



# **IGGA Guide Specification: NGCS Test Section Construction on New Roadways**

## **Introduction**

This standard developed by the International Grooving and Grinding Association (IGGA) specifies the procedures for test section construction of the Next Generation Concrete Surface (NGCS) on newly constructed roadways using diamond grinding and grooving techniques. This test section will aid the industry in developing a new standard for quiet concrete pavement and to that end this specification includes additional controls and safeguards to ensure proper construction. This standard does not apply to any other diamond grinding or grooving processes and should not be used for construction of project level NGCS. The user of this standard shall be responsible to ensure that all local safety, health and environmental standards are made a part of the specifications.

NGCS is a term used to describe a category of texture(s) that have or will evolve through current research. The term may apply to several textures that evolve for both new construction and rehabilitation of existing surfaces. When constructed properly, these textures will provide a very smooth profile coupled with good micro texture and excellent macro texture. This specification provides direction for test section construction of the technique.

The user of this standard accepts ALL responsibility for decisions made as a result of its use. The International Grooving and Grinding Association, its Officers, Board of Directors and staff are absolved of any responsibility for any decisions made as a result of your use. Use of this standard implies acceptance of the terms of use.



## **NGCS Test Section Location Selection Guidelines**

### **Objective**

These guidelines were developed to assist in selecting locations for and constructing Next Generation Concrete Surface (NGCS) test sections. When constructing NGCS test sections, the following items should be considered:

### **Length of Test Section**

A minimum length of 1000 feet with a preferred length of 1500 to 2500 feet is desired. The full lane width should be ground.

### **Roadway Geometry of Test Section**

It is desirable to construct the sections on level, tangent sections with good sight distance where possible. Adequate distance before and after the test section is necessary to conduct field testing.

### **Evaluation of Test Section**

NGCS test sections are generally constructed to conduct noise and friction evaluations. As such it is important to consider how the future evaluations can be conducted at the proposed test section. Test sections should not be located near stop signs, traffic signals, intersections, etc.

#### **Speed**

Noise testing is conducted at 60 MPH and friction testing at 40 mph. Noise testing is conducted with a passenger car and it takes approximately 0.25 miles in distance to get to 60 mph and set the cruise control. Upon completion of the noise testing it will take approximately 1000 feet after the test section to stop. Locations with posted speed limits in the range of 50 to 70 mph are preferred.

#### **Wheelpath**

Noise testing and friction testing are conducted in the right wheelpath. This is the most important texture to construct. Feathering of the test grind should not occur at this location.

#### **Shoulders**

Although not a requirement, it is highly desirable to have paved shoulders where possible. This facilitates testing and provides a location to take photographs.

### **NGCS and CDG Test Sections**

Whenever possible, it is desirable to construct both a conventional diamond ground (CDG) test section and an NGCS test section together. It is best to construct them in the same lane at the same location to assure similar traffic. If the textures must be constructed in adjacent lanes, it is desirable to have them begin and end at the same location. Both textures are constructed to facilitate comparisons between the two surface types.



### **Transverse Joint Opening Width**

Transverse joint opening widths do impact overall tire-pavement noise levels. The impact increases as the joint gets wider and deeper. A wide joint that is 0.5 inch wide and 1 inch deep can add between 1 and 1.5 dBA to the noise level of a quiet pavement. Whenever possible, narrow sealed joints should be selected. If the existing pavement has wide joints, the joints should be sealed. Overbanded sealant should not be allowed.

### **Existing Texture**

Since the purpose of the test section is to evaluate the CDG and NGCS textures, it is important to completely remove the existing pavement texture from the test section so that it will not influence the final results.

### **Pavement Life**

It is anticipated that field reviews will occur for a period of 5 to 10 years. Therefore, it is desirable that the roadway surface not be altered during the evaluation period such as with an overlay or additional grinding/slab repair, etc. Only pavements in good condition should be used.



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## **SCOPE**

This standard specifies the procedures for test section construction of the Next Generation Concrete Surface (NGCS) on newly constructed roadways using diamond grinding and grooving techniques. This test section will aid the industry in developing a new standard for quiet concrete pavement and to that end, this specification includes additional controls and safeguards to ensure proper construction. This standard does not apply to any other diamond grinding or grooving processes and should not be used for construction of project level NGCS. The user of this standard shall be responsible to ensure that all local safety, health and environmental standards are made a part of the specifications.

## **EQUIPMENT**

Grinding shall be accomplished using diamond blades mounted on a self-propelled machine designed specifically for diamond grinding and texturing pavement. The equipment shall weigh a minimum of 35,000 pounds including the grinding head and be of a size that will grind a strip at least 4 feet wide in a single pass. Grinding equipment that causes raveling, aggregate fractures, spalls, or disturbance to the transverse or longitudinal joints shall not be permitted. 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.

The equipment shall be maintained to ensure it is in proper working order, with attention paid to the "roundness" of the match and depth control wheels. Any wheels found to be out of round shall be replaced immediately.

## **CONSTRUCTION**

The construction operation shall be scheduled and proceed in a manner that produces a neat, uniform finished surface. Shoulder, auxiliary or ramp lane grinding shall transition from the edge of the mainline as required to provide drainage, leaving no more than a 0.1875 inch ridge and an acceptable riding surface. When conditions require a feather pass into the shoulder, auxiliary or ramp lanes, conventional diamond grinding shall be used. Joint sealing shall be completed subsequent to the diamond grinding operations and shall be installed in a recessed condition.

This standard assumes that the newly constructed texture will consist of a simple drag texture and that a tined texture has not been constructed. If a tined texture has been constructed as part of the original construction, this texture shall be removed using conventional diamond grinding techniques or the NGCS procedure, at the contractor's option. The contractor must determine the need and include conventional pre-grinding within the lump sum price if necessary, to achieve the specified smoothness levels.

Grinding shall be accomplished in a manner that eliminates joint or crack faults so there is no more than a 0.0625 inch differential between the adjacent sides of the joints and cracks. Grinding shall also substantially remove pavement conditions such as warp and curl to provide an acceptable ride.



Lateral drainage shall be achieved by maintaining a constant cross slope between grinding extremities in each lane. The finished cross slope shall mirror the pre-grind cross slope and shall have no depressions or misalignment of slope greater than 0.125 inch in 12 feet when measured with a 12 foot straightedge placed perpendicular to the centerline. Straightedge requirements will not apply across longitudinal joints or outside the ground area.

Grinding shall begin and end at lines normal to the pavement centerline at the project limits. Passes of the grinding head shall not overlap more than 1 inch. No unground surface area between passes will be permitted.

Construction of the NGCS shall be accomplished as a two-pass procedure requiring two separate operations. The first operation will create the flush ground surface. The flush grind blades shall be mounted on a 4 foot grinding head, stacked with 0.125 inch wide blades separated by 0.035 +/- 0.005 inch wide spacers. The blades used to produce the flush ground surface shall be flat across their contact surface and in the same plane with other flush grind blades when mounted. The complete head, when stacked with all blades, shall be straight across its length without bowing when mounted on the diamond grinding machine. No unground surface area between passes will be permitted. The smoothness levels stated within this standard must be attained and measured to the satisfaction of the Contracting Agency prior to constructing the second operation. The second operation will provide the longitudinal grooves. The longitudinal grooves shall be 0.125 inch wide and will be 0.125 inch to 0.1875 inch in depth. The longitudinal grooves will be spaced on 0.5 inch to 0.625 inch centers. The grooves shall be constructed parallel to the centerline. The contractor shall use a guide to ensure proper alignment of the grooves to centerline.

### **FINAL SURFACE FINISH**

The NGCS grinding process shall produce a pavement surface that is true to grade and uniform in appearance with a longitudinal grooved texture. The flush ground surface shall appear smooth and shall contain no ridges that exceed 0.03 inch. The longitudinal grooves shall be constructed parallel to the centerline. At a minimum, 98% of the pavement surface shall be textured utilizing the NGCS. Depressed pavement areas due to subsidence, edge slump or other localized causes will be excluded from this requirement when approved by the Contracting Agency.

The final surface will look similar to the photo in Appendix A.

### **SLURRY HANDLING AND REMOVAL**

The contractor shall remove and dispose of all residues from the pavement surface in a manner and at a location that satisfies environmental regulations. The diamond grinding machine shall be equipped with a well maintained vacuum system that is capable of removing all standing slurry, leaving the roadway in a damp condition after the grinder passes. Residue shall not be permitted to encroach into open lanes or enter into closed drainage systems. Slurry handling requirements should be defined in the contract documents. (The International Grooving and Grinding Association has published a Best Management Practices for slurry handling that should be used in defining the proper operation for each project). The three basic handling procedures are outlined below:

#### **SLURRY SPREADING DISPOSAL**

In rural areas that have vegetated slopes, the slurry can be deposited on the slopes as the grinding operation progresses down the road. As part of the contract documents, the



Contracting Agency shall identify wetlands and other environmentally sensitive areas where slurry discharge operations are not permitted. The Contracting Agency and contractor shall make a site inspection prior to the start of grinding to define and mark the sensitive areas. The spreading of slurry should not take place through these sensitive areas. The slurry spreading start and stop points shall be clearly marked on the shoulder of the road. The slurry generated in non-spread areas shall be picked up and hauled for disposal to non-sensitive areas of the project. The vacuumed material shall be spread uniformly on the adjacent slopes by dragging a flexible hose or other approved device along the slope. Spreading should begin a minimum of 1 foot from the shoulder with each pass of the grinder moving the spreading operation farther down the slope to ensure no build-up of grinding residue. The slurry shall not be spread within 100 feet of any natural stream or lake or within 3 feet of a water filled ditch. Efforts should be taken to restrict the spreading operation to above the high-water line of the ditch.

### **SLURRY COLLECTION AND POND DECANTING**

In urban and other areas with closed drainage systems, the slurry shall be collected in watertight haul units and transported to settlement ponds constructed by the contractor. These ponds may be constructed within or outside of the right-of-way. All locations shall be approved by the Contracting Agency. These ponds shall be constructed to allow for the settlement of the solids and decanting of the water for reuse in the grinding operation. At the completion of the grinding operation, the remaining water will be allowed to evaporate or may be used in a commercially useful manner (e.g. dust control). After drying, the remaining solids may be used for fill material or other commercially useful applications. The pond area shall be reclaimed to its original condition and vegetated to protect against erosion.

### **SLURRY COLLECTION AND PLANT PROCESSING**

The slurry shall be collected and hauled as with the pond processing. There are various plant designs such as centrifuge and belt press. The plant site shall be prepared to control any storm water runoff in accordance with local regulations. The site should be restored and vegetated at the completion of operations. The processed water and solids are to be handled in the same fashion as the settlement ponds. The site may be within or outside the right-of-way. Site location is to be approved by the Contracting Agency.

### **SMOOTHNESS REQUIREMENTS**

The finished NGCS test section shall have a final profile with a Mean International Roughness Index (MRI) of 50 inches/mile or less. Smoothness acceptance shall be measured following the flush grinding operation and prior to the longitudinal grooving operation.

The smoothness profile shall be generated using lightweight profiler equipment with a laser that simulates the tire footprint. Single point lasers shall not be used. Line laser equipment such as RoLine™ or an approved equal shall be used. All equipment shall have current certification and be approved by the Contracting Agency.

The contractor shall run the profile in both wheel paths and average the resulting IRI results to determine acceptance (MRI). The profiles shall be run 3 feet from each lane line. A guide shall be used to ensure proper alignment of the profile. The Contracting Agency shall have a representative with the lightweight profiler during all testing periods. This representative shall sign the resulting profile



form. Segments found not meeting the smoothness requirements will require regrinding at no additional cost to the Contracting Agency.

The finished ground surface shall not include any bumps exceeding 0.3 inch in 25 feet.

**BASIS OF PAYMENT**

NGCS test section construction will be paid for at the lump sum price. Payment shall be full compensation for all labor, equipment, material and incidentals to complete this work, including hauling and disposal of grinding residue.

## APPENDIX A – Photos of NGCS Textures



Figure 1: Overall View of NGCS Texture

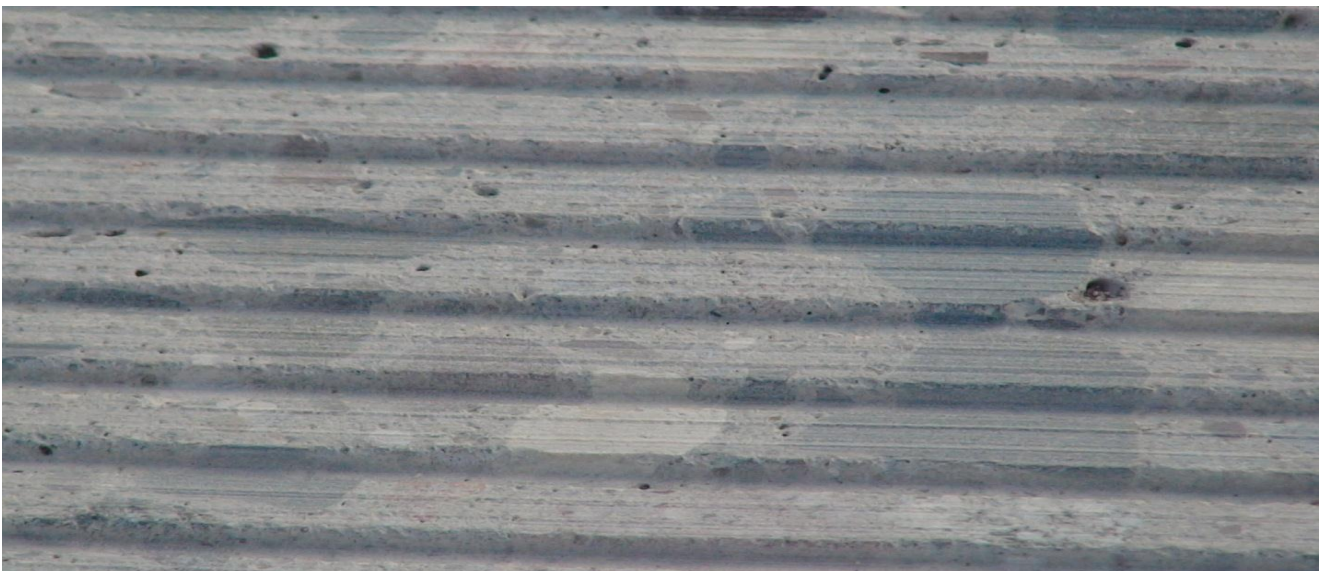


Figure 2: Close Up Photo of Completed NGCS Texture



**Figure 3: Photo of Flush Grind Immediately After First Pass of Two Pass NGCS Operation**



**Figure 4: Photo of Grooving Operation of a Two Pass NGCS Operation**