

# **IGGA Guide Specification: Conventional Diamond Grinding of City Streets**

## **Introduction**

This standard developed, by the International Grooving and Grinding Association (IGGA), specifies the procedures for conventional diamond grinding of city streets. 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.

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 its use. Use of this standard implies acceptance of the terms of use.

## **Guide Specification: Conventional Diamond Grinding of City Streets**

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### **SCOPE**

City streets are defined as roadways with a closed drainage system along with numerous structures such as manholes, water shutoffs and catch basins. The general profile varies to accommodate these structures and intersecting streets. Generally, the posted speed limit is less than 45 mph.

This standard specifies the procedures for operations of continuous diamond grinding Portland cement concrete or asphalt concrete pavement city streets and low speed roadway surfaces to provide desired surface characteristics such as ride, friction and drainage. The standard also provides guidelines for levels of acceptance for the desired surface characteristics. 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 specifications.

Conventional diamond grinding is also utilized to reduce the noise created by the interaction of the tire with the pavement surface in areas of low to moderate noise concern. When grinding solely for noise reduction, it is important to completely remove the existing surface texture such as transverse tining. The profile requirements stated elsewhere in this specification may not apply to grinding solely for noise abatement. In areas of high tire/pavement noise concern and speed limits above 45 mph, the pavement should be ground in accordance with the specification for the Next Generation Concrete Surface (NGCS) grinding.

### **EQUIPMENT**

Grinding shall be performed using diamond blades mounted on a self-propelled machine designed for grinding and texturing pavement. The equipment shall be at a minimum 35,000 pounds, including the grinding head, and of a size that will grind a strip at least 3 feet wide. The effective wheel base of the machine shall be no less than 12 feet. The effective wheel base is defined as the distance from the front wheel assembly transverse pivot point to the transverse pivot point of the profile/depth control/ ground drive wheels.

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.

Grinding equipment that causes raveling, aggregate fractures or disturbance to the joints shall not be permitted.

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 immediately replaced.

## **CONSTRUCTION**

The construction operation shall be scheduled and proceed in a manner that produces a neat, uniform finished surface. Mainline grinding adjacent to any unground turn lane, gutter section, shoulder, auxiliary lane or ramp lane shall feather smoothly from the edge of the ground mainline into the unground surface leaving no more than a 1/4 inch ridge at this transition as measured by a 3 foot straightedge. Unique project conditions may require the ground area to extend into the gutter section feathering up to 12 inches within the curb face to provide proper drainage. Full- and partial-depth concrete repairs, slab stabilization and dowel bar retrofit shall be completed prior to any grinding. Joint sealing shall be completed subsequent to the diamond grinding operations.

Grinding shall be accomplished in a manner that eliminates joint or crack faults so there is no more than a 1/16-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.

The grinding shall feather into existing structures such as manholes and water shutoffs in a manner that eliminates abrupt ridges or drops and provides a uniform texture and acceptable ride. If project conditions exist that prohibit acceptable feathering operations, the engineer may require that the structure be raised or lowered. The added work of raising and lowering these structures that is not included as a predetermined bid item shall be paid for at an agreed upon price or as defined in the Force Account section of the Standard Specifications. Structure adjustments that occur within the limits of a full-depth repair shall be reset to an elevation 1/4 inch below the new pavement surface to facilitate the diamond grinding operation.

Lateral drainage shall be achieved by maintaining a constant cross slope between grinding extremities in each lane. The finished cross slope shall mirror the pregrind cross slope and shall have no depressions or misalignment of slope greater than 1/4-inch in 10 feet when measured with a 10 foot straightedge placed perpendicular to the centerline. Steps will be taken to ensure that wheel path rutting is substantially removed and that the grinding operation is simply not texturing the wheel path depressions. Areas of deviation shall be reground. Straightedge requirements will not apply across longitudinal joints, areas where existing structures limit grinding operations or outside the specified ground area.

The maximum removal required in any area shall not exceed 3/4-inch. Areas where required removal exceeds this limit shall be excluded from smoothness requirements found elsewhere in this specification.

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. This requirement shall be waived in irregularly shaped roadway sections that do not allow for full passes of the grinding equipment. No unground surface area between passes will be permitted.

## **FINAL SURFACE FINISH**

The grinding process shall produce a pavement surface that is true in grade and uniform in appearance with a longitudinal line-type texture. The line-type texture shall contain corrugations parallel to the centerline and present a narrow ridge corduroy type appearance. The peaks of the ridges shall be 1/8 inch +/- 1/16 inch higher than the bottom of the grooves with evenly spaced ridges.

It shall be the contractor's responsibility to select the number of blades per foot to be used to provide the proper surface finish for the aggregate type and concrete present on the project. The number of blades used for grinding will range between 50-60 blades per foot as necessary. Harder aggregate may require the use of 55 – 60 blades per foot. The engineer may require removal of unbroken fins at the contractor's expense. 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 will only be considered for payment once. A minimum of 90 percent of the area of any 100-foot section of pavement surface shall be textured. Depressed pavement areas due to subsidence or other localized causes will be exempted from texture and smoothness requirements.

### SLURRY HANDLING AND REMOVAL

Slurry shall be collected, processed and disposed off in accordance with the IGGA Diamond Grinding Slurry Handling--Best Management Practices - April 2013. This document is available on the web at [www.igga.net](http://www.igga.net).

### SMOOTHNESS REQUIREMENTS

An initial smoothness index of representative portions of the project may be available through the project contact person upon written request. When available, this information represents the conditions that existed at the time the survey was made. The contractor is cautioned to note the date the survey was made since the conditions may have changed over time. This profile is for informational purposes only, to give the contractor an idea of the conditions that existed at the time of the survey. The contractor assumes the risk of error if the information is used for any purpose other than as stated. Contractors are responsible for visiting the project site to make their own condition determination prior to bidding.

Prior to performing any grinding work, the contractor shall provide a control profile 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™, Gocator™ or an approved equal shall be used. All equipment shall have current certification and be approved by the contracting authority.

A control profile will be used to identify the required smoothness for the project as indicated in Table 1. The control profile will be obtained after any and all corrective work which impacts the pavement roughness such as slab repairs, DBR, pothole repair, etc. The profile will be obtained in 0.1 lane mile long segments (528 feet), and the location of each segment accurately established, either through stationing or GPS coordinates. The finished surface shall have a final MRI improvement in accordance with Table 1 and grinding will not be considered acceptable until the smoothness requirements are achieved. It is important that the segment locations from the control profile match the segment locations tested in the smoothness acceptance measurements. Price adjustments for exceeding the requirements are indicated in Table 2.

**TABLE 1 SMOOTHNESS REQUIREMENTS**

Posted Speed Limit (mph)	< 45	
Existing Segment MRI	≤ 330	> 330
Required Post Grind MRI	≤ 115	≤ 0.35*(Existing Segment MRI)

Depressed pavement areas due to subsidence or other localized causes and areas that have reached the maximum removal will be excluded from the smoothness requirements. These areas shall be reviewed and approved by the engineer.

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

The engineer shall conduct comparison profiles on no less than 10 percent of the segments using the same type of certified equipment as the contractor. It is of great importance that a proper guide is used to ensure that all testing is completed over the same track. The contractor testing and agency testing should be completed during the same time of day and under similar climatic conditions. The results of these verification profiles shall not vary more than 10 percent from the contractor profiles.

The engineer may choose to accept isolated sections if the variance between the two profiles is less than 15 percent. When the difference exceeds 15 percent on an isolated basis or 10 percent on a consistent basis, referee testing will be required to determine which device is providing an accurate evaluation of the pavement surface. The party found to have the inaccurate equipment will pay for the referee testing. The engineer may choose to withhold payment for segments that do not meet these criteria until the problem is resolved. The engineer may choose to run verification profiles on the entire project if the comparison profiles are constantly outside the allowable tolerance. The engineer will charge for the additional testing if the contractor's operation is found to be in error. Segments found not meeting the smoothness requirements will require regrinding at no additional cost to the department.

The finished ground surface shall not include any bumps exceeding 0.4-inch in 25 feet.

The conditions of smaller municipal projects may not be suited for the aforementioned smoothness requirements. In these instances, the use of a 12-foot straightedge requiring a maximum 1/8-inch variance will suffice.

#### **METHOD OF MEASUREMENT**

Grinding of pavement will be measured by the square yard of area diamond ground. The measurement will be the final textured surface area regardless of the number of passes required to achieve the specified results. Minor areas of unground pavement within the designated areas to be ground will be included in the measurement up to 10 percent of the surface area. When conditions require a feather pass into the shoulder, auxiliary or ramp lanes, payment will be the square yard based on a width of 2 feet times the length of the required feather pass. The minimum length of a feather pass will be 100 feet. Gutter sections requiring a feather pass will be paid by the square yard based on a width of 1 foot times the length of the required feather pass. The minimum length of a feather pass will be paid as 100 feet. Areas which were not designated to be diamond ground will not be measured for smoothness.

**BASIS OF PAYMENT**

Grinding will be paid for at the contract price per square yard. Payment shall be full compensation for all labor, equipment, material and incidentals to complete this work, including hauling and disposal of grinding residue. Covering of catch basins will be paid per each unit. Structure adjustments will be by agreed price or by Force Account.

**TABLE 2 RECOMMENDED PRICE ADJUSTMENTS**

<b>Posted Speed &lt; 45 mph</b>	
<b>MRI (in./mi.)</b>	<b>\$/ Sq. Yd.</b>
<b>0-79</b>	<b>\$1.13</b>
<b>80-90</b>	<b>(90-MRI)*0.1125</b>
<b>≥ 91</b>	<b>0</b>