

SPECIFICATION STRATEGIES TO ELIMINATE CONCRETE MOISTURE

*Aligning specification language
to fulfill the owner's requirements*

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Principal



AIA course: [ISL03H](#)

1 AIA LU/HSW CE Hour

VARIOUS REFERENCES



Project Delivery Practice Guide

Construction Specifications Practice Guide

Construction Contract Administration Guide

ACI 302.2R-06: Guide to Concrete Slabs that Receive Moisture-Sensitive Flooring Materials



A “best practice” is the belief that there is a technique, method or process that is more effective at delivering a particular outcome than any other

With proper processes (specifications) a desired outcome can be delivered with fewer problems and unforeseen complications.

DISCLAIMER

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Course number: **ISL03H**

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



POLL QUESTION 1

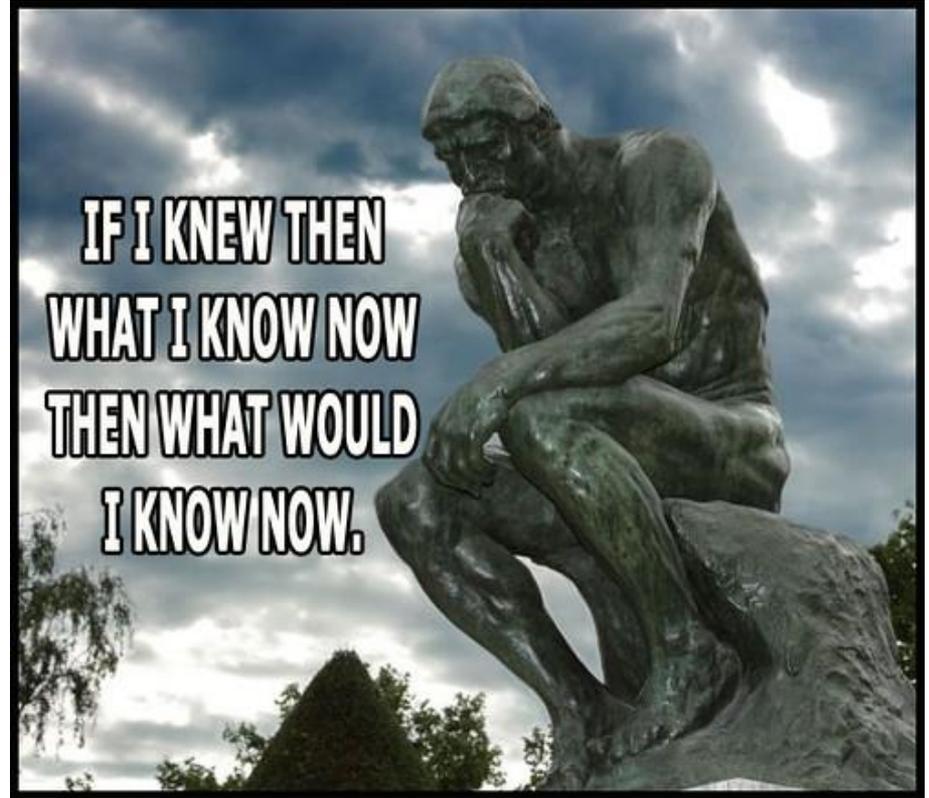


I have had projects delayed, or incur additional costs, due to excessive moisture test results right before flooring.



YES or No

*IS THIS COURSE FOR
YOU?*



IT IS IF YOU...



Write or oversee project specifications.



Have projects with concrete slabs.

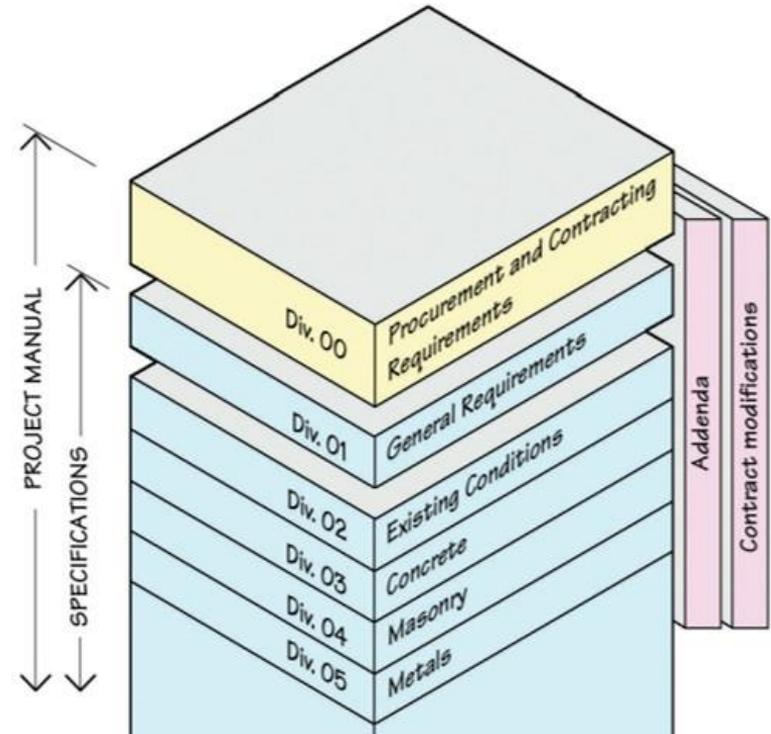


Have projects with or that will have flooring installed on concrete.



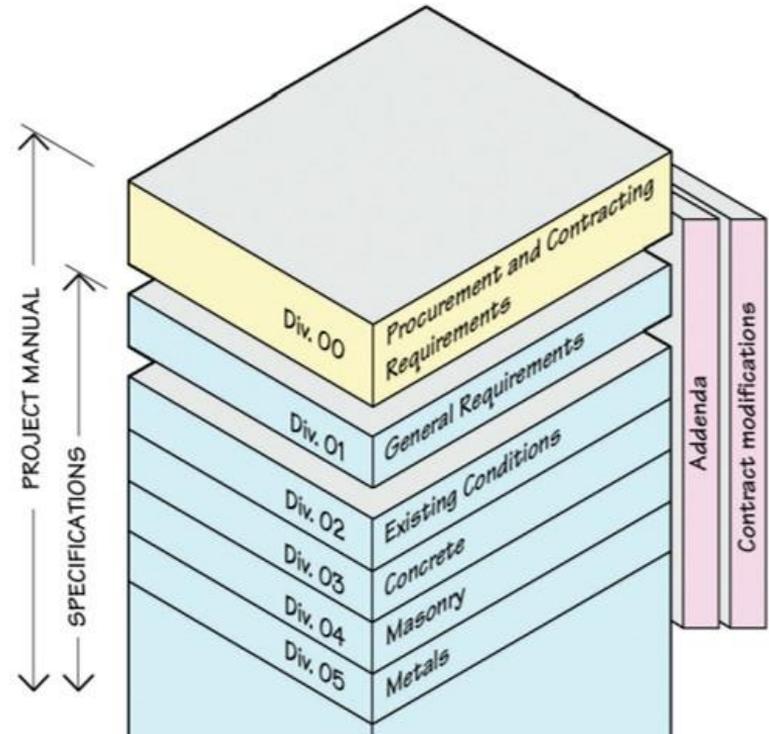
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WHAT IS A SPECIFICATION



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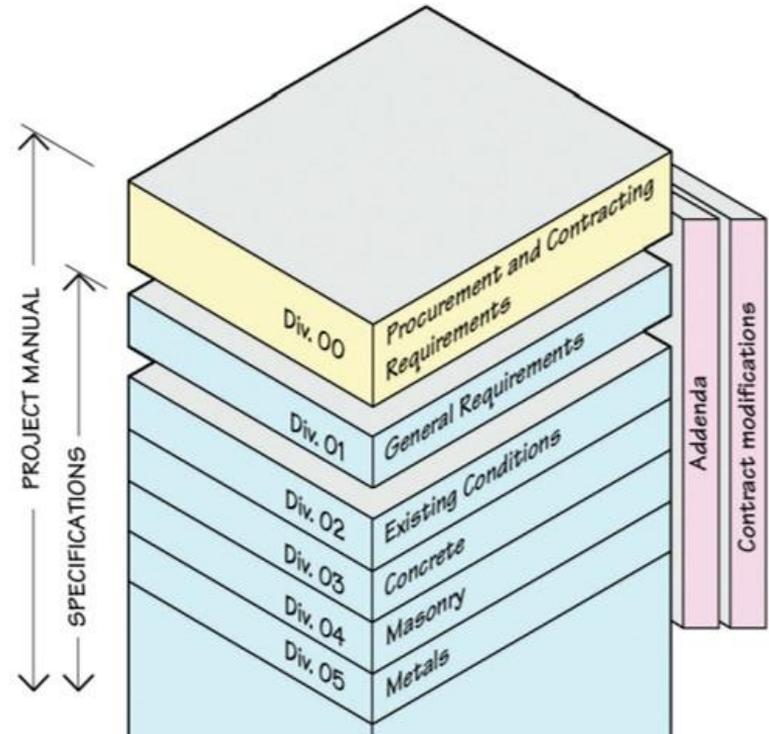


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According to the American Institute of Architects:

- “The Architect and the Architect’s consultants shall be deemed the authors...of their...Specifications...” (AIA 201 – 2017).
- specifications are part of the contract documents between the owner and the contractor (AIA 201 – 2017).



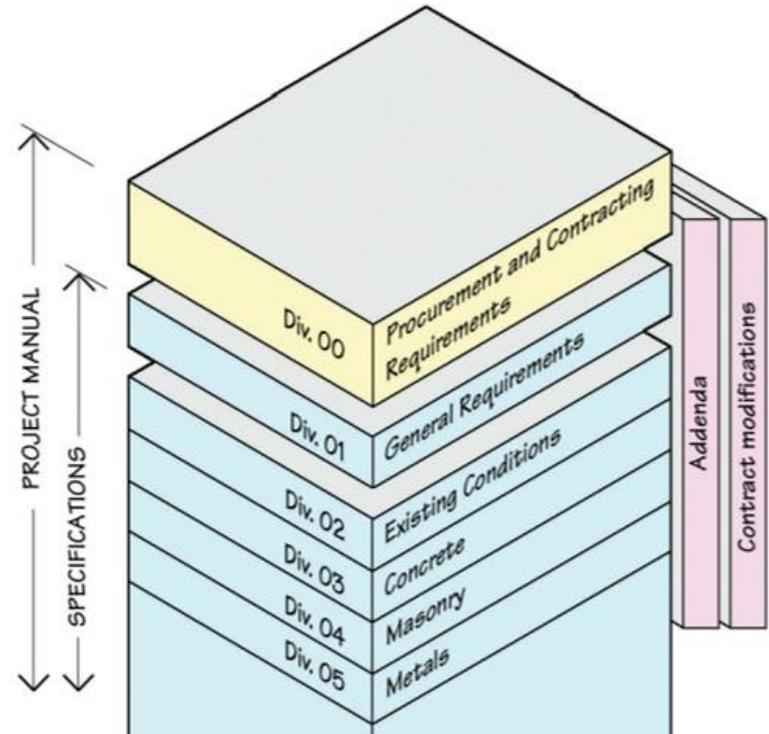
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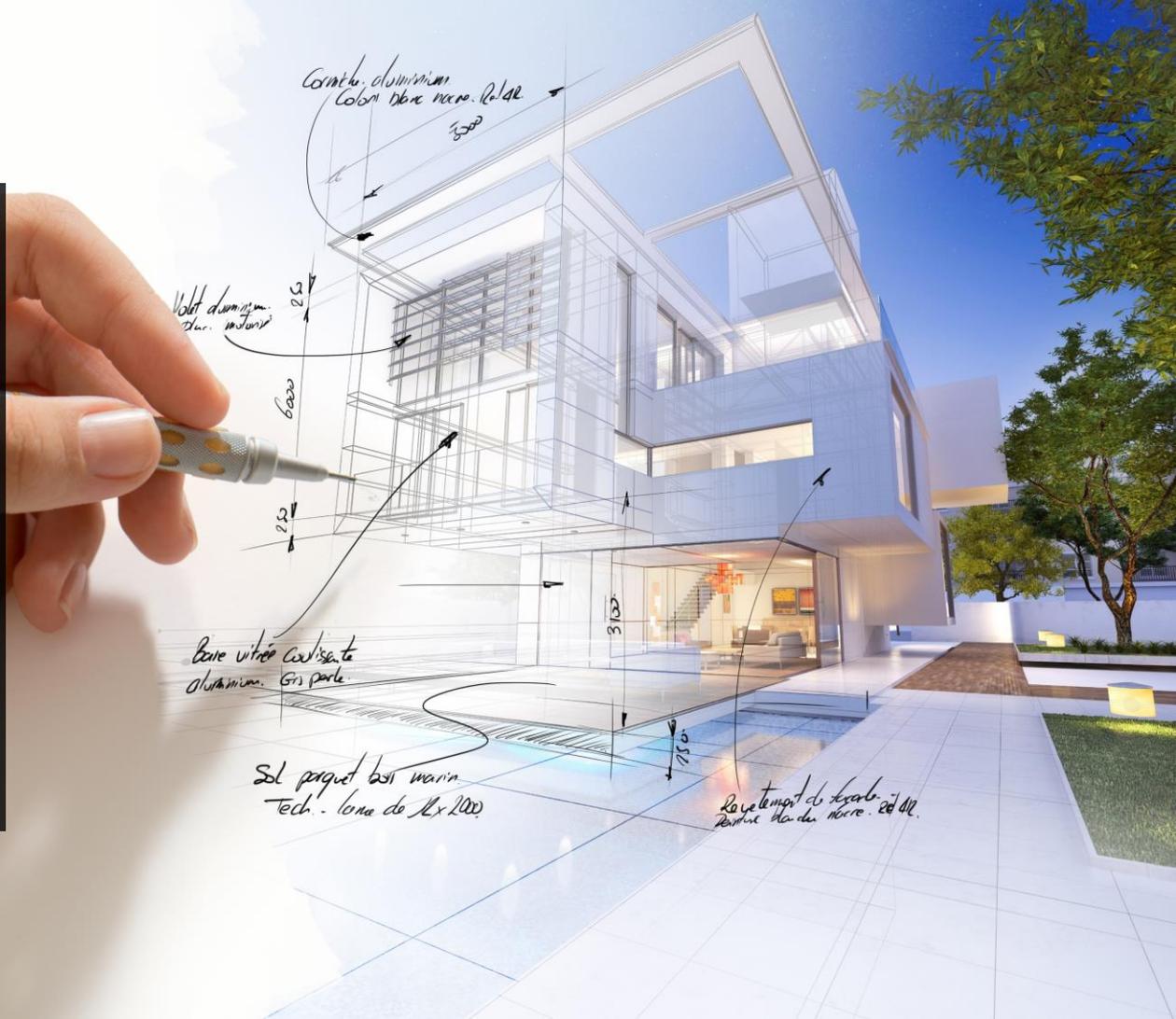
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Specifications can serve as a “legal safety net”: *If a contractor is required to build according to plans and specifications prepared by the owner, or the owner’s representative, then the contractor will not be responsible for the consequences of defects in the plans and specifications (Spearin Doctrine).*



THE
"DECISION TO
BUILD"
SOMETHING
INITIATES THE
PROCESS



PROJECT CONCEPTION

- An owner decides to build something (... or renovate, re-purpose, recondition, etc.)¹
- ‘**Design intent**’ is conveyed – “...a detailed explanation of the ideas, concepts, and **criteria** that are **defined by the owner** to be important”²

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- ‘Design intent’ is conveyed – “...a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important”²
- “...owner’s *project requirements* are determined”...from the overall project “design intent”³
- ²[Designing Buildings Wiki](#). September 2019.
- ^{1,3}[Project Delivery Practice Guide, 2nd ed.](#)

CSI'S PROJECT DELIVERY PRACTICE GUIDE

- “The *success of a project* depends on well-developed project requirements.”¹

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- “If the *project requirements* are not fully identified, there is a strong likelihood that the owner’s expectations will **not** be met.”²

CSI'S PROJECT DELIVERY AND CCCA PRACTICE GUIDES

- “The *success of a project* depends on well-developed project requirements.”¹
- “The *goal of every project delivery team* is:
 - for the facility (the project) to *meet the owner's expectations*,
 - be completed *on time*, and
 - for construction costs *at, or below*, the owner's *budget*.”³
- “Successful project”:
 - On time
 - Within budget
 - All claims resolved

PROJECT DELIVERY



COST: Delivering at or below budget

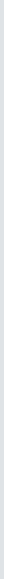
One of the most important considerations during the planning for a project is anticipating what the new facility will cost to design, construct, and occupy and then preparing a realistic budget and sticking to it.

TIME: Delivering the project on schedule

Similarly, a well-prepared project and realistic schedule which is derived from project requirements can make the difference between a project that progresses smoothly and one that is characterized by delays and other problems.

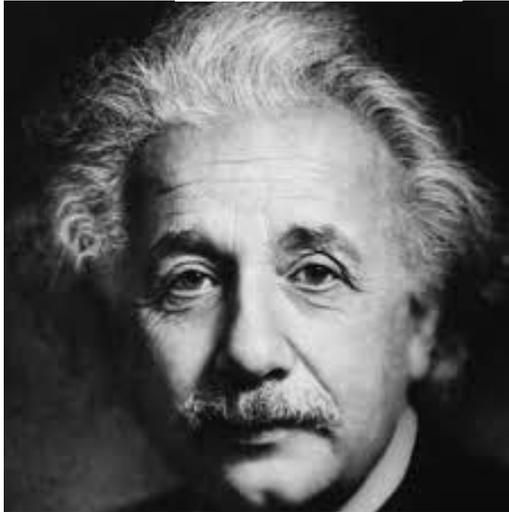
Errors in documents or construction = extra cost and/or time

Extra time = extra money (e.g. financing, loss of use)



*MACRO
SPECIFICATION
POINTS TO REMEMBER*

ALL SPECIFICATION SECTIONS



Things to think about when writing specifications

“The architect and/or their consultants are considered to be the author of the specification” (AIA or American Institute of Architects).

This implies opportunity, responsibility as well as liability.

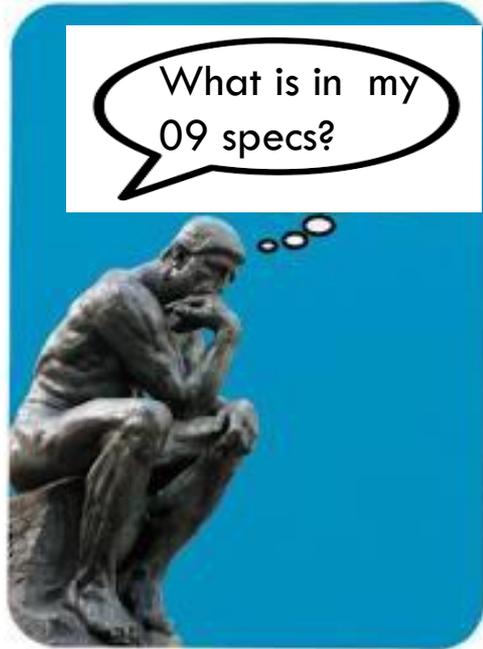
“If a material is inexpensive, it does not mean that the installation is as well, or vice versa” (CSI)

Specifiers should research cost for value for all materials.

“Manufacturers’ suggested guide specifications must be reviewed carefully for bias” (CSI)

While most manufacturers make honest claims, all products and any alternatives should still be researched by the specifier.

ALL SPECIFICATION SECTIONS



Things to think about when writing specifications

“Reference standards are referred to in the specification just as though included in their entirety.” (CSI)

In other words, every word in a referenced standard is included in the specification itself. Specifiers should familiarize themselves with the standards they are referencing in order to realize what they are asking for.

“It is necessary to determine if there are alternate installation methods that must be designated into the specs.” (CSI)

Technologies, methodologies and product compositions change constantly and the specifier should remain current on which processes are available.



***IMPACT OF
SPECIFICATION
LANGUAGE ON
FLOORING***

POLL QUESTION 2



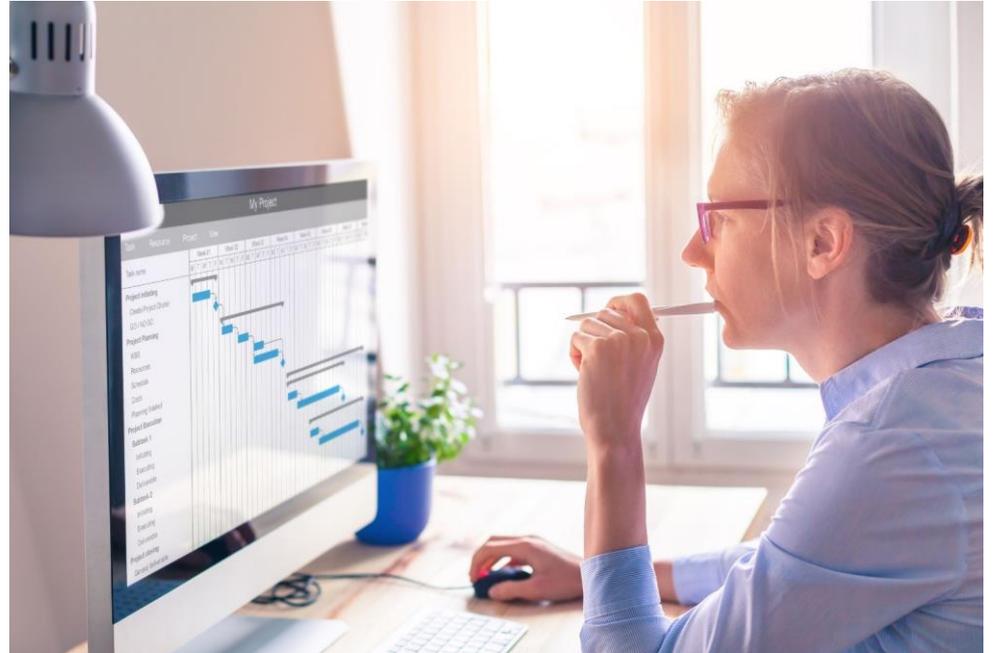
I have been taught or told that if concrete moisture is high there will be no flooring warranty.



YES or No

FLOORING IMPACT ON PROJECT SCHEDULE

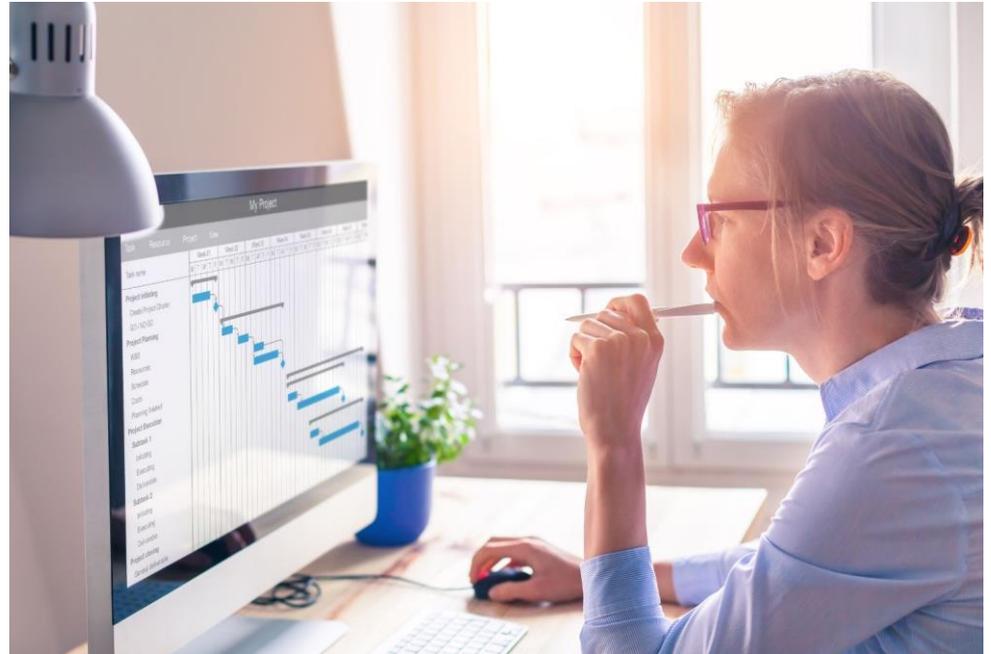
Failed slab moisture tests can delay flooring installation, result in an expensive change order, or both.



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Because flooring often occurs at the end of a project schedule, delays in flooring can negatively impact the entire project delivery schedule.

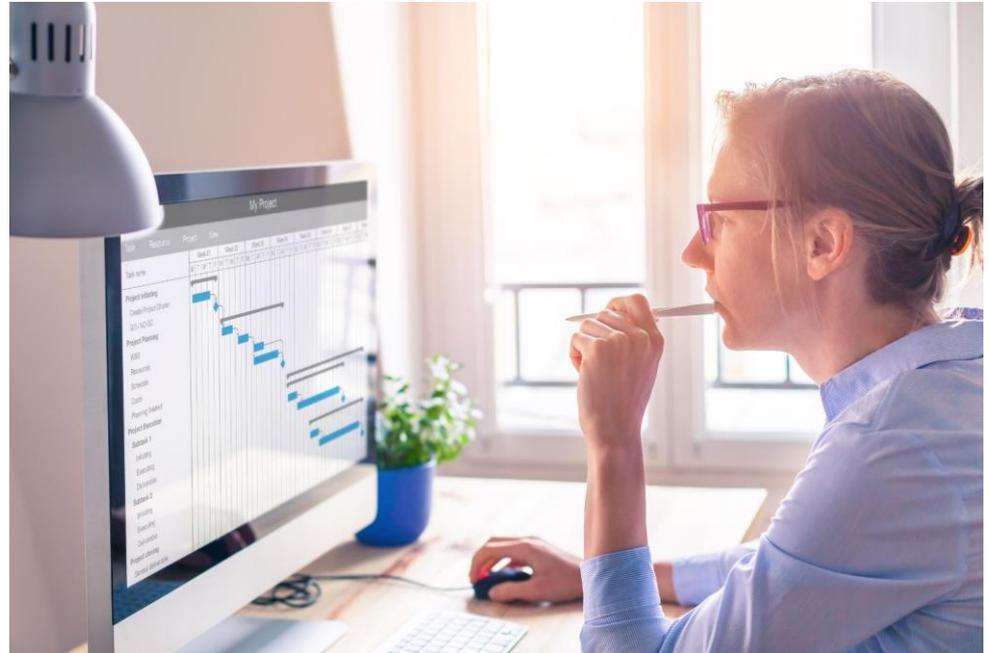


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Failed moisture tests can therefore negatively impact “project success” by negating “on time” AND “within budget”.



REFERENCES IMPACTING FLOORING INSTALLATION (SOME)

- Carpet and Rug Institute Standard For Installation of Commercial Carpet (CRI 104)
- ASTM F710: Standard Practice for Preparing a Concrete Slab to Receive Resilient Flooring
- Resilient Floor Covering Institute Recommended Installation Practices (RFCI - various)
- Manufacturers' instructions

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- Manufacturers' instructions – take precedence over the above
- *Has anyone read all of these???*

WHAT FLOORING TYPES REQUIRE TESTING?

Carpet – Tile	Resilient Sheet
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Ceramic Tile	Resinous
w/crack suppression membrane	Resinous Matrix Terrazzo
Cork	Rigid Core Vinyl
Electro-Static Dissipative	Rubber – Sheet
Fluid-Applied Athletic	Rubber – Tile
Laminate	Vinyl Composition Tile (VCT)
Linoleum	Vinyl Enhanced Tile (VET) Bio-Based
Luxury Vinyl Plank (LVP)	Wood Athletic
Luxury Vinyl Tile (LVT)	Wood - Engineered

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Pretty much all of them

VARIOUS SLAB MOISTURE TEST METHODS

ASTM F1869 (1998)



ASTM F2170 (2002)



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REQUIRED SITE CONDITIONS

...**shall** be at average ambient temp and RH that will be typically found in a building's occupied space during normal use 48 hours before and throughout test



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...**shall** be at average ambient temp and RH that will be typically found in a building's occupied space during normal use 48 hours before and throughout test (*how many projects can do this?*)



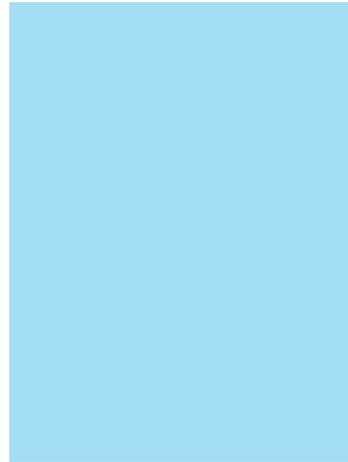
WHAT DO THESE TESTS MEASURE?

ASTM F2170 (2018):

5.3 “Moisture test results indicate the moisture condition of the slab only at the **time of the test** and in the **specific locations tested**”

ASTM F1869 (2016):

4.1 “The results obtained reflect the condition of the concrete floor surface at the **time of testing** and may not indicate **future conditions.**”



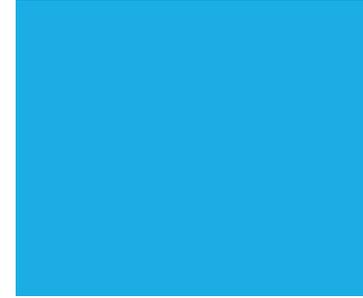
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POLL QUESTION 3



What event most directly impacts the field moisture test result.



The time the water hits the cement at batching.



The date the concrete was placed.



The last “wetting” of the slab.

DRYING DOES NOT BEGIN UNTIL SPACE IS CONTROLLED

If the concrete is exposed to wetting (waterproof roof and walls not present during construction of the concrete slab) drying will be delayed. Using a low-w/cm concrete to reduce the time needed for slab drying is of doubtful value if the slab will be exposed to weather for 3 to 9 months after placement. **The required concrete drying time is as much related to the time of the last wetting as it is to the original w/cm.***

**ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials*



WHAT IS THE VERY LAST “RE-WETTING”???

***Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials; p. 21.**

Paragraph 4.4.5 ***Adhesive Water***

“The water in water-based flooring adhesives can have an immediate effect on the pH of the concrete surface.”

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Paragraph 4.4.5 **Adhesive Water**

“The water in water-based flooring adhesives can have an immediate effect on the pH of the concrete surface.”

*“A few minutes after the adhesive had been applied, the surface pH rose from 9 to 11.5. This indicated that **alkalis had been brought into solution quite quickly**, exposing the adhesive to a high pH environment that was **unrelated to concrete mixing water or external moisture sources other than the adhesive.**”*

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So...what is the last re-wetting?

The literature has told us for 15 years that it is the application of the adhesive.

What does THAT do to the RH of the concrete RIGHT before flooring???

PROJECTS IN DESIGN SHOULD EXPECT FAILED MOISTURE TESTS

“...unless many months of very favorable interior drying conditions are provided (meaning...HVAC running), it will be difficult for a concrete slab to reach the moisture levels...required...”

Another Look at the Drying of Lightweight Concrete (2012)

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Which projects do not have...reiterating concrete likely will not pass

Another Look at the Drying of Lightweight Concrete (2012)

ALL FOR AN ISSUE NOT CORRELATED TO FLOORING ADHESION

A report on recent testing that attempted to correlate moisture in the concrete with floor covering performance concluded that: “The evidence presented suggests that there is **no relationship between the relative humidity of a concrete base or screed and adhesion of resilient floor coverings**” (The Concrete Society 2004).

***Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials; p. 18.**

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While moisture criteria are often used, the relationship between these criteria and floor covering performance is not well understood.

***Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials; p. 18.**

FAILURES DUE TO MOISTURE ARE EXPLICITLY EXCLUDED

“<Manufacturer>’s limited replacement warranty shall not cover...moisture...”

“Failure of the floor to adhere to the subfloor due to, for example, moisture...”

“This warranty does not cover...excessive moisture...”

“...not responsible for product failure as a result of changes to sub floor conditions, including increases in moisture and pH levels, post installation.”

SPECIFICATIONS

A few

Cases

*ACTUAL MANUFACTURER
LANGUAGE*

#1: “INSTALL PER MANUFACTURER’S INSTRUCTIONS”

- “...testing...per ASTM F2170...is mandatory” (75% or 85% RH)
- “If...results exceed...maximum...installation *must not proceed until either...moisture content...* drops to...acceptable level *or* an...ASTM F3010...” moisture mitigation system is used (*most expensive means to address*) & (RH \neq “moisture content”)
- “...responsibility of...installer to determine...suitability of...substrate...” (*subcontractor in charge???*)
- “The use of any other manufacturer’s adhesive is not permitted and will void the warranty.” (*further limiting project options*)

#1: THAT SAME MANUFACTURER'S WARRANTY

- Moisture testing, when applicable, at the installation site is *not the responsibility of <manufacturer>*, and issues, problems or damage related to or arising from excessive moisture are specifically excluded from this warranty...”

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- After that manufacturer specifically directed:
 - What test to use
 - What limit to reach
 - Who is responsible to assess
 - How to address if/when results are excessive

#2: “INSTALL PER MANUFACTURER’S INSTRUCTIONS”

- “Perform either the preferred...RH Test (ASTM F2170) or the acceptable...MVER Test (ASTM F1869)”
- “Failing to use <manufacturer’s> adhesives will void all applicable warranty coverage”. *(further limiting project options)*
- “Concrete subfloors that exceed adhesive specifications...require a Moisture Suppressant System.” *(no other option)*
- “...suggests...ASTM F3010...” moisture suppressant systems
- “...final responsibility for determining if the concrete is dry enough for <flooring> installation...lies with the floor covering installer.”

#2: THAT SAME MANUFACTURER'S WARRANTY

- “*Problems due to moisture*, mildew, alkaline substances, or hydrostatic pressure in the sub-floor are not covered by this warranty.”

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TESTING AND WARRANTY LIMITATIONS

Testing does not protect the project team.

ASTM F710 – 17 states in Para. 7.3:

“It is the project design team’s responsibility to determine the presence, quality, and location of a below-slab vapor retarder.”

This information, along with the concrete slab moisture test results, will then be used by the design team to assess the risk of a moisture-related flooring problem and determine an appropriate approach.”



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Yet this same ASTM standard states in paragraph 1.5: *“**This practice does not supersede in any manner the resilient flooring or adhesive manufacturer’s written instructions.**”*



What to do?

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 3. Strive for moisture limits that are not achievable
 4. Mitigate with the most expensive option available

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*Specification Strategies to
Eliminate Concrete Moisture*

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Remove Project Concern for Flooring Warranties

REMOVE PROJECT CONCERN FOR FLOORING WARRANTIES

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- Special Warranty for *<insert flooring system material>*:
Manufacturer's standard form in which *manufacturer agrees to repair or replace components of installation that fail due to defects in materials, or due to a manufacturing defect within the adhesive* during the specified warranty period.

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 - A. Warranty does not include deterioration or failure of substrate, *excessive substrate moisture*, vandalism, or abuse.

REMOVE PROJECT CONCERN FOR FLOORING WARRANTIES

- Require *installation warranties* in the 09 Spec Sections

REMOVE PROJECT CONCERN FOR FLOORING WARRANTIES

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- Installation Warranty: *<Insert flooring system material>* installation organization *shall warrant the quality of workmanship to be professional and in keeping with industry standards.*

REMOVE PROJECT CONCERN FOR FLOORING WARRANTIES

- Require installation warranties in the 09 Spec Sections
- Installation Warranty: *<Insert flooring system material>* installation organization shall warrant the quality of workmanship to be professional and in keeping with industry standards.
 - A. Conditions such as lack of climate control after installation, improper maintenance or cleaning, abuse, movement or warping of the substrate, *excessive substrate moisture*, vandalism, alterations, and subfloor hydrostatic pressure are not subject to this warranty.

*Specification Strategies to
Eliminate Concrete Moisture*

Remove Project Liability for Concrete Moisture

REMOVE PROJECT LIABILITY FOR CONCRETE MOISTURE

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 - Not warranted
 - Not directly associated with adhesion
 - And likely not even achievable

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- Remove field moisture testing as a pre-flooring installation requirement from the project specification
- The warranty language in Part 1 ensures all warranties convey

*Specification Strategies to
Eliminate Concrete Moisture*

Remove Potential Unknowns w/Component Products

REMOVE POTENTIAL UNKNOWNNS W/COMPONENT PRODUCTS

- Specification language such as: “...*use an adhesive* (primer, thin set, underlayment, etc.) *recommended by manufacturer*” may lead to unanticipated change orders and project delays

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- Specification language such as: “...*use an adhesive* (primer, thin set, underlayment, etc.) *suitable for substrate conditions and compatible with flooring backing*” enables a much wider array of options for the project team if faced with situations that were not known in design such as substrate surface porosity conditions and even high moisture

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*Specification Strategies to
Eliminate Concrete Moisture
Division 1 Summary of Work*

DIVISION 1 SUMMARY OF WORK

CONCRETE SLAB MOISTURE MITIGATION

- The concrete slabs for this project are scheduled to incorporate a moisture vapor reduction admixture (MVRA) as outlined in Section 03 30 00 Cast-In-Place Concrete.
- This admixture is designed to disrupt the integral slab capillary system and form a permanent barrier for vapor transmission to the surface of the slab.
- Each flooring Contractor shall be solely responsible to determine if this admixture is sufficient for the proper application of their flooring and/or adhesive

DIVISION 1 SUMMARY OF WORK

CONCRETE SLAB MOISTURE MITIGATION (cont.)

- Any additional remedial action required to install a flooring product will be the responsibility and at the cost of the flooring Trade Contractor.
- All flooring Contractors, including those for ventilated wood floors, shall allow for this admixture when considering their bid proposal and how they will install their floor product, especially those that are installed with an adhesive.

DIVISION 1 SUMMARY OF WORK

CONCRETE SLAB MOISTURE MITIGATION (cont.)

- The Contractor may, at his own cost, install supplementary coatings on the slab on grade if the presence of the MVRA additive is contrary to their standard methods of installation.
- Under no condition may any adhesive applied flooring product be installed with a double-faced tape or similar product
- No further field moisture testing per ASTM F2170 nor ASTM F1869 shall be required.

SPECIFICATION STRATEGIES TO ELIMINATE CONCRETE MOISTURE

The AIA portion has ended



AIA course: ISL03H

1 AIA LU/HSW CE Hour

Concrete Moisture Mitigation Solutions



www.iselogik.com



Designed to be used for moisture mitigation in new concrete that receives coverings and coatings

MVRA 900

MVRA 900



FEATURES

- Proactive concrete moisture control dosed at the time of concrete batching
- Warranted to 100% RH
- No Moisture Testing Required
- ASTM C494 Type S Certified
- Use in Both Normal and Light Weight Concrete
- HPD (Health Product Declaration) Certified
- Cross Compatibility Warranty with Taylor Adhesive
- Permanent and Integral

MVRA 900



ADHESIVE COMPATIBILITY

Multiple classes of Taylor adhesives were applied on days 4, 7, 14 and 21 and allowed to fully cure.

No discernible bond strength discrepancies were observed between the control and MVRA 900 treated concrete.



MVBA 500

MVBA 500

FEATURES

MVBA 500™

UNLIMITED MOISTURE VAPOR BARRIER
HARD-SET RESILIENT FLOORING ADHESIVE



PRODUCT BENEFITS

- Simple 1-part system (modified urethane)
- Strong early grab, fast-curing formula
- High-strength, waterproof bond
- Self-leveling technology reduces telegraphing
- LEED v4.1 contributing
 - VOC content 0.1 g/L (meets SCAQMD Rule 1168)
 - CDPH/EHLB Standard Method v1.2
 - Does not contain methylene chloride or perchloroethylene
 - Contributes to low emitting materials

APPROVED FLOORING TYPES

- LVT/LVP
- Sheet goods (vinyl, homogeneous, heterogeneous, fiberglass, felt-backed)
- Rubber (tile and sheet)
- Linoleum
- WPC/WSC
- Cork-backed hard surface
- Cork flooring
- Cork underlayment
- VCT/VET
- Stair treads (rubber and vinyl)

APPLICATION METHODS

- 150-260 sf/gal
- Note: Coverage range dependent upon substrate composition and porosity, application method and flooring type.

CERTIFICATIONS



NOW FEATURING NO MOISTURE TESTING

Combating extreme moisture, **MVBA 500™** eliminates the need for moisture testing. Its safe, 1-part chemistry makes it a faster, more install-friendly alternative to 2-part epoxy systems. Engineered for heavy rolling loads and challenging environments, MVBA 500's™ waterproof design forms a robust moisture vapor barrier and can also take the punishment introduced by topical liquids.

Shelf Life: 1 Year



AVAILABLE IN 2-GALLON PAIL

NOTE: See technical data sheet for details.

- Simple 1-part system
- No moisture testing required
- Strong early grab, fast-curing formula
- High-strength, waterproof bond
- Self-leveling technology reduces telegraphing
- Intact vapor retarder membrane NOT required
- LEED v4 contributing
 - CDPH/EHLB Standard Method v1.2
 - Meets SCAQMD Rule 1168, 0.1 g/L
 - Does not contain methylene chloride and perchloroethylene
 - Contributes to low emitting materials

MVBA 500

APROVED FLOOR TYPES

MVBA 500™

UNLIMITED MOISTURE VAPOR BARRIER
HARD-SET RESILIENT FLOORING ADHESIVE



NOW FEATURING NO MOISTURE TESTING

Combating extreme moisture, MVBA 500™ eliminates the need for moisture testing. Its safe, 1-part chemistry makes it a faster, more install-friendly alternative to 2-part epoxy systems. Engineered for heavy rolling loads and challenging environments, MVBA 500's™ waterproof design forms a robust moisture vapor barrier and can also take the punishment introduced by topical liquids.

Shelf Life: 1 Year



AVAILABLE IN 2-GALLON PAIL

PRODUCT BENEFITS

- Simple 1-part system (modified urethane)
- Strong early grab, fast-curing formula
- High-strength, waterproof bond
- Self-leveling technology reduces telegraphing
- LEED v4.1 contributing
 - VOC content 0.1 g/L (based on SCAGS 100-762)
 - CDPH/EHLB Standard Method v1.2
 - Does not contain methylene chloride or perchloroethylene
 - Contributes to low emitting materials

APPROVED FLOORING TYPES

- LVT/LVP
- Sheet goods (vinyl, homogeneous, heterogeneous, fiberglass, felt-backed)
- Rubber (tile and sheet)
- Linoleum
- WPC/WSC
- Cork-backed hard surface
- Cork flooring
- Cork underlayment
- VCT/VET
- Stair treads (rubber and vinyl)

APPLICATION METHODS

- 150-260 sf/gal
- Note: Coverage range dependent upon substrate composition and porosity, application method and flooring type.

CERTIFICATIONS



- LVT/LVP
- Sheet goods (vinyl, homogeneous, heterogeneous, fiberglass, felt-backed)
- Rubber (tile and sheet)
- Linoleum
- WPC/WSC
- Cork-backed hard surface
- Cork flooring
- Cork underlayment
- VCT/VET
- Stair treads (rubber and vinyl)

NOTE: See technical data sheet for details.



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MVEC 710

MVEC 710

FEATURES

MVEC 710™

MOISTURE VAPOR BARRIER

PROTECTS FLOORING UP TO 100% RH



PRODUCT BENEFITS

- No costly moisture testing required
- 1-part system increases ease of install
- pH blocker protects from alkali attack
- Fast, 8-hour cure time improves efficiency
- LEED v4 contributing
 - CDPH/EHLB Standard Method v1.2
 - Meets SCAQMD Rule 1168, 0.05 g/L
 - Does not contain methylene chloride and perchloroethylene
 - Isocyanate-free

FOR GLUE-DOWN APPLICATION

STEP 1. MVEC 710™
Moisture Vapor Barrier

STEP 2. MVPB 600™
Bond Promoter and Encapsulator

STEP 3. TAYLOR™
Flooring Adhesive

APPLICATION METHODS

Up to 120 sq/gal

Note: Coverage ranges dependent upon substrate composition and porosity and application method.

CERTIFICATIONS



PH
100%

pH
5-14

MVER
N/A

CURE TIME
8 Hrs

Shell Life: 1 Year

MADE IN THE USA

AVAILABLE IN 2-GALLON PAIL

NOTE: See technical data sheet for details.

ISE Logik
INDUSTRIES

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- Extreme moisture control solution (no moisture testing required).
- 1-Part, 1-coat system (trowel applied – acts as a metering device).
- Dries to a clear, smooth, hydrophobic MVB (8 hours).
- Replaces 2-part epoxy systems, reducing labor time and errors.
- Self-leveling technology greatly reduces telegraphing.
- Not affected by pH (will not break down under high pH).
- pH neutralizer (acts as a barrier, protecting flooring from pH attack).
- Designed for use with MVPB 600.
- Approved for use with all flooring types and systems.
- Protects glue-down, floating, and loose-lay floors.
- Water resistant & freeze/thaw stable.
- Non-flammable, solvent and isocyanate free.
- LEED v4 contributing (CDPH v1.2).



A “best practice” is the belief that there is a technique, method or process that is more effective at delivering a particular outcome than any other

With proper processes (specifications) a desired outcome can be delivered with fewer problems and unforeseen complications.



QUESTIONS?

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Dean E. Craft, DBA, ASTM, CSI, CDT
LtCol USMCR (ret.)
Principal

AIA course: ISL03H

1 AIA LU/HSW CE Hour

