

ASBA  **2024**

ASBA TECHNICAL MEETING & TRADE SHOW
DECEMBER 3-6, 2024 | ORLANDO, FLORIDA

2D Indoor Sports Surfaces - Moisture Mitigation and Site Prep



Why so important?

- Indoor sport flooring failures estimated at \$1 billion annually
- Catastrophic system failures generally occur in the first year of the lifecycle
- Premature system failures: serviceability of floor covering often reduced from 20 years to 7 or 8 years or less.
- Average cost to replace is 2-5 x of original installation cost
- Operational Downtime / Revenue Losses



Anatomy of a failure

- Excess Moisture
- Low Permeability Flooring
- Ambient Environment
- Source/Available pH



Must know tests

- ASTM F3191 - Field Determination of Substrate Water Absorption (Porosity)
- ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate (MVER) of Concrete Subfloor Using Anhydrous Calcium Chloride
- ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- ASTM F3441 - Standard Guide for Measurement of pH



ASTM F3191 - Field Determination of Substrate Water Absorption (Porosity)



- If water is readily-absorbed in less than 60 seconds into the concrete in non-traffic areas, as well as traffic areas, application of installation products may proceed.
- If water is not readily-absorbed, the concrete must be shot-blasted or mechanically-abraded to remove the curing compound or any other bond-breaking contaminants preventing absorption.

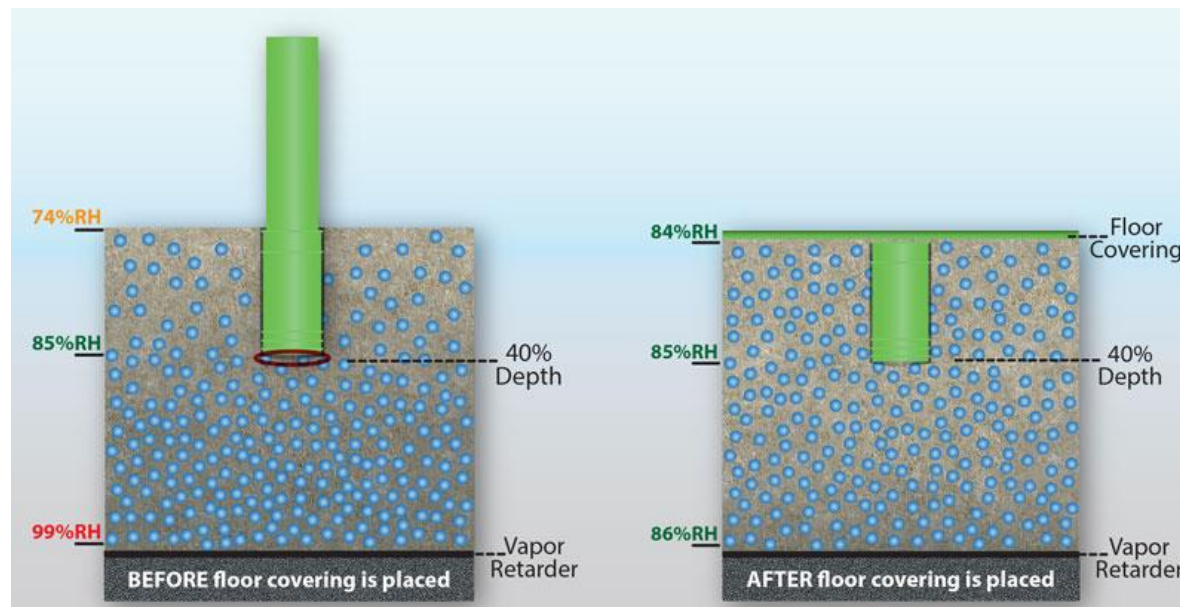
ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate (MVER) of Concrete Subfloor Using Anhydrous Calcium Chloride

- Also referred to “CaCl test”
- Quantitative indication of how many pounds of slab moisture evaporated from 1000 square feet of concrete over a 24-hour period.



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

- In-situ concrete moisture testing places sensors, or probes, inside the slab itself. As concrete dries, moisture migrates from the bottom of the slab to the surface where it can evaporate away.
- Probes placed at 40% of the slab's depth if drying from one side only. For slabs drying from two sides, probes be placed at 20% of the slab's total depth.



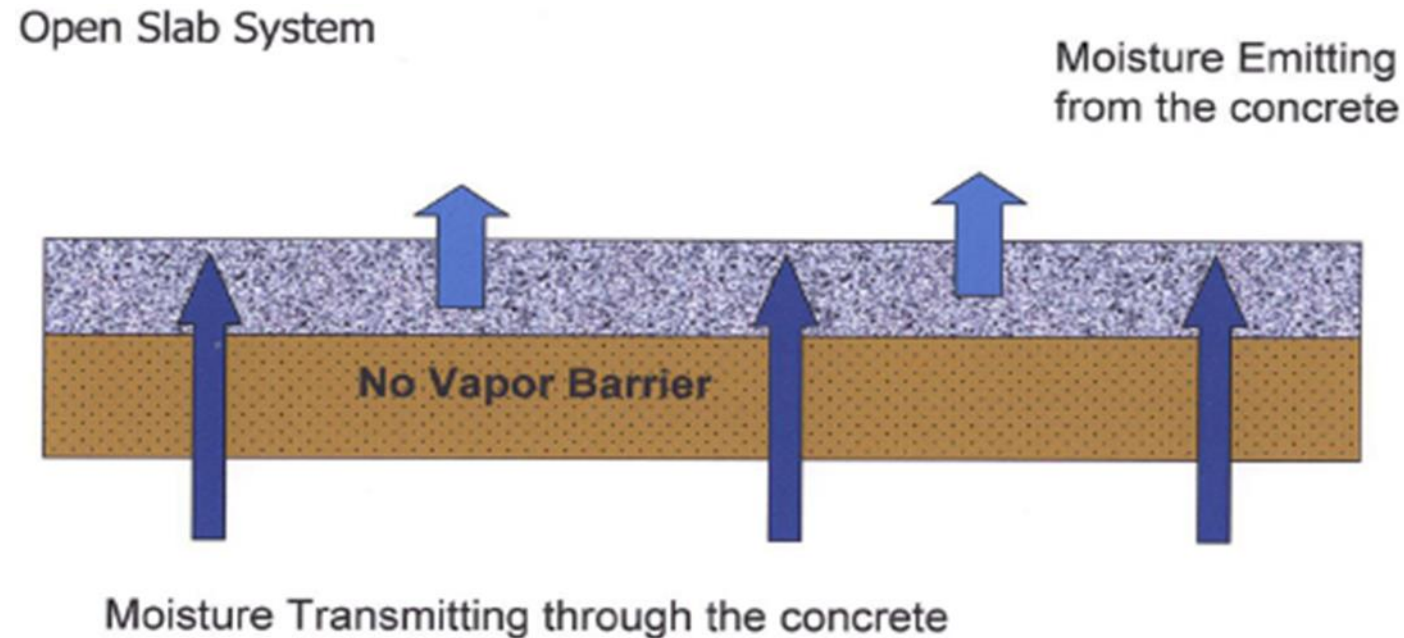
ASTM F3441 - Standard Guide for Measurement of pH

- Higher concentration of soluble alkali salts in the surface region of a concrete slab due to the initial bleeding process of a freshly placed concrete.
- Typically most acceptable pH ranges for installation are 8-12



Chronic or Unknown Moisture Sources: “Open Slab Situations”

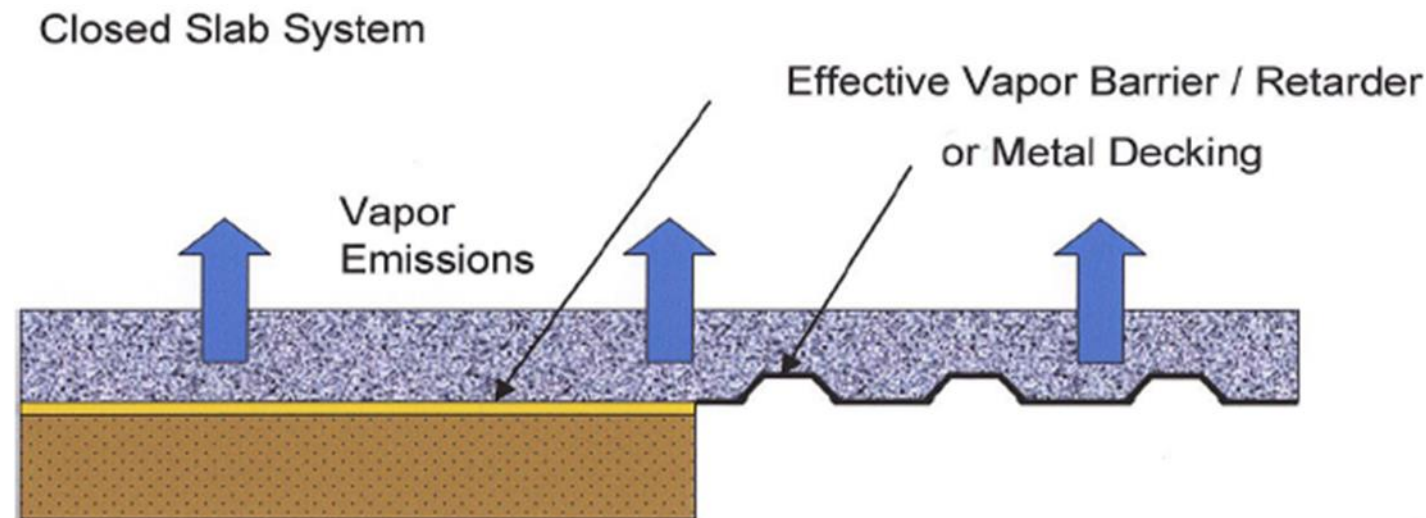
- An Open Slab System is a more challenging condition. The concrete slab is in direct contact with the ground. Therefore, the source and amount of moisture is unknown and will typically differ from the originally tested levels over time.



Note: RH or CaCl testing provides no predictive value when performed on open slabs

Actual Concrete Drying Issues: “Closed Slab or Above Grade Situations”

- A Closed Slab System is where the concrete slab is isolated.
- A “permanent vapor barrier” or elevated metal decking in direct contact with the slab are prime examples of a closed system.
- In a Closed Slab System, the only source of moisture is free-water originating from within the concrete itself.



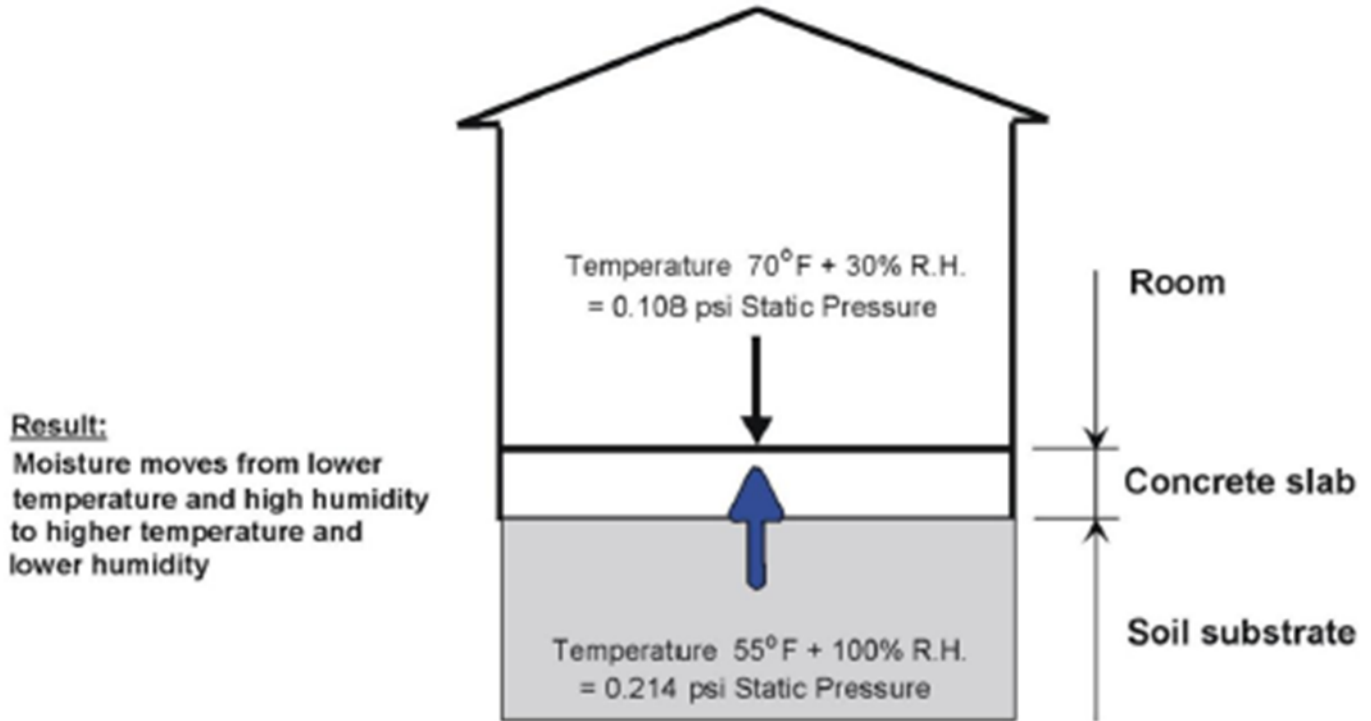
Closed Slab Systems

- Total water in concrete mix = 34 gal/cubic yard
- Water required for hydration of cement ~30% 10.2 gal/cubic yard
- Resulting ~70% surplus water needs to be accounted for = 23.8 gal/cubic yard

Note: Assumes w/c ratio of .50



How moisture vapor emission passes through interior slabs

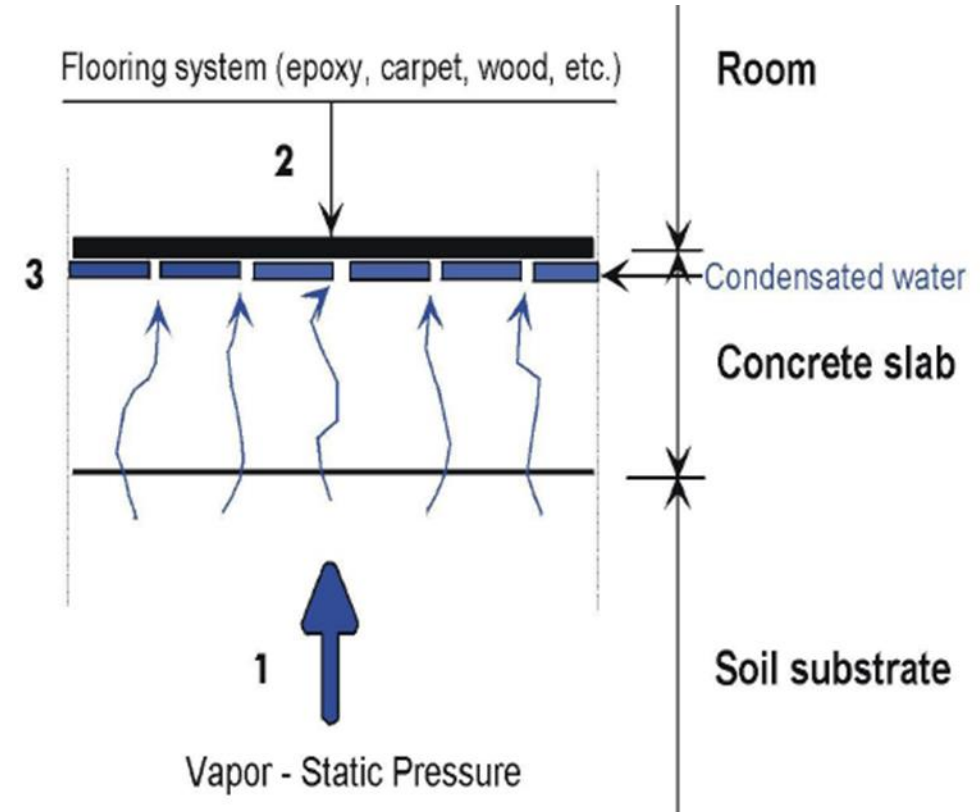


Note: Vapor emission may vary through the slab; may also fluctuate during different times of year



Moisture vapor emission condenses at the surface & solubilizes high pH minerals

1. Moisture vapor migrates through concrete
2. Flooring system = vapor barrier prevents moisture vapor from escaping
3. Result: Moisture vapor condensates to liquid (water) and reduces adhesion of flooring system. Liquid has high alkaline content in pore water (pH 13 -14)



Vapor transmission

- NOT ALWAYS AN ON GRADE OR A “NORMAL” DRYING ISSUE
- Lightweight concrete floors (expanded clay or shale)
- Larger structural member/components (greater mass)
- Both have more moisture and retain it longer = High MVER and RH
- Plan or budget for a Moisture Management System



Substrate Review – Surface Preparation

- Instead of a “one-size fits all” philosophy, the goal of proper substrate preparation is to allow for the selection of specific preparation practices based on the exact conditions present on each individual job site.
- The type of mitigation being used will dictate what surface profile or type of mechanical abrasion will be necessary.



Concrete contaminants

- The concrete needs to be clean, sound and solid to receive surface repair products.
- The Subfloor must be structurally sound
 - Sweeping compounds
 - Paint
 - Drywall mud
 - Oil/Grease
 - Abatement Chemicals
 - All concrete contaminated with chemicals must be mechanically removed.



Concrete Surface Profile



Grinding

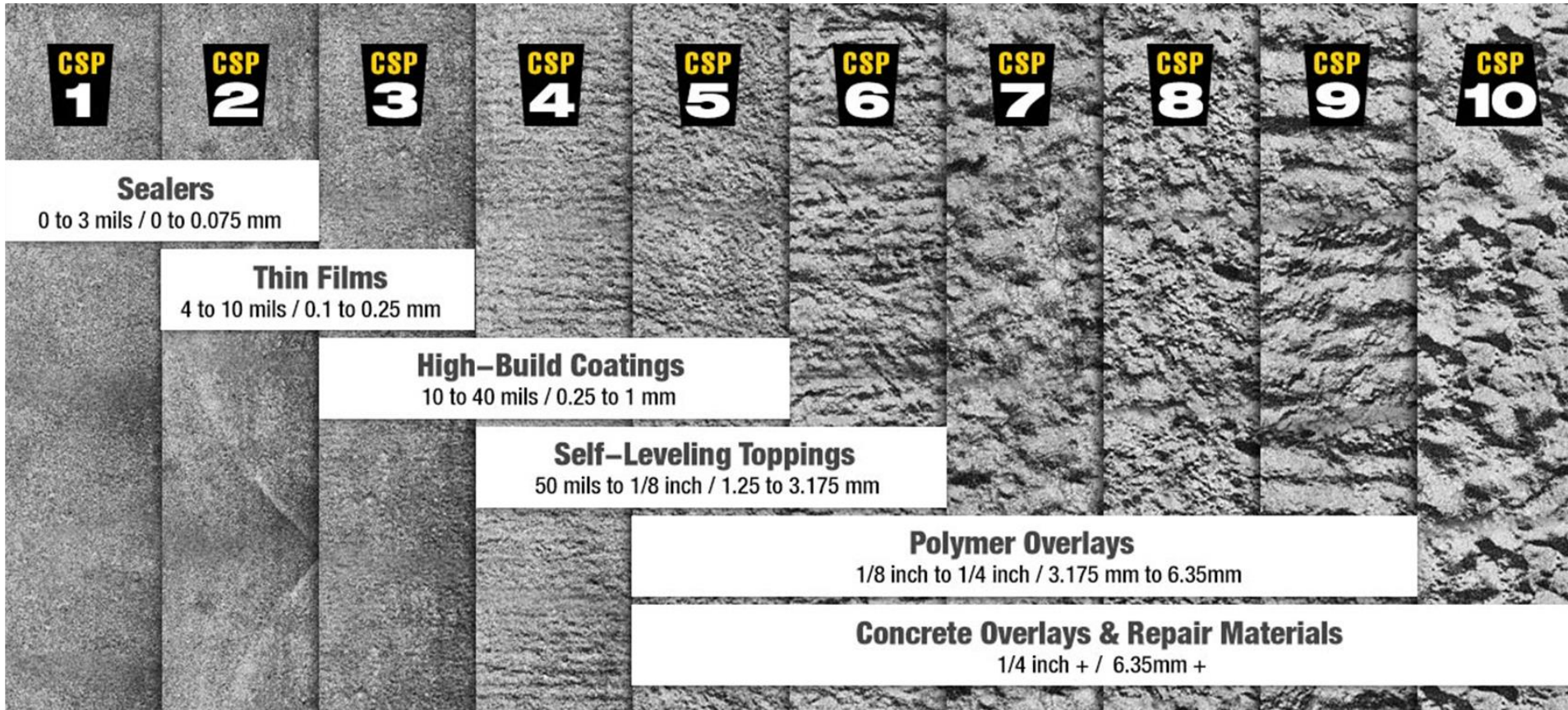


Shotblasting



Scarifying

Concrete Surface Profile



Solution options

- **Good \$:** High Limit Adhesives
 - Performance: RH 90-99%, MVER 8-15lbs, pH 9-11
 - Does not typically protect flooring materials
- **Better \$\$:** Encapsulators/Sealers/pH Blockers
 - Performance: RH 99%, MVER 15-25lbs, pH 12-14
 - Isolates & protects flooring materials
- **Best \$\$\$:** 2 Component Epoxies (ASTM 3010)
 - Performance: RH 100% MVER 25lbs, pH 14
 - Maximum Protection
- **Fast Track:**
 - Moisture Resistant Installation Tapes
 - Moisture Barrier Adhesives
 - Tape-Based Moisture Barrier
- **Multi Purpose:** Underlayment Membranes



Difference between topically applied curing compounds vs integrally applied curing compounds

- If **topically** applied curing compound, you MUST mechanically abrade the concrete slab until it passes ASTM F3191 (Water Drop Test).
- If **integrally** applied curing compound, you can treat the slab as usual.
 - What does treating the slab as usual mean?
 - ASTM F3191
 - Moisture Testing
 - Removing Surface Contaminants



How to address asbestos abatement

Mechanically abated or chemically abated?

- Mechanically abated → Treat as normal slab
- Chemically abated → Remove top 1/8" of slab → Treat as normal slab

Below Grade, Slab on Grade, or above grade?

- Below Grade or On-Grade → Almost always high moisture present
 - No longer a functioning vapor barrier.
 - Even if slab does NOT read high moisture, it is **HIGHLY RECOMMENDED** to encapsulate the slab to eliminate potential future vapor drive issues.
- Above Grade → If high moisture present, then mitigate → Otherwise, no encapsulation needed due to no source of vapor drive.

Q&A



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