



# Binder Experience with Open Graded Friction (OGFC) In Massachusetts

AMAP 8<sup>th</sup> Annual Conference

February 13, 2008

Boston, Massachusetts

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# OGFC History

- OGFC was first used in Massachusetts in 1974.
- Since 1976, MassHighway has constructed 86 projects with OGFC.
- June 26, 1990 MassHighway established a Policy in a letter to FHWA which made OGFC a standard wearing surface...

“In normal high speed, high volume locations where conditions do not preclude its use..... the wearing surface is Open Graded Friction Course.”
- June 1, 2001, MHD issued an Engineering Directive which required all OGFC to be polymer modified. (latex) (OGFC – P). This remains the current standard.

# OGFC Benefits

- Reduced Hydroplaning
- Increased Wet Weather Friction
- Reduced Splash and Tire Spray (Improved Wet Weather Visibility)
- Reduced Noise
- Improved Night-time Visibility of Pavement Markings
- Public feedback after it is placed, especially when replacing a dense mix – “We love it – when can I have it on my street!!!” People are demanding i

# Polito secures sound absorbent pavement for I-290

**Shrewsbury** - State Rep. Karen H. Polito, R-Shrewsbury, was able to secure a noise attenuation study in order to research the noise levels for Shrewsbury residents living near Interstate 290 (I-290). This is the only study funded by MassHighway in 10 years. After succeeding in her goal of having

MassHighway re-examine the noise on I-290, Polito also required that this segment of I-290 be resurfaced with sound absorbing pavement.

Using a Type II Noise Attenuation Study, MassHighway determined which are the loudest interstate segments. The original study was conducted in 1988,

and the Final Priority List: those communities that had computed a right-of-way noise level of 79 dBA or higher, included the noise level criteria established by the Federal Highway Administration. The communities on the Final Priority List then qualified for the construction of sound barriers. The com-

puted noise level along the right-of-way on I-290 in Shrewsbury in 1988 was 75 dBA, and therefore the project was not included in the Final Priority List. Concerned about the quality of life for her constituents, and worried that the noise level may have increased since the last study, Polito pushed for

MassHighway to reexamine I-290 in Shrewsbury and update their previous noise results. No other district in the commonwealth has been granted a request to do a second noise study.

In December 2003, MassHighway used its latest technology to monitor the current noise levels at peak traffic hours in the morning and evening along the residential neighborhoods of Tory Drive, Rawson Hill Drive, Glen Gery Road, Colonial Drive, Colonial Way, and Notel Brook Road. The loudest registering noise levels were around Tory Drive and Glen Gery Road which were documented as 77 dBA.

"While the results from this new study are disappointing to our residents, as they fall below the minimum noise level to qualify for sound barriers at this time, I will continue to work hard with Transportation Secretary Grabauskas and MassHighway Commissioner Conlino to improve the quality of life for residents along this stretch of I-290, an lobby to place Shrewsbury on the Final Priority List in the future," Polito said.

In addition to her efforts to secure noise barriers, Polito continued to lobby MassHighway to develop ways to reduce the noise from traffic on I-290 in Shrewsbury. Her efforts were successful, as she secur-

# Types of OGFC Used

- Our standard is the conventional “1980’s Type” OGFC gradation using 3/8” Aggregate and 6% minimum binder content.
- We placed a “European Gradation” OGFC with 1/2” Aggregate, higher voids and a 6% minimum binder content last year on I-395. We are monitoring its performance.

# How much?

- 470,000 tons of non-modified OGFC prior to the 2001 Mandate. (1977 to Present)
- 400,000 tons of polymer modified OGFC-P. (2001 to Present)
- Wearing surface on approximately 294 centerline miles of Interstate (2200 lane miles) and approximately 50 centerline miles (60 lane miles) of Principal Arterial.

# Binders and Modifiers Used

- AC-20
- AC-20 with Latex
- AC-20 with Rubber (20%)
- PG 64-28
- PG 64-28 with 3% Latex \*(current standard)
- PG 76-34 with Chemically Modified Crumb Rubber

# OGFC Performance & Maintenance Issues

- Raveling and Weathering
- Delamination of Pavement Surface Due to Thermoplastic Damage
- Plow Damage / Plow Chatter
- Winter Maintenance & Low Salt Areas
- Not Easily Resurfaced Without Milling





2001 / 1 / 25 11:57am





2001 / 1/25 11:56am





2001 / 1/25 12:34pm





# Thermoplastic Damage







2001 / 2 / 7 2:35pm



# Plow Chatter







2001 / 2 / 7 12:15pm





# OGFC Binder Experiments

## ■ 1991

- ◆ 10 mile Test Section Route 140, Taunton-Lakeville- Freetown with rubber
- ◆ Liquid Applied to OGFC and HMA Modified Top Course
- ◆ Compared to Standard OGFC and Modified Top
- ◆ Modified Asphalts performed better, but District resurfaced test sections.

## ■ 1994

- ◆ Liquid Applied to OGFC
- ◆ 5mile Section I-93 Wilmington-Andover with Latex.
- ◆ Still there, modified asphalts performing well.

## ■ 1996

- ◆ I-95 Foxboro
- ◆ Liquid Applied to OGFC
- ◆ Still there. However, Binder Content was never increased for job mix.

# Binder Experience - Timeline

- Original AC-20 performance was adequate, service lives averaged 15 or more years
  - ◆ I-195 Westport 1976 – 1996
  - ◆ I-290 Shrewsbury 1982 – 2004
- In the late 1990's, we noticed extensive thermoplastic and plow damage on OGFC.
- The projects placed in the early 1990's began raveling in 6-7 years.
- Service lives ranged from 8 years to 22 years.

# Binder Experience (cont.)

- Early Deterioration and Unpredictable Performance was attributed to many factors.
  - ◆ Nighttime and “Cool Weather” Placement
  - ◆ Draindown caused visible fat spots and raveling
  - ◆ 400° Thermoplastic damaged asphalt film
  - ◆ Winter maintenance – “black & wet policy”
- 23 Miles of 9-10 year old OGFC (4 projects) on I-95 failed between 2002-3. \$3m in insurance windshield claims.



# Binder Experience (cont.)

- When these failure began occurring, MHD changed to standard binder to latex modified PG 64-28.
- This decision was based on the experience of other states and the performance of modified OGFC pavements which had been placed in the 1990's on I-93 and Rte 140.







# What Next?

- In 2006, we placed 3.5 miles of “European OGFC” using PG 76-34 CMCR. We are watching the performance of this pavement.
- Considering placing more “European OGFC” with modified asphalts – possibly rubber or other polymer.
- Searching for a way to perform Preventive Maintenance on OGFC.

Questions?