

\*\* USE WHEN SPECIFIED IN THE MATERIALS MEMORANDUM \*\*  
\* USE IN CONJUNCTION WITH STORED SPECIFICATION 416ACES \*  
\* INSERT SMOOTHNESS DATA IN 416-7.06(B) \*  
\* INSERT IDV DATA IN 416-9 \*

(416PAVSM, 03/11/99)

## SECTION 416 - ASPHALTIC CONCRETE-END PRODUCT:

**416-7.06 Smoothness:** of the Standard Specifications is revised to read:

### (A) General:

The final pavement surface shall be evaluated for smoothness by testing.

Past experiences have shown that the following practices have contributed to smooth pavements:

Keeping a constant head of hot mix material in front of the screed. Not letting the truck bump the paver. Running the paver continuously at a speed which matches the asphalt delivery. Avoiding stopping the paver. Exercising care in making transverse joints. Using a uniform, consistent mix, and avoiding segregation at any point.

Some newer techniques and systems for placing the material that can improve pavement smoothness are:

Precision controls to maintain a proper head of material, maintaining uniformity in both consistency and volume. Infinitely variable auger-conveyer speeds to match paver speed and thickness requirements. Power adjustable auger height to provide "on-the-go" control. Ultrasonic sensing systems to check automatically for material height and signal the auger and conveyer drive to keep correct head of material. Three-point suspension systems and hydraulic drives. Mix temperatures maintained within a narrow range.

Some compaction techniques and systems for improving smoothness include:

Edge compactors to compact mat edges more efficiently. Edge cutters to trim mat edges in preparation for paving additional lanes, thereby promoting smoother longitudinal joints. Heavier/larger rollers to "break down" thicker lifts. Solid state controls for speed, direction, frequency and amplitude to promote more efficient compaction and smoother surfaces. Use of higher frequency ranges and the ability to match amplitude and frequency to production densification at higher production rates.

However, the contractor may need to adopt innovative or state-of-the-art techniques to achieve an incentive payment.

The U.S. Army Corps of Engineers distributes the Handbook of Hot-Mix Asphalt Paving which presents some advanced pavement techniques the contractor may elect to use to achieve greater smoothness. The handbook was jointly prepared by the American Association of State Highway and Transportation Officials (AASHTO), the Federal Aviation Administration (FAA), Federal Highway Administration (FHWA), National Asphalt Pavement Association, U.S. Army Corps of Engineers, American Public Works Association (APWA), and National Association of County Engineers. A copy is available for reference at the ADOT Materials Group, 1221 North 21st Avenue, Phoenix, Arizona, 85009-3740.

This document is available from the Federal Aviation Administration Advisory Circular AC 150/5370-14 and from the U.S. Army Corps of Engineers Publication UN-13 (CEMP-ET). In addition, the National Asphalt Pavement Association has available information on Pavement smoothness, including information series 111, Pavement Smoothness.

**(B) Testing:**

Testing will be performed by the Department in accordance with the provisions of Arizona Test Method 829. At the completion of mainline paving, the contractor shall notify the Engineer in writing that the pavement is ready for testing. The Engineer will then evaluate the roadway. If the Engineer determines that additional roadway preparation is required, the contractor shall perform such preparation as directed by the Engineer. The contractor shall ensure that the road can be driven safely at the design speed. If requested by the Engineer, the contractor shall broom the pavement immediately prior to testing. No measurement or direct payment will be made for preparing the roadway, the cost being considered as included in the price of contract items.

The testing will be performed within seven days after the Engineer has accepted the roadway for testing. The Engineer will notify the contractor of the test results no later than seven days after the testing has been performed.

Testing will be done on mainline traffic lanes only, and will include the full length of the pavement placed under the contract. Distress lanes, shoulders, ramps, tapers, cross roads, and frontage roads will not be tested. Testing will not be performed on any portions that cannot be made safe for testing at the design speed, or on any lanes of less than 0.30 miles in length.

Testing will not be done when the ambient air temperature is less than 40 degrees F or during rain or other weather conditions determined to be inclement by the Engineer.

The existing roadway has the following smoothness values (Mays-Meter inches per mile):

**\*\* INSERT 0.1-MILE SMOOTHNESS VALUES HERE, IF AVAILABLE;  
OTHERWISE DELETE ABOVE SENTENCE.**

**\*\***

Any 0.1-lane-mile increment having an Actual Smoothness (AS) equal to or greater than the Correction Value (CV) shall be repaired. Upon completion of the repairs, the 0.1-lane-mile increment containing the repaired area will be re-tested.

The Correction Value (CV) for this contract is 100 inches per mile.

If repairs are required, the contractor shall prepare a written repair proposal detailing corrective actions and submit the proposal to the Engineer within ten working days after the contractor's receipt of test results. Within three working days, the Engineer will review the submitted proposal and either accept it or reject it and ask for a new proposal. If rejected, the contractor shall prepare a new proposal for corrective action, within ten working days, based on discussions with the Engineer.

If, after the first attempt to repair the pavement, the Actual Smoothness (AS) is still equal to or greater than the Correction Value (CV), additional repairs and testing shall be performed as directed by the Engineer.

In addition to the smoothness requirements, the finished pavement surface shall not vary more than 1/8 inch from the lower edge of a ten foot straightedge when the straightedge is placed in a longitudinal direction. All deviations exceeding the specified tolerance shall be corrected by the contractor at no additional cost to the Department. The asphaltic concrete surface will be tested by the Engineer.

The contractor shall perform remedial work, including furnishing materials, required to correct pavement smoothness deficiencies such that the Correction Value (CV) is less than 100 inches per mile. Remedial work shall be performed by the contractor at no additional cost to the Department.

Traffic control costs during the initial smoothness testing period will be reimbursed under the provisions of Section 701 of these specifications. Any additional traffic control costs incurred, outside the normal scope of work, due to pavement repairs and subsequent pavement smoothness measurements shall be borne solely by the contractor.

**416-9**                    **Basis of Payment:** of the Standard Specifications is modified to add:

An Incentive/Disincentive Value will be added to or subtracted from the contract monies due the contractor based on the following:

The Incentive/Disincentive Value (IDV), plus or minus, for each 0.1-lane-mile shall be determined from the following formulas:

When  $AS < XX$ :

$$\text{Incentive Value} = ((XX - AS) / (XX + 2)) * 2500$$

When AS > YY:

$$\text{Disincentive Value} = ((\text{YY} - \text{AS}) / (\text{XX} + 2)) * 1000$$

The Actual Smoothness value (AS) will be determined in accordance with Arizona Test Method 829.

The Incentive Base for this contract is \$2,500.00 for each 0.1-lane-mile increment or fraction thereof. The Disincentive Base for this contract is \$1,000.00 for each 0.1-lane-mile increment or fraction thereof.

The total Incentive/Disincentive Value, plus or minus, for the contract shall be the summation of the individual Incentive/Disincentive Values for the respective 0.1-lane-mile segments.

Incentive/Disincentive Value will not be applied to pavement in distress lanes, shoulders, ramps, tapers, cross roads, or frontage roads.