

Laying the Floor: Quality Control on a Concrete Job

BY FLOYD DIMMICK, SR.
WITH STEPHANIE MARIE CHIZIK

Photos courtesy of the author

Considering the number of variables that can affect the outcome of any one concrete job — such as temperature, humidity, intended use, and size of project, just to name a few — it's no wonder that the risk of a failed job can hang heavily on a contractor's mind. Once the concrete is poured, the outcome of that job becomes the responsibility of the coatings contractor. That's the kind of pressure that may break some. But don't let such accountability scare you! Fueled with the right information, you can make the correct decisions on your next concrete overlay project.

To address some of the issues regarding quality control in the concrete inspection industry, *CoatingsPro* asked expert Floyd Dimmick, Sr. a few pertinent questions. Dimmick — co-founder and Technical Director of Crown Polymers — has been involved in the polymer industry for over 40 years and teaches polymer classes.



ABOVE ▲ The photo above shows an example of spalled concrete at the edges of a contraction joint. Spalling is the chipping, fragmenting, or separation of a surface. It's a safe bet that any coating applied on top of a spalled surface will disbond.

Q: Quality control starts from the beginning of a project. In the coatings industry, that means surface preparation. How do you prepare concrete? What tools are used?

A: There are a variety of ways to prepare concrete. These depend on the Portland cement concrete's (PCC) environmental past or future exposures. Typically, the surface preparation would include one or more of the following methods: Shot Blasting, Water Blasting, Grinders, Acid Etching, or Scarifying.

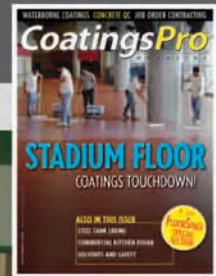
Surface Preparation

Proper surface preparation of the PCC substrate is critical to the success of the polymer coating or polymer concrete overlay. This prep includes the removal of laitance on heavy traffic or abused floors, and partial removal for lighter-used areas. The foundational



ABOVE ▲ Shot-blasting is a popular surface preparation method among concrete coatings contractors as it leaves an essentially "dust-free" surface. Most shot blasters have attached vacuums to reclaim spent shot and debris.

Copyright 2008 • Reprinted with permission *CoatingsPro Magazine*



All concrete is not equal and all might not be compatible with the grinding method of surface preparation, as shown here. According to ASTM D 4259 acceptable grinders do not leave powered residue on the concrete surface during the grinding process.

objective of surface preparation is to properly prepare the concrete surface to a clean and sound substrate that is acceptable for the attachment of the polymer overlay.

Shot Blasting

Dry abrasive blasting is the method preferred by most contractors and architects. This is a dust-free method that uses centrifugal shot blasting, using steel beads. A vacuum is attached to reclaim the un-spent beads for re-use as well as for disposal of the dust and other surface contaminants. Shot blasting is most often selected by surface preparation experts because it leaves a dust-free and clean surface ready for immediate polymer application — as described in ASTM D 4259.

Water Blasting

High pressure abrasive water blasting — 10,000 psi (70 MPa) and higher — is very effective in above-freezing temperatures when the water can be disposed of properly. In below freezing temperatures, though, ice crystals form on the PCC surface and prevent proper [coating] adhesion. The cleaned concrete surface — as described in ASTM D 4259 — requires a drying period in order for the polymer of choice to be accepted as the protective base coat, prime coat, or membrane. If the project is exposed to freezing temperatures after blasting, it may have to be re-cleaned once the temperatures reach above freezing in order to rid the surface of contamination. Because

of this, dry prep methods are preferred in below-freezing temperatures. Most high quality 100% solid epoxies will adhere to a moist or dry surface, but not a wet surface. And, only a few polymer manufacturers have the technology to cure at below-freezing temperatures. Consult the polymer manufacturer for the product's specification regarding surface moisture and low temperature curing for during and after application procedures.

Grinders

There are many different grinders in the concrete industry. Acceptable grinders — as described in ASTM D 4259 — are those that do not leave powered residue on the concrete surface during the grinding process or those that compact the dust into the exposed

The floor coating business doesn't have inspectors like the steel industry. Even when architects are present, they'll only check the finished system. It's up to the contractor to warranty the project.



ABOVE ▲ Carefully follow the written specification. If there happens to be a disagreement *before* starting the project, don't proceed until there is a *written* agreement. Any finished work must be *approved* in written form before leaving the project.

open concrete pores or cavities. Consult with the grinder manufacturer on the selection of grinding tools for the best results with your local concrete. All concretes are not equal. Softer concretes may not be suitable for the grinding process. Typically, grinding methods are more expensive per square foot and require more workman hours to complete a project than shot blasting methods. However, grinders do a great job on hard concretes for smaller projects, and require a smaller investment from the contractors.

Acid Etching

Acid etching — described in ASTM D4260 — is a method used to remove the thin, weak laitance surfaces from the concrete. Thicker laitance surfaces may require multiple acid etching applications, thus increasing the cost above other abrasive blasting methods. On thicker laitance surfaces it will also create a slight surface profile, giving a false impression that the concrete is ready for the polymer overlay when heavier pedestrian or forklift traffic is anticipated. However, if the laitance has not been properly removed for these types of environments and the bond line attachment area — the weak area — between the laitance and concrete mass has not been removed, then the surface preparation is not complete.

To achieve proper laitance removal, careful attention to the removal process is required by a knowledgeable and responsible person in the concrete and polymer industry. Most polymer manufacturers will not accept acid etching as a surface preparation method and some states will not allow the use of acids. It is believed that acid etching is a process of the past in regard to concrete applications. However, it is still used occasionally today, by smaller contractors who haven't yet invested in mechanical methods of cleaning. It should be noted that acid is still a good choice for contractors in the chemical industrial floor and secondary containment markets. After the acid is used as the first step of



ABOVE ▲ Once contraction joints have been cleaned, they must be protected with a joint sealer. Filling the joints with a 100% solids, flexible epoxy, such as CrownFlex Joint Sealer No. 505, will waterproof them and help guard against future spalling.

the preparation process and has neutralized other chemicals on the concrete surface, abrasive dry blasting is then used as the final preparation.

Scarifying

Scarification is a dry method — as described in ASTM D 4259. The scarifying process uses rotary cutters that impact the surface at right angles. This fractures and pulverizes the concrete, resulting in a surface with micro-cracks. After the removal of the concrete is completed, the surface is then abrasive shot-blasted or high-pressure water-blasted to remove as much of the damaged surface concrete as possible. An in-depth removal is the most commonly used method. The other option is laitance removal; but when it is used, a striation pattern in the concrete surface results, creating voids in the concrete that need to be filled with additional polymer. The in-depth removal, then, increases the project cost. Because of the noise and dust — and the micro-cracking — created by in-depth removal, this method is not recommended for thin layer surface preparation.

Architectural Concrete Surfaces

Architectural projects with concrete surface aesthetics require attention to detail because of the artistic look that the floors provide. To accomplish the desired look of a super smooth surface, a combination of grinders and shot blasting equipment may be used. If only a small amount of laitance is to be removed, grinders may be the only equipment required. However, if all the laitance is to be removed in order to expose the larger aggregate, a combination of shot blasting and grinding should be used.

There is an unknown factor that occurs on a large percentage of these projects: It is common to find bug holes and other defects below the laitance. Another problem that commonly causes the contractor headaches during the surface prepara-



ABOVE ▲ Quality control begins — and to a certain degree, ends — with the individual contractor. In the polymer floor coating and overlay business, the only rules are what the polymer manufacturer sets. These are governed by individual quality control tests and the American Society for Testing and Materials (ASTM) individual component standards.

tion process is the damage found on the control joint edges. The edges spall and become irregular in width during the surface prep process. The result is that any defects or irregular-sized joints stand out; there is no way to hide them. If the owner decides to accept the appearance of a patched look, it could devalue his property values.

Another problem could develop if the project was bid without a good specification. If the spec writer doesn't understand the entire process, typically there will be problems on the project. In this case, the floor surface will require higher maintenance costs in order to maintain the floor surface in a safe and presentable manner. This occurs because the floor is typically polished but not sealed; or the wrong sealer is applied to create an immediate shine or glossy appearance. If thin film, clear coatings are used, they help in the short run; but they provide minimal moisture and abrasive protection in the long run. To seal the floor properly, a thicker clear film such as an epoxy or polyurea should be used. These 100% solids coatings will penetrate into the concrete surface and become a monolithic part of the structure, and, additionally, are available as a clear or a translucent pigmented coating. The selection of which polymer to use is solely based on UV exposures: Epoxy is used with no exposure and polyurea is used for areas with part or full exposure. Both polymers will provide moisture resistance coupled with ADA or OHSA slip-resistant compliance.

Q: What are the post-cleaning disposal practices?

A: The concrete dust and normal contaminants are typically sent to an approved landfill. The concrete dust easily becomes part of the landfill. There is nothing special about this process of disposal unless there are chemical contaminants. If this is the case, local regulations regarding contaminants need to be followed.

Call for the location of your nearest Crown Polymers representative.

All registered trademarks are of Crown Polymers, LLC unless otherwise noted.
© Crown Polymers, LLC, 2008-2009 Printed in the USA

Q: Are there safety precautions/health risks involved in the cleaning process?

A: Each cleaning method has its own risks. However, protective eye glasses should be worn with each method and, if dust or water mist is present, a dust mask should also be worn. Deciding on which protective clothing is appropriate will depend on the method being used and the environment during the cleaning process. For instance, rain gear will be used by most water blasting companies because of the water accumulation involved during the cleaning process.

Q: Are there any tips as to how the contractor should work with the inspector?

A: The floor coating business basically does not have inspectors like the steel tank industry. Even when architects are present on the project — unless there are problems — they will only check the finished system in place. It's up to the contractor to warranty the project. If there was an inspector on the project, a friendly meeting before starting the project would be good to discover the attitude of the inspector and try to understand what the inspector expects. Once that is known, you will know how to proceed with the project. Carefully following the written specification and plan notes will help make your job as smooth as possible. If there happens to be a disagreement before starting the project, do not proceed until there is a written agreement of the difference. Once you've settled on an agreement, you may proceed. It also important to remember to get the finished work approved in written form before leaving the project.

Q: What are the rules for concrete inspection?

A: In the polymer floor coating and overlay business, the only rules are what the polymer manufacturer sets. These are governed by individual quality control tests and the American Society for Testing and Materials (ASTM) individual component standards. The rules, then, are at risk for frequent changes.

However, most all floor overlays are dependent on both the contractor's ability and the quality of the product. Today, more projects are being installed using a specification either from the architect or the polymer manufacturer. The training of contractors, though, has remained the task of the polymer manufacturer. However, the responsibility of making the concrete inspection rules is shared by many.

Every aspect of the polymer overlay project takes planning and preparation. Yes, there are a lot of aspects to consider when starting a new job. But what it comes down to is: Do you have the right information to achieve the best possible results? Gather as much information about the concrete as possible because once that concrete is down, there's no turning back! Quality control of your portion of the work — from the very start to completion of the job — is your best guarantee of a quality project every time. Remember, the serious responsibility is yours. CP



Crown Polymers, LLC.
11111 Kiley Drive
Huntley, Illinois 60142

info@crownpolymers.com
www.crownpolymers.com

847.659.0300 Phone
847.659.0310 Facsimile
888.732.1270 Toll Free