

M A S S INTERCHANGE

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Using Geotextiles In Unpaved Low Volume Roads

There is an old saying about roads, "If you can drain it, you can maintain it." Excessive water in a roadbed is the most common cause of rutting on rural roads. Poor or insufficient base compounds the problems caused by water. Common sources of water in the roadbed are underground springs in or near the roadbed, a high water table in areas having flat terrain, or low areas where surrounding fields are higher than the roadway and there is nowhere to divert the water. The problem may be continual such as ground seepage or intermittent due to rain or flooding. Improving drainage is ideal, but cannot always be accomplished.

In order to increase the stability of weak subgrades and to increase the load bearing capacity while reducing the cost of maintaining the road, geotextiles have been used successfully.

The Function of Geotextiles

The three primary functions of geotextiles when they are used in unpaved roads are:

☆ Separation is the main benefit in stabilization work with geotextiles. It is the ability to prevent the intermixing of two materials. With a geotextile in

place, aggregate base materials under load are not forced into the subgrade. Subgrade soils cannot mix with the clean aggregate layer. Without geotextiles the aggregate and weak subgrade soil would mix. Load bearing capacity would be reduced and rutting accelerated. The fabric would allow water to pass through while preventing the layers from mixing.

☆ While acting as a separator, the

geotextile may also function in a filtration and drainage capacity in wet or saturated soils. Under load, high pressure creates a soil slurry that "pumps" upwards against the fabric. The fabric acts as a filter, screening out the fines from contaminating the aggregate layer while allowing water to drain freely through the aggregate. Filtration is the process of allowing water to pass

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LTAP Local Technical Assistance Program

(413) 545-2604 <http://baystate.ecs.umass.edu>

New Pedestrian and Bicycle Information Center Unveiled

If you've ever had a technical question about bicycling or walking facilities, wanted to know what the latest research says about bicycle and pedestrian safety, or needed examples of how different communities have solved a problem involving bicycling or walking, you can now call toll free **(877) WALKBIKE** or visit the website at **www.walkinginfo.org** to find the answer.

In both instances you'll be dealing with the new Pedestrian and Bicycle Information Center established by the U.S. DOT to serve as a clearinghouse and technical resource for professionals in the field. Managed by the University of North Carolina's (UNC)



Highway Safety Research Center, with the expert assistance of the Association of Pedestrian and Bicycle Professionals, the center provides a unique resource, which is accessible by mail, phone, fax, and online.

Call and talk with the on-site technical resource person, Andy Clarke, or one of UNC's knowledgeable staff members.

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WALK MASSACHUSETTS

Baystate Roads presented **Not Just Another Pedestrian Conference**, on May 24, 2000 at Clark University in Worcester, MA. This was the first Pedestrian Road Show to educate participants of the needs of pedestrians in Massachusetts communities. National and local experts spoke on education, enforcement, the economic and health benefits of walking, advocacy for walkers, and traffic and urban design. The conference was a collaborative effort of talented people who came together out of a concern for the needs of pedestrians in the Commonwealth. Over 120 people attended this very successful conference.

Members of the organizing committee are shown above.

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through the fabric while preventing of soil mitigation. Evaporation from underlying soil can proceed, preventing development of water pockets and hydrostatic excessive pressure due to rapid or repeated loads.

☆ Drainage can be critical to the structural performance. Water must be able to pass through the fabric. If the subgrade soil is subjected to persistent or even occasional wet conditions, the section must be permeable to allow rapid drainage of water from the loaded subgrade soils up into the free draining aggregate base. Maintaining the drainage of the aggregate base and of the subgrade soils is very important in preventing failure of the support system. If the fabric is placed full width so that the edge of it is out to the shoulder, it will also "wick" away from the center of the grade to the shoulder.

☆ The use of geotextiles on a road section allows for the increase of stress of subgrade soils. Geotextiles with superior frictional characteristics, such as needle punched nonwoven fabrics, aid in "locking" the aggregate in place. By keeping the aggregate in place, the base course retains its structural integrity. When using geotextiles, a reduction in the thickness of aggregate is possible.

Benefits of Using Geotextiles

1. Longer serviceable life of the roadway.

2. Reduced maintenance costs.
3. Reduction of the depth of the structural section required to carry the load.
4. Reduced initial construction costs.
5. Possibility of reclaiming aggregate used in temporary roads.
6. Structural section life is prolonged and maintenance costs reduced because soil intermixing between layers is restricted.
7. Cost effectiveness--approximately 33% reduction in aggregate required

in the initial design of unpaved structural sections.

Woven Versus Nonwoven Geotextiles

Woven fabrics have a higher modulus (stress/strain) and develop maximum tensile strength with minimum elongation, but woven fabric has lower abrasion resistance, less permeability, and poorer surface friction than nonwoven fabric. Passage of water within the plane is defined as lateral

permeability or transmissivity. Woven fabrics do not pass within their plane and because they do not, woven fabrics can be a problem on gravel bases. Woven fabrics should be considered only for locations that are fairly dry, where abrasive forces are minimized and where soil/fabric/aggregate friction characteristics are not important.

Nonwoven fabrics offer superior resistance to abrasion damage and provide excellent characteristics for separation, filtration/drainage. Under load they develop high tensile strength and have good friction properties making them excellent for reinforcement.

Nonwoven fabrics have the capacity of passing water through both normally and within the plane. Nonwoven geotextiles are recommended for most unpaved road applications.

Installing Geotextiles

In order for geotextiles to perform well in road stabilization, the fabric chosen must be of the proper type, and it must be installed properly. Fabrics damaged during placement, or installed in a highly wrinkled condition, will not perform well.

The aggregate overlay must be placed to its full depth and must be applied in a way that will not cause damage to the fabric from movement of construction equipment. The performance of geotextiles will be no better than selection and installation procedures.

Packaging and Storage

Geotextiles come in rolls which are wrapped for protection from moisture and ultraviolet exposure. If these are stored outside, they should be elevated and covered with waterproof protection.

Site Preparation

Clear and grade the area. Remove sharp objects. Cut trees and shrubs flush with the subgrade. Top soil and vegetation need not be removed. Excavate soft spots, backfill and compact so filled area provides an equal stability with the adjacent areas. Grade the surface as much as possible to provide surface drainage and cross slope shaping. Tight blading will provide a smooth surface to support the fabric, and will also provide a well established crown. When roadbed material contains gravel, as the blade or grader drags the surface, sharp tips and edges on the gravel will be rolled over and become flush with the surface reducing the possibility of puncture or tears in the fabric.

Unroll the geotextile in the direction of the construction traffic. Overlap in the direction of subbase placement. Overlap is dependent on load bearing capacity of the subgrade and it varies from 2 feet to 3 feet.

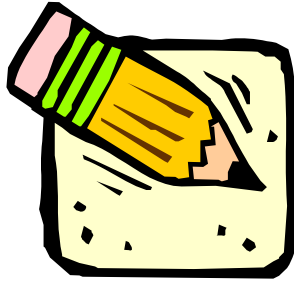
Dump the aggregate on top of the geotextile. Spread it using a loader or small bulldozer. Avoid heavy traffic directly on the geotextile. Spread the aggregate in the same direction as the geotextile. Overlap to avoid separation. Aggregate depth is determined by subgrade strength and anticipated wheel loading. Usually 4-6 inches is used. Compact the aggregate using conventional methods. Vibratory compaction is NOT recommended.

Damage Repair

If the geotextile is damaged during the installation process, repairs can be made. Clear the damaged area plus three additional feet of all fill material. Cover area with a geotextile patch extending three feet beyond the perimeter of damage. Replace subbase material and compact.

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Upcoming Baystate Workshops



PUNCTUATION AND GRAMMAR

Speaker: Rockie Blunt

Blunt Consulting Group

SEPT. 28 Plymouth

29 Northampton

OCT. 4 Andover

5 Worcester

MANAGING THE STORM

Speaker: Paul G. Brown

Roadtech, Inc.

OCT. 11 Taunton

12 Northampton

31 Worcester

NOV. 2 Burlington

CONCRETE FOREVER

Speaker: Art Stenberg

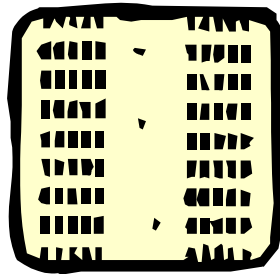
MaCAPA

DEC. 12 Peabody

13 Taunton

14 Worcester

15 Northampton



BICYCLE SAFETY 2000: More Than Just a Helmet!

Speakers: Various private
and community agencies
from Massachusetts

SEPT. 27 Worcester

10 Ways to Cut Tire Costs

The key to good maintenance is checking tires regularly. Routine tire maintenance reduces downtime, eliminates preventable major repairs, improves operating efficiency, and promotes higher levels of productivity, according to Michelin North America. Simply translated, 10 simple steps can save you considerable time and money.

STEP1

Conduct a visual inspection of your vehicle's tires prior to operation. Look for signs of irregular wear in the tread or shoulder of the tire, and examine the tire for bubbles or bumps caused by air infiltration or foreign objects. If you notice either of these symptoms, have the tire repaired promptly because both can lead to tire failure and potential danger.

STEP2

If you notice deep cracks, cuts or other major problems during the inspections, don't operate the vehicle. Have a trained service person diagnose the severity of the problem and make the proper repairs. Never allow an unskilled person to attempt repairs because incorrectly mended tires can lead to performance problems in the future, or even result in personal injury if the tire fails.



STEP3

Check tires for correct air pressures. Perform this step daily on vehicles in constant use because air pressure is critical to a tire's performance. Check air pressure weekly on vehicles with less demanding schedules.

STEP4

Check the owner's manual to determine precise air pressure. It should provide initial data on the weight of the vehicle and standard load. Your tire distributor or dealer can help pinpoint the exact air pressure recommendations for your tires based on the manufacturer's requirements and the application in which the vehicle is being used.

STEP5

Never operate a vehicle that has flat tires, damaged or distorted rims or wheels, missing bolts, or cracked studs. Any of these symptoms could be dangerous.

STEP6

Never weld or apply heat to parts of the wheel near the tire. Heat causes serious damage to tires and can cause them to explode. Tires always should be removed before these types of procedures are conducted.

STEP7

Store tires properly when they are not in use. Place them in a cool, dry place away from direct sun-

light to avoid premature aging. Also, prevent exposure to ozone sources such as sun, arc-welders and mercury vapor light bulbs, as well as ultra-violet rays and inclement weather. Store tires standing upright on the tread and avoid stacking -- which can weaken the tires on the bottom of the stack.

STEP8

Avoid lifting tires through the center with a crane hook, because this can damage the critical bead area. Instead, lift the tire under the tread by using flat straps which are recommended over steel slings or chains because they will not cause cuts or abrasions.

STEP9

Deflate the inner and outer tires of a twin fitment before removing any rim fixture from the hub of the vehicle.

STEP10

Avoid mixing tires on your vehicle -- for example, pairing a normal tread depth with a deep tread depth or a bias-ply tire with a radial. Using two different types of tires could cause damage to the vehicle's internal components because the tires do not work together to provide the same traction and handling performance.

Tire maintenance impacts the entire job site by keeping fleets operating at maximum efficiency. By following these 10 simple steps, your operation can take advantage of its tire investment and boost productivity levels.

This article first appeared in Better Roads, January 2000 based on information from Michelin North America Corp.

Roadway Managers' Worst Enemy

Drainage cannot be overemphasized in road construction and maintenance. Water affects the entire serviceability of a road. Water allowed to remain on top of a gravel or blacktopped road weakens the surface and, combined with traffic, causes potholes and cracking. If improperly channeled, water causes soil erosion and a breakdown of pavement edges.

Whether it is mud in the spring or frost heaves in the winter, the presence of water in roads is nothing but trouble.

A good surface drainage system is the best way to lessen water damage on a road. Proper surface drainage prevents water from infiltrating the pavement surface and removes water from the driving lanes in a constant thin sheet to the side ditches, which carry the water away from the roadway. A surface drainage system has four main components: road crown, shoulders, ditch ditches, and culverts.

The road crown, or super-elevation of the road surface allows water to run off to the shoulders.

Shoulders are an extension of the road surface and allow for the continued flow of water to the ditches.

Ditches are used to carry water away from the roadway. They need to be kept clean and protected from erosion. Water left in the ditch can sometimes leak back into the base.



Water collected and carried in the ditch has to be directed away from the roadway at frequent intervals, sometimes using culvert pipes.

Culverts usually channel water from one side of the road to the other, helping to control the flow of water and slowing it down to reduce erosion.

Road managers are guided by the principles that water runs downhill, that water needs outlets at the bottom of all grades, and that puddles mean problems. Except for some water needed for soil compaction, dust control, and vegetation, water is the roadway manager's worst enemy.

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STORMWATER CONFERENCES

EPA PHASE II STORMWATER COMPLIANCE & TECHNOLOGY WORKSHOP/TRADE SHOW

The U.S. Environmental Protection Agency (EPA) recently expanded its storm water requirements to include smaller communities, smaller construction projects and ALL communities' vehicle maintenance operations. A workshop/trade show scheduled for December 4 in Sturbridge will explain these new Phase II requirements and offer technological and engineering options for meeting them.

The workshop will feature plenary sessions and job-specific breakout groups to equip municipal officials and private construction firms with the information they need to begin planning and budgeting to meet the March 2003 permit application deadline.

**PHASE II
NATIONAL POLLUTION
DISCHARGE ELIMINATION
SYSTEM (NPDES)** requires new parties to control stormwater runoff including:

Municipalities in urbanized areas with populations UNDER 100,000

Public and private construction activity disturbing at least ONE ACRE of soil

ALL communities' industrial operations; i.e. vehicle maintenance operations, wastewater treatment plants, etc.

WORKSHOP

December 4, 2000

**Sturbridge Host Hotel
Sturbridge, MA**

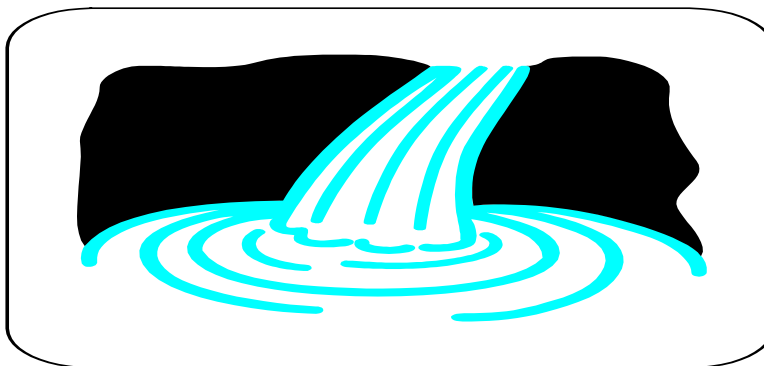
Registration Fee: \$30.00
Baystate Roads Program, EPA, USDA NRCS, and Massachusetts DEP are the primary cosponsors.

For placement on a mailing list,
CONTACT one of the following:

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STORMWATER & EROSION CONTROL WORKSHOP/TRADE SHOW

OBJECTIVES:

Provide members of the construction industry with information on sound practices for water quality protection

Give them access to manufacturers of erosion control materials & innovative stormwater treatment systems

WORKSHOP:

November 1, 2000
Lantana's Conference Center
Randolph, MA

Registration fee \$30
covers continental breakfast,
lunch and workshop materials.

Cosponsored by Baystate Roads Program, Quarry Hill Associates, USDA NRCS, MA-DEP, NEIWPCC, and US EPA.

For placement on a mailing list,

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PHONE 508-295-1481 X118
carol.hansen@ma.vestware.fsc.usda.gov

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



Daniel S. Lynch
Newburyport DPW
Louis Manring
Sterling DPW
John N. Pritchard
Newburyport DPW
Douglas Wilcox
Cummington DPW

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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). FHWA is joined by the Massachusetts Highway Department, the Department of Civil and Environmental 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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