
Guide Specification for Highway Construction

**Texturing Concrete Pavement for
Reduced Tire/Pavement Noise using
Diamond Grinding**

Designation: CPSCP GS 1-11 (rev 3/1/2011)

National Concrete Pavement
Technology Center



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1. SCOPE

- 1.1. This document provides language that can be used by an Owner-Agency to develop materials and construction specifications with the objective of reducing tire/pavement noise. While the practices described herein are largely prescriptive, they have been demonstrated to increase the likelihood of constructing a durable, quieter concrete surface.

2. SIGNIFICANCE AND USE

- 2.1. While these practices were developed with the intent of use in their entirety, some benefit is possible with partial implementation. Measures should be taken to ensure that implementation is compatible with the friction design policy of the Owner-Agency. The Owner-Agency should also recognize that aspects of a prescriptive specification could conflict with end-result or performance specifications. Measures should be taken during implementation to minimize the potential for conflict.

3. DESCRIPTION

- 3.1. This work shall consist of continuous texturing of the surface of a new or existing concrete pavement as shown on the plans. This work shall consist of diamond grinding concrete pavement to provide good riding characteristics and surface texture. The limits of the surface to be diamond ground shall be as shown on the plans or as directed by the Owner-Agency. The user of this standard shall be responsible to ensure that all local safety, health, and environmental standards are made a part of the project specification.

4. EQUIPMENT

- 4.1. Diamond grinding shall be performed using diamond blades mounted on a self-propelled machine designed for diamond grinding and texturing concrete pavement. The equipment shall be at a minimum 35,000 pounds including the grinding head, and of a size that will grind a minimum width of 4 feet in a single pass. The equipment shall provide enough power, traction, and stability to maintain the specified depth of cut and cross slope.
- 4.2. The equipment shall have a positive means of vacuuming the grinding residue from the pavement surface, leaving the surface in a clean, near-dry condition.
- 4.3. Diamond grinding equipment that causes spalling, raveling, aggregate fractures, or excessive disturbance to the joints, cracks, and other locations shall not be permitted.

- 4.4. The equipment shall be maintained to ensure it is in proper working order, with attention paid to the runout (roundness) of the match and depth control wheels. Any wheels found to have excessive total runout shall be immediately replaced.

5. CONSTRUCTION

- 5.1. The diamond grinding process shall produce a final pavement surface that is true to grade and uniform in appearance as a longitudinal type texture. The texture shall contain parallel longitudinal corrugations that present a narrow ridge corduroy-type appearance.
- 5.2. Unless otherwise shown on the plans, the finished cross slope of the pavement surface after diamond grinding shall be the same as the pavement surface before grinding.
- 5.3. When diamond grinding is used to retexture an existing concrete pavement, and if applicable, it shall be accomplished in a manner that eliminates joint or crack faults so there is no more than a 1/16-inch height differential between the adjacent sides of the joints and cracks. Diamond grinding shall also substantially improve pavement characteristics that affect ride quality such as slab warp and curl. If applicable, measures shall be taken to ensure that wheelpath rutting is substantially removed during the diamond grinding operation.
- 5.4. Unless otherwise shown on the plans, diamond grinding shall begin and end at lines normal to the pavement centerline at the project limits. Substantially all of the pavement surface shall be textured. Passes of the grinding head shall not overlap more than 1 inch. There shall be no surface area left without diamond ground texture between passes, unless otherwise shown on plans.
- 5.5. When diamond grinding is used to retexture an existing concrete pavement, the existing surface texture shall be removed to the greatest extent possible. Excessive grinding to eliminate minor depressions with the goal of providing texture on 100 percent of the pavement surface shall not be required. The grinding depth shall not exceed 3/4 inch from the top of the original surface.
- 5.6. The pavement surface after diamond grinding shall have no depressions or misalignment of slope in the transverse direction exceeding 1/4-inch in 12 feet when measured with a 12-foot straightedge placed perpendicular to the centerline. Any ridges on the outside edge next to the shoulder, auxiliary, or ramp lane greater than 3/16 inch high shall be feathered out to the satisfaction of the Owner-Agency in a separate, feather pass operation.
- 5.7. The pavement surface after diamond grinding shall have no depressions or misalignment of slope in the longitudinal direction exceeding 1/8 inch in 12 feet when measured with a 12-foot straightedge placed parallel to the centerline. All areas of deviation shall be reground to the satisfaction of the Owner-Agency in a separate operation.
- 5.8. When texturing newly constructed concrete pavement, diamond grinding shall not begin until the pavement has attained strength sufficient to be opened to all types of traffic. If grinding is performed within three days of placement, and if the pavement has not yet been opened to public traffic, liquid membrane curing compound shall be reapplied immediately after grinding. All diamond grinding shall be completed on any given section prior to opening that section to other than construction traffic, unless approved by the Owner-Agency.
- 5.9. When diamond grinding is used to retexture an existing concrete pavement, any concrete pavement preservation activities, except for joint sealing, shall be completed prior to any diamond grinding.
- 5.10. After diamond grinding is completed, all joints and cracks that were diamond ground shall be cleaned and sealed in accordance with plans. Subsequently, edgelines, centerline, and/or lane line

markings that are removed by the contractor's operations shall be replaced as specified in the plans.

6. GRINDING RESIDUE

- 6.1. The contractor shall manage all residue generated from the grinding process in a manner that satisfies environmental regulations. The contractor shall have the approval of the Owner-Agency for the method of grinding residue management prior to beginning any diamond grinding operations. For additional guidance on Best Management Practices for grinding residue, contact the International Grooving and Grinding Association.

7. TEXTURE REQUIREMENTS

- 7.1. Diamond grinding should produce a neat, uniform finished surface. The peaks of the lands of the final texture shall be 1/8-inch \pm 1/16-inch higher than the bottoms of the grooves. The grooves shall be evenly spaced. The width of the lands should measure within the ranges listed in Table 1.

Table 1—Typical Diamond Grinding Land Widths

Coarse Aggregate Type	Typical Land Width
Calcareous (e.g., limestone)	0.090 to 0.110 inches
Siliceous (e.g., gravel)	0.080 to 0.095 inches

- 7.2. The contractor shall select the type of blades and the number of blades per foot to be used to provide the proper surface texture based in part on the concrete being ground, and in particular, the coarse aggregate type. The Owner-Agency may require removal of excess fins at the contractor's expense.
- 7.3. When diamond grinding for texturing newly constructed concrete pavement, a minimum of 98 percent of any 100-foot section of pavement surface shall be textured. For existing pavements, a minimum of 95 percent of any 100-foot section of pavement surface shall be textured. Depressed pavement areas due to subsidence or other localized causes shall be exempted from texture requirements.
- 7.4. The project conditions may dictate that the contractor has to make multiple passes with the equipment to meet the specifications. It is the contractor's responsibility to determine the proper sequence of operations to meet the specification. If multiple passes of the grinding equipment are required, the area shall only be considered for payment once. Any deficiencies in the final surface due to improper contractor operations or equipment shall be corrected by the contractor, at the contractor's expense.

8. SMOOTHNESS REQUIREMENTS

- 8.1. *Existing Owner-Agency smoothness requirements could be included, or alternatively AASHTO Standard Practice R 54-10, Accepting Pavement Ride Quality When Measured Using Inertial Profiling Systems. It is recommended that a maximum International Roughness Index (IRI) of 65 inches/mile be considered, as this is readily achievable by an experienced grinding operator. If an inertial profiler is specified for measurement, the height sensor should be specified not to be a single point laser. Instead, a LMI Technologies RoLine sensor or equivalent should be used.*

9. METHOD OF MEASUREMENT

- 9.1. Diamond grinding of concrete pavement shall be measured by the square yard. The measurement shall be the final textured surface area regardless of the number of passes required to achieve acceptable results. Minor areas of unground pavement within the designated areas to be ground shall be included in the measurement. No deduction shall be made for gaps within the pavement lane to avoid striping, raised pavement markers, manholes, or other structures.
- 9.2. When conditions require a feather pass into the shoulder or auxiliary or ramp lanes, payment shall be by the square yard based on a width of 2 feet times the length of the required feather pass.

10. BASIS OF PAYMENT

- 10.1. The accepted quantity of diamond ground concrete pavement surface shall be paid for at the contract unit price per square yard. This payment shall be full compensation for all labor, tools, equipment, material, and incidentals to complete this work, including hauling and disposal of grinding residue.
- 10.2. Existing Owner-Agency incentives/disincentives for smoothness could be included.