



**FROM SPEC
TO PROTECT**

How Concrete Surface Preparation Impacts Coating Integrity and Service Life

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Concrete Surface Preparation

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Learning Objectives

- **What is concrete cleanliness and how to tell if your surface is “clean”**
 - Surface cleanliness
 - Surface pH
 - Chloride and sulfate penetration
- **What is adequate surface profile**
 - What profile is required
 - How to measure it
 - Surface “defects”
- **Proper termination details**
- **Surface saturated dry (SSD)**

Laitance

- A layer of poorly-bonded, non-reacted cement and fine particles at the surface
- Normally occurs on “over-finished” floor slabs
- Must be mechanically or chemically removed

Webster Definition

- **Laitance:** “a layer of a weak and nondurable material containing cement and fines from aggregates, brought by bleeding to the top of over-wet concrete, the amount of which is generally increased by overworking or overmanipulating concrete at the surface, by improper finishing or by job traffic.”

Laitance



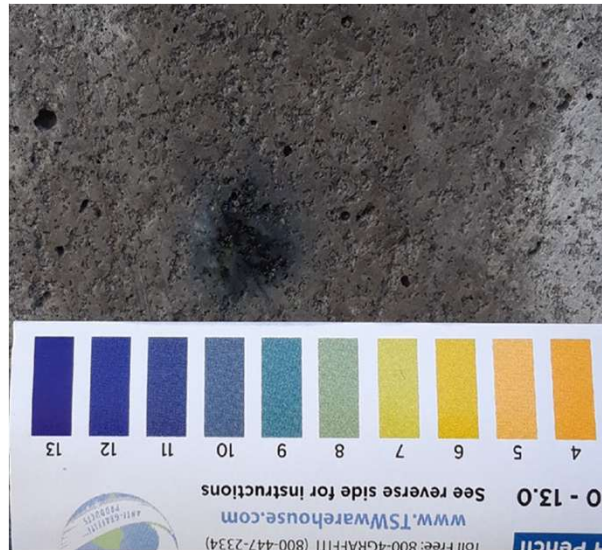
Concrete Cleanliness - Surface pH

- We are NOT trying to test the pH of a solid. Rather, we are measuring the pH of the moisture in the concrete capillaries.
- pH of new concrete is usually in the range of **12 to 13**.
- pH of aged concrete is usually **9 to 10**.
- Concrete subjected to acid attack can be have a pH **below 6**.
- Prior to application of rehabilitation linings, pH **MUST** be 9 or above.

Concrete Cleanliness

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Surface pH

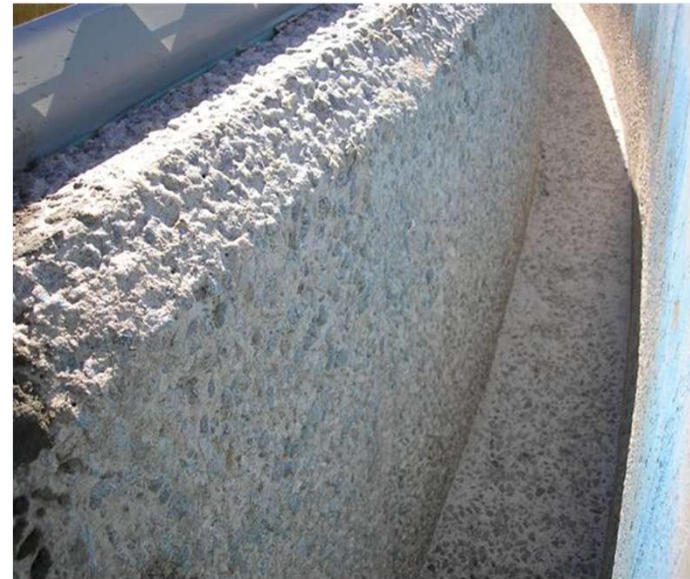


Chloride and Sulfate Penetration



- ACI 318 Building Code Requirements for Structural Concrete
 - Prestressed concrete
 - Reinforced concrete dry
 - Reinforced concrete exposed to moisture and chlorides
 - Reinforced concrete exposed to moisture, no chlorides
- ACI 222 Guide to Protection of Reinforcing Steel in Concrete against Corrosion
- Requirements are percent of contaminant by weight of **cement**

Chloride and Sulfate Penetration



For severely deteriorated concrete or if there is evidence of reinforcing steel corrosion, core samples should be removed for petrographic analysis.

What is Surface Profile?

“Profiling to produce the best combination of surface area and anchor pattern for which maximum adhesion [a uniform, continuous coating film] can be achieved.”

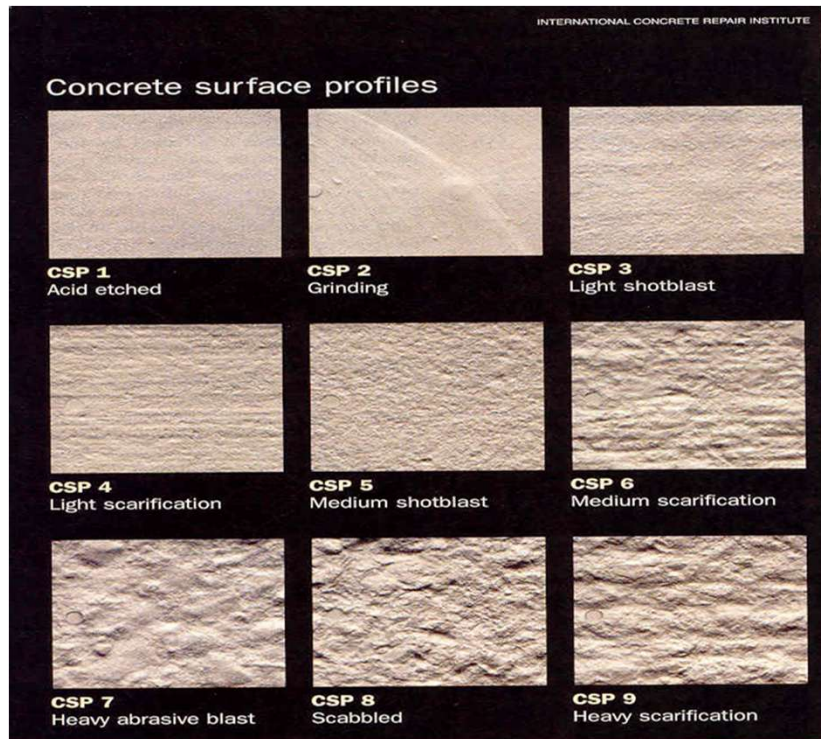
Surface Profile

What Surface Profile is Required?

Material to be applied	Concrete Surface Profile									
	CSP 1	CSP 2	CSP 3	CSP 4	CSP 5	CSP 6	CSP 7	CSP 8	CSP 9	CSP 10
Sealers, 0 to 3 mils (0 to 0.075 mm)	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Thin films, 4 to 10 mils (0.01 to 0.025 mm)	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
High-build coatings, 10 to 40 mils (0.025 to 1.0 mm)	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Self-leveling toppings, 50 mils to 1/8 in. (1.2 to 3 mm)	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Polymer overlays, 1/8 to 1/4 in. (3 to 6 mm)	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black
Concrete overlays and repair materials, >1/4 in. (>6 mm)	Black	Black	Black	Black	Black	Black	Black	Black	Black	Black

Surface Profile

How Do We Measure Surface Profile?



ICRI 310.2 Comparator Coupons

Air Pockets/Bugholes



Open with a Ball Peen Hammer

Surface Defects

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Correct
surface profile
but with
bugholes



Bugholes
filled with
patching
material



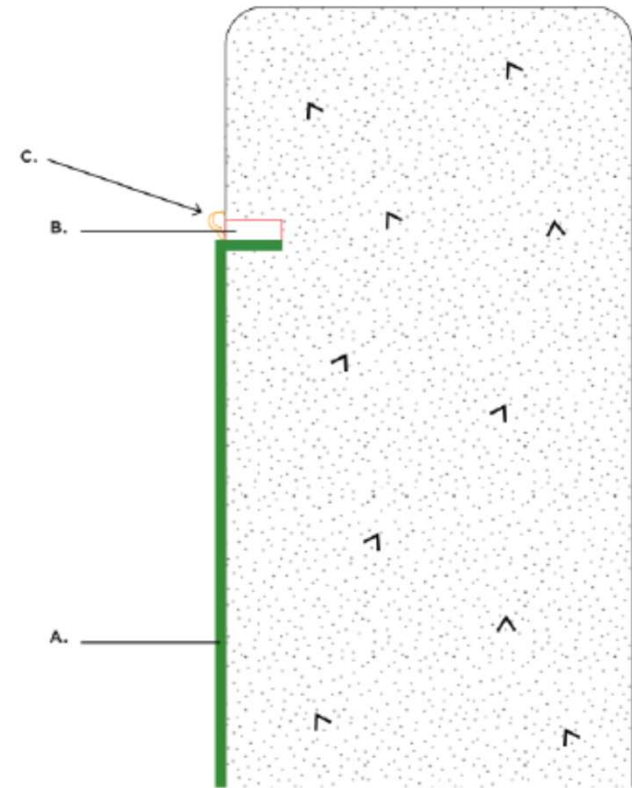
Honeycomb



Termination / Penetration Details

Terminations

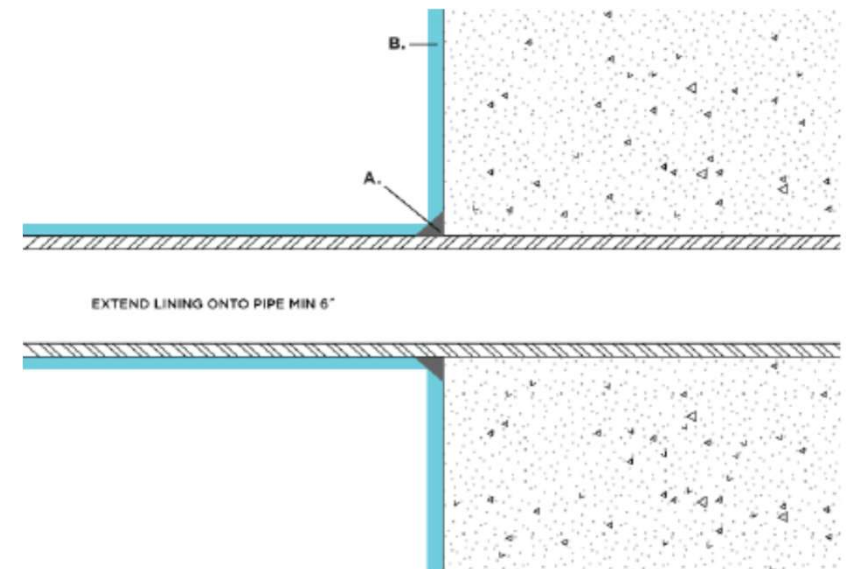
- Either keyed or transitioned depending on location and coating system
- Very important in tanks using flexible coating systems
- Prevents undercutting of coating system



Termination / Penetration Details

Penetrations

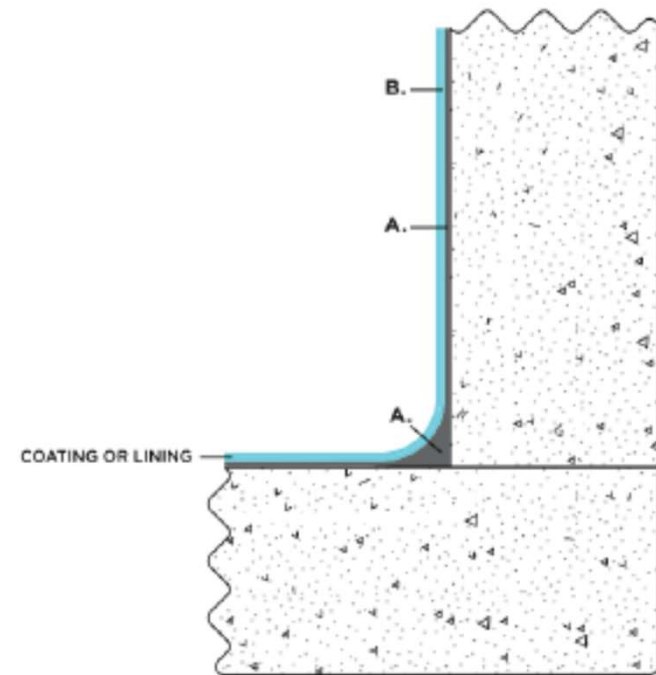
- Pipes or structural members penetrating the concrete.
- Sometimes different coatings are used on pipe and concrete.



Termination/Penetration Details

Angles and Corners

- Hard areas to coat and many times there is a joint at inside angles (walls poured on top of existing floor)
- Outside angles should be rounded so coating edge retention is not an issue
- Inside corners should be coved to reduce the stress that may be encountered by a coating and to reduce the deflection seen when loading a concrete tank



CONCRETE COVE DETAIL (Horizontal and Vertical Connections)

What is SSD?



ACI CT-13, ACI Concrete Terminology

Saturated surface-dry – condition of an aggregate particle or other porous solid when the permeable pores are filled with water and no water is on the exposed surfaces.



Now I know more, but...

**How do we achieve and maintain SSD
during the application?**

Understanding SSD

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How you get there isn't important.

Maintaining SSD and Curing Mortar Repair

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Continuous Wetting



Burlap & Lined Burlap



Maintain SSD & Cure





How Do You Check For or Measure SSD?

Use a spray bottle with water: if the water is absorbed – not SSD.

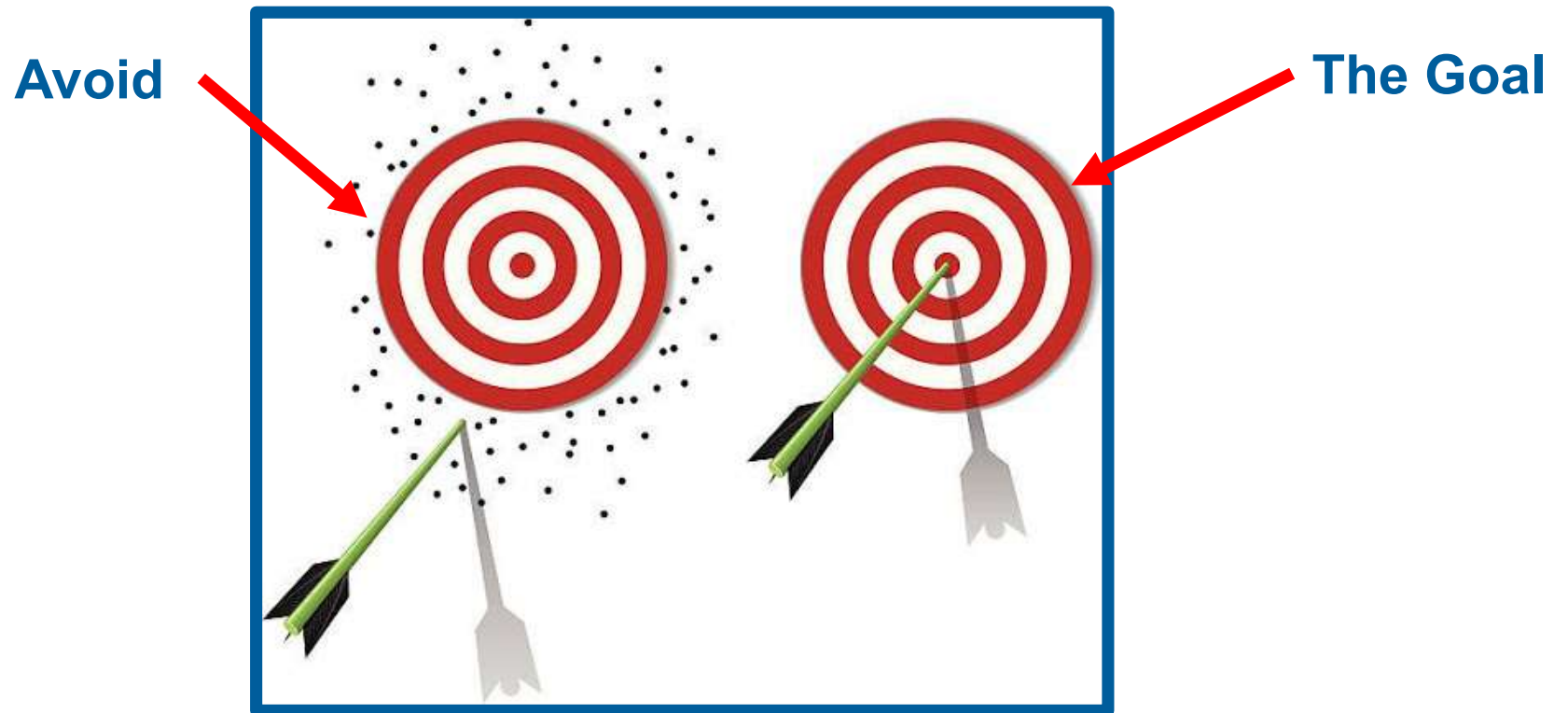
KEEP CHECKING!

Can I get SSD here?



Proper Surface Preparation – Hit The Target

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Concrete surface preparation for long-term service in immersion involves:

- Concrete cleanliness
- Concrete surface profile
- Proper terminations
- Proper detailing
- Saturated surface dry!

Thank You!

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Questions?



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An aerial photograph of a water treatment plant, showing several large circular clarifiers and rectangular aeration tanks. A white wireframe grid is overlaid on the image, and a white wireframe architectural drawing of a building is visible on the left side. The text "FROM SPEC TO PROTECT" is overlaid in the upper left quadrant.

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THANK YOU

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