IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource® since 1972

conventional diamond grinding

A Cost-Effective, Sustainable Way to Provide a Smooth, Safe, Quiet Riding Surface

Concrete Pavements Can Achieve Maximum Longevity Through Diamond Grinding

CONVENTIONAL DIAMOND GRINDING (CDG) is often used to create the smoothest and safest pavements available today. It is appropriate for both new construction and existing pavement and can be performed at any time during a pavement's life.

Diamond grinding removes a thin layer of the hardened concrete surface using a self-propelled machine outfitted with a series of closely spaced diamond saw blades mounted on a rotating shaft. Unlike diamond-impregnated carbide bits, which use impact to chip away the concrete surface, CDG blades use abrasion to gently remove the surface layer without the risk of introducing microcracking of the aggregates. After diamond grinding, the pavement texture consists of grooves and lands, with the grooves lying beneath the pavement interface.

CDG has been in use since the 1960s, with nearly 20 million square yards of pavement diamond ground each year in the United States alone. In addition to using CDG to improve the performance of existing, in-service pavements, several state Departments of Transportation specify diamond ground surfaces as the final surface on newly placed portland cement concrete pavement (PCCP).

CDG PAVEMENTS ARE...

SAFE

The increased macro-texture provides drainage that mitigates the chance of hydroplaning in wet weather (especially for worn tires). In fact, diamond-ground surfaces have been definitively shown to reduce accident rates. The Wisconsin DOT (working with Marquette University) found that the overall accident rate for diamond-ground surfaces was only 60 percent of the rate for unground surfaces. Furthermore, diamond-ground pavements had significantly reduced accident rates up to six years after grinding.

QUIET

The longitudinal texture produced by diamond grinding reduces noise compared to transverse tining, which was an early solution for providing traction on concrete pavement. The combination of grooves and lands also reduces the contact area between a tire and the road, minimizing air entrapment and thereby reducing noise.

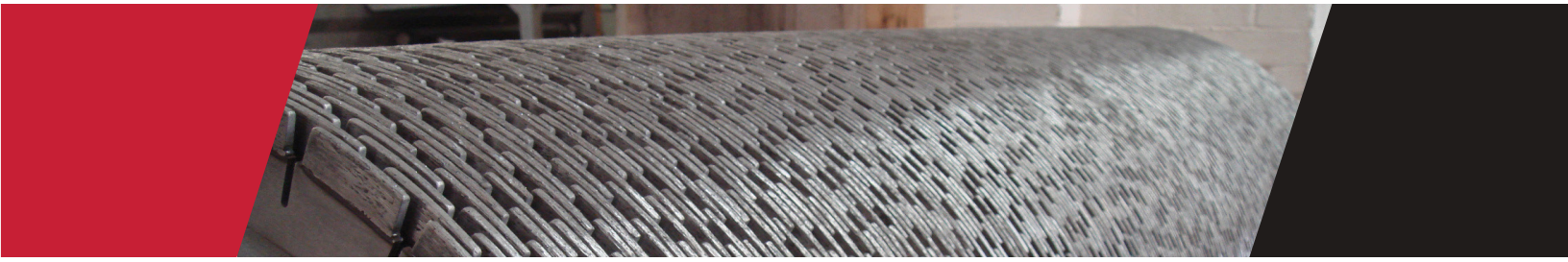
SMOOTH

Diamond grinding is the most effective way to improve smoothness on newly constructed PCCP. Research has shown that the smoother a pavement is initially, the better it will perform over time and the longer it will last. Since 1995, the FHWA has required states to collect their performance monitoring data using a roughness statistic called the International Roughness Index (IRI). Today this measurement is used by most state agencies as a performance metric for their pavement management systems. IRI measurements show that diamond grinding improves smoothness significantly, producing IRI numbers commonly as low as 60 inches per mile and even in the 20s when constructed on new pavement.

» DIAMOND GRINDING AS CONCRETE PAVEMENT PRESERVATION

For existing pavements, diamond grinding removes joint faulting, slab warping, studded-tire wear and unevenness resulting from patches, creating a smooth, uniform pavement profile. Polished pavements treated with diamond grinding demonstrate enhanced macro texture and skid resistance. When pavement distress is the issue, early application of diamond grinding typically provides the best results at the least cost.

CDG can be used as a spot treatment to fix small local issues in structurally sound concrete pavement. It can also be used in conjunction with other concrete pavement preservation (CPP) treatments to blend patching and other surface irregularities into a consistent surface.



Techniques employed in a CPP program usually include a combination of full-depth repair, partial-depth repair, dowel bar retrofit, joint and crack resealing, slab stabilization, cross-stitching of longitudinal cracks, and grooving (along with diamond grinding). If the application of each technique occurs at the right time, the maximum use and life of the pavement will be achieved, resulting in cost-effective, long-lasting maintenance solutions for existing jointed plain concrete pavements (JPCP), jointed reinforced concrete pavements (JRCP) and continuously reinforced concrete pavements (CRCP).

Many states—with various climatic conditions represented—have found that effective CPP helps extend the life of pavements another 10 to 20+ years before further restoration/rehabilitation is needed. Some roads have received CPP with diamond grinding up to four times, significantly improving customer satisfaction and adding decades to the life of the pavement.

As with newly constructed pavements, diamond grinding deployed as part of CPP reduces noise produced at the tire/pavement interface. Some studies have shown that, combined with other repairs, diamond grinding can improve IRI numbers by 20 to 80 percent (with 60 percent being typical).

While diamond grinding is sometimes used on asphalt pavement, it should not be confused with milling or scarifying. Milling is an impact process that chips small pieces from the pavement surface. Diamond grinding does not fracture aggregates or otherwise harm the pavement structure. Diamond cutting media contacts a pavement surface nearly 27,000,000 times per square yard, on average. This results in gentle abrasion of the concrete surface.

Because of its limited scope and targeted repairs, CPP is cost-effective in the short term. But it's important to note that CPP also offers long-term savings. The American public pays for poor road conditions several times over. This is because rough roads exert greater rolling resistance on a tire and overcoming the resistance requires extra fuel. In addition to increased fuel costs, more greenhouse gasses are emitted when cars must overcome rolling resistance. Rough roads can also result in costly vehicle damage. Furthermore, sustaining deteriorating roads costs significantly more over time than does regularly maintaining a road in good condition. Costs per lane mile for reconstruction after 25 years can be more than three times the costs of preservation treatments.

The best approach, both short- and long-term, is to achieve a balance between high friction level and low roughness and noise levels over the life of the pavement. Maintained roads are not only cost effective and quieter to drive on—their improved safety will save lives.

BENEFITS OF CDG:

- Provides a smooth riding surface that is often as good or better than a new pavement.
- Removes faulting at joints and cracks.
- Removes construction-related or environmental roughness.
- Does not significantly affect fatigue life. A typical concrete pavement may be ground up to three times without reducing traffic carrying capacity.
- Extends the service life of well-designed concrete pavement by decades.
- Does not affect overhead clearances underneath bridges or signs.
- May be done in isolated areas as needed and during off-peak hours.
- Costs less than most asphalt overlay treatments.
- Eliminates problems associated with bituminous overlay, like rutting and reflection cracking, while often being less than half the cost.
- Enhances texture and skid resistance, reducing wet weather accidents and the potential for hydroplaning.
- Has been shown to reduce tire/pavement noise by several decibels when compared to transversely tined pavements.

IGGA
International Grooving & Grinding Association
Your Pavement Preservation Resource® since 1972

ABOUT IGGA
The International Grooving & Grinding Association (IGGA) is a non-profit trade association founded in 1972 by a group of dedicated industry professionals committed to the development of the diamond grinding and grooving process for surfaces constructed with Portland cement concrete and asphalt. In 1995, the IGGA joined in affiliation with the American Concrete Pavement Association (ACPA) to form what is now referred to as the Concrete Pavement Preservation Partnership (IGGA/ACPA CP3). The IGGA/ACPA CP3 now serves as the lead industry representative and technical resource in the development and marketing of optimized pavement surfaces, concrete pavement restoration and pavement preservation around the world.