What Lies Beneath….

… A Discussion of Underlayments

By Dean Moilanen

Session Description

Over the years, the tile and stone industries have seen numerous new products and installation methods regarding underlayments. There has been some confusion as to what constitutes an underlayment, a substrate, or a system. This presentation provides some context and perspective on this topic.

Session Description

Whether you are an architect, specifier, contractor, or industry professional, this briskly-paced presentation will bring to the forefront current concepts and information on the topic of underlayments.

Learning Objectives

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

1. Review the history of underlayments and the important role they play in successful tile installations.

2. Review current industry standards with regard to underlayments.

3. Explore the interconnected relationship between underlayment choices and successful tile and stone installations.

4. Outline the critical path necessary to ensure that your projects successfully address these critical areas of performance.

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- This program is registered with the AIA CES for continuing professional education.
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Presentation Benchmarks

EDITORIAL FEATURE

Permeation, crack isolation and how they impact waterproofing choices

By Dean Shulman, director of architectural services, Noble Company

I call Las Vegas the Petri dish of waterproofing, because Las Vegas has more hotel rooms (over 140K) than any city in the country. With demanding, fast-track construction schedules, and streaks of stubborn "wild west" independence, what winds up in shower pans and wet areas sometimes can resemble a lab experiment gone awry.

The demand for luxurious, durable, and safe showers, spas, and wet areas spawned twin challenges to hotel and casino owners. The "durability challenge" forced hotel/casino owners to get creative in their mission to eliminate failing shower pans and wet areas. The "safety challenge" tasked these owners with banishing the threat of microbial growth – aka mold – in stud-wall cavities and other areas of the guest environment.

A small army of forensic experts, waterproofing consultants, and risk-mitigation attorneys, hired by the hotel owners, turned their attention to the challenges outlined above in 2004-2005. They first focused on movement concerns, and the impact on waterproofing longevity.

It came as no surprise that the areas around the drain, the pan-to-wall plane transition movement joint, and saw-cut, cold joints areas had higher incidences of failure if the waterproof membrane could not tolerate these movement forces.

Membranes meeting high-performance standards to the rescue!

In the end, job site variables, varying levels of installer competence, and independent, third-party product test results were all factored into the solution path: waterproof membranes that met the ANSI A118.12 high-performance standard were less prone to failure in these areas of movement concern. ANSI A118.12 high performance means the membrane

Presentation Benchmarks

"What is…an underlayment? The first known use of the word was in 1949.

Presentation Benchmarks

"What is…an underlayment?"

Your underlayment is part of the substrate or actually can be the substrate.

Presentation Benchmarks

"What is…an underlayment?"

Presentation Benchmarks

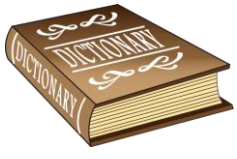
"What is…an underlayment?"

Your subfloor is NOT
(and should not be)
an underlayment.

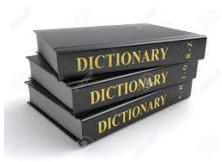
What is an underlayment?

Some definitions:

- "a layer between a subfloor and a finished floor that facilitates leveling and adhesion"



What is an underlayment?



Some definitions:

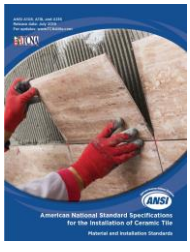
- "refers to a layer of material that rests in between the subfloor and the surface floor covering. In some cases, it is required in order to properly prepare the subfloor for the installation of the surface flooring. **It can also be used to effect the characteristics of the surface flooring in a variety of ways."**

What is an underlayment?

Are liquid membrane products….underlayments?

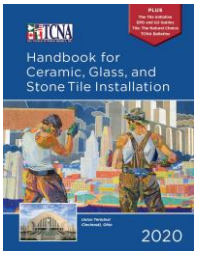
- If the finished product is intended to achieve the same results as a typical underlayment or other interface between the subfloor and finished tile, it could be considered to be an underlayment.

What does ANSI say?



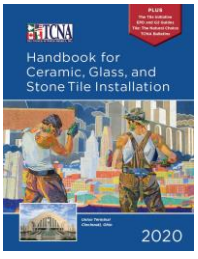
"refers to a layer of material that rests in between the subfloor, and the surface floor covering. In some cases, it is required in order to properly prepare the subfloor for the installation of the surface flooring. **It can also be used to effect the characteristics of the surface flooring in a variety of ways."**

What does TCNA say?



Pages 444-451 under "Estimated Weights for Floor Coverings" – a variety of underlayment methods are referenced.

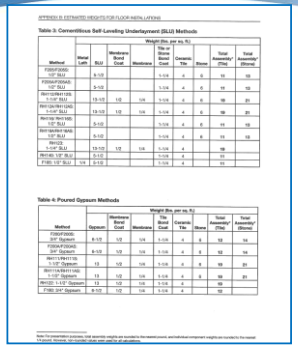
What does TCNA say?



"acceptable underlayments" that are referenced:

- **Cementitious self-leveling**
- **Poured gypsum**
- **Backer board and wood**
- **Backer board and wood panel**
- **Membranes and cork**

What does TCNA say?



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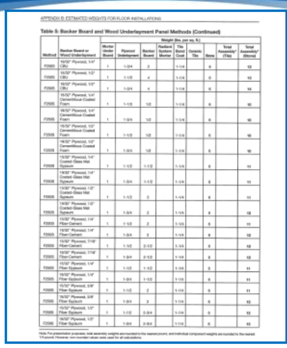


What does TCNA say?

APPENDIX B: ESTIMATED WEIGHTS FOR FLOOR INSTALLATIONS

Table 6: Membrane and Cork Underlayment Methods

Method	Membrane Type	Weight (lbs. per sq. ft.) Plywood	Membrane Bond Coat	Membrane	Tile or Stone Bond Coat	Ceramic Tile	Stone	Total Assembly* (Tile)	Total Assembly* (Stone)
F122/ F122S	Waterproofing		1/2	1/4	1-1/4	4	6	6	8
F122A/ F122AS	Waterproofing		1/2	1/4	1-1/4	4	6	6	8
F125/ F125S	Crack Isolation		1/2	1/4	1-1/4	4	6	6	8
F128	Uncoupling		1/2	1/4	1-3/4	4		6	
F135	1/2" Cork		1/4	1/2	1-1/4	4		6	
F136	Bonded Sound Reduction		1/4	1/2	1-1/4	4		6	
F147	Uncoupling	1	1/2	1/4	1-3/4	4		7	
F148	Uncoupling		1/2	1/4	1-3/4	4		6	
F152	Generic	1	1/2	1/4	1-1/4	4		7	

What does TCNA say?

“manufacturers’ installation instructions supersede TCNA recommendations”

- Backer Board and Wood - page 20 of the 2016 manual (note special cautionary comments)
- Membranes - pages 21 and 22 of the 2016 manual
- TCNA comments are not comprehensive and final

What does TCNA say?

“manufacturers’ installation instructions supersede TCNA recommendations”


MEMBRANE SELECTION GUIDE

Cleavage Membranes

Vapor Retarder Membranes

Waterproof Membranes

Low Perm Waterproof Membranes

Crack Isolation Membrane

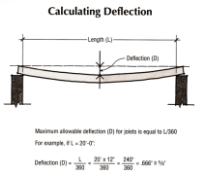
Uncoupling Membrane

What does TCNA say?

“manufacturers’ installation instructions supersede TCNA recommendations”


Bonded Sound Reduction Membranes

What determines the choice of an underlayment?



- Deflection concerns
- Condition of current substrate/subfloor
- Waterproofing concerns
- Crack isolation issues
- Sound reduction requirements
- "The Budget"
- Usage and application

What determines the choice of an underlayment?

- Deflection concerns
- Condition of current substrate/subfloor
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- "The Budget"
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Why do underlayments fail?

Why do underlayments fail?

Why do underlayments fail?

- Improper substrate
- Improper underlayment
- Using incorrect adhesive to bond the underlayment to substrate
- Using the incorrect adhesive to bond the tile to the underlayment
- Installer error

Why do underlayments fail?

- Improper substrate
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- “Bond Breakers”
- Installer error

"Unacceptable" Substrates - NTCA

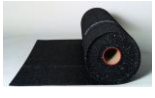
- Luan
- Plywood that does not meet APA standards for subfloors and underlayments under ceramic tile
- Particle board
- Scribing felt and mastic

"Questionable" Substrates - NTCA

- Vinyl tile
- Post-tensioned concrete
- Cork
- Gypsum concrete
- Poured gypsum underlayment
- Cracked concrete
- Pre-cast concrete

Narrowing the focus….sheet membrane underlayments

- Options available
- Performance required
- Best practices
- Pros & Cons



Presentation Benchmarks

"The Nature of Attributes"

….attributes are the means by which a product's performance characteristics can be identified.

The three essential considerations of an attribute:

- Requirements
- Criteria
- Tests

Narrowing the focus….sheet membrane underlayments

- **Options available - Crack Isolation**
- PVC, PE, "Peel & Stick", CPE, Cork, crumb rubber
- ANSI A118.12, ANSI A118.10
- Compressive variables
- Bonding methods

Presentation Benchmarks

"The Nature of Attributes"

….attributes are the means by which a product's performance characteristics can be identified.

The three essential considerations of an attribute:

- Requirements **- Crack Isolation**
- Criteria **- Can withstand movement up to 1/8"**
- Tests **- ANSI A118.12 "High Performance"**

Narrowing the focus….sheet membrane underlayments

- **Options available - Waterproofing**
- PVC, PE, "Peel & Stick", CPE
- ANSI A118.10, ANSI 118.12, ASTM E96
- Performance variables
- Bonding methods

Presentation Benchmarks

"The Nature of Attributes"

….attributes are the means by which a product's performance characteristics can be identified.

The three essential considerations of an attribute:

- Requirements **- Membrane must prevent vapor migration**
- Criteria **- Perm rating must be .5 or lower**
- Tests **- ASTM E96**

Presentation Benchmarks

"The Nature of Attributes"

….attributes are the means by which a product's performance characteristics can be identified.

The three essential considerations of an attribute:

- Requirements **- Crack Isolation**
- Criteria **- Can withstand movement up to 1/8"**
- Tests **- ANSI A118.12 "High Performance"**

Narrowing the focus….sheet membrane underlayments

- **Options available - Sound Isolation**
- PVC, Crumb rubber, "Peel & Stick", CPE, Cork
- Delta rating, IIC & STC, ANSI A118.13
- Performance variables
- Bonding methods

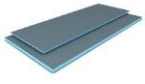
SOUND [ISOLATION] COMPANY

Soundproofing Made Simple

Narrowing the focus….sheet membrane underlayments

- **Radiant heat**
- Variety of sheet/mat systems which incorporate a radiant heat system
- May require unique and specialized skills relevant to a company's radiant heat product
- Some products may tout multiple benefits (crack isolation, WP)

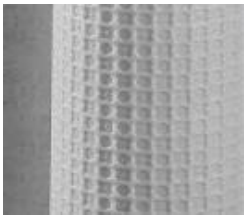
Narrowing the focus… lightweight foam board underlayments



- **Options available - Backer board replacement/waterproofing**
- "Foam Board"
- Deflection
- Compressive variables
- Bonding methods

Uncoupling Underlayment

What is uncoupling?...backer board replacement, crack isolation, waterproofing?.....all three?



Uncoupling as BB Alternative

Vast majority of uncoupling membranes used for this purpose:

- Confirm acceptable bonding methods
- Confirm "cure time" prior to installing tile/stone
- Confirm the substrate/subfloor is acceptable
- Confirm the uncoupling membrane's ability to minimize/prevent cracked tile

Is uncoupling "Crack Isolation?"

I have been told…

- …it is "kind of like" crack isolation
- …it is not crack isolation…but protects tile from cracking
- …that it is crack isolation

…some blog titles that reinforce the confusion:

"Uncoupling Membranes - Protect Tile from Cracking"

"Uncoupling or Crack Isolation - What's the difference?"

"What Actually Does an Uncoupling Membrane Do?"

Is uncoupling "Crack Isolation?"

Uncoupling: a Webster's Definition…. "to separate or disconnect (something) from something else"

Is uncoupling "Crack Isolation?"

Isolation: …. "to separate from others"

Is uncoupling "Crack Isolation?"

Is it an accepted method per TCNA?

Is uncoupling "Crack Isolation?"

Are there any ANSI Standards?

Presentation Benchmarks

"The Nature of Attributes"

….attributes are the means by which a product's performance characteristics can be identified.

The three essential considerations of an attribute:

- Requirements **- Provide "uncoupling" performance**
- Criteria **- None available from industry**
- Tests **- None available**

Is uncoupling "Crack Isolation?"

Request ANSI A118.12 test results for any "uncoupling" membranes

SUMMARY

- Successful tile and stone installations in almost all cases incorporate an underlayment.
- It is critical to make the sometimes subtle distinction between the subfloor, substrate, and the underlayment.
- Industry standards, performance requirements, customer expectations, and your own "standards of quality" will often determine the underlayment used on your project.

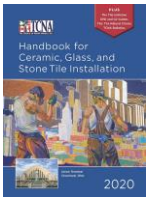
SUMMARY

- Using current, updated ANSI and ASTM standards for crack isolation and waterproofing and incorporating the CSI "nature of attributes" approach to evaluating a product's performance potential reduces the chance of sales and marketing spin from unduly influencing your final product selection.
- Carefully review product installation instructions and limitations of different products…..seemingly similar products can often times require significantly different installation methods.

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



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 Masonry Institute (IMI) Contractor College
- Journeyman Tile Layer Apprenticeship Programs
- Natural Stone Institute (NSI) Accreditation for Natural Stone Tile Installation
- National Tile Contractors Association (NTCA) Five Star Contractor Program
- Tile Contractors Association of America (TCAA) Trowel of Excellence Program

ACT CTEF FIVE-STAR CONTRACTOR TCAA TCNA

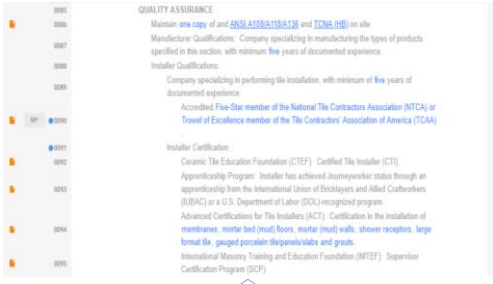
MasterSpec®

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

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

BSD SpecLink


QUALITY ASSURANCE

Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

Installer Qualifications:

Company specializing in performing tile installation, with minimum of five years of documented experience.

Accredited Five-Star member of the National Tile Contractors Association (NTCA) or Trowel of Excellence member of the Tile Contractors' Association of America (TCAA)

Installer Certification:

Ceramic Tile Education Foundation (CTEF): Certified Tile Installer (CTI).

Apprenticeship Program: Installer has achieved Journeyworker status through an apprenticeship from the International Union of Bricklayers and Allied Craftworkers (IUBAC) or a U.S. Department of Labor (DOL)-recognized program.

Advanced Certifications for Tile Installers (ACT): Certification in the installation of membranes, mortar bed (mud) floors, mortar (mud) walls, shower receptors, large format tile, gauged porcelain tile/panels/slabs and grouts.

International Masonry Training and Education Foundation (IMTEF): Supervisor Certification Program (SCP).

ACT

ADVANCED CERTIFICATIONS FOR TILE INSTALLERS

LARGE FORMAT TILE

MEMBRANES

MUD WORK

SHOWERS

GAUGED PORCELAIN TILE

GROUTS

Advanced Certifications for Tile Installers
tilecertifications.com

Ceramic Tile Education Foundation
ceramictilefoundation.org
info@ceramictilefoundation.org

National Tile Contractors Association / Five Star Contractor Group
tile-assn.com
NTCAqualifiedlabor@tile-assn.com

Tile Contractors' Association of America
tcaainc.org
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Tile Council of North America, Inc.
TCNAtile.com/find-qualified
info@tcnatile.com

ANY QUESTIONS?

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

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THANK YOU!