



Copyright Materials

This presentation is protected by US and International Copyright laws. Reproduction, distribution, display, and use of the presentation without written permission of the speaker is prohibited.

> © 2024 Noble Company

3

Why Did the Waterproofing Fail?



AIA CES Disclaimer

and the state

- Noble Company is a registered provider with The American Institute
 of Architects Continuing Education System.
- Credit Earned on the completion of this program will be reported to CES Records for AIA Members. Certificates of Completion for non-AIA members are available upon on request.
- This program is registered with the AIA/CES for continuing professional education.
- As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.
- Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

5

4



to the Mobile Atternate provide have the formation of the Atternate the formation of the acception of the a certificate of certificate tion will be

Attendees who do not have a unique IDCEC number will be provided with a paper/electronic certification of completion after this CEU.

Session Description

This course evaluates the reasons that lead to failures of waterproofing installations. It examines product attributes that lead to successful installations and identifies the ways to identify necessary characteristics. Also compares installation methods and identifies ways to specify successful installations.

7

Learning Objectives

At the end of this session, participants will be able to:

- 1. Review common waterproofing products, installation methods, and building code compliance.
- 2. Understand the relationship of movement in the surface and substrate to waterproofing.
- Understand reasons for failures in waterproofing installations under tile and the relationship of failed waterproofing to durability and sustainable design.
- 4. Understand permeation and its impact on creating suitable water and vapor barriers for tile installations and the relationship of permeation to indoor air quality.

8

Learning Objectives

- Understand ANSI A118.12 & WP Choices
- · Using all the "Pieces" of the WP "System"
- · Explore Solutions for Future WP Success





Presentation Outline

- Presentation Objective:
 Identify the Elements of Failure
- Review Common Methods of W/P
 Characteristics and Impacts
- Understand the Importance of Permeation - There are Significant Variations
- Crack Isolation and Waterproofing? - What is the Connection?
- Exploring the Waterproof Installation - You Need all the "pieces"

10

Elements of Failure

- Substrate Issues
- Installer Error
- Unclear Specifications/Details
- Unrealistic Project Demands

11

Elements of Failure

Lack of Substrate Preparation



Elements of Failure

Installer Error



13

Elements of Failure

Thermal Images of Shower Pan Leaks at Base



14

Elements of Failure

Many Failures Occur at Pan/Wall Upturn



Elements of Failure

Unclear Specifications/Details

- A. Waterproof/Crack Isolation Membrane:

1. Type & Manufacture: "Brand X".....does not require the use of fabric; anti-fracture protection of up to $\frac{1}{2}$ " over shrinkage and non-structural cracks and exceeding ANSI A 118.10 and ANSI 118.12

16

Common Waterproofing Methods

- Fluid Applied
- Trowel Applied
- Sheet Membranes
- "Trays, Pre-Fabricated Pans"

17

Common Waterproofing Methods

- Fluid Applied Product Challenges
- Ensuring uniform coverage
- Ensuring reinforcing fabric is used
- Allowing time for proper curing and additional second/third coat applications
- Movement and Permeation Concerns

Common Waterproofing Methods

Typical Fluid Application Methods



19

Common Waterproofing Methods

- Fluid Applied Product Solutions
- Mandate the Use of a Mil Gauge
- Mandate reinforcing fabric be used
- Plan time for proper curing and additional second/third coat applications
- Match Product Performance to Project Demand

20

Common Waterproofing Methods

Fluid Applied Seaming & Coverage Issues





Common Waterproofing Methods

Fluid Applied

The use of this simple tool would greatly reduce installer-related error for these type of products

25 51 76 102 127	Image: Constraint of the second se	305 279 254 229 283	305] [1 279] [1 254] [2 229] [2 203] [2 203] [2 203] [2 204] [2 205]	H 91 81 82 82 82 82 82 82 WET FILM THICKNESS GAUGE <u>OMECTORS FOLUE</u> Mithdraw verically and note deepset tooth having pain on it and the next higher tooth that is not coated with paint. The true well film thickness less between these two readings. Clean gauge in suitable solvent later each		
152	889 1016 1143 1270 1270 1524 1524 1551 1551 1778 2032	178]	-	1 TO 80 MIL SCALE 80 70 65 60 55 50 45 40 35	9	

22

Painting Liquid Rubber



Painting Liquid Rubber.MPG

23

Improper Installation

\$7 Million Dollar Waterproofing Failure... official cause, improper installation.



Project leaked from day one... required removal and replacement of 55K sq. ft. of natural stone

Improper Installation

"Because the membrane wasn't thick enough, it developed lots of little leaks"



"The waterproof membrane turned out to be not the correct thickness... it was an installation issue"

25

Are You Using the Right Waterproof Membrane for Your Project?



26

Common Waterproofing Methods

- Trowel Applied Product Challenges
- · Ensuring uniform coverage
- Ensuring reinforcing fabric is used
- Allowing time for proper curing and additional second/third coat applications
- Permeation and Movement Concerns

Improper Installation

WP Membrane was not "Smooth Troweled"



Leaving "too much" WP product on the substrate does not ensure success

28

Common Waterproofing Methods

- Sheet Membrane Product Challenges
- · Ensuring uniform bond of sheet to substrate
- Ensuring seams/corners are watertight/correctly sealed
- Allowing time for proper curing of sheet bond coat

29

Improper Installation

Poor seaming will result in a failure



Properly embedding the seams and using a watertight sealant will eliminate this problem

Common Waterproofing Methods

- Sheet Membrane Product Solutions
- Mandate proper adhesive application/bond
- Mandate proper seam/corner sealant methods
- Allow time for curing of sheet bond coat

31

Exterior Applications often Demand Sheet Membranes for Primary WP



32

Common Waterproofing Methods

- "Trays/Pre-Formed Pans" Challenges
- Job-Site Variables vs. Pre-Formed Pan
- Compression Concerns and Tile Size
- Seam/Joint/Penetration Concerns

"Trays and Pre-formed Pans"

Some Pans are Waterproof...others need WP





34

"Trays and Pre-formed Pans"

There are pre-fab trays that have the membrane pre-installed and can be adjusted in the field



35

Common Waterproofing Methods

- "Trays/Pre-Formed Pans" Solutions
- Be Aware of the Manufacture Variables
- Vett Products for Compression & Tile Size
- Employ a High Level of Q/A-Q/C to seams/joints/penetrations Details

Unacceptable Permeation

- What is Permeation
- Different WP Products=Varying Perm
- Project Demands Determine Performance
- Match the Product to the Project

37

Unacceptable Permeation

The end result of excessive vapor migration into the stud wall cavity of shower Walls



38

Unacceptable Permeation

The end result of excessive vapor migration into the stud wall cavity of shower



A "low perm" wall membrane would have prevented this from happening

Unacceptable Permeation

Shower walls need low-perm WP membrane



A variety of products are available

40

Moisture Vapor Transmission							
Classification / permeation*		Highest perm in classification	Oz of water / hr/ sq. ft	Amount of water / week/ 100 sq. ft	Amount of water / week/ 1000 sq. ft		
1	0.1 perm or less	.1 perm =	0.00022 8571	3.84 oz	38.4 oz		
2	0.1 <u>< 1</u> .0 perm	1.0 perm =	0.00228 5714	38.4 oz	384 oz (3 gallons)		
3	1.0 <u>≤</u> 10.0	10 perm =	0.02285 7143	384 oz (3 gallons)	3840 oz (30 gallons)		



41

Unacceptable Rates of Movement

- What Are the Movement Forces
- How Do they Impact Waterproofing
- How Do You Prevent Failure







44

Unacceptable Rates of Movement

- ANSI A118.12
- Products Will Vary with Regard 118.12
- "Standard Performance" vs "High Perf"
- Match the Product to the Project Demands











50

Standard Performance vs. High Performance

5.4.9 Continue testing at one hour intervals by opening the gap an additional 0.016 in. (theoretical) until one of the following occurs: (A) the specimen gap is 0.062 in. (for standard performance) or 0.125 in. (for high performance) or (B) tile cracks or de-bonds. Report the maximum specimen gap opening before tile failure occurs for each of the three test specimens.

Requirement: Standard performance: Tile failure occurs after 1/16 in. specimen gap opening, but before 1/8 in. gap opening. High Performance: Tile failure does not occur by 1/8 in. specimen gap opening.

END OF ANSI A118.12

Does Your Waterproofing Meet ANSI A118.12 for High Performance?



52

Integrating the Components



It's more then just the membrane.

It's the drain, the curb, the niches, and the benches.

53

Integrating the Components

"Membrane Friendly" Linear Drains and Low-Profile "Thin-set" Drains





Integrating the Components

Linear Drains now integrate with waterproof membranes



55

Integrating the Components

Waterproof pre-formed products are part of a successful waterproofing





56

Integrating the Components

Waterproof pre-formed products are part of a successful waterproofing









Integrating the Components

Waterproof pre-formed curbs eliminate failures like this!!



59

Integrating the Components

Waterproof foam benches are the solution



Improper Installation

Many failures have several installation short-comings

Incorporation of a Drain/Slope to Drain

To fully evacuate water, shower pan membranes and bonded waterproof membranes must slope to and connect with a drain. Plumbing code typically requires membranes to be sloped a minimum of 1/4" per foot and extend at least 3" above the height of the curb or threshold. Account for the perimeter floor height required to form adequate slopes. Membranes must be installed over other horizontal surfaces in very areas subject to deterioration, like shower seats. They must be sloped and configured so as to direct water to the membrane connected to the drain.

When water cannot migrate to the drain, it flows to areas where other installation errors can lead to a failure.

61

Improper Installation

Many failures have several installation short-comings



When water cannot migrate to the drain, it flows to areas where other installation errors can lead to a failure

62

Improper Installation

Many failures have several installation short-comings



When water migrates to the back wall, and the detail does not have fabric reinforcement and/or minimal mil coverage.... failure is likely

Improper Installation

Failure of membrane detail at drain attachment resulted in a waterproofing failure



Using a mil gauge and/or a drain flashing would correct this problem

64

Improper Installation

Failure to install WP membrane correctly around the drain resulted in a failure



Incorrect "Slope to Drain" and plugged weep holes can both cause this condition

65

Improper Installation - Solution

A variety of manufacturers provide drain flashings to ensure watertight drain details



These can be used in both sheet membrane and fluidapplied systems



Improper Installation - Solution

Even the best waterproofing installation can unravel if you don't use all the "parts & pieces"



Inattention to curb corner details was the undoing of this shower

67

Improper Installation - Solution

Pre-fabricated inside and outside corners ensure the curb detail is watertight





M



68

Waterproofing

Insist that a flood test be done!



Waterproofing

Insist that a flood test be done!



70

Waterproofing

Water is just drained....and the abuse starts



71

Waterproofing

Waterproofing is not a wearing surface



Typical Shower Pan View



- Where waterproofing meets tile or stone... these are the wettest places on earth
- Successful installations rely on a "systems" approach
- Durable components and Q/A-Q/C installations ensure waterproofing success

73

Summary

- Conclusions
 - Improper installation is a common theme
 - Permeation rates play a part
 - ANSI A118.12 performance is a factor
 - Successful waterproofing is more then the membrane, it is all the components as well

74

Summary

Solutions -

Quality Assurance and Quality Control Have to be Built into the Installation Sequence

- Q/A-Q/C can be performed by the sub, GC or an independent "third party"
- Q/A-Q/C must have "veto power"

Why leave it to just anyone?

"Because tile is a permanent finish, the lowest bid should not be the driving factor, but rather who is the most qualified to perform the scope of the work specified."



- TCNA Handbook - TCNA Handbook The Tile Council of North America urges design professionals to include language in specifications to secure qualified contractors and installers. The following nonprofit programs are well-established and recognized by the Handbook Committee: Advanced Certifications for Tile Installers (ACT) Ceramic Tile Education Foundation (CTEF) Certified Tile Installer Program International Masorny Institute (IMI) Contractor College Journeyman Tile Layer Apprenticeship Programs Natural Stone Institute (INSI) Accreditation for Natural Stone Tile Installation

- TCNA Handbook

Tile Installation

National Tile Contractors Association (NTCA) Five Star Contractor Program Tile Contractors Association of America (TCAA) Trowel of

Excellence Program



76

MasterSpec[®]

QUALITY ASSURANCE 1.5

- A. Installer Qualifications:
 - 1. Installer is [a Five-Star member of the National Tile Contractors Association] [or] [a
 - Trowel of Excellence member of the Future Tale Contractors' Association of America]. Installer's supervisor for Project holds the International Masonry Institute's Foreman 2. Certification. Installer employs only [Ceramic Tile Education Foundation Certified Installers] [or]
 - 3. [installers recognized by the U.S. Department of Labor as Journeyman Tile Layers] for Project.
 - tor troject. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of [mud Boors] [mud walls] [membranes] [shower receptors] [gauged porcelain tile panels and aba)[[and] [large format tile]. 4.



77

SpecLink

СТ		III 🚳 🔇 🍁 📅 🕅 M
•	0095	International Masonry Training and Education Foundation (IMTEF). Supervisor Certification Program (SCP).
•	0294	Advanced Cardinations for Tile Installers (ACT). Certification in the installation of membranes, monta bed (mud) floors, monta (mud) web, shower receptors, large format the, gauged porcelain float-panelvaluka and qurots.
•	0010	Approxificable Program: Installer has addresed Journeyworker status through en apprenticeable from the International Union of Ericklayses and Allied Craftworkers (UBAC): or U.S. Department of Laber (DOL)-responsible frompann
	0092	Ceramic Tile Education Foundation (CTEF). Certified Tile Installer (CTI)
	0000	Instalar Carification
•	M" 0000	Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trewal of Excellence member of the Tile Contractors' Association of America (TCAA)
	0089	Company specializing in performing the installation, with minimum of five years of documented experience.
	0008	Installer Qualifications:
	0067	Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
•	0286	Maintain one copy of and ANSI A108(A118/A136 and TCNA (HB) on site
	0080	SCORFLET ASSOCIATE

ACT

ADVANCED CERTIFICATIO	INS FOR TILE INSTALLERS					
LARG	e form <i>a</i>	T TILE				
MEME	BRANES					
MUD	WORK					
SHOW	/ERS					
GAU	GED PO	RCELA	IN TI	E		
GRO	UTS					
ACT	CTEF Validation Control of the The Index of December of		FIVE-STAR	T C A A	Ţ	TCNA

79





tilecertifications.com

Advanced Certifications for Tile Installers

tile-assn.com NTCAqualifiedlabor@tile-assn.com



TCNA

*

Tile Contractors' Association of America tcaainc.org info@tcaainc.org

Tile Council of North America, Inc.

TCNAtile.com/find-qualified info@tcnatile.com



ANY QUESTIONS?



Noble Company

This concludes our program. Please feel free to contact me for additional information.

James Medina National Sales Manager/Architectural Support Noble Company AIA Las Vegas & Cleveland Allied Member, CSI, CTEF, IIBEC, Certified Forensics Stone and Tile Inspector 702-540-6025 YOU