

# M A S S I N T E R C H A N G E

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## New Tools Provide Local Solutions

It's rush hour. Traffic bypassing an incident on the highway is causing major backups on local roadways. An ambulance, unaware of the situation, is mired in stopped traffic on the narrow streets of the town center. Passengers wait anxiously for a bus that should have arrived by now. As sleet falls, the DPW director weighs the uncertain risk of icing against the town's dwindling stock of treatment materials. . .

Sound frustratingly familiar? Cities and towns across Massachusetts grapple with increasing demand on their road network, a demand that cannot be met by simply building new capacity. Whether due to right-of-way, financial, political, or environmental considerations, substantially increasing capacity is rarely a viable option. Yet, congestion threatens the mobility, economic vitality, and quality of life of many communities. As an alternative, these communities are looking for new ways to actively *manage* the transportation system to address our present and future mobility needs.

Intelligent Transportation Systems, or ITS, is one such option to improve our existing transportation network with a relatively small investment. ITS, broadly defined, is the application of advanced technology to improve transportation efficiency, reliability, safety, and security. While ITS is not a panacea in *all* situations, it adds a set of proven tools to the congestion toolkit.

In the situation above, imagine using traffic detection and coordinated traffic signal control to improve traffic flow in real time. Imagine giving priority to emergency responders, snowplows, and transit vehicles to minimize the impacts of congestion. Imagine coordinating with the statewide Traffic Operations Center to manage the highway incident. Imagine sharing this information with the traveling public and the transit agency so they can circumvent trouble spots. And to ease the mind of our DPW director, imagine automated pavement monitoring and maintenance management systems.

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**LTAP Local Technical Assistance Program**

(413) 545-2604    [http://www.ecs.umass.edu/baystate\\_roads](http://www.ecs.umass.edu/baystate_roads)

Sounds great, but is it practiced at the local level? Absolutely. Communities are doing all these things--and more--in Massachusetts and nationwide. ITS has stepped "out of the laboratory" and is delivering measurable results. The technology is here and now, and your community can benefit from ongoing ITS planning and investment occurring at the local, regional, and state level.

You will hear a lot more about ITS as it is "mainstreamed" into the planning and design of transportation projects. However, there is no need to wait to take advantage of ITS technologies that can provide benefits today. Join the dialogue occurring through state and regional planning processes, and encourage decision makers and project proponents in your area to consider technology options.

This article is the first in a new series of articles written by members of ITS Massachusetts exploring how ITS can address the concerns local communities face every day. ITS Massachusetts ([www.ITSMassachusetts.org](http://www.ITSMassachusetts.org)) is a volunteer organization comprised of professionals from the public, private, and academic sectors dedicated to building ITS awareness, promoting dialogue, and providing educational and training opportunities.

Future articles will focus on specific ITS applications (traffic signal coordination, for instance), municipal ITS success stories, and practical advice on making ITS a reality in your community. We hope they provide insight into how ITS technologies can help to keep your community moving.

This article was written by Randy J. Knapick ([rknapick@ibigroup.com](mailto:rknapick@ibigroup.com)), President of ITS Massachusetts and an Associate with IBI Group in Boston.



*ITS is the application of advanced technology to improve transportation efficiency, reliability, safety, and security*



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

**James Shuris, P.E.**  
**Concord Public Works**  
**Baystate Roads Scholar!**



# FHWA Showcases Research on the Nanoscience of Highway Materials

A major goal of research in the construction and transportation industries is to improve the performance of the materials used in the Nation's roads and bridges, including steel, portland cement concrete, and asphalt pavements. Researchers now recognize that improving these materials has to be done by manipulating them at the nanometer scale, which is equal to one-billionth of a meter or approximately 16 times the diameter of a hydrogen atom. To understand and manipulate materials at this level, researchers need nanoscience, the science of the physical and chemical processes that form materials and the methods used to manipulate materials at this small scale.

To address this need, the Federal Highway Administration's (FHWA) Office of Infrastructure Research and Development increasingly employs nanoscience to develop and test materials that have been modified on an atomic level to provide macroscopic attributes such as improved strength and corrosion resistance, and longer service lives. To highlight some elements of this work, Dr. Richard Livingston, the Office of Infrastructure Research and Development's advanced research coordinator, recently presented a lecture during a course titled Materials in Service, offered at the Department of Materials Science and Engineering at The Johns Hopkins University.

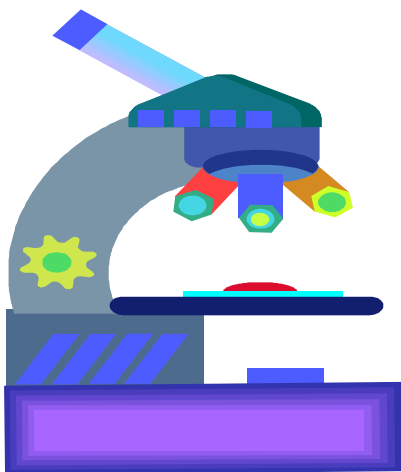
In particular, Livingston discussed research into the nanoscience of steel. Researchers at FHWA and the Office of Naval Research have found that they were able to



produce high-strength steel by adding very small particles of copper at specific locations within the material's microstructure. The researchers were able to produce high-strength steel by precipitating copper particles in targeted areas at the interfaces, or grain boundaries, of crystals within the alloy. This research also produced steel with a stable rust layer on the surface, which will help eliminate the need for regular maintenance painting on transportation structures.

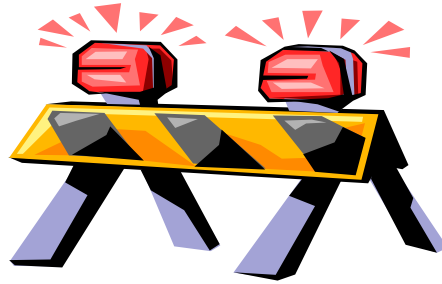
Portland cement concrete (PCC), also a common material in transportation structures, includes a calcium silicate hydrate gel composed of particles only a few nanometers in size that act as a binding agent. FHWA researchers are trying to change the setting time of the concrete by learning more about the gel and other nanoscale surface layers in PCC. Researchers hope that adjusting PCC's setting time will facilitate its transport to construction sites, enhance the material's long-term strength and reduce the potential for cracking. To conduct this research, FHWA currently is using heavy ion beams to probe chemical admixtures that can either accelerate or retard the mixture setting time.

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# WEB SITE HAS WORK ZONE TIPS FOR EVERYONE

[www.ops.fhwa.dot.gov/wz/index.asp](http://www.ops.fhwa.dot.gov/wz/index.asp)



Much like the roads to which it is dedicated, the Federal Highway Administration's (FHWA) work zone Web site has undergone an overhaul. The new Web site, at [www.ops.fhwa.dot.gov/wz/index.asp](http://www.ops.fhwa.dot.gov/wz/index.asp), is broken down into eight sections, and within each is a wealth of information. Some of it applies to larger transportation agencies, while some of it pertains to those with more modest projects and budgets.

Each of the eight sections has several different features. For example, the section entitled "Best Practices" has a guidebook and a link to a related training module. Visitors can even submit their own best practices to share with others. The "Regulation and Policy" section links to the *Manual on Uniform Traffic Control Devices*, and other FHWA publications related to work zone safety.

While just about all the information on the Web site is useful to some degree, the following areas you may find particularly so.

- The "Best Practices" section helps agencies compare their work zone procedures with those of other agencies. Project planners can find out what has worked in similar situations or share a solution that worked well on their own projects.

- The 90-minute best practices training module link outlines a course that could be offered to road workers to introduce them to the information in FHWA's best practices guidebook.

- Another page worth looking at is the Utah LTAP's innovative contracting page. Located in the "Contracting Strategies" section, it outlines several approaches to contracting work zone work that make the process more efficient. For example, the site advocates using "cost plus time" bidding to make sure that getting the lowest price on a contract doesn't mean prolonging the life of the project. To the same end, it also suggests building "lane rental" into the contract, where contractors pay to rent any road space they need to close off while working on the project. This is particularly useful if alternate routes are impractical. These strategies and others are found on the Web site, which describes each approach as well as when and how to use it.

- In the "ITS & Technology" section, Web site visitors can read about the ITS Peer-to-Peer program, a national technical assistance program that provides free short term assistance, usually in the form of one-on-one information exchange, to those who request it. For example, the program will provide agencies with assistance with traveler safety and security, emergency service, and fleet operation and maintenance.

- A work zone self-assessment guide can be found in the "Performance Measurement" section. This tool can be adapted to the size of any project or organization. Using this tool, you can evaluate your agency's use of work zones and identify areas that need attention.

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## New Publications

**COC-134** - Simplified Design (Reinforced Concrete Buildings of Moderate Size and Height)

Portland Cement Assn.

**COC-135** - Design and Control of Concrete Mixes

Portland Cement Assn.

**COC-136** - Notes on ACI 318-02 Building Code Requirements for Structural Concrete (LOAN ONLY)

Portland Cement Assn.

**COC-137** - Concrete Inspection Handbook

Portland Cement Assn.

**COC-138** - Concrete Engineering of Streets and Local Roads

American Concrete Pavement Assn.

**SAF-148** - Common Sense Solutions to Intersection Safety Problems

CDROM (LOAN ONLY)

FHWA Office of Safety

**T&P-39** - Model Job Descriptions for Public Works CDROM (LOAN ONLY)

Local Government Institute

**T&P-40** - Leadership in the New Age of Public Works CDROM (LOAN ONLY)

APWA

**T&P-41** - Supervision: Conflict Solving for the New Supervisor

CDROM (LOAN ONLY)

APWA

*Check out other current publications at:  
[http://www.ecs.umass.edu/baystate\\_roads](http://www.ecs.umass.edu/baystate_roads).  
Please fax your requests using the library  
code to: 413-545-6471*

## MOVING TOGETHER October 19, 2005



Moving Together 2005, the annual Massachusetts statewide bicycle-pedestrian conference, will be held on Wednesday, October 19, at the Marriott Courtyard Tremont Hotel, 275 Tremont Street, Boston, MA. This is a new venue for the conference which has been held in Worcester for the past four years. Twelve workshops on a wide variety of topics will be presented, and an exhibit hall will be featured. The \$35.00 registration fee includes a continental breakfast, break refreshments, lunch, and complete workshop materials. Excellent networking opportunities with professionals representing planning; design and construction; traffic safety; public health; consulting; and bicycling, walking and trail advocacy disciplines are also provided.

### SAVE THE DATE

Participation is limited to the first 200 registrants. Please contact Baystate Roads at 413-545-2604 or [baystate\\_roads@hotmail.com](mailto:baystate_roads@hotmail.com) for additional conference details and registration information.

Register at:

[www.baystateroads.org/MT2005/](http://www.baystateroads.org/MT2005/)

**MASS**  **HIGHWAY**

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- The "Outreach and Training" section contains downloadable workshops for improving work zone practices as well as both a list of National Highway Institute courses and a directory of Local Technical Assistance Program (LTAP) centers.
- A guide to creating work zone incident management policies is included in the "Work Zone & Traffic Analysis" section.

If you can't find what you're looking for, the Web site also includes an alphabetical subject index for locating information more easily. The site contains much more useful information than what has been outlined here, so doing a bit of your own exploration may lead you to information you didn't know was so easy to find.

*Article written by Courtney Hansen and reprinted with permission from the Kansas LTAP center from the Winter 2005 issue.*

## **BAYSTATE ROADS WORKSHOPS**

**2-Cycle Engine Troubleshooting**  
Oct. 3 - Ashland DPW

### **Chain Saw Skills & Safety**

*Limited to 15 -- maximum of 2 per municipality*

Sept. 29-30 - Quabbin Reservoir,  
Belchertown

Oct. 6-7 - Devens DPW

### **Anti-Icing Applications**

Sept. 30 - Econolodge, Lenox

Oct. 7 - Holiday Inn, Worcester

Oct. 12 - Holiday Inn, Tewksbury

Nov. 18 - Holiday Inn, Taunton

**register online:**  
**[www.baystateroads.org](http://www.baystateroads.org)**

## **Results of the 2005 Needs Survey and the winners are.....**



Thanks to all who completed the annual needs survey. This valuable input will assist the Baystate Roads Advisory Board and program staff in improving services and meeting the needs of local communities. This year's incentive of a reward prompted the highest response to our annual request for identifying strengths and weaknesses of the program. Congratulations to the five lucky winners of Home Depot gift certificates:

Carole Hamilton, Wilmington Planning Dept.  
Richard Hathaway, Concord DPW  
Stephen Kadlik, Wayland Highway Dept.  
Richard Sullivan, Weston DPW  
Greg Taylor, Mashpee DPW

Survey results reveal:

- ◆ Workshops and newsletters are the most useful services
- ◆ A majority (60.2%) believe training is financially beneficial to their agency
- ◆ Brochures are still the best vehicle for workshop notification
- ◆ Almost 12% of respondents have attended over 21 workshops since 1990
- ◆ Most respondents work for small towns with fewer than 5 employees in their departments
- ◆ Interest in online training is evenly split at 47.3%



# 10 TIRE TIPS

## for tire life and work safety

### 1 Under-inflation costs money

Operating on soft tires means they wear faster and the truck burns more fuel. At normal speeds, you'll cut tire life by 16% and increase fuel use by 2% by running tires at 20% under recommended pressure.

### 2 Explosion is possible

Any radial tire that has been driven at less than 80% of its recommended pressure has the potential to "zipper rupture" when it's re-inflated. A zipper rupture is when the side of a radial tire explodes during inflation. You can learn to recognize hazardous tires and how to re-inflate them safely from videos or in training programs.

### 3 Expect tires to lose air

Rubber tires are made of a porous material; they lose air continuously. A truck tire is expected to lose up to two pounds a month according to industry standards. In addition, air can leak through valve caps or small punctures.

### 4 Think about outside temperature

A tire will gain or lose a pound of pressure with every 10 degree difference in outdoor temperature.

### 5 Know the proper pressure

Tires are designed to run at specific pressures based on the total load. Gather information on each truck's actual axle load, then use standard load charts to calculate the correct tire pressure. Ask your tire supplier for help and training. (See load charts at [www.goodyear.com/truck](http://www.goodyear.com/truck))

### 6 Calibrate gauges monthly

Even with regular checking, tires could be at the wrong pressure due to faulty gauges. Invest in a master gauge



(about \$100) and calibrate all the gauges in the shop monthly.

### 7 Check pressure every season or before use

You should check tire pressure every season at a bare minimum, but more often is better. For infrequently used or seasonal equipment --like motor graders-- check tire pressure before using.

To get an accurate reading, be sure the tire is cold; at least three hours after the last use.

### 8 "Read" tires regularly

Check for signs of wear before tires sustain serious damage. Regularly look at tire walls for signs of zippering; inspect for cuts, cracks, blisters, or bulges. Measure tread depth. (It should be no less than 4/32" on the steer axle and no less than 2/32" on all others.) Run your hand over the tread and feel for abnormalities like rib edge feathering or cupping. Feathering is an early sign of misalignment or could be caused by improper pressure. Take the tire/wheel assembly off and look at the face of the tire for any type of irregular wear pattern. For example, drive tires may develop heel and toe wear.

### 9 Rotate tire position for longer life

Any rotation schedule is better than no rotation. How often it's needed depends on truck usage.

### 10 Repair correctly

The only proper way to fix a tire is to put a patch on the inside and a plug through the injured area. Any repair from the outside will void the tire warranty, even if it is properly fixed afterwards. Up to 40% of tires in use are incorrectly repaired.

*Adapted with permission from the Wisconsin LTAP.*

Livingston's lecture also touched on FHWA's interest in exploring the feasibility of creating roadways made of self-healing materials with nanostructures that include embedded microcapsules of plastic-forming liquids. A crack occurring adjacent to a microcapsule would cause it to break open, release its contents, and then harden to close the crack. This type of self-healing material would prolong the service lives of structures. Producing microcapsules is challenging because of the severe conditions imposed when roadways are constructed. The capsules would have to survive the stresses and elevated temperature of surrounding materials during construction while remaining sensitive enough under normal service conditions to detect a fracture in the hardened material.

*Article by Dr. Richard A. Livingston reprinted with permission from Research & Technology Transporter, FHWA, April/May 2005.*

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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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