8.40 GENERAL CONSTRUCTION

8.41 UNSTABLE SUBGRADES AND SUBBASES

Specification 2109.03, A, for natural subgrade and various types of subbases requires contractor to immediately repair rutting or other damage occurring from hauling operations. Inspectors shall not permit HMA to be placed over any distorted subgrade or subbase.

Whenever batch trucks or other paving equipment cause rutting of subbase or subgrade in HMA placement area, such that layer being placed does not conform to design dimensions, inspectors shall immediately stop construction. Construction shall not be permitted to resume until distorted subgrade or subbase is repaired.

Locating Unstable Areas

Contractors and inspectors are required to locate by proof rolling, unstable areas in advance to avoid distortion under equipment. Wet, unstable areas can be dried out before starting placement of HMA to avoid unanticipated and costly work shutdowns.

Locating wet or soft areas in advance can be accomplished by testing finished subgrade or subbase with a loaded truck. When distortions are observed under truck, subbase and subgrade can be dried out and reworked *(Specification 2109.03, A)*.

Construction of HMA pavement should not proceed unless testing gives a reasonable indication that distortions will not occur during construction of overlying pavement.

Determining Cause

During spring and early summer, unstable subgrades caused by high moisture contents are encountered statewide. This condition is usually seasonal and tends to improve as warmer, dryer summer weather stabilizes subgrade. Additional pavement thickness is not justified to bridge over these particular soft subgrades because of their seasonal nature.

When evaluating individual cases of instability, experienced judgment is advisable because of the similarity in outward appearances between moisture in subgrade due to seasonal conditions and more serious causes such as frost boil, unsuitable material, etc.

If excess seasonal moisture is encountered, dry subgrade by overdepth aeration and recompaction.

Overdepth Aeration and Recompaction

Treatment may be paid by change order provided project engineer authorizes its use, and work is closely monitored by inspector.

Specification2109.03, A, requires contractors to aerate and recompact distorted areas in subbase at their expense. For a natural subgrade, contractors are required, if necessary, to repair distorted areas by scarifying to a depth up to 150 mm (6 inches), aerating, and recompacting at their expense. Overdepth aeration and recompaction below the top 150 mm (6 inches) shall be paid for as extra work.

When repair, aeration, and recompaction are required to correct damage from contractor's operation, all necessary repair will normally be done at contractor's

expense. However, if project engineer determines that additional depth of aeration and recompaction are needed, that should be paid by change order.

Information accompanying such change order shall include a breakdown of time and equipment involved with authorized extra work.

Special Treatments
When unusual problems are encountered with unstable subgrades or subbases, District should contact Office of Construction for assistance.

8.42 STAKING METHOD FOR HMA PAVEMENTS

Refer to "Inspector's Handbook for Construction Survey" for instructions on construction staking for HMA paving.

8.43 GUIDELINE STRINGS AND EDGE ALIGNMENT

Inspector should make frequent measurements to insure guideline string has been correctly set and maintained. Nails used to secure guideline string shall be at intervals close enough to eliminate chords on curves and other irregularities.

Guideline strings placed on two-lane HMA pavement should be located by measuring from redhead nails placed on centerline. Placement of lower HMA layer will cover redheads. For succeeding lifts, guideline string should be located by measuring from exposed nails used to hold string for each previous lift.

When resurfacing two-lane PCC pavement, contractors may locate guideline strings on shoulders along outer edges. This is done by measuring out from one of the pavement edges at intervals of approximately 150 m (500 feet), then tightening string and using intermediate nails to secure string. To insure that parallel alignment is used for adjacent lane, guideline string for that lane shall be located by measuring across pavement from nails used to secure first string.

When city streets or other multilane pavements are being surfaced, guideline strings shall be inspected according to procedure described in *Construction Manual 8.54*.

True edge alignment controls correct lap at longitudinal joint. If insufficient lap, joint will lack density resulting in raveling and joint deterioration. Excessive lap produces an objectionable wide scab of mixture on the surface next to the centerline joint, resulting in unacceptable appearance.

An intended lap of 25 mm (1 inch) with a variance of 12.5 mm (1/2 inch) will normally be the optimum overlap for longitudinal joint construction. To maintain these close variances, adjacent lane must be constructed with true edge alignment.

Finishing machine operator shall follow guideline string exactly. If machine goes off line for any reason, it shall be adjusted back onto the line immediately. It is incorrect to smooth out the edge alignment by coming back onto the line gradually. This results in long stretches where incorrect lap at longitudinal joint will occur. When batch trucks bump finishing machines off line on curves, movement is usually down slope of curve. If machine is brought back on line gradually, an objectionable, long, straight chord will result in what is supposed to be curved edge alignment.

Irregular edge alignment due to any cause, including adjustments of finishing machine, shall be corrected at once by hand tools. When corrections in edge alignment are unable to be made promptly after they occur, inspector shall require finishing machine to be stopped until workers catch up with making corrections.

When constructing handworked areas such as driveway run outs and bridge approach tapers, edge alignment may become irregular during rolling because small high and low spots in handworked surface tend to extend in width unevenly. Edge alignment of handworked areas can be made true by first rolling the surface with a steel-tired roller, then immediately trimming the edge with hand tools while mixture is still hot and workable.

8.44 LONGITUDINAL JOINTS

To obtain adequate compaction at longitudinal joints, contractor shall place sufficient thickness of mix to compensate for 20 to 25 percent reduction in thickness that normally occurs from rolling. If thickness is insufficient prior to rolling, joint will usually be smooth in appearance but lack density because of inadequate compaction.

The vertical face of exposed, longitudinal joints must be tacked before the adjacent lane is placed. If a Notched Wedge Joint configuration is used, the tacked area also includes the sloping “wedge” face placed in conjunction with the first lane. This treatment is very important to insure a seal at the joint. No tack coat shall be sprayed on surface of lane being matched. Shields on distributor spray bar will help protect adjacent lane.

If overlap is maintained at approximately 25 mm (1 inch) and thickness of joint is correct, brooming or raking is not necessary to obtain a good joint. However, occasional corrections with hand tools may be necessary. When handwork is completed, excess material should be wasted as opposed to scattered on lane being constructed.

When automatic screed controls are used, short joint matching shoe shall not be permitted except when placing a single lift of 38 mm (1 1/2 inches) in thickness or less; or for placement in conjunction with heater scarification work. The specified 9 m (30-foot) ski device shall be used for joint matching on each layer for all other situations.

Short joint matching shoes produce joints with smoother appearances than 9 m (30-foot) ski devices. However, they do not contribute toward a smoother riding surface.

Careful adherence to inspection procedures described in *Construction Manual 8.43* will insure true edge alignment, which is essential for correct construction of longitudinal joints.

8.45 TACK COATS USING EMULSIONS

For Dilution

SS-1, SS-1H, CSS-1, and CSS-1H grades are specified. Dilution of emulsion is required if non-uniform tack applications are experienced. Dilute at 1:1 ratio, i.e., 1 L emulsion to 1 L water (1 gallon emulsion to 1 gallon water).

Application Rate for Diluted Emulsion

For diluted material, double the rates of undiluted material application.
Example: 0.14 to 0.23 L/sq m (0.03 to 0.05 gallons/square yard) undiluted increased to 0.272 to 0.454 L/sq m (0.06 to 0.10 gallons/square yard) dilute emulsion.

Sample for Compliance
Sample emulsion at spray bar of distributor with bar valve in a circulating position.

Measurement for Pay
Net liters (gallons) of undiluted emulsion.

Keep in mind, undiluted emulsion must contain a minimum of 57% asphalt residue; therefore, diluted emulsion must contain a minimum of 28.5% residue.

Settlement of Diluted Emulsions
Varying residue rates of diluted emulsion may be related to blending of original emulsion or settlement while in storage. To minimize this problem, the following steps are recommended:

- Contractor emulsion delivered to storage should be gently circulated prior to pumping into distributor truck.
- If contractor obtains emulsion directly from terminal, the emulsion should be gently circulated prior to use each day.

Material in a storage tank can be circulated with a large diameter, slow turning propeller, or by pumping from top to bottom. Only a small amount of agitation is necessary. Forced air should not be used for agitation since it may cause the emulsion to break.