

Surface Preparation Standards Updates for Concrete

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SSPC: The Society for Protective Coatings

PDA 20th Anniversary Conference
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Introduction

- Preparing the surface for subsequent application of the coating system is the most critical step.
- No matter the surface is plastic, glass, wood, concrete, masonry, aluminum, carbon steel or stainless steel, surface preparation remains a key factor in determining the ultimate service life of the applied system.

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Introduction

- The better the surface preparation, the longer the life of the coating system.
- Not all surfaces or service environments and not all coating systems demand the same degree of surface preparation.
- This presentation will focus on concrete surface preparation.

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Concrete Surface Evaluation

- Visually report and map the surface irregularities from concrete placement, finishing, and curing
- Takes place prior to any concrete repairs
- Each designated area of concern is graded as to whether it needs repaired

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Concrete Surface Irregularities

- Correct surface irregularities in new concrete to obtain a surface suitable for coating.
- The inspector may be required to verify that fabrication defects are corrected, and that surface contamination is sufficiently removed.

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Concrete Defects

- Concrete defects such as honeycombs and spalling shall be repaired



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Physical Damage

- Concrete that has been damaged because of physical forces such as impact, abrasion, or corrosion of reinforcement shall be repaired prior to surface preparation.
- Test for concrete soundness
 - Chain Drag
 - Delam 2000
 - Schmidt Hammer

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Testing Concrete Soundness

- Scratch a screwdriver, file, or pocket knife lightly across the concrete surface.
- Strike the concrete surface lightly with the edge of a hammer head.
- Drag a chain across horizontal concrete surfaces or strike vertical surface areas lightly with the edge of a hammer head.
- Difference in sound indicate hollow pockets.

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Chain Drag



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Delam 2000



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Schmidt Hammer



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Surface Contamination


- Contamination on concrete surfaces includes all materials that may affect the adhesion and performance of the coating to be applied. Examples include, but are not limited to:
 - dirt
 - oil
 - grease
 - chemicals
 - existing incompatible coatings

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Water Break Test on Concrete Surface (ASTM F22)



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Black Light



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Surface Preparation

- The desired levels of surface cleanliness and texture/profile and the methods of achieving them are dependent on the particular coating to be applied.

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Concrete Surface Preparation Standards

- SSPC-SP 13/NACE No.6 Surface Preparation of Concrete
- SSPC-SP CAB 1 Abrasive Blast Cleaning – Thorough Blast
- SSPC-SP CAB 2 Abrasive Blast Cleaning – Intermediate
- SSPC-SP CAB 3 Abrasive Blast Cleaning – Brush Blast
- ASTM D4258 Surface Cleaning Concrete for Coating
- ASTM D4259 Standard Practice for Abrading Concrete
- ICRI Guideline 310.2 Selecting/Specifying Concrete Surface Preparation

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SSPC-SP 13/NACE No. 6

- Requirements for surface preparation of concrete by mechanical, chemical or thermal methods prior to the application of bonded protective coating or lining systems.
- Applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls and shotcrete surfaces.

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SSPC-SP CAB (CAB-1, CAB-2, CAB-3) Concrete Abrasive Blast Cleaning

TABLE 1
COMPARISON OF DEGREES OF CONCRETE ABRASIVE BLAST CLEANING

	Unsound Surface, Efflorescence, Laitance	Opening of Surface Air Voids	Existing Coating	Notes
Thorough Blast Cleaning	Remove All	Fully Opened	Remove All	Full removal and uniform profiling of the surface
Intermediate Blast Cleaning	Remove All	Not Required	Remove Most	Remove all existing coating except for that remaining in surface air voids and uniform profiling of the surface
Brush Blast Cleaning	Remove All	Not Required	Remove Loose	Uniform profiling of the surface

This standard, developed by the SSPC C.7.3 Concrete Surface Preparation Committee, was first issued in December 2019.

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ASTM D4258

Surface Cleaning Concrete for Coating

- Describes practices for removing grease, dirt and loose materials by broom cleaning, vacuum cleaning, air-blast cleaning, detergent cleaning, water cleaning, and steam cleaning.
- **NOTE: It is not intended for use in profiling concrete surfaces.**

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ASTM D4259

Standard Practice for Abrading Concrete

- Describes methods for abrading concrete surfaces to remove foreign materials and to profile concrete surfaces:
 - Mechanical cleaning.
 - Waterjetting and abrasive blasting.
 - Acid cleaning/etching.

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ICRI Guideline 310.2

Selecting/Specifying Concrete Surface Preparation (formerly 03732)

- Covers selecting the best surface preparation procedures for a particular coating type.



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ICRI 310.2

- Different profiling techniques in order of increasing profile height:
 - Detergent scrubbing
 - Low-pressure water cleaning
 - Acid etching
 - Grinding
 - Abrasive blasting
 - Steel-shot blasting
 - Scarifying
 - Needle scaling
 - High/ultra-high water pressure waterjetting
 - Scabbling
 - Flame blasting
 - Milling/Rotomilling

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Surface Profile

- ICRI 310.2
 - Ten concrete profile levels (CSP 1 to CSP 10)
 - Define profiling techniques



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Dry Abrasive Blast Cleaning

- Three general methods
 - Conventional open air-driven.
 - Vacuum collection air-driven.
 - Centrifugal wheel (shotblasting).

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Compressed Air Cleanliness ("Blotter Test")

- Must verify that the air is clean and dry.
- ASTM D4285, "Test Method for Indicating Oil or Water in Compressed Air" describes a standard practice for verifying the cleanliness of compressed air.

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Wet Abrasive Blast Cleaning

- Controls dust formed by conventional abrasive blasting.
- Four systems:
 - Radial water injection
 - Coaxial water injection
 - Slurry blasting
 - Water blasting with abrasive injection
- Described in SSPC-TR 2/NACE 6G198 Wet Abrasive Blast Cleaning.

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Acid Cleaning/Etching

- Alkaline concrete can be cleaned and etched with acids using the technique described in ASTM D4260.
 - Liquid Acid Cleaning
 - Gel Acid Cleaning
- Concrete should have a minimum age of 6 weeks before acid etching.
- **Note: Most coating manufacturers prefer this method of cleaning to be used as a last resort, where other cleaning methods are impossible.**

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Types of Acids

- Muriatic (hydrochloric) acid diluted with water 1:10 by volume, is the acid most commonly used for cleaning.
- A 1:1 volume can be used to etch the concrete surface.
- Add the acid to the water (A to B, acid to base).
- **NOTE: Acid solutions may attack steel brackets, pipes, or other metal appurtenances in the area.**

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Safer Alternative Acids

- Citric, sulfamic, and phosphoric acids.
 - React more slowly than muriatic acid.
 - Muriatic cleans concrete in 3-5 minutes.
 - Phosphoric acid requires 10-15 minutes.
 - Citric acid requires 20 minutes.
 - Citric acid is biodegradable and may be discarded through storm drains in some locations.

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Acid Application



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Flame Cleaning

- Occasionally used to remove coating up to ¼ inch (6 mm) thick for application of a concrete overlay.
- May be used to remove oil and grease.
- Heating may also produce micro-cracks in concrete.

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Moisture Testing

- Excessive moisture in concrete can cause a variety of premature failures, including delamination, efflorescence, popouts, and curling.
- There are three ASTM methods used to test for moisture in concrete.
- Ideally, these tests should be performed after surface preparation has been completed, before the coating is applied.

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ASTM Test Methods

- D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
- F1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

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ASTM Test Methods

- **F2170, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in-situ Probes.**

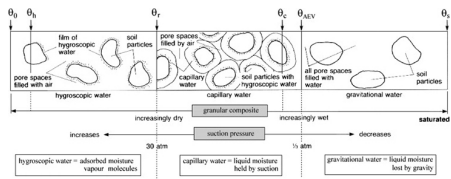
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ASTM D4263

- **Used to indicate the presence of capillary moisture in concrete.**



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ASTM F1869

- **Covers the quantitative determination of the rate of moisture vapor emitted from below-grade, on-grade, and above-grade bare concrete floors.**
- **Moisture is always in concrete!**
 - Typically about 9-12%

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ASTM F2170

- Covers the quantitative determination of percent relative humidity in concrete slabs using in situ probes.



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ANY QUESTIONS?

If you would like additional information, please visit sspc.org or contact me at:
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