

Guidelines for Maintaining Adequate Pavement Friction in Surface Pavements

June 30, 2010

BACKGROUND:

It is a given that Districts will pro-actively address known pavement friction problems. The following guideline is to help Districts isolate and correct causes of poor pavement skid resistance.

This guideline includes a method of evaluating the potential causes of poor skid resistance and appropriate responses. Included is the method by which an aggregate source can be restricted based on a history of poor pavement friction. This guideline applies to surface pavement requirements only.

As there are no previous documents regarding the treatment of the above situations it is anticipated there will be questions dealing with special circumstance issues. Technical assistance with these guidelines is available by contacting any of the following individuals.

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DEFINITIONS:

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| JMF | Job Mix Formula - Documents having an accurate record of all materials and materials configuration used in a surface pavement. |
| Microtexture | The surface characteristics of an individual particle of aggregate. |
| Macrotexture | The surface irregularities of a pavement caused by distribution of particular aggregate particles and binder type used in a pavement. |
| OMM | Office of Materials Management |
| Skid resistance | The ability of the traveled pavement surface/ vehicle tire interaction to resist loss of tire traction in stopping or maneuvering a vehicle. It is affected by roadway alignment, driver habits, tire condition and type, the aggregate |

microtexture, the pavement surface macrotexture, and by the weather.

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| Skid resistant aggregate | Any aggregate allowed by specification or policy to be used in a pavement surface. |
| High skid resistant aggregate | Specific aggregate geologic types shown thru performance history to provide very high skid resistance, pavement friction and SN. These usually are higher cost and at times isolated in availability. However, they are desirable in locations where particularly difficult issues with maintaining friction or controlling accidents exist. |
| Pavement Friction | The description of a pavement surface of it's ability to resist the sliding of a vehicle tire. |
| PA-RT | Pavement Aggregate Review Team. The review team shall consist of at least one Central Office person from OMM, one involved District person, one Ohio Aggregates and Industrial Minerals Association (OAIMA) representative and one representative of the association for the pavement type in question. Industry members have opportunity to, but are not required to, comment. The review team assures fair application of restrictions on aggregate sources. |
| Polishing | The process by which aggregate microtexture changes over time resulting in poor Pavement Friction. |
| SN | Skid Number – A test value as determined by ASTM E274 |
| SR | Designation given to the OMM record of an aggregate source when the aggregate type is found prone to rapid polishing and is thus restricted from use in any surface pavement except as allowed in Section III Part B of these guidelines. |
| SRH | Designation given to the OMM record of an aggregate source when the aggregate type is found prone to rapid polishing and is thus restricted from use in heavy traffic surface pavement except as allowed in Section III Part B of these guidelines. |

GUIDELINE:

- I. Determining Causes of Poor Skid Resistance
 - A. Collection of Data - The District should collect all pertinent data pertaining to the pavement section in question. Included should be the following.
 1. Description of the problem including location, pavement alignment and general condition.

2. History of the problem including supplier/ contractor issues, anecdotal knowledge of District personnel, accident reports, or other pertinent information.
3. Data on all materials used in the surface pavement including JMF and visual examination of macrotexture.
4. SN and/or other data such as from laboratory tests.

B. Analysis of Data - The District should determine the cause or causes of the problem (from a pavement standpoint) and document the analysis. The following should be used in this analysis.

1. Alignment - Are there stop conditions, slopes, or curves or are there obstacles that impede traffic flow? Any of these in conjunction with a known loss of skid resistance is a likely factor.
2. Pavement condition
 - a. If the pavement is less than 3 months old and is an asphalt pavement the asphalt binder has possibly not completely worn off to expose the aggregate microtexture for producing expected pavement friction
 - b. If the pavement is old in its expected life, normal long term aggregate polishing is one likely cause regardless of alignment.
 - c. If the pavement is only 1 to 4 years old, previous pavements have performed well and a significant skid resistance problem exists then, provided no obvious problem like flushing exists, it is possible excess aggregate polishing has taken place.
 - d. The pavement macrotexture may have an unusual problem such as flushing of binder in asphalt pavement or rutting that has led to a very smooth surface or loss of macrotexture or tire contact with the aggregate.
3. SN
 - a. Does the SN show relatively average to good numbers? If so, alignment may be the significant factor.
 - b. Does the SN show relatively average to poor numbers? If so, aggregate polishing or loss of macrotexture may be significant factors although alignment is not necessarily ruled out.
4. Type and source of aggregate

- a. Is this the first time a significant problem has occurred with a pavement using this aggregate source?
- b. Is there a history of pavements with significant problems occurring with this aggregate source?

II. Solutions to determined Skid Resistance Problems

- A. If a serious problem exists the pavement should quickly receive a grinding, overlay, or surface treatment. The severity will dictate the speed with which a repair should be programmed.
- B. If it is determined from the analysis an alignment problem is creating a skid resistance problem that will not go away with normal pavement treatments, then the alignment will need to be addressed. This may include different traffic control methods such as reduced speed, etc.

If re-alignment is not practical, consideration should be given to a special skid resistant pavement (microsurfacing, open graded surface course, high skid resistant aggregate requirements, etc.).

- C. If it is determined that the aggregate source is a significant factor in the poor skid resistance the source may be restricted in its future use in pavement surfaces if the following are closely followed and provided any obvious alignment issues are addressed where practical.
 1. At least three (3) projects must have used the same source and exhibit a similar degree of problems.
 2. All data and history as in I.) A.) above must be collected for additional projects in which problems have existed.
 3. The data must be submitted to the OMM for a review by the PA-RT.

III. If the PA-RT determines that the aggregate does indeed need to be restricted then this should be accomplished in the following manner.

- A. The PA-RT will determine if the aggregate source should be given an additional designation of SR or SRH. SRH will usually be applied when data shows heavy traffic or truck traffic causes aggregate polishing but lower traffic levels do not. Once an aggregate source(s) is designated SR or SRH, additional aggregate source(s) in the vicinity of the SR or SRH designated source(s) may be designated SR or SRH by the OMM if the OMM determines the same type of aggregate is being produced. Designations will be placed on the aggregate gravity list by OMM and the source will be restricted in future use in surface courses.
- B. The SR/SRH restricted source may only be used in surface courses by blending each JMF component size (each coarse size and/or fine aggregate

size) in a blend of 50 percent with a same component size skid resistant or high skid resistant aggregate as follows:

1. Do not blend any SR aggregate for chip seals.
2. If the traffic level designation is not specified in the plans or proposal apply requirements for heavy traffic as follows.

For heavy traffic blend a restricted source with a high skid resistant aggregate or use 100 percent of a skid resistant aggregate. (a minimum 65 percent crushed gravel, natural sand, trap rock and air cooled slag are known high skid resistant aggregate. Other high skid resistant aggregates must be approved by the OMM. Other JMF aggregate requirements must still be met.)

3. For medium traffic blend a restricted source with a skid resistant aggregate or use 100 percent of a skid resistant aggregate.
4. For blend JMFs where # 7, #8 and /or #9 aggregate is used #7, #8 and/or #9 aggregate can be considered one component size. Ensure the skid resistant aggregate is at least 50% of the blend.