

N. *Surface Smoothness.* Effective January 1, 2005, surface smoothness shall be measured using the International Roughness Index (IRI). Until that time surface smoothness may be measured using either the Profile Index or International Roughness Index.

The pavement placed by the Contractor shall conform to the smoothness schedule defined in this section and specified in the contract.

The Contractor shall perform pre-paving (Schedule III only), quality control, and acceptance surface smoothness testing, analyze the results of this testing, and submit the results to the Engineer.

Pre-paving results shall be submitted to the Engineer prior to the start of paving. Prior to the beginning of paving the Contractor shall notify the Engineer which surface smoothness index will be used.

Quality Control results shall be submitted to the Engineer no later than the next calendar day following placement. Quality control testing may be performed using either a profilograph or profiler at the Contractor's option.

Acceptance testing results shall be performed on the final lift and submitted to the Engineer prior to any corrective action. Acceptance testing shall be completed within one (1) week of completion of paving.

At the Contractor's option, the quality control testing may be used for acceptance provide the quality control testing is verified.

All acceptance surface smoothness testing shall be verified. For profilographs, a verification block shall be used at least once for every profilograph run. The verification block shall be 3/4-inch (19 mm) thick and 75 inches (1900 mm) in length and shall be placed longitudinally in the profilograph path by the Engineer. The Engineer will note the approximate station(s) of the block placement.

For manual profilographs (those using a pen plotter linked directly to the wheel), the profilogram will be initialed by the Engineer at either the beginning or the end of the run, and at the location(s) where the verification block was placed. For all other profilographs, a documentation point shall be inserted in the file at the location of the verification block. For electronic profilographs a preliminary copy of the profilogram shall be submitted to the Engineer immediately at the end of the run.

For profilers, the profile run shall be witnessed by the Engineer and a preliminary copy of the profilogram shall be submitted to the Engineer immediately after the end of the run. Profilers shall be a Class I or Class II as defined by ASTM E950.

Should the results of the quality control testing indicate surface smoothness is not within specifications, the Contractor shall suspend paving operations until it can be demonstrated that steps taken to modify operations will result in surface smoothness, which meets specifications.

The finished pavement shall conform to the following requirements:

1. The surface shall be tested with 10-foot a (3 m) straight-edge, at locations to be determined. When the straightedge is laid on finished pavement in a direction parallel

with centerline or perpendicular to centerline, the surface shall not vary more than 1/4 in. (5 mm) from the lower edge. Any high points that cause the surface to exceed these tolerances shall be removed by grinding.

2. The surface shall be profiled in accordance with Idaho T-140 and these provisions:

Profiles shall be made 3 feet (1 m) from and parallel to the inside edge of each driving lane, and in other locations as directed, with a maximum of two profiles per driving lane.

Pavement shall conform to the following surface smoothness schedule requirements:

- a. When longitudinal grade is 4.5 percent or less, pavement on tangent alignment and pavement on horizontal curves having centerline radius of curve 2,000 feet (600 m) or more shall meet the surface smoothness requirements for the smoothness schedule specified. Consecutive 0.1-mile (100 m) sections of roadway tested will be added together to obtain the mile (km) section. There will be no overlapping of either the 0.1-mile (100 m) or 1-mile (1 km) sections to change cumulative test results.

Smoothness Schedule

Profile Index:

Schedule I Projects: Target Profile Index values - 0.44 to 0.50 in/0.1 mile (7.1 to 8.0 mm/100m). Corrective action required above 0.70 in/0.1mile (11mm/100m)

Schedule II Projects: Target Profile Index values – 0.51 to 0.55 in/0.1 mile (8.1 to 8.6 mm/100m). Corrective action required above 0.70 in/0.1mile (11mm/100m)

Schedule III Projects: Target Profile Index – The smoother of 1) 50 percent improvement to the pre-paving index or 2) a maximum final index of 1.0 in/0.1 mile (16.0 mm/100m). Corrective action is required above the target profile index.

International Roughness Index (IRI):

Schedule I Projects: Target IRI values - 6.1 to 7.0 in/0.1 mile (95.1 to 110.0 mm/100m). Corrective action required above 9.5 in/0.1 mile (150mm/100m)

Schedule II Projects: Target IRI values - 7.1 to 8.0 in/0.1 mile (110.1 to 125.0 mm/100m). Corrective action required above 9.5 in/0.1 mile (150mm/100m).

Schedule III Projects: Target IRI – The smoother of 1) 50 percent improvement of the pre-paving index or 2) a maximum final index of 10.0 in/0.1mile (160.0 mm/100m). Corrective action is required above the target IRI.

- b. Acceptance test strips, pavement on horizontal curves having a centerline radius of curve 1,000 feet (300 m) or more but less than 2,000 feet (600 m) and pavement within the superelevation transition of such curves or any pavement with a grade greater than 4.5 percent shall be excluded from incentive/disincentive payments but shall meet the corrective action requirements for the smoothness schedule specified.

3. The following areas of pavement shall not be profiled unless otherwise specified:

- a. Pavement on horizontal curves having a centerline radius of curve less than 1000 feet (300 m) and pavement within the superelevation transition of such curves.
- b. Pavement within 50 feet (15 m) of a transverse joint that separates the pavement from a structure deck, an approach slab, or an existing pavement not constructed under the contract.
- c. Pavement for approaches and structure decks.

The profiling equipment shall be operated at a speed no greater than that recommended by the manufacturer. It shall be calibrated at the beginning of the project and as needed thereafter.

Finished pavement shall be ground until it complies with the following smoothness requirements.

Individual high points in excess of 0.3-inch within a 25 foot (8 mm within an 8 m) distance or less, as determined by measurements of the profilogram, shall be reduced by grinding, until such high points do not exceed 0.3-inch (8 mm).

After grinding has been completed to reduce individual high points in excess of 0.3-inch (8 mm), additional grinding shall be performed in sections requiring corrective action as necessary to reduce the Profile Index or International Roughness Index to the Schedule I target values specified above in any 0.1-mile (100 m) section along any line parallel with the pavement edge.

All grinding shall be done parallel to centerline. Adjacent grinder passes, within any one ground area, shall be extended to produce a neat rectangular area having a uniform surface appearance. At transverse boundaries between ground and unground areas, smoothly feathered transitions shall be made. After grinding has been completed, the ground pavement surface shall receive a fog coat in accordance with Section 408 – Fog Coat.

The grinding equipment shall be a power-driven machine that is specifically designed to smooth Portland cement concrete pavement with diamond blades. The effective wheelbase of the machine shall not be less than 12 foot (3.6 m) and cutting width shall be at least 3-foot (900 mm). In lieu of diamond grinding, a self propelled milling machine of the type used for removal of asphalt pavement may be used provided a special milling head is used that is designed to provide a texture similar to diamond grinding. The cutting teeth on the milling head shall have a maximum spacing of 0.3-inch (7 mm). The forward speed of the machine is restricted to 10-feet (3 m) per minute while milling. Should the texture produced by milling be unsatisfactory diamond grinding shall be required. Grinding or milling equipment shall be of a shape and dimension that does not encroach on traffic movement.

The Contractor shall check the pavement for smoothness after grinding, in accordance with the requirements of this Subsection, and shall make any additional corrections necessary to the pavement to achieve smoothness. The Contractor shall submit a graph chart evaluated in accordance with Idaho T-140 showing compliance of the final surface to the smoothness requirements.

The cost of such grinding or milling, and all related work such as fog coat, disposal of milled material, traffic control, flagging, profiling, surface repair of ground or milled areas, and temporary striping shall be at the Contractor expense.

Add to 405.05 Basis of Payment.

For each evaluation section the Contractor is entitled to an incentive payment excluding acceptance test strips and Schedule III surface smoothness projects. An evaluation section is defined as a 0.1 mile (100m) per traffic lane; or fraction thereof as applicable. The incentive payment will not be paid for pavement on the roadway shoulders, center turn lanes, turn bays, crossovers, tapers or other miscellaneous pavement. The incentive payment will be paid in accordance with the following schedule:

Profile Index

English Schedule

Payment \$ per 0.1 mi.	Initial Index in/0.1 mile section	
	Schedule I	Schedule II
\$500	0.29 or less	0.32 or less
\$300	0.30 to 0.35	0.33 to 0.43
\$100	0.35 to 0.43	0.44 to 0.50
\$ 0	0.44 to 0.50	0.51 to 0.55
-\$100	0.51 to 0.55	0.56 to 0.60
-\$300	0.56 to 0.60	0.61 to 0.70
-\$500	0.61 to 0.70	
-\$300 and corrective action	0.71 or greater	0.71 or greater
-\$300 and corrective action	individual high points	individual high points

Metric Schedule

Payment \$ per 100m	Initial Index mm/100m section	
	Schedule I	Schedule II
\$310	4.5 or less	5.0 or less
\$190	4.6 to 5.5	5.1 to 7.0
\$60	5.6 to 7.0	7.1 to 8.0
\$ 0	7.1 to 8.0	8.1 to 8.6
-\$60	8.1 to 8.6	8.7 to 9.6
-\$190	8.7 to 9.6	9.7 to 11.0
-\$310	9.7 to 11.0	
-\$190 and corrective action	11.1 or greater	11.1 or greater
-\$190 and corrective action	individual high points	individual high points

International Roughness Index

English Schedule

Payment \$ per 0.1 mi.	Initial Index in/0.1 mile section	
	Schedule I	Schedule II
\$500	4.0 or less	4.5 or less
\$300	4.1 to 5.0	4.6 to 6.0
\$100	5.1 to 6.0	6.1 to 7.0
\$ 0	6.1 to 7.0	7.1 to 8.0
-\$100	7.1 to 7.5	8.1 to 8.5
-\$300	7.6 to 8.5	8.60 to 9.5
-\$500	8.6 to 9.5	
-\$300 and corrective action	9.6 or greater	9.6 or greater
-\$300 and corrective action	individual high points	individual high points

Metric Schedule

Payment \$ per 100m	Initial Index mm/100m section	
	Schedule I	Schedule II
\$310	63.0 or less	71.0 or less
\$190	63.1 to 79.0	71.1 to 95.0
\$60	79.1 to 95.0	95.1 to 110.0
\$ 0	95.1 to 110.0	110.1 to 125.0
-\$60	111.0 to or greater	125.1 to 135.0
-\$190	120.0 to or greater	135.1 to 150.0
-\$310	135.0 to 150.0	
-\$190 and corrective action	150.1 or greater	150.1 or greater
-\$190 and corrective action	individual high points	individual high points

Only one incentive payment will be made per evaluation section. The evaluation sections shall run consecutively from the point paving begins to the point paving is interrupted as shown on the plans such as at bridges, the end of lane paving or areas specifically excluded by the specifications.

Incentives will be based on initial profiles prior to any corrective work on the top course of paving.