Pickering, John

From: Purvis, Keith
Sent: Tuesday, September 15, 1998 3:13 PM
To: Ruff, Wendel; McMahen, Steve; West, Tom; Boyd, Barry; Turner, Mitch; Dixon, Chris; Cross, Alan; Schaub, Ed; Ruff, Wilson; Wells, Bobby Jr.; Brumfield, Jimmy; Russell, Buddy; Crisco, Leroy; Crawley, Alfred B.; Pickering, John; Balentine, Ray; Whitfield, Robert; Reese, John; Lowe, Greg; Kidd, Jim; McCorkle, Jerry; Pittman, Richard; Reeves, Steve; Dickerson, Randy
Subject: Revised MDOT Pavement Design Procedure/Policies

I forgot to attach file.

We have revised the "MDOT Pavement Design Procedures/Policies" to allow the use of granular material (classes 1-6, group D) in lieu of lime fly ash or crushed stone in short sections of new pavement (less than 300 feet).

POLICY.doc

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MDOT PAVEMENT DESIGN PROCEDURE/POLICIES

Original: 06/15/98
Revised: 08/27/98 (Page 2, Page 6)
Revised: 09/15/98 (Page 7, Item 10)

Contained within this document is a description of the MDOT pavement design procedure and current pavement design policies. When changes occur, Roadway Design Division (RWD) will revise this document and forward a copy to the Construction Division, the Research Division and each District Materials Engineer (DME).

CURRENT PROCEDURE

During development of right-of-way plans, RWD will request an earthwork recommendation from the DME, using the attached form. Accompanying the completed form will be a current set of plans.

Earthwork Recommendation:

Upon receiving the completed request form, the DME will examine the original soil profile, and make a recommendation regarding earthwork. This recommendation will include the design CBR and detail any special instructions (such as undercutting, or requiring a certain class borrow in the design soil) necessary to achieve it. This plan should identify high-volume change soil (>60%) in the design soil prism, and propose one of the three methods included in S.O.P. # T.M.D. 20-14-00-000 for treating it. Furthermore, if the removal of high volume change material is required, a recommendation should be made on whether to: A) utilize this material in embankments (in accordance with the high volume change S.O.P); or B) waste the material. Please note that if high-volume change material is to be used in fill sections, then 5:1 fill slopes must be required, and a select borrow (classes listed in SOP) must be placed over that material. The earthwork recommendation should specify such disposal areas. A secondary option for the disposal of undercut material is to place the high volume change material in a core. The details for this method are documented in a memorandum dated April 13, 1998 (copy attached)

NOTE: Previously, it was MDOT's policy to fully control the design soil prism of cut and fill sections on all major grading projects. Currently, removal of material in cut sections is considered if high volume change characteristics are present, or if a **much** better material is available near the project. Material going into the design soil prism of fill sections should be of equal quality to that which is present or to be placed in the cut sections.

After RWD reviews the recommendation, this information is passed on to the design squad so that the specific details may be implemented into the plans.

During development of construction plans, RWD will request a pavement recommendation from the DME, using the attached form. Accompanying the completed request form will be a current set of plans and the design traffic data.

Pavement Recommendation:

The pavement design request form will give specific project data and list the pavement information which is needed for plan development, such as: 1) flexible pavement design, 2) rigid pavement design, 3) rehabilitation strategy, 4) fwd survey, 5) core analysis, 6) shoulder design, 7) chemical treatment of the subgrade and 8) temporary pavement design.

MDOT PAVEMENT DESIGN PROCEDURE/POLICIES (2 of 8):

A computer program written in Quickbasic should be used to calculate structural requirements. An executable copy of the program is located in my public directory (RWD58655\PUBLIC\MDOTPAVE \FILES). To run this program you must copy all the files and type in "mdotpave" for the english version, or "mdotpavm" for the metric version. This program is routinely updated to keep up with changes in the pavement design procedures. The initial screen and printouts include the current version number (8E/8M).

Upon receiving the completed request form, the DME will examine the original/final soil profile, and determine the design CBR. The DME should input the design traffic data (the current year of the traffic data should be set at the year the project is to scheduled to be completed) and the design CBR into module #2 of the computer program for rigid design, or module #3 for flexible design. On flexible designs, a potential thickness design can be checked by inputting it into module #4 of the program. Module # 5 will calculate the paving quantities for a particular pavement design (rigid or flexible).

All rigid designs will consist of a minimum of 10 inches (250 mm) plain concrete, a 3-inch (75 mm) drainage blanket with edgedrains, over a lime fly ash treated granular base course.

Module #4 includes the current layer coefficients used by MDOT. These coefficients are based on research conducted under the supervision of the Research Division.

Previously, MDOT used pay item descriptions such as surface, binder and base course. In August 1997, MDOT implemented the superpave specifications. They include new pay item numbers and descriptions.

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The are as follows:

907-403-A: Hot Mix Asphalt, (1) , (2)
907-403-B: Hot Mix Asphalt, (1) , (3) , Leveling
907-403-C: Hot Mix Asphalt, (1) , (4) , Trench Widening
907-403-D: Hot Mix Asphalt, HT, (3) , Polymer Modified
907-403-D: Hot Mix Asphalt, HT, (3) , Polymer Modified, Leveling

(1) ST, MT, or HT
(2) 9.5-mm MIXTURE, 12.5-mm MIXTURE, 19-mm MIXTURE, or 25-mm MIXTURE
(3) 9.5-mm MIXTURE, 12.5-mm MIXTURE, or 19-mm MIXTURE
(4) 19-mm MIXTURE, or 25-mm MIXTURE

Gradation	Minimum Layer Thickness	Maximum Layer Thickness
9.5 mm MIXTURE	1.0″ (25 mm)	1.5″ (40 mm)
12.5 mm MIXTURE	1.5″ (40 mm)	2.0″ (50 mm)
19 mm MIXTURE	2.25″ (55 mm)	3.0″ (75 mm)
25 mm MIXTURE	3.0″ (75 mm)	4.0″ (100 mm)

Based on the past performance of these mixes, acceptable minimum and maximum lift thickness have been established, and are shown above.

MDOT PAVEMENT DESIGN PROCEDURE/POLICIES (3 of 8):

Example pavement design:

2″	Hot Mix Asphalt, HT (12.5 mm MIXTURE) (1 @ 2)
5″	Hot Mix Asphalt, HT (19 mm MIXTURE) (2 @ 2.5)
6″	Lime Fly Ash Treated Granular Material (9/C)
1″	Granular Material (9/C)
14″	Structure Thickness
7″	Shoulder Granular Material (5/C)

On certain projects, a pavement type selection (asphalt or concrete) will be made, and submitted for approval. The pavement type selection is based on traffic characteristics, structural requirements, soil conditions and the estimated cost. In order to determine the costs of different alternates, RWD will calculate a life cycle cost of each potential paving alternate.

The pavement type selection and design will be submitted for approval to either the Federal Highway Administration (FHWA) or the Chief Engineer. Included in the package, will be other paving details such as shoulder construction, local road pavement design, detour road/temporary connection design and bridge end pavement details.

Lime Fly Ash Treatment:

During the Department's implementation of the new Superpave specifications, problems have arisen on some projects due to the amount of water present in untreated granular material. In order to alleviate this problem, it was decided to chemically treat subbase granular material prior to the placement of pavement, regardless of the amount of pavement. If subgrade material is of such quality that granular material is not needed, LFA treatment of the subgrade is required prior to the placement of pavement.

It has been determined that one inch (25 mm) of untreated granular material will be required below the LFA treatment on all future pavement designs. The purpose of the untreated material is to insure that none of the subgrade is treated.

The LFA requirement will be exempted if a crushed stone base is included in the pavement design.

Bridge end pavement details will include LFA treatment under the bridge end pavement. Previously, the LFA treatment stopped 100 feet (30 meters) from the bridge end pavement, with the asphalt thickness increased to compensate for the reduced structure. This detail will be prepared by RWD, and shown in the plans of all projects which include bridge construction.

LFA treatment is to be depicted in the typical sections and quantities calculated for: the mainline; interchange ramps; local roads which require an interchange with the mainline; and any new construction or reconstruction of state highways. LFA treatment is not to be shown on cross-overs, driveways, county roads, local roads or streets which do not require interchanges with the mainline.

MDOT PAVEMENT DESIGN PROCEDURE/POLICIES (4 of 8):

The width of LFA treatment should comply with the following table:

TYPE FACILITY	PAVEMENT WIDTH IN FEET (METERS)	LFA TREATMENT WIDTH IN FEET (METERS)
Through Lanes	14 (4.2)	14 (4.2)
Through Lanes	12 (3.6)	14 (4.2)
Interchange Ramps	16 (4.8)	16 (4.8)
Interchange Loops	20 (6.0)	20 (6.0) + C/G width + 1 (0.3) behind C/G
Curb & Gutter (C/G) Sections		Pavement width + C/G width + 1 (0.3) behind C/G

Rehabilitation Policy:

If requested on the pavement request form, the DME will include a pavement rehabilitation strategy in the pavement recommendation. This recommendation should be consistent with the MDOT Rehabilitation Policy which was signed by the Chief Engineer on August 7, 1992 (copy attached). This policy requires:

- construction, rehabilitation and maintenance history;
- condition survey;
- pavement safety issues;
- structural evaluation with deflection measurements;
- analysis of pavement cores; and
- alternative rehabilitation strategies considered.

MDOT PAVEMENT DESIGN PROCEDURE/POLICIES (5 of 8):

Contained within this section of the document is an up-to-date list of current MDOT policies regarding pavement design. When changes occur, this document will be revised and forwarded to the Assistant Chief Engineers, District Materials Engineers, the Construction Division, the Materials Division, the Research Division, and the Roadway Design Division.

POLICIES:

ITEM #1

Concrete pavement will be designed on a 35-year design life. All asphalt pavement will be designed based on the following design life:

Interstate	20 Years
Bridge Approaches (100 feet from bridge end)	20 years
Urban projects	20 years
Temporary connections/detours	projected life, not less than 1 year
All other locations	10 years

ITEM #2 (REVISED 8/27/98)

On January 23, 1997, the map titled "Routes Designated for High Type and Polymer Modified High Type Asphaltic Mixtures" was distributed to you. It should be used to determine what type mix (ST, MT, or HT) should be used on a particular project. The following guidelines were used in developing the map:

Number of ESALs in the Ten-year Design Life	Type
< 1 million	ST
1 million to 3 million	**MT**
> 3 million	HT*

* Polymer modification required on a portion of the roadway (See polymer.doc for details)

Only one mix type (ST, MT, or HT) should be used on each project

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ITEM #3

On September 11, 1997, it was decided to require all lifts of HMA (12.5 mm MIXTURE) to be 2 inches (50 mm). This decision was based on the performance of this material placed in 1.5 inch (40 mm) lifts, at several locations. It is MDOT's opinion that the thicker lifts will enhance the possibility of achieving proper densities. Any HMA (12.5 mm MIXTURE) included in projects let in October 97 or after (with a few specific exceptions) will be placed in 2 inch (50 mm) lifts.

Previously, the Department routinely allowed traffic to be temporarily placed on new pavement structures, prior to the time that the final lift was placed. This procedure, which was used primarily on projects where parallel lanes are paved, was reviewed in November of 1997. At that time, it was decided that when future pavement designs were reviewed, the following procedure would be followed:

- If traffic is to be placed on a new structure for one year or less, the final lift may be left off, while traffic utilizes the pavement structure. When traffic is shifted back to the existing lanes, the final lift will be placed;
- If traffic is to be placed on the new structure for more than one year, the full structure will be placed prior to allowing traffic to utilize the lanes. When the traffic is shifted back to the existing lanes, an "additional" lift will be placed.

This procedure was discussed with the Assistant Chief Engineers, Construction Division, Materials Division, Research Division, Roadway Design Division and all Districts.

MDOT PAVEMENT DESIGN PROCEDURE/POLICIES (7 of 8):

ITEM #8

Considering: A) the lift thickness requirements which were distributed on May 12, 1997; B) the 2.25 inch (55 mm) maximum allowable longitudinal drop-off; and C) the variable amount of material required to change a cross-slope from 1.5% to 2%, questions have arisen about the manner in which to revise the cross-slope. In particular, when a cross-slope is to be revised from 1.5 percent to 2 percent on a two-lane route (traffic expected to cross centerline during construction), a compromise of the lift thickness requirements must be made if the maximum allowable drop-off is not to be exceeded.

On January 26, 1998, it was decided that in these situations (two-lane routes where traffic is expected to cross centerline), the cross-slope would be revised in the following manner:

1. If milling is part of the contract, require all cross-slope correction to be done in milling.

2. If milling is not required and more than one lift of asphalt is needed, require the cross-slope correction to be done in the bottom lift. The cross-slope should be corrected by placing a lift of HMA (19 mm MIXTURE) 2.25 inches (55 mm) at the centerline, and 1.5 inches (40 mm) at the existing edge of pavement.

3. If milling is not required and only one lift of asphalt is needed, require the cross-slope correction to be done by placing one lift of HMA (12.5 mm MIXTURE) 2.25 inches (55 mm) at the centerline, and 1.5 inches (40 mm) at the existing edge of pavement.

ITEM #9

On May 27, 1998, it was determined that the minimum flexible pavement structure for a four-lane highway (AHEAD program), would consist of 6.5 inches (165 mm) of HMA over 6 inches (150 mm) of lime fly ash treated granular material.

ITEM #10 (Revised 09/15/98)

On June 9, 1998, it was decided that LFA would be required on all new construction.

This lime fly ash requirement will be exempted if a crushed stone base is included in the pavement design.

On September 15, 1998, it was determined that clay gravel (granular material with classes 1-6, group "D") is considered to be an acceptable substitute to crushed stone base in "short sections" of new pavement, where "short sections" are defined as 300 feet or less.

ITEM #11

On May 27, 1998, it was determined that one inch (25 mm) of untreated granular material will be required below all lime fly ash treated courses. The purpose of the untreated material is to insure that none of the subgrade is treated.