

# Concrete Pavement Surface Restoration

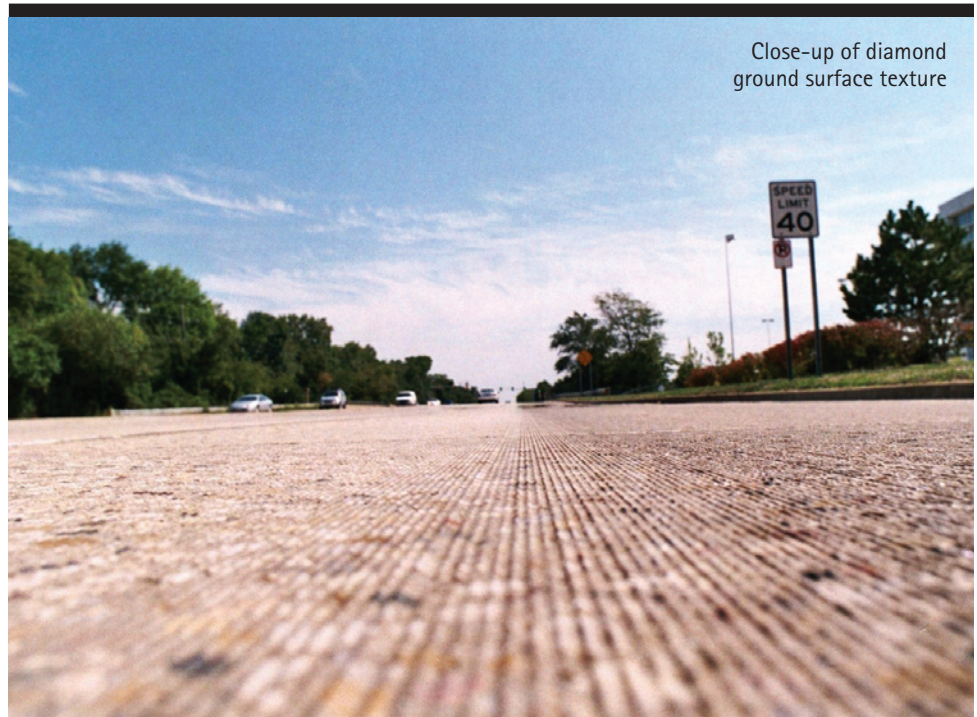


## Comparison Between Diamond Grinding vs. Carbide Milling for Surface Restoration

### >>> DIAMOND GRINDING VS. CARBIDE MILLING

By design, most Portland cement concrete (PCC) pavements last for 20 to 30 years with minimal structural damage. The most common pavement deterioration after this time is increased roughness due to faulting or settlement and wheel-path rutting due to studded tires. In the past, agencies used asphalt overlays to smooth the pavement. However, these were only temporary fixes that covered up the problem and did not address the cause.

Diamond grinding has been used since 1965 and is an excellent procedure to repair PCC pavement roughness, increase friction and reduce tire/pavement noise. Recently, some agencies have tried carbide milling to restore smoothness. **This is not recommended since the final surface is far rougher than a diamond ground surface and due to the increased risk of damage to the longitudinal and transverse joints.**



Close-up of diamond ground surface texture

### >>> COMPARISON

The main difference between diamond grinding and carbide milling is in the way that the cutting head removes the concrete layer. Diamond grinding uses closely spaced, diamond saw blades that gently abrade away the top surface of the concrete. On average, the diamond cutting media will contact the pavement surface nearly 27,000,000 times per square yard. This accounts for the gentle removal action. The level surface is achieved by running the blade assembly at a predetermined level across the pavement surface. The uncut layer between each saw cut breaks off, leaving a level surface (at a macroscopic level) with longitudinal texture. The result is a pavement that is smooth, safe, quiet and pleasing to ride on.

Diamond grinding of concrete pavement leaves a surface which is often as good as a new pavement. In reducing the bumps and dips in the pavement surface, the dynamic loading from heavy wheel loads is decreased, resulting in lower stresses in the pavement. Diamond grinding reduces road noise by providing a longitudinal texture, which is quieter than transverse textures. The longitudinal texture also enhances surface macro-texture and skid resistance in polished pavements.

Carbide milling (also referred to as cold planing, rotomilling and profiling) is a demolition technique, not a PCC surface restoration technique. The carbide milling process is similar to a jackhammer, in that it chips away at the surface of the concrete with a milling head, which is an arbor equipped with carbide-tipped-teeth. On average, these carbide teeth will contact the pavement nearly 5,000 times per square yard (millions fewer when compared with diamond grinding). This breaks away the top layer of concrete from the pavement surface, leaving a roughened pavement and possible fractured joint faces. Even with recent advancements, incorporating greater numbers of machined teeth and a smoother drum, the carbide milling process falls short of the diamond grinding process. According to a Caltrans report, "Unless an agency is willing to accept badly spalled joints, the cold planer (rotomill) is NOT considered a satisfactory substitute for diamond grinding." Washington DOT further notes in a recent report that "Use of a roto-milling machine impacts the surface and results in the 'popping' out of aggregate rather than cutting it. The roto-milling process causes significant damage to the joint."



⚡ Completed diamond ground surface



⚡ Diamond ground surface under construction

## ABOUT IGGA

The International Grooving and 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 represent its newly formed Concrete Pavement Restoration Division. The IGGA/ACPA CPR Division now serves as the technical resource and industry representative in the marketing of optimized pavement surfaces, concrete pavement restoration and pavement preservation around the world. The mission of the International Grooving and Grinding Association (IGGA) is to serve as the leading promotional and technical resource for acceptance and proper use of diamond grinding and grooving as well as Concrete Pavement Preservation (CPP) and restoration.

## >>> USES AND APPLICATIONS OF DIAMOND GRINDING

Diamond grinding is most often used as part of a comprehensive Concrete Pavement Preservation (CPP) program. The 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, grooving and diamond grinding. If the application of each technique occurs at the right time, the maximum use and life of the pavement will be achieved.

Diamond grinding can also be used for spot situations, to fix smaller, local problems in newer and older concrete pavements. If there are “must grinds” or rough areas in a newly constructed concrete pavement, the easiest and most cost-effective way of achieving the desired smoothness is to diamond grind the pavement.

Diamond-ground surfaces have been found 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 non-ground surfaces. The diamond-ground pavements provided significantly reduced accident rates up to six years after grinding.

### Additional Information



For more information on diamond grinding, contact the International Grooving and Grinding Association at (518) 731-7450 or visit us on the web at [www.igga.net](http://www.igga.net).

### References

- The Concrete Pavement Restoration Guide, TB020P, American Concrete Pavement Association, Skokie, Ill., 1998.
- Diamond Grinding and Concrete Pavement Restoration, TB008P, American Concrete Pavement Association, Skokie, Ill., 2000.
- Roa, S., Yu, H. T., and Darter, M. I., “The Longevity and Performance of Diamond-Ground Concrete Pavements,” RD118P, Portland Cement Association, 1999.
- Caltrans report number FHWA-CA-TL-78-15, “Evaluation of Cold Planers for Grinding PCC Pavements,” Final Report, September 1978.