

## ORIGINATION FORM

**THE INFORMATION BELOW IS TO BE PROVIDED BY THE ORIGINATOR**

Modify Specification \_\_\_\_\_330\_\_\_\_\_.  
Section/File number

New Section \_\_\_\_\_.  
Section number

**Subject:** Name of Section, Article or Subarticle

**Origination date:** December 19, 2006

**Originator:** David Wang  
**Office/Phone:** State Construction Office/850-414-4152  
**Email address/** david.wang@dot.state.fl.us  
**Userid:** cn982dw

**Problem statement:** The quality of smoothness on asphalt surface

**Information source:** David Wang

**Background data:** Analysis and evaluation data files of Asphalt Smoothness Committee.

### **Recommended**

**Usage Note:** The QC/VT System will be used on all the asphalt roadway construction projects and the incentive/disincentive system will only be applied on FC-5 Limited Access Roadways with design speed equal to or greater than 50 miles per hour.

**Estimated fiscal impact, if implemented:**

**Implementation of these changes, if and when approved, will begin with the July 2007 letting.**



# Florida Department of Transportation

JEB BUSH  
GOVERNOR

605 Suwannee Street  
Tallahassee, FL 32399-0450

DENVER J. STUTLER, JR.  
SECRETARY

## MEMORANDUM

**DATE:** December 21, 2006  
**TO:** Specification Review Distribution List  
**FROM:** Duane F. Brautigam, P.E., State Specifications Engineer  
**SUBJECT:** Proposed Specifications Change: 3301200 Surface Requirements

In accordance with Specification Development Procedures, we are sending you a copy of a proposed new specification change Surface Requirements

This change was proposed by David Wang of the State Office of Construction to clarify surface smoothness requirements for asphalt pavement.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at SP965DB or duane.brautigam@dot.state.fl.us. Comments received after January 18, 2007 may not be considered. Your input is encouraged.

DFB/ft

Attachment

COMMENTS:

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Submitted by:

Phone #:

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**SURFACE REQUIREMENTS.**  
**(REV 12-18-06)**

ARTICLE 330-12 (Pages 239 – 242) is deleted and the following substituted:

**330-12 Surface Requirements.**

**330-12.1 General:** Construct a smooth pavement with good surface texture and the proper cross-slope.

**330-12.2 Texture of the Finished Surface of Paving Layers:** Produce a finished surface of uniform texture and compaction with no pulled, torn, raveled, crushed or loosened portions and free of segregation, bleeding, flushing, sand streaks, sand spots, or ripples. Correct any area of the surface that does not meet the foregoing requirements in accordance with 330-12.5.1.

Do not use asphalt concrete mixtures containing aggregates that cause a different color appearance in the final wearing surface in sections less than 1 mile in length and across the full width of the roadway unless approved by the Engineer.

**330-12.3 Cross Slope:** Construct a pavement surface with cross slopes in compliance with the requirements of the Contract Documents. Furnish a level with a minimum length of 4 feet or a digital measuring device approved by the Engineer for the control of cross slope. Make this level or measuring device available at the jobsite at all times during paving operations. Utilize electronic transverse screed controls on the paving machine (unless directed otherwise by the Engineer) to obtain an accurate transverse slope of the pavement surface.

**330-12.3.1 Quality Control Requirements:** Measure the cross slope of the pavement surface by placing the measuring device perpendicular to the roadway centerline. Report the cross slope to the nearest 0.1%. Record all the measurements on an approved form and submit to the Engineer for documentation.

Measure the cross slope at a minimum frequency of one measurement every 100 feet during paving operations to ensure that the cross slope is uniform and in compliance with the design cross slope. When the difference between the measured cross slope and the design cross slope exceeds  $\pm 0.2\%$  for travel lanes (including turn lanes) or  $\pm 0.5\%$  for shoulders, make all corrections immediately to bring the cross slope into the acceptable range.

When the cross slope is consistently within the acceptable range, upon the approval of the Engineer, the frequency of the cross slope measurements can be reduced to one measurement every 250 feet during paving operations.

**330-12.3.2 Verification:** The Engineer will verify the Contractor's cross slope measurements by randomly taking a minimum of ten measurements of the cross slope over a day's production. If the average cross slope of the ten random measurements varies more than the allowable tolerance from the design cross slope (0.2% for travel lanes including turn lanes and 0.5% for shoulders), take immediate action to bring the cross slope into the acceptable range. A recheck of the cross slope will then be made following the adjustment. If the recheck indicates that the cross slope is still out of tolerance, stop the paving operations and correct the deficient section in accordance with 330-12.5.1. Resume paving operations only upon approval of the Engineer. The Engineer reserves the right to verify the pavement cross slope at any time by taking cross slope measurements as described above.

The Engineer may waive the corrections specified above (at no reduction in payment) if:

1) the deficiencies are sufficiently separated so as not to affect the overall ride quality, traffic safety and surface drainage characteristics of the pavement and;

2) the corrective action would unnecessarily mar the appearance of the finished pavement.

For intersections, tapers, crossovers, transitions at beginning and end of project and similar areas, adjust the cross slope to match the actual site conditions or as directed by the Engineer.

**330-12.4 Pavement Smoothness:** Construct a smooth pavement meeting the requirements of this Specification.

**330-12.4.1 General:** Furnish a 15 foot manual and a 15 foot rolling straightedge meeting the requirements of FM 5-509. Make them available at the job site at all times during paving operations. Obtain a smooth surface on all pavement courses placed, and then straightedge all final structural and friction course layers in accordance with 330-12.4.5.

**330-12.4.2 Test Method:** Perform all straightedge testing in accordance with FM 5-509 with one pass of the rolling straightedge operated along the outside wheel path of each lane being tested. The Engineer may require additional testing at other locations within the lane.

**330-12.4.3 Traffic Control:** Provide traffic control in accordance with Section 102 and the Design Standards Index Nos. 607 or 619 during all testing. When traffic control cannot be provided in accordance with Index Nos. 607 or 619, submit an alternative Traffic Control Plan as specified in 102-4. Include the cost of this traffic control in the Contract bid prices for the asphalt items.

**330-12.4.4 Process Control Testing:** Assume full responsibility for controlling all paving operations and processes such that the requirements of these Specifications are met at all times. Address in the QC Plan the methods to be used to control smoothness.

**330-12.4.5 Quality Control Testing:**

**330-12.4.5.1 General:** Straightedge the final Type SP structural layer and friction course layer with a rolling straightedge. Test all pavement lanes and ramps where the width is constant using a rolling straightedge and document all deficiencies on a form approved by the Engineer. Notify the Engineer of the location and time of all straightedge testing a minimum of 48 hours before beginning testing.

**330-12.4.5.2 Rolling Straightedge Exceptions:** Testing with the rolling straightedge will not be required in the following areas: intersections, tapers, crossovers, parking lots and similar areas. In addition, testing with the rolling straightedge will not be performed on the following areas when they are less than 50 feet in length: turn lanes, acceleration/deceleration lanes and side streets. However, correct any individual surface irregularity in these areas that deviates from the plan grade in excess of 3/8 inch as determined by a 15 foot manual straightedge, and that the Engineer deems to be objectionable, in accordance with 330-12.5.1.

In addition, the Engineer may also waive the straightedging requirements on ramps and superelevated sections where the geometrical orientation of the pavement results in an inaccurate measurement with the rolling straightedge.

**330-12.4.5.3 Intermediate Layers:** Straightedge all intermediate Type SP layers (structural and overbuild) as necessary to construct a smooth pavement. ~~On roadways with a design speed 50 miles per hour or greater, when an intermediate Type SP layer will be opened to traffic, straightedge the pavement with a rolling straightedge and correct all deficiencies in excess of 3/8 inch within 72 hours of placement, unless directed otherwise by the Engineer. Correct all deficiencies in accordance with 330-12.5.1.~~

**330-12.4.5.4 Final Type SP Structural Layer:** Straightedge the final Type SP structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. The Engineer will verify the straightedge testing by observing

the Quality Control straightedging operations. Correct all deficiencies in excess of 3/16 inch in accordance with 330-12.5.1, and retest the corrected areas prior to placing the friction course.

For bicycle paths, straightedge the final structural layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation. Correct all deficiencies in excess of 5/16 inch in accordance with 330-12.5.1. Retest all corrected areas. If the Engineer determines that the deficiencies on the bicycle path are due to field geometrical conditions, the Engineer will waive corrections with no deduction to the pay item quantity.

**330-12.4.5.5 Friction Course Layer:** *Straightedge the friction course layer with a rolling straightedge, either behind the final roller of the paving train or as a separate operation upon completion of all paving operations. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations. Correct all deficiencies in excess of 3/16 inch in accordance with 330-12.5.1, and retest the corrected areas to meet this requirement. Acceptance for pavement smoothness will be based on verified Quality Control measurements using the rolling straightedge. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations.*

~~At the completion of all paving operations, straightedge the friction course as a separate operation. As an exception, if approved by the Engineer, straightedge the friction course behind the final roller of the paving train. Correct all deficiencies in excess of 3/16 inch in accordance with 330-12.5.1. Retest all corrected areas.~~

**330-12.4.5.6 Quality Control for Laser Acceptance:** *Quality control straightedging and corrections for the Final Type SP Structural Layer and Friction Course Layer are optional when acceptance is by Laser Profiler in accordance with 330-12.4.6.2.*

*As an exception, if determined necessary by the Engineer when any Type SP layer will be opened to traffic, straightedge the pavement with a rolling straightedge and correct all deficiencies in excess of 3/8 inch within 72 hours of placement. Correct all deficiencies in accordance with 330-12.5.1.*

**330-12.4.6 Acceptance:**

**330-12.4.6.1 Straightedge Acceptance:** *For areas ~~mainline traffic lanes of Limited Access~~ of roadways where the design speed is ~~less~~ equal to or greater than 50 miles per hour ~~with other than FC-5 Friction Course~~, acceptance for pavement smoothness will be based on verified Quality Control measurements using the rolling straightedge as required by 330-12.4.5. The Engineer will verify the straightedge testing by observing the Quality Control straightedging operations. ~~The Engineer may waive the corrections and penalties if the deficiencies are caused by manholes, valve boxes, intersections, etc. that are beyond the control of Contractor.~~ The Engineer may ~~also~~ allow the contractor to leave in place at no pay segments that would be required to be removed and replaced if it is determined not to be a significant detriment to the ride quality. A reduction to the pay item quantity will be made in accordance with 330-12.5.2.*

**330-12.4.6.2 Laser Acceptance:** *For areas ~~FC-5 Friction Course on Limited Access~~ of high speed roadways where the design speed is equal to or greater than 50 miles per hour, acceptance testing for pavement smoothness of the friction course (for mainline traffic lanes only) will be based on the Laser Profiler. Ramps, acceleration and deceleration lanes, and other areas not suitable for testing with the Laser Profiler will be tested and accepted with the rolling straightedge in accordance with 330-12.4.5.5 and 330-12.4.6.1*

*Upon completion of all corrections to the friction course, the pavement smoothness of each lane will be determined by a single pass of a Laser Profiler furnished and operated by the Department in accordance with FM 5-549. The average Ride*

*Number of both wheel paths reported to one decimal place. In no case will the pavement be retested once the smoothness is determined.*

*For this testing the pavement will be divided into 0.1 mile segments. Partial segments equal or greater than 0.01 mile shall be considered as a 0.1 mile segment. For transitions within 50 feet from the beginning and ending of the project, bridge approaches and departures, and other areas where the segment is less than 0.01 mile, the segment shall be tested and accepted with the rolling straightedge in accordance with 330-12.4.5.5 and 330-12.4.6.1 following testing with the Laser Profiler.*

**(A) For FC-5 friction course on limited access roadways:**

*The acceptance criteria and pay adjustments for pavement smoothness are as shown in Table 330-3.*

<i>Table 330-3 Limited Access FC-5 Laser Profiler Acceptance Criteria a Pay Adjustment Schedule</i>	
<i>RN for each 0.1 mile segment</i>	<i>Pay Adjustment \$/ 0.1 mile segment</i>
<i>≥ 4.5</i>	<i>+\$2,400.00</i>
<i>4.4</i>	<i>+\$1,200.00</i>
<i>4.3</i>	<i>+\$600.00</i>
<i>4.2</i>	<i>+\$300.00</i>
<i>4.1</i>	<i>\$0.00</i>
<i>4.0</i>	<i>\$0.00</i>
<i>3.9</i>	<i>-\$500.00</i>
<i>3.8</i>	<i>-\$1,000.00</i>
<i>3.7</i>	<i>-\$2,000.00</i>
<i>3.6</i>	<i>-\$4,000.00</i>
<i>3.5</i>	<i>Remove and Replace</i>
<i>&lt;3.5</i>	<i>Remove and Replace</i>

*A \$0.00 Pay Adjustment will be applied to any segment that would receive a positive Pay Adjustment when the total number of segments receiving a negative Pay Adjustment on a project exceed 15% of the total segments on a project. The maximum payment for smoothness Pay Adjustment based on Table 330-3 will be limited to 5 percent of the original Contract amount.*

~~*The Engineer may waive the corrections and penalties if the deficiencies are caused by manholes, valve boxes, intersections, etc. that are beyond the control of Contractor. The Engineer may also allow the contractor to leave in place at the maximum negative Pay Adjustment of \$4,000.00, segments that would be required to be removed and replaced if it is determined by the Engineer not to be a significant detriment to the ride quality. Segments that are removed and replaced will be tested with the rolling straightedge in accordance with 330-12.4.5.5. This straightedging (and corrections and retesting as necessary) is required and is not optional.*~~

~~*For FC-5 Friction Course on Limited Access roadways where the design speed is equal to or greater than 50 miles per hour the transverse pavement joints at the beginning and end of the project and at the beginning and end of all bridge structures shall meet the requirements as defined in 330-12.4.6.3.*~~

(B) For other friction course on high speed roadways where the design speed is equal to or greater than 50 miles per hour: The acceptance criteria for pavement smoothness are as shown in Table 330-4.

Table 330-4	
RN Per Segment/Partial Segment	Method of Acceptance
RN >= 4.0	Acceptance with full payment
RN <=3.9	Correct all roughness causing deficiencies in excess of 3/16 in [10mm] in accordance with 330-12.5 after the evaluation of Note 1.
<p><b>Note 1:</b> For 0.1 mile segments and partial segments with a RN less than 4.0, the Engineer will issue a second report with RN in 0.01 mile interval for both wheelpaths. When no RN in the second report is less than 3.5 at any wheelpath in a segment, this segment will be accepted with full payment. Correct those areas with RN less than 3.5 in any wheelpath in accordance with 330-12.5. When there are three or more RN less than 3.5 in 0.01 mile interval being found within a segment, remove and replace the entire segment at no cost to the Department.</p> <p>Notify the Engineer of the location and time of correction a minimum of 48 hours before beginning the correction operation. Upon completion of the corrections, straightedge the pavement with a 15 foot rolling straightedge in both wheelpaths as observed by the Engineer, and ensure that there are no deficiency(ies) greater than 3/16 inch.</p>	

~~The Engineer may waive the corrections if the deficiencies are caused by manholes, valve boxes, intersections, etc. that are beyond the control of Contractor.~~

The Engineer may ~~also~~ allow the contractor to leave the deficient areas in place with reduction in pay item quantity in accordance with 330-12.5.2 if it is determined by the Engineer that the roughness of surface will not be a significant detriment to the ride quality.

For FC-5 friction course on limited access roadways, the transverse pavement joints at the beginning and end of the project and at the beginning and end of all bridge structures shall meet the requirements as defined in 330-12.4.6.3.

**330-12.4.6.3 Joint Smoothness Requirements:** For all transverse pavement joints for FC-5 Friction Course on Limited Access roadways where the design speed is equal to or greater than 50 miles per hour, at the beginning and end of the project and at the beginning and end of all bridge structures, straightedge the friction course layer with a rolling straightedge in accordance with 330-12.4.5.5. Place the rolling straightedge on the new pavement parallel to the centerline along the wheel path of each lane (2 feet from each longitudinal edge). Locate the front wheel of the rolling straightedge 42.5 feet from the joint or project end with the body of the rolling straightedge extending away from the joint. Pull the rolling straightedge across the joint, stopping when the front wheel is 8 feet onto the old pavement or bridge deck. Repeat the process for both wheel paths in each lane. Record all deficiencies in excess of 3/8 inch during the straightedging operation for each wheel path.

**330-12.4.6.3.1 Joint Smoothness Acceptance Criteria:** The joint smoothness and acceptance criteria are shown in Table 330-45:

Table 330-45	
Joint Smoothness and Acceptance Criteria	
Smoothness	Acceptance Criteria

<i>All deficiencies of both wheel paths at each lane <math>\leq</math> 3/16 inch (5 mm)</i>	<i>Acceptance with incentive payment at \$1000.00 per joint per lane</i>
<i>3/16 inch (5 mm) &lt; Deficiency of any wheel path at each lane <math>\leq</math> 3/8 inch (10 mm)</i>	<i>Acceptance with no deduction</i>
<i>Deficiency of any wheel path at each lane &gt; 3/8 inch (10 mm)</i>	<i>Remove and replace in accordance with 330-12.5.1 at no cost to the Department</i>

~~When the surface conditions of the existing/old asphalt pavement at the beginning and/or end of the project are extremely irregular and uneven, the Contractor may request permission to extend the project limits. Upon approval by the Engineer, extend the project limits a maximum length of 100 feet at either or both ends of the project to construct a smooth transverse joint.~~

*The incentive payment will be based only on the initial measured smoothness value, after placement of the friction course but prior to any corrective work.*

*The Engineer may waive the joint acceptance criteria if the deficiencies are caused by factors beyond the control of the Contractor. Where the Engineer waives the joint acceptance criteria neither the incentive payment nor the pavement removal requirements will apply.*

*The maximum payment for joint smoothness will be limited to 3 percent of the original Contract amount. The joint smoothness incentive payment is calculated by using the following equation:*

*The total joint smoothness payment = (Total Number of Qualified Joints) x \$1000.00*

### **330-12.5 Correcting Unacceptable Pavement:**

**330-12.5.1 General:** Correct all areas of unacceptable pavement at no cost to the Department.

**330-12.5.1.1 Structural Layers:** Correct deficiencies in the Type SP structural layer by one of the following methods:

- a. Remove and replace the full depth of the layer, extending a minimum of 50 feet on either side of the defective area for the full width of the paving lane.
- b. Mill the pavement surface to a depth and width that is adequate to remove the deficiency. (This option only applies if the structural layer is not the final surface layer.)

**330-12.5.1.2 Friction Course:** Correct deficiencies in the friction course layer by removing and replacing the full depth of the layer, extending a minimum of 50 feet on either side of the defective area for the full width of the paving lane. Corrections may be waived if approved by the Engineer, and an adjustment to the pay item quantity made as defined in 330-12.5.2.

**330-12.5.2 Reduction in Pay Item Quantity:** When the Engineer elects to waive corrections, the Department will reduce the pay quantity for the pay item in question by the amount of material that the Contractor would have removed and replaced had the correction been made. When the pay quantity is in tons, the Department will base the reduction on removing a quantity of material that is 100 feet by the lane width by layer thickness as determined through the following equation:

$$\text{Quantity (tons)} = t \times G_{\text{mm}} \times W \times 0.24$$

design

Where  $t$  = Layer thickness (in.)

$G_{mm}$  = Maximum specific gravity from the verified mix

$W$  = Lane width (ft.)

For FC-5 and other open-graded friction courses, the Department will base the reduction on the area that the Contractor would have removed (100 feet by lane width) multiplied by a spread rate of 80 lb/yd<sup>2</sup> *as determined through the following equation:*

$$\text{Quantity (tons)} = W \times 0.44$$

*Where  $W$  = Lane width (ft.)*