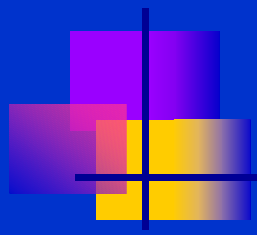


Concrete Surface Preparation

The **MOST** Important Factor for the Success of Coating and Lining Installations

What is Surface Preparation?

- Mechanically or chemically preparing a substrate to an acceptable industry standard prior to the application of a coating or lining system to the substrate.

The Inspection Process

- Determine project objectives & requirements
- Establish performance priorities
- Evaluate surface preparation methods

Concrete Conditions

- Concrete cured to sufficient strength
- Surface color, hardness, & continuity
- Moisture vapor emissions
- Cracking type and severity
- Joint layout and design

Discoloration & Stains

Blisters

surface finished too soon

Dusting

Chemical attack

Crazing cracks

Shrinkage cracks

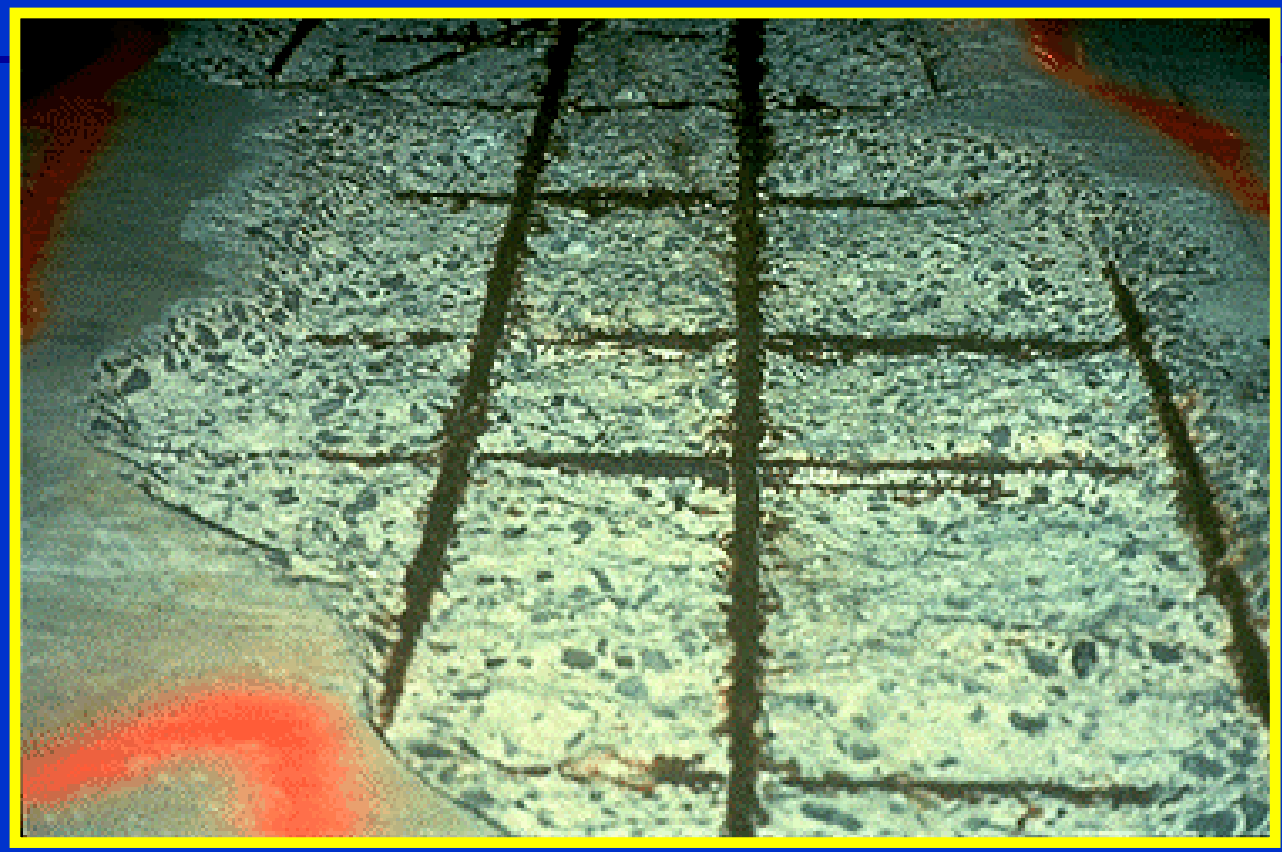
Scaling

Spalling

Spalling

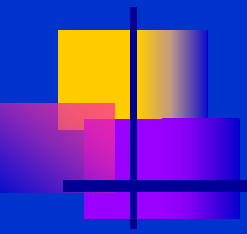
corrosion of steel, lack of cover

Spalling



corrosion of steel

Industry Standards



Industry Associations

- American Concrete Institute (ACI).
- American Society for Testing Materials (ASTM).
- International Concrete Repair Institute (ICRI).
- The Society for Protective Coating (SSPC)
- National Association of Corrosion Engineers (NACE)

American Concrete Institute

- Website: www.concrete.org
- Phone: (248)848-3700
- ACI 350-01 Code Requirements for Environmental Engineering Concrete Structures
- ACI 302.1 Guide for Concrete Floor and Slab Construction

American Society for Testing Materials

- Website: www.astm.org
- Phone: (610) 832-9530
- ASTM D4258 Cleaning Concrete
- ASTM D4259 Abrading Concrete
- ASTM F1869 Measuring Moisture Vapor Emission Rate of Concrete

International Concrete Repair Institute

- Website: www.icri.org
- Phone: (847) 827-0830
- Technical Guideline 03732 Surface Prep
- TG 03731 Selecting Application Methods
- TG 03733 Selecting Materials for Repair

The Society for Protective Coatings

- Website: www.sspc.org
- Phone: (412) 281-2331
- NACE 6/SSPC SP-13 Surface Prep of Concrete

National Association of Corrosion Engineers

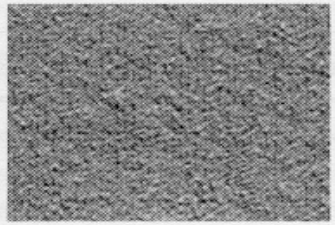
- Website: www.nace.org
- Phone: (281) 228-6200
- NACE 6/SSPC SP-13 Surface Prep of Concrete

ICRI Technical Guideline No. 03732

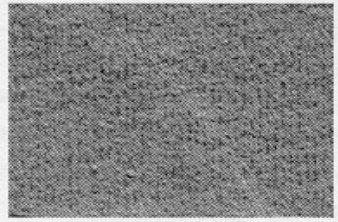
"Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays."

Caution! *The texture and appearance of the profile obtained will vary depending on strength, the size and type of aggregate, and finish of the concrete surface. On sound substrates the range of variation can be sufficiently controlled to closely resemble the referenced CSP standard. As the depth of removal increases, the profile of the prepared substrate will be increasingly dominated by the coarse aggregate.*

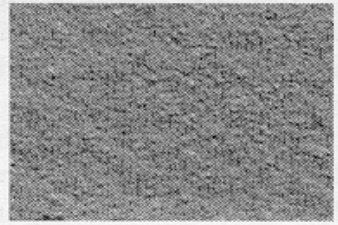
Images generated using video density imaging techniques are courtesy of David Lange, Department of Civil Engineering, University of Illinois at Urbana-Champaign.



CSP 1
(acid etched)

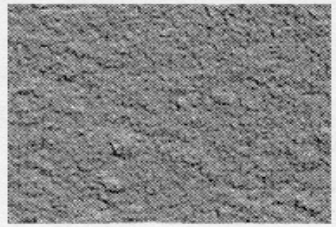


CSP 2
(grinding)

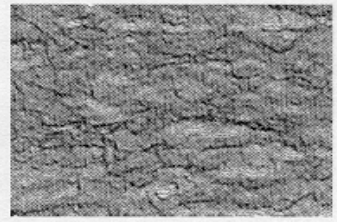


CSP 3
(light shotblast)

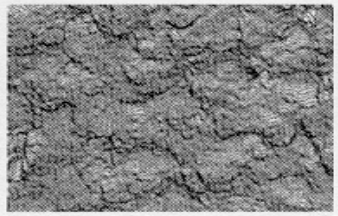
CSP 4
(light scarification)



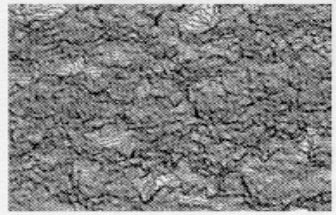
CSP 5
(medium shotblast)



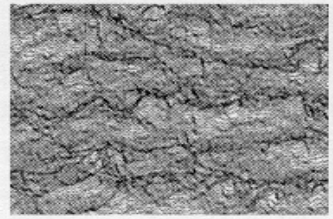
CSP 6
(medium scarification)



CSP 7
(heavy abrasive blast)

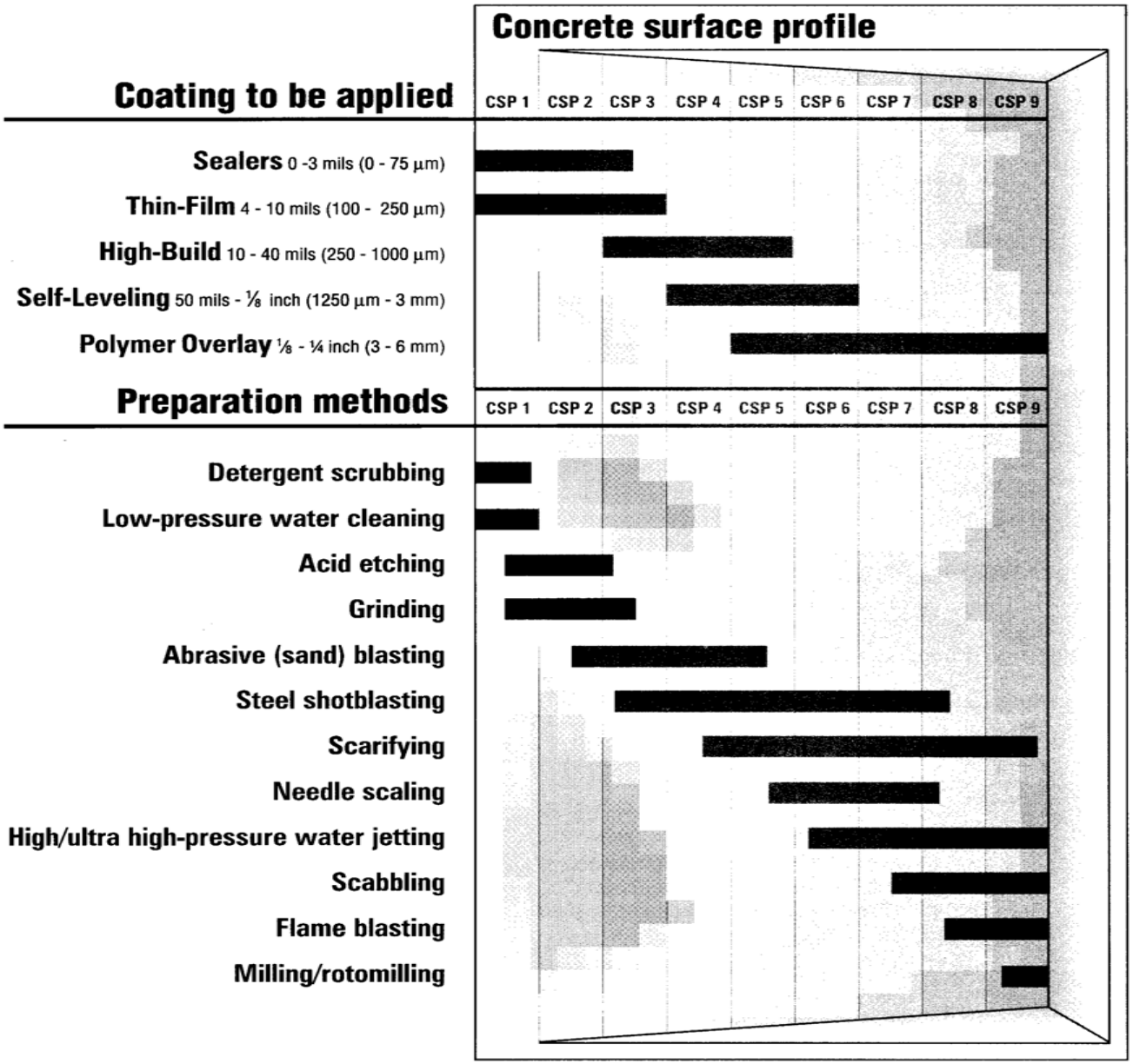


CSP 8
(scabbled)



CSP 9
(heavy scarification)

Method selector



Coating Requirements For Concrete Surface Profile (CSP)

Sealers (0-3 mils)	CSP 1-3
Thin-Film (4-10 mils)	CSP 1-3
High Build (10-40 mils)	CSP 3-5
Self-Leveling (50 mils- 1/8″)	CSP 4-6
Polymer Overlay (1/8″ –1/4″)	CSP 5-9

Types of Surface Preparation

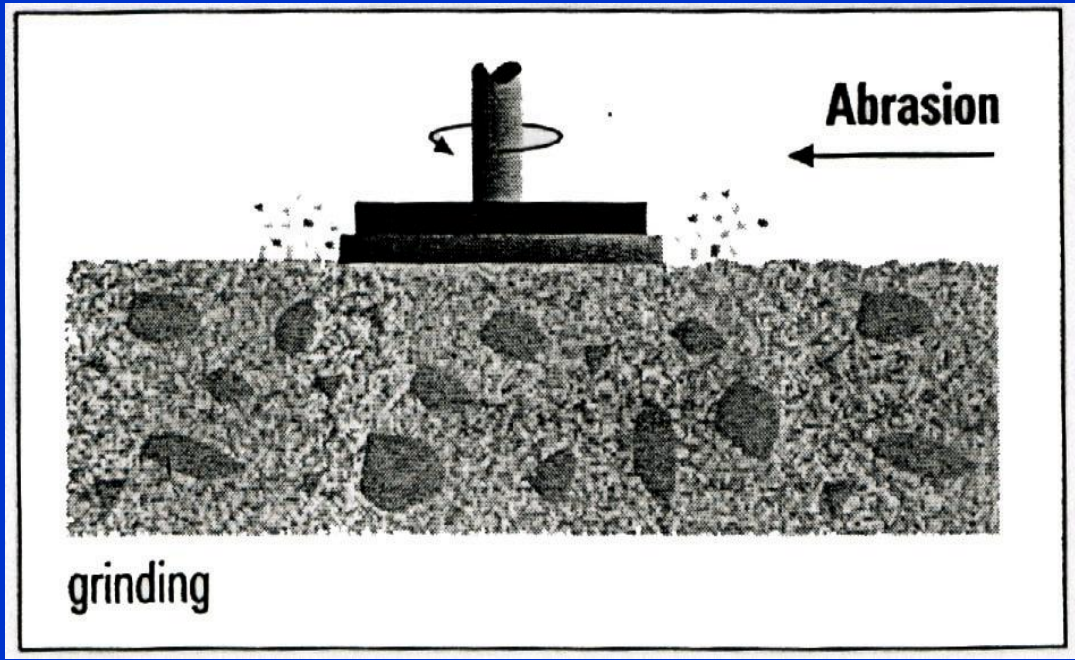
- Detergent Scrubbing
- Low-Pressure Water Cleaning
- Grinding
- Abrasive (Sand) Blasting
- Steel Shotblasting
- Scarifying

CSP-1

- Detergent Scrubbing
  - No change in surface profile
- Low Pressure Water Cleaning <5,000 psi
  - Slight change in surface profile

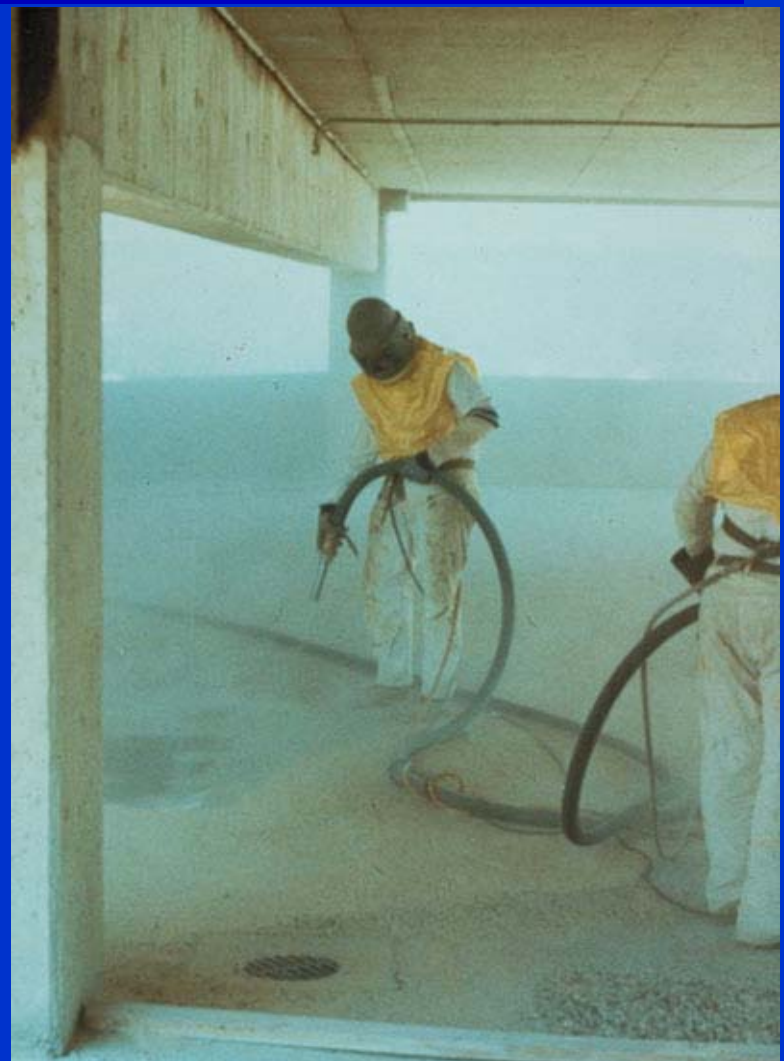
CSP 1 - 3

- Grinding
  - Produces Smooth Surface
  - Can Remove Rigid Coatings
  - Various Discs



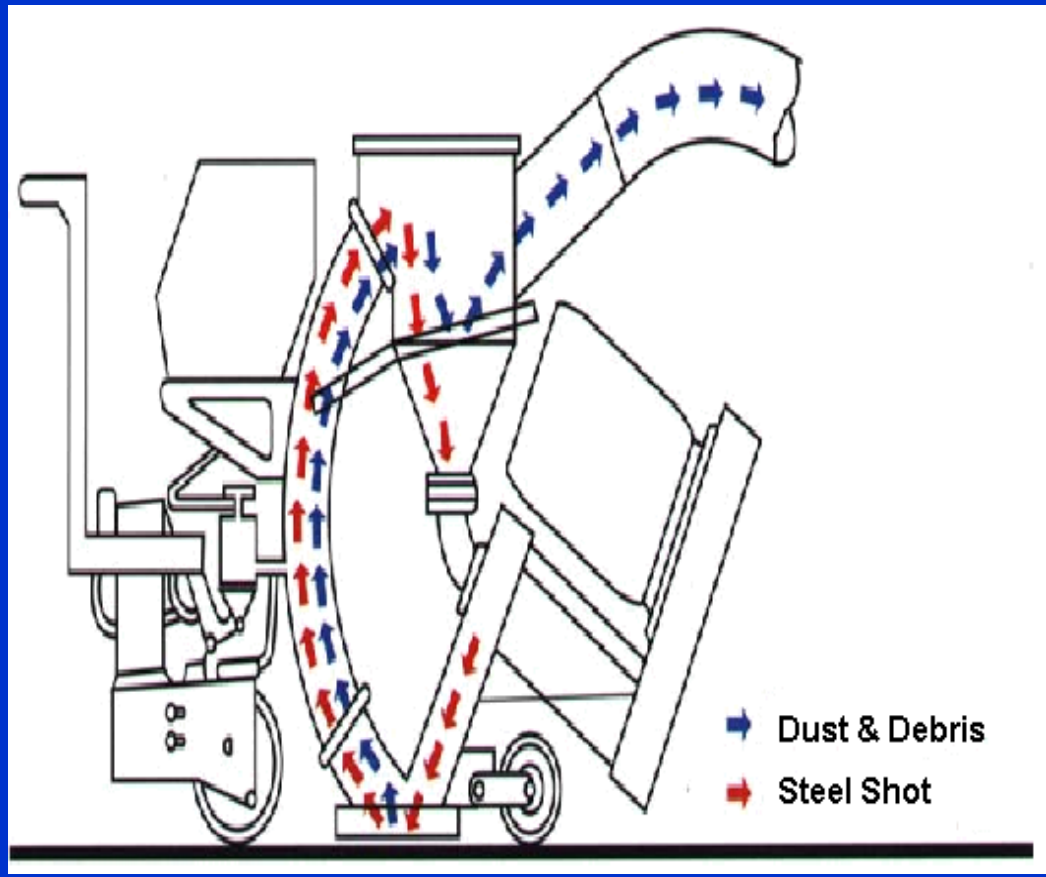
CSP 2 - 5

- Abrasive (Sand) Blasting
  - Wide profile range
  - Removes resilient or rigid coatings
  - Requires Containment and Clean-up
  - Noise levels = > 85 dB



CSP 3 - 8

- Steel Shotblasting
  - Cleans & Profiles
  - Coating Removal varies with thickness and resin
  - Shot varies Profile



Steel Shotblasting

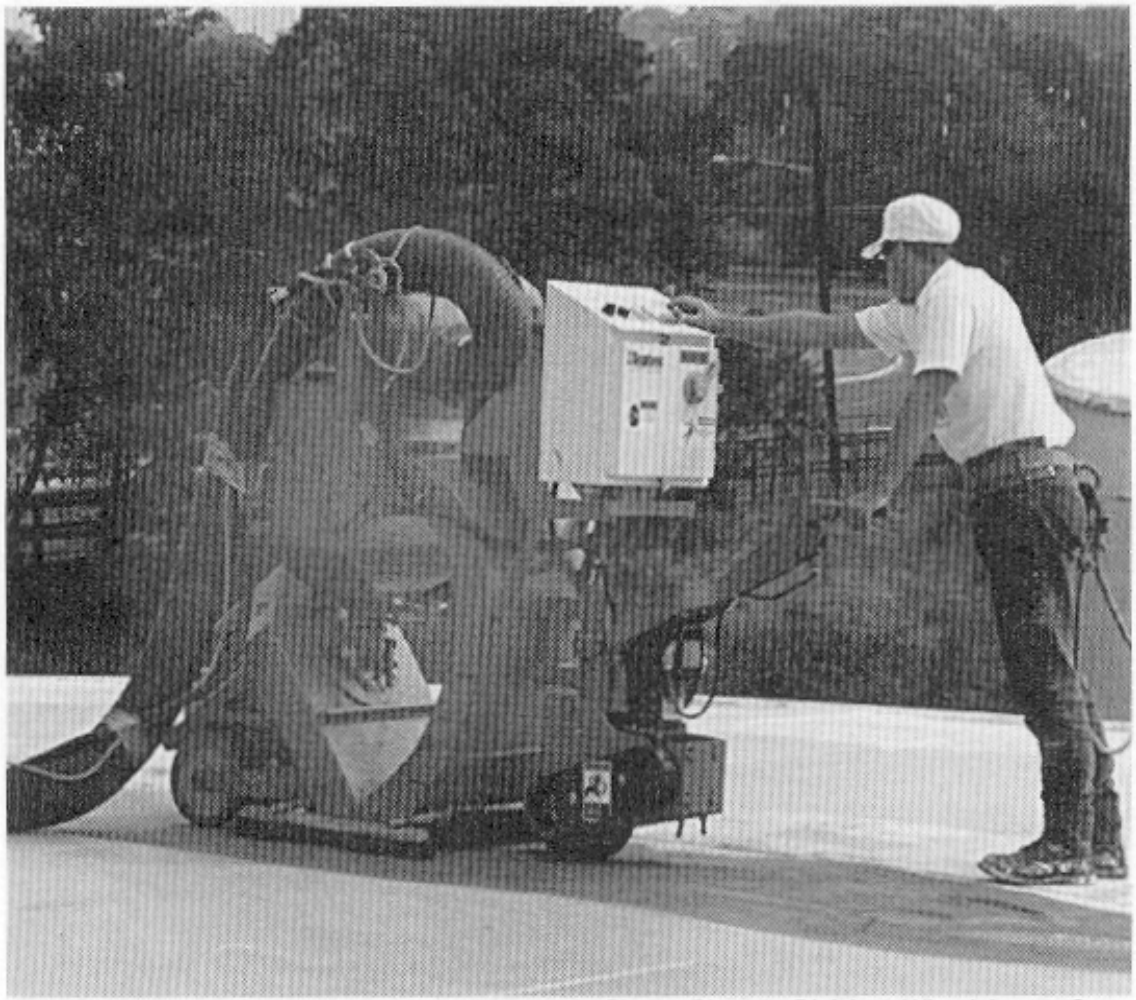
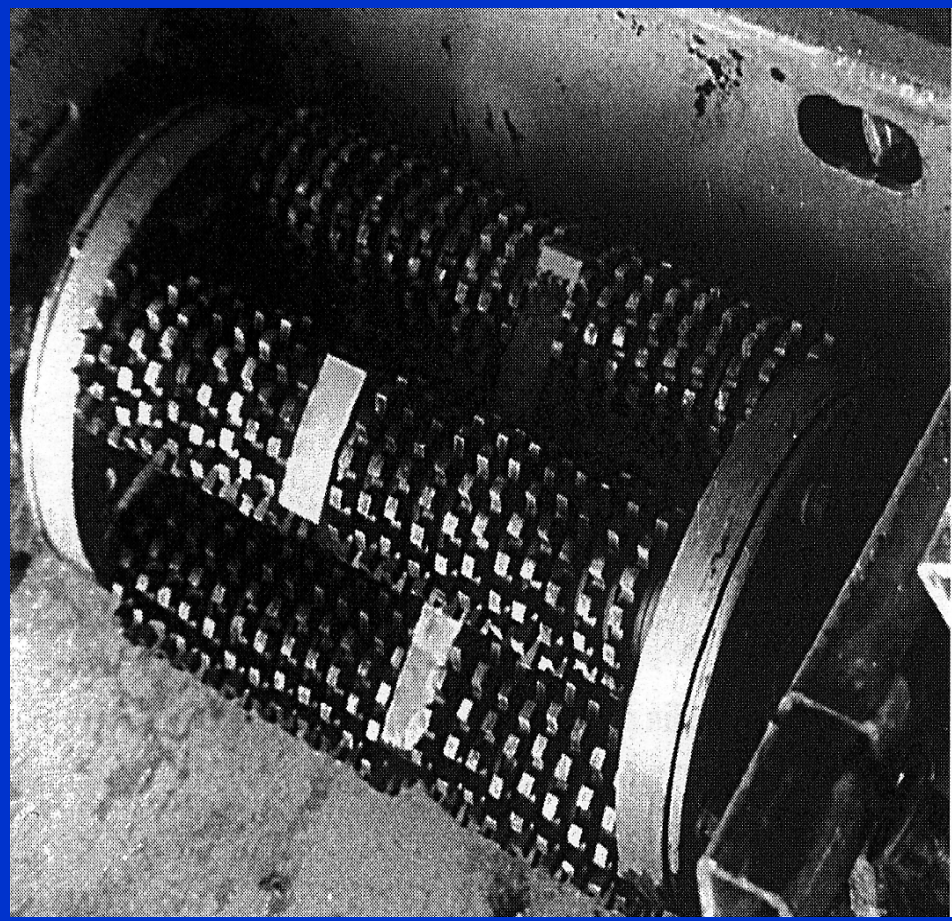


Photo: Blastrac Division, Wheelabrator Corp.

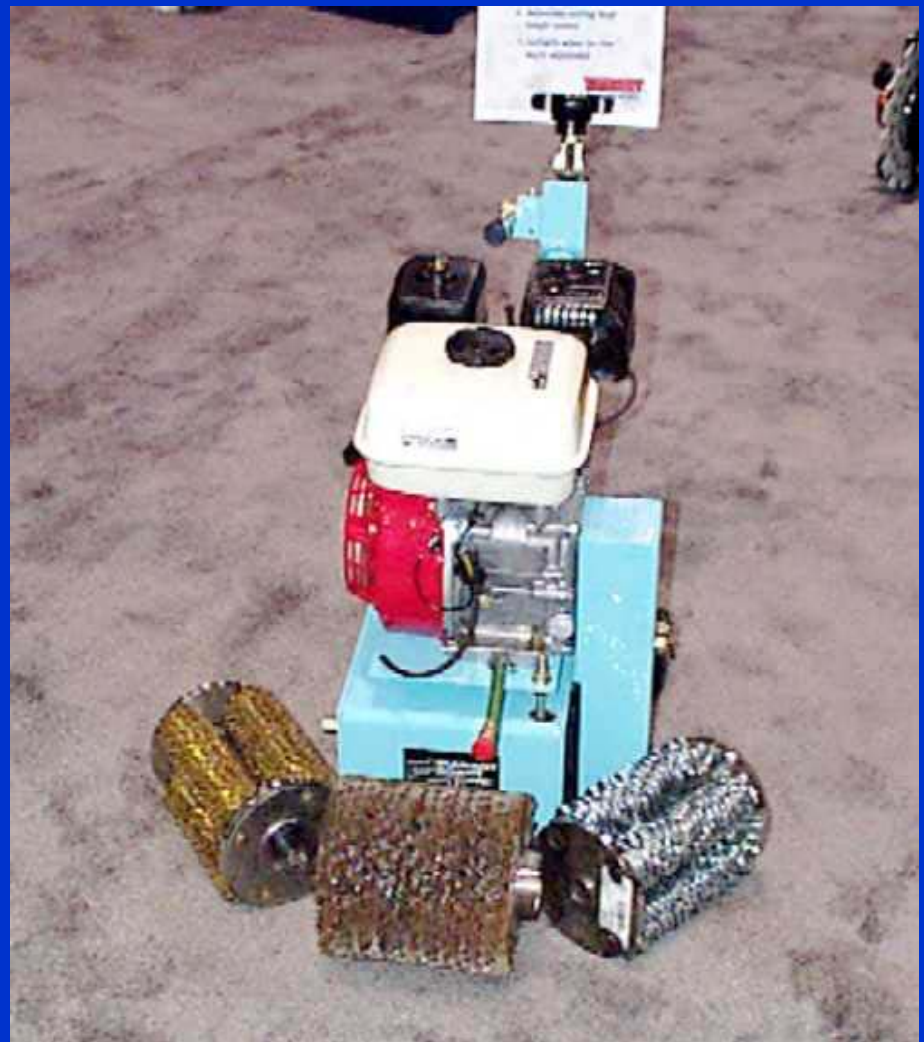
Steel Shotblasting

CSP 4 - 9

- Scarifying
  - Medium to Heavy Profile
  - Remove Toppings (<1/8”)
  - Will “Bruise” Concrete

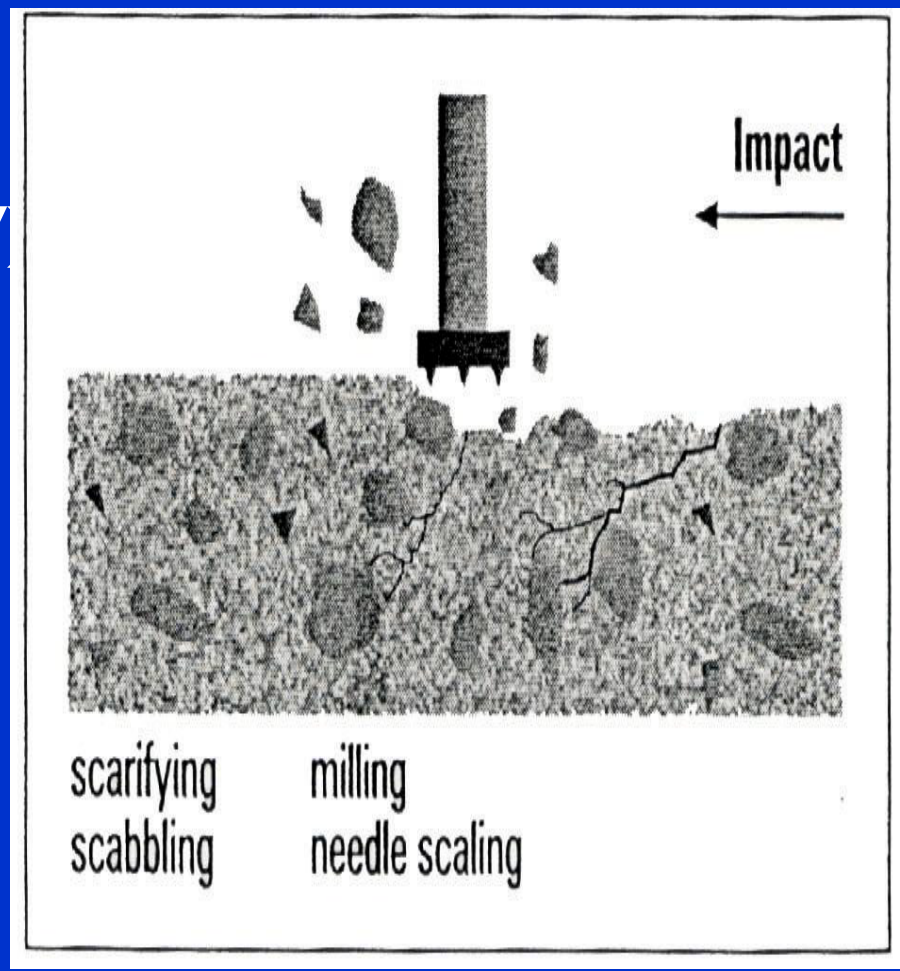


Scarifier



CSP 7 - 9

- Scabbling
  - Removes Coatings and Toppings (1/4”)
  - Heavy Profile
  - Will “Bruise” Concrete
  - Dust and Debris



BRUISING

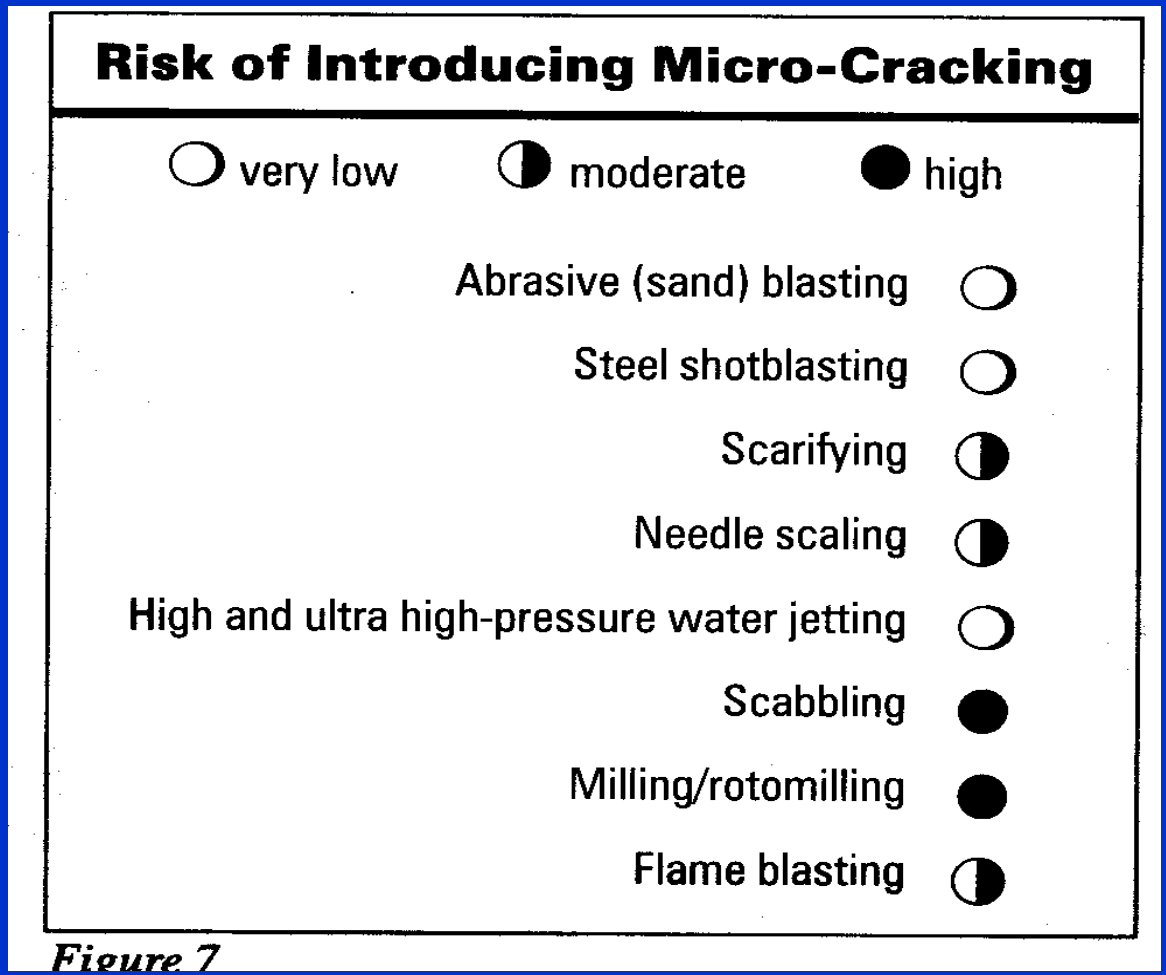
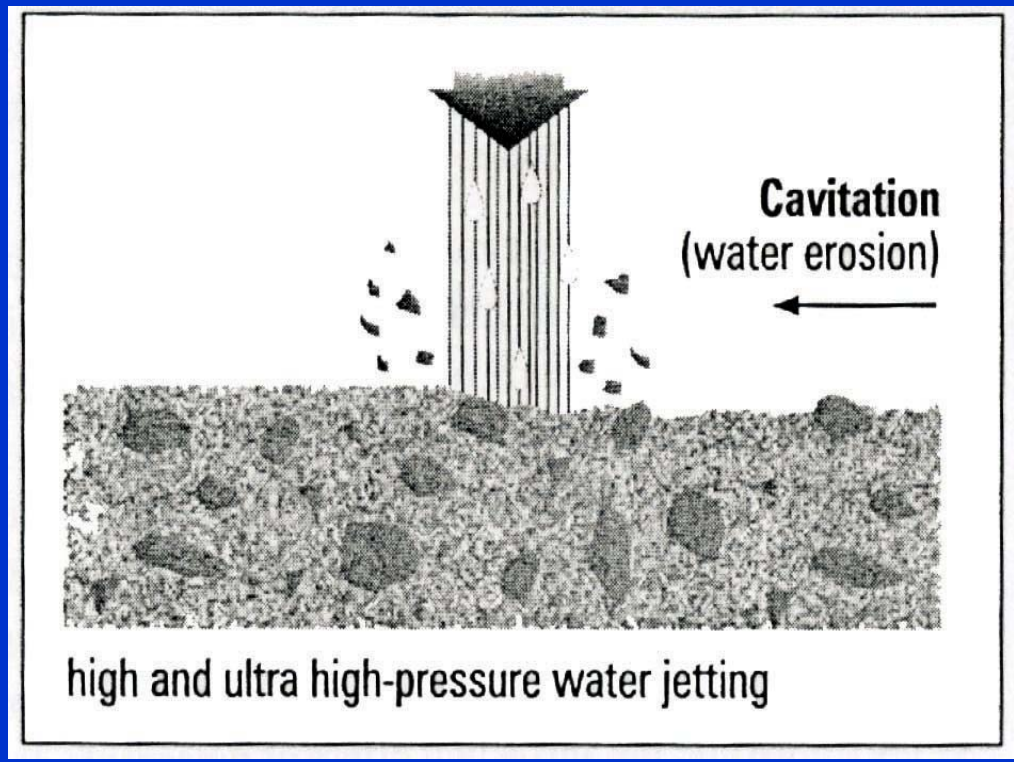


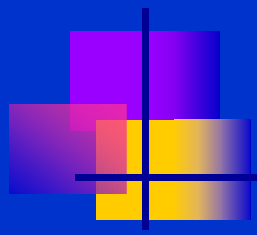
Figure 7

CSP 6 - 9

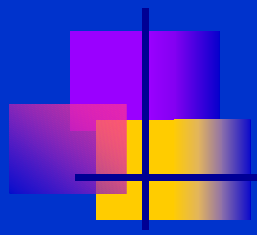
- High Pressure Water Jetting
  - 15,000 to 45,000 psi water
  - Can remove in excess of ¼" of surface



high and ultra high-pressure water jetting



What tests can be done to assure proper surface preparation is complete?



- Visual Test – Compare area to set industry standards, i.e. ICRI Surface Profile Chips.
- Water Absorption Test – Verify surface is open porous.
- Moisture Vapor Transmission – Calcium Chloride

Testing for Moisture Vapor Emission from concrete

- ASTM F 1869 – Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Using Anhydrous Calcium Chloride Moisture Emissions Test
- Vaprecision 1-800-449-6194
- www.vaportest.com

Adhesion Testing

- ASTM D 4541 (tensile adhesion)
  - Location of detachment recorded as:
    - Adhesion break
    - Cohesion break
    - Glue failure


lb/in² x 100

Chemical Contamination Tests

CSP Summary

- Clean Surface
- Abrasive Blast or Shot blast
- Check for Moisture
- Check for Chemical Contaminants
- Repair as Required

GOOD Surface Preparation?

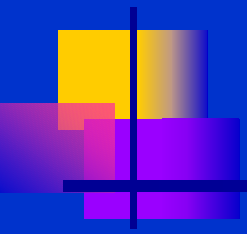
- Defined as the process by which sound, clean and properly profiled surfaces are produced on concrete substrates
- Does not damage the surface to be topped
- Does not damage or loosen the reinforcing steel

BAD Surface Preparation !

Final Thought

- The more attention you pay to concrete surface preparation requirements the more successful you will be in long term performance of polyurea systems.

Questions?



Thank you!