

Tech Talk is a regular feature of *Concrete Openings* magazine, focusing on equipment, maintenance and operational issues of interest to concrete cutting contractors. Readers wishing to have a particular subject addressed can call or email CSDA with their suggestions at 727-577-5004 or [cherry@csda.org](mailto:cherry@csda.org).

## The World of Surface Preparation

By Mike Orzechowski

**A**dvancements in the machines, accessories and techniques involved with surface prep have recently sparked a strong interest amongst many sawing and drilling contractors to explore expansion into the surface prep markets, to complement traditional sawing and drilling services. Often, concrete slabs can be rejuvenated or repaired at a fraction of the cost of demolition and replacement. The concrete slab surface can be changed to look different, allow for artistic expression and uniqueness, to provide more light, to be easier and less expensive to maintain and to provide better bonding sites for new performance coatings.

The concrete slab surface can be modified or repaired, rather than replaced due to the slabs containing some of the damages or defects that are typically associated with concrete slabs, including blistering, cracking, crazing, curling, delaminating, discoloration, dusting, high/low spots, pop-outs, scaling, spalling, micro fractures, heaving and/or shifting, surface traction and high vapor transmission. It is important to understand more about surface prep, as it is quickly becoming an integral part of our industry.

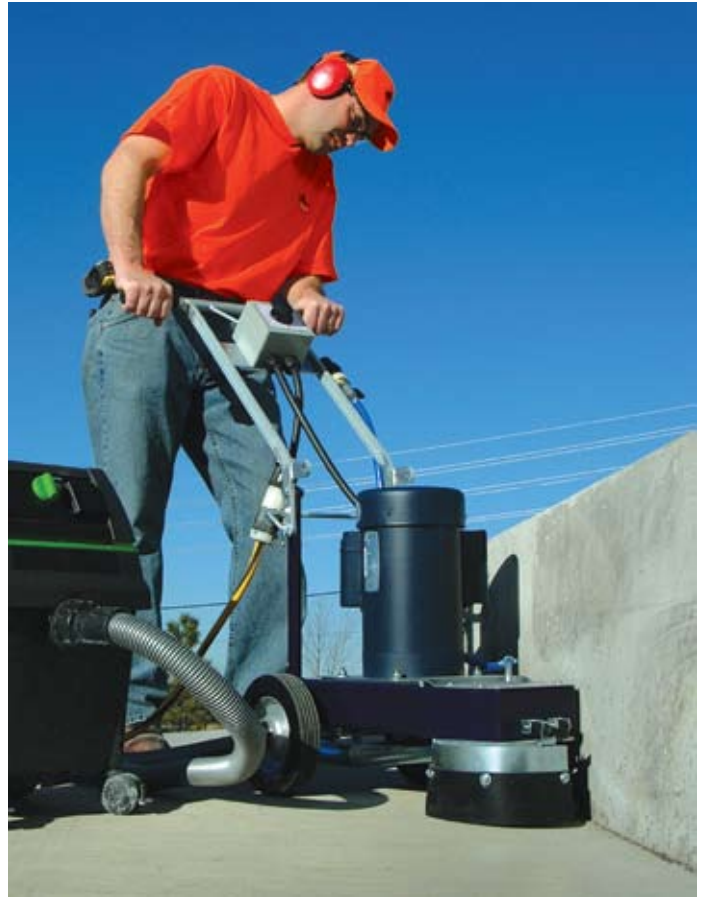
Surface prep is an industry-accepted term for equipment used in the mechanical preparation of concrete slab surfaces. The key to this definition is that a mechanical preparation of the slab surface and does not include chemical acids, phosphates, degreasers, poultice and/or pressure washing. Many folks lump it all together, but the reality is that the use of our restricted definition helps to carve out of the larger picture the machines and accessories that better parallel the current sawing and drilling equipment used in our industry.

Surface prep can be classified in three categories: stock removal, coating removal and coating preparation.

Stock removal is simply removing material to lower the slab height, removing loose delaminating concrete, smoothing trip hazards (discontinuities), removing portions of the slab that are defective (damaged or out of spec), or removing material to provide drainage, an artistic look or increased traction.

Coating removal is removing an existing coating from the slab. The coatings can be topical like paint, epoxy, urethane, elastomeric/waterproof membranes, and waxes; or synergistic coatings like chemical/petroleum/organic stains, acid stains, dyes, curing agents, admixtures, sealers, and densifiers. Other caps or coverings include polymer-modified cements, overlays, tile, carpet, etc.

Coating preparation is creating an ideal surface profile for a particular coating to increase the bond strength and integrity. The bond of the new coating to the existing slab surface can be maximized by providing the best 'bite' for the coating to adhere to the slab. The profile of the slab surface is typically categorized by the Concrete Surface Profile (CSP) numbering system that was developed by the International Concrete Repair Institute.



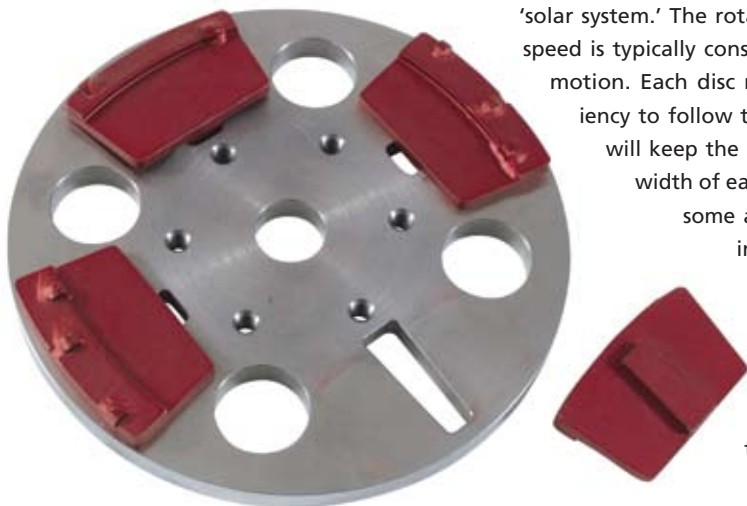
The CSP system uses a CSP range of 1 through 9 to define the surface profile. Grinding is usually in the CSP 1-2 range, planing is usually in the CSP 3-9 range depending on the cutters and spacing between the cutters, and scabbling is usually in the CSP 7-8 range. The coatings might call for a specific CSP number; whereas sealers having an application thickness of up to 3 mils might call for a CSP in the 1-2 range. Thin mil coatings (4-10 mils) might call for a CSP in the 3-4 range; high build coatings (10-40 mils) might call for a CSP in the 2-5 range; self leveling coatings (circa 50 mils) might call for CSP in the 3-6 range; and Polymer overlays (0.125 to 0.250 inches thick) might call for a CSP in the 4-9 range.

A typical job may include multiple categories such as removing a coating and providing

a profile for a new coating. It is important to understand each phase of the job to choose the best machines, accessories and techniques to accomplish the goals of that phase. The phase of the job for removing a coating might involve entirely different equipment than the phase for profiling the surface.

The machine, accessory and the technique are sometimes lumped together. For example, someone might view a concrete grinder as simply a concrete grinder and not fully appreciate the multitude of different grinders on the market, including planetary and rotary grinders. There are major differences in power and weight, various tooling speeds defined by the disc diameter and RPMs, different grinding head pressures, a multitude of different accessories including abrasive stones, scarifier wheels, carbide scrapers, polycrystalline diamond (PCD) and diamonds in a multitude of grits and bond types. To truly appreciate the advances to the state of the art in the surface prep industry, one must be able to understand that the machines on the market today typically have a cadre of different accessories designed for specific purposes. The techniques used also play a vital role in the overall production rates of a given job.

Surface prep equipment can be grouped into five different classifications based on the methodology of the cutting action of the machine: grinders and/or polishers (horizontal rotary abrasive, shredding or slicing action); planers (aka scarifiers, milling or flailing action); shot blasters, needle scalers and scabblers (hammering and/or impact action); chisel scalers and strippers (scrapping action); and saws, crack chasers and decorative saws (vertical slot grinding aka cutting action).



## CSDA ISSUES POLISHING CONCRETE SPECIFICATION

The Concrete Sawing & Drilling Association (CSDA) has been the leading association for issuing standards, specifications and best practices for the sawing and drilling industry since its founding in 1972. CSDA provides vital materials for architects and engineers to work on a professional basis with sawing and drilling contractors. As part of its effort to achieve these goals, CSDA has developed a Specification entitled Polishing Concrete.

Establishing proper industry standards ensures that each professional following the CSDA Specifications is providing the highest levels of safety and workmanship. CSDA Specification CSDA-PC-113, Polishing Concrete, covers the proper codes and standards to be applied on polishing projects, as well as the needed prerequisites for the work, polishing setup procedures and equipment operation.

"It pays for architects, engineers and cutting contractors to be working with the same up-to-date industry standards in today's competitive construction market. More than ever before, a contractor's success depends on access to the most current methods and technology to get a job done and to do it right."—Patrick O'Brien, Executive Director, Concrete Sawing & Drilling Association.

For more information on the Polishing Concrete Specification, contact the CSDA office at 727-577-5004 or visit the CSDA Website, [www.cdda.org](http://www.cdda.org), and click on the Standards, Specs and Best Practices link on the right-hand side of the CSDA home page.

Grinders and polishers are very similar. They work in a horizontal plane to level, profile, clean and/or polish a surface. Polishing and grinding is abrading the surface using friction, typically with accessories that are abrasive.

There are two distinct categories of grinders/polishers based on the motion of the discs and accessories, which are planetary and rotary. The planetary machines have smaller planets of accessories that independently rotate (passively or actively) around a larger 'solar system.' The rotary machines the disc speed is typically constant and in a circular motion. Each disc maintains some resiliency to follow the slab contours that will keep the working width to the width of each disc. Some overlap, some are designed to move in a sweeping motion.

The advantages and disadvantages of the planetary machines are that it creates a random scratch pattern, has varied dia-

mond speeds as it rotates and a larger working width of the machine which is across the 'solar system' and not the individual planets.

The grinding action of a grinder and polisher is a horizontal motion and in many ways is similar to the grinding action of a concrete saw that is vertical. Grinders and polishers are in many ways very similar to concrete saws. The bond hardness, the diamond concentration and the size of the diamonds all play a critical role in the life and production rate of the grinding action. Concrete saws are really grinders that are grinding a vertical slot in the slab surface. The knowledge we have gained working with diamond blades can help us better understand the diamond accessories on grinders.

Polishing is done either wet or dry and involves a progression of increasingly larger diamond grit sizes in the accessories. The accessories are typically classified as 'metals' (vacuum brazed diamonds, metal bonds, sintered bonds, etc.), and 'resins' (semi-metal hybrids, phynolic resins and polymer bonds, etc.). Typically the polishing process includes the application of a densifier to harden the slab

skin, prevents dusting, and increases the shine. Polished concrete floors are easy to maintain, have long life, have increased reflectivity of available light, and allow the slab to breathe if vapor transmission is high. Typical progression formula is: 100G, 200G, 400G, 800G, 1200G and 3000G. Some technicians double up and some step back a grit on the transition from metal to resin.

Planers are also known as scarifiers, milling machines, rotary cutters/grinders and surface prep machines. Planers spin a cylindrical drum tangent to the slab surface removing the top surface at a controlled depth with either rigid abrasive cutters milling the top surface, or, with smaller carbide or steel cutters on independent shafts on the drum perimeter by a flailing action of the smaller cutters as the drum rotates. They can be classified as either an upcut or downcut machine depending on the drum rotation with respect to the motion of the machine. Some of the planers use diamond blades and can remove large depths of material in a single pass.

Shot blasting uses a machine that propels thousands of particles per second at the slab surface, then the particles are circulated back into the machine whereby the dust, debris and worn particles are vacuumed away and the process is repeated.

Needle scalers and scabblers use compressed air to propel a piston perpendicular to the slab surface to drive hardened steel rods or carbide tipped bits (respectively) into the slab surface with a hammering action.

A chisel scaler uses compressed air to propel a piston to drive metallic blades with a hammering action. Strippers are typically electric powered with a slicing or chipping action, but both are used to remove things like tiles, carpet and VTC. A sharp blade can sometimes scrape the slab surface clean of glues and adhesives. Larger self-propelled diesel, gasoline, propane, electric and battery powered strippers are available that scrape the floor clean of tiles, carpet and VTC with weight and power.

Concrete saws are also part of the surface prep machines for stock removal. The depth of cut can be fixed to allow for a series of cuts in a slab close enough together to chip down to a specific level (at the root of the cuts) to allow for a slab to be lowered or recapped.

Crack chasers and decorative (deco) saws are highly maneuverable slab saws used to follow random cracks for repair or create artistic cuts in a slab surface for aesthetics. Typically these saws use thicker blades in bevel or standard configuration.

Typically the machines used in surface prep can be used in a wide range of jobs. The trick is to understand that some machines, accessories and techniques will be much more productive in specific niche applications. The contractor can perform a cost analysis on the job based on the cost of the machine, accessories and labor and determine a cost effective approach using what some would consider practical solutions of using multiple machine types and/or multiple accessories to complete the job. To fully

understand the best solution, one should consider mixing (pairing) methodologies of either the accessories or machines.

**Example 1:** Removing stock with scarifier then grinding the slab smooth with a grinder.

**Example 2:** Using PCDs to remove a resilient coating then using diamond grinding accessories to create the desired CSP and clean the slab surface of coating residuals to provide a clean open bonding surface for the new coating.

**Example 3:** Using a grinder to feather out the zebra stripping after shot blasting.

The advancements in the machines, accessories and techniques in surface prep are providing the CSDA contractors with new market opportunities. The world of surface prep can be broken down simply into three categories (stock removal, coating removal and coating prep) with five different classifications of machines based on the methodology of the cutting action (grinders and/or polishers; planers; shot blasters, needle scalers and scabblers; chisel scalers and strippers; and saws). Recently the CSDA standards and specifications committee released a specification on polishing concrete. The CSDA involvement in the creation of this specification demonstrates a commitment to developing industry accepted definition of a true polished concrete slab without major shortcuts to the claim of a polished slab.

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