

Zack Stewart
Northern District Commissioner

Wayne O. Burkes
Central District Commissioner

Ronnie Shows
Southern District Commissioner



S.P.
Kenneth I. Warren
Executive Director

James H. Kopf
Deputy Executive Director/
Chief Engineer

Mississippi Department of Transportation / P.O. Box 1850 / Jackson, Mississippi 39215-1850 / Telephone (601) 359-7001 / FAX (601) 359-7110

January 27, 1998

MEMORANDUM

TO: District Materials Engineers

**FROM: Roadway Design Division
C. Keith Purvis**

RE: Leveling Courses

Due to recent policies regarding minimum and maximum lift thicknesses, and maximum allowable centerline drop-off, confusion has arisen over the type material to specify on leveling courses. Enclosed are copies of two letters regarding leveling courses on future MDOT projects.

Should additional information or assistance be deemed necessary, please advise.

Attachment

pc: District ~~Five~~ Materials Engineers (West, Turner, Dixon, Cross, Schaub, Wells)
District Construction Engineers (Palmer, Gray, Biggers, Vance, Twedt, Stewart)
Roadway Design (Pickering, Balentine, Reeves, Section Engineers, Purvis)
Central Files

c:\msoffice\winword\keith\pment\misc\level.doc



January 22, 1998

MEMORANDUM

TO: Materials Division Engineer
 Mr. Jimmy Brumfield

FROM: Roadway Design Division
 C. Keith Purvis

RE: Leveling Courses

Recently, questions have arisen in regards to the type material being required in leveling courses. Historically, leveling courses have consisted of "binder mix", or in some cases, "surface mix". With the advent of superpave mixes, it was assumed that the leveling courses would consist of HMA (19mm mix).

On many of the Department's projects, the pavement cross-slope is typically increased from 1.5 to 2 percent. Unless the pavement is milled to the new slope, a leveling course is included in the pavement design. To increase the slope, 0.75 inches (19 mm) more asphalt is required at the centerline as compared to the pavement edge (on a 24-foot, 7.3-meter roadway). To complicate matters, Department policy prohibits centerline drop-off from exceeding 2.25 inches (55 mm). Also, new lift thickness requirements for superpave mix designations provide very little flexibility in varying thicknesses.

Therefore, it is requested that the Materials Division provide guidance on the type material to be used in leveling courses on future projects.

pc: District Five Materials Engineer (Cross)
 Construction Division (Russell, Crisco)
 Research Division (Crawley)
 Roadway Design (Pickering, Reeves, Section Engineers, Purvis)
 Central Files

January 26, 1998

MEMORANDUM

TO: Mr. C. Keith Purvis
Roadway Design Division

FROM: Jimmy W. Brumfield
State Materials Engineer

SUBJECT: Leveling Courses

The following comments are made to assist you in addressing those issues you mentioned in your memorandum dated January 22, 1998:

First let me say that there is not a serious problem here. It is true that we set minimum lift thicknesses for our mixtures and we do have a maximum centerline drop-off policy. Neither of which are violated, as far as the intent of our policies are concerned, when using a 19 mm mixture for correcting cross-slope. Let me try to explain.

The Department in 1992 adopted the "Hot-Mix Asphalt Paving Handbook" and has made it a part of our specifications. In this handbook under sections addressing nonuniform texture and tearing of the HMA mat, it is pointed out that a good rule of thumb for the relationship between maximum aggregate size used in the mix and the minimum compacted course thickness is that the depth of the compacted layer should be at least twice the largest coarse aggregate particle size. Thus a mix containing a 3/4-in. (19 mm) top-size aggregate should be placed at least 1 1/2 in. (37.5 mm) thick. Admittedly we have changed our definition of mixture size from maximum aggregate size to nominal maximum size, but we likewise set the laying thicknesses to accommodate this new terminology and also to help with our density problem. Density can be obtained at two times the maximum aggregate size. Tearing of the mat at the pavement edge is not as big of a concern as density especially when additional lifts are to be placed. We should be more concerned with the fact that when we build cross-slopes into our pavements with HMA, the Contractor will probably be rolling the different mat thicknesses across the pavement the same, thus giving us varying levels of compaction, some of which may not meet specifications.

After saying all that, it does appear that a 12.5 mm should be used for the leveling course, though preferably a 19 mm should be specified. Under no circumstances should a 9.5 mm or 25 mm be used for leveling of the nature you referenced. However, where an increase in cross-slope is not a concern, a 9.5 mm mixture could be specified for preleveling. Where such preleveling is used to address skin patching such as pot holes, rutting, raveling, surface texture,

Mr. Purvis
January 26, 1998
Page 2

etc. and no structural value is assigned to the construction layer, then a 9.5 mm mixture should be used.

The Materials Division offers these guidelines with preference in order listed when addressing 12 ft. (3.65 m) lanes:

- 1) When milling is a part of the contract, require that any increased cross-slope be constructed by the milling operations.
- 2) When milling is not an option or is not used on a project and there is at least two additional layers of mixture to be placed, then use a 19 mm mixture with a depth of 2.25 in. (55 mm) at the centerline. This should work just fine especially when the next layer of the additional layers to be placed is specified to be a 19 mm mixture. With the newly constructed cross-slope of two percent this will give you at least 1 1/2 in. (37.5 mm) of compacted thickness on the edge. There will be some tearing of the HMA surface at the pavement edge since the maximum size aggregate is one inch (25 mm), but with the additional layers to be placed this should not be a major concern as long as this mix is not left uncovered to traffic over any lengthy period of time particularly over winter.
- 3) When milling is not an option or is not used on a project and there is only one additional layer of mixture to be placed, then use a 12.5 mm mixture with a depth of 2.25 in. (55 mm) at the centerline. With the newly constructed cross-slope of two percent this will give you at least 1 1/2 in. (37.5 mm) of compacted thickness on the edge. This does not violate the rule of thumb of two times maximum aggregate size and therefore should not cause any problem associated with tearing and surface texture.

In closing let me just say that we cannot forget what we already know. Also, it should be understood that we need to use common sense. No particular set of rules will work in all situations. If a policy on type of mix must be set and followed for all situations when cross-slopes are increased from 1.5 to 2 percent, then we would be better off just to specify 12.5 mm mixtures.

Please advise should you desire additional information at this time.

JWB

PC: District Five Materials Engineer (Cross)
Construction Division (Russell, Crisco)
Research Engineer (Crawley)
Central Records (via McMahan)
Lab File (via Sheffield)