

**503 - PORTLAND CEMENT CONCRETE PAVEMENT SMOOTHNESS**

**SECTION 503**

**PORTLAND CEMENT CONCRETE PAVEMENT SMOOTHNESS**

**503.1 DESCRIPTION**

Determine the smoothness of the pavement surface. Correct the smoothness deficiencies discovered in the pavement surface.

**BID ITEM**

Concrete Pavement Smoothness

**UNITS**

Lump Sum

**503.2 MATERIALS** - None specified.

**503.3 CONSTRUCTION REQUIREMENTS**

**a. General.** Determine the pavement smoothness by profiling the pavement surface of through traffic lanes and ramps. Excluded from profilograph testing, and not eligible for pay adjustments, on all projects are:

- bridge decks;
- acceleration and deceleration lanes of at-grade intersections;
- turning lanes;
- shoulders;
- pavement on horizontal curves with centerline radius of curvature of less than 1000 feet, and pavement within the superelevation transition of such curves;
- individual sections of pavement less than 50 feet in length;
- sideroads less than 250 feet in length; and
- the first (or last) 15 feet of a pavement section where the Contractor is not responsible for the adjoining surface
- county secondary projects

**b. Equipment.** Use a California type profilograph, prequalified by the Bureau of Construction and Materials, to determine the pavement profile. If approved by the Bureau of Construction and Materials, other types of profilographs that produce results compatible to the California type profilograph may be used. If the profilograph has a mechanical recorder, provide a ProScan electronic scanner with motorized paper transport to reduce the trace. Use the motorized paper transport when scanning the profilograph traces. The Bureau of Construction and Materials can provide the information necessary for the Contractor to obtain a ProScan electronic scanner. If approved by the Bureau of Construction and Materials, other types of automated trace reduction equipment may be used. If the profilograph has a computerized recorder, the trace produced is evaluated without further reduction.

Provide a self-propelled grinding machine specifically designed to grind and texture portland cement concrete pavement using diamond blades mounted on a multi-blade arbor. The arbor must contain enough blades to provide at least a 36-inch wide cutting head and provide 55 to 60 evenly spaced grooves per foot.

Do not use equipment that causes excessive ravels, aggregate fractures or spalls. Use equipment that provides a flat plane surface without crown and a uniform texture for the full width of the lane. Grind a nominal depth of 3/16 inch.

When grinding is performed, use vacuum equipment or other continuous methods to remove grinding slurry and residue. Remove from the project and properly dispose of the material. Do not allow the grinding slurry to flow across lanes being used by traffic, onto shoulder slopes, into streams, lakes, ponds or other bodies of water, or gutters or other drainage facilities. Do not place grinding slurry on foreslopes.

Bush hammers or other impact devices will not be permitted.

**c. Profilograph Operation.** Provide an operator for the profilograph certified according to KT-46, Part V.

Determine the pavement profiles for each lane according to the procedures for 1 lane shown in Kansas Test Method KT-46. Additional profiles may be taken only to define the limits of an out-of-tolerance surface variation. The

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Engineer may use a 10-foot straightedge (or other means) to detect irregularities outside the required trace paths. The Engineer may also use the straightedge to delineate the areas that require corrective action.

Determine a profile index (in./mi.) for each pavement section of finished pavement. A pavement section is a continuous area of pavement surface 0.1 mile long by 1 lane wide (12 feet nominal). A partial pavement section resulting from an interruption (such as a bridge) of the continuous pavement surface is subject to the same testing and evaluation as a whole section.

During the initial paving operations (and after long shutdown periods), profile the pavement as soon as the concrete has cured sufficiently to permit testing. The Engineer and the Contractor will use the results of the initial testing to evaluate the paving methods and equipment. If the initial paving operation produces acceptable results, the Contractor may continue paving. Repair or replace any PCCP curing medium that is damaged or removed during the testing.

On surfaces excluded from profilograph testing, the Engineer will determine the pavement smoothness using a 10-foot straightedge. The Engineer will select the locations to be tested. The variation of the surface from the testing edge of the straightedge shall not exceed  $\frac{1}{8}$  inch between any 2 contacts, longitudinal or transverse.

Correct all irregularities exceeding the specified tolerance using equipment and methods approved by the Engineer. After the irregularities are corrected, the Engineer will retest the area to verify compliance with the specified tolerance.

**d. Profilograph Evaluation and Corrective Actions.** Evaluate the profilograph results according to KT-46. Provide the Engineer with the profilograms and their evaluation within 2 working days after placement of the pavement.

Determine and evaluate the profile index (in./mi.) for each trace and the average profile index (in./mi.) for each section to identify required corrective action.

Determine the daily average profile index (in./mi.) for each day's paving operation. A day's paving operation is the pavement placed in a day (a minimum of 1 pavement section).

- If less than 1 pavement section is placed in a day, the day's production is grouped with the next day's production.
- If the production of the last day of project paving is less than 1 pavement section, it is grouped with the previous day's production.
- The Contractor has the option of profiling the final portion of a day's production (not to exceed 5 sections) the first working day that paving is continued in the same lane. If the Contractor opts to profilograph the final portion of a day's paving the next working day that paving is continued in the same lane, those results (the final portion of the previous day's paving) are grouped with the day's paving as the lane is continued.

Make the required corrections for pavement smoothness before making the pavement thickness determinations. Take the required corrective actions according to **TABLE 503-1**.

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<b>TABLE 503-1: PCCP SURFACE CORRECTIONS</b>		
<b>Pavement Surface Tolerances (in./mi.)</b>		<b>Required Corrective Action</b>
<b>Through Lanes Speed Limit Greater than 45 mph</b>	<b>Acceleration Lanes<sup>1</sup> Deceleration Lanes<sup>1</sup> Ramps<sup>1</sup> Through Lanes Speed Limit 45 mph or Less</b>	
Profile Index per Section of 30 or less for an individual trace	Profile Index per Section of 40 or less for an individual trace	Correct all bumps and dips <sup>2</sup>
Profile Index per Section of greater than 30 for an individual trace		Correct the Profile Index of each individual trace to 30 or less per section <sup>3</sup>
	Profile Index per Section of greater than 40 for an individual trace	Correct the Profile Index of each individual trace to 40 or less per section <sup>3</sup>
Daily Average Profile Index greater than 40	Daily Average Profile Index greater than 65	Suspend the paving operations until corrective actions are taken to improve the paving operations

<sup>1</sup> Acceleration/deceleration lanes include the taper. Acceleration lanes that become through lanes are limited to 500 feet from the nose of the ramp. Ramps are from the nose to the intersection of the adjoining road.

<sup>2</sup> Correct all areas within each section having high points (bumps) with deviations in excess of 0.3 inches in a length of 25 feet or less regardless of the profile index value.

<sup>3</sup> Contractor has the option to replace the section when the Profile Index per Section is greater than 65.

After the profilograph traces have been evaluated, make corrections according to **TABLE 503-2**.

<b>TABLE 503-2: GRINDING REQUIREMENTS</b>	
<b>Condition</b>	<b>Action*</b>
Greater than 25% (132 feet) of the 0.1 mi. section requires correction	Continuously grind the entire 0.1 mi. section.**
Greater than 25% (1320 feet) of 1.0 mi. segment require correction	Continuously grind the entire 1.0 mi. segment, when the areas requiring correction are dispersed throughout the 1.0 mi. segment. If the areas requiring correction are isolated to 1/3 or 1/2 mi. within the 1.0 mi. segment, then only grind that 1/3 or 1/2 mi.

\* Continuously grinding requires a minimum of 98% of the pavement be ground.

\*\*If the skip length between areas to be ground (either within a 0.1 mi. section or between 0.1 mi. sections) is less than either grind length, combine the grinds so the area between is also ground. This additional ground area (area between) will apply to the computation of the 25% of the 0.1 mi. section.

If the Contractor elects or is required by **TABLE 503-2** to continuously grind the entire project, the following apply:

- the areas excluded in **subsection 503.3a** are not required to be ground;
- at intersections constructed with multiple transitions for drainage (especially in urban areas), if smoothness meets **SECTION 503**, the intersection is not required to be ground; and
- when transitioning from a ground area to an unground area, feather the grinding a uniform distance throughout the project.

Grind and texture the entire surface of the pavement in the longitudinal direction. Provide positive lateral drainage by maintaining a constant cross slope between grinding passes in each lane.

Maintain a uniform transverse slope that matches the existing cross slope to the extent possible with no depressions or humps greater than 1/4 inch in 12 feet when tested with a string line or straightedge. Do not exceed by more than 1/16 inch the vertical alignment between adjacent passes of the cutting head. Begin and end grinding lines

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normal to the direction of vehicle travel. Grind the surface so corrugations are parallel to the pavement edge with ridges 1/16 inch,  $\pm 1/32$  inch higher than the valleys of the corrugations.

Use the following methods for corrections:

- Diamond grinding or other profiling devices approved by the Engineer,
- Remove and replace the entire pavement thickness

Apply the corrective measure to the full lane width of the pavement. The corrected areas shall have uniform texture and appearance. The beginning and ending of the corrected areas shall be squared normal to centerline of the paved surface.

**e. Profilograms.** After pavement sections are corrected, re-profile the pavement surface to verify compliance with the specified pavement smoothness. Provide the Engineer with the profilograms and their evaluation within 2 working days after correcting the pavement surface.

The Engineer may perform profilograph testing on the pavement surface for monitoring and comparison purposes. If the Engineer determines that the Contractor's certified test results are inaccurate, the Engineer may choose to test the entire project length. The Engineer will charge the Contractor for such testing at the rate of \$500 per mile per profile track, with a minimum charge of \$1000. Providing inaccurate test results may result in de-certification of the Contractor's certified operator.

### 503.4 MEASUREMENT AND PAYMENT

Pay adjustments will be based on the initial average profile index determined for the "sections" prior to performing any corrective work, unless the surface of the entire project is continuously ground.

If the Contractor elects or is required by **TABLE 503-2** to continuously grind the entire project, pay adjustments will be based on the average profile index determined after all grinding is performed.

If the Contractor elects to remove and replace the sections, the Contractor will be paid the price adjustment that corresponds to the initial average profile index obtained on the pavement sections after replacement.

The Engineer will apply the contract price adjustment according to **TABLE 503-3**.

Payments made for "Concrete Pavement Smoothness" will be shown as an added item to the contract.

<b>TABLE 503-3: CONCRETE PAVEMENT SMOOTHNESS PAY ADJUSTMENT NEW CONSTRUCTION</b>	
<b>Average Profile Index (in./mi. per lane per 0.1 mi. section)</b>	<b>Contract Price Adjustment (per 0.1 mi. section per lane)</b>
6.0 or less	+\$1000.00
6.0 to 10.0	+\$835.00
10.1 to 15.0	+\$625.00
15.1 to 18.0	+\$310.00
18.1 to 30.0	0.00
30.1 to 40.0	0.00*
40.1 or more	-\$615.00*

\*Correct to 30.0 inch/mile (40.0 in./mi. as noted in **TABLE 503-1**).

The pay adjustments in **TABLE 503-3** are for 12-inch thick hot mix asphalt and 8-inch thick portland cement concrete pavements. Pay adjustments for pavements of different thicknesses will be reduced or increased proportionally, based on the typical section for the extent. (i.e. pay adjustment for a 12-inch portland cement concrete pavement is equal to the adjustment from the TABLE multiplied by 1.5).