

grinding the existing asphalt pavement surface to remove surface distortions to achieve the specified surface smoothness requirements.

907-401.02.6.7.2--Equipment. The grinding equipment shall be a power driven, self-propelled machine that is specifically designed to smooth and texture pavement surfaces with diamond blades. The effective wheel base of the machine shall not be less than 12.0 feet. It shall have a set of pivoting tandem bogey wheels at the front of the machine and the rear wheels shall be arranged to travel in the track of the fresh cut pavement. The center of the grinding head shall be no further than 3.0 feet forward from the center of the back wheels.

The equipment shall be of a size that will cut or plane at least two feet (2') wide. It shall also be of a shape and dimension that does not encroach on traffic movement outside of the work area. The equipment shall be capable of grinding the surface without causing spalls at joints, or other locations.

907-401.02.6.7.3--Construction. The construction operation shall be scheduled and proceed in a manner that produces a uniform finish surface. Grinding will be accomplished in a manner to provide positive lateral drainage by maintaining a constant cross-slope between grinding extremities in each lane.

The operation shall result in pavement that conforms to the typical cross-section and the requirements specified in Subsection 907-401.02.6.7.4. It is the intent of this specification that the surface smoothness characteristics be within the limits specified.

The Contractor shall establish positive means for removal of grinding residue. Solid residue shall be removed from pavement surfaces before it is blown by traffic action or wind. Residue shall not be permitted to flow across lanes used by public traffic or into gutters or drainage facilities, but may be allowed to flow into adjacent ditches.

907-401.02.6.7.4--Finished Pavement Surface. The grinding process shall produce a pavement surface that is smooth and uniform in appearance with a longitudinal line type texture. The line type texture shall contain parallel longitudinal corrugations that present a narrow ridge corduroy type appearance. The peaks of the ridges shall not be more than 1/16 inch higher than the bottoms of the grooves.

The finished pavement surface will be measured for riding quality. The grinding shall produce a riding surface which does not exceed either the specified profile index or the specified bump and dip limit.

907-401.02.6.8--Acceptance Procedure for Pavement Smoothness Using Mean Roughness Index (MRI). When compaction is completed, the lift shall have a uniform surface and be in reasonably close conformity with the line, grade and cross section shown on the plans.

The smoothness of the surface lift will be determined by using an Inertial Profiling System (IPS) to measure and record roughness data in each designated location. Roughness data for each longitudinal profile will be reported as a Mean Roughness Index (MRI). MRI is calculated by

averaging the International Roughness Index (IRI) values from the two individual wheelpath profiles. The surface shall be tested and corrected to a smoothness index as described herein with the exception of those locations or specific projects that are excluded from smoothness testing with an IPS.

The smoothness of the surface lift will be determined for traffic lanes, auxiliary lanes, climbing lane and two-way turn lanes. Areas excluded from a smoothness test with the IPS are acceleration and deceleration lanes, tapered sections, transition sections for width, shoulders, crossovers, ramps, side street returns, etc. The roadway pavement on bridge replacement projects having 1,000 feet or less of pavement on each side of the structure will be excluded from a smoothness test. Pavement on horizontal curves having a radius of less than 1,000 feet at the centerline and pavement within the super elevation transition of such curves are excluded from smoothness testing. Smoothness testing shall terminate 264 feet from each transverse joint that separates the pavement from a bridge deck, bridge approach slab or existing pavement not constructed under the contract. This shall apply to any other exceptions including, but not limited to, railroad crossings and manholes. Segments containing a considerable amount of encroachments such as intersections, manholes, curb and gutter sections, etc. may be excluded at the Project Engineer's discretion.

Initial smoothness measurements shall take place no more than 72 hours following placement of surface and must be performed at the posted speed limit or 50 miles per hour (± 5 mile per hour), whichever is lower. This speed requirement will be waived for all lightweight profilers. Measurements will be made in both wheel paths of exterior and interior lanes. The wheel paths shall be designated as being located three feet (3') and nine feet (9') from centerline or longitudinal joint, respectively. Beginning and ending latitude and longitude coordinates shall be required on each smoothness surface test. Testing will also be required on sections that have been surface corrected. No smoothness testing shall be performed when there is moisture of any kind on the pavement surface. Any additional testing shall meet the requirements of Subsection 907-403.03.2.

The surface lift will be accepted on a continuous interval basis for pavement smoothness. Continuous reporting is based upon all MRI values for a specified running interval. These values are averaged and presented at the midpoint of the specified running interval. The last 15 feet of a day's lift may not be obtainable until the lift is continued and for this reason may be included in the subsequent section.

Areas of localized roughness exceeding the continuous 25-foot interval threshold described in Subsection 907-403.03.2.1 shall be corrected regardless of the 528-foot interval MRI value of the section. Surface correction by grinding shall be performed in accordance with Subsection 907-401.02.6.7. The Contractor shall also make other necessary surface corrections to ensure that the final mean roughness index of the section meets the requirements of Subsection 907-403.03.2.

Continuous sections exceeding the accepted long interval MRI value shall be corrected as specified in Subsection 403.03.4. All such corrections shall be performed at no additional costs to the State. Scheduling and traffic control will be the responsibility of the Contractor with

approval of the Engineer. All tests and corrections shall be in accordance with AASHTO R 54-10, Accepting Pavement Ride Quality When Measured Using Inertial Profiling Systems.

907-401.02.6.9--High Speed Inertial Profiling System.

907-401.02.6.9.1--General. The IPS, furnished and operated by the Contractor under the supervision of the Engineer or the Engineer's representative, shall be a dual laser high speed or lightweight vehicle meeting the requirements of AASHTO M 328-10, Standard Specification for Inertial Profiler.

907-401.02.6.9.2--Mechanical Requirements. The IPS should function independent of vehicle suspension and speed with an operational range of 15-70 mph (for high speed profilers only) and must collect data at a sample interval of no more than three inches (3"). All IPSs, operators, and combinations thereof shall be verified in accordance with AASHTO R 56-10, Standard Practice for Certification of Inertial Profiler Systems and AASHTO R 57-10, Operating Inertial Profiler Systems.

907-401.02.6.9.3--Computer Requirements. The computer measurement program must be menu driven, Windows compatible, and able to produce unfiltered profiler runs in any one of the following file formats: University of Michigan's Transportation Research Institute's (UMTRI) Engineering Research Division (*.erd) file, ProVAL's Pavement Profile (*.ppf) file, or Ames Engineering's (*.adf) file format. The computer shall have the ability to display and print data on site for verification and shall have the ability to save and transfer data via Universal Serial Bus (USB) flash drive, which shall be provided by the Contractor.

All profiler runs must be named in the following format for acceptance by the Project Engineer:

- County_Route_Direction_Lane_BeginStation_EndStation

In addition to manufacturers software; the latest version of FHWA's ProVAL software shall be installed on the IPS computer. ProVAL software is available for free download at <http://www.roadprofile.com>.

907-401.02.7--Nuclear Gauges.

907-401.02.7.1--Nuclear Moisture-Density Gauge. The nuclear gauge unit used to monitor density shall contain a full data processor which holds all calibration constants necessary to compute and directly display wet density, moisture, and dry density in pounds per cubic foot. The data processor shall compute and display the percent moisture and percent density based on dry weight.

907-401.02.7.2--Nuclear Asphalt Content Gauge. The Contractor shall furnish and calibrate, unless designated otherwise in the contract, a Troxler Nuclear Asphalt Content Gauge Model 3241 or updated model, or a Campbell Nuclear Asphalt Content Gauge Model AC-2 or an approved equal.

907-401.03--Construction Requirements. Mississippi DOT has adopted the "Hot-Mix Asphalt

second paving operation working in tandem.

During the finishing and compacting of pavement lifts, it shall be the responsibility of the Contractor to check the surface and joints for progress toward conformance to surface requirements set forth herein. Variations from surface requirements exceeding the allowable tolerances shall be corrected at the Contractor's expense.

When a portland cement concrete pavement is to be placed on an asphalt lift, the finished top of the asphalt lift shall meet the requirements of Sections 32I and 50I.

Sections(s) or portions thereof representing areas excluded from a smoothness test with the High Speed Inertial Profiling System (IPS) shall also be excluded from consideration for a contract price adjustment for rideability.

Any contract price adjustment for rideability will be applied on a continuous basis to the pay tonnage, determined in accordance with Subsections 907-401.02.6.8 and 907-403.04, for the section(s) or portions thereof for which an adjustment is warranted.

Contract price adjustments for rideability shall only be applicable to the surface lift and furthermore to only the long continuous section(s) or portions of the long continuous section(s) of the surface lift that require smoothness be determined by using a profiling device.

907-403.03.2.1--Smoothness Tolerances for Mean Roughness Index (MRI). Smoothness tolerances shall be applied to asphalt pavements based on the following pavement categories.

Category A applies to the following pavement constructions:

- New construction
- Construction with three (3) or more lifts
- Mill and two (2) or more lifts

Category B applies to the following pavement constructions:

- Mill and one (1) lift
- Two (2) lift overlays without milling

Category C applies to the following pavement constructions:

- Single lift overlay without milling
- All 57,650-pound routes regardless of the pavement construction

Additional projects may qualify for Category C construction at the department's discretion. Spot Leveling does not count as a lift. Full width / continuous leveling courses that have a minimum thickness of ¾" across the entire lane width will be considered a lift.

Category A projects shall have a long continuous interval (528-foot) surface MRI of not more than 60 inches per mile.

Category B projects shall have a long continuous interval (528-foot) surface MRI of not more than 70 inches per mile.

Category C projects shall have the existing surface profiled at no additional cost to the State. These projects shall be measured by a long fixed interval (528-foot) surface MRI and meet the higher value of the following requirements:

- A 50% improvement in MRI from the existing surface
- OR
- 80 inches per mile

In the case that 50% of the existing surface MRI is greater than 80 inches per mile, the short continuous threshold shall be increased from 160 inches per mile by the difference between 50% of the existing surface MRI and 80 inches per mile.

For all projects, areas of the surface lift with localized roughness greater than 160 inches per mile as determined by the continuous short interval (25') report will be identified for correction by the Project Engineer.

When a project has multiple lifts, the lift underlying the surface lift shall have a MRI of no more than 10 inches/mile more than the surface lift threshold for both long and short continuous intervals. Category B projects containing multiple lifts must meet the Category C percent improvement requirement for the underlying lift. Corrective action must be taken on those segments that do not meet this requirement. No unit price adjustment will be applied on any underlying lift.

For Category A and B projects, a unit price increase will be added when the MRI for the final surface lift, prior to any required localized roughness (short interval) corrective action, is less than or equal to fifty inches per mile (50.0 inches / mile) on the long interval report. These Projects will be considered for incentive pay based on the following guidelines for the long interval surface lift MRI.

Mean Roughness Index inches / mile	Contract Price Adjustment Percent of Asphalt Unit Bid Price
Less than 35.0	108
35.1 to 40.0	106
40.1 to 45.0	104
45.1 to 50.0	102
50.1 to Required Surface MRI	100

In addition to the above pay incentive factors, a project may be subject to a disincentive when the Long Continuous Interval MRI for the surface exceeds the allowable tolerance.

Mean Roughness Index (inches / mile)	Contract Price Adjustment Percent of Asphalt Unit Bid Price
Above 20.0 Over	REMOVE AND REPLACE
15.1 to 20.0 Over	80
10.1 to 15.0 Over	85
5.1 to 10.0 Over	90
0.1 to 5.0 Over	95
Required Surface MRI	100

For Category C projects, segments may be subject to a disincentive when the Fixed Interval MRI for the surface does not meet the minimum requirements.

Percent Improvement MRI (inches/mile)	Contract Price Adjustment Percent of Asphalt Unit Bid Price
Below 30 Percent	REMOVE AND REPLACE
30.1 to 35.0 Percent	80
35.1 to 40.0 Percent	85
40.1 to 45.0 Percent	90
45.1 to 50.0 Percent	95
Above 50%	100

Segment(s) or portions thereof representing areas excluded from a smoothness test shall also be excluded from consideration for a contract price adjustment for rideability. Where a segment less than 528 feet occurs at the end of a section, it will be combined with the preceding 528-foot segment for calculation of MRI. Corrective action must be taken on those sections that exceed the 'Remove and Replace' threshold as directed by the Project Engineer. The minimum remove and replace length will be 528 feet (0.1 mile). Additional smoothness testing shall be required on sections following replacement and will be required to meet *at least* the maximum surface MRI short of 'Remove and Replace' tolerance.

The above pay factors will be applied in conjunction with the Long Continuous Histogram Chart from ProVAL's Smoothness Assurance Module. The price adjustments for rideability will be tabulated in MDOT's Pay Incentive spreadsheet on the basis of a theoretical tonnage of 110 lbs/yd² * inch thickness (pounds per square yard * inch thickness) determined in accordance with Subsections 907-401.02.6.5 and 907-403.04, for the segment(s) or portions thereof for which an adjustment is warranted.

907-403.03.3--Thickness Requirements. Asphalt overlay lifts shall be constructed as nearly in accordance with the thickness shown on the plans as the underlying pavement and foundation will permit. Periodic and cumulative yield tests will be made to determine practicable conformity to the thickness of each lift. The Engineer may order modifications in placement thicknesses to prevent unwarranted variations in plan quantities.

When the paver is operating off an established grade line, no thickness determination will be

required for the various lifts of pavement. It is understood that the tolerances from design grade will control the thickness requirements.

When grade stakes are eliminated by Notice to Bidders or as outlined in Subsection 907-403.03.2(d) and where resulting in the placement of two (2) or more lifts, acceptance and payment will be determined on a lot to lot basis by cores taken from the completed pavement. Lots will be coincidental with acceptance lots for the surface lift as provided in Subsection 907-401.02.6.4, except that only lots resulting from the placement of mainline surface lift will be used for thickness assessment. One core will be obtained at random from each lot. Irregular areas will not be cored.

When the average thickness of all the cores from the lots representing a day's production, excluding any discarded by the Engineer for justifiable reason, is within three-eighths of an inch (3/8") of the total pavement thickness shown on the plans, excluding lift(s) placed using an established grade line, corrective action will not be required and a price adjustment will not be made for non-conformity to specified thickness.

When the average thickness of all the cores from the lots representing a day's production is deficient in thickness by more than three eights of an inch (3/8") of the total pavement thickness shown on the plans, excluding lift(s) placed using an established grade line, the deficiency shall be corrected by overlaying the entire length of the day's production. The thickness of the overlay shall be equal to the thickness deficiency but no less than the minimum single lift laying thickness for the specified mixture.

When the thickness of all the cores from the lots representing a day's production is more than three eights of an inch (3/8") thicker than the total thickness shown on the plans, excluding lift(s) placed using an established grade line, a price adjustment will be made in accordance with Subsection 907-403.05.1.

The cores shall be cut and removed by the Contractor in the presence of the Engineer's representative and turned over to the Engineer's representative for further handling. The Contractor shall fill each core hole with surface lift mixture and compact to the satisfaction of the Engineer within 24 hours after coring.

907-403.03.4--Lift Corrections. Pavement exceeding the allowable surface tolerances shall be corrected at the Contractor's expense by the following methods:

Lower, Leveling and Lower Intermediate Lifts:

- (a) Removal or addition of mixture by skin patching, feather edging, wedge lift construction or full depth patching where appropriate and can be completed in a satisfactory manner.
- (b) Superimposing an additional layer which shall be an approved grade raise for the full roadway width and length of the area to be corrected.

Top Intermediate Lift: