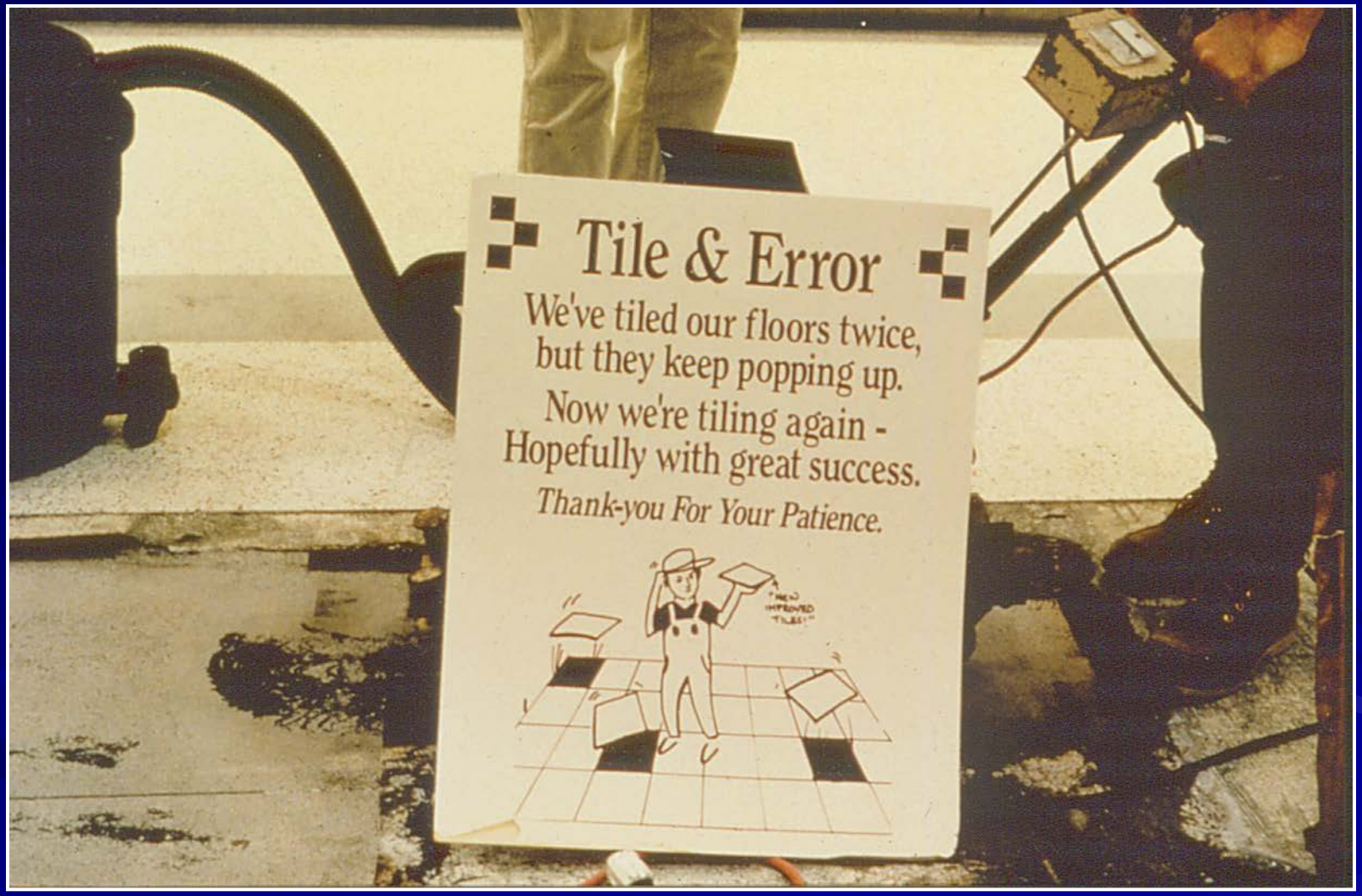
Testing & Mitigating Moisture in Concrete Sub-floors

Presented by:

Peter Craig - FICRI

Concrete Constructives

Introduction



It is estimated that the direct and in-direct costs associated with moisture-related problems with concrete slabs runs between 300 million and one billion dollars each year in the USA.


Mold

The 8 Steps

for Successfully Testing and Mitigating Moisture in Concrete Sub-floors

Step 1: Sub-floor Evaluation

Is the project new construction ?

An existing slab with a failed flooring ?

Or an existing slab where a flooring system is being replaced ?

Step 2: Sub-floor Evaluation

With any type of flooring installation it is important to the decision making process to determine if an effective vapor retarder is present directly below the slab.

With new construction this information may be readily available.

With existing slabs, sub-floor exploration may be necessary.

Sub-floor Exploration

Core through slab


BC 700
C-1

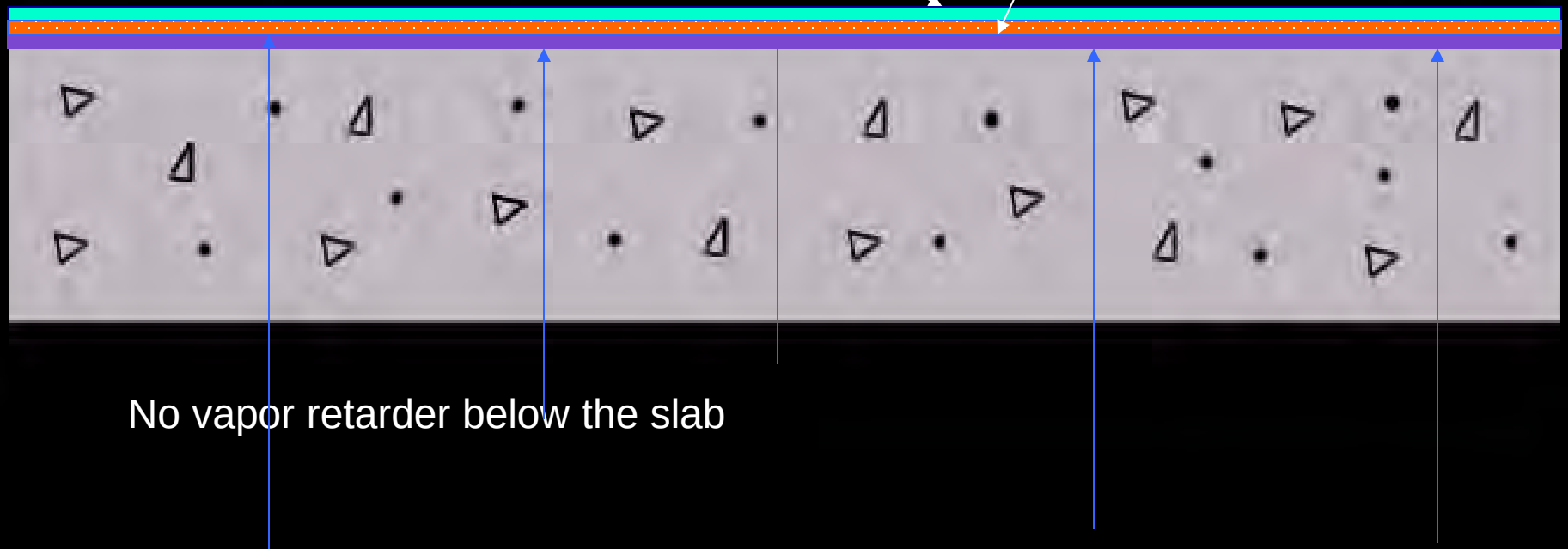

Milwaukee

Step 3: Interpretation

If an effective vapor retarder is not present directly below the slab a moisture mitigation treatment should be used and the system selected should have no moisture or pH limits.

Flooring installed

MVER , in-situ RH and pH levels all rise once the floor is covered



No vapor retarder below the slab

Moisture Diffusion

Step 3: Interpretation

For moisture mitigation systems with no moisture or pH limits additional moisture testing may not be required

Step 3: Interpretation

If an effective vapor retarder is present, directly below the slab proceed to moisture testing.

Step 4: Moisture Testing

Methods:

a: Moisture Vapor Emission Rate (MVER) – ASTM F 1869

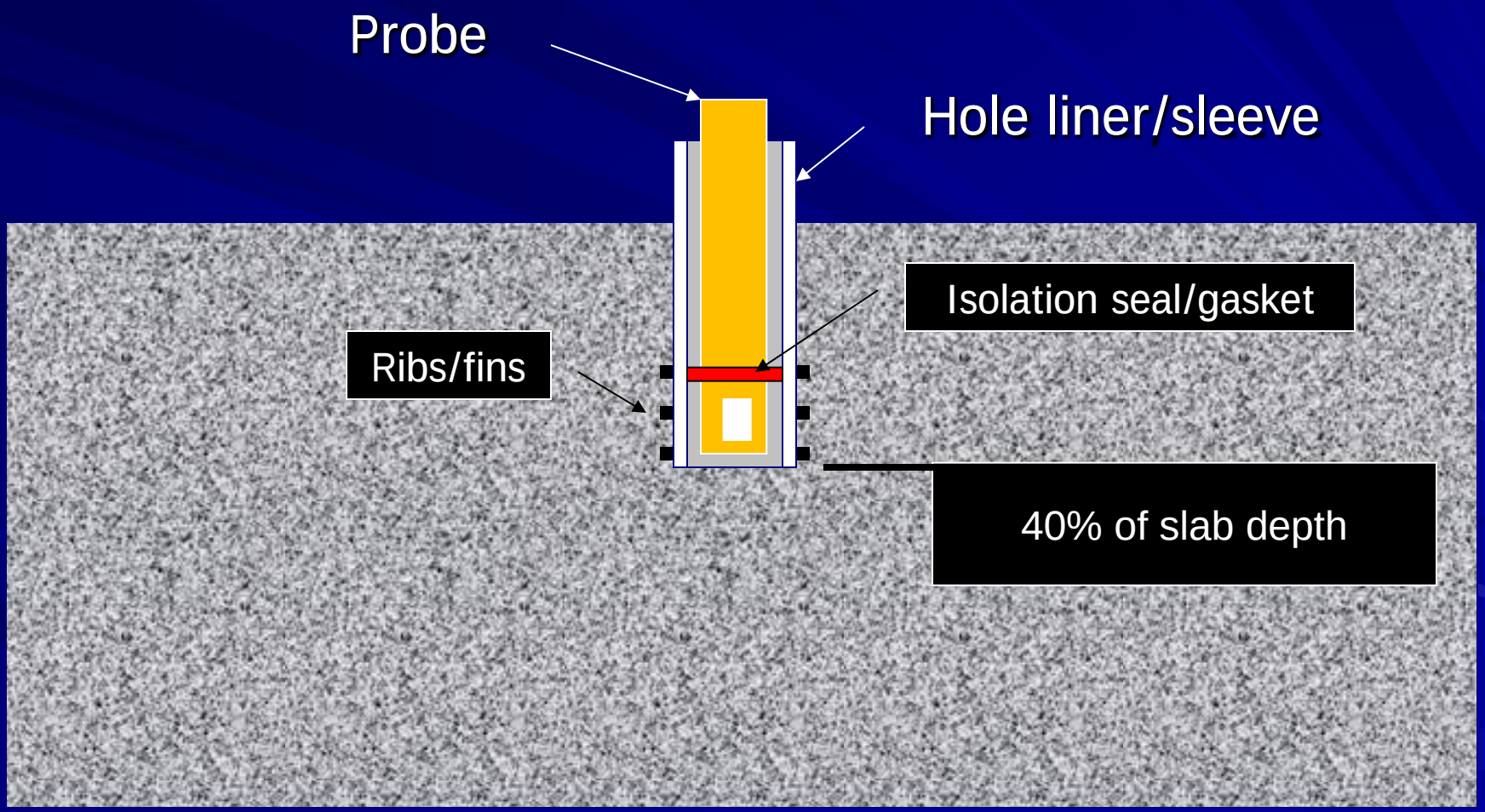
Step 4: Moisture Testing

Methods:

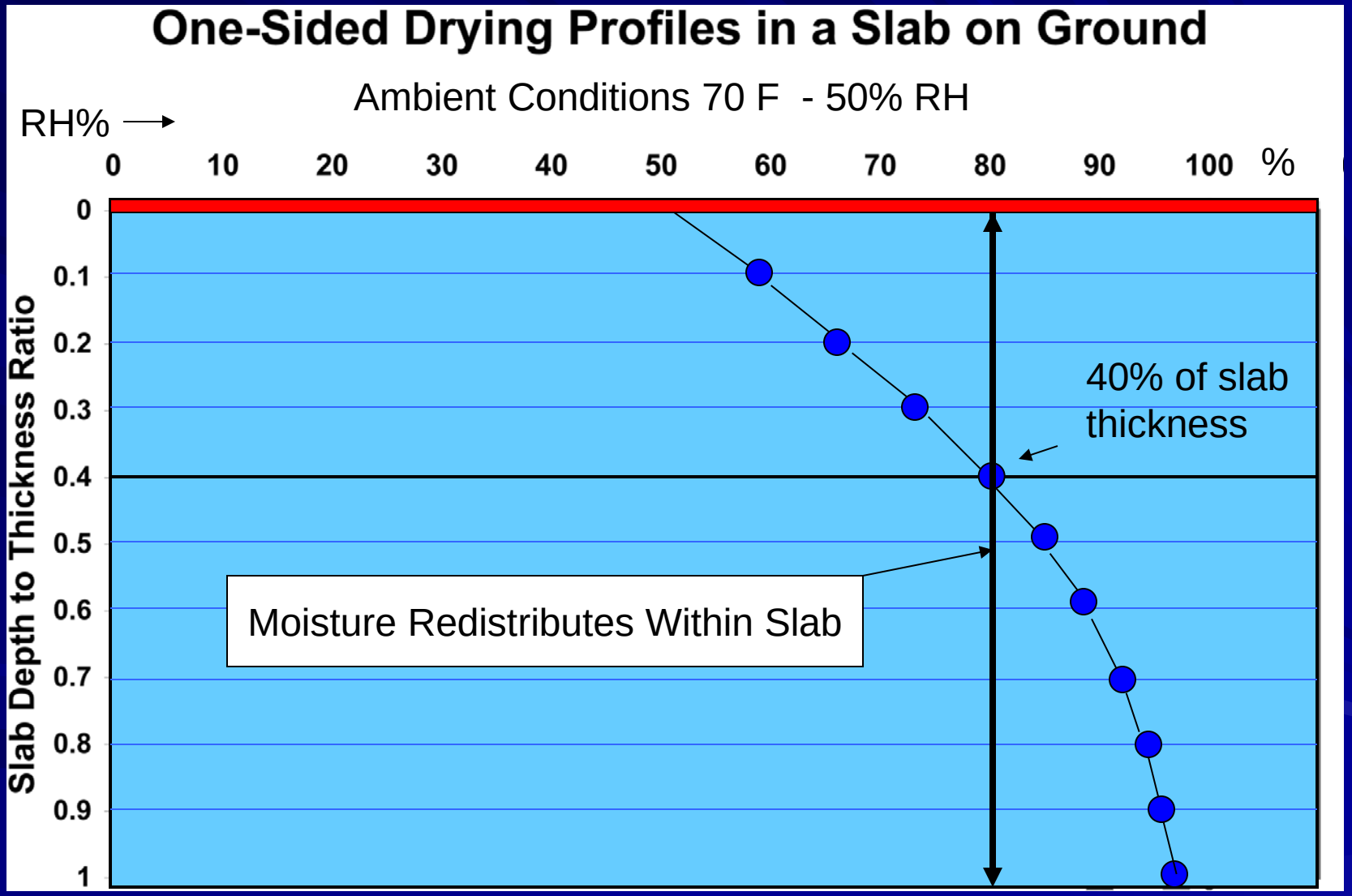
a: Moisture Vapor Emission Rate (MVER) – ASTM F 1869

b: Concrete Internal Relative Humidity ASTM F 2170

Concrete Internal RH Testing



ASTM F2170: Slab Humidity



Concrete Internal RH Testing

1. Drill hole

2. Brush and vacuum

3. Insert liner

4. Insert probe

5. After 72 Hours Take reading

Step 4: Moisture Testing

If an effective vapor retarder is in place directly below the slab, and the moisture test results are within the acceptable limits for the flooring materials to be installed, moisture mitigation is not necessary.

Step 4: Moisture Testing

If an effective vapor retarder is in place directly below the slab, and the moisture test results are not within the acceptable limits for the flooring materials to be installed either more drying time or a moisture mitigation system will be needed

Step 4: Moisture Testing

If the warranty of a moisture mitigation system is tied to a particular MVER such as: 9 lbs, 11 lbs, 15 lbs etc.

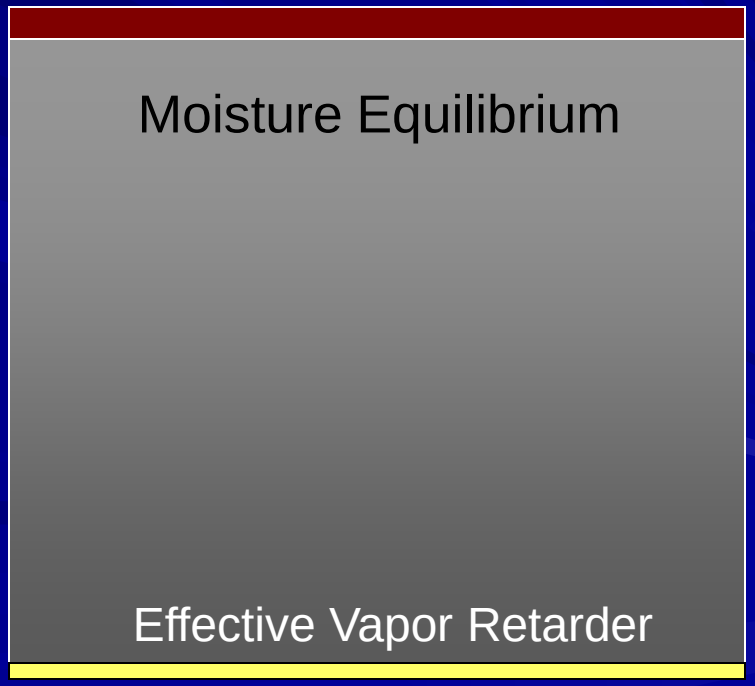
a modified means of performing the MVER test should be used.

Modified MVER Testing ….

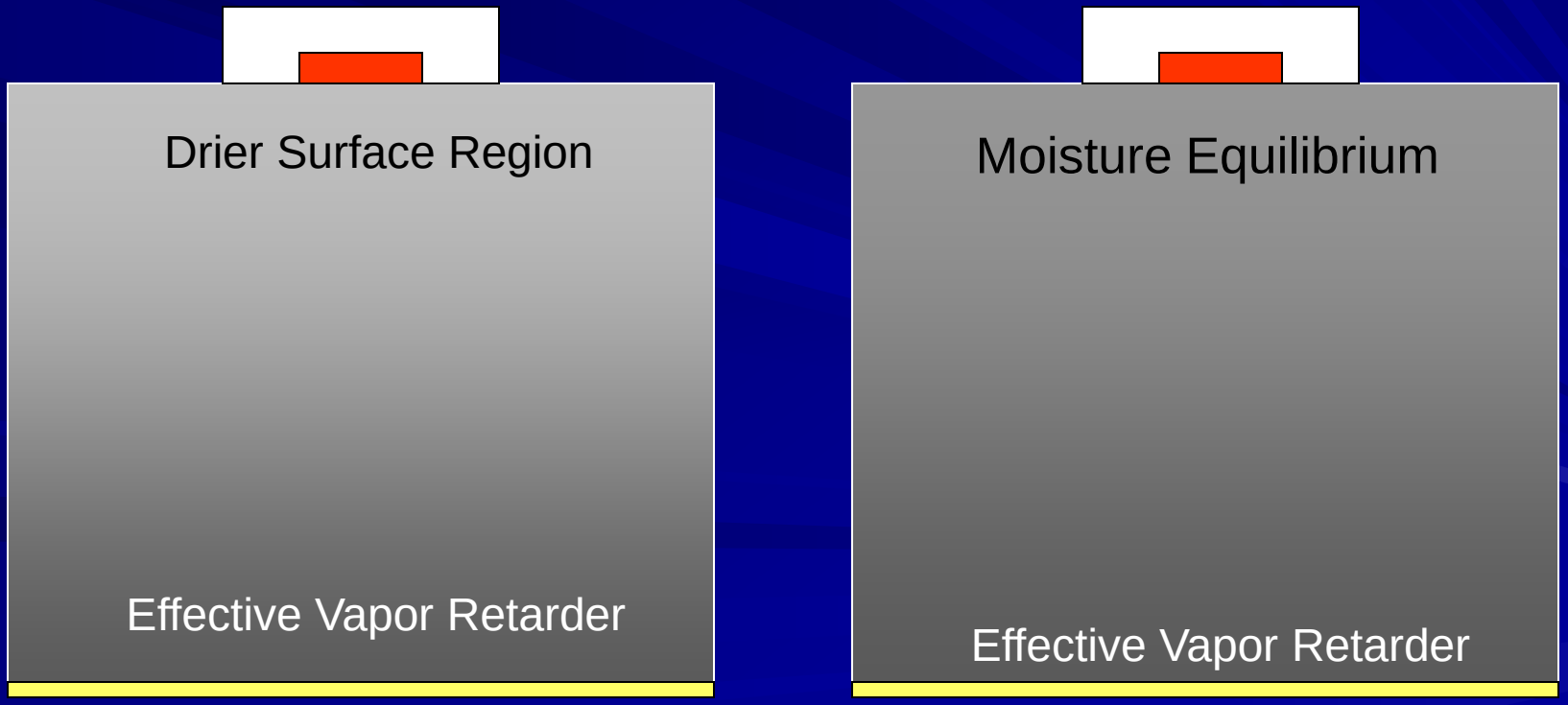
Dry vacuum grind a 20” x 20” area of slab surface and cover with a 24” x 24” rubber backed carpet, rubber flooring, sheet vinyl or other low permeance material for a two week period prior to conducting MVER tests.

Modified MVER Testing ….

Pre-covering MVER test sites allows moisture deeper in the slab to rise and establish a state of moisture equilibrium which when tested more closely reflects the MVER that the mitigation system must be capable of controlling.

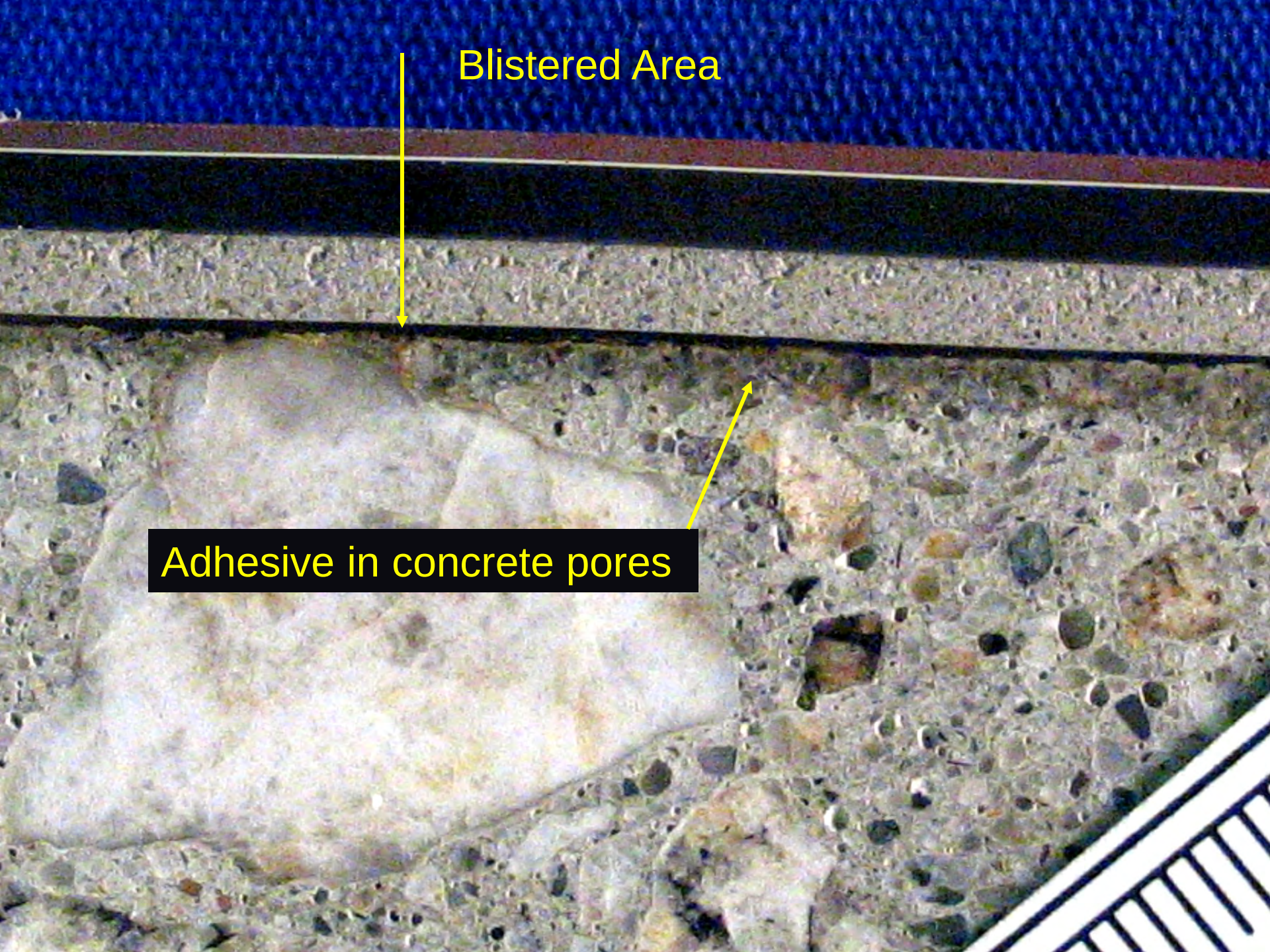


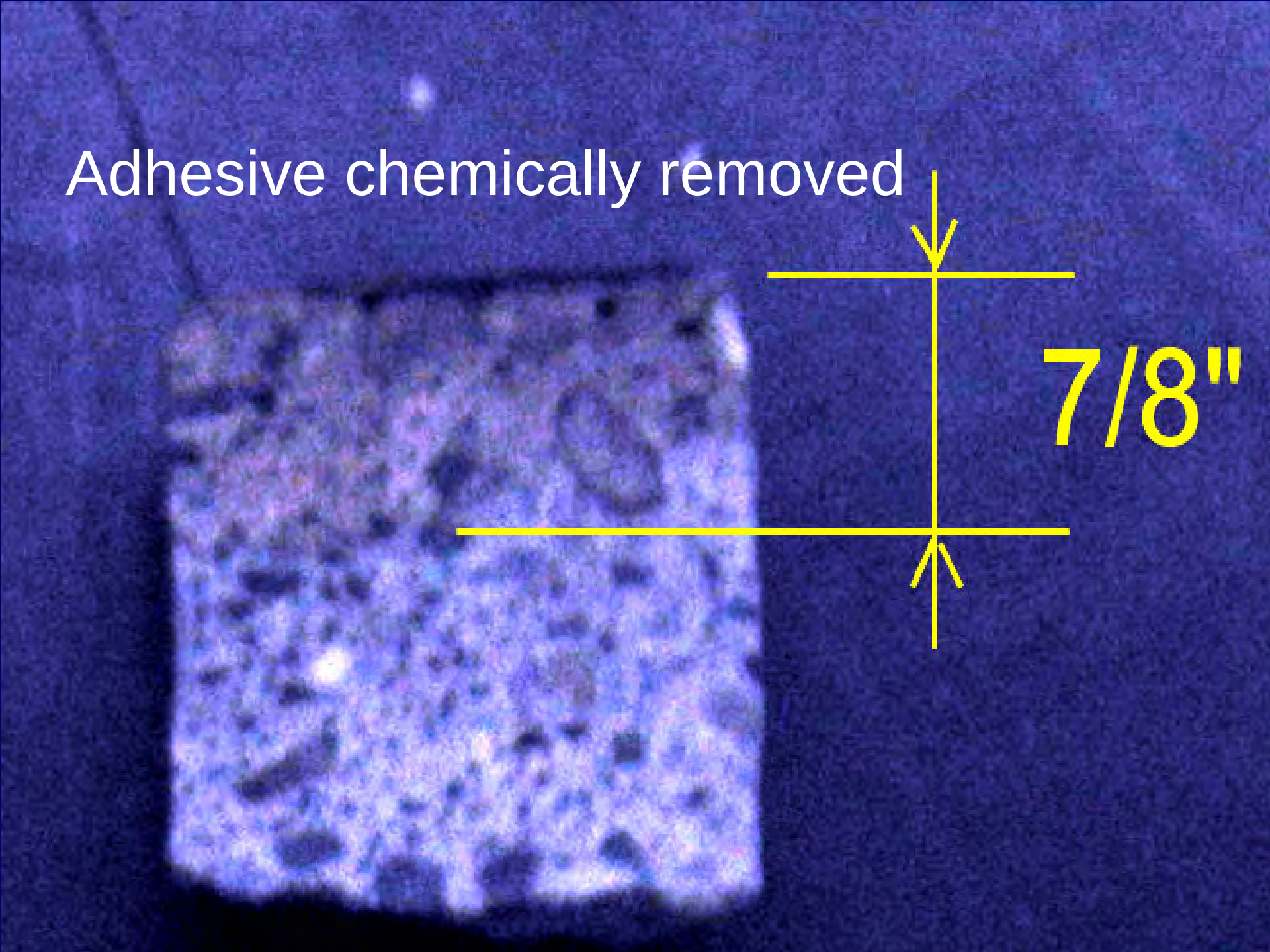
Modified MVER Testing ….



Step 5: Surface Evaluation

For concrete sub-floors that have had a previous flooring system or coating it is necessary to determine the depth of surface preparation necessary to totally remove all traces of previous materials or existing contaminates.


Blistered Area
Adhesive in concrete pores


Adhesive chemically removed
7/8"

Step 5: Surface Evaluation

High concentrations of soluble alkali salts or un-reacted silicates in the near surface region of the slab may contribute to the formation of osmotic cells and/or adversely affect the adhesion of flooring and coating materials.

Ion Chromatography Results

Sample ID	Depth BTC*	Sodium	Potassium	Chloride	Sulfate
Core #1 - 10498-01					
10498-01A	0-3 mm	1580	1100	60	5200
10498-01B	3-5 mm	1140	830	50	3590

Step 6: Surface Preparation

Where the depth of surface removal creates a surface profile greater than CSP 3, reprofiling of the prepared concrete surface may be required before installation of the mitigation system.

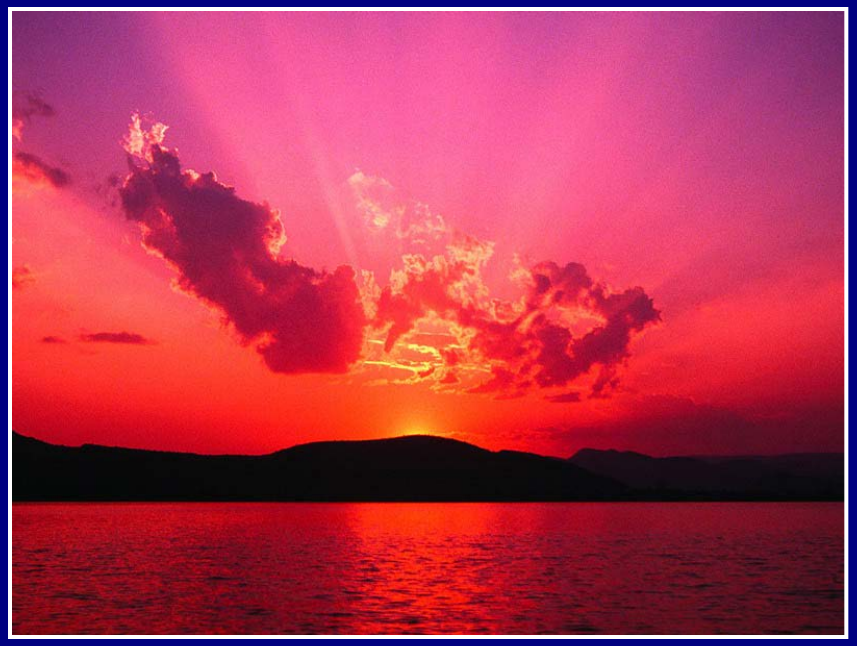

Re-profiling Beneath Mitigation Treatment


Check bond strength of reprofiling material

Step 7: System Selection

Moisture Mitigation Strategies

Confirm if the moisture mitigation system needed is for a Level 1 or Level 2 condition



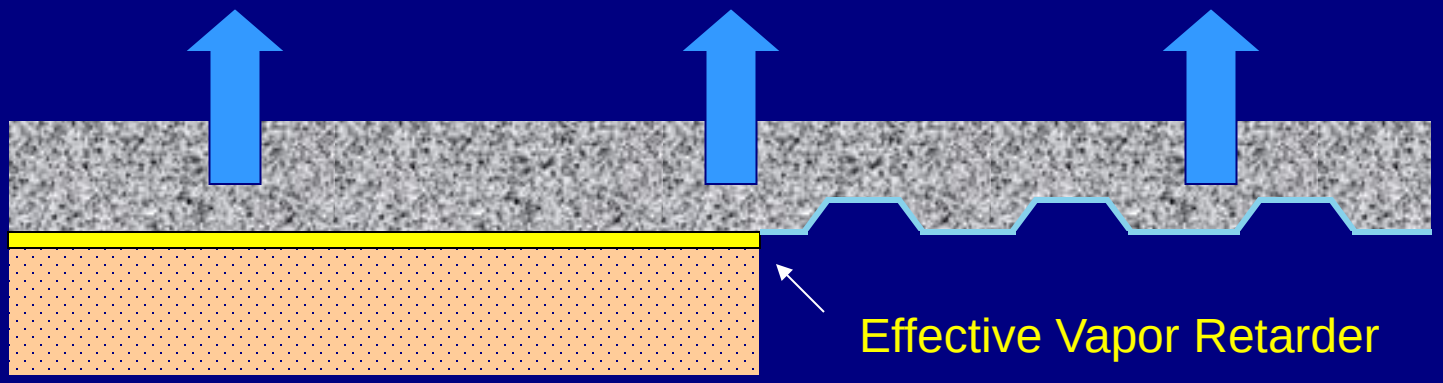
Level 1

Level 2

Level 1 Condition:

1. New or existing slabs with an effective vapor retarder directly below the slab.

Closed Slab System

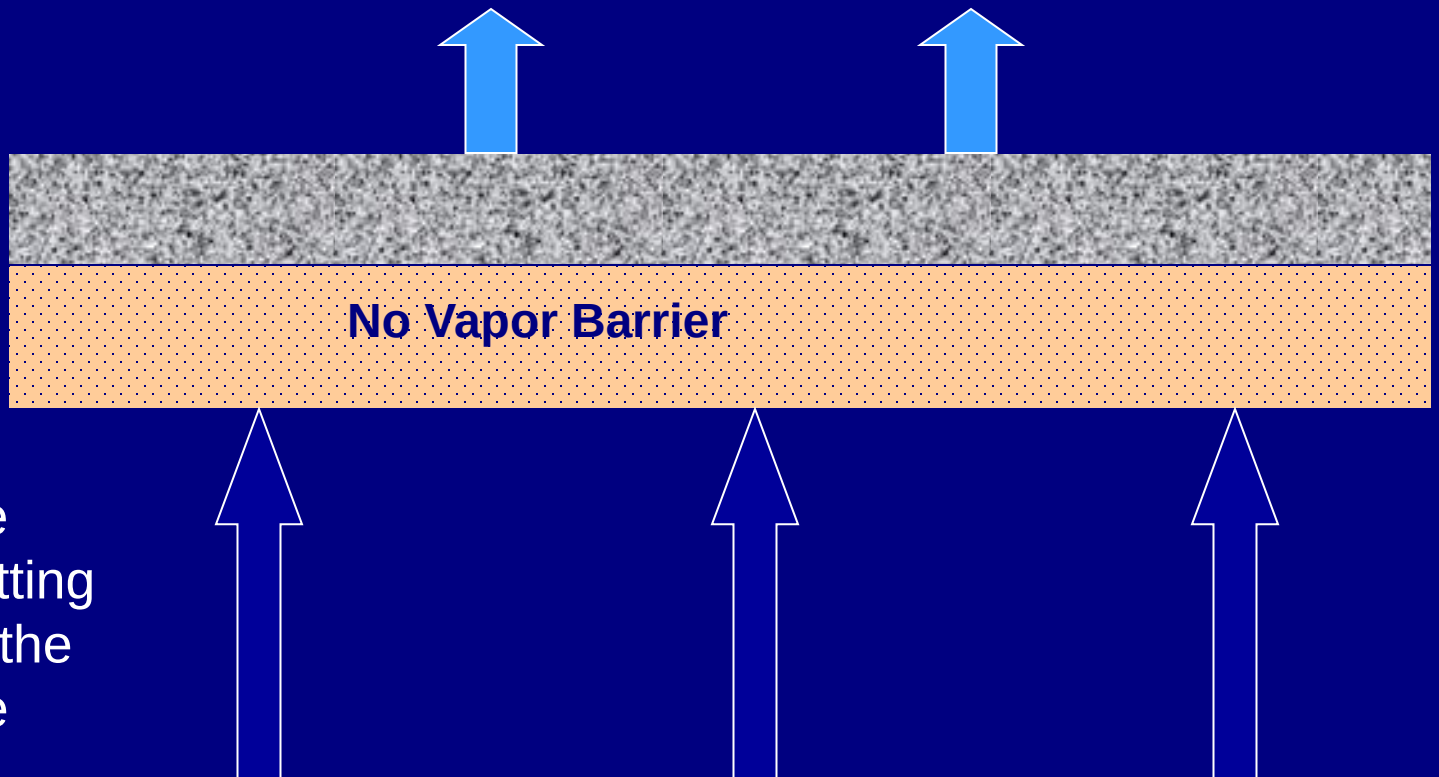


System need only suppress moisture originating within the concrete.

Level 2 Condition:

2. New or existing structures without an effective vapor retarder directly below the slab.

Open Slab System



There are two approaches to implementing a moisture mitigation strategy

1. The pre-emptive approach

   It is determined that a mitigation system will be needed in advance and the system is selected in advance and the cost incorporated into the project budget.

There are two approaches to implementing a moisture mitigation strategy

2. The 23rd Hour Strategy

Where no mitigation system or strategy has been decided upon in advance and the selection and payment for implementation ends up in a costly dispute

Moisture Mitigation Methods

- Slab Replacement
- Accelerated Drying
- Alternative Finishes
- Topical Methods
- Preformed Systems
- Rapid Drying Concrete

Moisture Mitigation Methods

- Slab Replacement
- Remove and Replace Slab

Moisture Mitigation Methods

- Slab Replacement Methods

  - ✓ Remove and Replace slab

  - ✓ New Concrete Overlay

Moisture Mitigation Methods

New Concrete Overlay

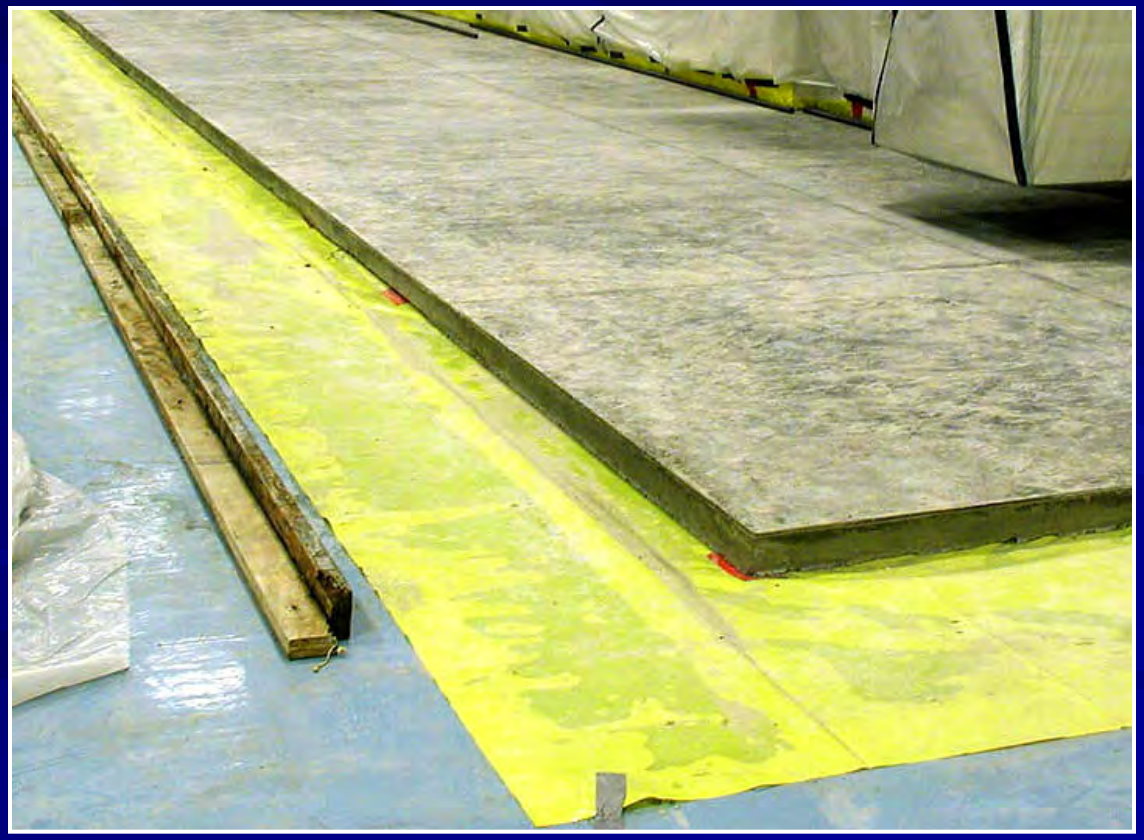


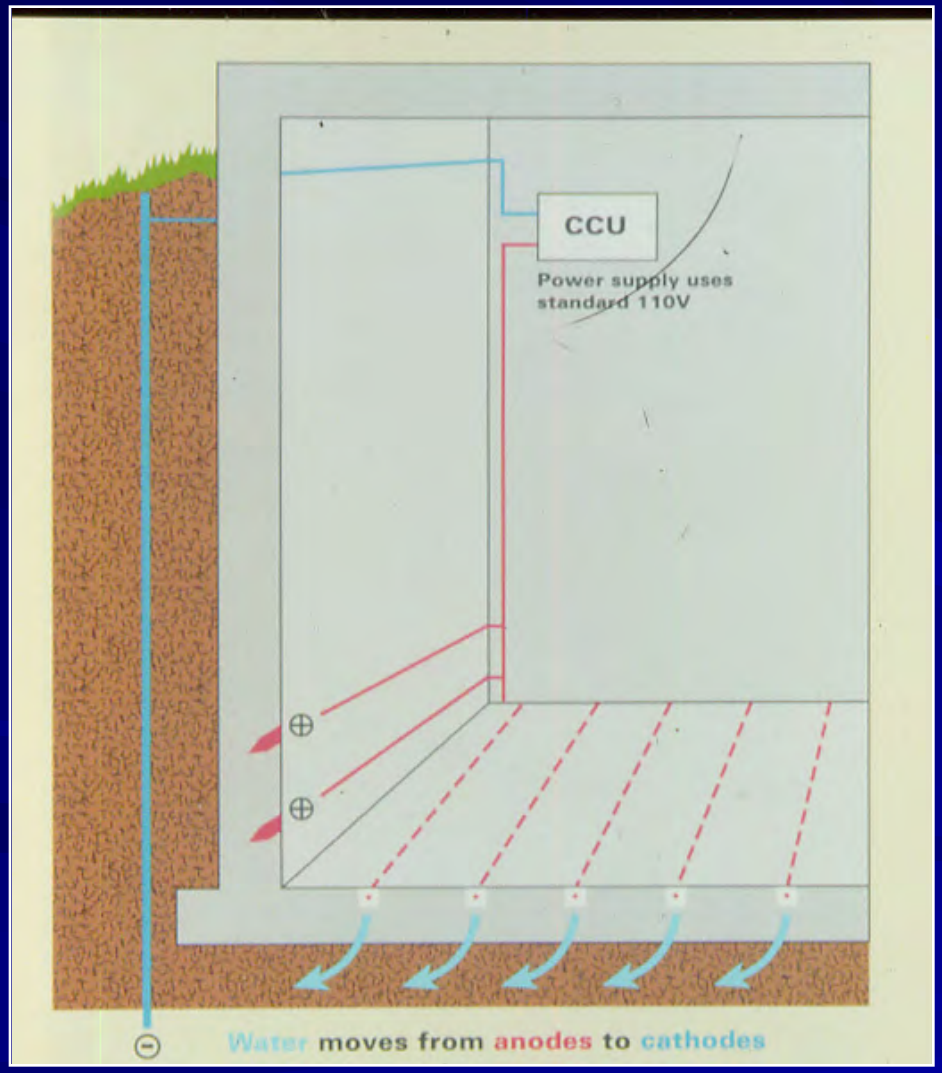
Photo courtesy of Simpson, Gumpertz & Heger

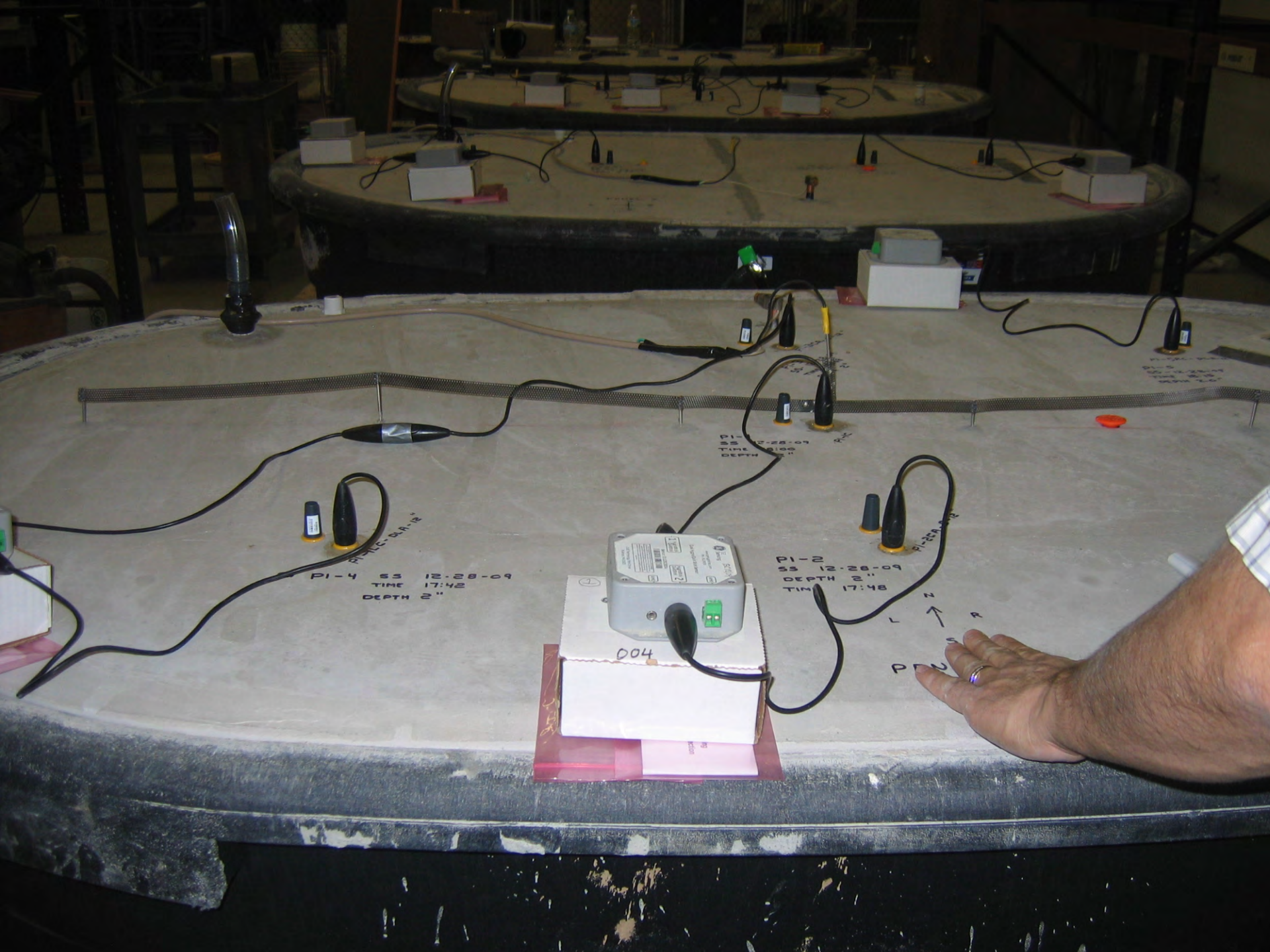
Moisture Mitigation Methods

- Accelerated Drying

Accelerated Drying

Electro-Osmosis




PI-4 SS 12-28-09
TIME 17:42
DEPTH 2"
PI-2
SS 12-28-09
DEPTH 2"
004

Moisture Mitigation Methods

- Alternative Finishes
  - Bare, Polished, Stained or Colored Concrete


FREE


ICE MOUNTAIN


BOBOLI
$1.99


Low Prices
Low Prices
98¢
$2.96
88¢

Moisture Mitigation Methods

- Alternative Finishes
  - Bare, Polished, Stained or Colored Concrete
  - Breathable Decorative Overlays

Stained Overlay

Moisture Mitigation Methods

- Alternative Finishes
  - Bare, Polished, Stained or Colored Concrete
  - Breathable Decorative Overlays
  - Breathable Coatings

Breathable Coating

Moisture Mitigation Methods

- Alternative Finishes
  - Bare, Polished, Stained or Colored Concrete
  - Breathable Decorative Overlays
  - Breathable Coatings
  - Ceramic Tile / Quarry Tile

Moisture Mitigation Methods

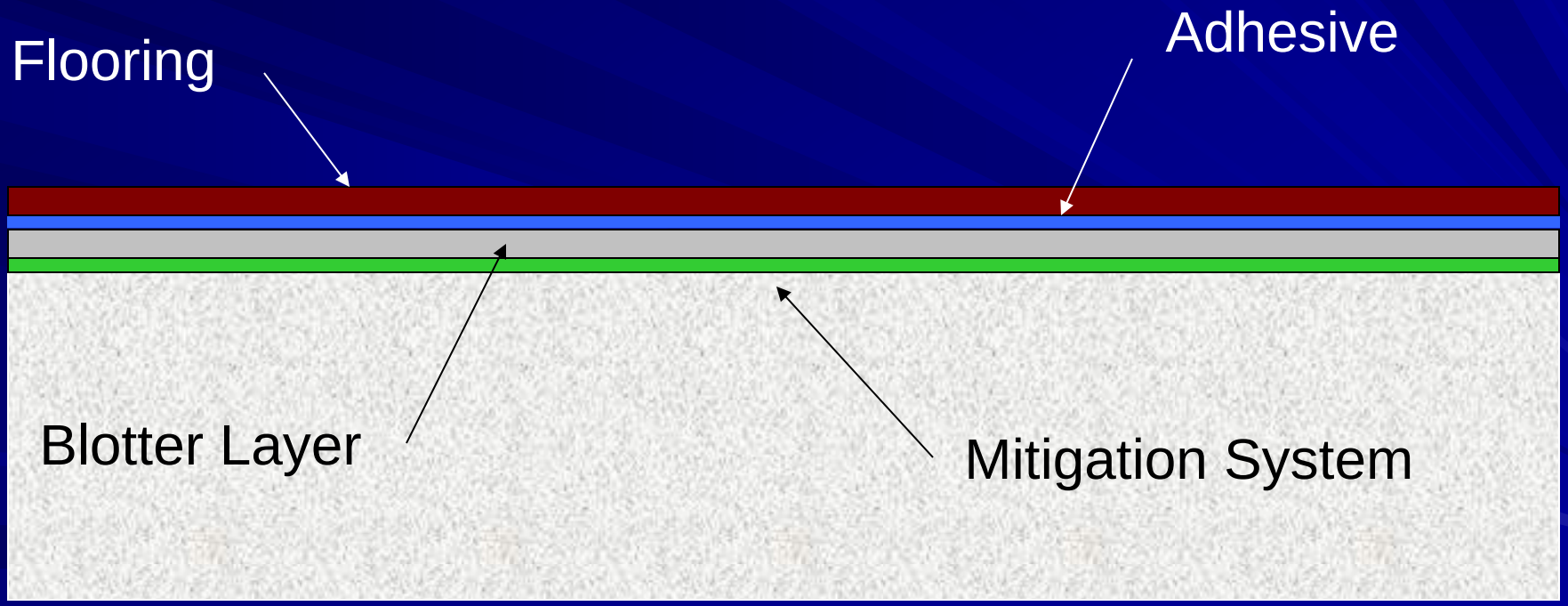
Topical Methods

- Moisture Suppression Coatings
- Modified Cementitious Surface Overlays
- Preformed Systems

Moisture Mitigation Methods

- ✓ Moisture Suppression Coatings

Cementitious Blotter Layer



Moisture Mitigation Methods

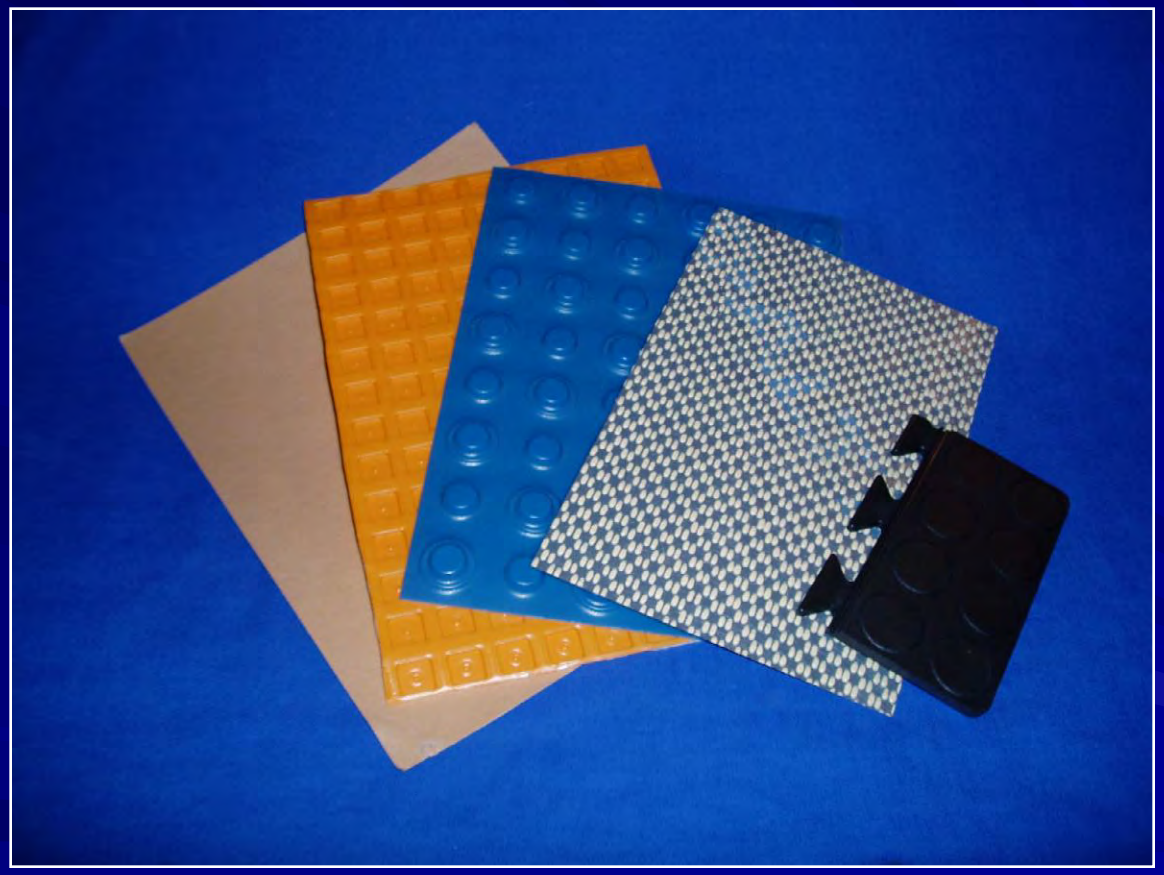
- ✓ Modified Cementitious

  Surface Overlays

Moisture Mitigation Methods

- ✓ Preformed Systems

Preformed Systems




PERFORATED SHEETS
8½ x 11
Blank
2500 Sheets
CS 04122

Moisture Mitigation Methods

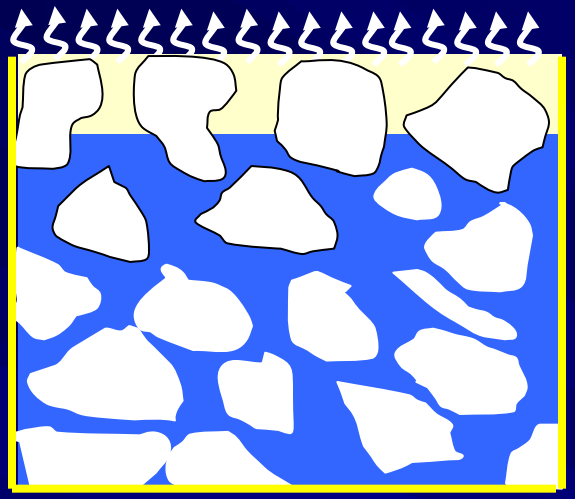
- ✓ Pre-applied adhesive backing with special priming system


DRIEAZ

Rapid Drying Concrete

How does Rapid-Drying Concrete Differ from Conventional Concrete ?

Conventional Drying

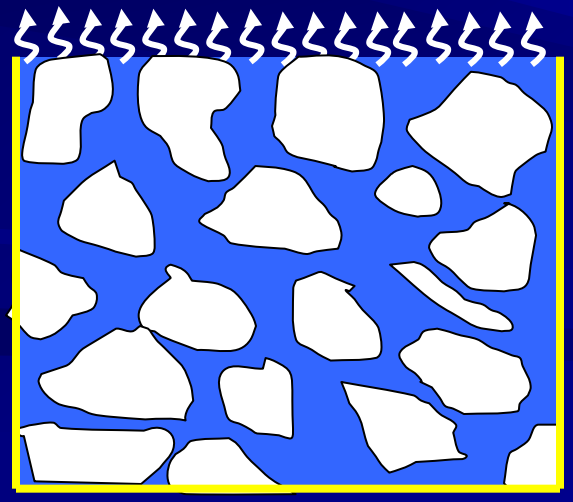


Conventional Concrete

- Dries from the top down.
- Drying time is related to ambient conditions.
- Seldom reaches an acceptable level of dryness within the project schedule.

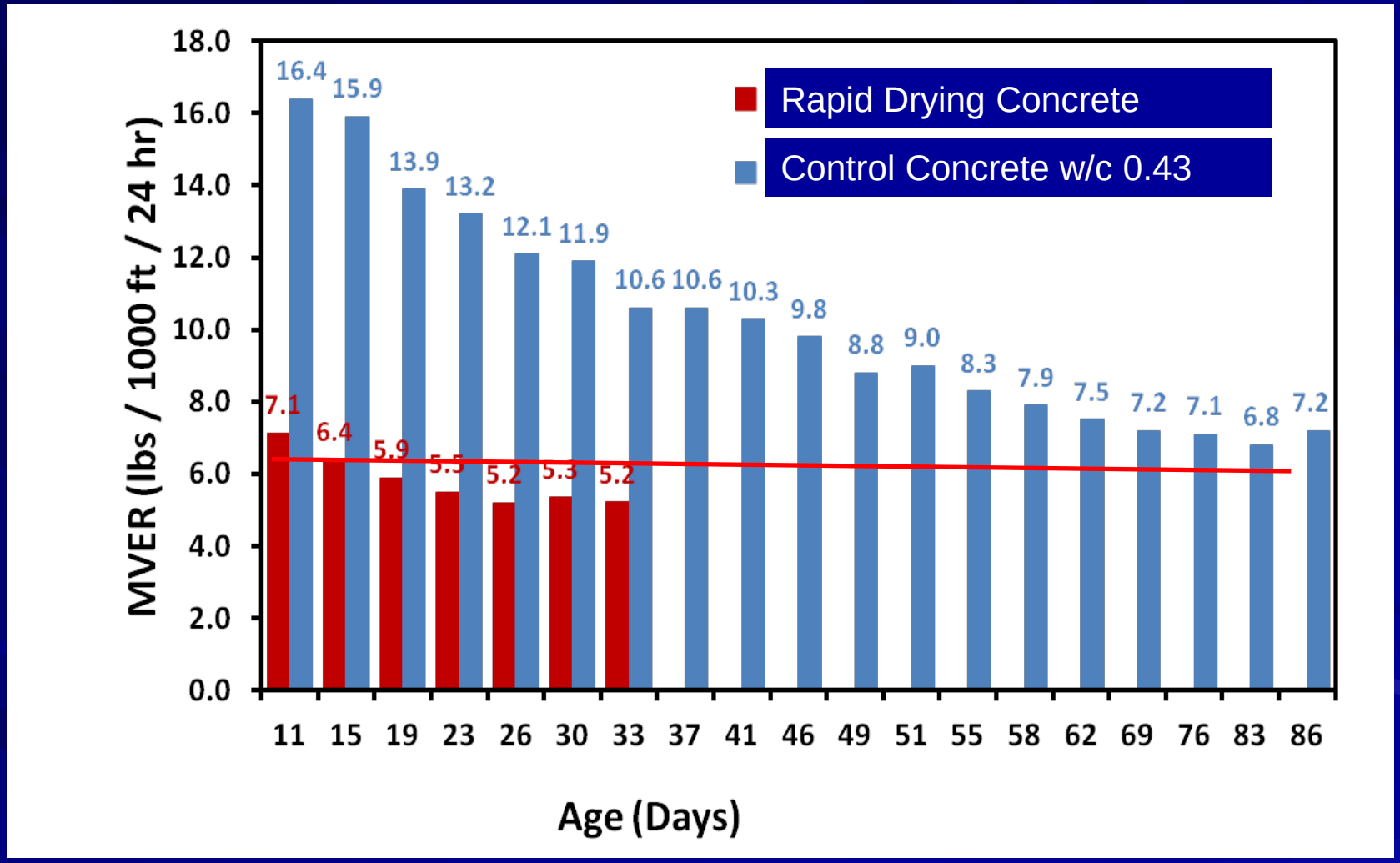
Rapid-Drying Concrete

Self-Desiccation



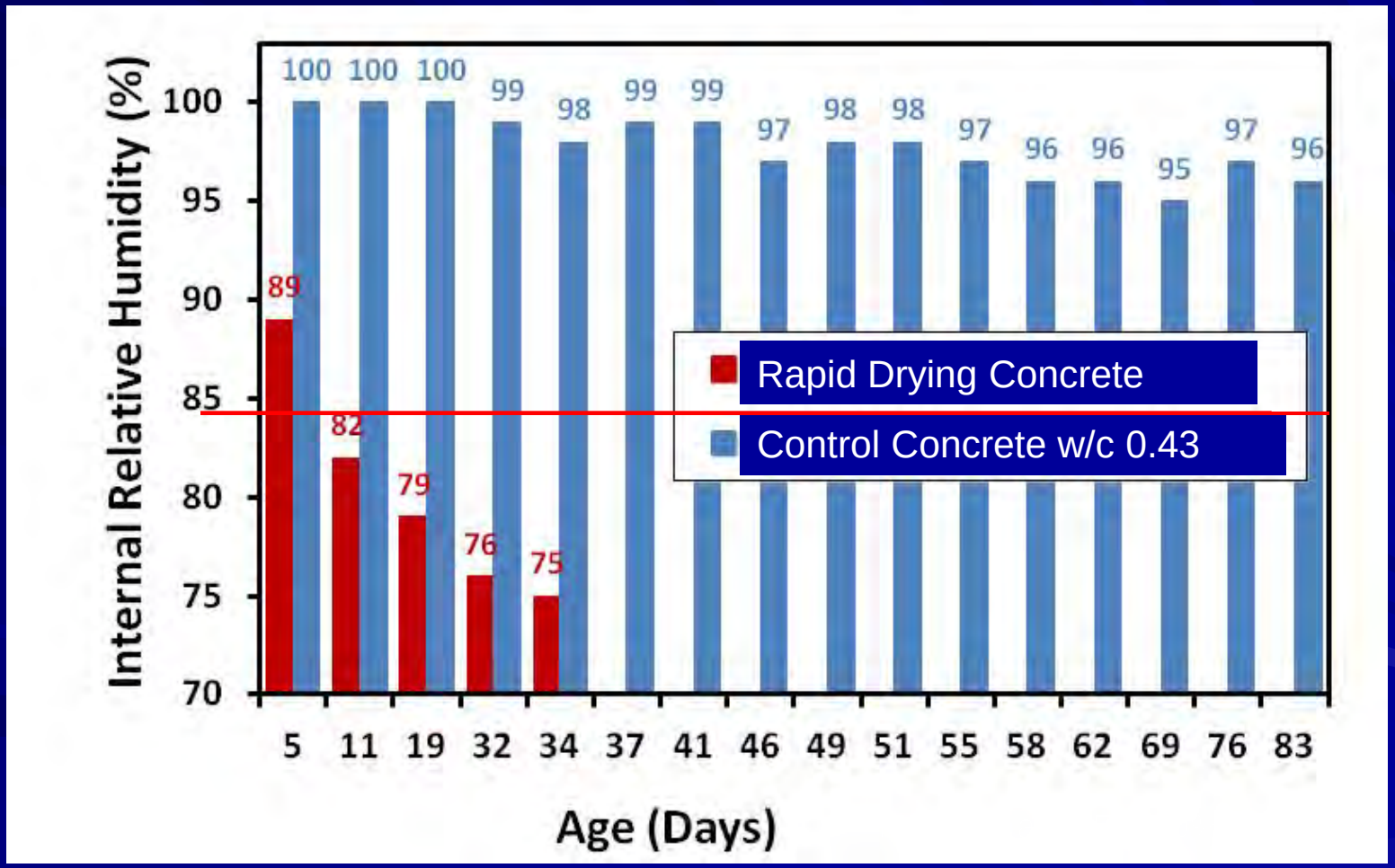
- Dries from the surface and consumes water internally through self-desiccation
- Uniform drying throughout the depth

MVER Test ASTM F 1869

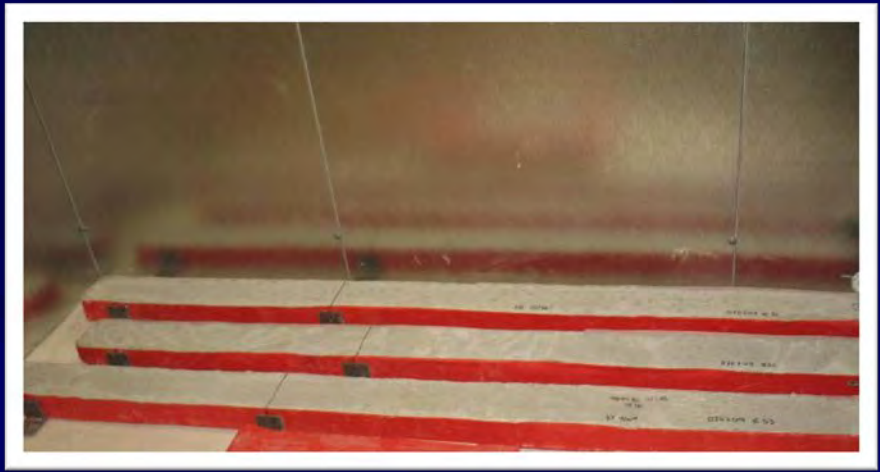


Concrete Internal Relative Humidity Test

ASTM F2170



Slab Curling

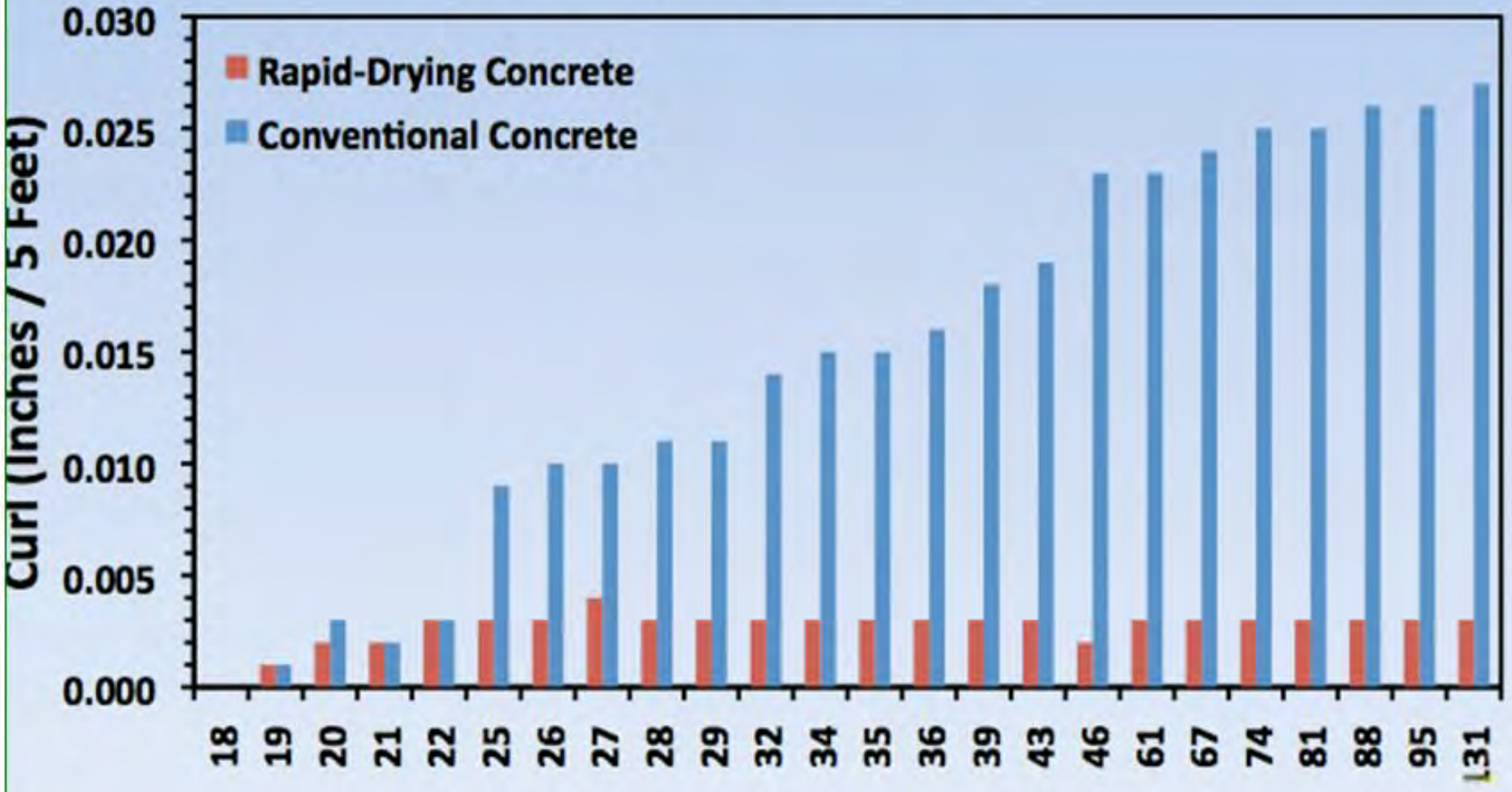


Curl Beam Test

- 8’-0” x 6” x 3.5” beams
- Anchored at one end.
- Curl was measured at the free end.

Curling

- Since rapid-drying concrete dries throughout its thickness, curling is reduced



Step # 8: Proper Flooring installation

INTERNATIONAL
CONCRETE REPAIR
INSTITUTE

Concrete Moisture Testing Certification Program

CERTIFICATION

What's included in the Level 1 certification program?

- Training seminar—3 to 4 hours (mandatory)

CERTIFICATION

What's included in the Level 1 certification program?

- Written examination

CERTIFICATION

What's included in the Level 1 certification program?

- Performance Examination
  - 4 ASTM Test Methods

- F 1869 CaCl MVER
- F 2170 Concrete in-situ RH
- F 2420 Concrete Surface RH
- F 710 pH

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