Appendix B

Pavement Guidelines for Treatment of High Stress Locations

July 2014

PAVEMENT GUIDELINES FOR TREATMENT OF HIGH STRESS LOCATIONS

BACKGROUND:

These guidelines are intended to be used to reduce or eliminate rutting or shoving problems associated with the use of asphalt concrete pavement surfaces in high stress locations.

These guidelines are intended to be used by district office staff in making best practice decisions regarding pavement resurfacing and design considerations. Technical assistance with these guidelines is available by contacting either of the following individuals:

Dave Powers - Asphalt Materials Engineer, Office of Materials Management (614-275-1387)

Craig Landefeld – Construction Pavements Engineer, Office of Construction Administration (614-644-6622)

Aric Morse - Pavement Design Engineer, Office of Pavement Engineering (614-995-5994)

DEFINITIONS:

Rutting: Rutting is visually identified by vertical depressions in the pavement surface along the wheel tracks. Rutting is measured transversely across the depression using a string line or straight edge. Rutting is generally considered significant when it approaches 0.4 inches (~10 mm) in depth. The presence of significant rutting may or may not indicate a high stress location. Circumstances resulting in faulty mix design, production, or placement could contribute to rutting.

Shoving: Shoving is longitudinal displacement of a localized area of the pavement surface. It is generally caused by braking or accelerating vehicles and is usually located on hills, curves, or intersections. Shoving may also include vertical displacement. Shoving is generally considered significant when it affects ride quality. The presence of shoving may or may not indicate a high stress location. Circumstances resulting in faulty mix design, production or placement could contribute to shoving.

High Stress Location: High stress locations are found at areas of high acceleration and braking, at intersections, sharp curves, ramps, and where heavy vehicles frequent at slow speeds. High stress locations occur at intersections with forced stop control and one or more of the following criteria:

- The approach grade to the stop control is greater than or equal to 3.5 percent.
- Current Design Designation of 500 trucks per day or greater in the design lane.
- Current Design Designation of 250 trucks per day or greater in a turn lane.

High stress locations occur on ramps or sharp curves with or without forced stop control that have greater than 250 trucks per day or have exhibited significant repeated rutting problems in

the past. As truck counts on ramps are often unknown and the definition of a sharp curve depends upon the speed of the curve, some judgment is required on new locations.

High stress locations occur on stretches of roadway that continue to exhibit significant rutting after several trials of standard mixes. These stretches of roadway generally exhibit rutting due to some combination of long or steep grades; trucking/traffic patterns, counts, or weights.

High stress locations occur at standard bus stops on bus routes or at park and ride lots.

High stress locations occur at all truck and bus lots located in the Department's rest areas.

TREATMENT OF HIGH STRESS LOCATIONS:

I. RIGID PAVEMENT:

No consideration is made for high stress locations where rigid pavement exists or is proposed. When replacing a composite or flexible pavement with a rigid pavement at a high stress location, the following needs to be considered:

A. When new pavement is being constructed, the designer should try to match subgrade elevation at the high stress termini. For most situations, the rigid pavement should be placed on a minimum of 6 inches (~150 mm) of Item 304 Aggregate Base; however, if the surrounding flexible or composite pavement is constructed on subgrade, it would be acceptable to do the same with the rigid pavement. The thickness of the rigid pavement should be a minimum of 8 inches (~200 mm). The exact thickness should be determined by design calculations in accordance with the procedures specified in Section 300 of the Pavement Design Manual. Additional thickness of Item 304 may be used, if necessary, to match subgrade elevations.

B. For composite pavements where clearance requirements are not a concern, an unbonded concrete overlay may be placed. Unbonded concrete overlays should be constructed a minimum of 8 inches (~200 mm) thick with standard dowels using Item 452. If dowels are not used or non-standard smaller diameter dowels are used, the thickness may be reduced to 6 inches (150 mm).

C. For flexible pavements where clearance requirements are not a concern, conventional whitetopping may be used. Conventional whitetopping should be constructed a minimum of 8 inches (~200 mm) thick with standard dowels using Item 452. If dowels are not used or non-standard smaller diameter dowels are used, the thickness may be reduced to 6 inches (150 mm).

II. FLEXIBLE PAVEMENT:

A. There are several options available for the use of flexible pavement in high stress locations. For cost consideration, the **'Next Step'** approach should be used. Next Step approaches are as follows:

1. In a high stress area with less than 1500 trucks that would normally use Item 441, specify a Superpave mix design using Item 442. All high stress areas using Item 442 shall use 446 acceptance regardless of the quantity limitations given in Section 404.1.

2. In a high stress area that would normally require a Superpave mix design, specify a non-standard modified asphalt concrete pavement mix design. A list of all available modified asphalt concrete mixes is on file with the Office of Materials Management. Contact the Asphalt Materials Section for a current list of available options. Item 443 Stone Matrix Asphalt Concrete may also be considered but not for small quantity applications.

B. For all high stress locations where rutting is evident, pavement planing should be specified to remove all deformed material.

1. For flexible pavement, planing should be specified to the bottom of the material responsible for the rutting. In order to determine the responsible layer, the comparison of pavement cores taken in the rutted area with cores taken outside of the rut may be helpful. Where this information is not available, best practice is to remove 3 inches (~75 mm) below the deepest portion of the rut. Standard practice concerning tack coat should be followed prior to the placement of the Next Step asphalt mixes.

2. For composite pavement, planing should be specified according to II.B.1. Where the surface of the rigid base pavement is within 2 inches (~50mm) of the required milled depth, best practice is to take the milling down to the concrete in order to provide a course of larger aggregate (301 or 302) material.

C. Lift combinations and thickness requirements will generally be the same as would be required for a standard flexible pavement or overlay.

LIMITS OF HIGH STRESS LOCATIONS:

The limits of the high stress treatment should be determined as follows:

A. A minimum of 250 feet (~75 m) back from the location of stop termini or traffic signal.

B. The length of the turn lane.

C. The limits of the existing problem condition.

In urban areas where several intersections exist within close proximity to each other and meet high stress criteria, best practice is to specify the required high stress mix the length of the section bounded at the outermost limits of the high stress locations.