U.S. Department of Transportation
Federal Highway Administration

ROAD BUSINESS

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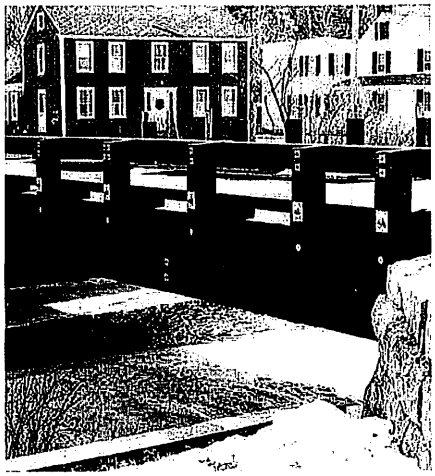


Above: New London's timber bridge spans 64.5 feet, has a 24 foot clear roadway, a 5 foot wide walkway, and saved tax payers over $100,000.00

On The Road In New Hampshire

Timber bridge saves money for New Boston

When the Town of New Boston needed a replacement for the Depot Street Bridge, they sought an alternative to the traditional steel and concrete type of construction. The idea of a timber bridge seemed to appeal to the people in New Boston and, in fact, they voted unanimously to forego a state proposal and seek proposals for a timber bridge.

Lee Murray, Road Agent for the Town of New Boston contacted bridge companies with questions concerning their bridge project and the use of timber for the superstructure. Lee found out a lot of information about modern timber bridges. After reviewing the Town's requirements Lee Murray met with Mr. Willard Dodge, First Selectman for the Town of New Boston and established the following course of action.

1. The town would request proposals from three engineering firms to review and advise on the bridge hydraulics, abutments, approaches, and superstructure. The firm selected would act as the "Engineer of Record." Costello, Lomasney & de Napoli, Inc. (CLD) of Manchester, NH was awarded the contract in the Spring of 1992. Mr. Kenneth R. Rhodes, P.E. was the Project Manager for CLD.

2. The town would request proposals from three timber bridge designers/fabricators for a bridge with a span of 64.5 feet, clear roadway width of 24 feet, 5 foot walkway on one side and design loading of AASHTO HS25 (maximum deflection of L/500). The bridge manufacturer's responsibility also included coordination of his drawings with

continued on p.2

A New Kid On The Block?

What is the NHCCPWA?

State Municipal Association leaders representing Public Works, Water Resources, Engineers, Fleet Managers and Safety agencies have established a new group designed to share information and resources among its members. The New Hampshire Coordinating Council of Public Works Associations has been created to provide a mechanism whereby the various professional associations representing the wide range of local

continued on p. 2

-- ALSO IN THIS ISSUE --

On The Road...
continued from p. 1

the abutment work and on-site supervision during erection. On July 29, 1992 Construction Dynamics of Goffstown, NH was selected to provide the timber superstructure.

3. The timber superstructure would be erected with town forces.

4. The abutment rehabilitation would be advertised to local contractors.

5. Road approaches, approach rail, signage, and asphalt paving would be advertised to local contractors.

6. The Town would seek funding from the State for portions of the work.

Murray, Dodge, and Kanik established a project budget of $140,000.00.

The original proposal from the state was in the amount of $550,000. The town would be responsible for 1/3 of the cost or $181,500.00. I must note that the state's original proposal was very different from that of New Boston and cannot be directly compared to the final proposal. For example, the final proposal indicated rehabilitating the existing abutments whereas the original proposal indicated completely new abutments. Nonetheless, the town and the state worked hard together to build a much needed bridge at the lowest possible cost. The final proposal was the result of a joint effort among all parties involved.

Recent conversation with the town has indicated that the project cost fell within the established budget of $140,000 and the state was funding approximately $71,000 of the construction costs.

The total expenditure by the town of New Boston was approximately $69,000.00. The town saved over $112,500 of taxpayers money and has built a bridge with a design life in excess of 80 years.

This is the kind of Yankee ingenuity that New England is famous for! ■

A New Kid...
continued from p. 1

government interests of Public Works, Engineering, Natural Resources, Infrastructure Management, and related activities can meet to coordinate work efforts, share resources, offer information and discuss issues and needs of their respective members.

The new Association has conducted several planning meetings to assist with the establishment of the Coordination Council, has developed a mission statement identifying its purpose and member representation, and has taken initial steps to communicate news of the new Council to related Associations. FHWA-Technology Transfer Center, at UNH-Durham (T2 Center) staff will provide assistance with maintaining membership lists, an annual state-wide calendar of events, and other resources in organizing future conferences.

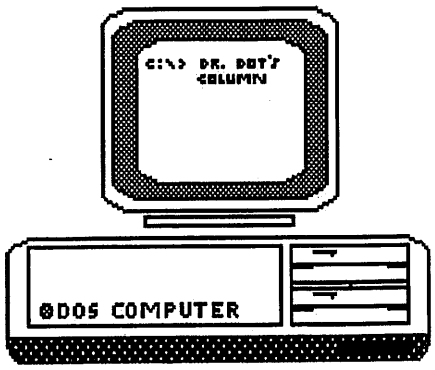
Michael Bobinsky, Director of Public Works for the City of Concord, and one of the founding members of the new Association, said, "The need for the Coordinating Council stemmed from the fact that many of the professional Associations representing local government interests had similar members, and found the need to more formally share information and resources regarding trends, conference and workshop events, and to discuss common issues. The new Coordination Council will provide this opportunity, and enable the various Associations belonging to the Council achieve greater results for their respective members." The Coordinating Council is presently represented by the following ten associations:

- NH Public Works Association
- NH Water Works Association
- NH Water Pollution Control Association
- NH Municipal Engineers Council
- Maintenance Association of the Granite State
- Compensation Funds of New Hampshire
- NH Municipal Association-Property Liability Insurance Trust
- NH Technology Transfer Center
- NH Road Agents Association
- Consulting Engineers of New Hampshire

For more information contact the Technology Transfer Center at 800-423-0060 or Mike Bobinsky, Public Works Director, City of Concord, at 228-2737. ■

New Offerings From The PC-TRANS Software Clearinghouse

Do you own a computer? Do you work in transportation? Do you know about PC-TRANS? ...you should ...and you should read on!



PC-TRANS offers toll-free fax line

PC-TRANS has established a toll-free telephone fax line dedicated to sales and technical support services. The number is 800-245-8760. It will be available 24 hours a day.

The toll-free line was established to increase convenience and decrease costs for customers of PC-TRANS' software distribution service. It should also enable staff to provide even faster, more reliable technical support.

continued on p. 3

Coming to Public Television In 1994: "Coming & Going"

Coming in the spring of 1994 is "Coming and Going," four moving hours about transportation in America on public television. The series will explore the importance of mobility to our economy, character, and way of life -- in the past, present and future.

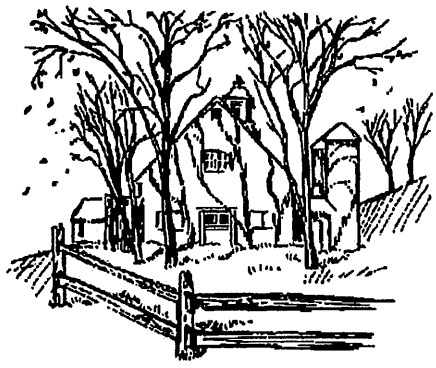
Program One: Long Distance Travel

This program explores how and why our nation's character and economy are inextricably connected to our desire and need to travel.

Program Two: Freight

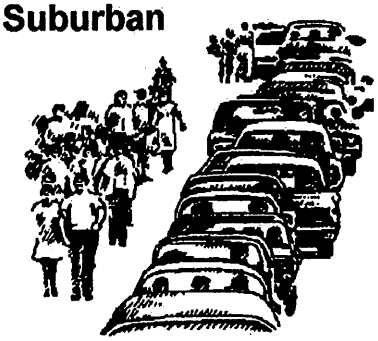
This program explores the heavy importance of freight transportation and goods to the nation's commercial and social well-being.

Program Three: Rural



This program explores how transportation affects rural America's access to jobs, education and health care. It will also show how rural areas present unique opportunities to test innovative solutions to transportation challenges, such as the use of timber bridges.

Program Four: Urban/ Suburban



This program will visit several major cities to investigate how our transportation systems are being challenged and how the nation is responding.

Keep your eyes open! We will continue to keep you posted concerning this event. This could be a great program for your local constituents to watch. The more the public can understand transportation the better we will be able to do our jobs. The program will be run sometime in 1994. It could be used in advertisements about Public Works week. It could be used to help inform the public about some of your departments accomplishments.
The departments that keep their public informed often end up better off than the ones who only get publicity when things go wrong. ■

New Offerings...
continued from p. 2

PC-TRANS is an FHWA-designated software distribution center established to help transportation professionals obtain the technology they need. The center's offerings include public-domain and shareware software in addition to many proprietary software packages. The recently released PC-TRANS 1993 catalog of software products describes about 200 programs and related publications available through the service. It's available free.

Another free service offered by PC-TRANS is a quarterly magazine, *pc-trans,* which explores issues and topics in the use of personal computers by transportation professionals.

Why not check out that toll-free fax line by requesting a free product catalog or subscription to *pc-trans?*

PC-TRANS releases revamped software directory

With nearly 800 listings of transportation-related software and information sources all in one publication, the *PCs in Transportation Software Directory* is the most comprehensive reference of its kind. The 1993 edition, now available from PC-TRANS, contains some 100 new listings.

Organized into eight sections, the *Directory* covers: civil engineering, facilities management, freight transportation, information sources, transportation planning, transit operation, traffic engineering, and utility/miscellaneous. A comprehensive index provides quick access to listings by title, distributor and key words. Each listing includes a description of the program, hardware and software requirements, pricing and availability.

The Directory is available in two formats, either as a 3-ring bound hard copy or in software form on diskette. The disk version is an easy-to-use, self-installing program providing enhanced access to all the listings of the *Directory.*

continued on p. 7

Steel Meshes Against Longitudinal Frost Cracks

The US FHWA is developing a "win-win" situation by working and sharing information with transportation organizations throughout the world. FHWA recently sent one of New Hampshire's T² Engineers to Finland to help facilitate a stronger international technology transfer partnership. We uncovered a very interesting piece of Finnish technology used for preventing cracking due to frost heaving. Given the frost heave problems we deal with in New Hampshire we wanted to share this information with you. The following article is reprinted with permission from FinnRA. We added the metric conversions for your convenience.

Longitudinal frost crack is a quite usual distress in flexible pavements in Finland. Permanent conventional repair measures are expensive and time consuming. Nearly 20 years of experience has shown that properly placed steel meshes in the pavement are a cheap, simple and reliable measure to prevent frost cracks.

Meshes can be placed either in the unbound granular base course or between two bituminous courses. If the bearing capacity of the pavement is poor, it is preferable to place the meshes into the base course. The meshes must always be placed so that the longitudinal bars (along the road centerline direction) are on top.

Steel meshes are suitable for the cases in which the width of the crack is less than 100 mm [4-inches] and the total frost heave is less than 200 mm [8-inches]. The drainage system of the road must function properly.

The meshes should be placed five to ten meters [about 16.5 to 33 feet] over the length of the crack. In transverse direction of the road the meshes must be continuous from one edge of the road to another.

It is recommended not to place meshes on road sections where there are cables, pipes, culverts or similar under the road.

Mesh Types

The choice of the mesh type shall be based on the width of the pavement and on the severity of the cracks. Generally, the wider the pavement is and the wider the cracks are, the stronger the meshes must be. The mesh B500K-7/5-150/200 (cold worked, tension test min. 500 N/mm) is usually strong enough for six to seven meters [about 20 to 23 feet] wide pavements with crack width of some centimeters. More information about meshes in FinnRA's publication. "Terasverkkojen asentaminen, Kaytannon ohjeita" (Arch. code 177/1991).

Mesh In The Base Course

The dimensions of the meshes are given in **Figure 1**. The length of the main bars must be 500...700 mm [20 to 28 inches] more than the width of the new surface. The length should be chosen so that the edges of the meshes are not coming out of the slopes.

For practical reasons there should be about 150 to 200 mm [6 to 8 inches] thick layer of aggregate above the meshes. If the increase in the bearing capacity requires a thicker (e.g. 300 or 400 mm [12 to 16 inches]) aggregate course, it should be done in two layers so that the meshes are between the lower and the upper layers.

continued on p. 5

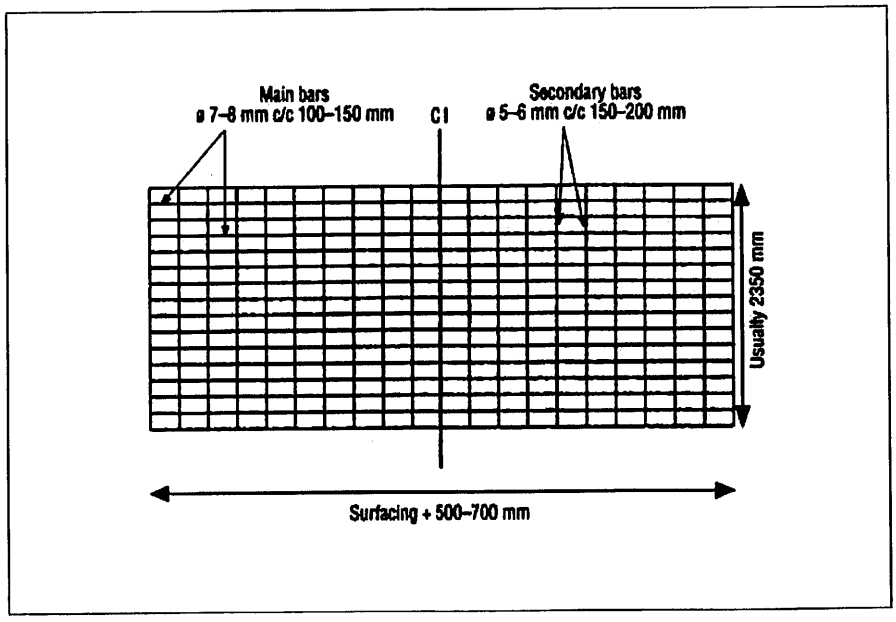


Figure 1

Dimensions for meshes in unbound granular base

Steel Meshes...
continued from p. 4

The road section under work is in normal cases 40 to 50 m [about 130 to 165 feet] and the speed limit is reduced to 10...20 km/h [about 5 to 10 mph].

Mesh In The Bituminous Layers

There have been some technical problems with the meshes when paving. The main problem has been the movement of the meshes caused by passing traffic and by the thermal effects of the hot bituminous mix. It is recommended first to lay a leveling course upon the meshes and after that the new wearing course. If a leveling course is not used, the thickness of the asphalt layer upon the mesh should be 50 mm [2-inches] or more. In the thin layers rutting may be a problem later on and milling can be difficult, maybe impossible.

The mesh types are the same as in the base course case. The meshes are laid upon the bituminous surface freely without overlapping or nailing one after another. The secondary bars must be on top. The proper length of the main bars is 100 to 200 mm [4 to 8 inches] less than the width of the new surface.

The paver should be a pneumatic-tired paver with four axles. The recommendation of the paving speed is 3 m/min [about 2 ft/min].

If the rutting depth is more than 50 mm [2-inches], the ruts should be filled or the surface should be milled.

The pavement structure must be unfrozen before the work is started.

The paving on the steel meshes is slower and needs usually more asphalt mix (a thicker layer) than normal paving.

The above article was written by Seppo Salmenkaita, FinnRA. ■

Basic Equipment For Asphalt Compaction

A look at the proper use of four rollers

Asphalt paving contractors use four types of self-propelled compactors; steel wheel static, steel drum vibratory, pneumatic tire, and combination rollers. Here's a look at the proper application for each.

Steel Wheel Static Rollers

For many years, the steel wheel static roller was the standard machine for compacting asphalt On many jobs, it was the only roller. However, increasing demands on asphalt pavement have shown steel wheel rollers alone cannot provide adequate density, especially on mats thicker than 2 to 3 inches (50 to 75 mm).

Also, they can bridge and leave soft spots in a mat. So today, contractors use steel wheel static rollers mostly for finish rolling. Their ironing effect smooths out previous drum marks as long as the mat is still hot enough to let the material move slightly.

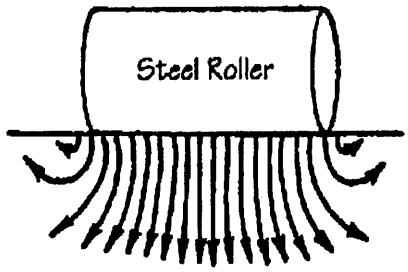


Figure A

The lines of force under a steel wheel static roller bend back up toward the surface of the mat as they meet resistance from the subgrade and from confining pressure within the mix (**Figure A**).

Some material may be pushed up, forming a hump next to the edge of the drum. If this occurs, the succeeding pass should overlap the previous pass by 3 to 4 inches (75 to 100 mm).

The only operator-controlled variables with steel wheel static rollers are rolling speed and distance behind the paver. Changing ballast is possible, but rarely used. In any event, the rolling pattern and weight should not be changed after they have been proved on a test strip.

Steel Drum Vibratory Compactors

You can use double drum, vibratory compactors in all phases of asphalt compaction: breakdown, intermediate, and finish.

The vibration is created by eccentric weights rotating inside the drums. Their action generates rapid blows that transmit compactive energy to the mat. The distance the drum moves up and down is called amplitude. The greater the amplitude, the greater the compactive energy.

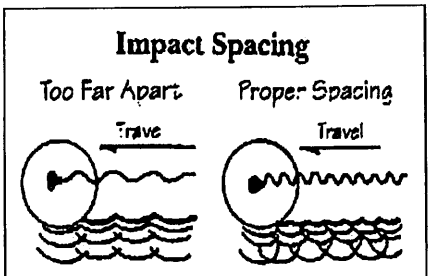


Figure B

Frequency of impact is measured in vibrations per minute. Ten impacts per foot of mat is a good rule of thumb (**Figure B**). For example, if the impact frequency of your machine is 2000 vibrations per minute (VPM), your operator should adjust rolling speed to about 200 fpm (61 mpm). A target working speed of 300 fpm (91 mpm) matches a frequency of 3000 vpm.

Many vibratory compactors deliver variable amplitude. Experiment with various amplitudes when compacting the test strip. Settle on the one that produces density in the fewest number of passes.

Recent-design vibratory compactors

continued on p. 6

Basic Equipment for Compaction... continued from p. 5

also offer other features that help improve mat quality:

- Independent drum vibration gives the operator broad flexibility in matching vibration to the type and depth of mix. The operator can have both drums vibrating, both static, or one vibrating and one static.
- Automatic vibratory shutoff suspends vibration when the roller stops. This way, the drum doesn't hammer the mat in one place when the roller pauses, even briefly when changing directions.
- Automatic reversing eccentric weights change direction when the roller does. When the weights always rotate in the same direction as the machine is traveling, the compactor produces a smoother mat.

Pneumatic Tire Compactors

Contractors use pneumatic tire compactors for breakdown and intermediate compaction. They can also be used to condition finished surfaces.

The critical difference in pneumatic tire compactors is the kneading action rubber tires exert (**Figure C**). This characteristic helps the multi-wheel, pneumatic tire machine manipulate the mat under and between its wheels. The result is a stable, tight finish.

Reducing tire pressure causes the bottom of the tire to flatten out, thereby increasing the contact area and reducing the ground contact pressure. Compactive effort is less, but the kneading action is accentuated. So, reduce your time pressures for finish rolling.

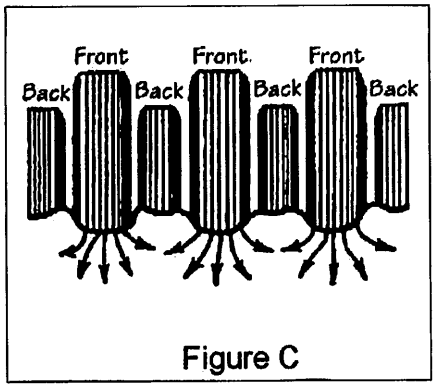


Figure C

Tire inflation pressure is critical to the performance of a pneumatic tire compactor. The higher the pressure, the smaller the ground contact area and thus, the higher the compactive force transmitted to the mat (**Figure D**). Keep pressure high for breakdown and intermediate compaction.

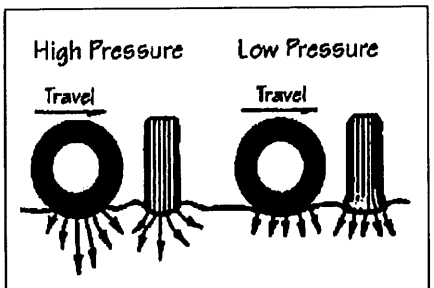


Figure D

The roller's water spray system is especially important when compacting with a pneumatic tire machine. When the roller starts to work, the tires will be cold and, unless they are wetted, hot asphalt will stick to them. As the roller works, the tires will heat, the asphalt will no longer stick; and your operator can turn off the water spray system.

Combination Rollers

Combination rollers combine a vibrating drum on one end of the machine with three or four pneumatic tires on the other. These rollers attempt to combine the characteristics of both types in a single machine. Their use can reduce the number of machines needed on a job where both vibratory and pneumatic compactors are required.

However, a single combination roller is not as effective as two separate rollers. Therefore, use of combination rollers is not widespread.

Reprinted from MO Transportation Bulletin, Vol. 10, No. 2. Original source: *International Paving News*, Vol. 2, No. 2, Caterpillar Paving Products, Inc., Minneapolis, MN. ■

New Offerings... continued from p. 3

The program requires an IBM-compatible PC with MS-DOS 2.1 or above, 640k RAM and about 2.5 megabytes of free hard-disk space.

The 1993 *Directory* is priced at $35. Owners of previous editions of the *PCs in Transportation Software Directory* can qualify for a reduced update price of $25 by returning either the title page or disk #1 of their old *Directory*. Specify format (hard copy, 3.5" disks or 5.25" disks) when ordering. A $5 processing fee is added to each order. Outside North America, add shipping charges of $15 per copy (printed) or $ 10 per copy (diskettes).

To order the 1993 *PCs in Transportation Software Directory*, contact PC-TRANS at the University of Kansas Transportation Center, 2011 Learned Hall, Lawrence, KS 66045, (913) 8645655; toll-free fax line for orders and technical support only, (800) 245-8760.

PC-TRANS updates software catalog

PC-TRANS announces the availability of its 1993 catalog of transportation-related software products. The catalog describes approximately 200 programs and related publications available through the PC-TRANS Software Distribution Service. The easy-to-use catalog is organized into 11 areas of application: environmental engineering, highway engineering, hydrology, management aids, mapping & GIS, structural engineering, surveying, traffic engineering, transit operations, transportation planning, and utilities & miscellaneous. To further aid in locating programs, the catalog is also indexed by title.

Additions to the catalog are listed in each issue of *pc-trans* magazine.

To request a free copy of the catalog (or a free subscription to *pc-trans* magazine), contact PC-TRANS at the University of Kansas Transportation Center, 201 1 Learned Hall, Lawrence, KS 66045, (913) 8645655; toll-free fax for orders or technical support only, (800) 245-8760. ■

Roads And Economics In New England

Efficiency in Public Goods Provision:
The Economics of New England's Rural Roads

This article includes excerpts from a study by Dr. John M. Halstead, Department of Resource Economics and Development, University of New Hampshire and Dr. Steven C. Deller, Department of Agricultural Economics, University of Wisconsin.

A study was recently conducted to analyze managerial efficiency of northern New England towns in the production of rural road services. Results suggest that managerial inefficiencies are present and costs may be 40 percent higher than necessary. Further analyses indicate that local road officials who participate in formal training programs tend to significantly raise efficiency levels.

Below are some excerpts of the study presented August 1993 at the American Agricultural Economics Association Meetings in Orlando, Florida. The applied research presented in this paper assesses the ability of local road officials in the three northern New England states to effectively provide local road services in a cost effective manner.

The local road network is the heart of the stock of infrastructure supporting economic activities in rural areas (Gillis, 1989). While a well-maintained road network is essential for the efficient transportation of goods produced in rural areas to and from markets as well as for linking rural residents to employment opportunities, shopping districts, and health care facilities, the combined effects of age and deferred maintenance have greatly reduced the effectiveness of local roads (Congressional Budget Office, 1983; Hackett and Busson, 1986; Deller and Halstead, 1991).

Rural Local Roads

The rural road system in the United States includes approximately 3.2 million miles of roads and highways plus thousands of connecting bridges (Chicoine, Walzer and Deller, 1989). More than 60 percent of rural road mileage is on county and town/township systems. In total, 14,349 towns and townships and 2,732 counties maintain rural roads. Mileage responsibility ranges from an average of 33 miles for towns and townships to 728 miles for counties (Chicoine et al., 1989).

In northern New England (Maine, New Hampshire and Vermont) towns are vested with maintaining a total of 26,552 miles of public roads and 2,957 bridges (Chicoine, Walzer and Deller, 1989). The typical northern New England town is responsible for only 28.5 miles of road and three bridges. In light of the typical size of operation, the maintenance of the northern New England rural road network can be viewed as a scattering of small operations.

The condition of the rural road network supporting local economic activity is a cause for concern. Based on the assessment of local road officials in the three study states nearly one mile in four is in need of major repair and one in three requires more than regular maintenance (Deller and Halstead, 1991).[1] Almost a third of all town maintained bridges are in a sufficient state of disrepair that traffic flows are negatively affected. This pattern of a decaying rural road network, unfortunately, is not specific to northern New England (Walzer and Chicoine, 1987, 1989; Chicoine and Walzer, 1984). At issue here is the ability of the rural road network to continue to provide the vital underpinning necessary. for the efficient operation of the rural economy.

Results

[Results of this study support that] ...a responsible policy prescription... is the consolidation of production responsibilities, something considerably short of jurisdictional consolidation. Cooperative arrangements, state- or region-sponsored circuit rider programs, or jointly hired engineers are examples of policies that have lower costs through a consolidation approach.

Another approach that is supported by these results emphasizes the training of current officials. Training workshops in road engineering practices are available in nearly all the states. The results suggest that the return on the initial costs of the training programs is sufficiently large to warrant serious attention. ...The dramatic under-investment in infrastructure and rapidly increasing property taxes in northern New England demonstrate that towns can ill afford to waste limited resources.

Notes:

[1]A survey instrument was mailed to 981 town road officials in Maine, New Hampshire, and Vermont in the summer of 1990. A total of 316 usable surveys were returned (Maine-176; New Hampshire-63; Vermont-77). Although a 33 percent response rate is similar to other such studies, it must be remembered that only one in three officials responded.

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For a complete copy of this paper contact the New Hampshire T² Center by sending in the attached mailer or calling 800-423-0060 (NH Only) or 603-862-2826. ■

Two Activities You Won't Want To Miss!!!

October 29, 1993

The New Hampshire Road Agent Association is sponsoring an exciting half-day get together for their members. Two sessions designed for New Hampshire Road Agents will be conducted.

- The national chairman of the board of the International Management Council will present an inspiring session on leadership skills and techniques.
- The nuts and bolts of prewetting salt with calcium chloride will be presented for your evaluation and discussion.
- Business meeting and election of officers for 1994.

At Waterville Valley Estates. Lunch will be included. Because this informative program is available only to NHRAA members, nonmembers should take this opportunity to join. For membership information call T² Center (800) 423-0600 or (603) 862-2826.

November 9, 1993

Responsible Deicing Practices, .a Road Scholar workshop developed as an informtion and eduction activity of the *Lake Winnipesaukee Watershed Non-Point Source Pollution Project.* Presentations include water quality issues, snow dumping, town salting policies, salt use and storge, alternative deing materials, liability issues, vulnerable/sensitive areas and risks, and calibrating salt spreaders. This exciting day in Meredith ends with a site visit to a salt sensitive area.

TECHNOLOGY TRANSFER CENTER (T²C)

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