

Flooring Design and Lessons Learned: Durability and ROI on Flooring Types & Moisture Prevention

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- *Principal, Legat Architects*



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Flooring Design and Lessons Learned

Objectives Today:

- We are here to help - Reach out to our teams and resources.
- Trends - K12 design, durability.
- Choices - Maintenance, and ROI on a variety of flooring types.
- Pros and Cons on material selection.
- Why more moisture problems are occurring.
- Learn ways to prevent, mitigate or solve moisture problems.

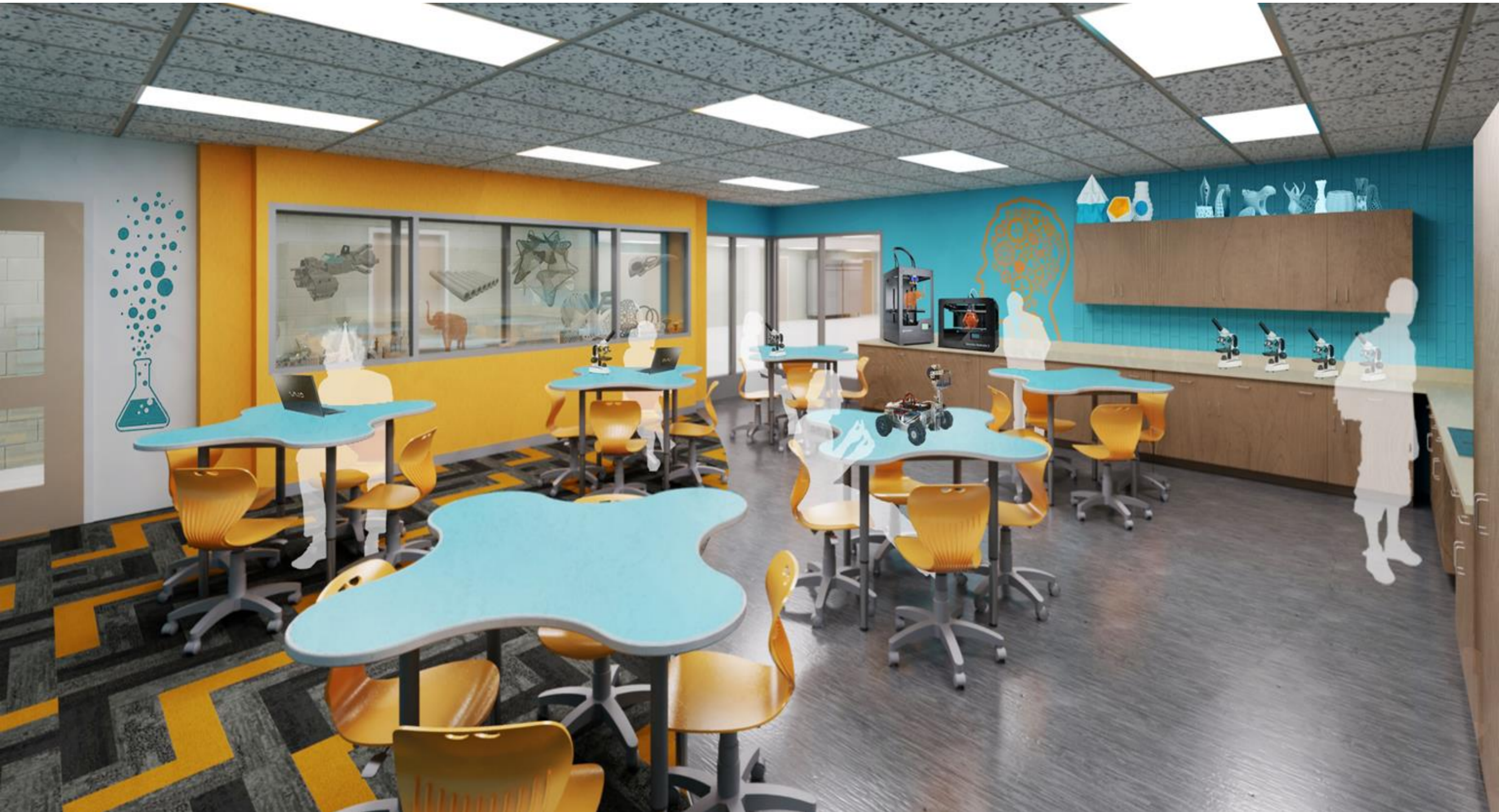
WHY NOW? - LEARNING ACTIVITIES ON FLOOR **HIGH-USE OF FLEXIBLE FURNITURE**



LEARNING ACTIVITIES ON FLOOR NEED DURABILITY FOR HIGH-USE OF FLEXIBLE FURNITURE



LEARNING ACTIVITIES ON FLOOR NEED DURABILITY FOR HIGH-USE OF LAB AREAS

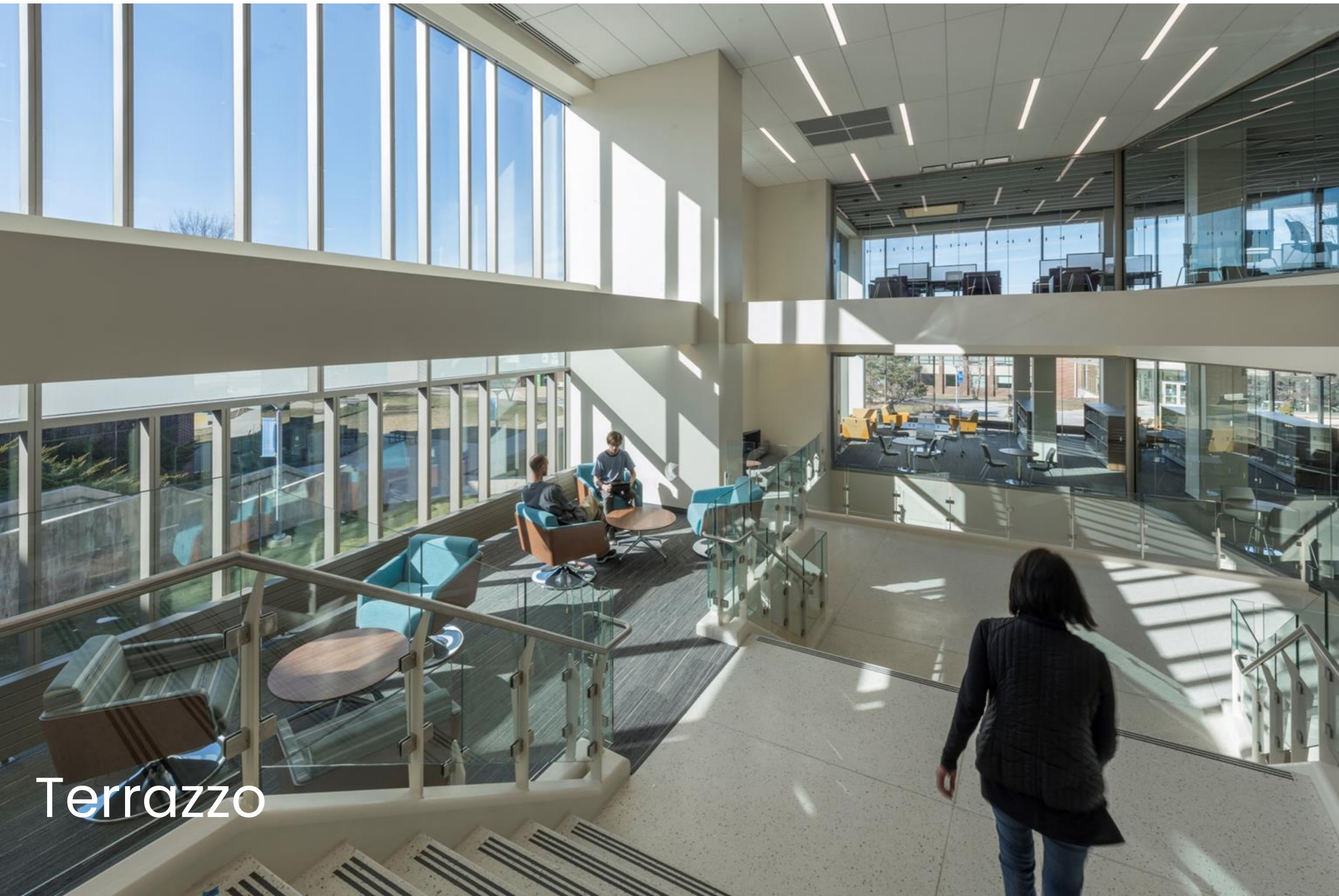


LEARNING ACTIVITIES ON FLOOR
NEED FOR DURABILITY AND PERFORMANCE



FLOORING TYPES

THE BENEFITS



Terrazzo



Concrete



Rubber



Linoleum



LVT



LVT



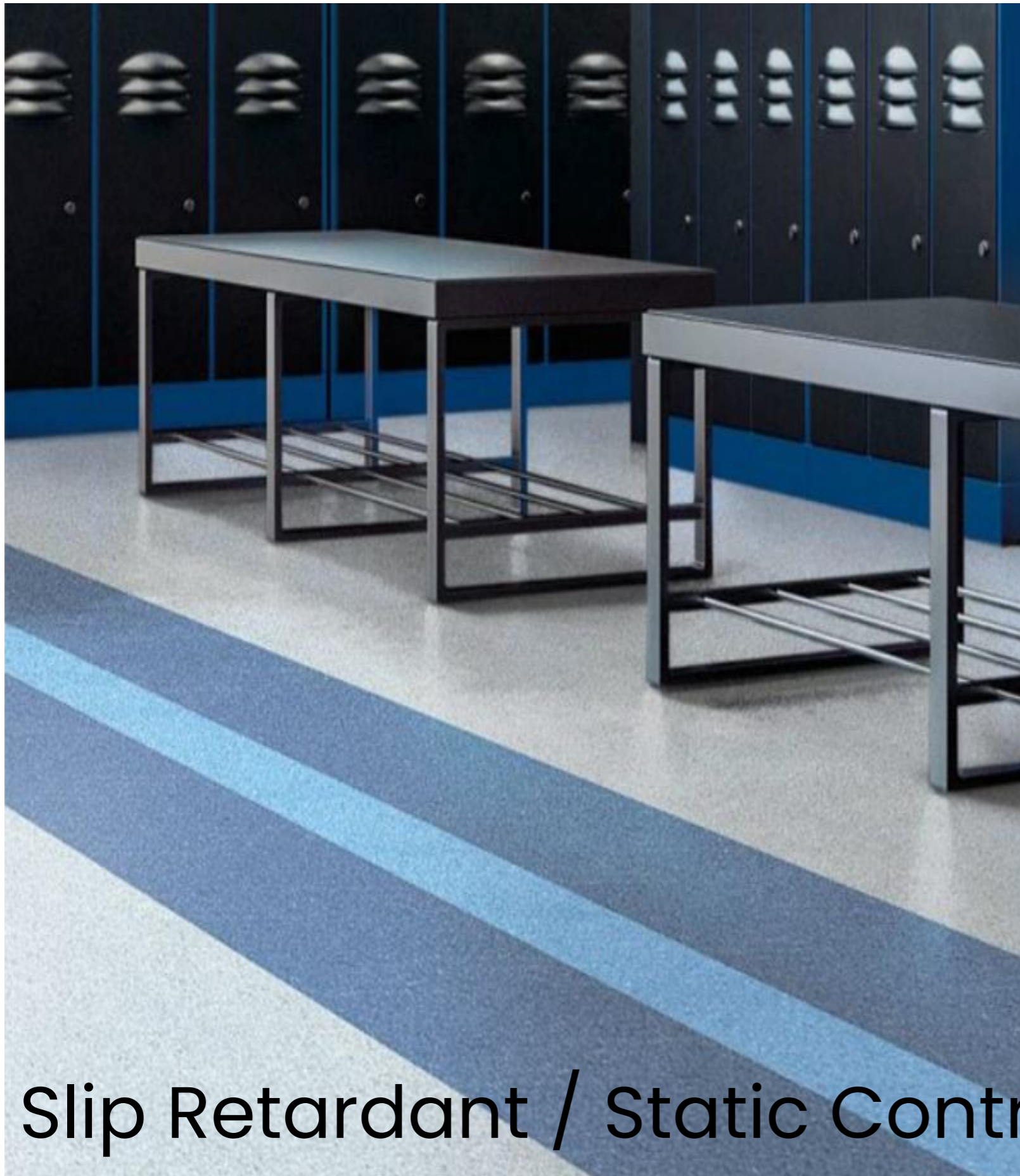
Sheet Vinyl



Solid Vinyl Tile



VCT



Slip Retardant / Static Control



Bio-Based



Specialty Flooring



Specialty Flooring



Carpet Tiles



Carpet

Moisture Prevention

The most commonly recurring and expensive flooring-related problem is moisture. North American commercial property owners spend \$1B on remediation from moisture-related flooring failures annually.

Highlights:

- Why these problems are increasing
- Effect of excessive moisture on flooring
- Where the moisture comes from
- How moisture behaves in concrete
- How to test for moisture
- How to prevent, survive and solve these problems

WHY MOISTURE PROBLEMS ARE INCREASING

- ▶ Water-based Adhesives (low VOCs)
- ▶ Impervious Flooring
- ▶ Accelerated Construction Schedules
- ▶ Missing or Damaged Vapor Barrier



GOOD FLOORS GONE BAD



A microscopic image showing a cross-section of a carpet tile. The top part is a dark, fibrous carpet pile. Below it is a thin, light-colored layer, likely the carpet backing. Underneath that is a thick, textured layer of emulsified adhesive, which appears as a complex, interconnected network of fibers and small droplets. The bottom part of the image shows a smooth, light-colored substrate, possibly a concrete or stone tile. A dark, irregular shape is visible on the left side, possibly a shadow or a defect in the adhesive layer.

EMULSIFIED ADHESIVES
UNDER CARPET TILE

WATER UNDER
CARPET TILE





LVP CUPPING

EFFLORESCENCE



MOLD UNDER LVP



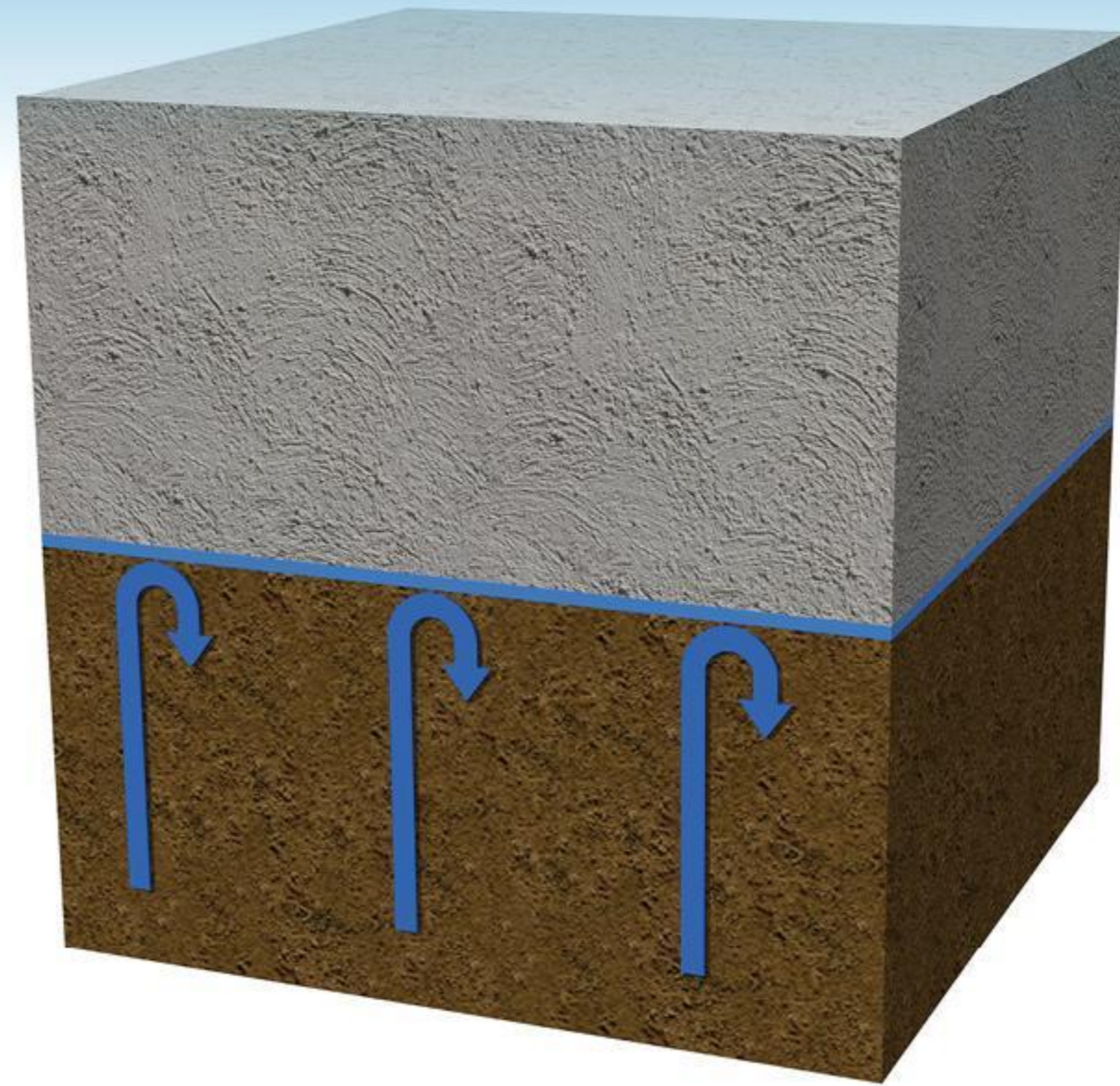
WHERE MOISTURE COMES FROM



SOURCES OF WATER

- ▶ The Earth Beneath the Slab
- ▶ The Air (Sweating Slab Syndrome)
- ▶ Water Pressure from Below
- ▶ Improperly Dried Concrete

THE EARTH BENEATH THE SLAB



WATER PRESSURE OR HYDROSTATIC PRESSURE



MOISTURE FORCED THROUGH SLAB



FAST TRACK CONSTRUCTION

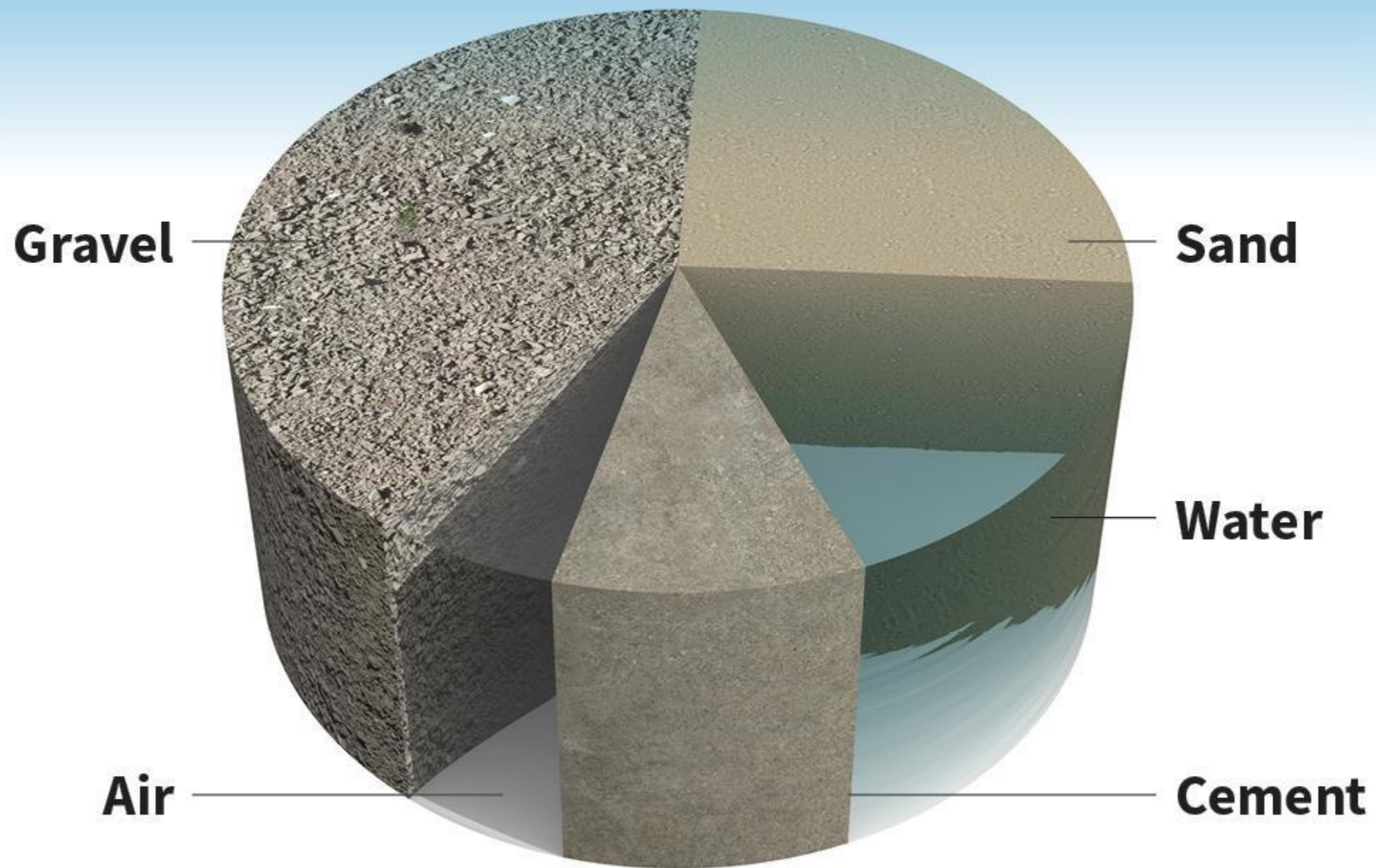


- ▶ Cost Overruns
- ▶ Construction Delays
- ▶ Liability Issues
- ▶ Damaged Reputation

HOW MOISTURE BEHAVES IN CONCRETE



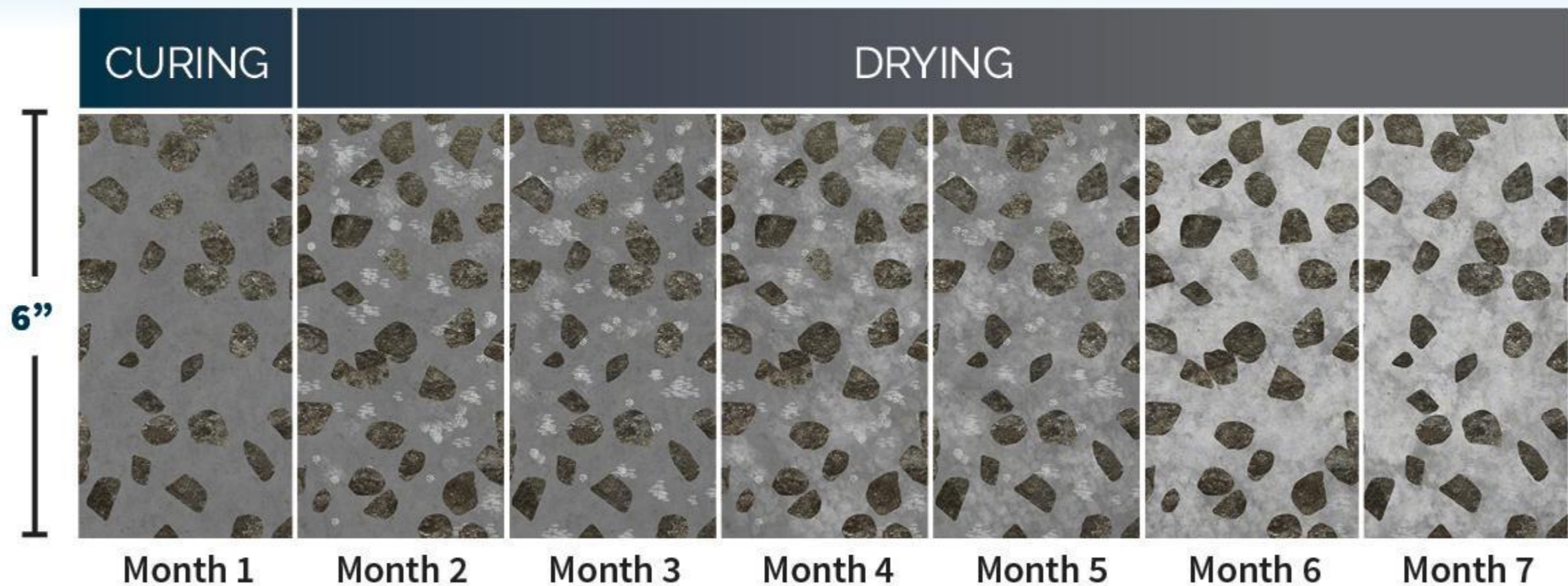
COMPONENTS OF CONCRETE



CURING THEN DRYING

CURING BUILDS STRENGTH—1 MONTH

DRYING PREPARES FOR FLOORING—1 MONTH/1 INCH



► 1 Month Curing + (1 Month Drying x 6" Deep of Concrete) = **7 Months To Completion**

MOISTURE TESTS

RH

Quantitative
Relative Humidity
ASTM F 2170-11



moisture in concrete



MVER (CaCl)

Moisture Vapor
Emission Rate
ASTM F 1869-11



*moisture moving out
of concrete*

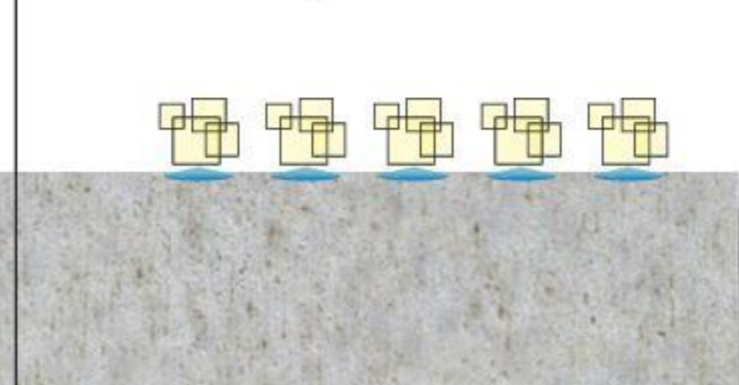


pH

Acidity or
Alkalinity
ASTM F 710-11

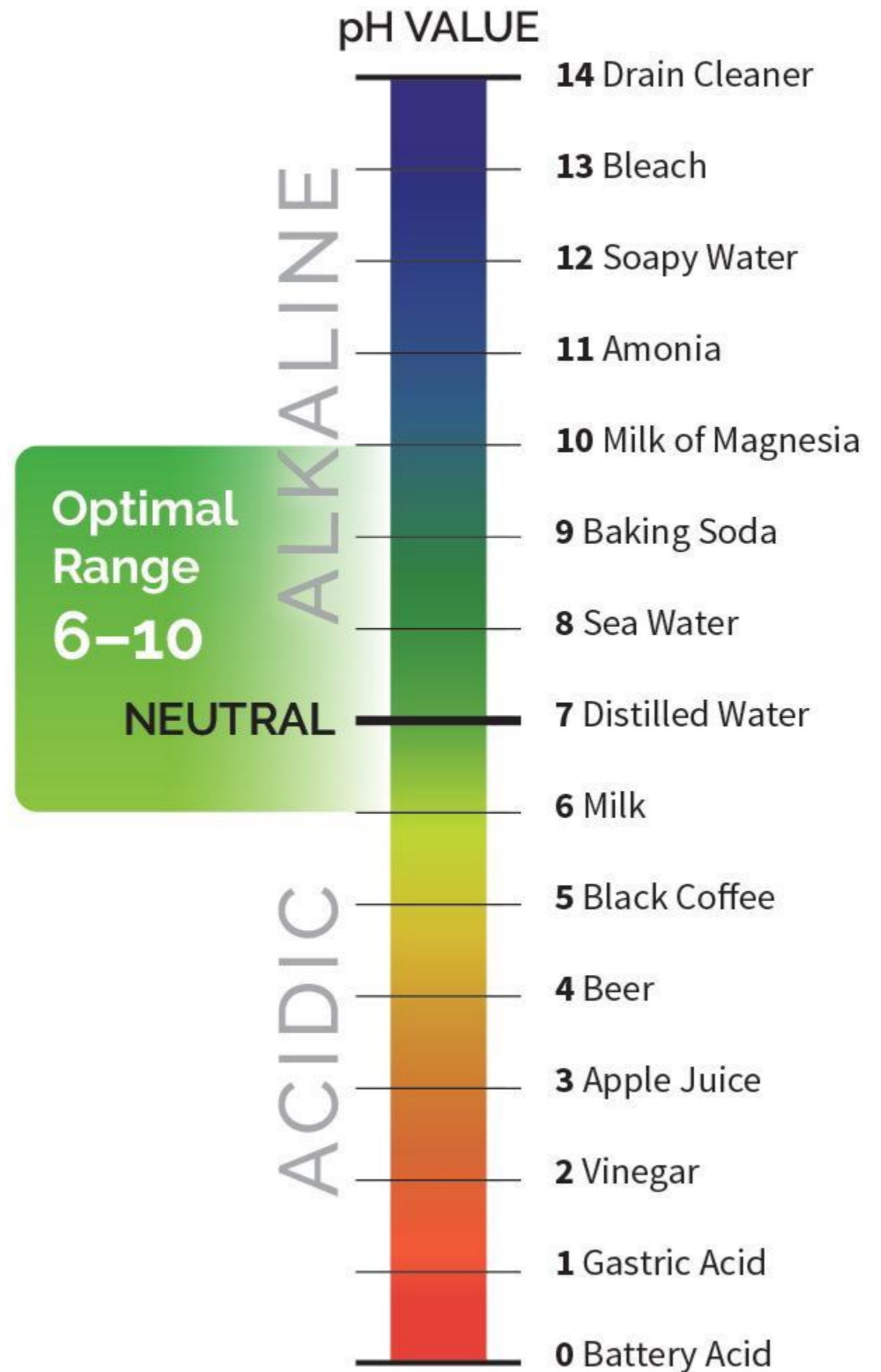


*resulting minerals
left behind*



WHAT IS pH? POWER OF HYDROGEN

COMMON PRODUCTS & THEIR pH VALUE



CONCRETE AND pH

12.5 pH



Initially
Too High

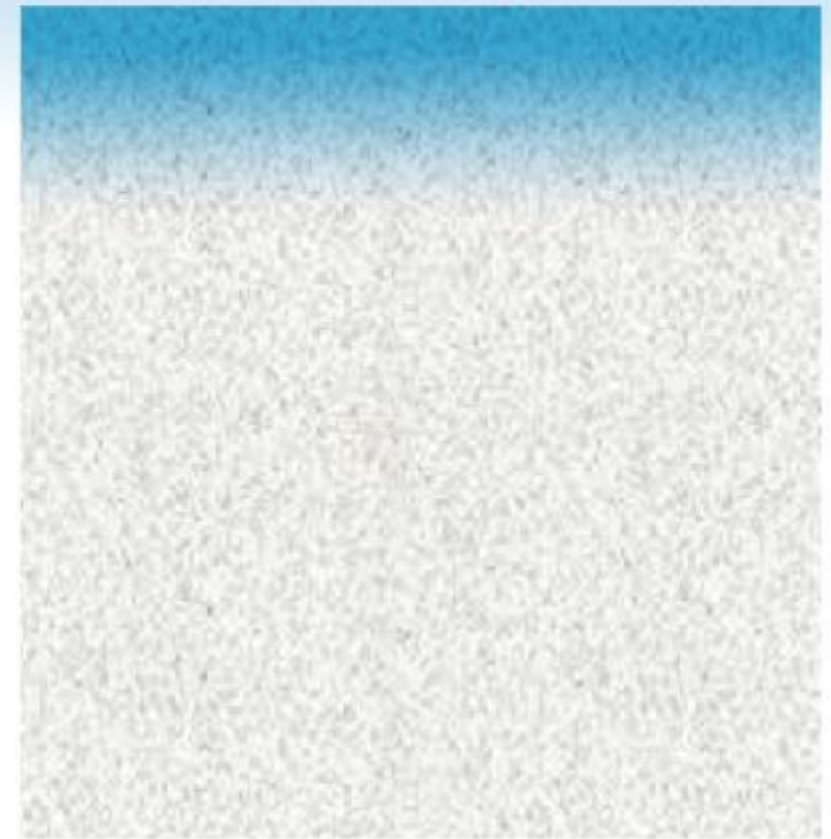
CO₂ Reacts with
Surface 8.5 pH

CARBONIZATION LAYER



Perfect

Extra Moisture Rises
Bringing Alkalies
10 - 14 pH



Need Special
Adhesives

3 OPTIONS

▶ Prevent Moisture

▶ Survive Moisture

▶ Solve Moisture



PREVENT MOISTURE

- 1.** Vapor Barrier Over Ground
- 2.** Dry Concrete 1 month/inch
- 3.** Moisture Vapor Barrier
on Concrete

SURVIVE MOISTURE

- 1.** Moisture-tolerant Patch or Skim Coat
- 2.** Moisture-tolerant Adhesives
- 3.** Breathable Floor Coverings
 - Broadloom
 - Cushioned Carpet Tile
- 4.** Rolled Moisture Barriers



MOISTURE- TOLERANT ADHESIVES

- ▶ Tolerate
90% to 100% RH
- ▶ Adhesive will hold
- ▶ Moisture is still present



BREATHEABLE FLOOR COVERINGS

- ▶ Some Broadloom
- ▶ Some Carpet Tile



HOW CUSHION TYPES COMPARE

BACKING

Hardback

PVC* Closed Cell Cushion

Urethane Open Cell Cushion

Fiber Matrix Cushion

WICKING ABILITY

None

Good

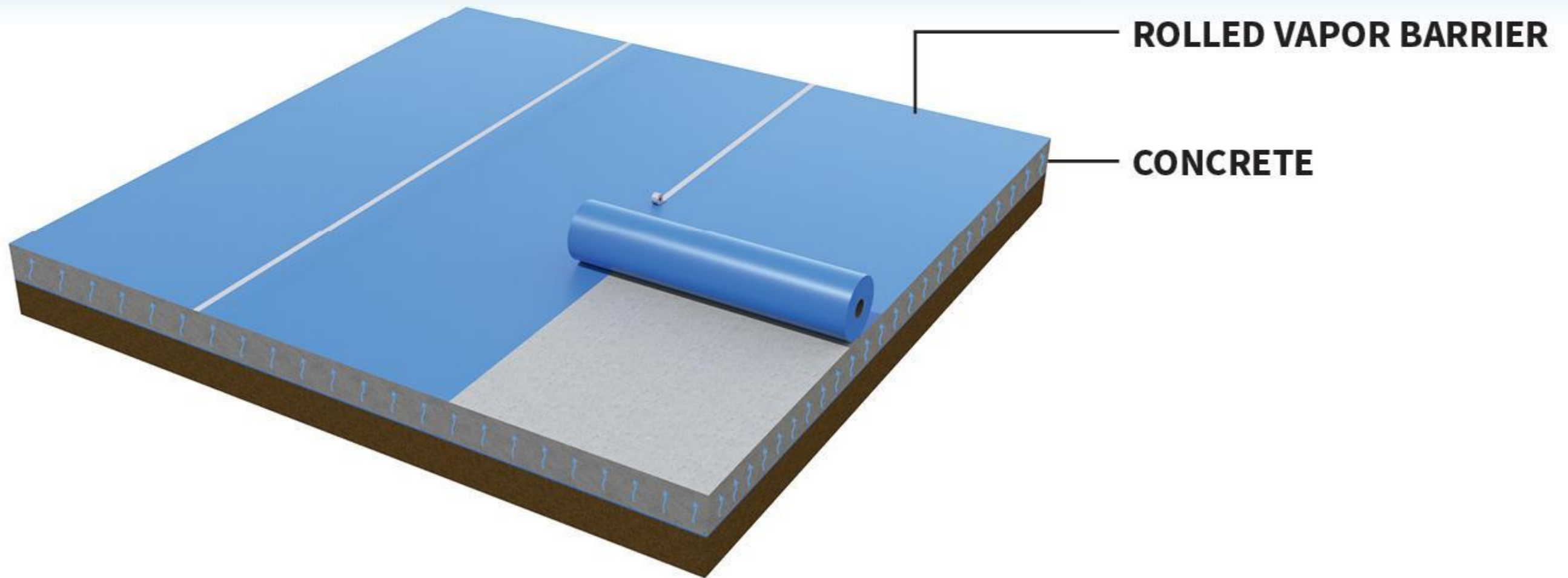
Better

Best



* Polyvinyl chloride

ROLLED VAPOR BARRIER



ROLLED MOISTURE BARRIER

Roll Out Barrier



Photos courtesy of Kovara

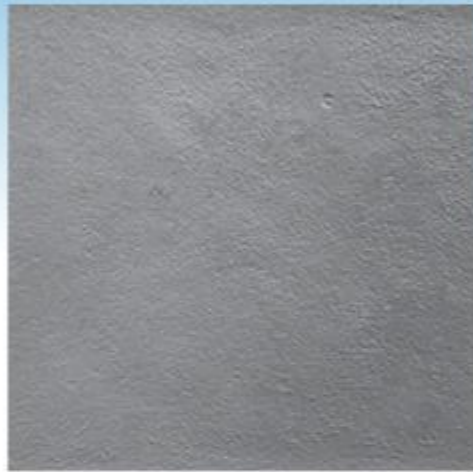
SOLVE THE PROBLEM

Options:

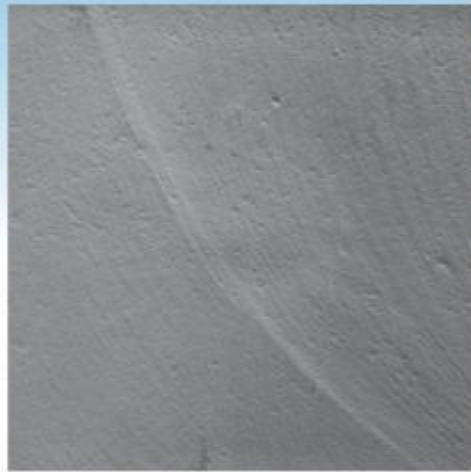
- Bead Blast
- Sprayed Moisture Barrier
- Poured Moisture Barrier



CONCRETE SURFACE PROFILES (CSP)



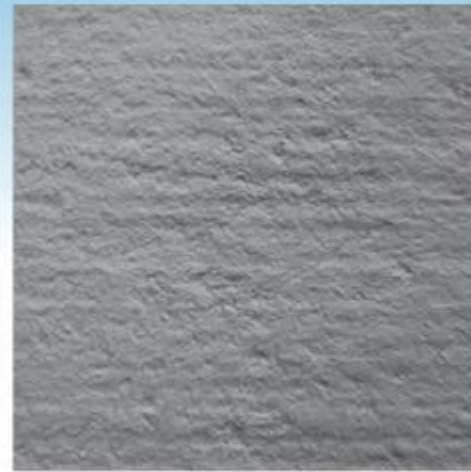
CSP 1
ACID ETCHED



CSP 2
GRINDING



CSP 3
LIGHT SHOTBLAST



CSP 4
LIGHT SCARIFICATION



CSP 5
MEDIUM SHOT BLAST



CSP 6
MEDIUM SCARIFICATION



CSP 7
HEAVY ABRASIVE BLAST



CSP 8
SCABBED



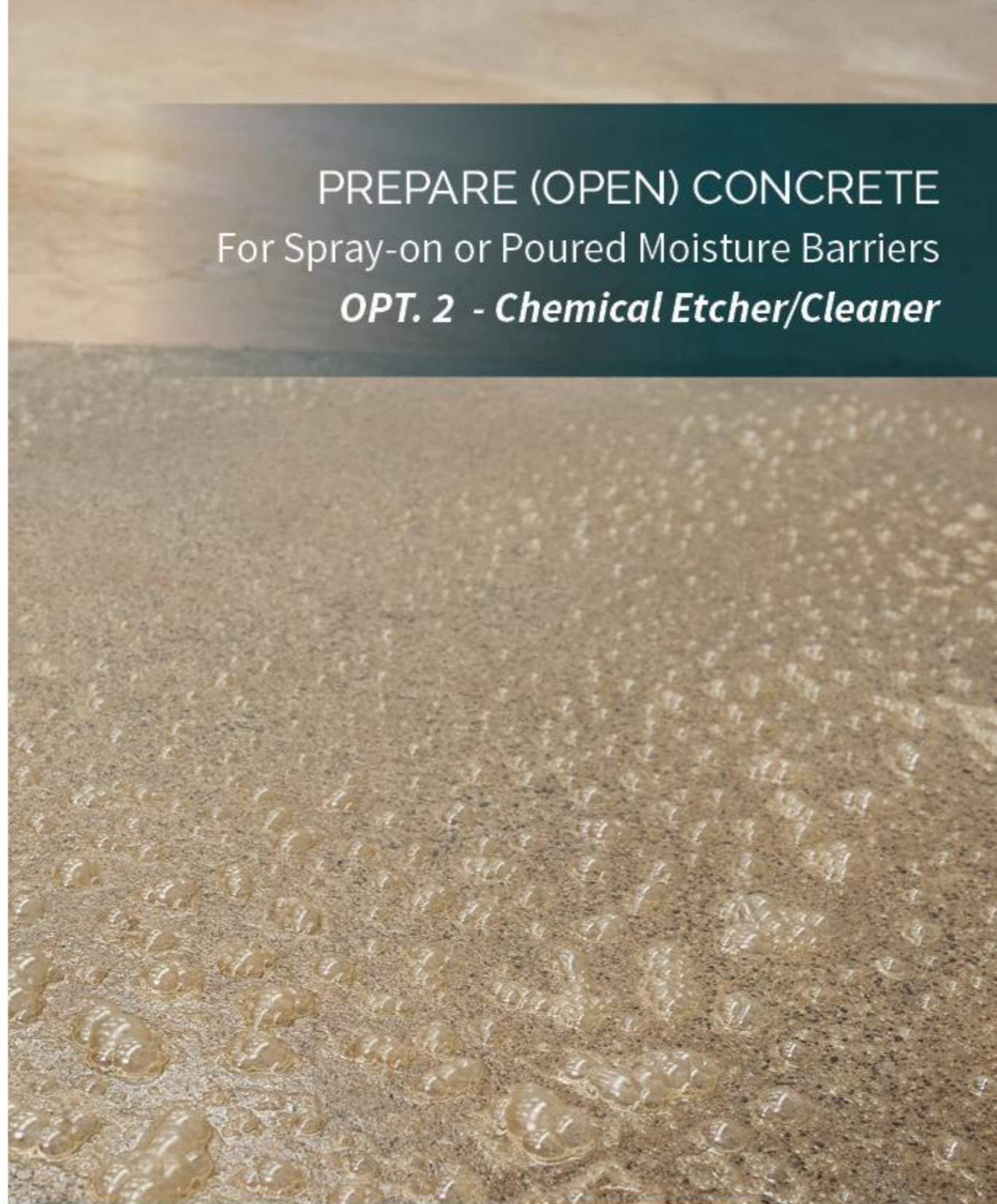
CSP 9
HEAVY SCARIFICATION



CSP 10
COURSE PLANING


PREPARE (OPEN) CONCRETE
For Spray-On or Poured Moisture Barriers
OPT. 1 - Beadblast and Vacuum





PREPARE (OPEN) CONCRETE
For Spray-on or Poured Moisture Barriers
OPT. 2 - Chemical Etcher/Cleaner

Spray on chemical etcher/cleaner then it starts reacting



PREPARE (OPEN) CONCRETE
For Spray-On or Poured Moisture Barriers
OPT. 2 - Chemical Etcher/Cleaner

Brush in/agitate then wait 2 hours



Rinse and vacuum twice, touch to determine when dry



SPRAY-ON MOISTURE BARRIER

Spray on application



Spray on to prepared concrete



SPRAY-ON MOISTURE BARRIER

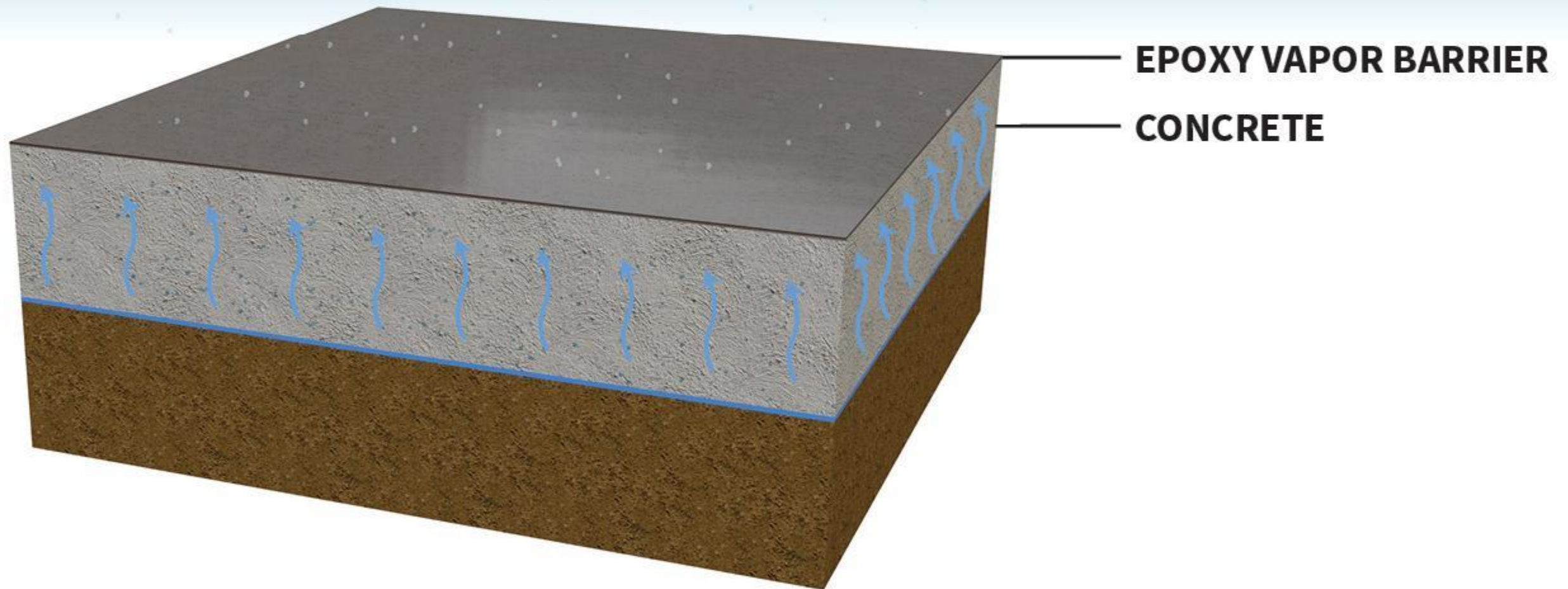
Spray on application

Brush in then dries clear



POURED MOISTURE BARRIER

PERMEABILITY = .08



POURED MOISTURE BARRIER
Back Rolling the Epoxy



Moisture Prevention

- New Construction:
 - Moisture Barrier Between Concrete and Ground
 - Dry Concrete 1 Month/Inch
- Existing:
 - Moisture Vapor Barrier on Top of Concrete

Survive Moisture

- Moisture-tolerant Adhesives
- Breathable Flooring
 - For Example Cushion Carpet Tile
- Rolled Moisture Barriers

Solve Moisture

- Spray-On Moisture Barrier
- Poured Moisture Barrier



THANK YOU!
AND PLEASE USE US AS A
RESOURCE
BEFORE YOU DESIGN OR
SPECIFY

Michael Eichhorn, AIA, LEED Speaker - Associate, PK-12 Education Planner - Wold Architects and Engineers

Michael Eichhorn has dedicated his 25 year career to PK-12 Public Education Facilities. He has extensive experience leading our team to successful results for small scale renovation projects to large high schools, and everything in between. He ensures Wold's designs and customer services are responsive, well-communicated and in alignment with our client's vision and goals. Michael advises and leads clients in long range facility planning, community engagement, and budgeting. He has presented at multiple IASBO annuals and active member of the IASBO PDC for Planning and Construction. m: 312-498-5056 meichhorn@woldae.com



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Robin leads clients in a customized design process that transforms their mission and purpose into meaningful, budget-conscious, forward-thinking learning environments. She builds exceptional collaborative teams around projects including master plans, facilities assessments, renovations, and new educational facilities. For over 30 years, Robin has designed and planned award-winning educational facilities ranging from early learning centers to high schools, as well as specialty learning environments. She regularly applies her research to her Legat practice with think tanks, competitions, workshops, and evidence-based design projects. 630 645 1923 RRandall@legat.com



Kieren Corcoran - Director of Performance Markets, Patcraft

Kieren has 20+ years experience in marketing flooring and is currently Director of Marketing for institutional markets with the Patcraft Brand of Shaw Industries. At Patcraft, Kieren works to develop flooring solutions across the complex value chain of end users, facility managers and architectural firms by providing leadership and lateral influence to a cross-functional team. Kieren is inspired by understanding user needs and expectations to create evidence-based solutions and transform their space and experience. m: 404.771.2700 kieren.corcoran@patcraft.com



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