STANDARD PRACTICE FOR THE USE OF HOT MIX OVERLAYS IN PREVENTATIVE MAINTENANCE (PM) ACTIVITIES

August, 1998

The Standard has been developed by Flexible Pavements, Inc., an Association for the development, improvement and advancement of quality asphalt pavement construction in Ohio. The most current update of this document can be obtained by contacting Flexible Pavements, Inc. at 1-888-4 HOT MIX.

1. Scope

1.1 This Standard details materials and methods for use in preventative maintenance (PM) activities utilizing hot mix asphalt (HMA). HMA has a history of excellent performance in PM applications. The ability of HMA to restore necessary pavement properties (i.e., impermeability, skid resistance, smoothness) while contributing to the overall load carrying capacity of the pavement make it uniquely suited for PM activity.

1.2 The Standard does not address those locations where the pavement requiring maintenance is exhibiting structural failure (i.e., fatigue cracking).

1.3 Although this Standard only addresses HMA materials it does recognize the need for the employ of pavement maintenance methods used to ensure the structural integrity of the pavement is maintained. Specifically, the use of crack sealing between HMA overlay intervals is strongly recommended.

1.4 Methods purported by this Standard are a compilation of specifications developed by the Ohio Department of Transportation and Ohio's asphalt paving industry. The specifications presented have been used successfully in Ohio.

1.5 Provided in the Standard is a figure which assists the designer in selecting the most appropriate HMA treatment for the given pavement condition.

2. Referenced Documents

2.1 Pavement Maintenance Effectiveness - Preventative Maintenance Treatments, U.S. Department of Transportation, Federal Highway Administration

2.2 Asphalt Institute, Manual Series No. 4 (MS-4)

2.3 Thin Hot Mix Asphalt (HMA) Overlays for Preventative Maintenance, W. Fair, Flexible Pavements, Inc.

2.4 TechBRIEF, Pavement Treatment Effectiveness, 1995 SPS-3 and SPS-4 Site Evaluations, National Report, U.S. Department of Transportation

2.5 Evolution and Benefits of Preventative Maintenance Strategies, O'Brien, L.G., NCHRP Synthesis of Highway Practices 153, Transportation Research Board, National Research Council, Washington, DC, 1984

2.6 Construction and Material Specifications, January 1, 1997 Edition, State of Ohio, Department of Transportation

2.7 Cold Planing Applications and Recommended Specifications, Asphalt Recycling & Reclaiming Association

2.8 Michigan Highway Preventative Maintenance Program Guidelines, Michigan Department of Transportation

3. Terminology

3.1 hot mix asphalt (HMA) - a high quality, thoroughly controlled hot mixture of asphalt binder and well-graded, high quality aggregate, thoroughly compacted into a uniform dense mass.

3.2 asphalt binder - an asphalt cement or a modified asphalt cement which acts as a binding agent to glue aggregate particles into a dense mass and to waterproof the mixture.

3.3 modified hot mix asphalt - a blend of HMA and a modifying agent resulting in the alteration of a specific or several mixture characteristics.

3.4 ravelling - the progressive loss of surface material by weathering and/or traffic abrasion.

3.5 oxidation - process by which HMA undergoes a chemical change resulting in a stiffening of the asphalt binder making it vulnerable to pavement distress.

3.6 preventative maintenance (PM) - a program strategy intended to arrest light deterioration, retard progressive failures, and reduce the need for routine maintenance and service activities.

3.7 ODOT - Ohio Department of Transportation

3.8 tenacity - a measure of a pavements ability to resist being pulled apart.

4. HMA Mixtures for Preventative Maintenance

Multiple types of HMA mixtures exist which have exhibited successful performance in PM applications. HMA mixture types recommended in this Standard for PM activities include:

- ODOT Conventional HMA mixtures--HMA mixtures meeting the requirements of 446 or 448, Type 1 have been the mainstay of the ODOT's maintenance program. Comprised of aggregate having a maximum size of approximately 3/8" (9.5mm) and performance grade asphalt binder PG 64-22, these mixtures have been used successfully for the past 20 years.
- ODOT item 412, Asphalt Concrete--this material is predominantly a sand asphalt having excellent capability of being placed in thin lifts. The asphalt binder content typically is high (%5 to 10%) which provides good flexibility to the pavement and results in the mat being effective in sealing out air and water.
- Sand Asphalt Concrete with SBR Latex--slightly coarser than a sand asphalt, this material provides enhanced durability by the use of an elastomer (SBR). Its elastomeric properties are very effective in eliminating ravelling which occurs often times at reflective cracks. Pavement skid numbers are enhanced by a silicon dioxide requirement.
- ODOT Supplemental Specification 805, Rubberized Sand Asphalt--also capitalizing on the elastomeric properties of SBR, this sand mix has proven effective in applications where a thin lift was needed to seal off a pavement. Durability is a key benefit, having documented up to 18 years of life without need for overlay. This durability results from high binder content, typically 8%, and the use of SBR.
- ODOT Supplemental Specification 803, Rubberized Open Graded Asphalt Friction Course--using slag aggregate and a polymer modifier (SBR), this product has proven very effective in providing enhanced skid resistance. Additional characteristics of rubberized open graded asphalt friction courses is reduced spray in wet weather and some reduction of noise generated at the tire/pavement interface.
- Asphalt Concrete with SBS Polymer--this mixture uses a conventional ODOT, Type 1, mixture grading with a polymer modified asphalt binder. The binder is modified with styrene butadiene stryrene (SBS) which changes the physical properties of the mixture. Increased stiffness and tenacity typically result.
- Asphalt Concrete with Verglimit--Verglimit asphalt concrete is an ice retardant overlay. The asphalt concrete mixture is made ice retardant by the addition of encapsulated calcium chloride pellets. These pellets break down under the action of traffic and form a mild brine which blocks the tight adhesion of ice at temperatures above 17º F.
- Rubberized 404--this material consists of ODOT conventional 404 mixture proportions and a polymer addition using styrene butadiene rubber (SBR). SBR alters the physical properties of the mixture, providing increased flexibility and durability against the effects of weathering and oxidation.

5. Mixture Selection

5.1 Provided in Figure 1 is a matrix which can be used to assist the designer in selecting the type of HMA mixture for the given application. Successful performance of the treatment will depend upon the appropriateness of the mixture for the application. Existing pavement condition, surrounding environment, traffic volume, and loading must all be considered. To ensure economy is optimized, the designer should select that material which most closely matches the need.

6. Existing Pavement Condition

Pavements receiving an HMA overlay as a PM treatment should exhibit good base conditions and a uniform cross section. The visible surface distress may include: moderate to severe ravelling, fine cracking, flushing, polishing, some patching, and/or edge wedging. The pavements may also have some minor depressions.

7. Surface Preparation

7.1 Surface preparation is an important factor in the successful performance of an HMA overlay. The degree of importance is heightened when using relatively thin overlays, as would be the case when performing a PM activity.

7.2 A strong bond is necessary between the existing pavement and overlay to ensure there is no occurrences of delamination. Strictly following the requirements of ODOT specification item 407 and the weather limitations in item 401.05 will provide the desired result.

7.3 Pavements exhibiting isolated areas of distress beyond surface deterioration should be corrected prior to the overlay. Preparation should be limited to the repair of the minor base failures and depressions, the filling of voids in the pavement surface, the removal of any area having a very high asphalt content that may bleed up through the new bituminous surface, and the correction of tented joints.

8. Cold Milling

8.1 Cold milling is the automatically controlled removal of pavement to a desired depth with specially designed equipment. In PM cold milling can be very helpful in restoring the surface to a specified grade and slope, free of humps, ruts and other imperfections resulting in improved ride quality.

8.2 Cold milling should only be used to correct rutting in an exiting bituminous surface if the rutting is not caused by a weak base. In curbed sections, cold milling can be used to remove a portion of the existing bituminous surface to retain the existing curb face or gutter plate. Cold milling can also be used in those areas where the existing pavement grade cannot be raised.

8.3 **CAUTION!** Designers should exercise judgment when specifying cold milling. Careful investigation must be made to ensure the combined effect of cold milling and HMA overlay results in an overall strengthening of the pavement. Particular care should be taken where cold milling is being used to reestablish the pavement profile. Depth of milling near the edge of pavement may result in significant weakening.

9. Limitations

Non structural asphalt overlays should not be placed on severely distressed concrete pavements, rutted asphalt pavements, pavement with a weak base, or delaminated asphalt surface.

The figure provides a relative indication of the effectiveness of the treatments in addressing the various criteria. Treatments having an asterisk (*) are comprised primarily of sand particles and asphalt binder. The designer should be aware that such mixes have little macrotexture which will have an impact on skid resistance.

Date: August, 1998

PREVENTATIVE MAINTENANCE TREATMENT	EFFECTIVENESS OF TREATMENT IN ADDRESSING:						PERFORMANCE OF TREATMENT FOR ENVIRONMENTAL FACTORS:							
	Aging & Oxidation	Minor Cracking	Ravelling	Skid Resistance	Sealing out Moisture	Prolonged Wet	Prolonged Dry	Shaded	Sunny	Ice Retardant	Overlay Thickness in (mm)	Service Life (years)	Cost
Rubberized 404	H (2)	H	H	H	H	H	H	H	H		1" - 1-1/2" (25 - 38mm)	12-17		
* 412	M	M	H	H	H	M	M	M	H		5/8" - 1" (16 - 25mm)	10-15		
441, Type 1	H	H	H	H	M	M	M	M	M		1" - 1-1/2" (25 - 38mm)	10-15		
441, Type 1 w/SBS Polymer	H	H	H	H	H	H	H	H	H		1" - 1-1/2" (25 - 38mm)	12-17		
* 805 Rubberized Sand Asphalt	H	H	H	H	H	H	H	H	H		5/8" (16mm)	12-17		
* Sand Asphalt w/SBR Latex	H	H	H	H	H	H	H	H	H		3/4" (19mm)	12-17		
Rubberized Open Graded Fiction Course (ROGFC)	M	H	M	H	=	H	M	H	H		3/4" (19mm)	11-16		
Asphalt Concrete w/Verglimit Additive	M	M	M	M	M	L	M	M	M	M	1-1/2" (38mm)	10 5 yr. as ice retard.		

= Underlying pavement must be impervious, having uniform slope and tight surface texture. ROGFC should not be placed upon cold milled surfaces.

Note 1: The icon provides a relative indication of the mixture's impact on the performance parameter. The maximum impact is seen as a completely filled area.

Note 2: Indicates the confidence level in the rating used to establish the icon for the particular performance parameter.

Low (L) - this indicates a low confidence level in the rating used to establish the icon. The low confidence level may be as a result of unfamiliarity with the product, or variability in the performance of the product.

Medium (M) - indicates a moderate confidence level in the rating used to establish the icon. The moderate confidence level may be as a result of some unfamiliarity with the product, or moderate variability in the performance of the product.

High (H) - indicates a high confidence level in the rating used to establish the icon.