



# Quarterly



## Center and Edge Line Pavement Markings



This New Hampshire rural collector carries more than 3000 vehicles per day. It should have both center and edge lines. Engineering judgment would probably conclude that the centerline should define no passing zones

**P**avement markings guide road users along travel paths and inform them of regulations. This article describes the MUTCD rules for two of them: centerlines and edge lines. They are especially important at night and for motorists new to the road. They are often required or recommended on local roads.

The box on page 3 contains definitions of key terms. Readers should also note the use of particular verbs. “Shall,” “must,”

and “required” denote MUTCD Standards, or mandatory rules. “Should” and “recommend” denote Guidelines, or recommendations. “May” denotes Options, or allowable actions. For illustrations of the rules, readers should refer to Figures in MUTCD Section 3B.

### Centerline Markings

Centerline stripes inform motorists that others will travel in opposite directions on a roadway. Solid or broken (Continued on page 2)

### Volume 14, Number 3

#### In This Issue...

Center and Edge Line Pavement Markings  
Page 1

Ecopassage Reduces Roadkills  
Page 3

Center Line Rumble Strips Reduce Crash Risk on Rural Two-Lane Roads  
Page 5

New FHWA Web Site Puts Highway Specifications Under One Roof  
Page 6

Get Moving To Stimulate Thought, Creativity  
Page 6

T<sup>3</sup>S Hosts SCDOT Research Workshop  
Page 7

Office of Safety is Pleased to Announce Its New Staff Member  
Page 7

Flags Aid Pedestrians, Educate Drivers  
Page 8

Safety Zone  
Page 9

Publications and Videos  
Page 10

Transportation Tidbits  
Page 10

## Terms and Definitions

*MUTCD.* The Manual of Uniform Traffic Control Devices, which provides the rules for pavement marking installation and maintenance.

*Urban areas* have high-density land development, usually with populations of 5,000 or more.

*Urban roads* are highways and streets in urban areas. Their primary uses are for commuting and shopping.

*Rural roads* are outside of cities. They serve as links between population centers.

*Arterial roads* serve travel between cities, large towns, and other transportation generators. Traffic volumes and speeds are usually very high.

*Collector roads* collect traffic from local urban streets and rural roads, and convey it to arterial roads.

*ADT.* Average Daily Traffic. The average of 24 hour traffic counts, usually expressed in vehicles per day (VPD).

*Engineering judgment.* The MUTCD recommends that engineering judgment be the basis for all traffic device decisions. It also recommends that agencies without staff engineers seek engineering assistance from others.

*Center and Edge Line Pavement Markings*  
Reprinted from *Road Business of the Technology Transfer Center University of New Hampshire*

lines define passing rules. The MUTCD requires centerline markings

- ▶ On urban arterials and collectors with a 20 foot or more travel way width, and an ADT of 6,000 vehicles per day or greater.
- ▶ On two-way roads with three or more traffic lanes.

It recommends centerline markings

- ▶ On urban arterials and collectors with a 20 foot or more travel way width, and an ADT of 4,000 vehicles per day or greater.
- ▶ On rural arterials and collectors with an 18 foot or more travel way width, and an ADT of 3,000 vehicles or greater.
- ▶ On other travel ways where an engineering study indicates a need.

The MUTCD allows engineering estimates of ADTs if traffic counts are not available. Cities and towns may place centerline stripes at specific locations. Examples include around curves, over hills, and before bridges.

Centerline stripes must be yellow, and 4 to 6 inches wide. On two-lane, two-way roadways they must be one of the following:

- ▶ A broken yellow line where crossing the centerline for passing is permitted for traffic traveling in either direction.
- ▶ A broken yellow line and a solid yellow line where crossing the centerline for passing is permitted for the traffic traveling adjacent to the broken line, but is prohibited for traffic traveling adjacent to the solid line.
- ▶ Two solid yellow lines where crossing the centerline markings for passing is prohibited for both directions.

On undivided two-way roadways with four or more traffic lanes, centerline stripes shall be two solid yellow lines. On two-way roadways with three traffic lanes, one- or two-direction no-passing zone markings should designate two lanes for traffic in one direction.

## Edge Line Markings

Edge line stripes inform motorists of roadway edges. They are especially important during adverse weather and visibility. The MUTCD requires them on rural arterials with a 20 foot or more travel way, and an ADT of 6,000 vehicles per day or greater. It recommends edge line markings:

- ▶ On rural arterials and collectors with a 20 foot or more travel way, and an ADT of 3,000 vehicles per day or greater.
- ▶ On other roads where an engineering study indicates a need.

Municipalities may place edge lines

- ▶ on roads without centerline markings;
- ▶ where edge delineation is desirable to minimize unnecessary driving on paved shoulders or on roads with less pavement strength than the adjacent roadway.

Edge lines must be white, and 4 to 6 inches wide. They should continue through driveways, but not through intersections.

If edges have curbs, parking, bicycle lanes, or other markings, municipalities may exclude edge lines. They should base such decisions on engineering judgment. In addition, they should not place edge lines where engineering judgment indicates they would decrease safety.

# Ecopassage Reduces Roadkills

## Barrier and Underpass in Florida Preserve Animal Lives

*J. Darryll Dockstader and Peter D. Southall*  
*Florida Department of Transportation*

A wildlife barrier and underpass in Paynes Prairie, a biodiverse Florida State Preserve, has reduced the numbers of animals killed on a section of U.S. 441, which transects the parkland, by 64.2 percent.

In 1971, Paynes Prairie was established as the first state preserve in the Florida park system. Encompassing 21,000 acres south of Gainesville, the preserve is home to 20 distinct ecological communities, including wet prairie, pine flatwoods, hardwood hammocks, and ponds. Paynes Prairie supports a biodiversity of more than 720 plant species—one-fifth of the total in the state—plus more than 100 types of animals, including waterfowl, hawks, snakes, alligators, rodents, bobcats, wild horses, and bison.

### Problem

Two major highways, Interstate 75 and U.S. 441, transect Paynes Prairie. Constructed in the 1920s, U.S. 441 carries more than 10,000 cars daily. The abundant wildlife and the heavy traffic have rendered this segment of U.S. 441 one of Florida's deadliest roads for animals. A 2-mile (3.2-kilometer) stretch of the highway has more documented roadkills than any other roadway segment in the state.

The primary reason for the high rate of animal mortality is that the roadway crosses prime habitat, or home range. The animals must be able to move back and forth across the roadway to preserve the viability of their species—to gain dispersal and to prevent genetic isolation.

In 1996, the Florida Department of Transportation (DOT) investigated constructing an ecopassage—a wildlife barrier and underpass system—to reduce the high rates of animal mortality. In 1998, Florida DOT convened a

**Overall, researchers recorded a 41 percent reduction in wildlife mortality between the pre- and post-construction**



Photos U.S. Geological Survey

Profile of barrier wall during construction.

multidisciplinary working group with representatives from the department, natural resource agencies, environmental groups, and the University of Florida to provide suggestions on ways to reduce the animal mortality rate. With feedback from the working group, Florida DOT District Two engineers designed and constructed a 1.8-mile (2.9-kilometer) ecopassage. The structure consists of a 3.5-foot-high (1.1-meter-high) gravity wall with a 6-inch (15.24-centimeter) lip, to prevent animals from climbing over, and a series of culvert underpasses to facilitate animal crossings. Florida DOT, however, needed to determine the effectiveness of the system.

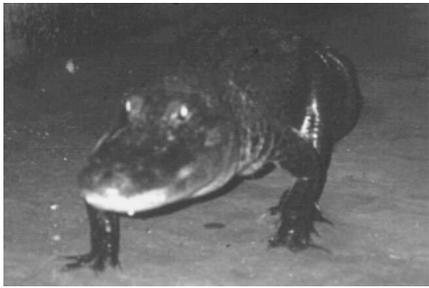
### Solution

In July 1998, Florida DOT contracted with the U.S. Geological Survey to conduct a two-phase study to investigate pre- and post-construction highway related animal mortality and animal movement through existing and added culverts. Under the leadership of C. Kenneth Dodd, Jr., the research team first established preconstruction roadkill levels and determined the kinds and numbers of animals that were using the box culverts already in place.

Researchers conducted weekly, 3-day-sampling period road surveys along the entire 2-mile road segment from August 1998 through August 1999. The sampled area included the median and the entire road surface in both directions, extending 10 to 13 feet (3 to 4 meters) into the grassy shoulders.

On the first day of the sampling period, the investigators marked and counted all road kills; on days two and three, they recorded all of the road kills from the previous 24-hour periods. Researchers recorded a total of 3,365 vertebrates killed: 1,333 frogs, 1,291 snakes, 374 turtles, 265 birds, 72 mammals, 29 alligators, and 1 lizard.

The investigators were not able to monitor all of the existing box culverts [each 7 feet 10.5 (Continued on page 4)



Motion-sensor photographs of animals in box culvert: from top, bobcat, alligator, and otter

inches × 7 feet 10.5 inches (2.4 meters × 2.4 meters)], because two box culverts were completely inundated throughout the study. Funnel traps and hardware cloth traps were used at the other sites. In addition, researchers examined animal tracks and used active infrared cameras at the dry culverts.

Researchers documented 28 species that used the culverts, with river otters, nine-banded armadillos, raccoons, and opossum making frequent crossings. This demonstrated that a significant variety of animals were using the culverts and that the construction of additional structures would be beneficial.

The ecopassage construction was

completed in February 2001. Phase 2 of the study began in March 2001 and ended in March 2002. The four new culverts, 3 feet (0.9 meter) in diameter, were sampled using commercial crayfish traps; otherwise, the general survey methods were similar to those in Phase 1.

The survey area extended 200 meters beyond the ecopassage at either end of the barrier wall and included a 400-meter section that bordered private property with a three-beam guardrail barrier instead of a concrete wall, because of the limited right-of-way. The barrier is a standard guardrail installed backwards, with the bottom of the guardrail touching the ground.

During Phase 2, 1,992 vertebrates were found dead along U.S. 441: 1,647 frogs, 149 snakes, 101 birds, 83 mammals, 7 turtles, 4 lizards, and 1 alligator. If the numbers of birds and tree frogs—affected minimally by the wall—are excluded, 157 animals were killed after construction, compared with the 2,411 animals killed before construction.

Researchers found that 64 percent of the non-tree frog deaths occurred along the guardrail fencing and at an access gate adjacent to the southbound lanes on the north side of the prairie. Another finding was that small mammals, snakes, and frogs could cross the barrier along vegetation that grew up the wall from the prairie side.

After construction, the number of species using the culverts increased from 28 to 51, including 9 fish species. One of the new culverts was wet regularly, but the others were wet or dry according to prairie water levels. Although the total number of animals using the culverts after construction of the ecopassage has not been documented, the decrease in

animals crossing the road suggests an increase in the number of culvert users.

## Benefits

Eliminating highway-related animal mortality may be impossible, particularly for species that can fly, climb, or jump over constructed barriers. Nevertheless, the research confirmed the need for—and proved the general effectiveness of—the Paynes Prairie ecopassage. Overall, researchers recorded a 41 percent reduction in wildlife mortality between the pre- and post-construction survey periods for the entire survey area, which extends beyond the ecopassage. But if the survey area is limited to the prairie basin directly adjacent to the concrete wall, the effects of the ecopassage become more pronounced, achieving an overall 64.2 percent reduction in mortality. Excluding tree frogs raises the figure to 90.1 percent, and excluding tree frogs and birds raises the effectiveness of the system to 93.5 percent. The finding that most of the roadkills—except for tree frogs—occurred in the limited area in which the wall was not installed increases confidence in the effectiveness of the structure.

Regular maintenance and improved drainage at the guardrail barrier to eliminate washout from erosion will improve the effectiveness of the system, as will routine maintenance of the vegetation. Motorists will benefit from the reduction of collisions with wildlife and from the improved aesthetics of far fewer animal carcasses along the roadside.

Previous, unpublished research by Richard Franz of the University of Florida determined that only 1 of 17 snakes that attempted to cross the road was successful. The ecopassage barrier deters animals from attempting to cross and forces *(Continued on page 5)*

# Center Line Rumble Strips Reduce Crash Risk on Rural Two-Lane Roads

*Richard Retting  
Insurance Institute for Highway Safety*

On a national basis, rural roads account for approximately 40 percent of all motor vehicle travel but 60 percent of all fatal crashes. Approximately 90 percent of all fatal crashes in rural areas occur on two-lane roads, which typically lack physical measures such as wide medians or barriers to separate opposing traffic flows. As a result, a major crash problem on these roads involves vehicles crossing the centerline and either sideswiping or striking opposing vehicles head-on. These types of opposing-direction crashes account for about 20 percent of all fatal crashes on rural two-lane roads and result in approximately 4,500 fatalities annually.

The risk of head-on and opposing-direction sideswipe crashes can be reduced by engineering improvements such as roadway widening and median barrier installation. However, such measures are costly and therefore generally are applied on a limited basis to high-priority locations. Because centerline incursions can occur at virtually any point along undivided roads, spot safety improvements can provide only limited protection against widespread opposing-direction crashes. More widely applied measures are needed to reduce

the risk of drivers inadvertently crossing roadway centerlines. One such potential countermeasure entails installation of rumble strips along the centerlines of undivided rural two-lane roads to warn/alert distracted, fatigued, or speeding motorists whose vehicles are about to cross the centerlines and encroach into opposing traffic lanes.

A comprehensive before-after study was undertaken to estimate the nature and magnitude of crash reductions associated with installation of center line rumble strips on rural undivided two-lane roads. Data were drawn from seven states: California, Colorado, Delaware, Maryland, Minnesota, Oregon, and Washington. In total, 98 treatment sites along approximately 210 miles of road were studied. Statistical procedures were used to properly account for regression to the mean—a threat to the validity of simple before-after studies—while normalizing for differences in traffic volume and other factors between the before and after periods.

Overall, motor vehicle crashes at treated sites were reduced 14 percent; injury crashes were reduced by an estimated 15 percent. Head-on and opposing-direction sideswipe crashes—the primary target of center line rumble strips—were reduced by an estimated 21 percent, while head-on and opposing-direction sideswipe crashes involving injuries were reduced by an estimated 25 percent. This result, taken together with the fact that installation costs are relatively low, suggest that consideration should be given to wider application of center line rumble strips on rural two-lane roads to reduce injury crashes.

*(Continued from page 5)*

use of the culverts. Animals are no longer crossing on the highway surface of U.S. 441 at the barrier wall area.

The demonstrated success of the ecopassage system, which received a Globe Engineering Award, may justify use as a model for similar efforts, both nationally and internationally.

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EDITOR'S NOTE: Appreciation is expressed to G. P. Jayaprakash, Transportation Research Board, for his efforts in developing this article.

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## New FHWA Web Site Puts Highway Specifications Under One Roof

Federal Highway Administrator Mary Peters today announced a new web site that, for the first time, makes available to highway agencies, contractors, construction engineers, and researchers all highway construction specifications from the 50 states, the District of Columbia, and Puerto Rico.

The new National Highway Specifications web site (<http://www.specs.fhwa.dot.gov>) is a collaborative effort of the Federal Highway Administration (FHWA), an agency of the U.S. Department of Transportation, and the American Association of State Highway and Transportation Officials (AASHTO). The web site serves as a clearinghouse and electronic library where users can search, review, cross-reference and download current specifications and other specification-related documents.

Previously, locating and retrieving current specifications was a time-consuming and often tedious process. Although more state highway agencies are putting their construction specifications online, finding and navigating the various web sites can still be difficult. Also, more than 20 national trade organizations and several federal agencies issue specifications and rules affecting highway construction.

“Consolidation of these multiple sources of documentation in one place will benefit highway agencies, contractors,

construction engineers, and researchers,” Peters said. “Electronic access, indexing, and search features will save time and money for all users while improving practices and promoting higher quality in construction end products.”

Documents included on the site are:

- ▶ Approved standard construction specifications and supplements from departments of transportation in the 50 states, District of Columbia, and Puerto Rico;
- ▶ Current approved standard specifications and supplements from FHWA’s Federal Lands Highway Program office;
- ▶ AASHTO Guide Specifications and American Society for Testing and Materials’ summaries; and
- ▶ Innovative provisions such as quality assurance, warranty, and performance-related specifications.

The site also features discussion forums on such topics as performance-related specifications, design-build, warranty specifications, and quality assurance. Users can find links to specification-related web sites hosted by highway agencies and others.

By consolidating information nationwide on highway specifications, “the National Highway Specifications website is helping to advance the concepts of e-government by using the power of the Internet to remove federal and state government organizational barriers, improve the operational efficiency of the government, and expand the range and quality of government services available to the public,” Peters said.

## FHWA Office of Safety is pleased to announce its new staff member:

Safety Welcomes John R. Baxter to the Office of Safety Design. On August 11, 2003 John Baxter became Director, Office of Safety Design. He leads a multi-disciplinary staff in the development and incorporation of road and roadside features that impact highway safety performance. Prior to this appointment, he held the title of FHWA Division Administrator in Indiana.

John joined the FHWA in 1983, and advanced through the Highway Engineer Training Program to assume engineering

program positions in Michigan and Utah. From 1988 to 1992 he held positions in traffic operations and Intelligent Transportation Systems at the national level. From 1992 to 1995 he assumed the position of Planning and Program Management Engineer in New Mexico, working with New Mexico’s MPOs and National Laboratories in research. From 1995 to 1999 he became the Assistance Division Administrator in the Utah Division, assisting in the development of plans for the 2002 Winter Olympic

Games and delivering the \$1.59 Billion I-15 megaproject. As Indiana Division Administrator he administered a \$700+ million Federal-aid highway program in partnership with the Indiana Department of Transportation, Metropolitan Planning Organizations and others.

John holds a bachelors degree in Civil Engineering and a master’s degree in Transportation Engineering from Clemson University in South Carolina. He is a registered Professional Engineer in the state of Utah.

## Get moving to stimulate thought, creativity

If you have six things on your mind at work and a group of off-the-job matters mixed in with them, you need a break. A coffee break might help, but not much. An exercise break is what you need to clear your mind and stimulate your thought processes.

Lack of energy dulls the thought process, but exercise produces stimulating changes such as the release of neurotransmitters that affect alertness.

A cluttered mind can make a person feel depressed. In his book *Write Mind: 299 Things Writers Should Never Say to Themselves and What They Should Say Instead*, (J.P. Tarcher) psychotherapist Eric Maisel, Ph.D., says exercise not only reduces depression, it also decreases anxiety, two conditions that interfere with progress throughout the day.

Writing in *Health* magazine, Maisel says the exercise benefit he likes best is what Buddhists call the “empty mind.” Exercise stills those little voices in your head that keep distracting and criticizing you. After experiencing the empty-mind effect, you are free to work on one thing at a time and do it well.



It would be difficult to prescribe an exercise that everyone could do, but aerobics, swimming, walking, and running are effective. The moments of physical activity and silence make worries slip away so you can think better, Maisel says.

## T<sup>3</sup>S Hosts SCDOT Research Workshop



The first South Carolina Department of Transportation (SCDOT) Research Workshop was held August 14, 2003 in Columbia, SC. The Transportation Technology Transfer Service (T<sup>3</sup>S) provided the logistical and administrative support for the workshop.

This workshop, the first of its type conducted by the SCDOT, was intended to market the research program, to identify a wide array of potentially beneficial research topics, and to develop a prioritized list of possible research topics for consideration by the SCDOT Research and Development Executive Committee (RDEC).

Over 90 people, including representatives from the SCDOT, FHWA, USGS, academia, and industry, participated in the workshop.



Potential research topics were identified in seven predetermined areas:

- ▶ Construction/Materials
- ▶ Maintenance/Bridge Maintenance
- ▶ Traffic/Safety
- ▶ Design
- ▶ Project Development/Planning
- ▶ Operations and Business Practices
- ▶ Field Operations.

The workshop was a great success, with over 150 potential research topics identified, approximately half of which were identified as higher priority topics.

## Flags aid pedestrians, educate drivers

Pedestrians have a new tool to help them cross 20 busy intersections in Dane County – a set of red plastic flags. They are designed to get drivers to yield to pedestrians in crosswalks and to teach walkers how to cross effectively. The project also includes education for drivers and enforcement by police.

“We had been trying things for years and nothing worked very well until we put in the flags,” says Ann Clark of Madison who helped initiate a trial of the flags in May 2002. Residents had identified crossing busy Monroe Street as the neighborhood’s top problem.

“It’s a communication tool,” says Clark. “It’s a way of letting drivers know you’re coming across.” The most frequent users are families with children, she observes. The idea



originated in Kirkland, Washington. Salt Lake City, Utah, adopted and expanded the program. The flags, now at 105 Salt Lake intersections, have helped dramatically improve its ranking as one of the worst cities for pedestrians in the US.

The Madison flags are made by volunteers of 12” x 12” red plastic squares stapled to ¼” x 3” dowels. Materials come from local hardware stores and cost about 50 cents each. The flags sit on both ends of the crosswalk in holders made of 4” PVC pipe attached to existing posts. Volunteers monitor the holders, redistributing flags and replenishing the supply as needed.

“This being a grassroots effort and neighborhoods taking ownership of it is really critical for us,” says Arthur Ross, Pedestrian and Bicycle Coordinator in the Madison Traffic Engineering Department. “Traffic Engineering doesn’t have the staff resources to replace flags and do education.”

### Education and enforcement

Education helps make the flags effective. “The community groups have done a good job of showing people how to use the flags,” says Ross. “It’s a way to educate pedestrians on how to be effective street crossers.”

TV and newspaper stories, leafletting to neighborhood residences, and law enforcement efforts also help. The goal is to educate drivers to yield to pedestrians in crosswalks as required by state law (*Section 346.24(1), Wis. Stats.*).

“We do education and enforcement in a tiered effort,” says Officer Stacey Vilas of the Madison Police Department’s Traffic Enforcement



Safety Team. Officers begin by handing out flyers to cars stopped at traffic lights and giving warning citations to drivers who don’t yield, then later issue citations for amounts from \$130 to \$225.

“You need enforcement,” says Vilas. “If you don’t have the concept that you could be penalized, you will continue to do something you’re not supposed to do.” Her unit is enforcing a Madison ordinance, but other local law enforcement agencies write citations based on state statutes.



### Success spreads the program

The flags seem to work. A study of the Monroe Street crossing found that motorists stopped for pedestrians nearly 80% of the time. This compares with a yield-to-pedestrians rate of less than 5% at other pedestrian crossings.

This success helped the Dane County Safe Community Coalition (DCSCC) secure a grant to offer the program county- (Continued on page 9)

# Safety Zone



## Unveiling the new FHWA Work Zone Website

The FHWA Office of Operations has recently made a number of improvements to its work zone program area website. Designed with the practitioner in mind, the site provides easy access to a variety of tools and information on making work zones work better and features an innovative practice each month.

A section on practitioner tools offers information on leading-edge practices and technologies that can reduce congestion and crashes in and around work zones. This section also includes information on available decision support tools that can be used to expand the analysis capabilities of highway agencies. Many of these tools are available for download through the site or can be requested using the contact information provided on the site. Furthermore, information on various outreach events, such as National Work Zone Awareness Week and the Making Work Zones Work Better Workshops, will enable practitioners to learn about work zone activities going on around the nation.

The site also provides other valuable resources, such as facts and statistics on work zone mobility and safety and access to publications and studies on current or emerging techniques and practices that can help make work zones work better. Resources also include links to the websites of other Federal agencies, State transportation departments and a variety of transportation/work zone related associations.

Please take an opportunity to view and bookmark our improved Work Zone Mobility and Safety page at <http://www.fhwa.dot.gov/workzones>. We hope you and your staff find these improvements useful. [Alonzi, AI] If you have any questions about the workzone website, please contact Scott Battles—his contact information follows.

Regards!

AI Alonzi

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*(Continued from page 8)* wide in 2003. Volunteer groups and local law enforcement agencies adopted the flags for 20 intersections in June. Funds from Active for Life, a project of AARP and the Robert Wood Johnson Foundation, bought equipment for flags and flag holders, printed informational brochures, and paid for billboards promoting the project.

One of the new sites is the Village of Marshall, about 20 miles east of Madison. The flags now help pedestrians cross Main Street (STH 19) at Pardee St. on a main route to the schools.

“It’s a tool to make crossing the street safer, faster, and more pleasant,” says Village Police Chief Lee Hellenbrand. “We’ve seen a lot of young people and adults use the flags since they were put in June 9th.” The Community Officer, who got the flags from DCSCC, did extensive education the first few days after they were installed. The Village is considering other intersections for flags, will continue education, and plans future enforcement efforts, Hellenbrand says.

“It’s a great way to say: ‘Hey pedestrians are important.’” Officer Vilas agrees.

*For more information, including Tips for Pedestrians and Tips for Drivers see the Safe Community Coalition, website <http://www.safecommunitycoalition.org> or contact Coordinator Cheryl Witke at 608/256-6713. See also <http://www.dmna.org> for Monroe St. neighborhood flag program.*

## Publications Available

*Common Roadside Invasives*, A roadside field guide to “showy” herbaceous weeds, *FHWA-EP-02-003*.

*Intelligent Transportation Systems Benefits and Costs*. The latest in biennial series of reports that synthesizes the information contained in the ITS Benefits and Costs Database. FHWA-OP-03-075. This report can be accessed on line at <http://www.benefitcost.itsdot.gov> electronic document number 13772.

*Facilitation at a Glance*, A comprehensive pocket guide of tools and techniques for effective meeting facilitation, *Goal QPC*.

*Optimal Procedures for Quality Assurance Specifications*. This manual is a comprehensive guide for developing new, or modifying existing acceptance plans and quality assurance specifications. *FHWA RD-02-095*.

*ITS/Operations Resource Guide*, A comprehensive listing of over 400 documents, websites, training courses and software tools as well as points of contact. Resources are grouped by topic. FHWA OP-03-073 It is available on line at <http://www.its.dot.gov/guide.html>.

**FOCUS Newsletter** In this issue: “*New Web Site Puts Highway Specifications at Your Fingertips*” and “*Proposed Work Zone Regulations to Improve Safety and Mobility*” Published monthly by FHWA, the newsletter covers the implementation of innovative technologies in all areas of infrastructure. You can access this document on line at <http://www.tfhr.gov/focus/focus.htm>.

## Transportation Tidbits

The safety of the traveling public is of major concern for the U.S. Department of Transportation. Although progress has been made in reducing fatalities, roughly 45 percent of U.S. deaths due to unintentional injury involve transportation. Roughly 95 percent of these transportation fatalities arise from motor vehicle crashes.

### Fatalities by Transportation Mode

Mode	1970	1980	1990	2000	2001
Large air carrier <sup>a</sup>	146	1	39	92	531
Commuter air carrier <sup>a</sup>	N	37	R <sup>7</sup>	5	13
On-demand air taxi <sup>a</sup>	N	105	51	71	60
General aviation <sup>a</sup>	1,310	1,239	767	592	553
Highway <sup>b</sup>	52,627	51,091	44,599	R <sup>41,945</sup>	42,116
Railroad <sup>c</sup>	785	584	599	512	548
Transit <sup>d</sup>	N	N	339	295	U
Commercial ship					
Vessel	178	206	85	32	U
Nonvessel <sup>e</sup>	420	281	101	87	U
Recreational boating	1,418	1,360	865	701	U
Gas and hazardous liquid pipeline	30	19	9	38	7

<sup>a</sup> Includes people on planes and on the ground. For large air carriers, fatalities resulting from the Sept. 11, 2001, terrorist attacks include only those persons onboard aircraft.

<sup>b</sup> Includes occupants, nonoccupants, and motor vehicle fatalities at railroad crossings.

<sup>c</sup> Includes fatalities from nontrain incidents as well as train incidents and accidents. Also includes train occupants and nonoccupants except motor vehicles occupants at grade crossings.

<sup>d</sup> Fatalities resulting from all reportable incidents, not just accidents. Includes commuter rail, heavy rail, light rail, motorbus, demand-responsive, van pool, and automated guideway.

<sup>e</sup> Fatalities unrelated to vessel accidents, e.g., individual falling overboard and drowning.

Key: N= data do not exist or are not cited because of reporting changes; R= revised; U= unavailable.

# Information Request and Address Change Form

To order any of the publications, videos, or other materials listed in this or other issues of *T<sup>3</sup>S Quarterly*, complete this form and mail it or fax it to **Sandi Priddy** at the address or phone number shown below. You can also order videos and publications on-line at <http://www.ces.clemson.edu/t3s>.

The publications in this issue are free to individuals employed by any city or county government agency in South Carolina. You can obtain a free single copy of most publications, or borrow a copy of one of our “for loan” publications.

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**Phone: 864.656.1456  
Toll free: 888.414.3069  
Fax: 864.656.2670**

## Publications

- Common Roadside Invasives,
- Intelligent Transportation Systems Benefits and Costs
- Facilitate at a Glance
- Optimal Procedures for Quality Assurance Specifications
- ITS/Operations Resource Guide
- FOCUS Newsletter

## 2004 Conference Needs

We are currently putting together our 2004 training calendar. Please notify us if there are training needs your agency is in need of for the coming year.

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## Other

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

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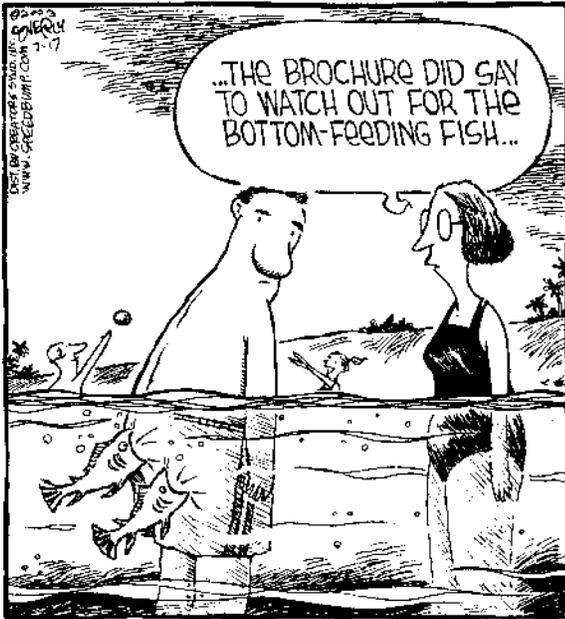
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**Dave Coverly**



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