Minnesota Department of Transportation

MEMO

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DATE: February 19, 2014

TO: Soils Engineers, District Materials Engineers, Resident Engineers, and Design Engineers

FROM: John Garrity, Bituminous Engineer
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SUBJECT: Bituminous Pavement Ride Quality Guideline

Ride specification, 2399, Pavement Surface Smoothness, requires pavement Smoothness and Areas of Localized Roughness (ALR) be measured by MRI (Mean Roughness Index). However, the specification does not contain guidance for selecting the appropriate "ride equation" for pavement Smoothness evaluation. Therefore, the following guideline should be used to determine which equation is appropriate. Also included in this memo are guidelines for selecting Percent Ride Improvement on 1-lift overlays. The designer should use their judgment or consult the Bituminous Office for other construction types not covered in this memo.

For the following construction types, use **Equation HMA- A**:

- New construction with a minimum of 3 lifts
- Overlay with a minimum of 3 lifts, lift thicknesses of at least 1.5" (40mm)
- Construction with a minimum of 3 lifts, with curb and gutter and at least 8 feet separating the traffic lane from the curb and gutter (shoulder at least 8' wide)

For the following construction types, use **Equation HMA- B**:

- New construction with 2 lifts
- Construction with curb and gutter adjacent to at least one driving lane, and three lifts
- Two- lift overlays, 1.5" (40mm) minimum lift thickness
- Winter carry-over - wearing course on two lifts
- Reclaim with 2 lifts
- Cold inplace recycled with 2 lifts
- Two lifts over concrete

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For single lift overlay construction on bituminous the Designer can choose either **Equation HMA- C** or **Percent Ride Improvement.** See Note 1 below for single lift overlay on concrete.

The Percent Ride Improvement provision compares the Smoothness of the roadway before any construction activities have taken place to the Smoothness of the roadway after construction activities are finished. Incentive/disincentive is determined by the percent ride improvement. Percent ride improvement is intended to be used in situations where the existing roadway is in poor condition. Data from pilot projects show that the rougher the road segment to begin with the greater the relative improvement possible. For instance, a road segment with a starting Smoothness of 150 in/mile is more likely to be reduced to a Smoothness of 75 in/mile than a road segment starting at 75 in/mile is to be reduced to a Smoothness of 37.5 in/mile. Contact the Special Provisions Unit to insert the Percent Ride Improvement in a Contract.

For the following construction types, use **Percent Ride Improvement** [(1) (2)]:

- Single lift bituminous over bituminous (BOB) overlays on a roadway surface with an overall Ride Quality Index (RQI) < 2.8 (MRI greater than 120 in/mi)*.

For the following construction types, use **Equation HMA- C** [(1)]:

- Single lift bituminous over bituminous (BOB) overlays on a roadway surface with an overall RQI $\geq$ 2.8 (MRI 120 in/mi or less)*.

* This information is available in the District's Pavement Management Condition Rating Reports.

Note 1: Table 2399-2 excludes Smoothness testing of single lift overlays on concrete, but, requires evaluation of ALR and the 10 ft. straightedge. However, there may be unique situations on single lift BOC construction where a Smoothness evaluation requirement is appropriate. The designer should consult the Bituminous Office for guidance in those considerations.

Note 2: The original Smoothness and final Smoothness values should be obtained by calendar date as close to one another as possible. Do not run the original Smoothness in one year and the final Smoothness in a different year (i.e. carryover projects).

The following "typical" Smoothness values and the equivalent RQI are given so that you have a perspective of various pavement Smoothness numbers:

	MRI	RQI
New pavement (3-lifts) –	37 in/mile	4.1
New pavement (2-lifts) –	47 in/mile	3.9
New pavement (1-lift) –	60 in/mile	3.6
Aged pavement (10 yrs) –	110 in/mile	2.9
Aged pavement (20 yrs) –	150 in/mile	2.5

Table 2399-2 lists pavement surfaces that are excluded from Smoothness testing but subject to evaluation of ALR and the 10 ft. straightedge 2360.3E (Surface Requirements). There may be other instances where you feel the ride specification is not appropriate on a Project. In those instances make note in the Special Provisions that ride will be verified by 2360.3E.

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