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TACM Guide for Concrete Surface Prep Samples 1 – 5

Introduction

Proper concrete preparation is paramount to a successful bond of coating materials to concrete substrates. These coating materials can range from penetrating sealers, topical sealers, thin films, high-build coatings to self-leveling toppings, overlays, and repair materials. Repair materials can range from a 1/16" skim coat to a partial depth or full depth structural repair. The above list is not exclusive, as the list of concrete coatings is ever-expanding and evolving over time.

These are general industry concrete preparation recommendations for various types of sealers, coatings and concrete repair materials. However, strict attention must be paid to the concrete surface preparation methods recommended by each manufacturer for specific product. For instance, some epoxy coating and self-leveling concrete manufacturers will allow Acid-Etching (Sample #1) as an accepted method of prep, while others will not. Installers should always follow the manufacturer's application method over general industry methods to assure success of the installation.

It is prudent to heed this warning as technical advances have created many new hybrid building industry materials. Each manufacturer is ultimately responsible for the specific concrete prep method(s) for their concrete coating and repair products, and for educating applicators in these prep methods.

General Industry recommendations can be found in guides and technical publications from different organizations such as ACA, ACI, AMPP, ASA, ASCC, CFIA, FCICA, ICRI, MMSA, NESCC, NTCA, NWFA, and TCNA (this is not an exhaustive list). One of the most widely referred to Technical Guidelines for concrete surface preparation is ICRI (International Concrete Repair Institute) Guideline No. 3102R-2013. The ICRI Guideline No. 310.2R-2013 details how to select concrete surface preparation methods, associated benefits and/or potential problems with each method used to achieve the required surface profile, production rates, and testing methods of the concrete surface (along with much more detailed information regarding concrete surface prep.)

This TACM Guide will describe methods used to prepare five different concrete surface preparation samples in TACM's kits. A description of the methods and processes used to achieve each type of sample is detailed in this Guide below. Common applications for these methods and quality assurance information is given in the Guide as well. It must be noted that there are many variables affecting concrete surface prep including, but not limited to the strength and soundness of the concrete surface, the apparatus and force applied, the number of passes (or applications) of a mechanical abrasion, the overlap of abrasion etc.

Sample 1 through 5 – Methods of Preparation

TACM's samples are created with stringent control processes, and are a visual and textural representative of the concrete surface prep profile for each mechanical process. It must be noted that variations will occur in the samples, just as they will occur in field concrete slabs. The "Variations in Concrete Surface Prep Profiles" section below gives detailed information of some of these variations and explains how they occur. Due to these variations, there is a range of acceptable inconsistency.

The goal for concrete surface prep is to remove any un-sound concrete, open the pores of the concrete surface and remove dirt, oil, laitance, curing compounds, coatings, and any other deleterious material. This is necessary to remove any material that may serve as a bond-breaker or interfere with the penetration of a sealer, repair material or other coating.

Sample #1 Acid Etched:

This sample is prepared on a 7,000psi concrete design mix substrate.¹ A dilution of 2:1 water/muriatic acid solution is sprayed on the surface and left to etch the concrete surface (approximately 3-5 minutes). The acid solution is subsequently scrubbed with a bristle brush for several minutes, then rinsed with water. The water rinse is followed by a neutralizing scrub of an ammonia solution for several minutes (and then rinsed with water again). The substrate is squeegeed and vacuumed. The heads of the sand in the concrete are slightly exposed by the dissolving of calcium hydroxide and calcium silicate, which make up the hydrate solids in cement paste. This leaves a slight profile on the surface. While it does not change the profile, it is imperative to neutralize the acid or bonding of materials later could be impacted.

Common Application—This method of concrete floor prep is most commonly used by the DIY (Do-It-Yourself) market segment. Homeowners typically do not have access to specialized equipment or the knowledge on how to operate equipment used commonly in the commercial market for concrete surface prep.

Quality Assurance—The surface should be clean & show no sign of laitance, debris or dirt. Visual inspection should show a slight exposure of the head of the sands, and running your hand across the surface should feel like running your hand over a light sandpaper. Water should not bead up on the surface and should absorb within a short period-of-time (if not repeat the procedure as contaminants are still on the concrete surface). PH testing should be done to assure that all acids have been removed. A tensile bond test would assure that the surface should be free of bond-inhibiting materials.²

Sample #2 Ground(Hand Grinder):

A 7,000psi concrete design mix is used for this ground sample.³ Grinding is accomplished using an electric, variable speed hand grinder with a 4" to 9" diamond cup-wheel. Rotation of the abrading stones on the cup-wheel is applied with pressure to the concrete surface on a right angle.

Common Application—This method is often used to remove thin and high-build coatings, and is common in the DIY and Professional markets. It is also regularly used at walls, doorways and other tight spots that are inaccessible to larger pieces of equipment.

Quality Assurance—The surface should be clean & show no sign of laitance, debris or dirt. Visual inspection should show some exposed aggregate and the surface should feel smooth while showing some circular grind marks. Water should not bead up on the surface and should absorb within a short period-of- time (if not repeat the procedure as contaminants are still on the concrete surface). A bond test would assure that the surface should be free of bond-inhibiting materials. The surface needs to be vacuumed and cleaned, as the concrete dust created during grinding will become a bond-breaker if not fully removed.²

Sample #3 Light Shot-blast:

A 7,000psi concrete design mix is used to prepare the substrate for this lightly shot-blasted sample.⁴ Shot-blasting equipment is calibrated per manufacturer's instructions prior to each start of blasting. Steel Shot #280 is used to mechanically shot-blast a light blasted surface impact velocity. The equipment blasts an 8" wide path. One 8" pass is made and then another pass from the opposite end of the material, minimizing an overlap of 1-1.5". Dust is removed and shot is recovered with a vacuum system.

Common Applications—This method is primarily used by industry professionals to clean and prepare horizontal concrete surfaces, although handheld apparatus can be used for vertical applications. This is one of the principal methods used by professionals to remove existing sealers and coatings, along with laitance and contaminants near the surface of the concrete. There are coatings, such as certain resin and tar-based products that are not removable by shot-blasting as they soften and gum-up in the process of blasting.

Quality Assurance—The surface should be clean & show no sign of laitance, debris or dirt. Visual inspection should be representative of ICRI's molded Sample 3 (light shot-blast). Water should not bead up on the surface and should absorb within a short period-of-time (if not repeat the procedure as contaminants are still on the concrete surface). A bond test would assure that the surface should be free of bond-inhibiting materials.²

Sample #4 Light Scarification:

The Light Scarification samples are produced on a 7,000psi design mix concrete substrate. An electric scarifying machine with a cutting drum is used to fracture the concrete surface. This surface profile is accomplished by loading a cutting drum with carbide six-point cutter teeth spaced with zero washers, making a striated parallel pattern. The machine is set at one of the highest adjustments and a single pass is made to create the minimal scarification depth of the sample. Vacuuming removes the dust created in the cutting of the concrete.

Common Application—This method is primarily used by industry professionals to clean and prepare horizontal concrete surfaces, although handheld apparatus can be used for vertical applications. Adhesives can be removed with appropriate adjustment of washers and cutters, however this is not an appropriate method for the removal of heavy elastic membranes.

Quality Assurance—The surface should be clean & show no sign of laitance, debris or dirt. Visual inspection should be representative of ICRI's molded Sample 4 (light scarification). Water should not bead up on the surface and should absorb within a short period-of-time (if not repeat the procedure as contaminants are still on the concrete surface). A bond test would assure that the surface should be free of bond-inhibiting materials.²

Sample #5 Medium Shot-blast:

A 7,000psi concrete design mix is used to prepare the substrate for this medium-blasted sample.⁵ Shot-blasting equipment is calibrated per manufacturer's instructions prior to each start of blasting. A Steel Shot #390 is used to achieve a medium blasted surface profile. The steel shot is propelled against the concrete surface via shot-blasting equipment with a high impact velocity. The equipment blasts an 8" wide path. One 8" pass is made and then another pass from the opposite end of the material, minimizing an overlap of 1-1.5". Dust is removed and shot is recovered with a vacuum system.

Common Application—This method is primarily used by industry professionals to clean and prepare horizontal concrete surfaces, although handheld apparatus can be used for vertical applications. This is one of the principal methods used by professionals to remove existing sealers and coatings, along with laitance and contaminants near the surface of the concrete. There are coatings, such as certain resin and tar-based products that are not removable by shot-blasting as they soften and gum-up in the process of blasting. This concrete surface prep profile is often

recommended for High-Build Coatings, Self-Leveling Toppings, Polymer Overlays, Concrete Overlays, and Repair Materials.

Quality Assurance—The surface should be clean & show no sign of laitance, debris or dirt. Visual inspection should be representative of ICRI's molded Sample 5 (medium shot-blast). Water should not bead up on the surface and should absorb within a short period-of-time (if not repeat the procedure as contaminants are still on the concrete surface). A bond test would assure that the surface should be free of bond-inhibiting materials.²

Variations in Concrete Surface Profiles

It must be noted that the strength of the concrete and the type and size of aggregate used in the design mix of the concrete substrate will impact the texture and appearance of the surface prep profile. A variance of texture will occur from substrate to substrate (also within the same substrate). This will occur even with strict adherence to quality control processes. Additionally, differences in concrete surface prep profiles are created by some of the mechanical processing steps, and by operator inconsistencies.

Examples of this are:

- 1) Sample #1 – Acid Etched: One Area of a substrate may have a puddling of acid and result in a slightly deeper etching, or a certain area could be scrubbed with more pressure resulting in a higher exposure of sand than another area.*
- 2) Sample #2 – Ground (Hand Grinder): Manual grinding applies different pressure on different spots of a concrete substrate, subsequently some areas have circular marks and other areas do not. Aggregate exposure is not entirely even.*
- 3) Sample #3 – Light Shot-Blast: Shot-blasting equipment is intentionally steered in straight strips of a defined width for each piece of blasting equipment (generally 5"-48" wide). There are intentional overlaps as a precaution to eliminate gaps or strips of unprepared concrete. These are kept to a minimum as they occasionally produce more exposure of aggregates and depth of profile. Another example that will alter finish is if the blasting equipment stays stationary for even a couple extra seconds, creating a deeper exposure.*
- 4) Sample #4 – Light Scarification: If the scarifying equipment runs over a weaker spot of concrete, or sits in one spot for a few extra seconds more removing more concrete can increase the chance of aggregate removal. This alters the pattern of the striations and the overall appearance of the sample.*
- 5) Sample #5 – Medium Shot Blast: Shot-blasting equipment is intentionally steered in straight strips of a defined width for each piece of blasting equipment (generally 5"-48" wide). As a precaution to eliminate gaps or strips of unprepared concrete, there are intentional overlaps. These are kept to a minimum as they occasionally produce more exposure of aggregates and depth of profile. Another example that will alter the finish is if the blasting equipment does not stay in constant motion even for a couple extra seconds, creating a deeper exposure. The Shot size (280) is coarse enough to create a higher chance of exposure.*

EACH SAMPLE HAS BEEN VISUALLY INSPECTED TO BE COMPARATIVE WITH ICRI'S CSP® MOLDED REPLICAS. THAT IS THE LIMIT OF TACM'S WARRANTY. THERE IS NO WARRANTEE, EXPRESSED OR IMPLIED THAT MATCHING TACM'S SAMPLES WILL GUARANTEE THE BOND OF A CONCRETE COATING TO A CONCRETE SUBSTRATE. APPLICATOR SHOULD ALWAYS REFER TO INDUSTRY GUIDELINES & MANUFACTURER'S TESTING RECOMMENDATIONS.

THE GUIDE IS NOT INTENDED TO GIVE ADVICE ON WHICH CONCRETE SURFACE PREPARATION METHODS ARE ACCEPTABLE FOR CERTAIN COATING APPLICATIONS. THIS GUIDE IS REPRESENTATIONAL OF CERTAIN TYPES OF CONCRETE SURFACE PREPARATION METHODS AND DESCRIBES THE PROCESSES TO ACHIEVE EACH SAMPLE TYPE.

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Failure of customer to give TACM written notice of claim within sixty (60) days after the claimed defect is discovered constitutes a waiver of all claims in respect of such goods.

Customer agrees that any claims or disputes arising out of or related to this Guide or TACM's Concrete Surface Prep Samples shall be governed by, and construed and enforced in accordance with, the laws of the State of California.

¹ Some early production samples were made with a 4,000psi concrete design mix, and a one to one water/muriatic solution was used.

² Several methods of testing to assure proper conditions are described in ICRI's Guideline No. 310.2R-1023

³ Some early production samples were made with a 4,000psi concrete design mix.

⁴ Some early production samples were created with a 4,000psi concrete design mix and 280 shot was used.

⁵ Some early production samples were created with a 4,000psi concrete design mix and 460 shot was used.