M A S S

INTERCHANGE

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WHERE RIVERS MEET ROADS

Do the culverts under your town's roads provide the necessary drainage for the rivers and streams they cross – and allow fish and wildlife to pass through? With over 30,000 transportation crossings of streams across the Commonwealth – that's an average of 85 stream crossings in every municipality – answering this question provides an important opportunity for collaboration between highway departments, volunteer Stream Teams, and state and federal biologists.

The Massachusetts Department of Fish and Game's Riverways Program and UMASS Extension Service have teamed up to lead a community-based survey and technical assistance program called the "River Continuity Partnership." The first phase of the River Continuity Partnership created protocols and training materials for volunteer assessment and inventory of culverts and other road crossings. The second phase resulted in the development of draft performance standards for use by local and state managers in avoiding, minimizing, or mitigating the impacts of these barriers. Phase three involves developing and testing a database system to track and prioritize substandard road crossings for remediation.

Riverways has provided training to volunteer Stream Teams in several municipalities across the state to complete surveys of stream crossings using a standard field form based on the draft performance standards. Volunteer surveys have thus far documented locations where transportation crossings have become barriers to fish and wildlife movement. The completed database will link crossing survey results with the location of critical aquatic habitats to identify the best opportunities for improving fish and wildlife movement. Fish and wildlife species need to move up and down rivers and

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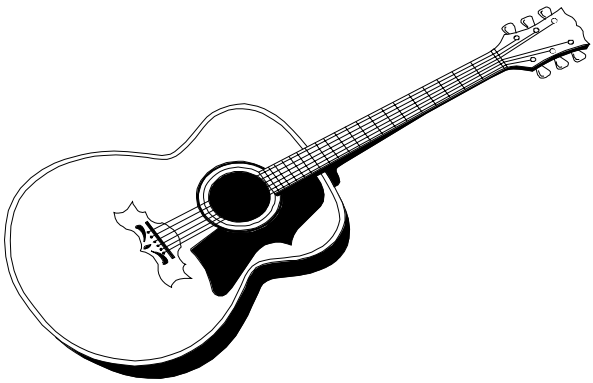
LTAP Local Technical Assistance Program

(413) 545-2604 http://www.ecs.umass.edu/baystate_roads

Please Don't Step on My Steel Toed Shoes



"It's a good thing I wasn't wearing my steel toed shoes when that manhole cover fell on my foot!"

How many times has a worker claimed the shoes are the problem?
Let's shatter another URBAN MYTH right now.

DO STEEL TOED SHOES ACTUALLY INCREASE THE EXTENT OF AN INJURY IF A HEAVY OBJECT CRUSHES THE SHOE?

NO! Steel toed shoes are very effective in preventing injury to toes. As a result of one accident, an employee who was not wearing these had two toes amputated when an I-beam fell from its support. The beam was only one foot off the floor. Protective footwear would have prevented this injury. There are no documented cases of toes being amputated as a result of wearing steel toed boots.

HOW CAN WORKERS PUT THEIR BEST FOOT FORWARD?

Employers should provide a hazard assessment of the work environment to determine when and how employees are exposed to foot injury hazards and how to protect them. As part of a personal protective equipment (PPE) program, this is an important element because it produces information needed to select the correct footwear.

SEVERAL OSHA STANDARDS ESTABLISH RULES AND GUIDANCE

OSHA's Occupational Foot Protection Standard, 29 CFR 1910.126 requires that employees wear protective footwear when exposed to dangers from falling objects, objects piercing the sole, or electrical hazards. OSHA's Personal Protective Equipment (PPE) Standard also requires supervisors to conduct a hazard assessment, develop a written plan, enforce policies, and train employees in foot protection concepts.

HOW DO YOU DETERMINE IF FOOT PROTECTION IS NECESSARY OR REQUIRED?

A hazard assessment produces the information needed to select the appropriate PPE for any dangers present or likely to be present in certain workplaces such as:

- Falling or rolling objects
- Punctures
- Stubbing or banging
- Chemical or corrosive contact
- Electrical shock
- Burns
- Slips and falls

SAFETY INCENTIVES CAN WORK

Safety professionals have found that incentives do work if presented in creative ways to motivate and reward employees. A recipe for accident-free work areas is a good safety program that includes workplace audits, management support, proper training and the correct personal protective equipment. The point of motivational programs is to make the employees pay attention to safety infrastructure. Rewards and recognition will boost safety behavior and motivate people.

Remember, the best protection is prevention!

DESIGNING FOR ELDERLY DRIVERS

One of the most significant trends of the new century will be the graying of the population, a fact that raises serious questions for everyone concerned with traffic safety and education. In 1990, elderly drivers accounted for 6.7% of all miles driven; by 2030 the conservative estimate is 18.9%. As a group, however, persons age 65 and older are relatively safe drivers representing 14% of all licensed drivers but only 8% of police-reported crashes and 11 % of fatal crashes.

Drivers' response time does not necessarily slow with age, but the ability to process complex information from a variety of sources often does.

As one ages specific functions related to driving skills may be impaired including vision, hearing, sensation, and cognitive and motor abilities. There may be a decline in peripheral vision, a decrease in range of motion, delayed reaction time and change in cognitive skills. Such difficulties are magnified when older drivers perform under stressful conditions, i.e. reading signs.

Transportation planners need to give more consideration to designing roads that accommodate the increasing number of drivers with reduced vision or reaction time. Many traffic signs have not been designed for an aging population. Lettering is often small, signs with a large amount of information may be confusing, and the spacing of the letters may create a reading problem even for a person with a mild vision impairment

The FHWA has developed the *Highway Design Handbook for Older Drivers and Pedestrians* (D&C-83 in Baystate Roads library). The lettering, color, size, and location of traffic signs can be changed to significantly improve visibility and communication. Traffic and road design can enhance driver safety by including left-turn lanes or traffic signals that show who goes first.

The *MUTCD 2000* Section 2D.06 specifies that lettering on post-mounted street-name signs should be at least 150mm (6 in) high, and that larger letters should be used for street-name signs that are mounted overhead. It provides an option for using 100-mm (4-in) lettering on street-name signs that are posted on local roads with speed limits of 25 mph or less. Selection of letter size for any sign must evaluate the needs of the user, which are continuously changing as a function of changes in automotive technology, roadway systems, and the population itself. For example, Phoenix, Arizona, a city with a large older driver population, has been using "jumbo" street-name signs at signalized intersections since 1973. These signs are 400 mm (16-in) in height and use 200-mm (8-in) capital letters.

Older drivers participating in focus groups and traffic safety research have consistently stated that larger street signs with bigger lettering and standardization of sign placement overhead would make driving easier. Also noted were difficulties reading traffic signs with too much information in too small an area, and/or with too small a typeface, which resulted in the need to slow down or stop to read and respond. Drivers allocate their visual search time among different tasks/stimuli such as side/rearview mirror glances during turning to reading roadway name signs. Older drivers exhibited excessive and unsafe vehicle-braking behavior whenever a signal or sign was sighted frequently either within or 40 feet before the intersection.

Based on physical attributes of older drivers, the standard of 0.6 m/mm (50 ft of legibility for every 1 in of letter height), corresponding to a visual acuity of 20/25 exceeds the visual ability of approximately 40 % of drivers between ages 65 and 74. *MUTCD 2000* Section 2A.14, indicates that sign letter heights should be determined based on 25 mm (1 in) of letter height per 12 m (40 ft) of legibility distance.

Photo courtesy of Marcia Brink, Center for Transportation Research and Education, Iowa State University.

How Safe Are Your Roads at Night?

In daylight and good weather drivers can use many clues to keep their vehicles safely on the road. At night, and in the rain, snow or fog, there may be only one — a sign or pavement marking shining in the headlights. It's important to keep those signs and markings in good shape and to replace the ones that are no longer retroreflective.

You can't always tell from looking at a sign in daylight if drivers can see it at night. In addition, signs deteriorate at different rates. Age, location, sun exposure, and original sheeting type are all factors. For example, sheeting on a sign facing south deteriorates faster than one facing north. The *MUTCD (2000)* Section 2A.23 recommends regular inspections, both day and night, to keep signs properly positioned, clean, legible, and adequately retroreflective. "Damaged or deteriorated signs should be replaced," it says.

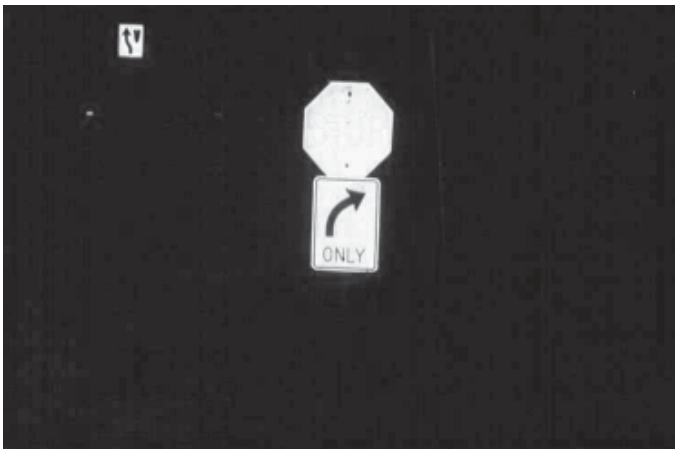
There are several methods for inspecting and measuring retroreflectivity. One is to measure with a reflectometer and compare the readings with minimum guidelines. This gives measurable results, but it can be expensive in labor and equipment. Also, standards are not yet in place. The Federal Highway Administration is developing them as part of an effort to encourage highway agencies to implement sign and pavement marking management. A draft of retroreflectivity standards for public comment is expected this year.

The easiest and least expensive way to find failing signs is to go looking for them, preferably in the dark. A visual inspection system does not produce precise measurements, but can pinpoint signs that have failed. When setting up a visual inspection system, here are some things to consider:

* Schedule and assign inspections to ensure they happen.
* Use a sign inventory system or maps so all signs are inspected.
* Set procedures so observers use consistent or comparable methods.
* Develop inspection guidelines that address:
    - Type of inspection vehicle used.
    - Type of headlamps on the inspection vehicle. (Use newer truck or SUV and low beam headlights.)
    - Direction of inspection vehicle headlamps.
    - Age and visual acuity of the inspector(s).
    - Type of personnel who can conduct inspections. (Some agencies use non-transportation personnel such as secretaries or bookkeepers because they are more representative drivers.)
* Keep written records.

Citizen complaints, law enforcement reports, and casual observations by municipal staff are also important ways of learning about poor quality signs. Be sure there is a method for collecting, recording, and following up on this kind of informal inspection. Also, give inspection priority to critical locations — stops, curves, and sites where crashes have

DAY



NIGHT

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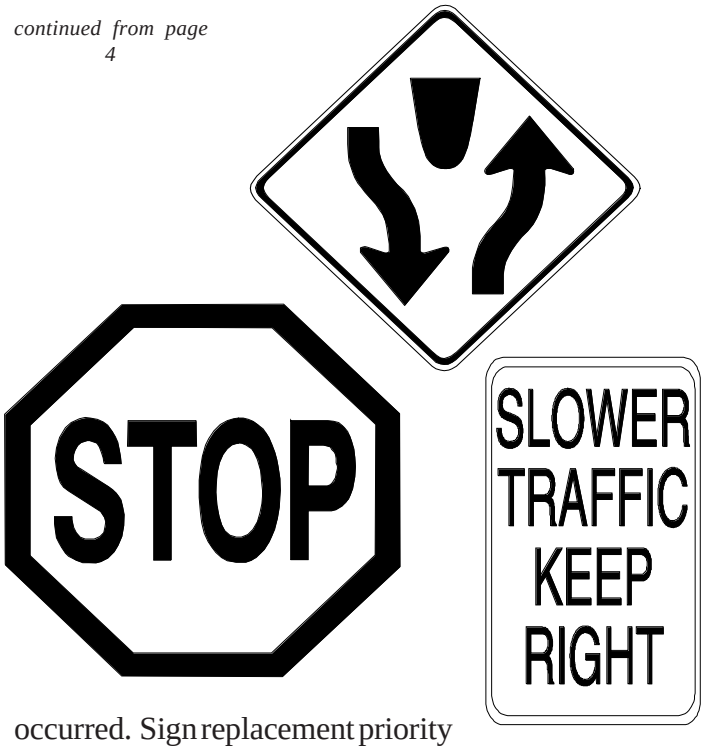

occurred. Sign replacement priority should be as follows:

Critical Signs – Stop signs and other red series signs such as DO NOT ENTER and WRONG WAY

Middle Priority – Warning signs such as curve signs

Lower Priority – Informational signs

If nighttime inspections are impossible, consider shining signs with a hand-held high-intensity spotlight during daytime inspections. You might make this system more precise by fixing a sample of retroreflective sheeting to the sign and comparing the sample's brightness to the sign's. You may also wish to schedule routine replacement at a certain age. This approach takes some careful recordkeeping and may result in untimely replacements, either before they deteriorate or long after.

Some communities have adopted computerized sign inventory systems. A variety of commercial programs are available. The University of New Hampshire LTAP program offers one for $25. The Windows-compatible "Sign Inventory Management System—SIMS02" is designed for small to medium-sized county highway agencies. Go to: http://www.t2.unh.edu/pwms/sims.html

Whatever approach you take, it's your responsibility to make your roads safe at night. Don't let your signs go dark. Also, be sure to voice your opinions to the FHWA when it publishes the retroreflectivity guidelines later this year.

BREAK OUT THE POPCORN BORROW A NEW VIDEO

MO-247 Protecting Our Pavements: Preventive Maintenance

Foundation for Pavement Rehabilitation & Maintenance Research **15 min.**

Benefits of preventive maintenance stress the right method used at the right time on the right road.

MO-248 On Again, Off Again: A Guide for Mounting & Dismounting Heavy Equipment

Assn. of County Comm. of OK **18 min.**

Covers safety tips such as reading the manual, using safety equipment provided by manufacturer, refusing passengers, keeping 3 points of contact with machinery and always checking vehicle prior to using.

ST-200 Hazards of Hurry

Caterpillar Corp. **22 min.**

Well produced safety video covers different models of backhoe loaders stressing safety features and drivers' skills. A good driver always wears correct gear and clothing, checks fluid levels and equipment before starting and does not rush.

MO-250 Crawler Safe Operating Techniques

Caterpillar Corp. **24 min.**

Covers choice of correct machine for each job and new OSHA regulations. Fellow workers share responsibility for teaching good techniques and watching out for others. Nothing replaces actual practice on equipment and quality instruction.

FAX your request to: 413-545-6471 and invite the crew to relax and enjoy a morning out at the movies

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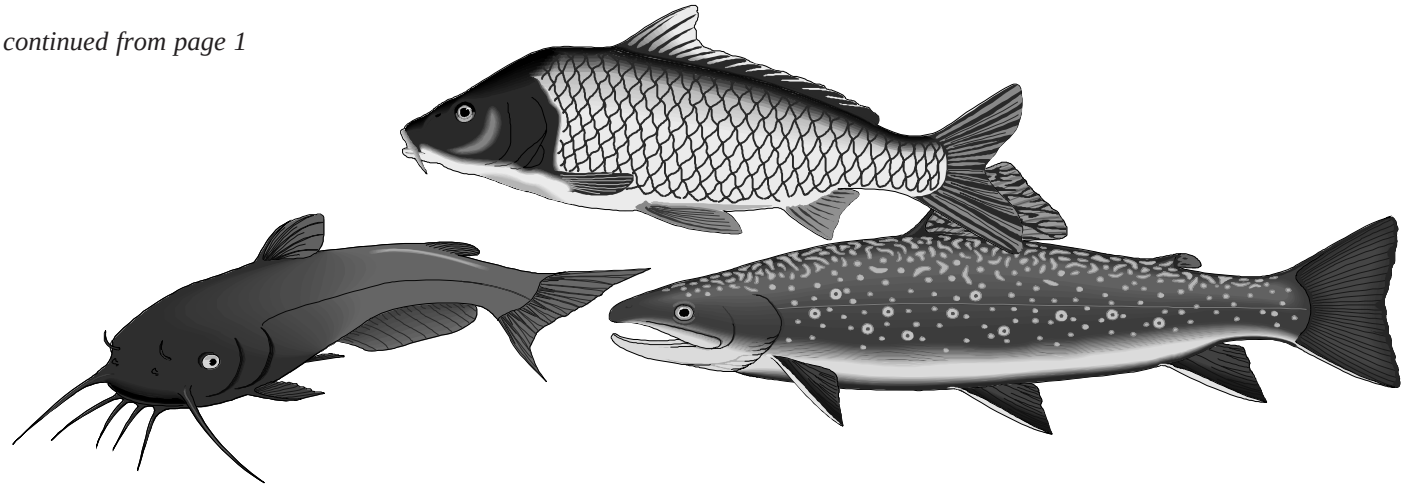


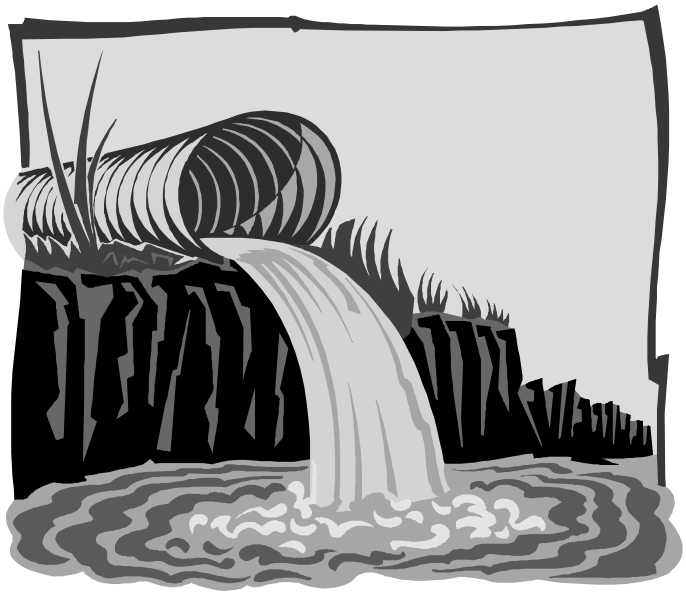
streams to use different habitat types for breeding, feeding, evading predators, and other daily and seasonal life cycle requirements. Barriers to movement can occur where flow depths are low or flow velocities are artificially high, culvert openings are small, embankments are high and steep, or the downstream end of a culvert pipe is "perched" above the stream bottom. Stream Teams plan to work in cooperation with local highway departments to pursue solutions to priority stream crossing problems.

Riverways is also providing technical assistance and/or funding to several municipal highway departments in western Massachusetts for demonstration projects at culverts that have been documented as barriers on streams that support coldwater fisheries. Our staff are also available to provide technical assistance to other communities statewide. In addition, Riverways has pre-qualified consulting and bridge designs for replacements or retrofits.

Where roads cross rivers and streams, bridges usually provide the best option for allowing fish and wildlife movement. Where a bridge is financially infeasible, sinking an extra-large culvert partially into the bed of the stream can also effectively provide movement for a range of species. As a simple rule of thumb, sizing the culvert to span the width of the stream frequently provides an opening large enough for fish and wildlife movement and limits high flow velocities that normally result when a small pipe constricts flow. Larger culverts also limit upstream flooding by allowing more water to pass during storms. Frequently, smaller culverts that are installed in-line with the stream bed can become perched above the downstream bed over time as constricted high velocity flows through the pipe scouring the stream bed downstream.

Sinking the culvert into the stream bed and filling the culvert bottom with material similar to the material found on the bed of the river also improves conditions for fish and wildlife. The objective is to make the crossing more like a piece of the river than a metal pipe or concrete box and thereby make it more hospitable to fish and other wildlife.

In some cases, a stream crossing that is acting as a barrier can be retrofitted to better provide fish and wildlife movement. Structures known as baffles can be installed inside culverts to slow excessive flow velocities and provide a little more water depth. In other cases, the stream bed downstream of a culvert can be built up to reconnect a perched culvert with the river below.



For more information, contact Brian Graber, Staff Scientist with the Riverways Programs at 617-626-1526 or brian.graber@state.ma.us

Gordon Robertson Joins the Master Roads Scholars

Chris Ahmadjian presents the award to Gordy Robertson at the Baystate Roads Advisory Meeting in Sturbridge, MA.

Baystate Roads Program welcomes another Master Roads Scholar to this select group. Gordon Robertson is the project engineer for the City of Leominster. He has successfully completed all requirements by attending at least twenty-two training workshops.

Mr. Robertson's duties in Leominster include managing and coordinating state and federally funded projects within the city as well as in-house efforts for the city's 162 miles of roadways. Gordy oversees contractors and is responsible for inspecting the work carried out by developers. When he is not in the field, he can be found preparing construction contracts and specifications for future projects. He has held this current position for 17 years and oversees 23 employees in the department.

Gordy enthusiastically shares his philosophy with us.

"I believe the most important function of a public works department is to provide maintenance of existing utilities. Failure to maintain water, sewer, drain lines and roadways at a consistently high level always proves more costly in the future when repairs need to be made. Ensuring quality work from contractors through strict conformance to specifications and thorough inspection is essential. Quality comes from people."

Activities in Leominster this season will be exceptionally busy when six MassHighway projects get underway. These include:

1. Merriam Bridge over Route 2
2. Main Street stone arch bridge over the Nashua River
3. Main Street sidewalks/resurfacing
4. New interchange at Exit 34 on Route 2
5. Hamilton/Crawford Streets reconstruction
6. Route 2 resurfacing in Leominster

Building his knowledge base and continuing his education have been important aspects of his career. Mr. Robertson received a project management certificate from Villanova University in 2004 and completed his Associates Degree from Worcester Technical Institute in 1987. He has shown his commitment to improving transportation infrastructure in Leominster by participating in the educational seminars offered by Baystate Roads Program.

Gordy attended the Baystate Roads Advisory Board's June meeting where he was presented with a Wearguard jacket of his choice as well as an engraved brass plaque. His knowledge and experience in solving local problems and his suggestions for future workshops have been beneficial in planning next year's agenda.

Congratulations to the newest Baystate Roads Scholars on your fine achievement. Keep saving those certificates and you, too, could be listed here!

Baystate Roads Scholars!

Greg Rounseville
Engineering Department
South Dennis, MA

Jeffrey Cormier
MassHighway District 4
Arlington, MA

Ronald Pasquarosa
Department of Public Works
Town of Canton, MA

in this issue...

Do You Know What ITS Stands For?

Be sure to check out TECH NOTE 36 included with this issue of Mass Interchange to discover new applicatons of advanced technology in the field of transportation.

The Baystate Roads Program, which publishes *Mass Interchange* each quarter, is a Technology Transfer (T2) Center created under the Federal Highway Administration's (FHWA) Local Technical Assistance Program (LTAP). This newsletter is prepared in cooperation with MassHighway and the United States Department of Transportation Federal Highway Administration. FHWA is joined by Mass Highway, College of Engineering at the University of Massachusetts/Amherst, and local public works departments in an effort to share and apply the best in transportation technologies.

In addition to publishing *Mass Interchange*, the Baystate Roads Program facilitates information exchange by conducting workshops, providing reports and publications and videotapes on request, and offering one-to-one technical assistance on specific roadway issues. Because the program relies on input from many sources, inquiries, articles, and ideas are encouraged.

LTAP Local Technical Assistance Program

To contact the Baystate Roads Program call (413) 545-2604 or FAX 413-545-6471.

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