M A S S

INTERCHANGE

VOLUME 4 NUMBER 2 SPRING 1990

PERSONNEL CHANGES AT BAYSTATE ROADS

By now many of you may have heard that Meryl Ann Mandell resigned from the Baystate Roads Program October 31. Meryl was with the program at its inception, and for three years played a major role in its growth. It is no exaggeration to say that each and every program activity — this newsletter, our workshops, the video lending library, and the effective distribution of reports, reprints and other technical information — have been, for all intents and purposes, the products of Meryl's energy, diligence, and creative effort. I know that you will miss the cheery voice on the other end of the telephone and the warm laugh on the other end of the handshake; I know, for I'll miss them more. But we can all take some comfort in the knowledge that, although Meryl has left Baystate Roads, she hasn't left the highway business. Meryl's knowledge of highway materials and practices and her experience with the cities and towns of Massachusetts are now being put to good use by All State Asphalt, for whom she is now working. From all of us — Thanks, and Good Luck in your new endeavor!

And now ... please welcome Silvio Baruzzi. On January 1, Silvio Baruzzi joined the Baystate Roads Program as Program Manager, replacing Meryl Ann Mandell. Immediately prior to joining the Program, Silvio was Highway Superintendent of the Town of Montague, a position he held since 1982. In addition to his highway experience with the Town of Montague, Silvio has served with several Engineering Battalions in the United States Army. His practical experience is complemented by a bachelor's degree in Civil Engineering and a master's degree in Business Administration. No stranger to the Baystate Roads Program, Silvio has worked with us in developing a computer-based pavement management system for the Town of Montague and was a speaker at our low-cost roads workshop. We feel most fortunate to have Silvio now with us full time and available to carry on where Meryl left off.

Paul W. Shuldiner
Director

Silvio J. Baruzzi
Program Manager

Cut Your Salt Costs

(Cartoon reprinted from *Vermont Local Roads News*)

Wetting salt before applying it to roads can enable you to get better results while saving money. Many municipalities already do so; most use calcium chloride. Major reasons for pre-wetting salt include:

- More salt will adhere to the road. One study indicates that with pre-wetting, up to 96% of salt applied on a 24-ft (7-m) wide pavement remained on the road, compared with 70% of dry salt. Another study showed that three to five times more wetted salt than dry salt remains on roads after traffic passes through.
- Wetted salt melts snow faster and longer. Dry salt does nothing to fight winter conditions. Salt must be in brine form to melt snow or prevent snow build-up and bonding. As temperatures fall and humidity levels decrease, salt attracts less moisture. This is why a moistening agent is needed.
- Salt fines turn to a brine faster than does rock salt. Fines provide the initial melt while chunks provide the long-lasting melt. Therefore, you want to prevent fines and rock salt from separating. Unfortunately, several factors are working against you. Salt is jostled during transport and handling. More importantly, the same impetus will send a heavier object farther than a lighter one. This means that rock salt will be thrown farther than fines. Pre-wetting fines will add weight to them, lessening this effect and producing a longer-lasting melt.
- Lower operating temperatures. Liquid calcium chloride enables salt to work better in lower temperatures. Salt is not very effective at surface temperatures of 20° F (-7° C) and below. At these temperatures, material with a lower melting point can assist salt and provide a faster, longer-lasting melt.
- Reduced salt consumption. Pre-wetting salt should reduce the amount of salt used by about 30%. If you are not reducing your salt consumption when pre-wetting, you are increasing your costs. Depending on your equipment, it is possible to reduce salt consumption either through operator discretion or automatically through pre-wetting.

Ideally the combination of salt and liquid should:

- Melt snow and ice
- Prevent snow build-up on road surfaces, making it easier to remove slush mechanically
- Work at low temperatures
- Reduce salt consumption
- Cut costs.

There are two categories of liquid application techniques–stationary and mobile. While less expensive, stationary application permits only a low liquid percentage and requires that spreaders be emptied and cleaned after each use. Either method requires four elements:

- Liquid storage tank
- Pump to spray liquid
- Electrical control for wetting device
- Spray/application location.

Possible locations include a simple hose spraying down a stockpile, a more elaborate spray-arm system, a set of nozzles on top of a conveyor belt, and an onboard tank and pump. Each has advantages and disadvantages.

Any onboard system must be either a fixed-gallon-per-minute system or a fixed-percentage system. As long as you have varying application rates of aggregate and varying truck speeds, the fixed-gallon-per-minute system will give either more or less than the ideal application percentage. When you apply too much, you waste liquid and lose money. When you apply too little, you raise a safety issue, as you are putting on less liquid than needed. However, the fixed-percentage system will always give you your selected percentage.

One issue faced by snowfighters is anti-icing vs. de-icing. Anti-icing is easier, costs less, and is more effective, as it prevents a bond from forming between pavement and snow. Anti-icing is a form of preventive maintenance. If the bond never forms, it will be easier to remove snow. It takes five to ten times more chemicals to remove ice than to prevent it from sticking initially.

If this is true, why doesn't everyone focus on anti-icing? Two major reasons are that equipment needed is more precise and therefore more expensive; and you risk "getting caught" if you put down an anti-ice application and it doesn't snow. Both application equipment and weather forecasting are becoming more sophisticated, reducing the number of times this will happen. While acquisition cost is higher, this cost is only incurred once. However, cost savings in material consumption occurs every time it snows. Preparing an education program for local news media and the public will enable you to explain what you are accomplishing and why it is necessary to be wrong occasionally.

Source: APWA Reporter, February, 1989.

Cold Weather Tips for Construction Equipment

Construction equipment needs special attention in cold weather to operate optimally. Moisture can cause costly and possibly permanent damage to equipment at freezing temperatures. Several precautions should be taken before and during the winter to help ensure that equipment will operate properly in cold weather.

Pre-Season Check. A proper maintenance schedule should include a change of transmission fluid, engine oil, and coolant at the start of cold weather. Fluids that have been used too many hours or left in the machine too many months are less able to provide the protection needed when the temperature drops to the freezing level. A machine's systems and parts are much more sensitive in winter than in warmer seasons because fluids tend to move more slowly when cold, taking longer to reach equipment parts.

Use a transmission fluid that absorbs and minimizes the effects of moisture resulting from cold weather condensation. Unabsorbed water can freeze, promote rust, reduce output of pumps, clog filters, and cause premature deterioration of machine parts. Use high-quality gasoline or diesel fuel. For diesel engines, use a fuel with a cloud point of at least 10 degrees F below the lowest anticipated temperature to prevent diesel fuel waxes from forming and plugging filters. The fuel should be a winterized grade 2-D meeting ASTM d-975 specifications.

Check the operator's manual to be sure that the engine oil is the correct viscosity for low-temperature operation. Newer engines use a multi- grade oil that does not require a viscosity change for cold weather use. Older engines require seasonal changes of oil that should be part of the machine's normal maintenance schedule.

Use a coolant low in silicates and a high-quality water low in minerals, chlorides, and sulfates. Mix the water with ethylene glycol, varying the amounts of each as required by the lowest anticipated temperature. Maintain the ethylene glycol concentrate at about 50 percent, which will provide protection to -34 degrees F. Never let it exceed 65 percent or fall below 45 percent because the additives in the anti-freeze will not protect properly outside those limits.

Cold Weather Starting. Keep the battery at full charge. Cold weather and thickened engine and transmission oil greatly increase cranking power requirements on a battery. Also, the electrolyte in a badly discharged battery can freeze in extremely cold temperatures.

A local dealer can supply starting aids, such as engine block, oil pan, battery, and coolant heaters. Do not use a dipstick heater because the heat is so localized that additives in the oil can be burned in one spot, while the rest of the oil is insufficiently heated. Use ether starting fluid only when the ether dosage can be controlled by an attachment mounted directly on the engine.

Cold Weather Operation. Always heat the hydraulic transmission fluid to operating temperature by running the engine at 1,500 rpm for about five minutes before operating the machine. Operating a machine with cold transmission fluid can cause erratic or rough operation.

During cold temperatures, the engine may not warm up to or maintain the rated operating temperatures at slow engine speeds. When the engine is operated below 1,500 rpm, incomplete combustion may result. Before stopping the engine after heavy, sustained loading, run it at slow speed for three to five minutes to allow a gradual decrease of engine temperature and prevent excessive condensation.

At day's end, fill the fuel tank to prevent condensation from forming in the tank. Remove water from the water trap each day to prevent damage to precision fuel injection parts.

Park the machine on a hard, level surface, out of mud or water that can freeze the tires or tracks to the ground. Then cover the end of the exhaust pipe to prevent moisture from entering. If the machine is to be stored for a long period of time, jack up the machine to alleviate the load on and prevent "flattening" of the tires.

Cold Weather Dangers. Never use gasoline or diesel fuel to reduce the viscosity of engine oil. Not only does fuel adversely affect the protective value of the oil, it creates a fire hazard when operating the engine. Never add gasoline or alcohol to diesel fuel. The mixture creates a vapor that is extremely explosive. Have the transmission fluid analyzed for water contamination at regular intervals. Fluid with over one half percent water by volume does not absorb condensation effectively and increases the chance of premature deterioration of machine parts.

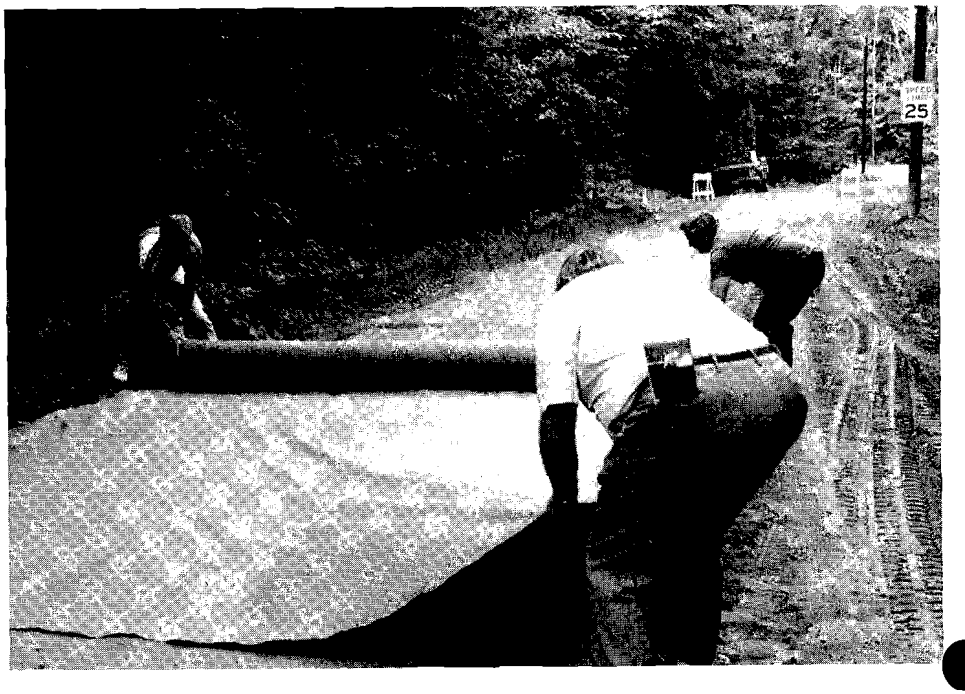
When storing equipment for long periods of time during cold weather, drain and replace the engine oil and coolant. Always store a machine with oil in it so that, in an emergency situation, the machine will be operational. Time spent on proper year-round maintenance will improve the performance and life of construction equipment. Even more critical in freezing temperatures, a few simple precautions can protect expensive machinery from premature wear and failure. (Source: Public Works, July, 1988)

Geotextile Demo in Shutesbury

What do a mattress and roads in the Town of Shutesbury, Massachusetts, have in common? Both contain geotextile fabric. Shutesbury scheduled a regravelling project for this year's road maintenance work. Part of the project included a demonstration installation of 300 lineal feet of geotextile fabric in a particularly boggy area. According to Gary Dihlman, Highway Superintendent, the chosen segment of road had a clay base which gets soft and muddy in the spring. The fabric was used for separation and stabilization between the clay base and the gravel riding surface. The area of the installation has been carefully identified , so that next Spring its performance can be compared with that of a test site.

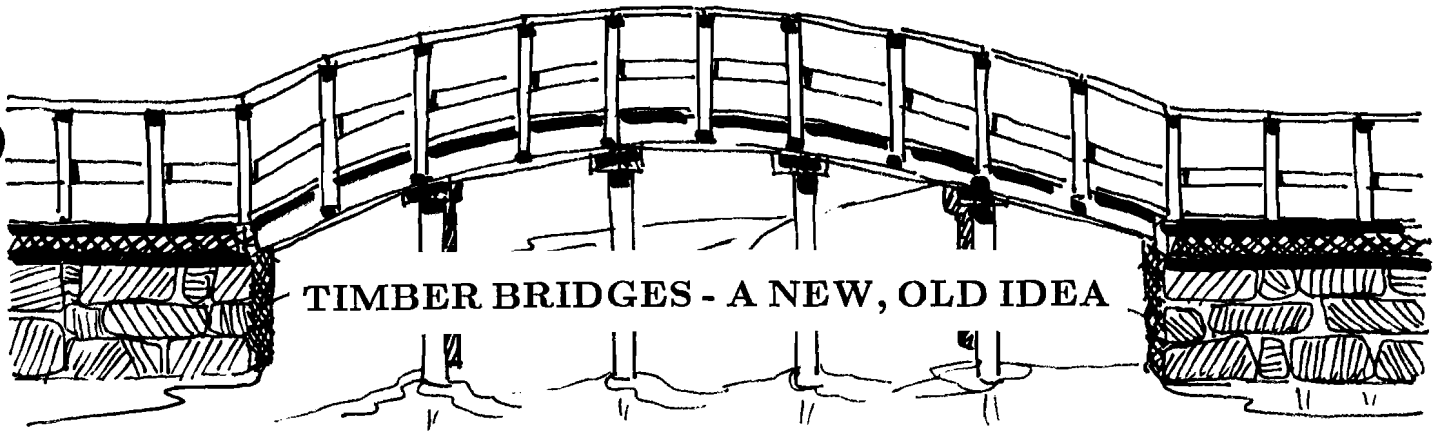
Roughly 40 people were on hand to observe the September 12 installation, which had been coordinated by Gary Dihlman and Norman Livingood, representing Phillips Fibers Corp., and Meryl Ann Mandell, Assistant Director of the Baystate Roads Program. The test area had been excavated to a uniform depth of 12 inches the previous day, so that the fabric installation was quick and simple. Polypropelene fabric was laid by hand in overlapping strips in the excavated section and then covered with roughly a foot of gravel which had been placed by dump trucks and then spread by a bull dozer, as shown in the accompanying photographs.

For more information about this installation contact Gary Dihlman, Highway Superintendent, Town of Shutesbury, Shutesbury, MA 01072. For information about geotextiles and their application in highway construction and maintenance, contact your Baystate Roads Program.



Fabric is easily rolled out by three people.

Gravel is spread on top of fabric using bulldozer.



TIMBER BRIDGES - A NEW, OLD IDEA

"An emerging technology of timber bridge construction could be a key to strengthening the rural and forest products economy in Massachusetts while reducing the cost to tax payers for bridge construction," says Mike Whalen of the Berkshire-Pioneer RC&D (Resource Conservation and Development) Area. RC&D, along with the Baystate Roads Program and others, helped coordinate a New England/New York Conference on Timber Bridges held in Fairlee, Vermont, this past June. The Conference was the first regional effort in the country to explore all aspects of timber bridge construction as a possible alternative to the use of concrete and steel bridges.

Use of this renewable resource for bridge construction can improve our transportation systems, with savings to taxpayers in both the short and the long run. "Construction cost savings have been running 20 to 25 percent less. But the important part is that you have to amortize costs over the length of time that the structure is going to be used and add in maintenance costs. That's where wood really comes to the forefront," Whalen said.

Wood doesn't need to be painted, is relatively immune to salt, and is less expensive and easier to work with than concrete or steel. Concrete needs relatively warm temperatures and time to cure properly, while wood bridges can be repaired in the middle of winter and are useable immediately.

Modern advances – such as the use of pre-stressed and glue-laminated timber – have made the contemporary timber bridge an increasingly attractive option to small local highway crews. The lighter weight of timber bridges relative to concrete and steel coupled with simpler installation requirements makes it possible to use semi-skilled workers for bridge installation and maintenance. A number of other states have successfully constructed timber bridges using their local roads crews for the majority of the construction.

Another advantage to using timber conponents is the longer life expectancy. The typical life of a steel and concrete bridge is above 30 years while the life of a modern timber bridge extends to 50 years or more. This results in considerable long term savings. Most timber bridges built today are designed to carry loads of up to 40,000 pounds, which places timber bridges on equal ground with steel and concrete in many applications, except for the cost.

The appearance of timber bridges is also an important aspect for many small towns. The aesthetics of timber seem to fit in more attractively with the small town landscapes than do steel and concrete. The State of Connecticut recently constructed a timber bridge at the entrance to Wadsworth Falls State Park in Middlefield, CT. The aesthetics of wood was a primary consideration. The bridge has a 50 foot span and was built with a crew of three semi-skilled workers under the supervision of an engineer.

Besides the June Conference, Vermont is sponsoring a nationwide architectural design competition for a second timber bridge that will be built in 1990. This is the first such competition in the country since 1889. Further information about what happened at the Conference can be obtained by contacting Dennis Borchardt of the George D. Aiken RC&D office in Randolph, VT at (802) 728-9526.

CALENDAR

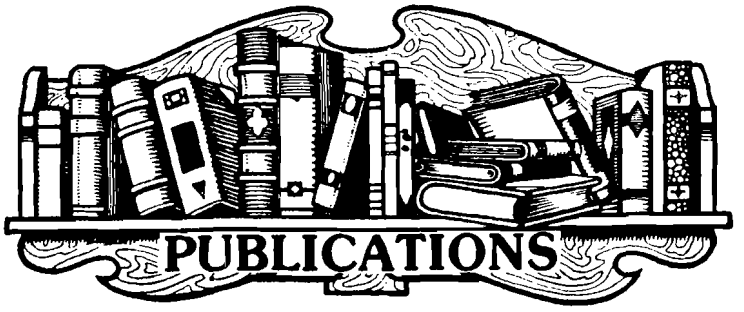
S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

March 19 & 20
APWA Motor Vehicle Maintenance Workshop
To be held in Wakefield, MA
Contact: Robert W. Simonds
(617) 932-4400

March 20, 21, & 22
Project Level Management Workshop
Dedham, Westborough, and Amherst
Contact: Silvio J. Baruzzi
(413) 545-2604

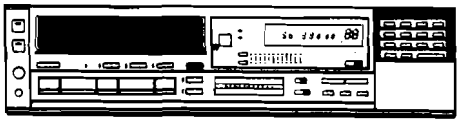
May 4
APWA Spring Meeting
Wetlands and Lake Restoration
Springfield College
Contact: Joe Superneau
(413) 584-1450

May 20 — 26
APWA National Public Works Week
Meeting to be held May 24
Anthony's Pier 4
Contact: Bob Albee
(617) 951-6000



New Listings

- "Safety Restoration During Snow Removal – Guidelines," FHWA (95 pages – 1987). This report addresses the hazards associated with nonfunctioning highway safety features that occur with snow removal operations during both emergency and post-snowstorm cleanup, and how these hazards can be remedied.
- "Model Pedestrian Safety Program User's Guide Supplement," FHWA (88 pages – 1987). This provides detailed information on specific pedestrian safety countermeasures grouped into three major areas of engineering countermeasures, education countermeasures, and enforcement countermeasures.
- "Walk Alert, National Pedestrian Safety Program – 1989 Program Guide," National Safety Council (167 pages – 1989). The WALK ALERT Program Guide is a companion to the MODEL PEDESTRIAN SAFETY PROGRAM USER'S GUIDE, 1987. The 1989 guide sets forth the steps in organizing, initiating, and carrying out a local pedestrian safety effort, and in building it into a comprehensive program. It is specifically developed for use by safety organizations at the grass root level, as well as city and county governments, their street and highway departments, law enforcement and public safety agencies, schools, and traffic engineering departments.
- "Asphalt-Paser Manual – Pavement Surface Evaluation and Rating," University of Wisconsin/Madison Transportation INformation Center (39 pages – Revised 1989). It is designed to provide background information on asphalt pavement conditions and causes of distress as well as a simple procedure to rate pavement condition.
- "Gravel – Paser Manual – Pavement Surface Evaluation and Rating," University of Wisconsin/Madison Transportation Information Center (32 pages – May 1989).
- "Concrete – Paser Manual – Pavement Surface Evaluation and Rating," University of Wisconsin/Madison Transportation Information Center (48 pages – September 1989).
- "Municipal Liability in Wisconsin: Highway Problems," University of Wisconsin/Madison Transportation Information Center (37 pages – June 1989). It is intended primarily for those who make and implement public policy in Wisconsin local government. It deals with the complex civil liability problems faced by public officials.



Video Lending Library New Acquisitions

The videotapes listed below have been added to our Video Lending Library holdings. To borrow a copy, or obtain a complete listing of our holdings, send a note or call the BRP with your request. A Borrower's Registration Card must be on file before a tape can be borrowed.

PA–134 The Best Defense is a Good Road (20 min.)

PA–135 SHRP, Paving the Way for Tomorrow's Highways (16 min.)

MO–172* Pavement Structure Repair Techniques – Part 1 (88 min.)

MO–173* Pavement Structure Repair Techniques – Part 2 (43 min.)

ST–132 Pedestrian Safety – What You Can Do (9 min.)

DC–129 Petromat Chip Seal (12 min.)

DC–130 Supac, Texas Installation (17 min.)

* The two tapes MO–172 and MO–173 are a set which also have accompanying supplements. Topics include crack sealing, shoulder maintenance, pothole patching, asphalt chip seals, ditch maintenance and maintenance of gravel roads. A tape for basic work zone traffic control for stationary and moving operations on two-lane roads is also available. If you would like to borrow these tapes, please ensure that you ask for the video supplements as well.

Note: Videotapes on the Baystate Roads program Snow Season Workshop (December 1989) and the BSCES/ASCE Seminar on Transportation and Land Use Policy (January 23, 1990) are available. Call for details.

GRANITE AND HIGHWAY CONSTRUCTION

Although granite has long been used in highway construction, how much do we know about it? What potential uses are available? What are its major advantages and disadvantages?

Typical uses of granite in highway construction are :

- ★ block pavements
- ★ curbing
- ★ inlets for catch basins
- ★ lining for drains and gutters
- ★ embankment slope protection and
- ★ bound posts

Basic Description

The name granite refers to igneous rocks composed of feldspar and quartz, usually with minor amounts of mica and/or hornblende, most often found exposed at the earth's surface owing to uplift and erosion. Granites are distinctive in color and have visible, granular, crystalline interlocking textures. Although, granite contains large amounts of brittle material, its interlocking texture gives it great cohesion and rigidity, and in sheets of sufficient thinness it is flexible.

Functions and Application

It is often cut into rectangular blocks for the construction of block pavements, pedestrian walkways, islands and medians on roadways, and driveway and alley entrances. Vertical granite curbing, straight and radius, are used for town and city street curbs, and for traffic or safety islands. On roadways where off-road parking is allowed, slope granite curbs are often employed.

For drainage applications, granite is cut into circular face inlets for use at catch basin locations providing overflow relief when gratings are obstructed.

Characteristics

Life and durability * By nature, granite is dense and tough. It resists wear, shock, and impacts from vehicular traffic loads. It does not readily disintegrate under destructive freeze/thaw cycles. Resistance to the deleterious action of salts and other chemicals used in ice and snow removal is very high.

Salvage value * Because granite curbing is durable and practically indestructible, it can be reset to new lines and grades at the same location or at new sites in curbing construction. Reuse in other areas of highway construction is also feasible. Where granite is used in roadway curbing construction, its structural properties also allow it to be left in place during road milling operations, a popular highway maintenance practice presently being employed in New England.

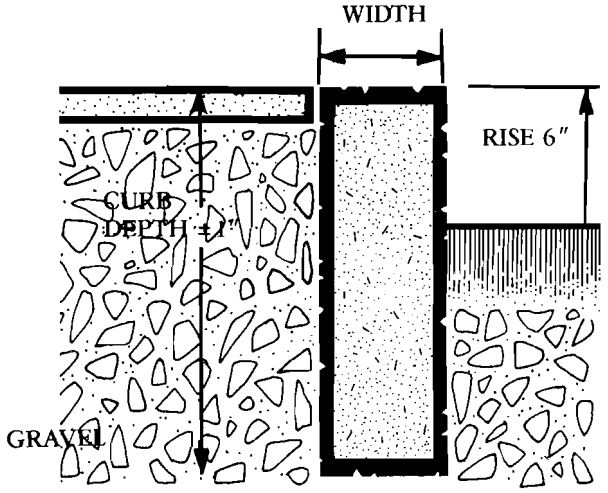
Erosion prevention * Where granite is used in drainage construction, edge ravelling of pavements, undercutting of gutters, and erosion of shoulders and fill are minimized.

Safety and accident prevention * Granite curbs clearly define pavement edges, and provide a high degree of protection to both motorist and pedestrian where sidewalks are used in conjunction with curbing.

Faster setting * Modern machinery and methods can produce granite products, with uniformity, to the required size and shape. This makes setting fast and economical.

Economy * Considering its long life and salvage value, use of granite in highway construction could be cost effective and economical in the long run. Although its initial cost is higher than other materials, all significant costs over the life time of the material, not just initial cost, should be considered. Alternative materials might have lower initial costs but higher subsequent recurring costs for maintenance, disposal and replacement.

Contributed by:
Emmanuel Ofori-Darko
Research Assistant



VERTICAL GRANITE CURB

Massachusetts Department of Public Works
Federal Highway Administration
University of Massachusetts/Amherst

Route to:
1. ____________
2. ____________
3. ____________

Baystate Roads Program
Dept. of Civil Engineering
University of Massachusetts
Marston Hall 214F
Amherst, MA 01003

Non-Profit Organization
U.S. POSTAGE PAID
Permit No. 2
Amherst, MA
01002

IN THIS ISSUE

The Baystate Roads Program, which publishes *Mass Interchange* each quarter, is a Technology Transfer (T^2) Center created under the Federal Highway Administration's (FHWA) Rural Technical Assistance Program (RTAP). FHWA is joined by the Massachusetts Department of Public Works, the Department of Civil 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, inquires, articles, and ideas are encouraged.

To contact Baystate Roads staff to receive future copies of this newsletter at no cost, or to submit ideas or articles to *Mass Interchange*, call Silvio J. Baruzzi at (413) 545–2604.