

PCC Pavement Rideability

SCDOT Designation: SC-M-502DB (01/10)

1. SCOPE

- 1.1. This Supplemental Technical Specification is intended specifically for Design-Build projects and supersedes **SC-M-502**. If conditions permit and unless otherwise specified in the special provisions, the Materials and Research Engineer will test the PCC pavement surface in accordance with **SC-T-124** or **SC-T-125** as appropriate. Unless otherwise stated, the Contractor will make all corrective action required by this specification at no expense to the Department.

2. REFERENCED DOCUMENTS

- 2.1. SCDOT Standard Specifications Division 500
- 2.2. **SC-T-124**, Operation of the Cox Model C8200 Electronic Profilograph for Surface Measurement
- 2.3. **SC-T-125**, Measurement of Pavement Rideability using the Dynatest 5051 Mark III Road Surface Profiler
- 2.4. **SC-M-502**, PCC Pavement Rideability
- 2.5. **SC-M-503**, PCC Pavement Thickness Tolerance

3. EQUIPMENT

- 3.1. *Diamond Grinding*
 - 3.1.1. Use only a self-propelled grinding and texturing machine with diamond blades mounted on a multi-blade arbor with a minimum cutting-head width of 36 inches. Equipment that causes strain or damage to the underlying surface of the pavement is not acceptable. Repair or replace any equipment that causes excessive ravels, aggregate fractures, spalls, or disturbance of the transverse or longitudinal joints.

4. REQUIREMENTS FOR TESTING

- 4.1. For **SC-T-124** to be used, the following conditions must be met:
 - 4.1.1. The segment of roadway is a minimum continuous length of 0.1 miles, not including bridges.
 - 4.1.2. The segment consists of mainline roadway, ramps at least 0.1 mile in continuous length, or shoulder pavement designated for eventual mainline use. Other shoulder pavement

and ramps less than 0.1 mile in continuous length are not appropriate for testing by **SC-T-124**.

4.2. For **SC-T-125** to be used, the following conditions must be met:

4.2.1. The segment of roadway is a minimum continuous length of 0.5 miles, not including bridges.

4.2.2. The segment is posted for a speed limit of 45 mph or greater and has no stop signs or traffic signals that would impede the profiler.

5. REQUIREMENTS FOR NEW CONSTRUCTION.

5.1. *Pavement with a Tined or Broomed Final Surface*

5.1.1. *Final Finishing*

5.1.1.1 After the surface has been prepared as described in Subsection 501.4.10 and the water sheen has practically disappeared, texture the pavement using a drag strip. Use a drag strip consisting of a seamless strip of damp burlap, cotton fabric, or artificial turf that produces a uniform surface of gritty texture after dragging it longitudinally with a slight back-and-forth motion along the full-width of the pavement.

5.1.1.2 Ensure that the drag is an integral part of the paving train or, in the case of stationary side forms, is mounted on a bridge that travels on the forms. The minimum acceptable length of the drag strip is 3 feet. Ensure that the bottom edge of the drag strip remains in full contact with the pavement surface for the full width of the pavement. Where burlap fabric is used, ensure that the drag strip consists of at least two layers with the bottom layer approximately 6 inches longer than the upper layer(s). Maintain the drag in a condition that produces a concrete surface of uniform appearance and reasonably free from grooves over 1/16 inch in depth. Ensure that the drag is maintained clean and free from encrusted matter. If a drag is unable to be cleaned, discard it and replace with a new drag.

5.1.2. *Belting and Brooming*

5.1.2.1 In order to obtain the desired surface qualities or texture, the RCE may require the use of an approved belt or belting procedure or an approved brooming operation. A belting or brooming operation may be required separately, jointly, or along with the fabric or turf drag.

5.1.3. *Initial Surface Check*

5.1.3.1 Ensure that the pavement is true to the specified cross slope and grade. As soon as the concrete has cured sufficiently to walk on, but not later than 18 hours following placement, the RCE or the RCE's designated representative will check the transverse and longitudinal surface contour of all mainline pavement and ramp pavement, as well as any shoulder pavement intended as a future lane, with a 10-foot straightedge or other device approved by the Materials and Research Engineer. All variations of 1/8 inch or more, exclusive of texturing, will be plainly marked on the surface. Straightedge

tests are made at approximate 100-foot intervals, but may be taken more frequently at the RCE's sole discretion if uneven areas are encountered or suspected.

5.1.4. *Immediate Correction*

- 5.1.4.1 Immediately attempt to correct the marked areas by rubbing with a carborundum brick and water. However, in no case is it acceptable to rub the surface to the degree that contact with the coarse aggregate is made and the enveloping mortar is broken. If variations of 1/8 inch or more remain after rubbing, remove these areas with a power-driven grinding machine after the concrete has attained approximate full strength, but not less than 14 days after placement. Promptly replace any curing compound disturbed by the straightedge check or rubbing activities.

5.1.5. *Profilograph Measurement*

- 5.1.5.1 For pavement meeting the requirements of Subsection 4.1, a measured profile index greater than 12 with a 0.1-inch blanking band is not acceptable for any 0.25-mile lot in any wheelpath. Additionally, individual bumps greater than 0.2 inch above the blanking band are also unacceptable. Unless otherwise specified, the Department's Pavement Evaluation Unit will make profile measurements using **SC-T-124** to determine the profile index and bump size.

5.1.6. *Further Corrective Action*

- 5.1.6.1 The Contractor must correct unacceptable conditions either by removing and replacing the unacceptable pavement or by using a power-driven grinding machine after the pavement has achieved approximate full strength, but not less than 14 days after placement. If the total length of grinding exceeds 132 linear feet as measured parallel to the centerline of the roadway in any 0.25-mile segment, regardless of the transverse grinding width, and the pavement is not designated to receive an overall grinding and texturing, then grind 100% of the entire surface area of that segment for the full width of the individual lane being measured to achieve a uniform appearance. Conduct all grinding operations in accordance with Section 5.2.3 contained herein. Prior to any corrective work, the Contractor will provide the RCE with a written plan of corrective action and receive approval from the RCE before implementation.

5.2. *New Pavement with a Diamond Ground Final Surface:*

5.2.1. *Surface Finish*

- 5.2.1.1 Texturing by mechanical equipment for grooving plastic concrete using steel tines is not required when the final surface will be textured by diamond grinding. All other required finishing and texturing, including texturing using a drag strip is conducted according to the Standard Specifications and Subsection 5.1, above. Tining and/or diamond grinding is not required for shoulder pavement unless otherwise directed in the Plans or Contract. However, a brooming or belting process as given in Subsection 5.1 is required for shoulder pavement to provide a medium to heavy broom finish.

5.2.2. *Diamond Grinding*

- 5.2.2.1 Conduct diamond grinding operations using equipment as specified in Section 3 and in accordance with the requirements provided herein. Perform no diamond grinding until the pavement has attained sufficient strength to be opened to all types of traffic, and no sooner than 14 days after placement unless otherwise directed by the RCE. Complete all diamond grinding on any section prior to opening that section to other than construction traffic unless otherwise instructed by the RCE.
- 5.2.2.2 Ensure that the finished surface has a corduroy-type texture consisting of grooves that are between 0.090 and 0.150 inch wide. Ensure that the land area between the grooves is between 0.060 and 0.125 inch wide and the peaks of the ridges are 1/16 inch higher than the bottom of the grooves.
- 5.2.2.3 Ensure that all grooves and adjacent passes are parallel to each other and the roadway, with no variation. Completely lap adjacent passes, allowing no unground surface between them. However, do not allow adjacent passes to overlap more than 1.5 inches. When measured with a 3-foot straightedge, ensure that adjacent passes are within 1/8 inch of the same height. Texture not less than 98 percent of the specified surface, with 100 percent of the specified area as a target. Allow no ridges between lanes after grinding. Feather out any remaining ridges on the outside edge into the shoulder in a separate operation to the satisfaction of the RCE. When grinding the shoulder is necessary to remove ridges, this operation is conducted at no additional expense to the Department.
- 5.2.2.4 Correct any deficiencies in the final surface due to improper operations and/or equipment. This includes, but is not limited to, a) corrugation due to "out-of-round" wheels or improper cutting operations, b) depressions created due to improper starting or stopping operations, or c) unground ridges due to defective blades. Make all corrections parallel to and matching existing operations.
- 5.2.2.5 Remove residue from the grinding and texturing operation from the roadway. Do not permit residue to flow across shoulders or lanes occupied by traffic. Also, do not allow residue to flow into gutters or other drainage structures. Remove solid residue from the pavement surface before such material is blown by the action of traffic or wind. Perform a final sweeping using power equipment before opening the pavement to traffic.

5.2.3. *Joint Sealing*

- 5.2.3.1 Complete all joint sealing operations after diamond grinding operations are conducted, including diamond grinding on adjacent lanes. Before and during grinding, place and maintain an appropriately sized temporary backer rod in the initial saw cut at a depth sufficient to prevent contact with the grinding operation in order to prevent slurry and other contaminants from entering the saw cut. Remove and discard the temporary backer rod shortly in advance of joint sealing activities.

5.3. *Rideability Requirements*

- 5.3.1. **SC-T-125** is modified such that the IRI measured for each wheelpath is averaged and the average value is reported for the section. The section will be tested with the profiler five

times and the best three of five IRI values are averaged to determine the overall IRI for the section. If the three lowest IRI values have a standard deviation of greater than 6 inches per mile, the section will be tested five additional times and the lowest three out of the second group of five runs will be averaged to determine section IRI. If the standard deviation of the lowest three out of five runs of the second group has a standard deviation of greater than 6 inches per mile, the section will be tested an additional five times and the lowest three out of five IRI averages for the third set of runs will be averaged to determine section IRI. If the standard deviation of the lowest three runs on the third attempt exceeds 6 inches per mile, the lowest three out of all 15 runs will be averaged to determine the section IRI for payment.

- 5.3.2. After grinding, the Department will test each lane of the mainline pavement with the inertial profiler and provide an IRI measurement for each 0.1-mile segment as described above. Ensure that at least 50 percent of the segments have a rideability of 60 inches/mile or less. Also, ensure that at least 90 percent of the segments have a rideability of 75 inches/mile or less. Correct any segment with a rideability of 96 inches/mile or greater such that the other rideability requirements are met before calculation of any pay reductions. The Contractor, at their option, may do additional grinding after the first final grinding pass to bring the roadway into compliance with smoothness specifications. If any additional grinding is performed after testing with the inertial profiler, all previous inertial profiler results are voided and the Department will retest all segments that are either partially or entirely re-ground. Such testing will be performed as described above in the same manner as for the first overall grinding operation. The Contractor may choose to regrind as many times as desired. However, all pavement thickness requirements apply after final grinding.

Example 1 – Assume the project has 400 segments. Of these, 200 segments have rideability values of 60 inches/mile or less, 160 segments have rideability values ranging from 61 to 75, 40 segments have rideability values ranging from 76 to 95, and no segments are greater than 95. No pay reduction is indicated.

- 5.3.3. If more than 50 percent of the segments have rideability above 60 inches/mile, but less than 10 percent of the segments are greater than 75 inches/mile, a pay reduction of \$1000 per segment will be taken for each segment over 50 percent that has a final rideability greater than 60.

Example 2 – Assume the project has 400 segments. Of these, 195 segments have rideability values of 60 inches per mile or less, 175 segments have rideability values from 61 to 75, 30 segments have values ranging from 76 to 95, and no segments are greater than 95. More than 90 percent of the segments are less than 76, but more than 50 percent of the segments are greater than 60. Consequently, there is a net excess of 5 segments in the 61 to 75 range. A pay reduction of \$5000 is indicated.

- 5.3.4. If more than 50 percent of the segments have rideability greater than 60 inches/mile and more than 10 percent of the segments have rideability greater than 75 inches/mile, a pay reduction of \$2000 per segment will be taken for each segment with a rideability above 75 inches/mile in excess of 10 percent of the total segments and a pay reduction of \$1000 will be taken for each segment above 60 inches/mile but less than 76 inches/mile in excess of the 40 percent of the total segments.

Example 3 - Assume the project has 400 segments. Of these, 195 segments have rideability values of 60 inches per mile or less, 162 segments have rideability values ranging from 61 to 75, and 43 segments have values ranging from 76 to 95. There are 2 excess segments between 61 and 75 and 3 excess segments between 76 and 95. Consequently, the pay reduction is \$2000 and \$6000, respectively, for a total of \$8000.

- 5.3.5. If fewer than 50 percent of the segments exceed 60 inches/mile, but more than 10 percent of the segments exceed 75 inches/mile, a pay reduction of \$2000 per segment will be taken for each segment above 75 inches/mile greater than 10 percent of the total segments.

Example 4 - Assume the project has 400 segments. Of these, 250 segments have rideability values of 60 inches per mile or less, 105 segments have rideability values ranging from 61 to 75, and 45 segments have values ranging from 76 to 95. There are 5 excess segments over 75. Consequently, a pay reduction of \$10,000 is indicated.

- 5.3.6. If the project has an odd number of segments, then the maximum number of segments in each range is calculated as if the project had one fewer segment, except that one additional segment is allowed in the range of 76 to 95 inches per mile.

Example 5 - Assume the project has 405 segments. Of these, 202 segments have rideability values of 60 inches/mile or less, 162 segments have rideability values ranging from 61 to 75, and 41 segments have rideability values ranging from 76 to 95. No pay reduction is indicated.

5.4. *Pavement Thickness*

- 5.4.1. When diamond grinding and texturing is required on new pavement as part of the original construction and/or if grinding and texturing is required for remedial purposes, requirements for pavement thickness tolerance as given in Supplemental Technical Specification **SC-M-503** or contract special provisions apply after all grinding operations are complete and accepted. It is the Contractor's responsibility to consider potential loss of pavement thickness from the grinding operation and adjust initial pavement thickness accordingly to ensure that the finished product has the required thickness.