

Simple Guidelines to Better Surface Preparation

by Allen Slater



Diamond cutters/slicers are a relatively new method for removing thick coatings, mastics and polymers. Also used to level out surfaces, they leave a smooth, even finish.

The key to a successful coating project is successful surface preparation. This article offers a few tips for improving surface preparation for coating concrete floors. The recommended methods are cost effective and can substantially reduce the possibility of coating failure and costly rework.

When faced with a surface preparation project, the first item to be considered should be the existing concrete surface. What is its condition? While this may seem like a relatively basic (and simple) question, overlooking this step can lead to premature coating failures, expensive rework, and unhappy customers. Concrete composites are made up of different constituents, each of which can and do vary, often substantially within sections of the same concrete floor.

Several factors may affect the condition of the surface as listed below.

- If too much water was added to the concrete mixture, the slab surface may be overly porous and weak.
- Consistency of the concrete mixture can vary from batch to batch.
- The amount of chemical modifiers or admixtures used to replace water can vary.
- Atmospheric conditions may have

changed while the concrete was being placed.

- The type of equipment used to place and finish the concrete can result in differences in surface characteristics.
- The amount and type of curing compound applied to the slab surface can vary and can alter the nature of the surface and its penetrability. Curing compounds permeate concrete surfaces at different depths.

To illustrate how everyday processes can change the nature of a concrete surface, consider the example in the sidebar accompanying this article.

The age of the concrete surface is also important. Older floors may have been subjected to years of abuse, accumulated dirt, oil, and grease, all of which can affect the performance of a coating. Previous coverings, such as tile or glue-down carpet, may have been removed, leaving behind mastics and glues. Older floors are typically harder, since hardening usually continues throughout the life of the floor (at least for the first 100 years). Curing compounds may remain on the surface of new floors.

With all of these variables, the condition of the surface can vary significantly even

within relatively small areas. Differences can show up in the amount of laitance, the layer of high water/cement ratio mortar that comes to the surface of a slab under normal finishing procedures. It typically varies from $1/16$ to $1/8$ inch (2-3 mm), but in some circumstances where excessive troweling has occurred, it can range from $1/8$ to $1/4$ inch (3-6mm). It is important to remember that a thick layer of laitance on the surface of a slab is not a desirable area to coat. The coating may be able to withstand tremendous loads, but the surface it is attached to may not. Contractors have often been fooled by thinking that preparation of a floor by acid-etching will suffice, only to discover a few months later that they have to remove the coating and start all over.

Any existing coatings on the surface should be carefully evaluated. The thickness and nature of the existing coating can help determine the type of equipment needed for surface preparation.

The type of coating that will be applied to the prepared floor must also be considered when selecting the surface preparation method to be used. For example, thin coatings and sealers are not appropriate over a floor in a condition that requires more than a light profile blast. The prepared area must be able to assume adhesion of a coating and provide the right amount of profile that will be hidden by the thickness of the coating. Adequate adhesion is the result of a good chemical and mechanical bond. Chemically, the prepared floor must not have any residues that would interfere with the curing of the coating. To mechanically lock onto a floor, the surface pores must be opened to allow for penetration of the coating into the substrate.

The coating application contractor usually also performs the surface preparation, and has to have fast turn-



Shot blasting is one of the most common floor preparation methods.

around capabilities to remain competitive. Surface preparation methods may include detergent scrubbing, acid etching, or mechanical abrasion. Shot blasting is one of the cleanest and fastest methods of mechanical abrasion, but others may also be applicable. These include scarification, grinding, and polishing. Scraping machines are also useful for removing the initial surface coverings such as tile, carpet, water-



Some hand work is frequently required; use of dustless equipment protects workers and keeps the surrounding areas clean.

proof membranes, or other thick coatings. Evaluating the existing floor surface helps to determine the best equipment to use.

With the different conditions that may be present on a floor, it can seem difficult to determine how best to tackle the job of surface preparation. However, following a few guidelines can help the contractor accurately assess the condition of the floor and lead the way to a successful surface preparation job. When performed correctly, this assessment can help the contractor accurately identify the scope of the job. Knowing the floor is essential to selecting the appropriate surface preparation method and equipment.

Following are some simple guidelines that will help accurately assess a floor surface and help ensure a successful surface preparation job.

1. Walk the floor, carefully noting differences in surface cleanliness, grade, and condition. Take a small tool, such as a screwdriver or nail, and pry up test areas of the surface that appear loose or soft. A ball peen hammer, struck against the surface, can also be useful to provide an indication of concrete hardness. It will also give an indication of whether an impacting force such as shot blasting will be appropriate.

2. Take care to notice edges, joints, and possible obstructions. What may seem at first glance to be a wide open area that can

be finished quickly may in fact have numerous sections that require hand work. It is also important to consider joints and large cracks or fractures that will need cleanout or chasing. Coatings will fracture along joints and cracks that are not properly addressed. Several manufacturers offer concrete grinders for edge work, along with joint cleanout saws and crack chasing saws. Using dust-free versions of these tools offers many

advantages: reduced worker fatigue, faster cleanup and the ability to have other workers working in the same area.

3. Perform a test surface repair, in a variety of locations on the slab if needed. Even a new floor must be prepared to remove any curing compounds or sealers, and to open up the pores in the concrete. Before a test patch is done over

a given area, it is a good idea to see if water soaks into the floor or simply beads up on the surface. If water will not penetrate into the pores, neither will a coating. If the floor is large enough and there are substantially different characteristics (a new slab is being added on to an older area, for example), it may be a good idea to perform several test patches.

4. If shot blasting is to be used, blast an area using different abrasive sizes and travel speeds to control the intensity of the shot blast. Note the shot size and travel speed that gives the desired result. A larger shot size or a mix of steel shot and grit is more aggressive. If rubberized coatings are present, test a mix of steel shot and grit to introduce more sharp edges in the abrasive mix. This will cut through the coating more effectively, minimizing a rebound effect, where the shot bounces off the surface of the coating without removing it.

5. The travel speed of the shot blast unit can also be adjusted to vary results. Determine if a thin or thick layer of the surface must be removed. Slower travel speeds tend to remove more material than if the shot blaster is moved quickly over the surface. The distance from the surface down to the first major layer of aggregate is the limiting factor for the amount of surface removed. The passageway for the abrasive can

Concrete surface differences

A contractor is placing and finishing a concrete floor outside, on grade. After the floor is finished, a building will be constructed over it.

During placement of the first section, the conditions are very favorable. The weather conditions are near perfect: 63°F, 55% relative humidity (RH), and a slight wind at 2 to 5 mph. It is early in the day (7AM), and the workers are fresh. The wait required for the “bleed water” to rise to the surface, an indication that the slab will support the weight of a power trowel, is one to two hours. The power trowel operator works slowly and carefully, knowing that there is plenty of time before he can start the next section.

After finishing the first section, the worker moves onto section two. The temperature has risen to 78°F and the RH to 62%. The wind has picked up and is gusting from 5 to 15 mph. He starts to trowel sooner than in the first section because the bleed water appears faster than before. The power trowel operator spends less time on this second section because the surface is setting up faster due to accelerated hydration. He is starting to feel the heat of the day and is anxious to finish the job. It is 12:00 noon.

In the last section, the trowel operator notices that the bleed water appears much faster than before, and he doesn't have nearly as much time to trowel the surface. Now 4:00 pm, the temperature has risen to 88°F with a RH of 70%, and the wind is gusting from 10 to 15 mph. The high temperature is a major factor to both the worker and the hydration rate of the concrete. The operator is tired, is eager to finish this project so he can go home, and spends very little time in this area.

Notice that in this example it would be difficult to find any two areas on the slab that are the same. In section one, the excess power troweling brings much more of the cement paste to the surface, resulting in the formation of a fragile layer on the top that will provide a poor bonding surface for any coating. Excessive troweling can also overheat the top layer of a slab, causing the area to set up or cure prematurely and preventing the escape of water through the top. Noticeable black swirl marks on a slab is a telltale sign that a slab surface was “burned” and is very weak. The result of this is demolition of the surface layer, which will later start to crumble.



Crack chasing with dustless equipment.

become plugged and must be cleaned out if pieces of rock are collected in the machine. If surface removal requires a depth past the initial aggregate, a diamond grinding machine can be used prior to shotblasting.

6. Consider a mix of tool types to address the specific needs of the floor and to address the type of coating or surface that is being removed. Shot blasting can be effectively combined with dustless grinding to take care of both open and tight areas. Some shot

blasters are designed to clean right up to edges. Additionally, sometimes a mix of several tool types can provide better results than simply performing several passes with one type of machine. Example: a contractor working on a parking garage project wanted to remove and replace a thick waterproofing membrane. A ride-on scraping machine was used to take up the bulk of the material. Next, a diamond cutter/slicer was used to remove the resilient coating underneath the membrane. This machine left the surface smooth and clean of debris. Finally, a shot blaster was used to create a new profile that would accept the new membrane.

7. Remember that shot blasting can be used for floors in sensitive areas that are otherwise “off limits” to other methods. Food preparation or manufacturing areas, clean rooms, working around sensitive inventory or machinery, or simply areas where chemical-free, dustless methods are required are all candidates for shot blasting.

Careful and thorough evaluation of the surface, along with consideration of the desired final result, is essential to a successful surface preparation job. Assessing the situation can help the contractor select the most appropriate tools and equipment for the job, resulting in fewer wasted hours and a better coating job.



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