

The longitudinal joint shall be sawed not later than five days after the concrete has been placed and before any equipment or vehicles are allowed on the pavement. When a multiple lane pavement is being constructed, all required sawing of longitudinal joints shall be performed on the pavement in place before additional lanes are constructed. Sawing of longitudinal joints shall be continuous across all transverse joints. Whenever sawing is discontinued, the cut shall terminate at a transverse joint. The sawed area shall be thoroughly cleaned and the joint shall immediately be filled with sealer or approved backer rod.

3. *Construction Joints.* The finished pavement shall be constructed to the full pavement width regardless of whether the fixed-form or slip-form method is used. Finished pavement in excess of 24N (7.2 m) wide and ramps or other pavement of non-uniform width shall be constructed in a manner to minimize formation of longitudinal construction joints. Transverse construction joints shall be constructed when there is an interruption of more than one hour in the concreting operations. Transverse construction joints shall not be constructed within 10N (3 m) of an expansion joint, contraction joint, or transverse plane of weakness. If necessary, an unanticipated construction joint shall be moved back to the last plan joint and the excess concrete removed and disposed of as directed.

Construction joints shall be formed by securing in place a removable bulkhead or header board, or alternatively as specified in Subsection 501.27. If a header board is used, it shall conform to the full cross-section of the pavement and shall be secured flush with the subbase and parallel to the normal transverse joints. The board shall be slotted or drilled to accommodate reinforcement as required by the Plans. The face of the form shall be oiled prior to concrete placement.

The roll of laitance and grout that usually forms in front of the paver shall not be used adjacent to transverse construction joints. Concrete adjacent to transverse construction joints shall be consolidated full width and depth using mechanical, hand-type, spud vibrators. One auxiliary vibrator shall be available for use in the event of mechanical malfunctions.

The Contractor shall stringline and correct variations of the concrete surface within 30N (9 m) on either side of transverse construction joints before the final finish is applied to the concrete. The surface shall be stringlined longitudinally. Surface deviations of more than 1/80 in 10N (3 mm in 3.048 m), in any direction, shall be corrected while the concrete is in a plastic condition.

Longitudinal construction joints shall be constructed by skilled concrete workers using tooling devices and edging tools while the concrete is in a plastic state. The Contractor shall use methods and equipment that ensure that joint reinforcement is properly located and not disrupted during construction.

All construction joints, transverse and longitudinal, shall be tooled with rounded or beveled edges to a radius or length specified on the Plans, or as directed, to accept the required joint sealant. Any joint of insufficient size or radius, or of poor workmanship, shall be corrected and sealed as directed.

**501.17 Surface Test.** The surfaces of finished concrete pavements will be tested by the Engineer using either a rolling straightedge, a straightedge, or a California-type profilograph. The California-type profilograph will be used unless otherwise stated in the Contract. All surface variations that exceed the tolerances specified for the type of test will be corrected and all excessive roughness shall be corrected before the work will be considered acceptable.

- a. *General.* In the absence of the requirement for profilograph testing as specified in (b) below, surface testing will be performed with a rolling straightedge or a straightedge

as described in the following paragraph. The finished surface of the pavement shall be within the tolerance of the following surface trueness test.

Finished concrete pavement will be tested by the Engineer for trueness in each wheel lane at the completion of the required curing or protection period. The surface will be tested by means of a rolling 10N (3.048 m) straightedge, or a 10N (3.048 m) straightedge placed parallel to the center line of the pavement, parallel to the grade line and touching the surface. Surface variations of the pavement measured by the 10N (3.048 m) rolling straightedge or measured from the base of the straightedge to the surface of the pavement shall not exceed 1/80 (3 mm). Surface variations which exceed 1/80 (3 mm) up to and including 20 in 10N (13 mm in 3.048 m) will be marked and shall be removed by an approved grinding tool or a device consisting of multiple saws. The use of a bush hammer or other impact devices will not be permitted. Determination of pavement thickness will be made after the removal of high spots.

Areas which vary from the true surface by more than 20 (13 mm) shall be diamond ground or removed and replaced with pavement of the specified quality and smoothness. When it is necessary to remove the pavement to eliminate surface variations, the sections removed shall be full lane width or the total width between longitudinal joints of the pavement, and shall be not less than 10N (3 m) in length. Pavement to be removed shall be saw-cut full depth along the faces of the patch. Pavement replaced shall conform to **Section 501** in every respect.

b. Profilograph Testing.

1. *General.* This test is performed in accordance with Department's Materials Manual to provide a value (Profilograph Ride Index, or PRI) for the riding surface smoothness of a traveled way and to locate excessive deviations ("must-correct" areas) in the relative profile of the riding surface.

The areas subject to smoothness testing will be designated as Primary Surfaces, Secondary Surfaces, and Shoulder Surfaces. Unless otherwise designated on the Plans, Primary Surfaces, Secondary Surfaces, Shoulder Surfaces, and surfaces not subject to smoothness testing are defined as follows:

- a. Primary Surfaces will be the traveled way consisting of mainline pavements (width limited to lane widths as shown on typical sections), shoulders described on the Plans as future traffic lanes, bridge transition and approach slabs, bridge decks, connectors, and ramps with radii of curvature of at least 1000N (300 m).
  - b. Secondary Surfaces will be the traveled way consisting of full-width acceleration and deceleration lanes and ramps with radii of curvature less than 1000N (300 m).
  - c. Shoulder Surfaces shall be concrete shoulders of at least 3N (1 m) width.
  - d. Any areas of riding surfaces not subject to surface testing using the profilograph will remain subject to other surface smoothness requirements of this Section.
2. *Construction Requirements.* The profile of all areas subject to smoothness testing shall be within 10 (25 mm) of the plan design profile.

The Contractor shall identify the locations of the limits of each test segment as identified by the Engineer with approved permanent markings in the pavement. This identification may be a scribe mark made at the time of paving into the top surface of the plastic concrete near the side of the slab.

This marking must remain visible until all of the riding surface testing is complete.

3. *Initial Testing Schedule.* Upon acceptable completion of the construction of each test segment of Primary or Secondary Surface, including all patching and other such work which may change the measured smoothness of the riding surface, but before any grinding or other such surface altering work, the Engineer will test and evaluate the riding surface smoothness.

Testing will be performed as soon as practical after construction of a full test segment, after curing has progressed to the point that the test equipment can properly ride the surface, and after the Contractor has cleared the area and requested testing by the Engineer. Results of this first evaluation will include a listing of "must-correct" areas and an Initial PRI. These results will be available to the Contractor within three working days after the test has been performed. All profilograph traces for the Project will be available for the Contractor's review at the Engineer's field office.

4. *Performance Requirements.* Each area having a deviation in excess of 0.300 (7.5 mm) above a reference line between two points which are up to 25N (7.62 m) apart on the traveled way surface constitute a "must-correct" area. The Engineer will report these deviations by station count where the approximate greatest deviation exists for each run made.

Prior to attempting to correct any "must-correct" area, the Contractor must receive approval for the proposed equipment and procedures from the Engineer. For bridge deck surfaces, the Contractor must furnish and use a pachometer to locate the top of the reinforcing steel prior to any corrective work. Generally, the Contractor may use grinding equipment that utilizes diamond cutting blades gang-mounted on a self-propelled machine.

As a requirement for approval, this equipment must have demonstrated previous successful use in grinding similar riding surfaces. The use of bush hammers or other impact devices will not be permitted. Any areas of spalls, aggregate fractures, disturbed joints, cross-slope discontinuities, or raveling pavement will not be accepted. Grinding work shall be performed parallel to, or at right angles to, the travel lane centerline.

The final texture of the surface shall be acceptable to the Engineer in terms of cross-slope drainage, skid resistance, and appearance. Cross-slope deviations in excess of 1/80 (3 mm) over a baseline distance of up to 3000N (900 m) will be unacceptable. In order to be accepted, the correction work may need to extend into adjacent test segments and into area not previously subject to profilograph testing.

The Contractor shall furnish and use a California-type profilograph to determine the limits of the proposed correction work for each "must-correct" area identified by the Engineer. The Contractor shall also evaluate the success of the attempted correction work with this equipment.

In addition to "must-correct" work, the Contractor may attempt to improve the PRI of a test segment. Prior to receiving acceptance of nonconforming test segments and prior to attempting to improve the PRI of a test segment, the Contractor must acceptably correct all "must-correct" areas in the test segment and present to the Engineer an acceptable profilograph trace of the full length of the test section showing satisfactory results of the correction efforts.

The Engineer reserves the right to use one working day to validate this evaluation. In case of disagreements, the standard equipment used for acceptance of the correction work shall be the Engineer's California-type profilograph and bump template. Should the Engineer's validation work reveal a lack of conformance to these requirements, the Contractor shall perform adequate corrections and shall request another evaluation by the Engineer. The cost to the Contractor for the Engineer to validate acceptable correction of "must-correct" areas is indicated in [Subsection 501.40 \(d\)](#).

Also prior to attempting to improve the PRI of a test segment, the Contractor must receive approval from the Engineer for the proposed procedures and for the proposed individual locations of corrective work for the test segment. Generally, the Contractor may use similar procedures as those used for correcting "must-correct" areas and must meet the same final performance requirements for work at "must-correct" areas.

The Contractor, in attempting to improve the PRI, should address the most rough areas within and immediately adjacent to the segment so that an evenly smooth traveled way results. The roughest areas may, or may not, be located where "must-correct" areas had existed. When the Initial PRI is acceptable (although a negative pay adjustment may be assessed), correction of "must-correct" areas alone may not be considered acceptable in attempting to improve the PRI. The Engineer will complete the evaluation of the improvement plan within three working days after it was received.

5. *Final Testing and Work Schedule.* As soon as practical after the Contractor performs PRI improvement work and requests another PRI determination from the Engineer, the Engineer will evaluate the smoothness of the test segment riding surface (but not necessarily before the Engineer has completed outstanding work in determining Initial PRI and validating "must-correct" correction work of other test segments). The result of this evaluation will be a Final PRI. This result will be available to the Contractor within three working days after the test has been performed.

If any "must-correct" deviations exist when the Final PRI is determined, the Contractor must correct them before that segment will be accepted for payment. In order to receive acceptance of any such segment after correction, the Contractor must request additional testing by the Engineer. The cost to the Contractor for the Engineer to validate acceptable correction of "must-correct" areas is indicated in [Subsection 501.40 \(d\)](#).

Should the total area of patching (full depth or partial depth) exceed 50 ft<sup>2</sup> (4.5 m<sup>2</sup>) of the surface within a test segment, this patching occurring after the Engineer has performed PRI testing, that PRI value is no longer valid; the Contractor must request additional testing to determine a Final PRI. Regardless of the value of the Initial PRI (or the Final PRI, if that value was also determined), patching which requires retesting shall result in the Contractor requesting another PRI determination.

The Contractor has the option of requesting extra profilograph testing in addition to the runs provided by the Engineer. There will be a cost for this work as described in [Subsection 501.40 \(d\)](#). Also, there may be a delay before this work is completed.

Damage to joint sealants, striping, etc. caused by corrective work performed

on the riding surface shall be acceptably repaired by the Contractor.

Determination of the pavement thickness will be performed after all corrective work is completed.

The Engineer will perform the work as soon as practical upon the Contractor's request but not necessarily before the Engineer has completed outstanding work in determining Initial PRIs. For scheduling purposes, the Contractor may expect the Engineer to evaluate about five test segments during a normal work day with acceptable environmental conditions. The Engineer will advise the Contractor of the results of these PRI determination tests within three working days and within one working day for validation of acceptable correction of "must-correct" areas.

**501.18 Sealing Joints.** Final sealing of all sawed, formed, or tooled longitudinal and transverse contraction and construction joints shall be done after all construction traffic has finished using the pavement. Transverse joints shall be filled with an approved backer rod prior to any vehicular traffic using the pavement. No widening of the joint shall be performed until construction traffic has been eliminated from the pavement.

The type of pavement joint sealant to be used shall be as shown on the Plans or specified in the Special Provisions. Prior to sealing, each joint shall be thoroughly cleaned for the full depth of the saw cut by brushing, oil-free compressed air, sand blasting, or other means. The cleaning shall completely remove all traces of laitance, curing compound, saw residue, dirt, and all foreign material, in accordance with the recommendations of the sealant manufacturer.

- a. All doweled transverse construction joints shall be sawed to the configuration of a contraction joint and sealed. Transverse construction joints tied with deformed bars may be tooled or sawed as directed, and sealed.

*Longitudinal Joint Sealant.* All longitudinal joints in the finished concrete pavement shall be sealed with hot-poured joint sealant to the configuration shown on the Plans.

All sawed joints to be sealed with hot-poured joint sealant shall utilize a polyethylene or urethane foam rod, or other approved bond breaker, sufficiently heat resistant to develop the required parabolic sealant shape and depth.

Construction joints shall be tooled and sealed as shown on the Plans. Immediately prior to installation of the backer rod and joint sealant, each joint shall be air blown, clean and dry.

Hot-poured joint sealant shall be placed in conformance with the manufacturer's recommendations concerning joint cleaning, application, and safe heating temperature.

For rounded or beveled joints, the sealant shall be installed to a depth as shown in the Standard Construction Details.

The sealing material shall be applied to each joint opening in accordance with the details shown on the Plans or as directed. Application shall be done in such a manner that the material will not be spilled on the exposed surfaces of the concrete. All excess material on the surface of the concrete pavement shall be removed immediately, and the pavement surface cleaned. The use of sand or similar material as a cover for the seal will not be permitted. Hot-poured joint sealing material shall not be placed when the air temperature in the shade is less than 50 EF (10 EC), unless approved by the Engineer.

- b. *Transverse Joint Sealant.* All sawed transverse joints in finished portland cement concrete pavement shall be sealed with preformed compression seals. The