UNH T²Center Field Services
Representative Patty Ferrelli

On The Road In New Hampshire

In Personal Service for Public Works Software Users

Last summer we became concerned that the number of people using our software packages would soon exceed our ability to service them. In a way, the Road Surface Management (RSMS) and Municipal Equipment Management Systems (MEMS) were becoming too successful. Many people needed help getting started, others needed help with details of the programs. Even experienced users were using only parts of the systems. The types of questions were becoming increasingly difficult to answer over the telephone.

We needed a field representative, someone with considerable experience and knowledge about computers, and who could work with people. How do you find someone with this combination of experience and personal relations skills? You get lucky. You find Patricia A. Ferrelli.

A college graduate in computer programming, Patty understands computers, and their related problems. And she likes to find solutions. For example, we developed our software on recently developed computers. Many municipal road and highway departments have older computers with sometimes (how can we say it) "unusual" operating systems or characteristics. With her considerable experience, Patty has diagnosed and corrected many such problems.

Patty refined her people-relations skills during her almost ten years in sales and marketing. Her skills developed there have been easily applied in public works and highway departments.

Patty had also been a trainer -- of individuals and of groups -- in computer use. Now she trains people throughout New Hampshire (and increasingly throughout Vermont and Maine).

Since last September Patty has talked to over ninety percent of the nearly one hundred RSMS and MEMS users in New Hampshire, and many more throughout the United States. She has provided face-to-face assistance during visits to twenty-four municipal offices.

Patty has also made broader contributions to the UNH T²Center as a member of the revisions committee for RSMS and MEMS. As those revisions are included in the programs, her services will likely become even more important.

If you want to contact Patty for assistance, you can reach her through the UNH T²Center.

Readers' Article and Training Wishes

Drainage Has Highest Interest

In the last Road Business we asked readers to complete a needs assessment survey. Preliminary analysis revealed a very strong message: local road managers want to read about, and have workshops for, drainage. And all aspects of drainage -- construction, design, maintenance, etc.

We have several other useful findings, but are reluctant to publish them before others respond. We've heard from over twenty percent of New Hampshire municipalities, and continue to get responses to a second mailing. If you haven't sent in your survey, please do so. If you've misplaced it, call us and we'll send another.

ALSO IN THIS ISSUE

Protect Concrete Structures 2
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Protecting Concrete Structures

Linseed Oil Easily Applied During Spring Maintenance

by Harvey S. Goodwin
Bridge Maintenance Engineer, NHDOT

The problem of protecting bridge decks, parking ramps, curbs, sidewalks, and other concrete surfaces from the ravages of winter is as old as the use of concrete itself. In spite of its smooth, rock-hard appearance, small, almost microscopic pores exist in the concrete surface. During the warmer months, moisture evaporates rapidly from these pores with no harm to the surface. In the winter, however, freezing water can cause measurable surface damage. At lower temperatures, water in the pores freezes and remains solid until the temperature rises enough to permit thawing. Several freeze-thaw cycles may occur during an average winter day. Since water expands when frozen, the effect of repeated freeze-thaw cycles is to initiate scaling and later spalling of the top surface. This is particularly true for concrete less than four years old.

The problem is aggravated by the use of most de-icing agents. These agents react with concrete and markedly accelerate the deterioration process. In particular, chlorides will penetrate concrete and cause corrosion of reinforcing steel. As the level of chlorides in concrete becomes excessive, the rate of corrosion increases. Reducing the case with which chlorides penetrate concrete surfaces is an effective means of preventing corrosive rebar and subsequent concrete deterioration.

The scaling and pitting which beset concrete surfaces, often after a single winter, point out a problem which urgently demands a solution. Two possible approaches to this problem are the use of air-entrained concrete and protective coatings, such as linseed oil.

Prominent among the corrective measures suggested is the use of air-entrained concrete. This material contains myriads of tiny air bubbles distributed more or less evenly throughout the mass. The air bubbles help to inhibit scaling and spalling due to freeze-thaw cycles and the use of de-icing chemicals. Today nearly all new concrete highway construction uses air-entrained concrete.

Air-entrained concrete failures occur frequently enough to be a source of serious concern to highway maintenance engineers. Plausible explanations, such as incorrect quantity of entrained air, improper formulation, inferior quality of aggregate, excessive trawelling of the top surface, etc. are often offered when air-entrained concrete fails in service. The fact remains that failures continue to occur and while more vigilant and costly inspection at the time of placing the concrete may obviate some of these difficulties, it could not entirely eliminate the possibility, of human error.

Protective coatings are harmless, easily applied, low-cost materials, which can be applied in thin coats to seal the pores of the concrete and thus prevent the entrance of water and corrosive solutions. These are a practical means of correcting the trouble at its source. Although we will primarily review linseed oil as a protective coating, various other substances, such as synthetic resins, silicates, and silicones have also been suggested as protective coatings for concrete. One major manufacturer of synthetic resins has advertised in national magazines to call public attention to the problem and to highlight the need for winter roadway protection.

The water-repellency characteristics of linseed oil films suggested, many years ago, its application for this purpose. The Portland Cement Association and the Salt Institute have pointed out the value of linseed oil as a protective coating for non-air-entrained concrete. Others have even suggested the use of boiled linseed oil for additional protection with non-air-entrained concrete. A number of state, county, and municipal highway departments have used and are still using linseed oil for both types of concrete.

To apply a protective coating of linseed oil costs around $.10 per square yard for materials. While application costs can vary, estimates indicate that this will not exceed an additional $.10 per square yard when readily-available, efficient spreading equipment is used.

Double-boiled linseed oil is preferred to raw oil because of its more rapid drying and film-forming characteristics. To decrease the viscosity and facilitate spreading, it is common practice to mix the oil with an equal volume of mineral spirits.

When the mixture is used, it is customary to apply two coats, the first at .025 gal. per square yard. When this has thoroughly dried, it is followed by a second coat applied at the rate of .015 gallons per square yard.

This article, and its supplement on page 3, appeared in a 1987 issue of Road Business. We have reprinted it to remind people responsible for bridge maintenance of Mr. Goodwin's important recommendations.

Mr. Goodwin, other NHDOT managers, and Steve White, a highly regarded structural engineer, have organized a workshop for local road managers.

Maintenance and Repair of Municipal Bridges

April 13 in Peterborough
April 20 in Newmarket
May 4 in Plymouth
Boiled Linseed Anti-Spalling Compound

Directions for Use

by Harvey S. Goodwin
Bridge Maintenance Engineer, NH DOT

Linseed anti-spalling compound protects concrete surfaces in two ways: by penetrating the porous surface of the concrete to a depth of approximately 1/8 inch; and by combining with atmospheric oxygen to form a protective coating through which destructive moisture and salt solutions cannot penetrate.

Uses: Linseed anti-spalling compound is used to protect roads, bridge decks, sidewalks, curbs, abutments, endposts, concrete handrails, and all exposed concrete surfaces from de-icing agents. Usually, it is not applied to the undersides and backsides of structures which are less exposed to chlorides. (For more information, see the main article.)

Material: 50% double boiled linseed oil and 50% petroleum spirits (AASHTO M-233-79 Type II).

Time of Application: Surfaces should be cleaned and washed annually in the spring of the year and oiled every two years. Linseed anti-spalling compound can be used on new and old concrete.

The oil is most effective if applied to new concrete upon completion of the initial curing period, usually considered to be about 28 days after placement. However, it has been successfully applied to new concrete after 2 weeks curing.

Linseed anti-spalling compound can be applied to concrete of any age. However, it is most effective in preserving sound concrete surfaces.

Preapplication conditions:

(1) The concrete should be dry and the solution should not be applied within 24 hours of a rainstorm.

(2) Remove sand and debris from joints, drains and bridge shoes (use high pressure water wash and let dry 24 hours).

(3) New concrete should be at least two weeks old. Ideally, it should be 28 days old.

(4) Although the ideal atmospheric temperature at the time of application is above 70 degrees Fahrenheit, successful applications have been made at temperatures as low as 35 degrees.

Application: Two coats are recommended, applied as follows:

1st Coat: 0.25 gal. per sq. yd.
(40 sq. yds. per gal.)
2nd Coat: 0.15 gal. per sq. yd.
(67 sq. yds. per gal.)

Application may be by spray or hand, but should be uniform. The coverage of each coat shall not be more than 50 square yards per gallon of the mixture. When applying the mixture to concrete surfaces, one should take all necessary precautions to ensure that the mixture does not contaminate adjoining asphalt pavements. The mixture will cause a potential safety hazard by making the asphalt pavement slippery. Also, the petroleum based linseed oil mixture may weaken the asphalt.

Complete drying should be permitted between coats. At temperatures of 70 degrees Fahrenheit or above, drying is complete within a few hours. At lower temperatures, proportionately longer drying times are required.

Care should be exercised to cover the concrete surface completely; including all edges, which are sometimes missed in spraying. Maximum protection is afforded only when coverage is complete.

CAUTION: Linseed anti-spalling compound has a flash point around 120 degrees Fahrenheit. While not dangerously flammable, it should not be heated.

In the Next Issue of Road Business

Diesel Fuel Gelling

The UNH T-Center staff has attempted to determine the reasons for excessive diesel fuel gelling during January 1994. The causes appear to be a combination of year-to-year weather patterns and EPA and IRS mandates for segregating fuel types. We will clarify and explain this conclusion in the June issue.

The information should help local equipment managers plan fuel supplies for the 1994-1995 winter. If you want information before June, call the UNH T-Center.

Also call if you want information for any of the following topics which are planned for the June issue.

Results of the Needs Assessment Survey

Metrication update and conversion tables.

Procedures for Sealing and Filling Cracks in Asphalt-Surfaced Pavements
ROAD SCHOLAR PROGRAM
REVISED

Features Multiple Levels of Recognition and Broad Subject Coverage

After a thorough review the UNH T^Center has revised its Road Scholar Program. The significant changes will provide for

1. Recognition of training participation and achievement across five levels.
2. Coverage of subjects essential to effective local road management.

Achievement Levels

The first of the five levels is Road Scholar Participant, for which an individual declares his or her intent to achieve Road Scholar status. The other four levels involve training and educational achievement. As shown in Table 1, they are defined in terms of “contact hours” (hours of actual instruction) within specific periods.

Contact hours measure the time of instructor-learner interaction. The UNH T^Center’s typical one-day training activity is from 8:30 am to 3:00 pm, with an hour and one-half for registration, breaks, and lunch. This format yields five hours of instruction, or contact hours, per training activity day. Thus, an individual could achieve the Road Scholar I level by attending six one-day activities, or four one day activities and one two-day activity.

We will also give credit and recognition for participation in certain training activities conducted by other T^Centers, by Compensation Funds of New Hampshire, and by the NHMA Property-Liability Insurance Trust.

Topic Requirements

Training activities completed will cover a range of subjects essential to local road management. Minimum requirements are established for the Road Scholar II level in terms of contact hours:

Contact Hours Subject
10 Road design and construction basics.
20 Other technical aspects of road maintenance or repair.
5 Supervision and/or personal development.
5 Tort Liability and/or Safety.
10 Balance from above and other designated training activities.

This structure ensures that, to be recognized as a Road Scholar II or above, an individual’s training will cover fundamental as well as specialized subjects. It also allows the UNH T^Center to respond to local road managers’ recommendations for training, and to provide informational programs covering new technologies.

Recognition Provisions

For all five levels -- Road Scholar Participant through Master Road Scholar -- the UNH T^Center will recognize individuals in Road Business and send a letter to their supervisor(s). For the Road Scholar I and II, Senior Road Scholar, and Master Road Scholar levels, the UNH T^Center will issue certificates and send news releases to individuals’ local newspapers.

![Table 1](image)

<table>
<thead>
<tr>
<th>Road Scholar Level</th>
<th>Contact Hours</th>
<th>Cumulative Within a Period of</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Scholar I</td>
<td>30</td>
<td>NA</td>
</tr>
<tr>
<td>Road Scholar II</td>
<td>50</td>
<td>4 years</td>
</tr>
<tr>
<td>Senior Road Scholar</td>
<td>70</td>
<td>6 years</td>
</tr>
<tr>
<td>Master Road Scholar</td>
<td>100</td>
<td>8 years</td>
</tr>
</tbody>
</table>

Road Scholars

Individuals previously recognized as Road Scholars are Road Scholar I in the revised Program. We have attempted to inform them of how they can achieve Road Scholar II status.

If you haven’t been contacted, please call (603) 862-2826 or, in NH, (800) 423-0060.

Training Activity Quality

The UNH T^Center has adopted the criteria of the International Association for Continuing Education as its standards for training activity quality. The UNH T^Center will provide a copy of this criteria to anyone who requests it.
Cold-mix Pothole Repair in Asphalt Surfaced Pavements

Common and Effective Procedures for Repairing Winter's Damage

Pothole patching can be performed during weather conditions, ranging from clear spring days to harsh winter storms, with temperatures from 100 °F (38 °C) to 0 °F (-18 °C). It is generally performed either as an emergency repair under harsh conditions, or as routine maintenance, scheduled for warmer and drier periods. Even though patches are subjected to various moisture and traffic conditions patches experience, the materials and methods for placing quality repairs are fairly similar.

Repair Techniques

Many maintenance agencies use the throw-and-go method for repairing potholes. While not considered the best way to patch potholes, it is the most commonly used method because of its high rate of production. The procedure, as described here is more accurately termed "throw-and-roll." It is considered a superior alternative to the traditional throw-and-go.

An installation technique used by many agencies is the semipermanent repair procedure. This procedure represents an increased level of effort for patching potholes. This increased effort increases the performance of patches by improving the underlying and surrounding support provided for the patches; it also raises the cost of the patching operation.

Many agencies also use spray-injection devices for repairing potholes. This technique has higher equipment costs than the other procedures, but also has a high rate of productivity and lower material costs.

Figure 1. Throw-and-roll procedure -- material placement

Figure 2. Throw-and-roll procedure -- patch compaction

continued on p. 6
Throw-and-roll

The throw-and-roll method consists of the following steps:

- Place the material into a pothole (which may or may not be filled with water or debris), as shown in Figure 1.
- Compact the patch using truck tires, as shown in Figure 2.
- Verify that the compacted patch has crown (between 0.125 in. and 0.25 in. [3.2 mm and 6.4 mm]).
- Move on to the next pothole.
- Open the repair to traffic as soon as maintenance workers and equipment are clear.

One difference between throw-and-roll and the traditional throw-and-go method is that some effort is made to compact the patches. Compaction provides a tighter patch for traffic than simply leaving loose material. The extra time to compact the patches (generally 1 to 2 additional minutes per patch) will not significantly affect productivity. This is especially true if the areas to be patched are separated by long distances and most of the time is spent traveling between potholes.

Semi-permanent

The semi-permanent repair method is considered one of the best for repairing potholes, short of full-depth removal and replacement. This procedure includes the following steps:

- Remove water and debris from the pothole.
- Square up the sides of the patch area until vertical sides exist in reasonably sound pavement, as shown in Figures 3 and 4.
- Place the mix.
- Compact with a device smaller than the patch area (single-drum vibratory rollers and vibratory plate compactors work best), see Figures 5 and 6.
- Open the repair to traffic as soon as maintenance workers and equipment are clear.

This repair procedure provides a sound area for patches to be compacted against, and results in very tightly compacted patches. However, it requires more workers and equipment and has a lower productivity rate than either the throw-and-roll or the spray-injection procedure.

Spray Injection

The spray-injection procedure consists of the following steps:

- Blow water and debris from the pothole.
- Spray a tack coat of binder on the sides and bottom of the pothole.
- Blow asphalt and aggregate into the pothole.
- Cover the patched area with a layer of aggregate. Open the repair to traffic as soon as maintenance workers and equipment are clear.

Construction

Local road managers usually assemble pothole-patching equipment and crews when there are a number of potholes within a maintenance area. Most patching operations simply try to repair the distress and restore rideability as quickly as possible. The following are recommendations for improving the overall quality of the patches. They are divided into winter and spring patching alternatives, and include preparation, placement, and compaction alternatives.

Winter Patching

Winter patching operations generally take place during periods of snow melt, when maintenance crews do not have to plow or apply abrasives or salt. Warmer weather not only provides time to patch, it also creates

continued on page 8
Spring Patching

Spring patching differs from the winter operation in that the climatic conditions will not stress the patches to the same degree. Because freeze-thaw cycling is finished, most of the conditions which soften the underlying support will have passed. Better climatic conditions increase the life expectancy for patches placed in the spring.

Materials. The choice of materials for spring patching should be based on cost-effectiveness calculations and local experience. Generally, any material acceptable for winter patching is acceptable for spring patching. One should, however, consider the effects of material handling and the differences in workability over wide temperature ranges. Materials workable at very low temperatures tend to be very sticky and hard to use at higher temperatures.

High-quality, crushed aggregate, again with few fines, and an emulsified asphalt should be used for spring patching. Antistriping additives are still advised. The mixtures can set more slowly than winter materials, since higher temperatures allow more rapid evaporation.

Selecting a procedure. Spring patching can be done by any of the procedures discussed above: the throw-and-roll, semi-permanent, or spray injection procedures. Cost-effectiveness and the availability of equipment and workers should be the most important criteria. Because the semi-permanent procedure requires more equipment and workers, that procedure may be impractical.

The throw-and-roll procedure should be considered a viable alternative for placing spring patches. Results from a recent study indicate that patches placed with this method can provide satisfactory results when high-quality materials are used.

Other Considerations. Patches placed during the spring are expected to last longer than patches placed under winter conditions. Observations in a recent field test indicated that patches in place after the initial setting period (2 to 4 weeks) were likely to remain in place until the surrounding pavement begins to deteriorate. The goal of spring patching operations should be to place patches which last as long as the surrounding pavement. Patches surviving more than one year reduce the cost of the overall operation by reducing the amount of labor, equipment, and material needed in subsequent years. However, cost-effectiveness calculations should still be based on survival for one year.

AVAILABLE WRITTEN MATERIALS
from the
University of New Hampshire Technology Transfer Center

Many copies of the following books/pamphlets/cards are available through the UNH T²Center. You can request them by mail or telephone. If by mail, check the items you would like to have, fill in your address at the bottom of the page, tear out the page and fold so the UNH T²Center address is on the outside. Tape closed and mail. To request by telephone, call (603) 862-4348 or (800) 423-0060 (in NH).

Highway/Utility Guide. Addresses the full array of issues which can arise from highway and utility facilities sharing common right-of-way.

- Importance of Maintaining Small Traffic Signs
- Repair and Replacement of Sign Panels
- Repair and Replacement of Sign Supports
- Materials and Equipment to Maintain Small Traffic Signs

- Line of Sight Clearance
- Trees in Clear Zone
- Mowing for Safety
- Safety Tips for Vegetation Control

Financing Rural Road and Bridges in the Northern New England States. Reports the results of an academic study, but is written in simple language. An excellent book for Town Managers, Selectmen, and similar officials.

Rating Unsurfaced Roads. An Army Corps of Engineers "field manual for measuring maintenance problems."

A Series of Quick Guides for New Hampshire Towns. A set of pamphlets, developed by the UNH T²Center with other agencies, covering the following topics.
1. Culvert Installation & Maintenance
2. Ditch/Channel Construction & Maintenance
3. Vegetative Erosion & Sediment Control
4. Non-Vegetative Erosion & Sediment Control
5. Cut & Fill Slopes
6. Beaver Pipe: Construction & Maintenance
7. Stormwater Inlets & Catch Basins
8. Mowing and Brush Control
9. Snow & Ice Control
10. Obtaining Permits

Local Low Volume Roads and Streets. A clear, comprehensive description of construction, maintenance, and repair basics. Cites numerous references, which are also available through the UNH T²Center. (The UNH T²Center recently distributed one copy of this book to every NH municipality.

The following materials remain from last summer's Work Zone Safety Workshop. Those marked with an asterisk (*) are specifically for field use.

Design and Operation of Work Zone Traffic Control: Participants Notebook. Contains useful information for self-teaching, local training, or reference.

Work Zone Traffic Control Information Catalog. Federal Highway Administration summary of standards, guides, handbooks, manuals, and training courses related to WZTC.


*Pocket-sized booklet Work Zone Safety for Rural Agencies.

*Traffic Control Card; Important Information.


To request material by mail, fill in your name and address below, and mail to the UNH T²Center.

Name: ________________________________

Address: ________________________________

______________________________________

Town: ________________________________ NH ______

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The following videos from UNH T³Center Video Library are particularly applicable to local road management this time of year. To request mail by mail, check the videos you would like to have, fill in your address on the previous page, tear out the page and fold so the UNH T³Center address is on the outside. Tape closed and mail. To request by telephone, call (603) 862-2826 or (800) 423-0060 (in NH).

__DC-201 Pothole Repair. 12 min. Demonstrates traffic control during repair, cleaning, filling and cleanup.__

__DC-213 Blading Unpaved Roads. 22 min. Illustrates operations described in the NACE Engineers Training Guide Series booklet "Blading Aggregate Surfaces."

__M-205 Potholes - Causes, Cures, and Prevention. 17 min.__

__M-223 Cleaning and Clearing of Bridges. 13 min.__

__M-228 Repair of Depressions, Rutting and Corrugations. 14 min.__

__M-230 Replenishing Earth and Gravel Shoulders. 19 min. Demonstrates shaping and compaction.__

__M-231 Mechanical Cleaning of Unlined Ditches. 20 min. Cleaning ditches with a motor grader and a backhoe.__

__M-232 Pothole Repair in Surface Treatment Pavement. 13 min.__

__M-233 Regraveling. 17 min. Shows basic steps and procedures.__

__M-234 Patching Unpaved Roads. 11 min. An eight-step procedure to provide a long, lasting repair.__

__M-235 Re-shaping Earth and Gravel Shoulders. 15 min.__

__M-254 Potholes: Causes, Cures, and Preventions. 13 min.__

__M-256 Pavement Structure Repair Techniques. 27 min. Gravel road aggregates, structure, and maintenance techniques using a motor grader.__

__M-256 Ditch Maintenance. 17 min.__


__M-264 Clean Cut Ditches. 10 min. Purpose of ditches, maintenance techniques, and special precautions.__

__M-264 Edge Rut Repair. 13 min. Demonstrates shoulder repair, and explains the purpose of each step.__

__Catalog. UNH T³Center Video Loan Program._
Road Business Three Year Index

Call UNH T²Center For Copies

When did this last happen to you? You need some information. You know you read about it somewhere. But where?

If you read it in past issues of Road Business, this index should help. For a copy of the article, please call us.

We suggest you keep the newsletters, which fit loose-leaf notebooks or file folders. We will retain copies, but having your own copy will be more convenient. A three-year index will be an annual feature of Road Business.


UNH T²Center
Office Hours

7:00 am to 3:30 pm
Monday thru Friday

Most local road managers and their crews begin work at 7. So they can reach us shortly after beginning work, we have revised our office hours.

To minimize inconvenience to others, if staff members are in the office after 3:30 they will answer the telephone.
Road Business
Technology Transfer Center
Civil Engineering Department
University of New Hampshire
Durham NH 03824-3591
800/423-0060 (NH) or 603/862-2826

UNH T² Center Staff:
David H. Fluharty      Manager
Charles H. Goodspeed    University Liaison
Jennifer Rand          Administrative Assistant
A. R. Van de Meulebroecke T² Engineer

Calendar

Northern New England Training for Local Road Managers
By UNH T² Center

(Boldface indicates a Road Scholar Program Activity)

For information and/or registration call
The UNH T² Center
(800) 423-0060 (in NH)
or (603) 862-2826

Bridge Maintenance:
April 13 in Peterborough
April 20 in Newmarket
May 4 in Plymouth

Reinventing Government Telecourse:
April 21 in Concord, with New England Chapter, American Public Works Association.

Municipal Equipment Management System: April 26 in Meredith.

Road Drainage: June in Portsmouth, date to be determined.

Work Zone Traffic Control: August 23 and 24, locations to be determined.

Planned for Fall, 1994:
Basics of a Good Road
Road Repair Strategies and Cost Estimates
Tort Liability
Winter Operations
Deicing

By 7th Annual Mountain of Demonstrations
June 10
Waterville Estates
NH Road Agents Association
UNH T² Center

By Other Organizations

For information and/or registration, call the number indicated.

By NHMA-PLIT: (800) 852-3358.
Snow Plow Rally Series and Snow Plow Rally Plof-Off: September and October in various locations.
By NH Public Works Association: 472-3070 or 424-2331.
Public Works Privatization: Threat, Option, or Opportunity: May 19 in Epsom.

By Maine Local Roads Center: (207) 287-2151.
Road Surface Management System: In April in various locations.
Skowhegan Highway Congress: June 2 in Skowhegan, ME; with Maine APWA.

By Baystate (Massachusetts) Road Program; (413) 545-2604.
Recycling Pavement: April 12 in Taunton, April 13 in Westford, and April 14 in Northampton.
Reinventing Government Telecourse: April 21 in Shrewsbury, Amherst, Lowell, and Barnstable.
Consider Geosynthetics: April 26 in Northampton, April 27 in Taunton, and April 28 in Southborough.
Culverts: June 22 in Northampton, June 23 in Westford, and June 24 in Taunton.

By Vermont Local Roads Program:
(802) 654-2652.
Basics of a Good Road: April 5 in Waterbury.
Advanced Welding: April 6 in Rutland.
Motor Grader Operator Training: April 25 in Bradford plus one day in field.
Asphalt Paving: May 5 in Rutland and May 6 in Waterbury.

Road Business is published quarterly by the Technology Transfer Center at the University of New Hampshire (UNH). The UNH T² Center is supported by the Federal Highway Administration (FHWA), the New Hampshire Department of Transportation (NH DOT), and the University of New Hampshire. Any opinions, findings, conclusions, or recommendations presented in this newsletter are those of the authors and do not necessarily reflect the views of FHWA, NH DOT, or UNH.

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