

The Standard Specifications are revised as follows:

SECTION 401, DELETE LINES 546 THROUGH 658.

SECTION 401, AFTER LINE 658, INSERT AS FOLLOWS:

401.18 Pavement Smoothness

Pavement smoothness will be accepted by means of an inertial profiler, a 16 ft long straightedge, or a 10 ft long straightedge as described below.

(a) Inertial Profiler with Smoothness Pay Adjustments

When a pay item for Inertial Profiler, HMA is included in the contract, the Contractor shall furnish, calibrate, and operate an approved inertial profiler in accordance with ITM 917 on the mainline traveled way and ramps, including adjacent acceleration or deceleration lane, where all of the following conditions are met:

- 1. The design speed is greater than 45 mph.*
- 2. The traveled way or ramp lane width and slope are constant and is 0.5 mi in length.*
- 3. The HMA is placed on a milled surface and the planned lay rate for a single lift is 165 lb/sq yd or greater, or the total combined planned lay rate of surface, intermediate, and base courses is 385 lb/sq yd or greater.*

The profiles, International Roughness Index, IRI, results including smoothness histograms and areas of localized roughness, and fixed interval IRI results produced shall become the property of the Department. The inertial profiler shall remain the property of the Contractor.

The paving exceptions and areas exempt from inertial profiler operation will be in accordance with ITM 917.

If the posted speed limit for an entire smoothness section is less than or equal to 45 mph, the section will be exempt from IRI operation and the smoothness within the section will be accepted in accordance with 401.18(b).

If the posted speed limit is greater than 45 mph for a portion of a smoothness section and is less than or equal to 45 mph for the remainder, the section smoothness acceptance will be as follows:

- 1. By inertial profiler for the portion of the section with a posted speed limit greater than 45 mph.*
- 2. In accordance with 401.18(b) or (c) for the portion of the section with a posted speed limit less than or equal to 45 mph.*

At locations where the inertial profiler is required, it shall be used on the surface course and on any dense graded intermediate course immediately below the surface course.

(b) Inertial Profiler without Smoothness Pay Adjustments

For contracts which include the Inertial Profiler, HMA pay item, the Inertial Profiler will be used to simulate the 16 ft long straightedge to accept longitudinal smoothness on surface courses at the following locations:

- 1. All mainline traveled way lanes longer than 0.1 mi and shorter than 0.5 mi.*
- 2. All mainline traveled way lanes within smoothness sections with posted speed limits less than or equal to 45 mph throughout the entire section length.*
- 3. All turn lanes, including bi-directional left turn lanes longer than 0.1 mi.*
- 4. All ramps.*
- 5. All acceleration and deceleration lanes associated with ramps with design speeds of 45 mph or less and longer than 0.1 mi.*

(c) 16 ft Straightedge and 10 ft Straightedge

The Department will furnish and operate 16 ft and 10 ft straightedges as described below. The 16 ft straightedge is used to accept smoothness along the direction of mainline traffic and the 10 ft straightedge is used to accept smoothness transverse to the direction of mainline traffic. This includes longitudinal smoothness on public road approaches and median crossovers.

For contracts which include the Inertial Profiler, HMA pay item, the 16 ft long straightedge will be used to accept longitudinal smoothness on surface courses at the following locations:

- 1. All mainline traveled way lanes shorter than 0.1 mi.*
- 2. All mainline traveled way lanes at locations exempted from inertial profiler operation in accordance with ITM 917.*
- 3. All tapers.*
- 4. All turn lanes, including bi-directional left turn lanes shorter than 0.1 mi.*
- 5. All acceleration and deceleration lanes associated with ramps with design speeds of 45 mph or less and shorter than 0.1 mi.*
- 6. All shoulders.*

For contracts where the inertial profiler is not used for smoothness acceptance, the 16 ft straightedge will be used to accept longitudinal smoothness on all dense graded courses at the above locations as well as all mainline travel way lanes and ramps with design speeds of greater than 45 mph. Smoothness acceptance on ramp acceleration or deceleration lanes will also be based on operation of the 16 ft straightedge.

The 10 ft long straightedge shall be used to check transverse slopes, across travel lanes and shoulders, approaches, and crossovers.

(d) Smoothness Correction

At locations where the inertial profiler is being used on an intermediate course, all areas having a localized roughness in excess of 150 in./mi utilizing a 25 ft window shall be corrected. The width of the corrected area may be partial or full lane width, depending on the respective wheel path profiles. After corrective action is taken on an intermediate course, a 16 ft straightedge or inertial profiler may be used to verify the adequacy of the corrective action.

At locations where the inertial profiler is being used on a surface course, all areas having a localized roughness in excess of 150 in./mile utilizing a 25 ft window shall be corrected. The width of the corrected area may be partial or full lane width, depending on the respective wheel path profiles. Underlying courses that are exposed by corrective action shall be milled to a depth of 1 1/2 in and replaced with surface course. After the corrective action is taken on a surface course, the inertial profiler shall be operated throughout the entire affected smoothness section to verify the adequacy of the corrective action.

At locations where the 16 ft straightedge is used, the pavement variations shall be corrected to 1/4 in. or less. When the 10 ft straightedge is used, the pavement variations shall be corrected to 1/8 in. or less.

If grinding of an intermediate course is used for pavement smoothness corrections, the grinding shall not precede the surface placement by more than 30 calendar days if open to traffic.

SECTION 401, DELETE LINES 770 THROUGH 817.

SECTION 401, AFTER LINE 817, INSERT AS FOLLOWS:

(c) Smoothness

Smoothness pay adjustments will only be applied when the smoothness is measured by an inertial profiler in accordance with 401.18(a). The pay adjustment will be based on the continuous IRI smoothness histograms utilizing a 25 ft window generated on the surface course only. The continuous pavement section length will be based on construction phases and will be subject to approval by the Engineer.

At locations where an inertial profiler is used to accept smoothness, a quality assurance adjustment will be determined for each lane. This adjustment will be applied to all QC/QA HMA pay items within the pavement section. The adjustment will be calculated using the following formula:

$$Q_s = K \times 0.5 \sum_{i=1}^n [(PF_i^s - 1)(Y_i + Z_i)]$$

where:

$$K = A \times \sum_{j=1}^m \left[\frac{S_j}{T} \times U_j \right]$$

Q_s = quality assurance adjustment for smoothness

PF_i^s = pay factor for smoothness for histogram cell i

m = number of layers

n = number of cells

A = area of the section, sq yd

S_j = planned spread rate for material, lb/sq yd

T = conversion factor, 2000 lb/ton

U_j = unit price for the material, \$/ton

Y_i = percentage of left wheel path IRI in histogram cell i

Z_i = percentage of right wheel path IRI in histogram cell i

When smoothness is measured by an inertial profiler, payment adjustments will be made based on the IRI in accordance with the following table. The IRI will be determined prior to any required smoothness correction in accordance with 401.18(d).

<i>PAY FACTORS FOR SMOOTHNESS</i>	
<i>Design Speed greater than 45 mph</i>	
<i>IRI, in./mi.</i>	<i>Pay Factor, PF</i>
<i>over 0 to 40</i>	<i>1.06</i>
<i>over 40 to 45</i>	<i>1.04</i>
<i>over 45 to 50</i>	<i>1.03</i>
<i>over 50 to 55</i>	<i>1.02</i>
<i>over 55 to 70</i>	<i>1.00</i>
<i>over 70 to 75</i>	<i>0.98</i>
<i>over 75 to 80</i>	<i>0.97</i>
<i>over 80 to 85</i>	<i>0.96</i>
<i>over 85</i>	<i>0.94</i>

SECTION 401, BEGIN LINE 887, DELETE AND INSERT AS FOLLOWS:

401.22 Basis of Payment

The accepted quantities for this work will be paid for at the contract unit price per ton for QC/QA-HMA, of the type specified, complete in place.

Payment for furnishing, calibrating, and operating the ~~profilograph~~ *inertial profiler*, and furnishing profile information will be made at the contract lump sum price for ~~profilograph~~ *inertial profiler*, HMA.

Adjustments to the contract payment with respect to mixture, density, and smoothness for mixture produced will be included in a quality adjustment pay item in accordance with 109.05.1.

SECTION 401, BEGIN LINE 912, DELETE AND INSERT AS FOLLOWS:

~~Profilograph~~*Inertial Profiler, HMA.....LS*

SECTION 401, BEGIN LINE 937, DELETE AND INSERT AS FOLLOWS:

The price for ~~Profilograph~~*Inertial Profiler, HMA* will be full compensation regardless of how often the ~~profilograph~~*inertial profiler* is used or how ~~many profilographs~~*often the IRI is determined* are produced.

SECTION 402, BEGIN LINE 341, DELETE AND INSERT AS FOLLOWS:

402.18 Pavement Smoothness

~~Pavement smoothness will be in accordance with 401.18 except profilograph requirements will not apply.~~ *A straightedge in accordance with 409.03(f) will be used to determine smoothness. The 16 ft straightedge will be used to accept smoothness along the direction of mainline traffic and the 10 ft straightedge will be used to accept smoothness transverse to the direction of mainline traffic. Smoothness correction shall be in accordance with 401.18(d).*
