M A S S

# INTERCHANGE

Volume 8, Number 1 Fall 1993

This cyclist is enjoying the Norwottuck Rail Trail, which was completed this past summer. The 8.5-mile trail links Northampton, Hadley and Amherst; this photo shows the trail crossing the Connecticut River. The rail trail is located along a former Boston & Maine Railroad right-of-way, which was purchased by the Department of Environmental Management in 1985. Funding for the trail was provided by the Massachusetts Highway Department State Transportation Bond bikeway fund, which covered 100% of the construction and design costs.

Photo credit: Karen Dodge

**Local Technical Assistance/Technology Transfer Center**
**(800) 374-ROAD or (413) 545-2604**

# Pinch that Joint

## *or* Don't Broadcast that Overlap

*by Chris Ahmadjian*

I have spent considerable time looking for the best way to explain, in a page or less, how to create a quality longitudinal joint during the placement of hot-mix asphalt. Finally, I decided the best I can do is hit the highlights and encourage you to call me so I can send a complete set of articles (15 pages) provided by the Asphalt Institute and the National Asphalt Pavement Association.

There are two primary reasons why we are concerned about the longitudinal joint.

- First, it is the hardest spot on the mat to develop density. As the roller hits the edge of the mat, the asphalt no longer has to compact downward, but can bulge out the side. This side movement makes it more difficult to develop the density needed for a long lasting joint.

- Second, even tight joints are susceptible to water intrusion, and as the density of the joint drops, the amount of water intrusion increases. This intrusion will mean a short service life, which in severe cases may be only several years.

So, how do you insure a quality joint? The solutions are easy, in theory. It's the implementation that's hard. First let's look at the theory, then we'll talk implementation.

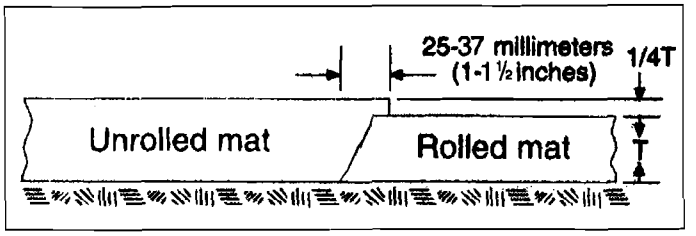
### Don't have a joint

I know that you're all made of money and just looking for a place to spend it. So, bring in two pavers and two crews and pave both lanes together. This is called echelon paving and no cold joint means no problems.

### Overlap and bump excess material at the joint

- On the first lane placed, do the best you can to develop density on the future joint side of the mat.

- When paving the second lane, have the paver operator adjust the height of the paver to be 1/4" higher than the adjoining (cold) lane for each 1" of compacted pavement height. In addition, have him steer so he overlaps the cold lane. The overlap should be sufficient to form a good tight joint. It varies from slightly less than an inch to about 1 1/2" and is based on the thickness of the mat and the type of mix.




*Overlap of adjoining lane*

*Continued on Page 3*

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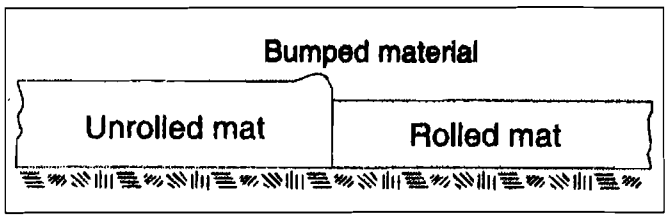
*Joint...continued from Page 2*

- Have the raker follow the paver at the joint and bump back the overlapped material (see diagram). Don't let the raker broadcast the material across the uncompacted mat. This broadcasting greatly reduces the material available at the joint and almost insures inadequate density. It often destroys the finish of the rest of the mat as well.

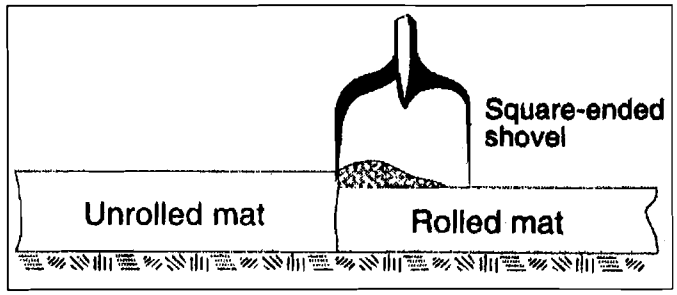



*Overlap crowded back ready to be rolled*

- Have the roller make its first pass over the joint using whatever rolling procedure traffic and efficiency allow. The squeeze this force applies at the joint, combined with the bumped material, should create an extremely tight joint.

## Trim the Joint

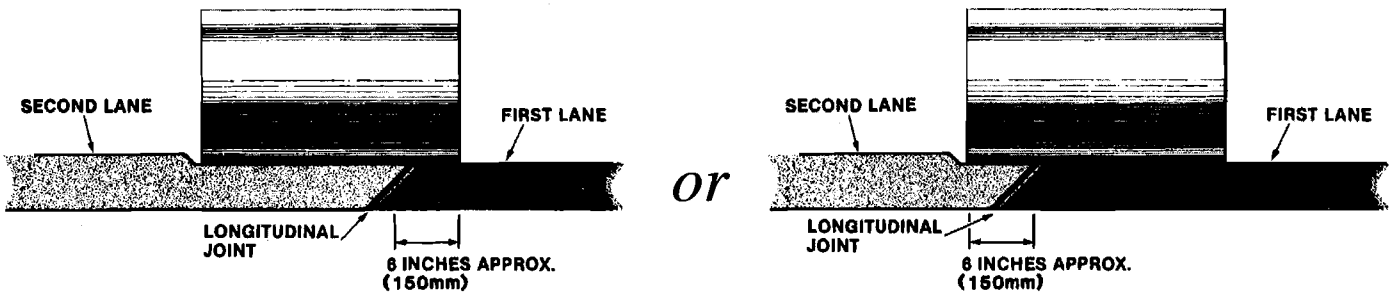
This is the same procedure as that for the bumped joint, except here the excess overlap material is removed with a squared-ended shovel (see diagram). This is generally only used where traffic does not allow a safe luting of the joint or where too much overlap material was placed.




*Making a trimmed joint*

## Implement, Implement, Implement

The implementation of these methods is the hard part. It is easier and faster for the raker to broadcast the excess joint material across the mat and for the operator not to diligently maintain the exact height and overlap over the cold mat. The mat may look good when it's done, but problems may arise one to two years later when the joint opens.




*Two ways to roll a hot longitudinal joint*

One final thought. Joint compaction is important regardless of what layer it's in. If the binder joint is not well densified it will deteriorate regardless of the quality of the finish course. A crack in the binder joint will reflect through even the best top courses. Quality and attention to detail today will mean fewer maintenance headaches in the future and more funds for other projects.

*Diagrams taken from the NAPA U.S. Army Corps of Engineers handbook,"Hot-Mix Asphalt Paving," and the Asphalt Institute's publication "Principles of Construction of Hot-Mix Asphalt Pavements."*

# Stop Segregation of Hot Mix Asphalt

"Segregation is a separation and consolidation of larger aggregate occurring most often in drier, harsher, gap-graded mixes. Segregation is most often likely to appear when materials are allowed to break and run any distance at all. When materials are allowed to break and run, larger aggregate particles rise to the surface and consolidate in a mass of sufficient size to appear in the placement of HMA pavements."

Once placed, the segregated pavement will be less dense and have too much large aggregate on the surface. The result is lower strength, increased water intrusion and reduced service life. In some cases, the reduction in service life can be severe.

Bob Joubert, the New England District Engineer for the Asphalt Institute and a regular Baystate Roads Program workshop speaker, recently sent me a six page article which describes the different types of HMA segregation, their possible causes, and solutions.

Sure, it sounds like good bedtime reading at first, but after reading Bob's cover letter, I became alarmed. Bob pointed out that he is seeing more instances of segregation in Massachusetts than ever before, due to more storage of mixes and use of coarser type mixes. This comment struck a chord with me because I noticed many instances of segregation in my travels this year.

Since I cannot include all six pages here (of the article Bob sent me), I will discuss only end-of-load segregation. This is what I have seen most lately and it has a fairly easy to explain solution.

## END OF LOAD SEGREGATION

End of load segregation is easily recognizable as you observe or ride the mat which has been laid. Observation reveals a chevron of large aggregate that consolidates together in the head of material.

End of load segregation normally starts in the hopper. As a truck completes its discharge, the operator will not release the truck until every last stone of mix is out of the hauling unit. Before the last of the HMA leaves the hauling unit, material in the hopper is allowed to run extremely low and large aggregate will be all that remains in the conveyor slat area.

The truck now moves out, and the hopper is folded (and should be often enough to keep HMA from cooling below laying temperature).

The large aggregate laying on the outside edge of the hopper now is placed on top of the larger aggregate in the conveyor area. Add to this any segregated material at the rear of the next hauling unit and you end up with sufficient segregated material to consolidate in the head of material that lies in front of the screed (in center and moving outward, causing the chevron of segregation in the mat). Should this segregation be great enough, you will feel it in the ride, as the segregated area will densify differently than the homogeneous section. A rough area could be rolled into the mat as well as allowing water to permeate into the mix and result in premature failure.

Close observation of the material in the paver hopper will help recognize segregation in its origination where it can be eliminated or re-agitated before it continues through the placement operation.

## SUGGESTED SOLUTIONS TO TRY - (END DUMPS)

- Never allow the level of HMA in the hopper to fall below the height of the flow gates. This insures the material flow from the hopper to the outer extremities of the screed will remain constant (+2").

- Release the hauling unit before the hopper is allowed to run low. (Low is defined as any level of material below the opening of the flow gates).

- When folding the hoppers, never allow the hopper to run low, as described above.

- Segregation in the hauling unit. This is usually a problem in loading at the plant or silo. Making multiple drops in loading trucks might help to eliminate this problem.

- A mixer-agitator device can be installed to re-mix HMA just prior to passing through the flow gates into the tunnel of the paver. (This is available through Blaw-Knox).*

There are quite a few other types of segregation from centerline streaks, to quarter point streaks, to random segregation, but I don't have the space here to address them. They are all discussed in the six page article Bob sent to me, which I will be glad to send you. Call us at (800) 374-7623. -- Chris Ahmadjian

*Definition of segregation, "End of Load Segregation," and "Suggested Solutions to Try - (End Dumps)," are from an article by Tom Skinner of Blaw-Knox. Mr. Skinner is a Paving Equipment Specialist.*

◆ **Effective Highway Accident Countermeasures - Status Report**, U.S. DOT/FHWA, 1993. This report describes the progress made to date regarding short term safety countermeasures at the local, state and federal levels. The range of activities includes: pedestrian safety improvements, driver behavior and performance, and roadway and roadside safety.

◆ **Road Surface Management**, National Association of County Engineers, 1992.

◆ **1993 AASHTO Guide for Design of Pavement Structures.** Baystate Roads Program now has this publication **available for loan**. Call us if you need it.

## NEW PUBLICATIONS

◆ **Long-Term Pavement Performance Information Management System - Data Users Guide**, U.S. DOT/FHWA, July 1993. This publication provides an overview of the Information Management System (IMS) of the Long Term Pavement Performance (LTPP) Program. This document is aimed to assist researchers in understanding the types of data collected under the program, how to request the data, the available formats of the IMS data, and how to use the output from the data base.

◆ **Drainage**, National Association of County of Engineers, 1992.

◆ **Estimation of Operating and Maintenance Costs for Transit Systems**, U.S. DOT/FHWA, December 1992. This report provides guidance regarding the development and application of operating and maintenance (O & M) cost models. An operating and maintenance cost data base containing representative information for motor bus, rail rapid, light rail, and commuter rail modes is presented.

◆ **Development of Relationship Between Truck Accidents and Geometric Design: Phase 1,** U.S. DOT/FHWA, March 1993. The results in this report will be of interest to those concerned with highway design and operations, as well as those involved in developing and establishing large-truck safety regulations.

◆ **Traffic Maneuver Problems of Older Drivers: Final Technical Report**, U.S. DOT/FHWA, August 1993. This report presents the results of a multi-phased investigation aimed at better understanding difficulties encountered by older drivers on several common traffic maneuvers, as well as at evaluating tradeoffs of several simulation display methodologies. Several countermeasures are proposed to ameliorate the problems identified.

## *Watch for these upcoming Baystate Roads Workshops*

***Pavement Maintenance Techniques***
*January 5, 6, 18, 19*

***Massachusetts Wetlands***
*January 20*

***Concrete***
*February 2, 3, 9, 10*

***Quality Control and Pavement Management***
*March 1, 8, 9, 16*

***Successful Roadway Supervision***
*March 3, 10, 24, 31*

***Techniques for Pavement Rehabilitation (3 day workshop)***
*March 14, 15, 16*

***Recycling and Materials Use***
*April 5, 6, 12, 13*

***AASHTO Pavement Overlay Design***
*May*

*and also*

**Making the Land Use, Transportation, Air Quality Connection** to be held on January 6-7, 1994 in Providence, RI Contact: Ann Long, Lincoln Institute of Land Policy, (800) LAND-USE

**1994 Engineer's Week Celebration**
February 2-3 (and throughout February) More info: 617-252-8376.

If you haven't received your Baystate Roads Program **Resource Notebook**, call us today. The Resource Notebook is designed to give you one place to store all of the information that we send to you, such as newsletters, brochures, Tech Notes, etc., so that you may have easy access!

***What's Wrong**...from back page*

# ...it's the *Single* Solid Yellow Centerline

We have had several towns ask us if a single solid yellow centerline can be used instead of a double solid yellow centerline on a two-lane, two-way roadway. Their idea is that this would reduce their town's pavement marking costs.

Well, we did our best to research the topic and have reached the following somewhat less than black and white conclusions:

- We found no support for the use of a single solid yellow centerline other than the argument that it is half the price of a double yellow centerline.

- The MUTCD does not allow a single solid yellow centerline on a two-lane two-way roadway. It does, however, have minimum thresholds under which a centerline may not be needed.

- The Massachusetts Highway Department follows the MUTCD marking standards on state roadways and has no provision for a single solid yellow centerline on a two-lane, two-way roadway. They could not, however, comment on what is appropriate for town roads because they have no control over town roads.

- MUTCD experimented with a single solid yellow centerline for urban areas in 1973, but terminated the experiment and did not adopt the idea.

- A lawyer who gave one of our BRP workshops commented that an accident involving a collision where one car had crossed over a single solid yellow centerline would be a good case to try, so long as he were not representing the town where the accident occurred.

- Based on our conclusions, we cannot tell you definitely that a single solid yellow centerline is inappropriate for a town road. We do, however, strongly recommend that you seek the opinion of your town counsel and selectboard. Let us know what they say and what you decide to do. It will help us complete our research on the subject.

If you would like a copy of our three page research summary, which has excerpts from the MUTCD, call us at (800) 374-7623 and we will send it to you.

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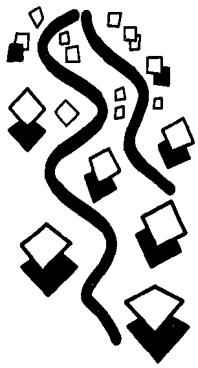
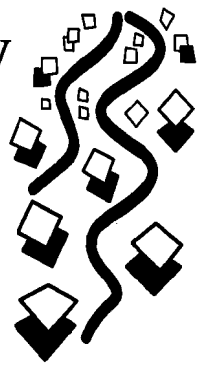


The Baystate Roads Program wishes all of you a very happy Holiday Season!



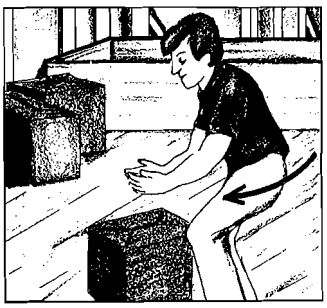
# LIFTING BASICS

## *Techniques for Safe Lifting*

Safe lifting is always important - but it's critical when lifting is a part of your job or everyday activities. If you've ever "thrown out" your back while doing a seemingly simple lift - moving a crate, lifting a piece of furniture, carrying a file box to the office - you know firsthand the importance of safe lifting. Safe lifting means keeping your back aligned while you lift, maintaining your center of balance, and letting the strong muscles in your legs do the actual lifting. By using the following techniques, you can learn how to lift safely and save your back from accidental strain and injury.

## The Safe Way to Lift

Before you lift anything, think about the load you'll be lifting. Ask yourself: "Can I lift it alone?" "Do I need mechanical help?" "Is it too awkward for one person to handle, or should I ask a coworker for help?" If the load is manageable, follow these tips for safe lifting:



### 1. Tuck Your Pelvis

By tightening your stomach muscles you can tuck your pelvis which will help your back stay in balance while you lift.

### 2. Bend Your Knees

Bend at your knees instead of at your waist. This helps you keep your center of balance and lets the strong muscles in your legs do the lifting.

### 3. "Hug" the Load

Try to hold the object you're lifting as close to your body as possible, as you gradually straighten your legs to a standing position.

### 4. Avoid Twisting

Twisting can overload your spine and lead to serious injury. Make sure your feet, knees, and torso are pointed in the same direction when lifting.

## Tips to Remember

In addition to these techniques, remember to make sure that your footing is firm when lifting and that your path is clear. And be sure to use the same safe techniques when you set your load down. It takes no more time to do a safe lift than it does to do an unsafe lift, so why not play it safe and lift right?

# *New Videotapes*

**LL-100 Construction Workzone Liability**

This videotape defines and discusses tort liability in the field of transportation, with a focus on construction workzones. Negligence, risk management, and governmental functions with regard to tort liability are reviewed.

**ST-144 Aesthetic Bridge Rails & Guardrails**

This videotape gives a history of the progressive advancement in the safety and design of guardrails. It shows how the rails can be constructed with a high degree of safety without taking away from the aesthetics. The cost of different guardrails is also covered.

**DC-100 Flowable Fill**

Flowable fill is a blend of sand, fly ash, cement and water which has properties similar to concrete while in a plastic state, but takes on the characteristics of a compacted fill once in place. Advantages and uses of flowable fill are discussed in this videotape.

# *What's wrong with this picture?*

*Turn to Page 6 to find out...*

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 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.

**To contact the Baystate Roads Program, call (800) 374-ROAD (in state) or (413) 545-2604.**



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