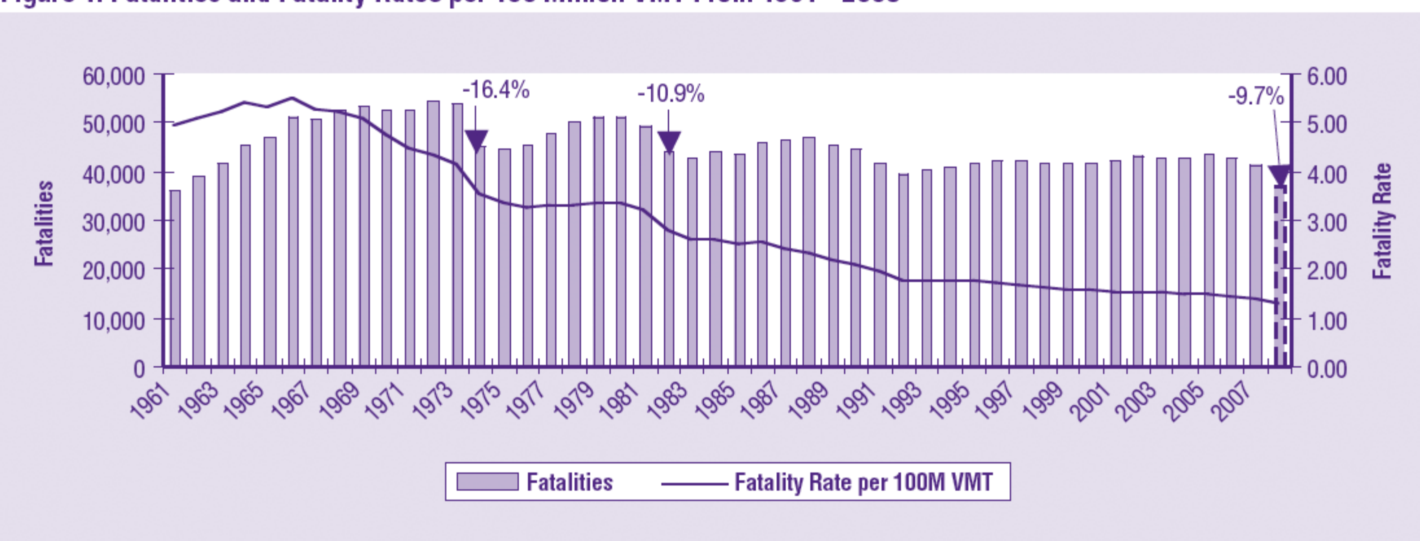
The number of traffic fatalities in 2008 reached its lowest level since 1961. There was a 9.7 percent decline in the number of people killed in motor vehicle crashes in the United States, from 41,259 in 2007 to 37,261, according to NHTSA's 2008 Fatality Analysis Reporting System (FARS) (see Figure 1). This decline of 3,998 fatalities is the largest annual reduction in terms of both number and percentage since 1982. More than 90 percent of this reduction was in passenger vehicles, which make up over 90 percent of the fleet of registered vehicles. Passenger car occupant fatalities declined for the sixth consecutive year, and are at their lowest level since NHTSA began collecting fatality crash data in 1975. Light-truck occupant fatalities dropped for the third consecutive year, and are at their lowest level since 1998. However, motorcyclist fatalities continued their 11-year increase, reaching 5,290 in 2008, accounting for 14 percent of the total fatalities. Data from previous years has shown that while motorcycle registrations have increased, the increase in motorcyclist fatalities has increased more steeply. The data (see Table 1) shows a decrease in fatalities for all person types except motorcyclists and pedalcyclists.

In 2008, an estimated 2.35 million people were injured in motor vehicle traffic crashes, compared to 2.49 million in 2007. The estimated number of people injured in crashes is at its lowest point since NHTSA began collecting injury data in 1988. This constitutes the ninth consecutive yearly reduction in people injured (Figure 2). The number of people injured increased only for pedalcyclists. The number of motorcyclists injured showed the first decrease since 1998, a reduction of 6.8 percent.

Fatalities in rural crashes declined by 10 percent (Table 7); those in urban crashes by slightly more, 11 percent. FHWA estimates for 2008 show rural VMT down by 4.1 percent, and urban down by 3.1 percent.

For more detailed information, the statistical summary can be found at http://www-nrd.nhtsa.dot.gov/Pubs/811172.pdf.

Figure 1: Fatalities and Fatality Rates per 100 Million VMT From 1961 - 2008



1961-1974: National Center for Health Statistics, HEW, and State Accident Summaries (Adjusted to 30-Day Traffic Deaths by NHTSA); FARS 1975-2007 (Final), 2008 Annual Report File (ARF); Vehicle Miles Traveled (VMT): Federal Highway Administration.

Table 1: Occupants and Nonoccupants Killed and Injured in Traffic Crashes

Description	Killed				Injured			
	2007	2008	Change	% Change	2007	2008	Change	% Change
Total*	41,259	37,261	-3,998	-9.7%	**2,491,000**	**2,346,000**	**-145,000**	**-5.8%**
Occupants								
Passenger Vehicles	29,072	25,351	-3,721	-13%	**2,221,000**	**2,072,000**	**-149,000**	**-6.7%**
Passenger Cars	16,614	14,587	-2,027	-12%	**1,379,000**	**1,304,000**	**-75,000**	**-5.4%**
Light Trucks	12,458	10,764	-1,694	-14%	**841,000**	**768,000**	**-73,000**	**-8.7%**
Large Trucks	805	677	-128	-16%	23,000	23,000	0	0.0%
Motorcycles	5,174	5,290	+116	+2.2%	103,000	96,000	-7,000	-6.8%
Nonoccupants								
Pedestrians	4,699	4,378	-321	-6.8%	70,000	69,000	-1,000	-1.4%
Pedalcyclists	701	716	+15	+2.1%	**43,000**	**52,000**	**+9,000**	**+21%**
Other/Unknown	158	188	+30	---	10,000	9,000	-1,000	---

Source: Fatalities - FARS 2007 (Final), 2008 (ARF), Injured - NASS GES 2007, 2008 Annual Files
* Total includes occupants of buses and other/unknown occupants not shown in table.
Changes in injury estimates shown in bold are statistically significant.

Figure 2: People Injured and Injury Rate per 100 Million VMT by Year, 1988-2008

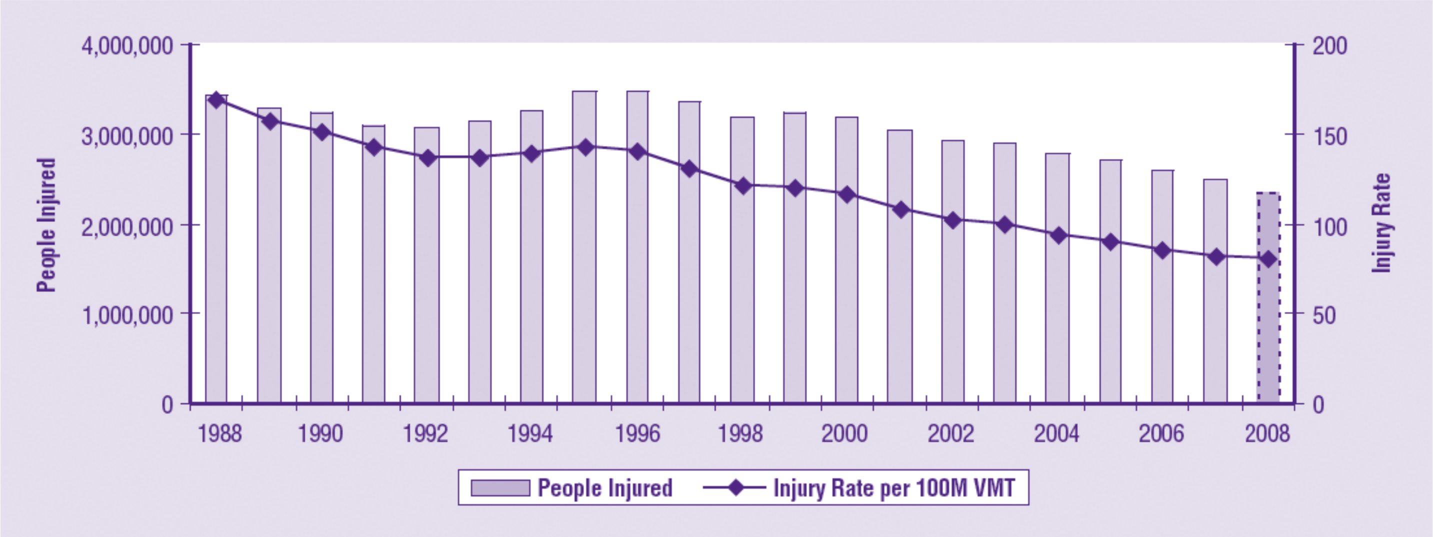


Table 7: People Killed in Motor Vehicle Crashes, By Land Use

Roadway Function Class	2007	2008	Change	% Change
Rural	23,254	20,905	-2,349	-10%
Urban	17,908	15,983	-1,925	-11%
Unknown	97	373	276	285%
Total	41,259	37,261	-3,998	-9.7%

Source: FARS 2007 (Final), 2008 (ARF)

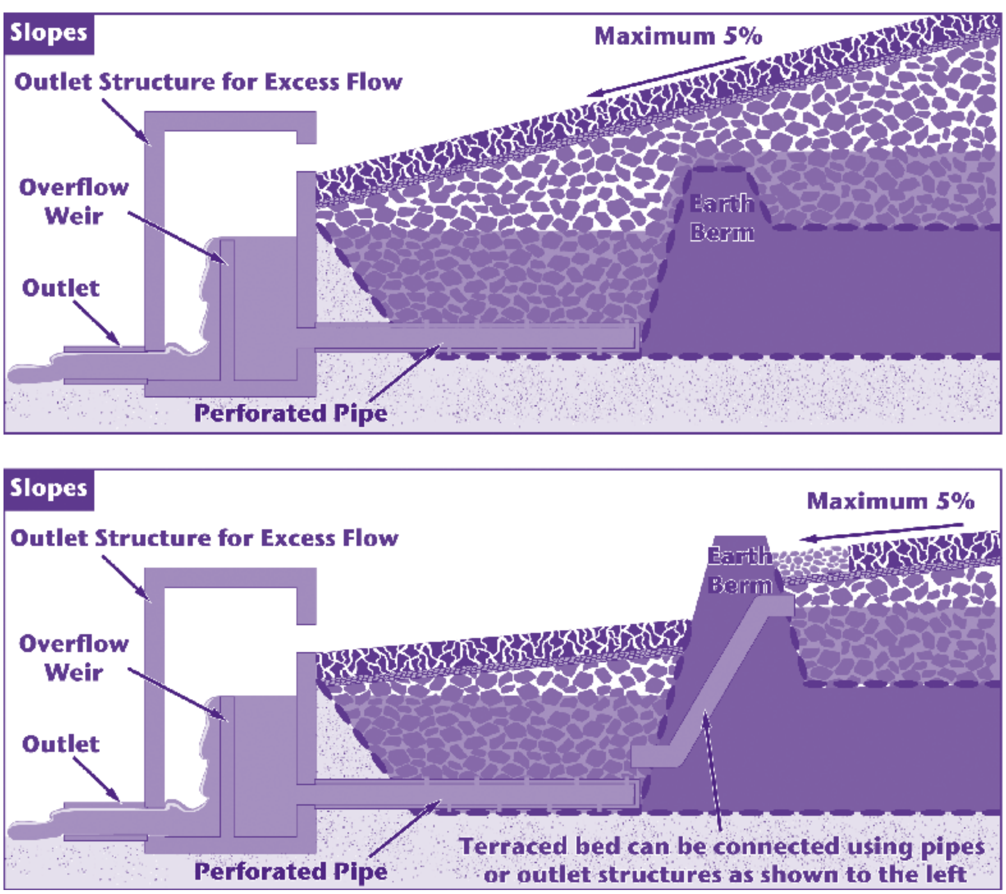
- Place aggregate for the stone recharge bed, taking care not to damage the filter fabric. Aggregate should be dumped at the edge of the bed and placed in layers of 8 to12 inches using track equipment. Compact each lift with a single pass of a light roller or vibratory compactor.
- The use of a choker course over the top of the stone recharge bed is optional. The purpose of this course is to stabilize the surface for the paving equipment. The purpose is not to cover the large stone in the recharge bed but to fill some of the surface voids and lock up the aggregate. Therefore some of the large stones will be visible after the choker course has been placed and compacted.
- The porous asphalt layer is placed in 2- to 4-inch thick lifts using track pavers, following state or national guidelines for open-graded asphalt mixes.
- After final rolling, traffic should be restricted for the first 24 hours.
- It is critical to protect the porous pavement during and after construction from sediment-laden water and construction debris that may clog it.

Post-construction practices

Where applicable, remove temporary stormwater drainage diversions after vegetation is established. Although snow and ice tend to melt more quickly on porous pavement, it may still be necessary to apply de-icing compounds such as salt or liquid de-icer. Do not use sand or ash on the surface since clogging may occur. As previously mentioned, the University of New Hampshire has shown that significantly less deicer may be applied than with conventional pavements.

Signs are often posted at porous pavement sites to alert maintenance personnel to keep silt and debris from entering the site. They should also warn not to seal the pavement or use sand or other abrasives for snow or ice conditions. In addition, these signs can include some educational information regarding the advantages of porous pavement. To prevent clogging of porous pavements it is recommended that they be vacuum swept twice per year. As previously discussed, it is also very important that sanding not be used for winter maintenance.

Figure 4: Terraced porous parking



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5. MacDonald, Chuck, "Porous Pavements Working in Northern Climates," *HMAT*, NAPA, Lanham, MD, July/ August 2006.

Additional Resources

The definitive guide for porous pavements is NAPA's *Porous Asphalt Pavements for Stormwater Management: Design, Construction, and Maintenance Guide* (IS-131). For an executive summary brochure, look at *Porous Asphalt Pavements* (PS-33). For porous asphalt mixes, consult NAPA's *Design, Construction, and Maintenance of Open-Graded Asphalt Friction Courses* (IS-115). For photos and videos visit www.porouspavement.net. To order these publications, visit http://store.hotmix.org.

Kent Hansen is the Director of Engineering for National Asphalt Pavement Association. Reprinted with permission from HMAT *May/June 2009.*

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☐ *This is a new address*

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Publications

☐ *Guide for Accommodating Utilities Within Right-of-Way for Counties and Small Cities in Kansas*, FHWA and Kansas Department of Transportation. This guide examines current issues and practices in Kansas and provides general recommendations that cities and counties can use to manage their right-of-way in the best interest of the traveling public, public agencies and the utilities.

☐ *Seeing in the Dark*, FHWA. What visual cues aid drivers the most as they drive at night? Advancing knowledge and understanding of how drivers acquire and act on visual information while driving at night is the goal of "Increased Understanding of Driver Visibility Requirements," an Exploratory Advanced Research (EAR) Program project launched by the Federal Highway Administration (FHWA) in 2008.

☐ *W Beam Guardrail Repair*, FHWA. Roadside barriers are a critical safety device as they shield motorist from what might be a more severe crash when leaving the roadway. Therefore, when damaged they need to be repaired so that they can perform this function. The purpose of this guide is to provide highway and maintenance personnel with up-to-date information on how to repair damaged W-Beam guardrail, the most frequently used barrier system.

☐ *Vegetation Control for Safety*, FHWA. The purpose of this guide is to help local road agency maintenance workers identify locations where vegetation control is needed to improve traffic and pedestrian safety, to provide guidance for maintenance crews, and to make them aware of safe ways to mow, cut brush and otherwise control roadside vegetation.

☐ *Traffic Analysis Toolbox Volume VIII: Work Zone Modeling and Simulation—A Guide for Decision-Makers*, FHWA, August 2008. The Federal Highway Administration has published a new guide on analytical tools for work zone planning to meet goals such as reducing the impact of construction congestion on drivers and cutting traffic management costs.

☐ *Low Cost Treatments for Horizontal Curve Safety*, FHWA, FHWA-SA-07-002. This publication was prepared to provide practical information on low-cost treatments that can be applied at horizontal curves to address identified or potential safety problems. The publication concisely describes the treatment; shows examples; suggests when the treatment might be applicable; provides design features; and where available, provides information on the potential safety effectiveness and costs.

SPEED BUMP **Dave Coverly**

JOE HAS SPENT A LITTLE TOO MUCH TIME SHOPPING ONLINE

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