

## **Pavement Preservation Roundtable Discussion**

July 24, 2008

Hartford

This Roundtable Discussion was held in order to help the Towns in Connecticut learn more about the options available for maintaining their roads. A technical presentation was provided by James Mahoney, Director of the CT Advanced Pavement Laboratory and Edgardo Block, an Engineer in the Asset Management Department of the Connecticut Department of Transportation.

### **Notes from James Mahoney's Presentation:**

Each town's *biggest asset* is the pavement in its roads. Most towns are responsible for a minimum of 70-80 miles of road.

The cost of maintaining roads is the second largest expenditure for each town:

1. education
2. road maintenance

Since the cost of asphalt continues to rise, we must ask ourselves: How can we make pavement last longer?

The goal of Pavement Preservation is to *keep good pavement in good shape* vs. the worst first mentality, or repairing the worst roads first.

### **Things to Consider**

1. Proper drainage: Proper drainage is the single most important factor in preserving and maintaining quality roads. Roads that are built without proper drainage can be destroyed within 6 months after construction.
2. Condition of the base material. (make sure road is constructed properly, influenced by drainage)
3. Condition of the roadway
4. Choice of surface treatment.

### **Goal at time of construction:**

Pavements that are uniform, dense, and smooth.

Air voids of 3-8% in order to provide long-term performance. Too many air voids, road falls apart quickly.

Low density areas stay wet longest—and will fall apart in three years or so.

### **Cracking:**

It is not possible to stop pavement from cracking. But it is important to treat cracks early, to slow the process down.

Environmental cracking: pavements expand and contract in response to temperature. Our goal is to slow down cracking.

Load cracking: cracking caused by excessive weight.

### **Types of Distress:**

- Rutting (wheel)
- Base rutting
- Thermal cracking
- Fatigue cracking
- Segregation
- Raveling
- Delamination
- Poor longitudinal joints
- Too high asphalt content from chip seals—or too much emulsion.

**Asphalt emulsion-** one of the primary liquid asphalts that are used in pavement preservation. It contains asphalt, water, and soap.

### **Cold Mix Pavement-**

Advantages: Stays flexible longer (holds up better on roads with a lot of frost), costs less

Disadvantage: Can't handle high levels of traffic. Sometimes the emulsion in the center of it never breaks. Thick placements (such as 6-8") don't allow the emulsion to break because the water can't evaporate out of it. Three to four inch placement will work.

### **Ground Level O-Zone-**reason for air quality alerts

Created by:

- Sunlight
- Vehicle emissions
- Ground level organisms—VOC volatile organic compound

New rule will go into effect next summer from the DEP that will limit the amount of VOC's that can be used during the non-attainment months-- May 1-Sept 30. Some of the medium set emulsions have fuel oil in them (about 8-12%) and the amount that can be used in any sort of paving material will be reduced during those months. Cold patch is made by essentially mixing diesel fuel with asphalt. There will be regulations on cold patch during non-attainment months. Cutbacks will not be used any more—emulsion and cutbacks are not the same thing.

### **Pavement Preservation Methods:**

Crack Sealing—sealing of cracks to extend the life of the pavement. It prevents water infiltration into the base.

Surface Treatments—maintenance tools used for roads that are in good shape.

Chip seals—use an asphalt emulsion applied to the surface.

Hot asphalt is a good option. Aggregate: Stone must be dry, clean, one sized, cubical, and 1/4" covered on stone.

Superthin overlays are very popular right now. They use hot polymerized asphalt binder, placed 3/4-1" range. It uses conventional paving equipment, and provides a smooth, durable, long lasting finish (as long as the road is in good shape when you apply it.)

How does hot asphalt or hot mix react to crack sealing—if it's been crack sealed recently? Some towns have had trouble with "Bubbling"

Suggestion: If you strike it off reasonably flush (draft specifications will tell you that there should not be more than 3/16" of material on the surface) you will have a very thin amount of material. Let it sit for a few months, and then sun will oxidize it. If you fill the crack and strike it off as even as possible then you won't get the mole hill problem - the band-aiding (or over banding) is what causes that. If there is a lot of over-banding, then you will need to shim before you crack seal or you will get mounds.

Chip seal will not bond/stick to thermal plastics (school crossings) or some epoxy paints.

Sand seals are essentially the same as chip seals, except that you are using sand rather than stone with an emulsion.

Slurry seals are usually a thin application about 1/2 to 1/4".

Micro-surfacing uses a cold polymerized material - usually an emulsion. It will be placed 1/2 to 3/4" thick, has a small stone size, and it's a relatively smooth surface, and it is usually more durable. Because it is polymerized material, it is a more elastic, forgiving material.

Micro-surfacing and slurry seals are wet surface treatment applications. They are less durable than chip-seals, but the pavement is smooth--lasts on average for 5-7 years. Need to make sure the surface is really clean, done frequently in MA and other states.

Emulsified crack seals—usually have 40-50% water in it. If you fill the crack—where does the water go? You wind up 40-50% short in material.

Compare the Cold Applied vs. Hot Application: (research report available on CTI's website - [http://www.caplab.uconn.edu/pdfs/crack\\_treatment\\_litreview\\_final\\_7-27-05.pdf](http://www.caplab.uconn.edu/pdfs/crack_treatment_litreview_final_7-27-05.pdf))

Cold Applied: failure at 90%, in 3 years. When it's hot out, the material gets soft.

Hot Applied: failure at 50%-60% in 5-6 years.

### **Nova Chip-Proprietary Product**

- Requires a special paver
- Paver sprays asphalt emulsion
- Places HMA onto the emulsion
- Instantly breaks emulsion
- Tends to provide better tire/pavement friction than typical dense grade HMA
- Causes problems in open bid process
- Thickness: ¾" to 1"—can be a little thicker.

### **Notes from Edgardo Block's Presentation:**

Towns should not repair the worst roads first because it isn't cost effective.  
Each town must get community buy-in to implement a successful pavement preservation program. Roads are very costly: Every American owns \$17, 000 in roads. Very costly per tax payer.

### **Definition of Pavement Preservation:**

Apply the right treatment to the right road at the right time.

After construction—preservation is 32% less expensive.

### **Preservation Treatments:**

Crack sealing

Surface treatments (prior to damage appearing or as early as possible)

Ultra-thin and HMA overlays

Functional overlays

### **Pavement Preservation Program Components:**

List of treatments (the tool box)

Need to know: Treatment costs and expected life

Process for project selection (rating system)

Programmatic approach-consider how to run program if budget is cut.

Performance analysis and feedback – is it working?

### **Pavement Preservation Program Needs:**

- Support for agency – buy in from municipal leadership
- Official recognition – be organized and have an actual program
- Technical assistance and training – understand the industry and concepts, get help when you need it
- Specifications – know what you are putting on the road, ensure quality of product/process

- Communication and education to public – get buy in by informing them of program, plans and processes
- Accountability - put someone in charge, determine expectations
- Size the program to the agency's ability to execute it – don't build false expectations
- Dedicated specific funding source – Capital Improvements
- Provide context – why it is important, cost savings over time

### **Notes from Roundtable Discussion:**

#### **Green Pave / Warm Mix**

Open graded friction course—probably coming back. Green Pave is a warm mix, just beginning to take hold—about 5 years. MA has 2 pilot roads, CT has none. He explained that the cool down rate is less, and that Green Pave is being studied at the national level to determine if it has the same structural integrity.

#### **Crack Sealing**

Contractor Tips:

Conduct an inspection after the cracks have been sealed and see if there are any that aren't filled.

Crack Sealing should not be used on alligator cracks – other treatments are better choices.

It is a good practice to check-in on contractors while they are working to verify that they are completing the work correctly. You have the opportunity to make sure they are preparing the cracks correctly (routing and cleaning).

South Windsor Program:

Have been crack sealing regularly since 1990. They implemented very aggressive program from 2003-2006. Had a \$150,000 maintenance budget—not a band aid. Routing significant. 2-3 years after overlay. In years 6,7, 8 look again for new cracks. Recapping program—extended life dramatically—getting water out—last two years, \$50,000 on road maintenance. They use a Pavement Management System from VHB. 25 % get done—re-surveyed.

J. Mahoney and E. Block both agreed that a successful Pavement Preservation Program requires a Pavement Management System in order to provide data which outlines the long term effects of the program.

Monroe: Had a Pavement Preservation presentation done for the 1<sup>st</sup> selectman, board of finance, and the town council—recommends this as a good way to educate newly elected officials.

West Hartford: Transverse cracking—so wide don't need to route them. Is there a rule of thumb about the width? South Windsor said 1/2" or 5/8", beyond that it would be cleaning and seal.

J. Mahoney said some places really like routing and some don't. It makes sense to route out from a materials stand point, in order to get to solid material. There is a lot of varying literature on the subject and that it is a personal choice.

Open Seams: some as wide as 3-6 inches

J. Mahoney said if your joints are opening up that much--3-6". It is possible to come in with a 1.5 foot wide miller and just mill out that section and re-pave that strip. Not a perfect solution, but if rest of road in good shape, then it is a viable option. If the rest of the road is in bad shape, then it's really not worth doing that.

E. Block said when overlaying next time—don't put the paving joint over the same place.

J. Mahoney said most specifications want you to offset the longitudinal joints by 1 foot, zigzagged to help offset the influence from down below.

Timing of Crack Sealing:

J. Mahoney said that the fall (Sept./Oct.) is a good time to crack seal. In the summer time the cracks are at a minimum width because the pavement is warm and it expands. In January the cracks are a maximum width—but it is not a practical time to fill them. If you are going to be going back over the surface, then yes I would put it down now, give it a little time to age and then go over it with micro surfacing.

Trouble with subdivision roads:

J. Mahoney said that often times when new subdivisions are in the process of getting built, the contractor often marks up the base course pavement and the pavement is weakened. Within a short time, there will be punch out failures. He said that if the contractors use their tire mats, (as they are intended to be used) then the pavement will be protected.

## **Chip Seals**

*Question submitted:* Is hot in place recycling a suitable replacement for a chip seal road?

J. Mahoney answered and said that it depends on what is under the chip seal road. If it is hot in place, it will work. If the road is all chip seal, then it isn't a viable option. If the road has reasonable base materials with 1 or 2 layers of chip seal on top, then it is a viable option.

*Question submitted:* Is chip seal truly beneficial?

One town felt it was not a long-term solution, but that it does extend the life of the road, and that an advantage is that you don't have to work with drainage, man holes, etc. He said one disadvantage is that the rough material is a hard sell.

E. Block said that determining if chip seal will be beneficial or not depends a lot on the technology used to chip seal. Some states such as Texas use chip seal for high traffic roads, and that it is obviously a different chip seal from the one that we use. He said that some of the rubberized chip seal has pre-coated stone in it and that are ways to get longer life out of the chip seal.

Winter Issues with Chip Seal:

New England has the freeze/thaw issue to contend with.

Problems with carbide blades removing chip seal.

*Question submitted:* At what point do you chip seal vs. hot mix overlay?

E. Block said that both protect the surface and that a lot of it has to do with what the neighbors will accept or not. Ideally from a preservation stand point you do it right before the first cracks will likely appear. He said for example if you are looking at hot mix overlay through Oxidation—depending on how good your mix was about 7-9 years - you can almost program it in, but if it's still holding on you could push it up one year, but start looking at it at year 7 or 8. Be sure to do it before you see any signs of any major distress—either method will help your pavement last a long time.

J. Mahoney emphasized treating before distress. Money is wasted if applied after the road is distressed.

*Question submitted:* When do you treat the road with a chip seal?

E. Block: Here is an example - You have a mix that is kind of dry. You can see its dry—then you start to see cracking—pretty soon-- around year 6 you see cracking—if I put this down—it will stop oxidation. Chip seal year 7-8. Four years later you start looking again, and when its time you spend more money on it. He said that in Nevada, they don't even look at the road, but that at year nine they schedule the project, they save money, and are seeing good results.

J. Mahoney said if you see the road begin to ravel a little bit—chip seal before there is a significant loss of materials. If you let it go then you will start to see significant loss of materials and it becomes too late for a chip seal. As long as there isn't a base problem, chip sealing can also help with alligator cracking. If you catch alligator cracking when

they are small and not covering a large area, you can retard that process by chip sealing. If you have a base problem, you need to get down to the layer that is failing and work from there.

It is very important to spend time and effort on ensuring good drainage. You can have the best base in the world, but that if proper drainage is overlooked then the road will be destroyed quickly.

### **Base Stabilization:**

Monroe chose to cement stabilize a road, not so much to stabilize the base but to save on the thickness of the asphalt. He expressed concern about water getting between the thin layer and this cement stabilized base and delaminate the 1 ½” that they have on top of it.

South Windsor used cement stabilization 20 years ago on a road in town and had a very negative experience. He said that they won't ever build a cement based road again. South Windsor decided to let the road go until the public demands that it gets repaired. Their road was built in 1997, on a main road, has a severe base issue, and is failing from the bottom up. He said that it is failing very quickly with heavy shrinkage and alligator cracks. He said their whole road will have to be removed and that it is a major project because it's a highly traveled road.

E. Block said that he would get shrinkage cracks and to seal them ASAP.

Monroe said that they had done micro-cracking, and that they would see how it works. Dry first, second slurry with cement injected in base

VHB has done some projects and research on base stabilization using Portland cement and that the road will gain some structural value due to a stronger base. He said that it's hard to say if it's cost effective in the long term.

M. McCarthy said that the percentage of cement used in the material used to stabilize roads is much lower than it was 15 years ago, and that both the equipment and processes for full depth reclamation using Portland cement have also changed considerably. Detailed information can be found at the Road Recycling Council website – [www.roadrecycling.org](http://www.roadrecycling.org)

### **Cold Patch: Bulk vs. Bag**

*Question submitted:* How are towns purchasing / using cold patch?

Tilcon has a product that contains fibers and it works great as long as you keep it covered.

Waterbury, Manchester and South Windsor all buying it in bulk

South Windsor: He said their material is pretty good--ours is covered and it makes a difference.

J. Mahoney asked if people are still going to MA to get cold patch?

South Windsor said that they were going to Bozrah two years ago, getting their bulk supply from QPR LaFarge, and that they had good first batches, and that it became inconsistent because it was stored outside uncovered. Many people commented on the benefits of keeping it covered.

Tolland also uses QPR LaFarge – permanent cold patch. They have an auto patcher – patching machine and it works well. The DOT is using a pothole patcher to do longitudinal joints and it is working very well - material really stays in the hole.

New Canaan went to bags because they were wasting the bulk, and that it wasn't covered.

### **Infrared Mending of Cracking**

Colchester said that they run an infrared machine and put an overlay on top, and that it is really slow. They are using it for small jobs and it seems to be working well so far.

J. Mahoney said that you must use an infrared machine very carefully. It is important to heat only what you need to or else the asphalt gets burned and it loses its properties. He said that if it's used correctly, it can correct utility cuts well.

West Hartford said that they had an infrared train come through and the part that was re-surfaced looks good. The part that was not re-surfaced looked bad within a year. Anything near the edge of the road (mailboxes, etc.) was damaged. It did not work well for them.

### **Utility Cuts**

*Question submitted:* Are any other towns having problems with Yankee Gas and utility cuts?

South Windsor said that all towns have difficulties with utility cuts and that since they had begun using their Pavement Management System; they were able to provide local utility companies with their plans three years in advance. South Windsor collects a fee and then has their own contractors come in and repair the cuts correctly.

J. Mahoney said that the utility companies are trying to fight town specifications for repairing utility cuts.

West Hartford said that CNG used to do rows of window cuts, and that they had started experimenting with taking a whole core out instead and then putting it back and sealing it. He said it winds up better for them because then they don't have to come back out. He

said they have about 150 of them since this began four years ago, and that they check them once a year and so far not one of them has moved.

### **High Friction Pavements**

*Question submitted:* Is anyone using high friction pavements such as Nova Chip, or if they were using anything else to get better friction?

E. Block said that the state uses Nova Chip gradation B, and that it works well in high traffic areas. He said that in the 90's they used micro surfacing, but that it requires good placement and increases skid resistance.

Goshen said that they used Nova Chip in a curve in their town and that it was very expensive--\$60,000.

New Canaan explained that they have a dangerous road where there had been 33 accidents in one year, and that the town had been willing to cover the cost of Nova Chip but that they hadn't been able to get any one to do it for them. They tried a rumble strip to slow people down but the neighbors complained about the noise and they had to take it out.

Would chip seal with a larger aggregate work?

J. Mahoney said that chip seal rubberized with 1/2" stone would work, but that it would be noisy where as Nova Chip would not be noisy.

E. Block said that "tire grip" works well but that it's expensive.

J. Mahoney said that open graded friction course is a more cost effective option and that it does deaden the noise.

### **Reconstruction / Reclamation**

*Question Submitted:* How do you deal with the worst roads?

E. Block said that it's important to look carefully at when to get to the worse roads. A good pavement management system includes preservation and reconstruction. You need to decide how long you build a road for...what is the timing for replacement. At the same time, you must have the preservation program in place to keep the new roads in good shape. Reclamation is a good option for old roads that need to be re-done.

If you have to rebuild a road, reclamation works very well; hot or cold.

J. Mahoney said that cold in-place recycling can work well for lower volume roads. It increases base material and adds emulsion for base stabilization. Need to make sure your RAP isn't more than 50% of what gets put down

Tolland has used cold-in-place recycling on several roads and has had good luck with it.

### **Other ideas / comments**

Stonington said that they have found that keeping their pavement preservation funding in their operating account (without roads identified) and their worst roads funding in their capital account (with each road listed) has served them well. The reason is that often times the capital account gets cut first. Then as funding to the capital account is cut, and the worst roads aren't repaired, the public will eventually complain and the funding will be restored.

New Canaan: He said he gives the town council a monthly update. He said that if a person complains that they can't get their road paved because it's a low priority, I ask them to write a letter to their first selectman asking for the paving program to be funded.

J. Mahoney said we have to do our own cheerleading, by letting the public know what we do and why it's important.