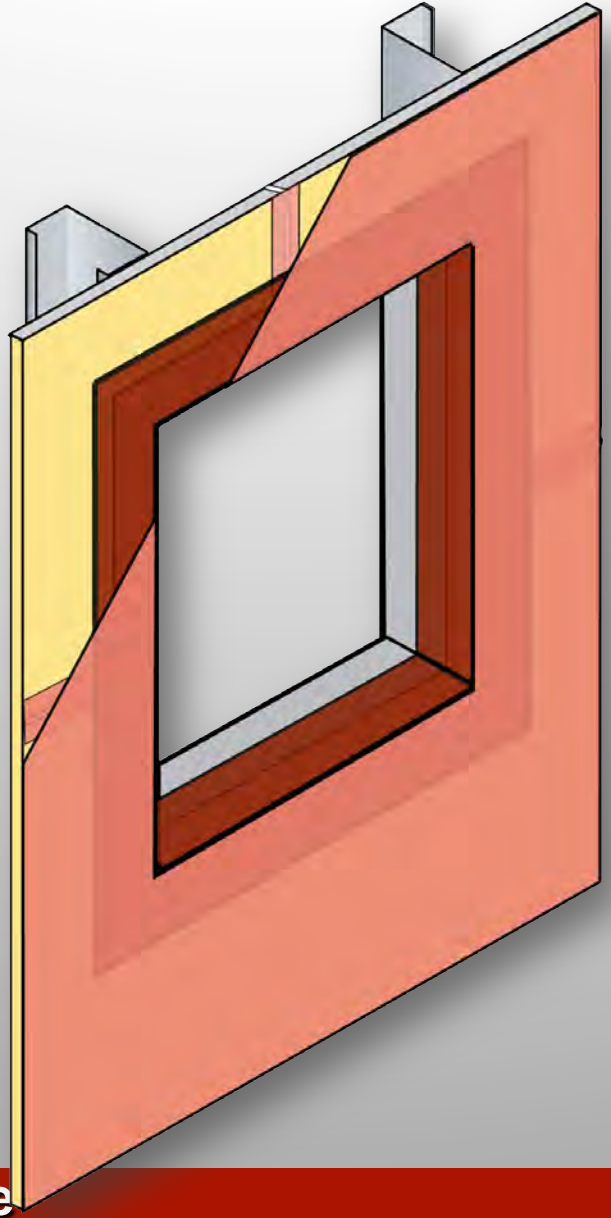
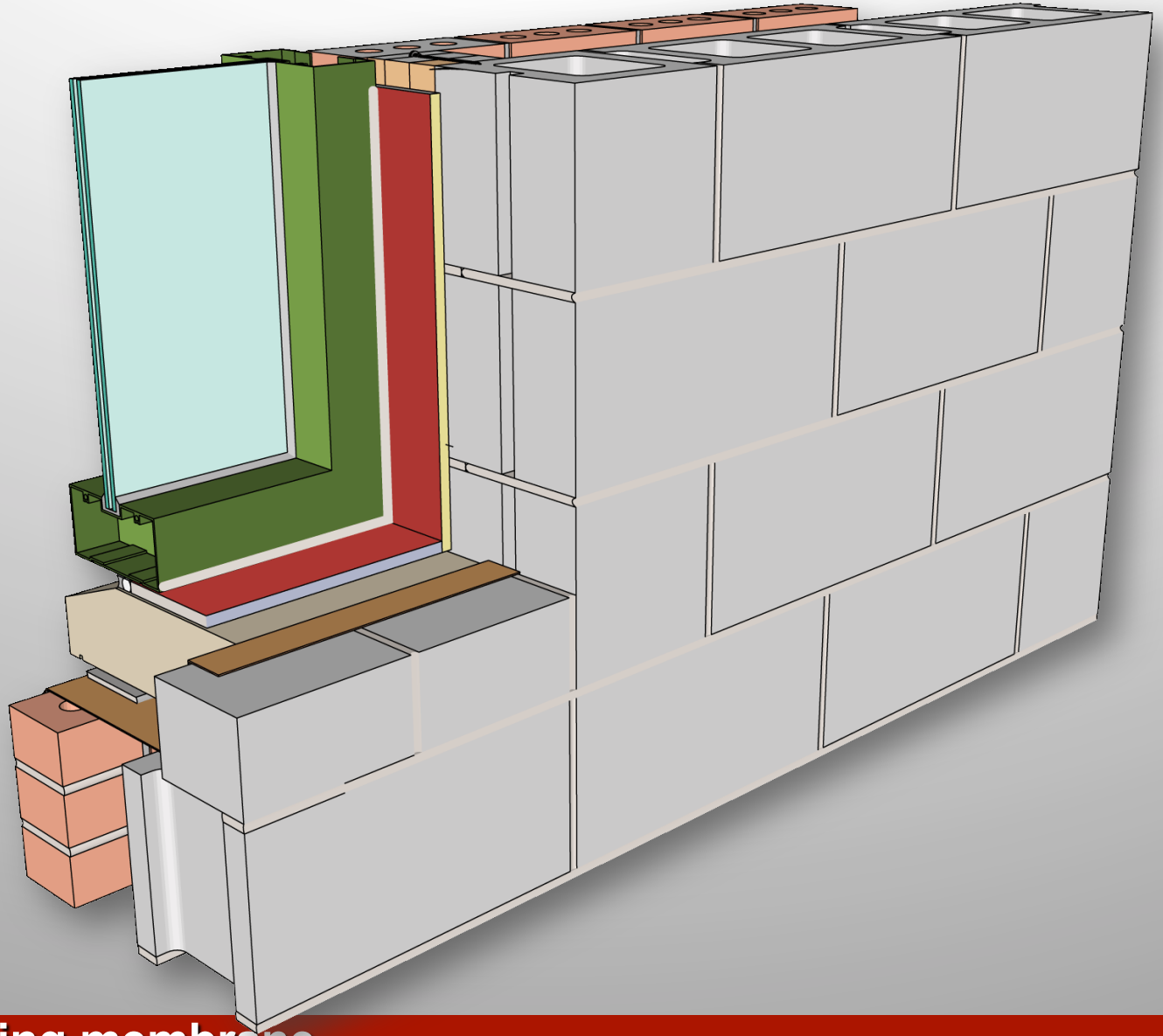
STPE liquid pan and rough opening flashing

- Becoming commonly specified
- Recognized in Architectural Record
- Entering ASTM process



WRB / Air Barrier

Liquid detailing membrane



Liquid detailing membrane

Liquid detailing membrane

STPE -- Interior seal / sill flashing

"In addition to being specified by many manufacturers' installation instructions,

the use of an interior air seal is also becoming noted in reference standards.

We encourage installers and builders to take a second look at the potential advantages offered by installing an interior air seal…"

Pushing the Building Envelope, February 16, 2011

Liquid detailing membrane

William D. Smith is the President of Glazing Consultants International, LLC (GCI), a building envelope consulting firm in business since 1988. He has nearly 40 years of experience in the design and construction of glazing systems and building envelopes and is recognized as an expert in the field of windows, doors, glass, and exterior wall systems, including all aspects of weatherproofing and water intrusion.

Liquid detailing membrane

AAMA Standard Practice for the Installation of Windows and Doors in Commercial Buildings:

"Backer rod should be placed around the interior side of the window. Place sealant over the backer rod in a continuous manner."

Liquid detailing membrane

Liquid detailing membrane

Liquid detailing membrane

Liquid detailing membrane

Liquid detailing membrane

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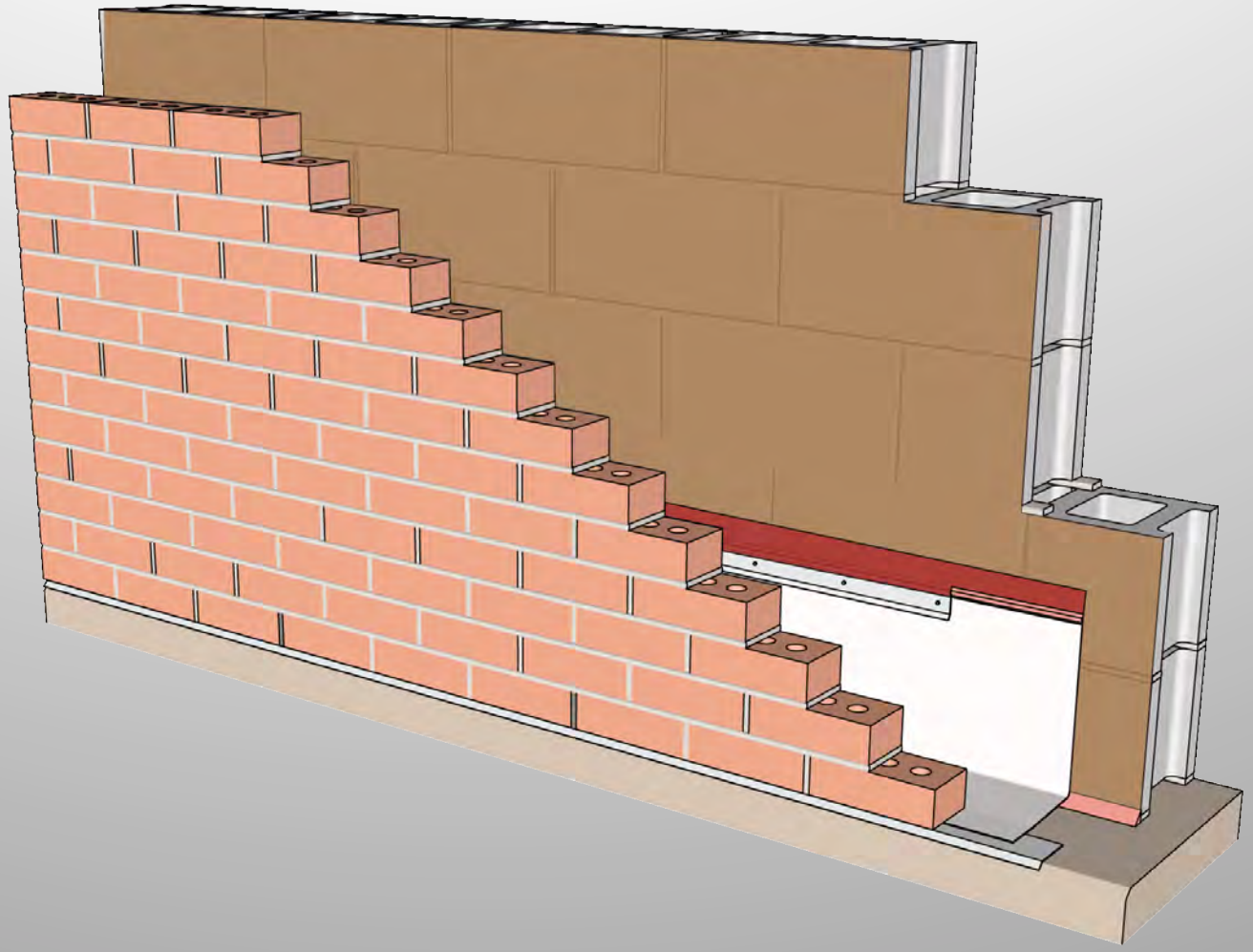
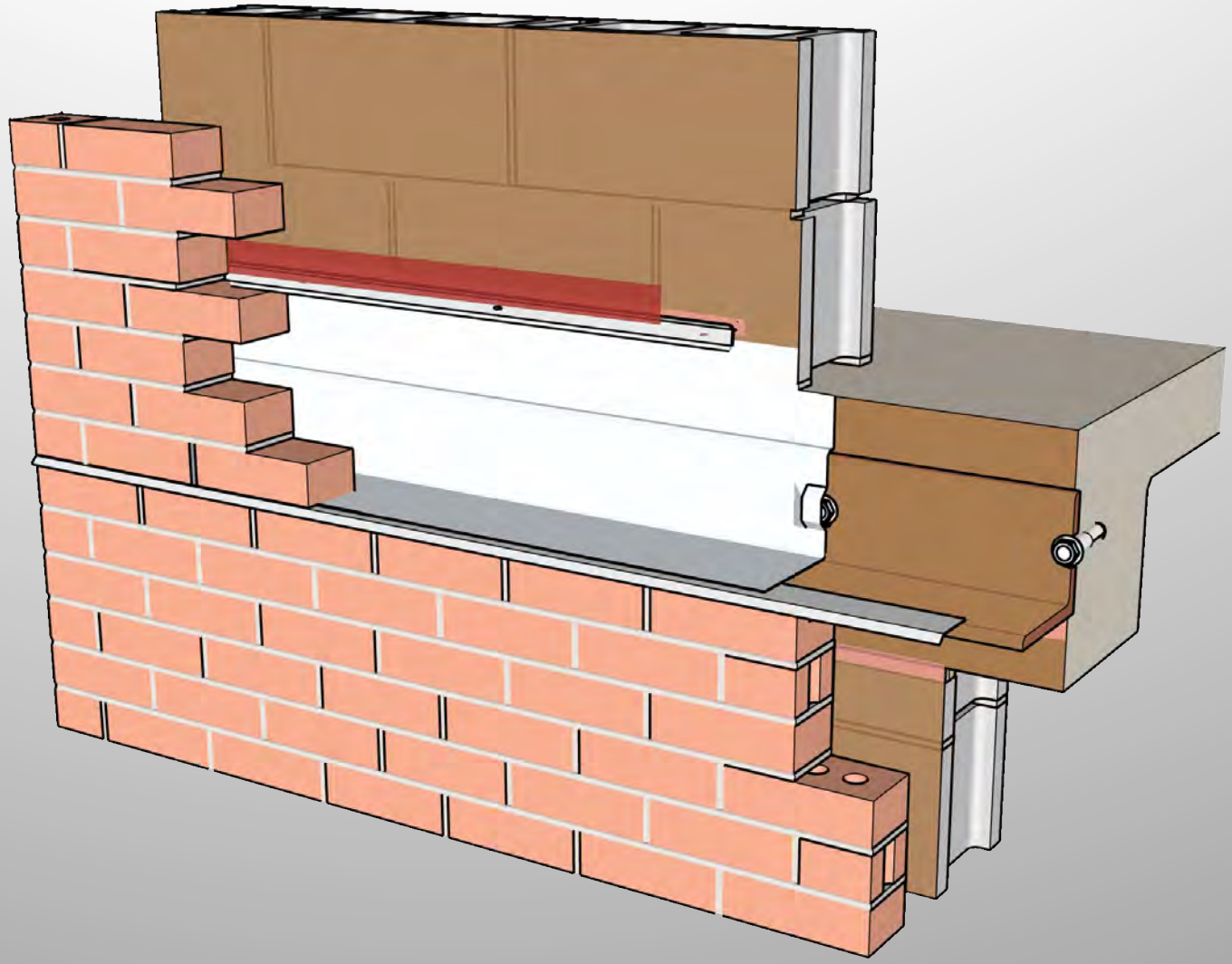
Liquid detailing membrane



Liquid detailing membrane



Liquid detailing membrane

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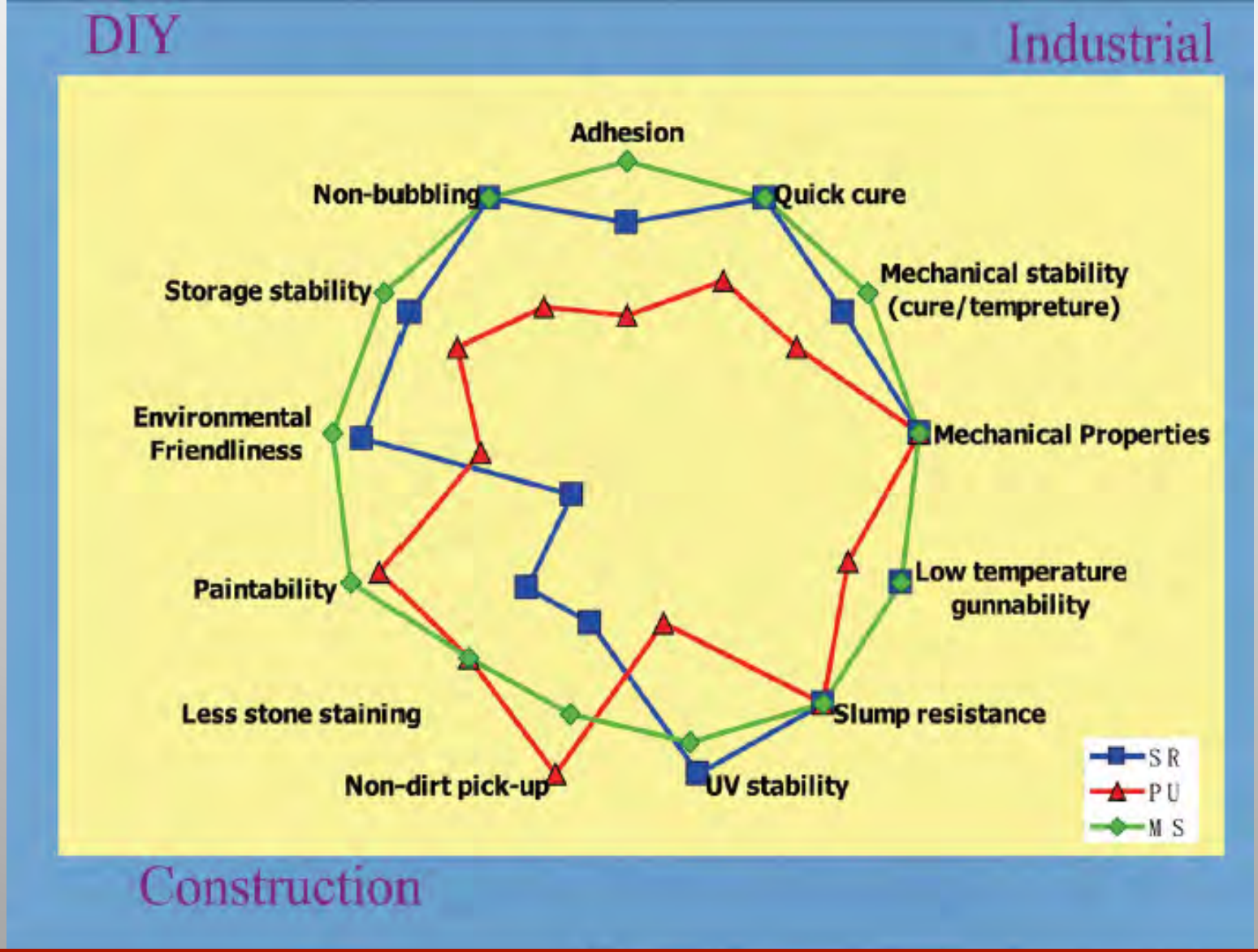
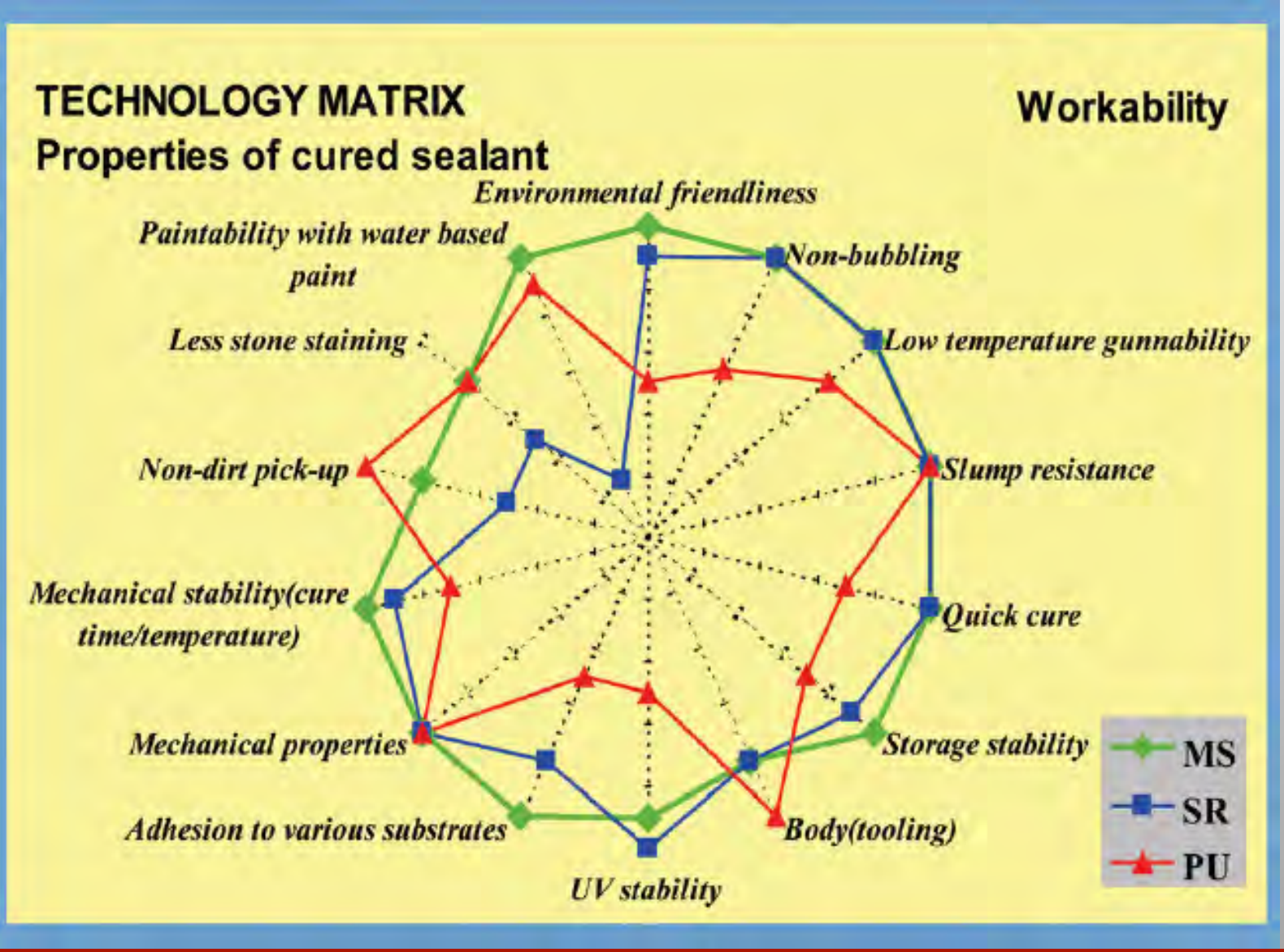
Liquid detailing membrane

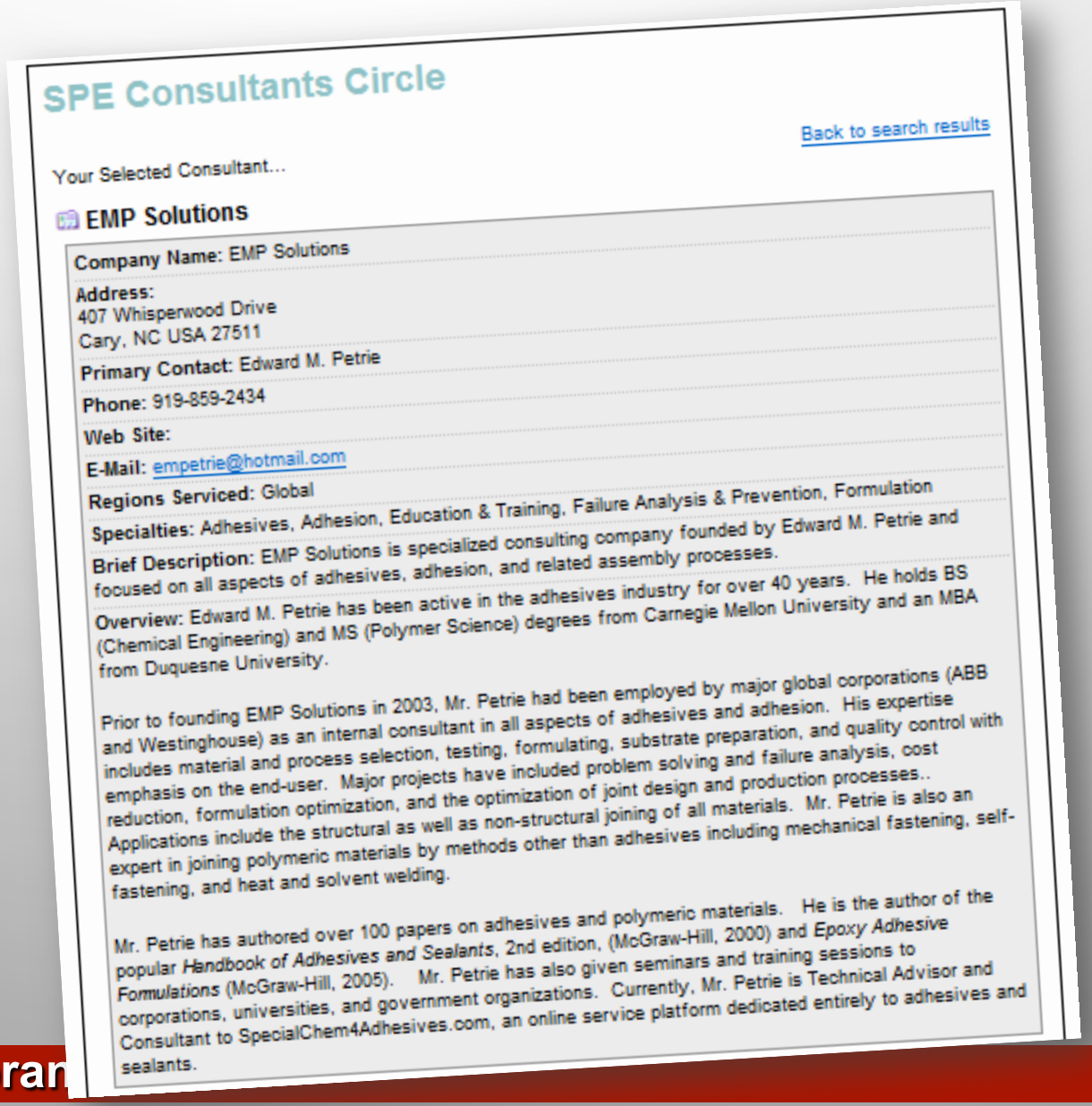


Liquid detailing membrane



Liquid detailing membrane

"... author of the popular *Handbook of Adhesives and Sealants*, McGraw-Hill."



SPE Consultants Circle

Back to search results

Your Selected Consultant...

EMP Solutions

Company Name: EMP Solutions

Address:
407 Whisperwood Drive
Cary, NC USA 27511

Primary Contact: Edward M. Petrie

Phone: 919-859-2434

Web Site:

E-Mail: empetrie@hotmail.com

Regions Serviced: Global

Specialties: Adhesives, Adhesion, Education & Training, Failure Analysis & Prevention, Formulation

Brief Description: EMP Solutions is specialized consulting company founded by Edward M. Petrie and focused on all aspects of adhesives, adhesion, and related assembly processes.

Overview: Edward M. Petrie has been active in the adhesives industry for over 40 years. He holds BS (Chemical Engineering) and MS (Polymer Science) degrees from Carnegie Mellon University and an MBA from Duquesne University.

Prior to founding EMP Solutions in 2003, Mr. Petrie had been employed by major global corporations (ABB and Westinghouse) as an internal consultant in all aspects of adhesives and adhesion. His expertise includes material and process selection, testing, formulating, substrate preparation, and quality control with emphasis on the end-user. Major projects have included problem solving and failure analysis, cost reduction, formulation optimization, and the optimization of joint design and production processes.. Applications include the structural as well as non-structural joining of all materials. Mr. Petrie is also an expert in joining polymeric materials by methods other than adhesives including mechanical fastening, self-fastening, and heat and solvent welding.

Mr. Petrie has authored over 100 papers on adhesives and polymeric materials. He is the author of the popular *Handbook of Adhesives and Sealants*, 2nd edition, (McGraw-Hill, 2000) and *Epoxy Adhesive Formulations* (McGraw-Hill, 2005). Mr. Petrie has also given seminars and training sessions to corporations, universities, and government organizations. Currently, Mr. Petrie is Technical Advisor and Consultant to SpecialChem4Adhesives.com, an online service platform dedicated entirely to adhesives and sealants.

Liquid detailing membran

Property	STPE	Urethane	Silicone
Environmental friendliness	10	5	9
Non-bubbling	10	6	10
Low temperature gunnability	10	8	10
Slump resistance	10	10	10
Quick cure	10	7	10
Storage stability	10	7	9
Body (tooling)	8	10	8
Weather resistance	8	6	10
Adhesion to various substrates	10	5	8
Mechanical properties	10	10	10
Heat resistance, mechanical stability	9	8	10
Non-dirt pickup	10	10	5
Stain resistance	8	8	5
Paintability with water-based paint	10	10	3
Scale: 10 – excellent; 1 – very poor	**133**	**110**	**117**

Adhesives & Sealants Council

"In addition to their high performance properties, these sealants are achieving popularity due to their formulation versatility that allows the customization of viscosity and early strength development for various applications. "

Liquid detailing membrane

- "Silyl Terminate Poly Ethers for Sealants and Adhesives of a New Generation" -- Designed mainly for sealants and adhesives, and can also be used for coatings.

- "Novel STPE prepolymers have proven to be straight forward and flexible in their formulating characteristics allowing a large degree of freedom in formulating design space."

STPE

Rough Opening Material Costs:

$2.00 per lineal foot

Air Barrier Challenge: FastFlash vs. Peel and Stick

CLOSE

Air Barrier Challenge: FastFlash vs. Peel and Stick

CLOSE

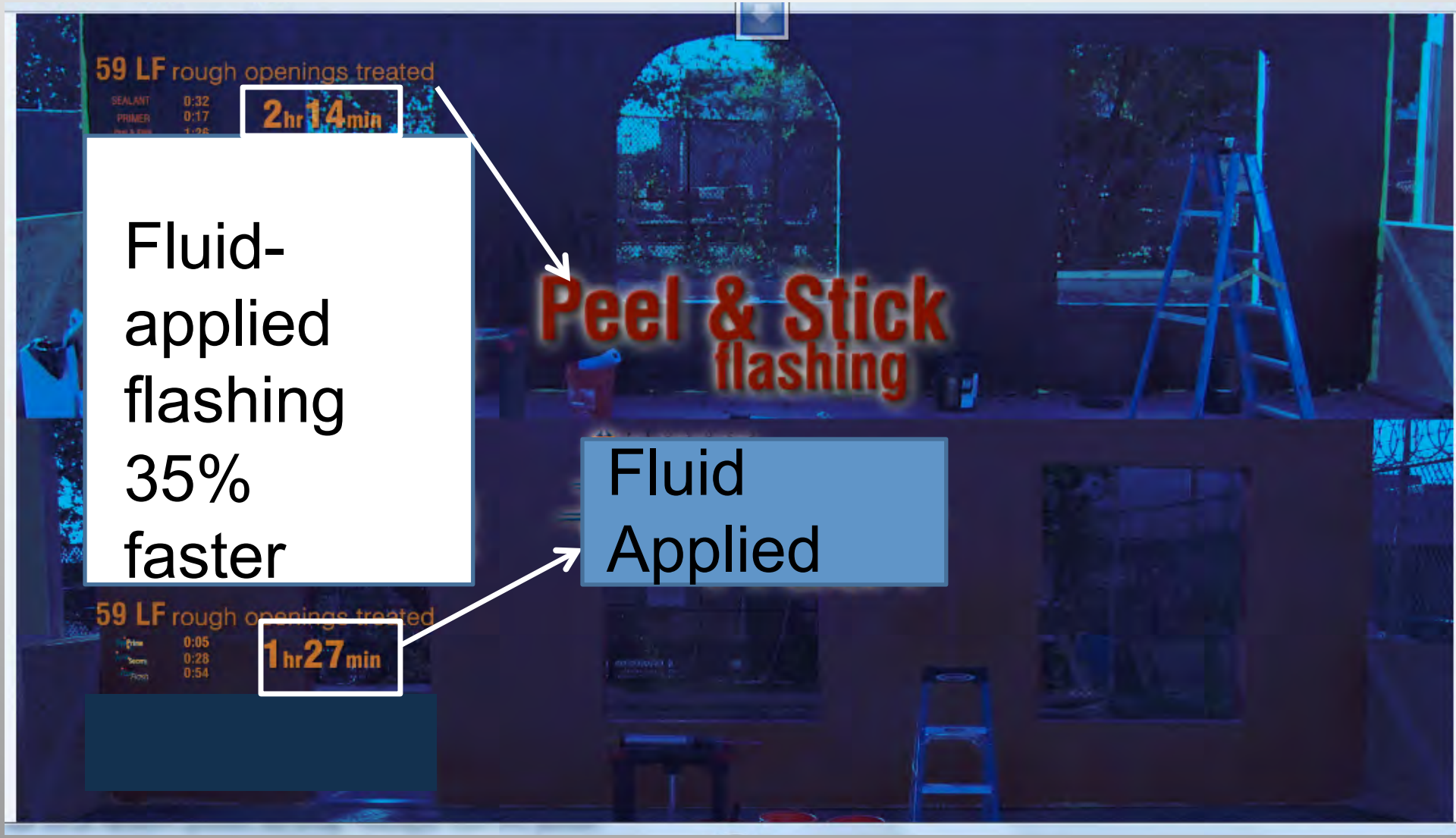
Air Barrier Challenge: FastFlash vs. Peel and Stick

CLOSE


share
03:07
06:11
Air Barrier Challenge: FastFlash vs. Peel and Stick
CLOSE

Air Barrier Challenge: FastFlash vs. Peel and Stick

CLOSE


59 LF rough openings treated
SEALANT 0:32
PRIMER 0:17
2hr 14min
Peel & Stick
flashing
Fluid-applied flashing 35% faster
Fluid Applied
59 LF rough openings treated
1hr 27min

Peel&Stick tapes

59 lineal foot
134 minutes
0.44 foot per minute
480 minutes in an 8-hour day
480 x 0.44 = 211 feet per day
$200 per man per day
$0.95 per foot labor
$1.80 per foot material

$2.75 per foot installed cost

Fluid-applied

59 lineal foot
87 minutes
0.68 foot per minute
480 minutes in an 8-hour day
480 x 0.68 = 326 feet per day
$200 per man per day
$0.61 per foot labor
$2.00 per foot material

$2.61 per foot installed cost

672 square feet wall

Sheetwrap 4.34 man hours

Sprayable 1.15 man hours (4 times faster)

PRODUCT	APPLICATION STEPS***	TOTAL MAN-MINUTES**	MAN-MINUTES PER SQ.FT.	TOTAL TIME
R-GUARD	Spray	= 11.13	.017 minutes per sq ft	1.15 MAN-HOURS
	Joint Treatment	= 58.63	.104 minutes per sq ft	
Spunbonded Olefin Sheet Wrap	Roll onto wall and tape seams	= 124.53	.185 minutes per sq ft	4.34 MAN-HOURS
	Screw in cap fasteners	= 136.14	.203 minutes per sq ft	

Sheetwrap

0.388 minutes per square foot (1 man)
480 minutes in an 8-hour day
480 / 0.388 = 1,237 square feet per day (35'x35' wall)
$200 per man per day
$0.16 per square foot labor
$0.155 per square foot material

$0.32 per square foot installed cost

Sprayable

0.274 minutes per square foot (1 man)
480 minutes in an 8-hour day
480 / 0.274 = 1,751 square feet per day (41.8'x41.8' wall)
$200 per man per day
$0.11 per square foot labor
$0.65 per square foot material

$0.76 per square foot installed cost

STPE

Air & Water***proofing*** Barrier

Material Costs (with joint treatment):

$1.98 per square foot

Sprayable

acrylic code-compliant

Air & Water-***resistive*** barrier

Material Costs (with joint treatment):

$0.65 per square foot

Code Council Testing WRB Air Barrier

ICC-ES AC212[1]
Acceptance Criteria for Water-Resistive Coatings Used as Water-Resistive Barriers Over Exterior Sheathing

Test	Method	Criteria	Results
Tensile Bond	ASTM C 297	Minimum 15 psi (105 kPa)	Pass
Freeze-Thaw	ICC-ES AC212	No cracking, checking, crazing, erosion, delamination or other deleterious effects	Pass
Water Resistance	ASTM D 2247	No cracking, checking, crazing, erosion, delamination, or other deleterious effects	Pass
Water Vapor Transmission	ASTM E 96 Wet Cup	Measure	18 perms
Water Penetration	ASTM E 331	No visible water penetration at the sheathing joints as viewed from the back of the panel	Pass
Structural, Racking, Restrained Environmental Conditioning & Water Penetration	ASTM E 1233 A ASTM E 72 ICC-ES AC212 ASTM E 331	No cracking of the coating	Pass
Weathering	ICC-ES AC212 AATCC[2] 127	No cracking of the coating; no water penetration	Pass
Air Permeance	ASTM E 2178	≤ 0.02 L / s·m² at 75 Pa (≤ 0.004 cfm / ft² at 1.57 psf)	Pass: 0.0009 L / s·m² at 75 Pa (0.00018 cfm / ft² at 1.57 psf)

Air Barrier Assoc. of America Testing

ABAA: Air Barrier Association of America Acceptance Criteria for Liquid Applied Membranes

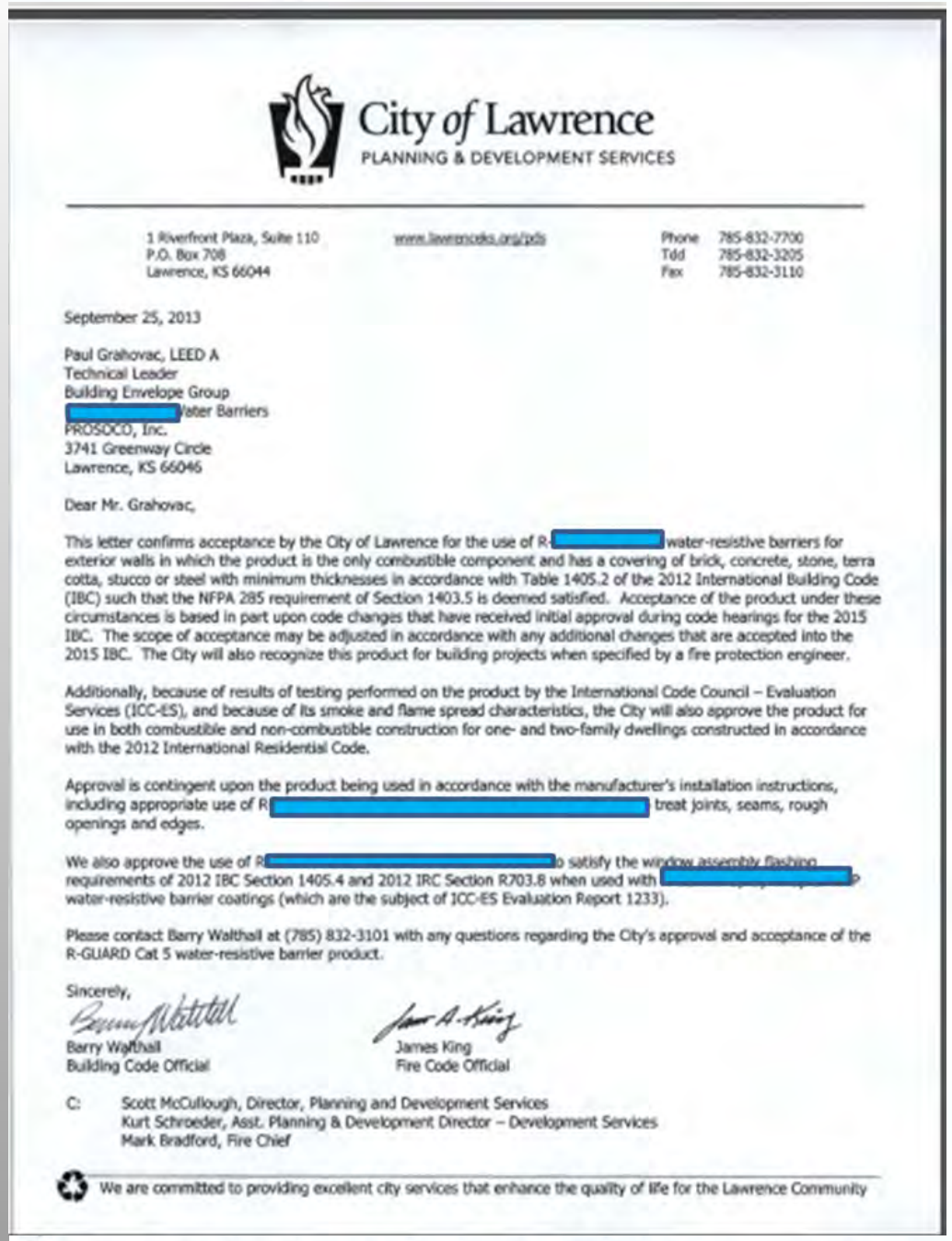
Test	Method	Criteria	Results
Air Permeance	ASTM E 2178	≤ 0.02 L / s·m² at 75 Pa (≤ 0.004 cfm / ft² at 1.57 psf)	Pass: 0.0009 L / s·m² at 75 Pa (0.00018 cfm / ft² at 1.57 psf)
Air Leakage of Air Barrier Assemblies	ASTM E 2357	≤ 0.2 L / s·m² at 75 Pa (≤ 0.04 cfm / ft² at 1.57 psf)	Pass: 0.0105 L / s·m² at 75 Pa (0.0021 cfm / ft² at 1.57 psf)
Water Resistance	AATCC[2] 127	No water infiltration after exposure to 55 cm head of water for 5 hours	Pass
Fastener Sealability	ASTM D 1970	No water infiltration	Pass
Pull Adhesion	ASTM D 4541	110 kPa (16 psi) or substrate failure	Pass
ICC-ES AC212	Entire Suite of Tests	Pass	Pass
Crack Bridging	ASTM C 1305	Pass	Pass
Water Vapor Permeance at applied thickness	ASTM E 96	Report in Ng/(Pa•s•m²)	Wet: 1015 Ng/(Pa•s•m²) Dry: 860 Ng/(Pa•s•m²)

This letter confirms **acceptance** by the City of Lawrence for the use of xxxxxxx as water-resistive barriers for ……
2012 International Building Code (IBC).

City will also **approve** the product for one- and two-family dwellings constructed in accordance with **the 2012 International Residential Code**.

Approval is contingent upon….. use of **xxxxx joint and seam filler and xxxx fluid-applied flashing** to treat joints, seams, rough openings and edges.

We also **approve** the use of **xxxxx joint and seam filler and xxxx fluid-applied flashing** to satisfy the **window assembly flashing requirements of 2012 IBC Section 1405.4 and 2012 IRC** Section R703.8 when used with [xxxx sprayable WRB].



City of Lawrence
PLANNING & DEVELOPMENT SERVICES

1 Riverfront Plaza, Suite 110
P.O. Box 708
Lawrence, KS 66044

www.lawrenceks.org/pds

Phone 785-832-7700
TDD 785-832-3205
Fax 785-832-3110

September 25, 2013

Paul Grahovac, LEED A
Technical Leader
Building Envelope Group
[redacted]ater Barriers
PROSOCO, Inc.
3741 Greenway Circle
Lawrence, KS 66046

Dear Mr. Grahovac,

This letter confirms acceptance by the City of Lawrence for the use of R-[redacted] water-resistive barriers for exterior walls in which the product is the only combustible component and has a covering of brick, concrete, stone, terra cotta, stucco or steel with minimum thicknesses in accordance with Table 1405.2 of the 2012 International Building Code (IBC) such that the NFPA 285 requirement of Section 1403.5 is deemed satisfied. Acceptance of the product under these circumstances is based in part upon code changes that have received initial approval during code hearings for the 2015 IBC. The scope of acceptance may be adjusted in accordance with any additional changes that are accepted into the 2015 IBC. The City will also recognize this product for building projects when specified by a fire protection engineer.

Additionally, because of results of testing performed on the product by the International Code Council – Evaluation Services (ICC-ES), and because of its smoke and flame spread characteristics, the City will also approve the product for use in both combustible and non-combustible construction for one- and two-family dwellings constructed in accordance with the 2012 International Residential Code.

Approval is contingent upon the product being used in accordance with the manufacturer's installation instructions, including appropriate use of R[redacted] treat joints, seams, rough openings and edges.

We also approve the use of R[redacted]o satisfy the window assembly flashing requirements of 2012 IBC Section 1405.4 and 2012 IRC Section R703.8 when used with [redacted] water-resistive barrier coatings (which are the subject of ICC-ES Evaluation Report 1233).

Please contact Barry Walthall at (785) 832-3101 with any questions regarding the City's approval and acceptance of the R-GUARD Cat 5 water-resistive barrier product.

Sincerely,

Barry Walthall
Building Code Official

James King
Fire Code Official

C: Scott McCullough, Director, Planning and Development Services
Kurt Schroeder, Asst. Planning & Development Director – Development Services
Mark Bradford, Fire Chief

We are committed to providing excellent city services that enhance the quality of life for the Lawrence Community

Construction Repair Technology

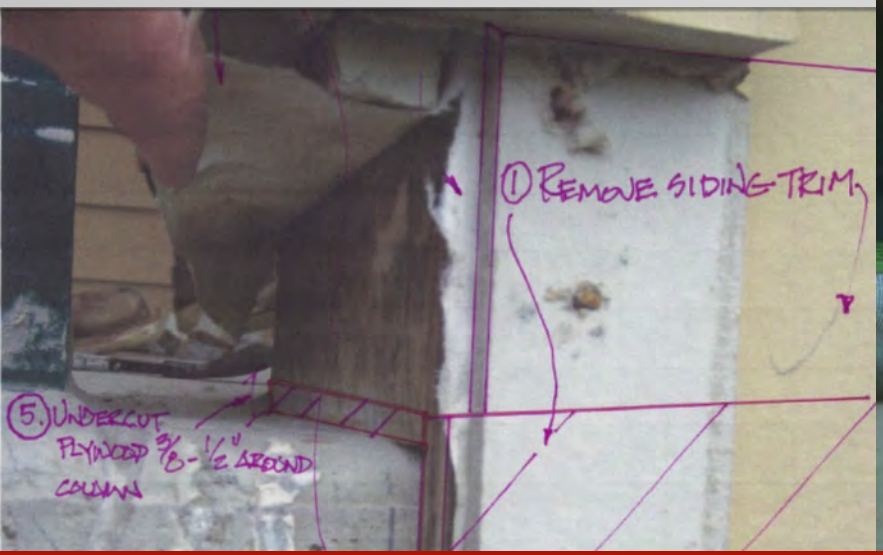
- Assisted Living Facility
- Water damage
- 100 balconies

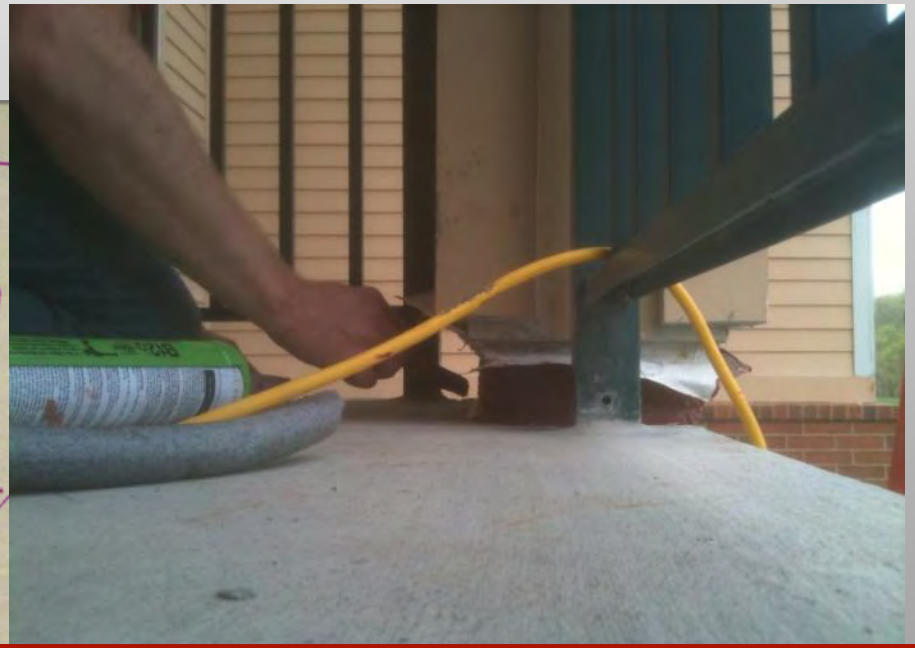
Liquid detailing membrane

Balcony slabs drain to columns and wet out column sheathing

Liquid detailing membrane

- Cut sheathing away from concrete
- Apply joint and seam filler into void created
- Apply liquid flashing membrane onto sheathing, down and over seam filler, and out onto slab





Liquid detailing membrane

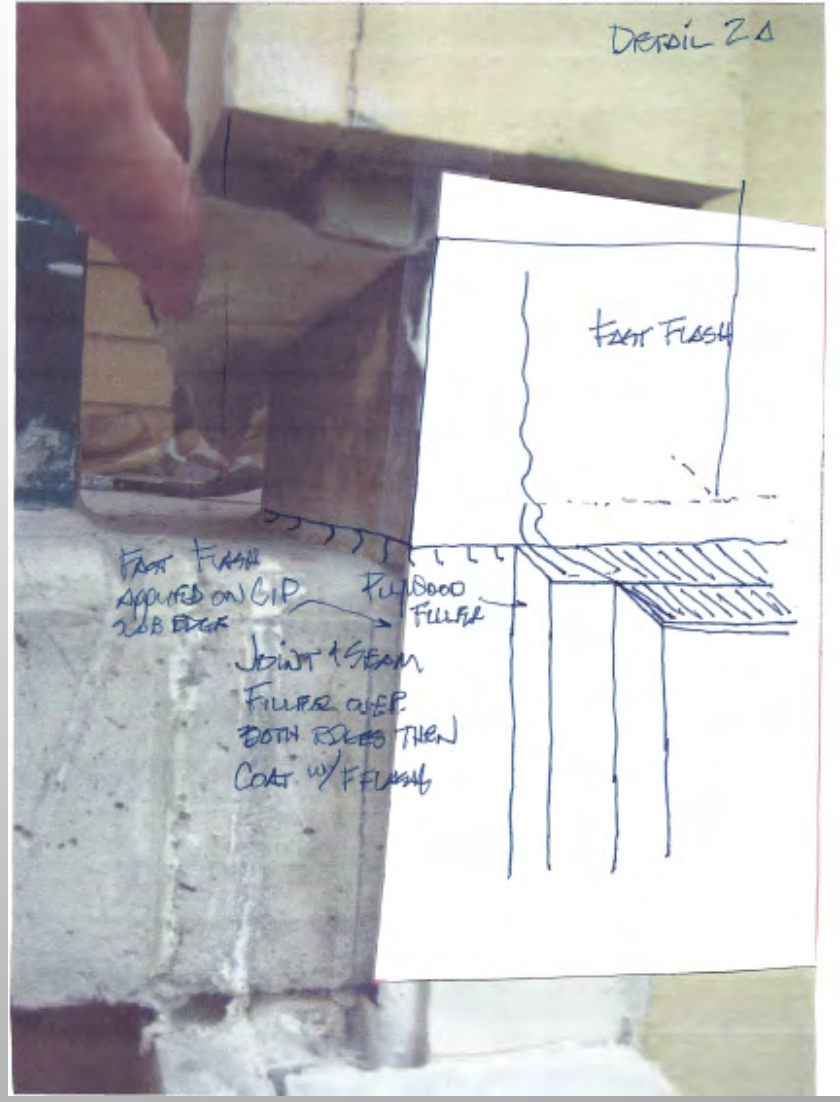
Water is diverted away from the column and flows off the slab edge

….. But some may get behind the column face siding and wet out the sheathing

Liquid detailing membrane

✓ Remove the siding and trim

✓ Cut the sheathing so that none is in contact with concrete



Liquid detailing membrane

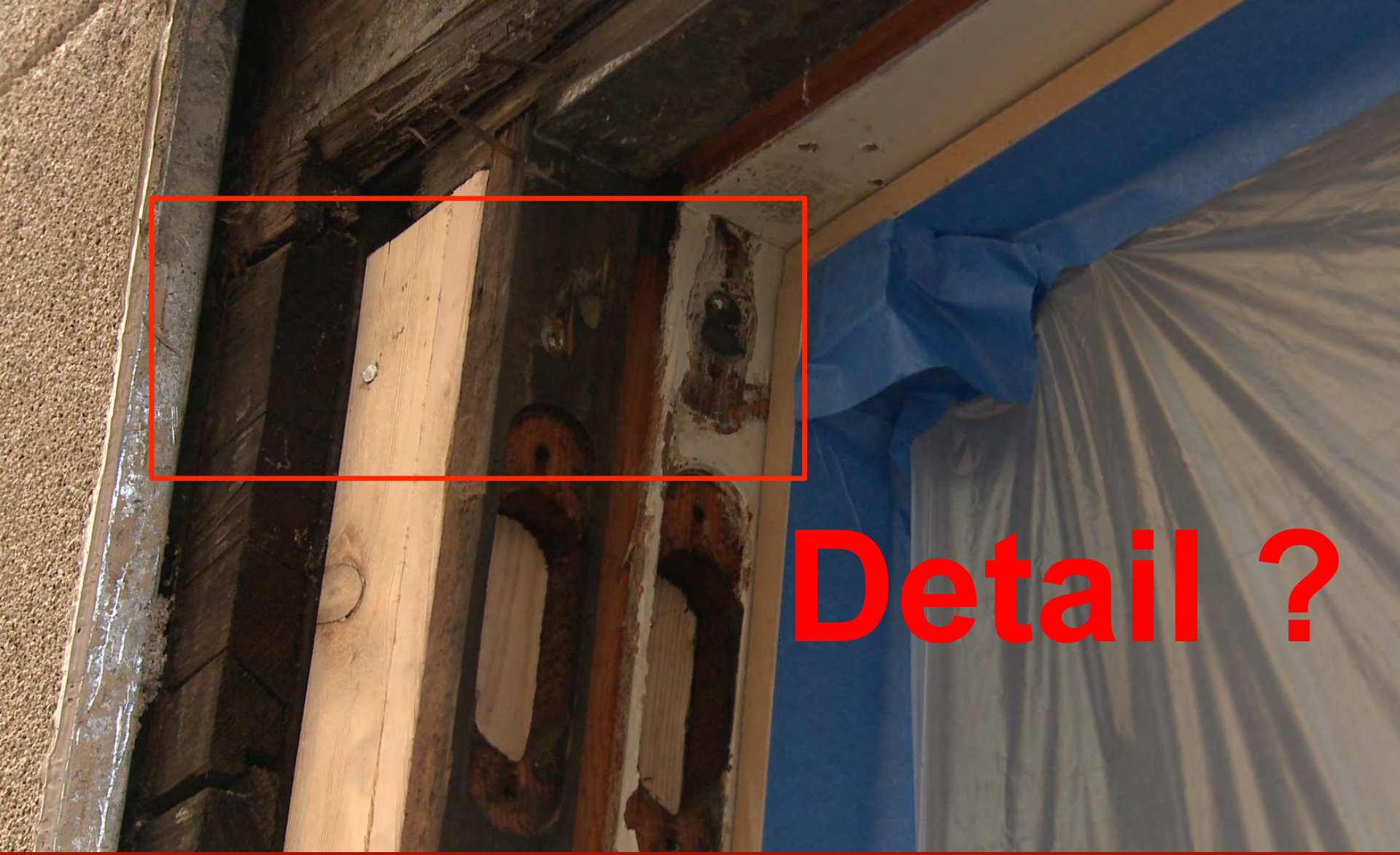
Apply joint & seam filler

Apply liquid flashing

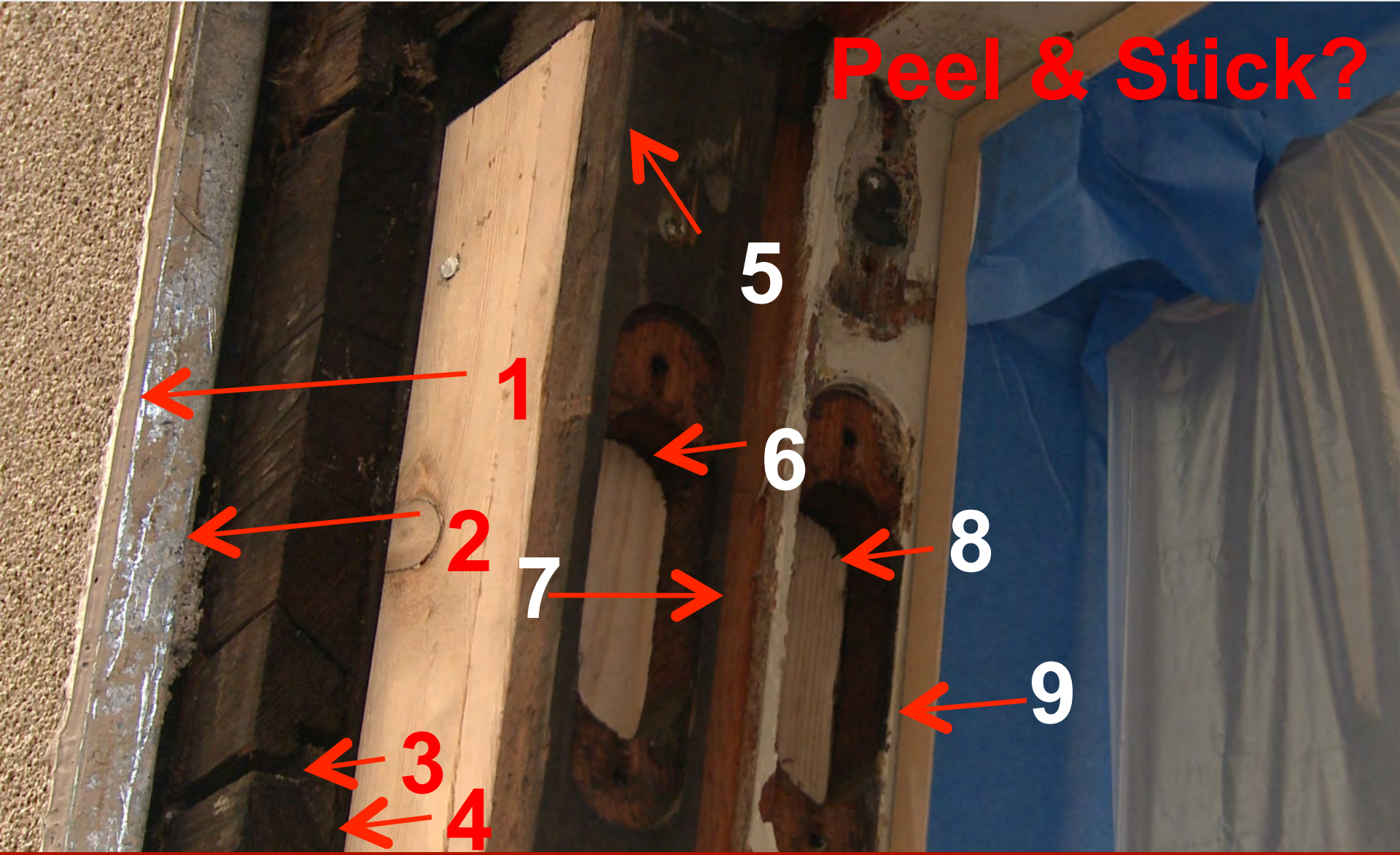
Liquid detailing membrane

Liquid detailing membrane

Liquid detailing membrane



Liquid detailing membrane



Liquid detailing membrane

Selecting the Best Air Barrier

"Peel and Stick" Rubber Membrane

Liquid detailing membrane

Liquid detailing membrane

"Five years from now, what will we look back on as an important development in building envelope construction?"

The answer: "The replacement of peel-and-stick flashing membranes with fluid-applied flashing products."

Liquid detailing membrane

This from panel member Alex Lukachko of a leading waterproofing and air-barrier consulting company **(Joe Lstiburek's** Building Science Corporation)

responding to an audience question at the

National Institute of Building Sciences, Building Enclosure Technology and Environment Council (BETEC), December, 2011 building envelope symposium in Washington, DC.

Liquid detailing membrane

The Pause

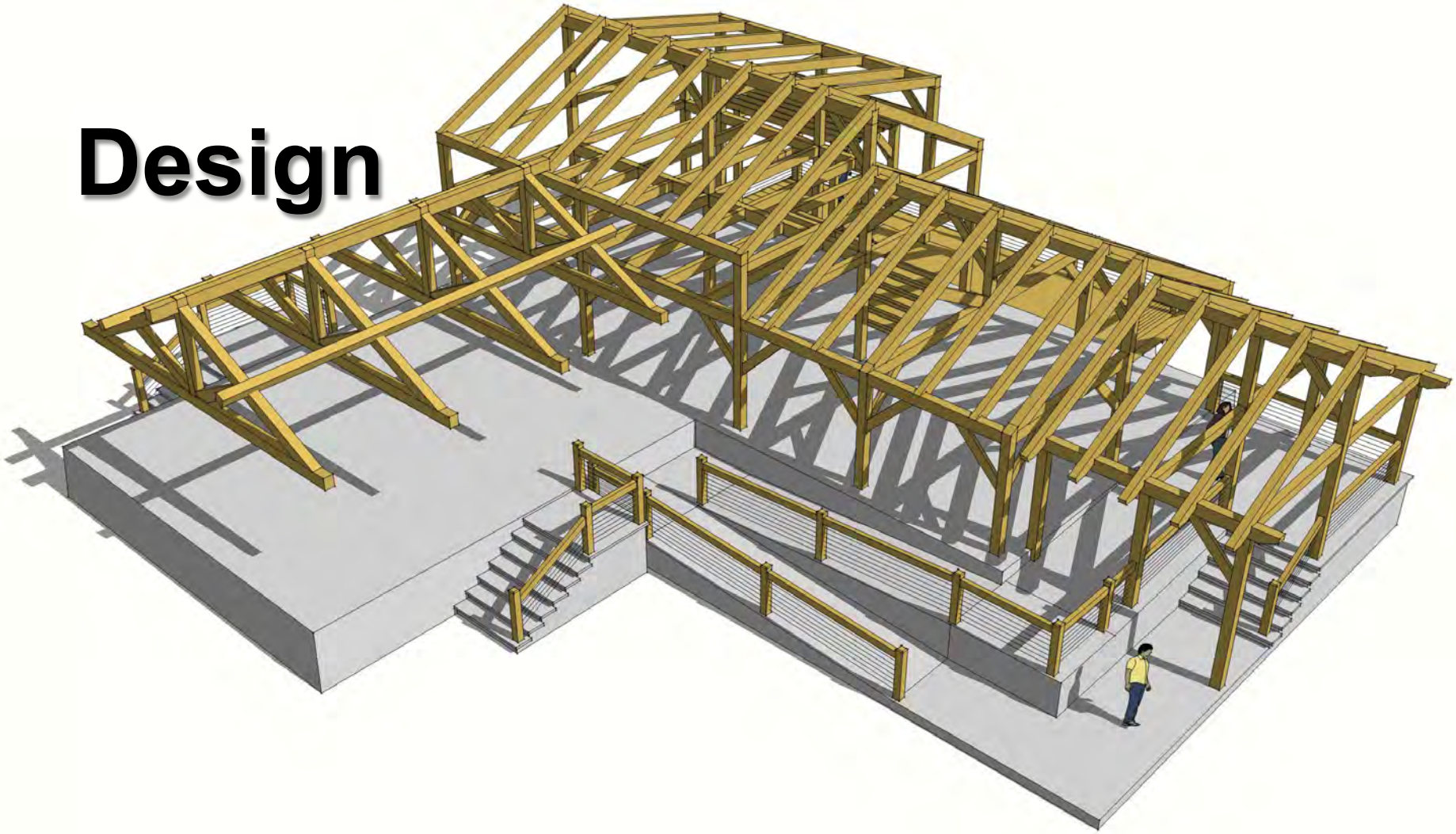
Supplement to

Managing Condensation, Water Intrusion & Energy Efficiency in the Real World

AIA Minnesota

Minneapolis, Minnesota
November 14, 2013

Design



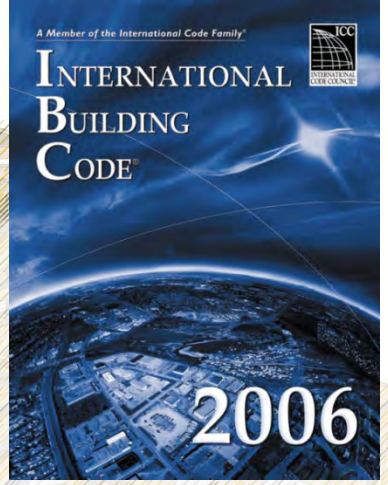
Challenging the way we build

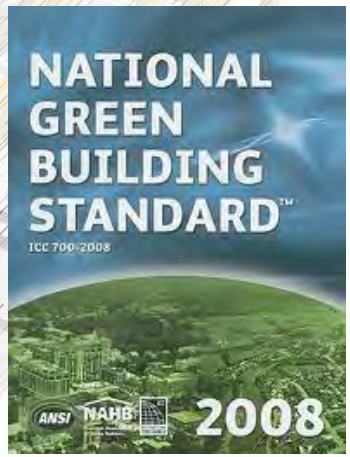
Refining Construction Details through

Design Verification Testing

Design

- ✓ Building codes
- ✓ Manufacturer recommendations
- ✓ Performance standards
- ✓ LEED considerations





air barrier
aaa
association of america

U.S. GREEN BUILDING COUNCIL
LEED
USGBC

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Design → Build

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Challenging the way we build

Refining Construction Details through

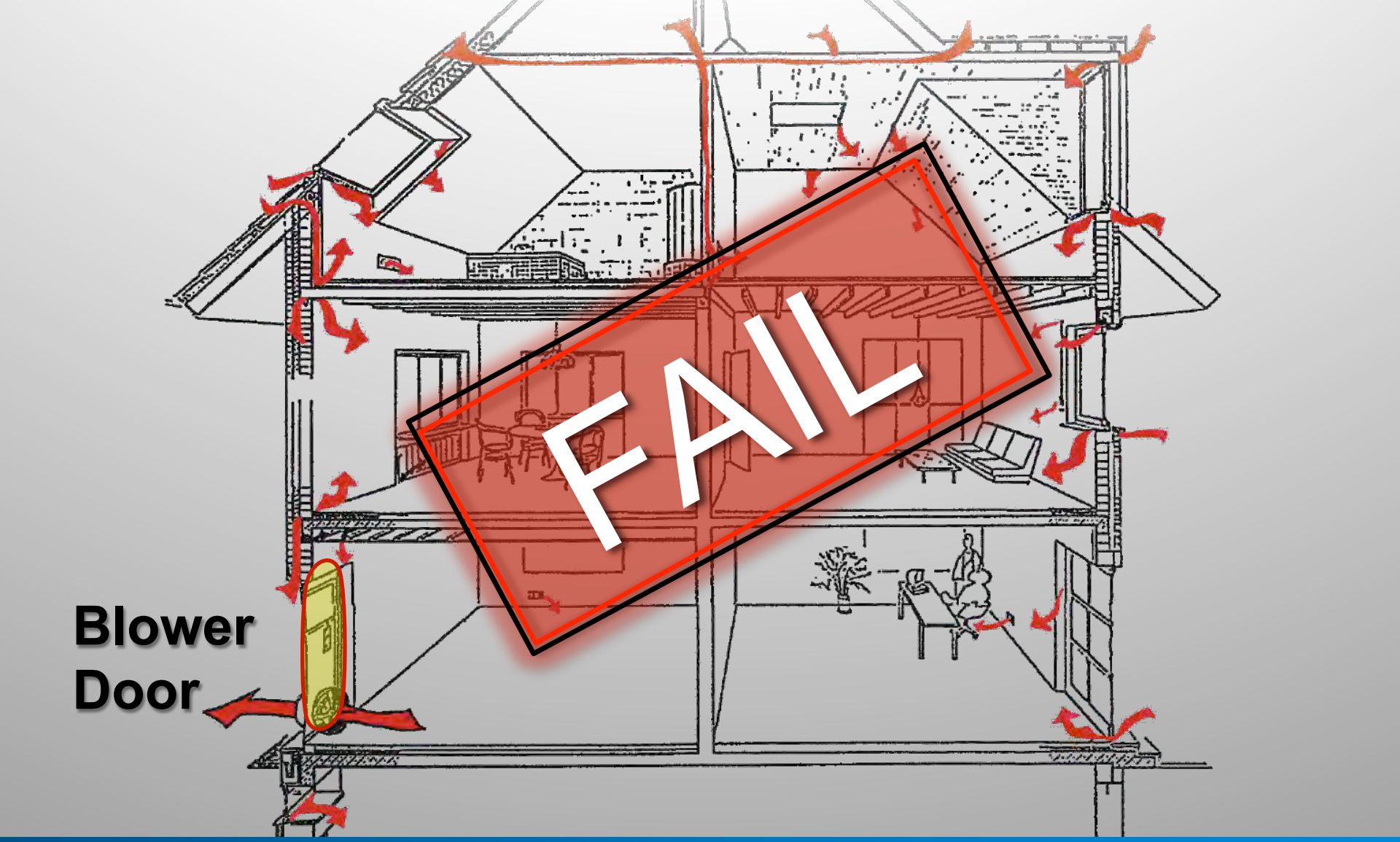
Design Verification Testing

- ✓ Design
- ✓ Build
- ✓ Test #1
- ✓ Dismantle
- ✓ Repair
- ✓ Rebuild
- ✓ Test #2
- ✓ Repeat as needed

Challenging the way we build

Refining Construction Details through

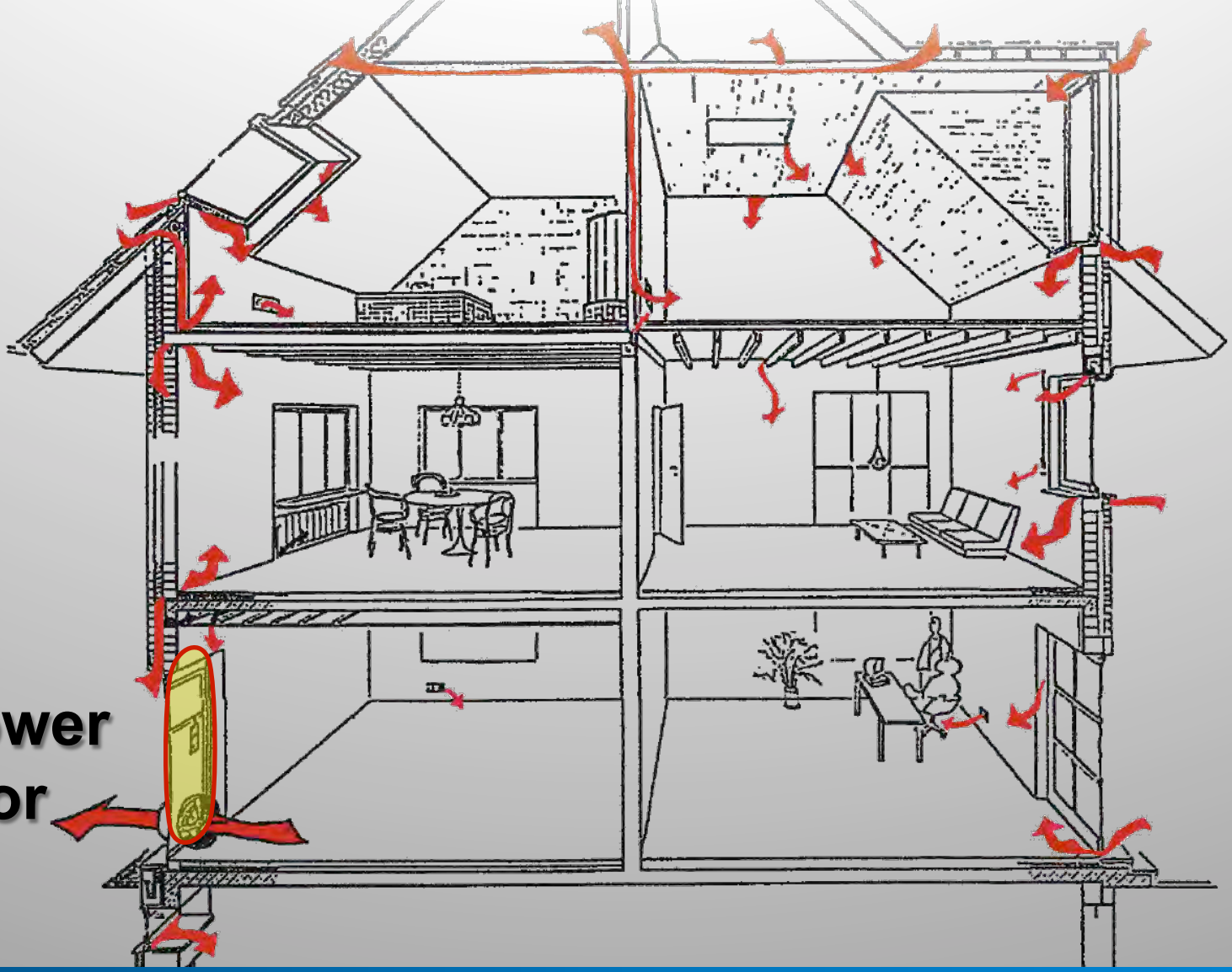
Design Verification Testing



Challenging the way we build

Refining Construction Details through

Design Verification Testing



Challenging the way we build

Refining Construction Details through

Design Verification Testing

Air and Water rarely take a straight path.

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Challenging the way we build

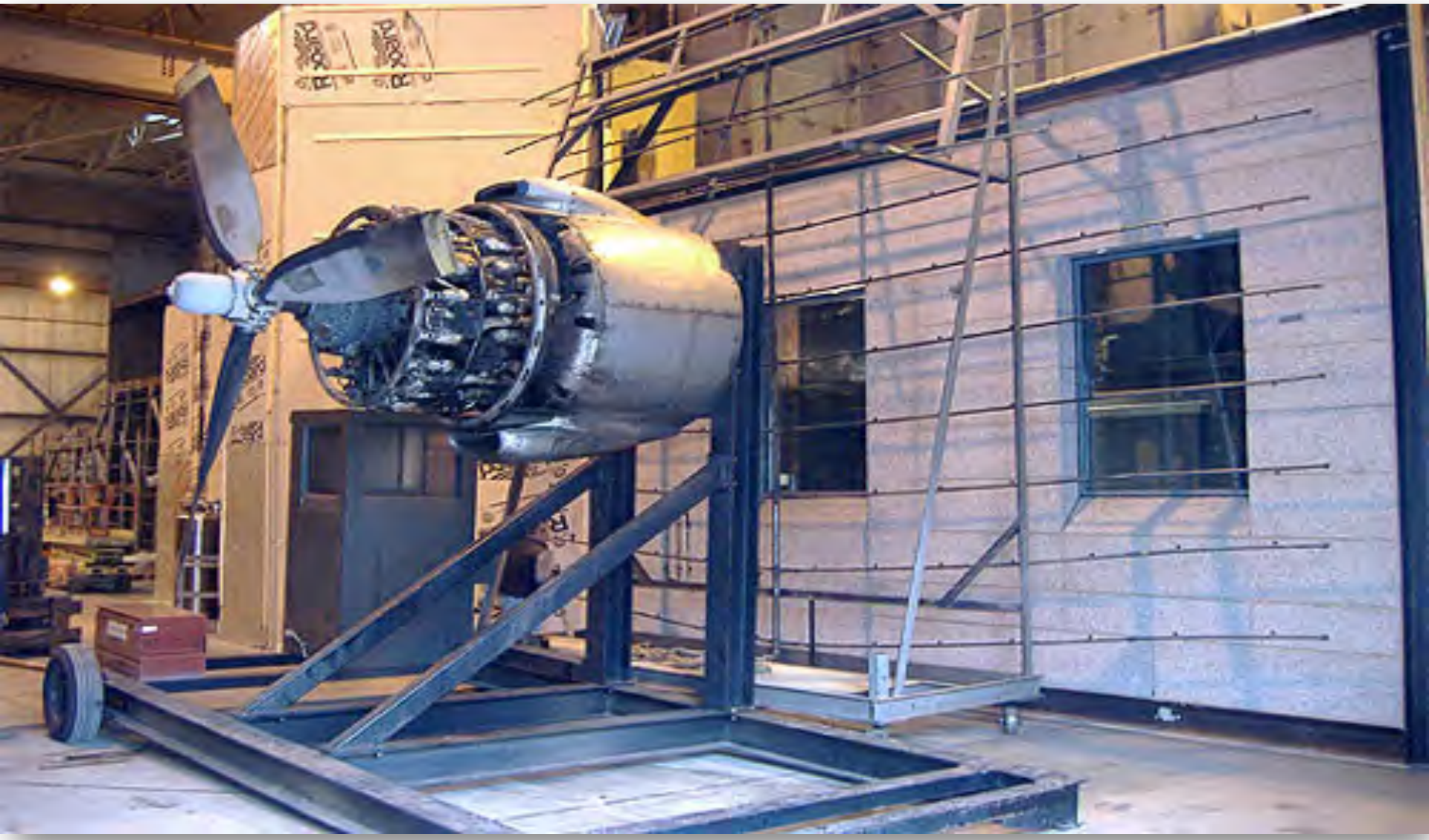
Refining Construction Details through

Design Verification Testing

If you're not testing, you're guessing

Refining Construction Details through

Design Verification Testing



If you're not testing, you're guessing

Refining Construction Details through

Design Verification Testing

Building Envelope Consulting Services

ASTM E 1105
Field Determination of Water Penetration of Installed Window

If you're not testing, you're guessing

Refining Construction Details through

Design Verification Testing

Design → Build → Test

Challenging the way we build

Refining Construction Details through

Design Verification Testing

Design Verification Testing

If you're not testing, you're guessing

Design
Test
Refine
Build

If you're not testing, you're guessing

Refining Construction Details through

Design Verification Testing

Typical construction mock-up

- ✓ Material selections
  - Colors
  - Textures
- ✓ Connections
- ✓ Construction sequence
- ✓ Other

If you're not testing, you're guessing

If you're not testing, you're guessing

Refining Construction Details through

Design Verification Testing

Design Verification mock-up

- ✓ Wall component(s)
  - Windows
  - Doors
  - Mechanical penetrations
  - Fasteners
- ✓ Flashing details
- ✓ Installation methods
- ✓ Difficult interfaces and transitions

If you're not testing, you're guessing

Install full scale wall components in test chamber.

If you're not testing, you're guessing

Refining Construction Details through

Design Verification Testing

Design Verification Testing

Determines real world limitations of wall components and assemblies.

If you're not testing, you're guessing

Design Verification Testing

Helps refine:

- ✓ Critical building details
- ✓ Project scheduling
- ✓ Construction sequences
- ✓ Construction costs

If you're not testing, you're guessing

How not to specify a thin-mil product

I am writing to address the relationship between our thin-mil system that has been specified and applied on this project and the 45 dry mils thickness referenced in Section 2.1.A.3 of the specification.

Section 2.1A.1.c, d states the contractor is to provide one of the listed products, and both thick-mil and thin-mil products are listed. The product data sheets for the thin-mil products call for a 10 wet-mil application which of course cannot yield a 45 dry-mil coating.

Section 3.4A on Air Barrier Installation states to apply the air barrier membrane according to the air barrier manufacturer's written instructions.

It is common to see this minor inconsistency in air-barrier specifications. It arises where the other products listed in the specification are thick-mil technology, and the specification language tends to follow the suggested language provided by manufacturers of such systems. In such cases, contractors in bidding and executing the project reasonably interpret the specifications to require the thin-mil system to be installed pursuant to the manufacturer's instructions. This is how hundreds of projects across the US have been handled.

Another example is self-adhered membranes. Specification section 2.2 on Auxiliary Materials states that the contractor is to provide self-adhered membrane wall flashing. This corresponds to the thick-mil products in the specification and not to the thin-mil system that utilizes the state-of-the-art silyl terminated polyether (STPE) fluid-applied flashing that was incorporated into this project.

Beyond that the manufacturer's instructions do not call for a thick-mil application, there are other reasons not to require the applicator of a thin-mil system to follow the manufacturer's instructions for thick-mil products. Since the product would not be installed per the thin-mil manufacturer's instructions, the liability of the manufacturer and the availability of funds from its product liability carrier are eliminated. Also, manufacturers do not issue warranties where their instructions are not followed.

Further, the vapor permeability of vapor permeable coatings is reduced by increasing the mil thickness. Some use a rule of thumb that doubling the thickness halves the vapor permeability. 2.1.A.2.a requires a vapor permeability of at least 5 perms. Spray Wrap at 10 wet mils is 10.5 perms. To achieve a 45 dry-mil coating with Spray Wrap would require application of 73 wet mils or seven times the recommended thickness of the application. The Spray Wrap would become a vapor barrier. Unless external insulation is being used, building scientists do not recommend air barriers that are vapor barriers.

Also, at the joints and seams where movement occurs, the thin-mil, fluid-applied product layers give you 40 dry mils.

The background of the thick-mil requirements of the other products specified and the assumed movement accommodation they afford also bears consideration.

A presentation at the web site of the Building Enclosure Technology and Environment Council (BETEC -- part of the National Institute of Building Sciences) that was provided by a Grace representative lists the following issues concerning thickness control of thick-mil products: "Control over thickness is the Achilles heel," "continuous air barrier," "membrane not supported or assisted by gravity," and onsite inspection to prevent sagging. It appears clear from the text and the microscope photographs provided that the need for thick millage arises from the need to assure that the membrane created is continuous. Thin-mil systems do not require thick millage to be continuous, and the presentation's section on thin-mil systems does not reference thickness issues. http://www.nibs.org/BETEC/04Membranes/Pres/PickettPresentation.pdf

Fluid Applied Wall Membranes – Generic Types

- Solvent Based Asphaltic
- Solvent Based Rubber
- Asphalt Emulsion Based
  - 1 part air drying
  - 2 part salt catalyzed
- 2 part vulcanized latex
- Acrylic Emulsions
- Spray polyurethane foam

BETEC

NIBS

Thick-mil

Manufacturer

40 mils Dry Film Thickness on CMU Block

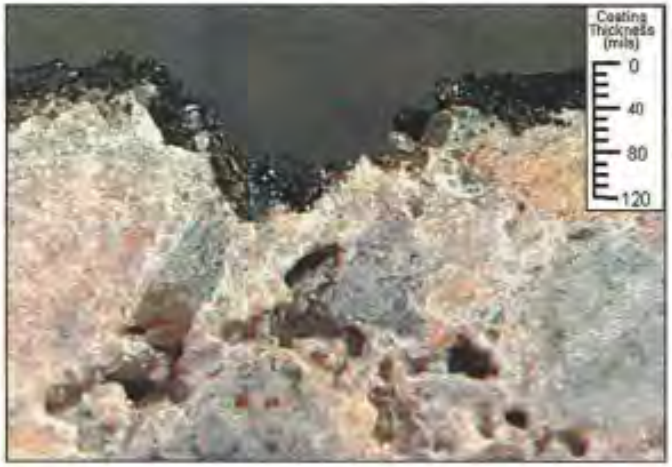
BETEC

NIBS

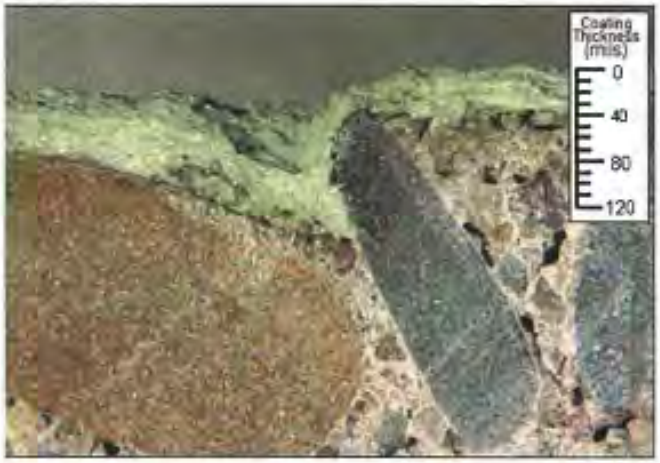
Thick-mil

Manufacturer

- Concrete Block
  - 40 mil does not provide continuous air barrier
  - All samples fail ASTM E1186
- DensGlass Surface
  - Membranes can provide continuous coating at 40 mil or less
  - Much thicker coating is required for joints, screw heads and penetrations



Asphalt emulsion at 40 mil dry thickness on concrete block



Vulcanized Latex at 40 mil dry thickness on concrete block

Thin-mil testing at National Concrete Masonry Association

Air leakage test passed at 17 dry mils.

air barrier thickness

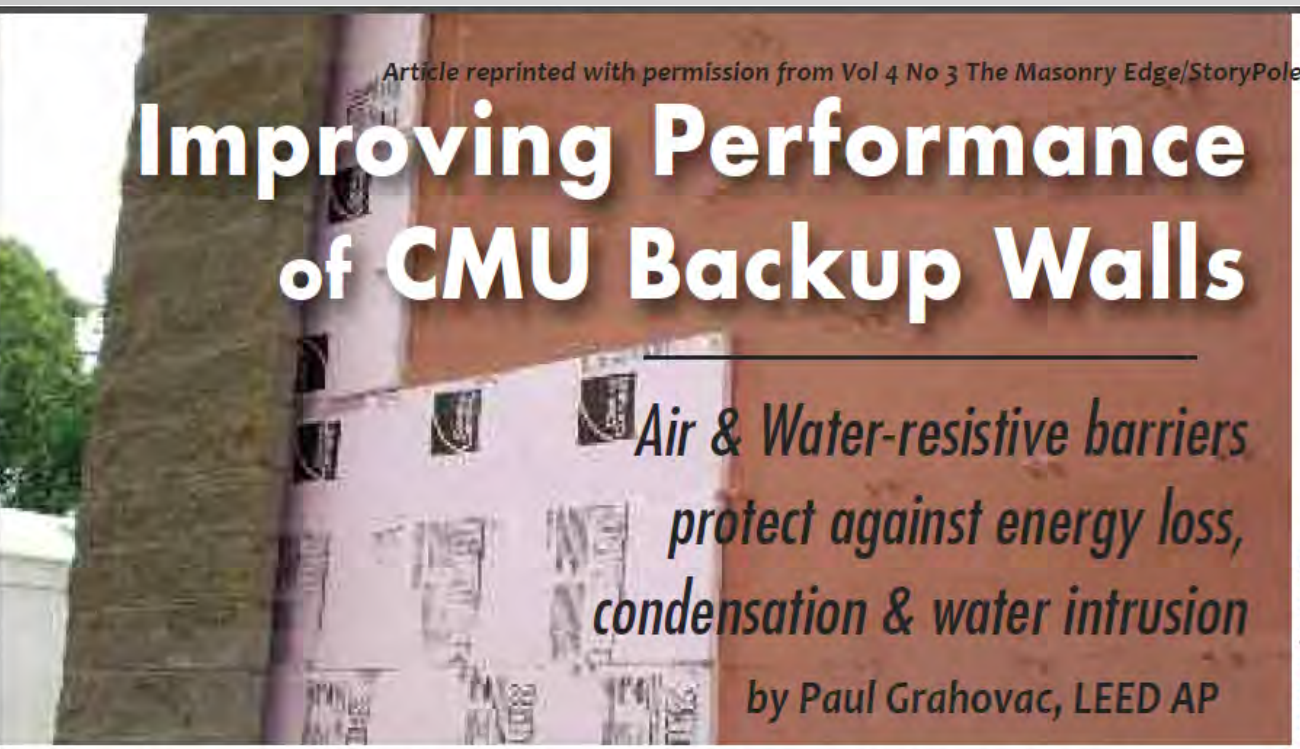
Pat Conway, AIA
Air Barrier Expert
International
Masonry Institute

- wet mil ?
- dry mil ?
- thicker is not necessarily better
- too thick can cause problems
  - sagging
  - vapor transfer reduction
- more important things to worry about

The confusion over "The vapor retarder shall be installed on the warm-in-winter side of the thermal insulation."

This is inapplicable to anything that is fastened or coated on the external face of sheathing walls.

Masonry Institute of Michigan
January, 2010



Article reprinted with permission from Vol 4 No 3 The Masonry Edge/StoryPole – Optimize Energy Performance

Improving Performance of CMU Backup Walls

Air & Water-resistive barriers protect against energy loss, condensation & water intrusion

by Paul Grahovac, LEED AP

An insulated masonry cavity wall's energy effectiveness improves with the simple addition of a continuous air barrier – according to National Institute of Science & Technology (NIST) study, an average of 40% in natural gas, 25% in electricity.

Photos courtesy of PROSOCO

"An air barrier *system* is simply a collection *of building assemblies tied* together using air barrier components to provide a continuous plane of air tightness *for the whole building enclosure. The air barrier system determines air leakage of the whole building.* The maximum air leakage of a whole building should not exceed 2.0 L(s•m^2) at 75 Pa."

Vapor Barriers vs Vapor Permeable Air Barriers

Many of us can remember how many days during the cooler months we would see water condensed on the interior side of single-pane glass windows. It is that same number of days that water can condense

Minnesota has a statewide building code. The state building codes division is preparing to adopt the 2012 editions of the International Codes.
Currently 2006 codes are in effect.
http://www.iccsafe.org/gr/Pages/MN.aspx

In section 402.5, the 2006 International Energy Conservation Code requires: “Above-grade frame walls, floors and ceilings not ventilated to allow moisture to escape shall be provided with an approved vapor retarder. The vapor retarder shall be installed on the warm-in-winter side of the thermal insulation.”

2012 IBC

1405.3 Vapor retarders. Class I or II vapor retarders shall be provided on the ***interior side of frame walls*** in Zones 5, 6, 7, 8 and Marine 4.

Lstiburek assemblies by climate

(Analysis of a paper by Joseph Lstiburek of Building Science Corporation entitled ***Understanding Vapor Barriers*** which can be found at http://www.buildingscience.com/documents/digests/bsd-106-understanding-vapor-barriers. You must scroll down at that web page and click the download option to be provided the additional material at the end of that article.)

ASSEMBLIES

CLIMATES

	Vapor barrier on block, external insulation	Vapor barrier on block, internal insulation [1]	Vapor barrier on sheathing, external insulation	Vapor barrier on sheathing, internal insulation (orphaned) [2]	Vapor permeable on sheathing >10 perms[3], internal insulation	Vapor permeable on sheathing >10 perms, internal insulation, internal vapor barrier [4]
Mixed-humid	Yes	Yes	Yes	No (implied)	Yes	No
Hot-humid	Yes	Yes	Yes	No (implied)	Yes	No
Mixed-dry	Yes	Yes	Yes	No (implied)	Yes	No
Hot-dry	Yes	Yes	Yes	No (implied)	Yes	No
Marine	Yes	Yes	Yes	No (implied)	Yes	No
Cold	Yes	No	Yes	No (implied)	Yes	Yes
Very cold	Yes	No	Yes	No (implied)	No	Yes

[1] Lstiburek maintains block's ability to hold water from condensation of indoor water vapor during the heating season justifies this assembly, but he does not address problems with subflorescense, spalling, and coating delamination that are commonly seen on masonry that has been coated with an impermeable coating and then allowed to receive water or water vapor from another direction. His identification of interior-side condensation shows that he considers the vapor barrier the worst case with this block assembly and would support vapor permeable systems with it as well.

[2] Lstiburek's does not show or discuss this assembly because of his observation that, unlike block, sheathing is without moisture storage capacity and must be kept insulated on the outside in all climates as indicated in the column to the left.

[3] Lstiburek indicates his paper is based on hygrothermal computer modeling, and that his vapor permeable air barriers were greater than 10 perms. R-GUARD Spray Wrap, MVP, and Cat 5 are all over 10 perms.

[4] Lstiburek recommends vapor permeable air barriers, but he does not support adding an internal vapor barrier in warmer climates -- for the same reason that the building code does not require an internal vapor barrier in such climates: an internal vapor barrier can lead to condensation and precludes drying to the inside.

	Vapor barrier on block, external insulation	Vapor barrier on block, internal insulation [1]	Vapor barrier on sheathing, external insulation	Vapor barrier on sheathing, internal insulation (orphaned) [2]	Vapor permeable on sheathing >10 perms[3], internal insulation	Vapor permeable on sheathing >10 perms, internal insulation, internal vapor barrier [4]
Mixed-humid	Yes	Yes	Yes	No (implied)	Yes	No
Hot-humid	Yes	Yes	Yes	No (implied)	Yes	No
Mixed-dry	Yes	Yes	Yes	No (implied)	Yes	No
Hot-dry	Yes	Yes	Yes	No (implied)	Yes	No
Marine	Yes	Yes	Yes	No (implied)	Yes	No
Cold	Yes	No	Yes	No (implied)	Yes	Yes
Very cold	Yes	No	Yes	No (implied)	No	Yes

CLADDINGS
and Entrapped Moisture

Lessons learned from early EIFS

The problems of wet insulation in a wall do not end with just poor thermal values—they also include mold, pest infiltration, and building material degradation. In fact, an exterior building envelope with no insulation can often be preferable to one with wet insulation.

The Construction Specifier
September, 2013

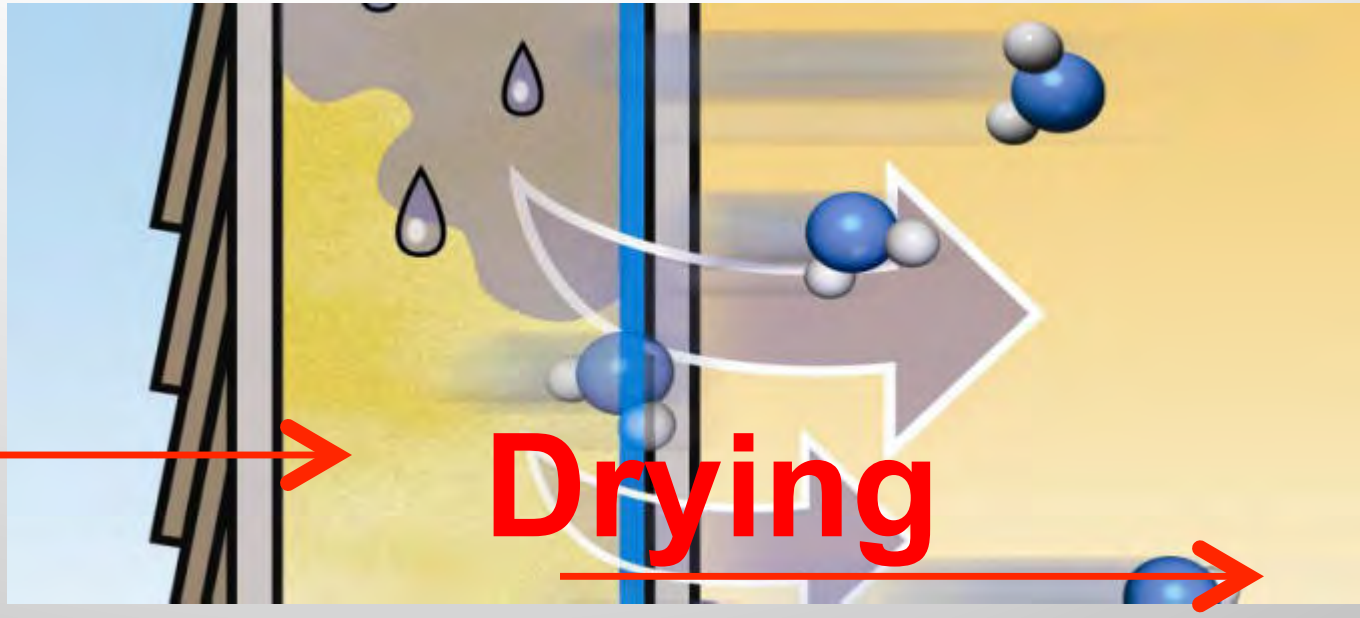
State-of-the-Art EIFS

- Notched trowel adhesive for drainage
- Vapor permeable water-resistive barrier
- Vapor permeable insulation

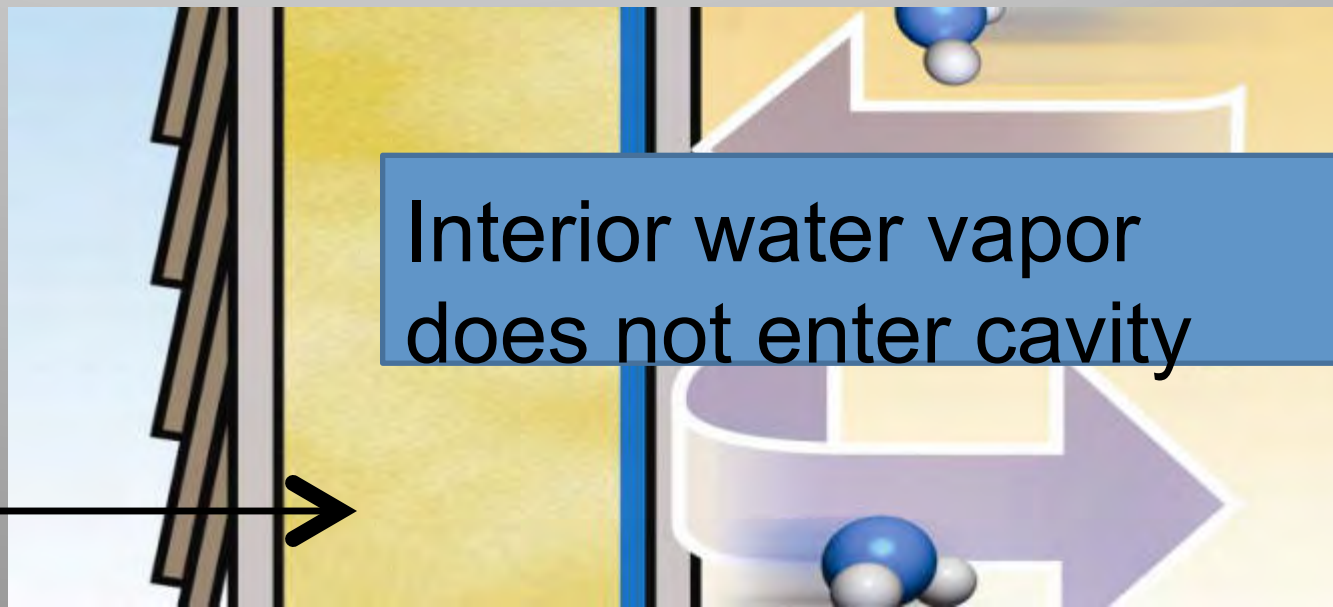
Vapor Permeability & Drying

- The Dreaded Double Vapor Barrier
  - Interior polyethylene sheeting behind drywall
  - Plastic foam exterior insulation or vapor barrier WRB
- Better to dry in at least one direction
- Best to dry in both directions
  - Smart interior vapor retarder ??
  - Vapor permeable WRB and vapor permeable mineral wool external insulation

Summer
High
Cavity
Humidity



Winter
Low
Cavity
Humidity



Pat Conway, AIA
Air Barrier Expert
International Masonry Institute

A vapor barrier air barrier holds out just a tiny bit more water vapor than a vapor permeable air barrier.

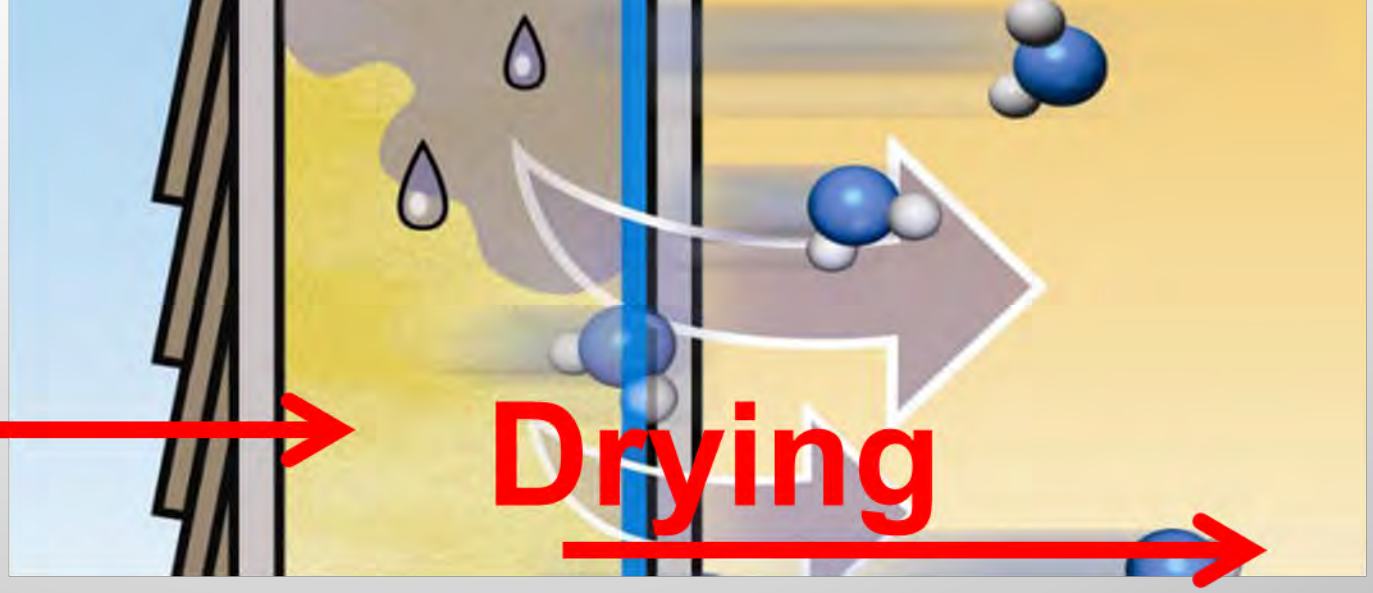
The great bulk of water vapor travels with air leakage through openings.

moisture transfer study

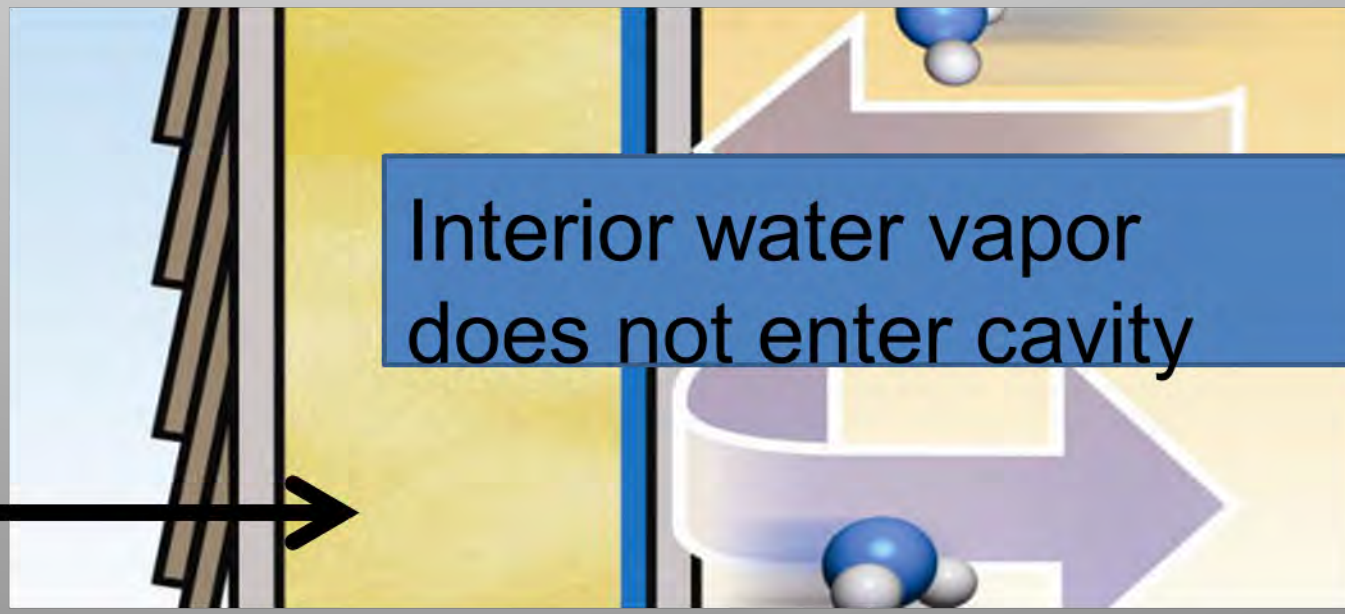
- 1 square meter wall board
- 1 month
- air diffusion thru wall board (no openings) = 0.00158 gal.
- air leakage thru wall board with 1 inch ² net opening = 3.7 gal.
- **2,333x** more moisture transfer with opening !
- other studies, **100x** to **5,000,000x** more

1 - Institute for Research in Construction, National Research Council, Canada
1m², 70°F, 30% RH, 9.3 MPH wind, -4°F sheathing, 4 mil VR, 1 month

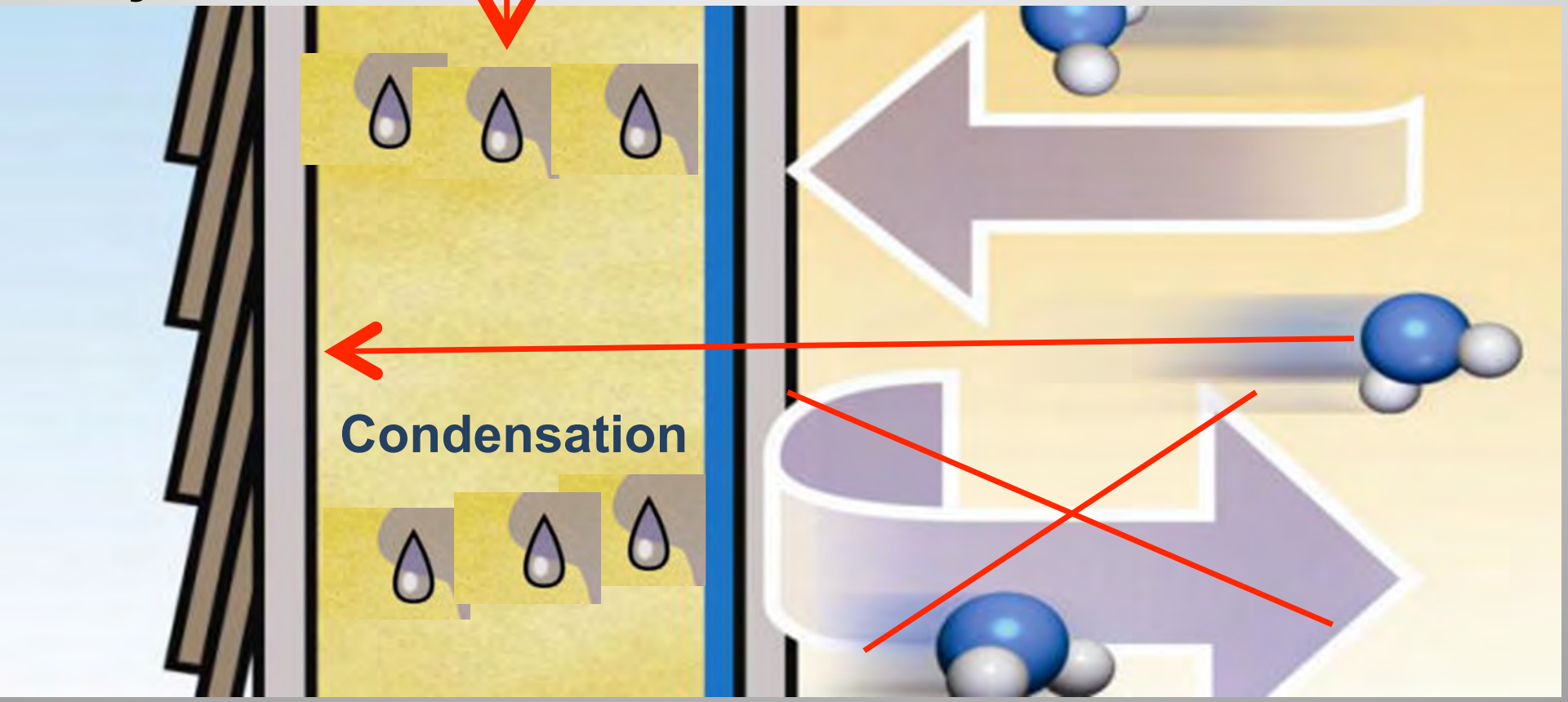
Summer
High
Cavity
Humidity



Winter
Low
Cavity
Humidity



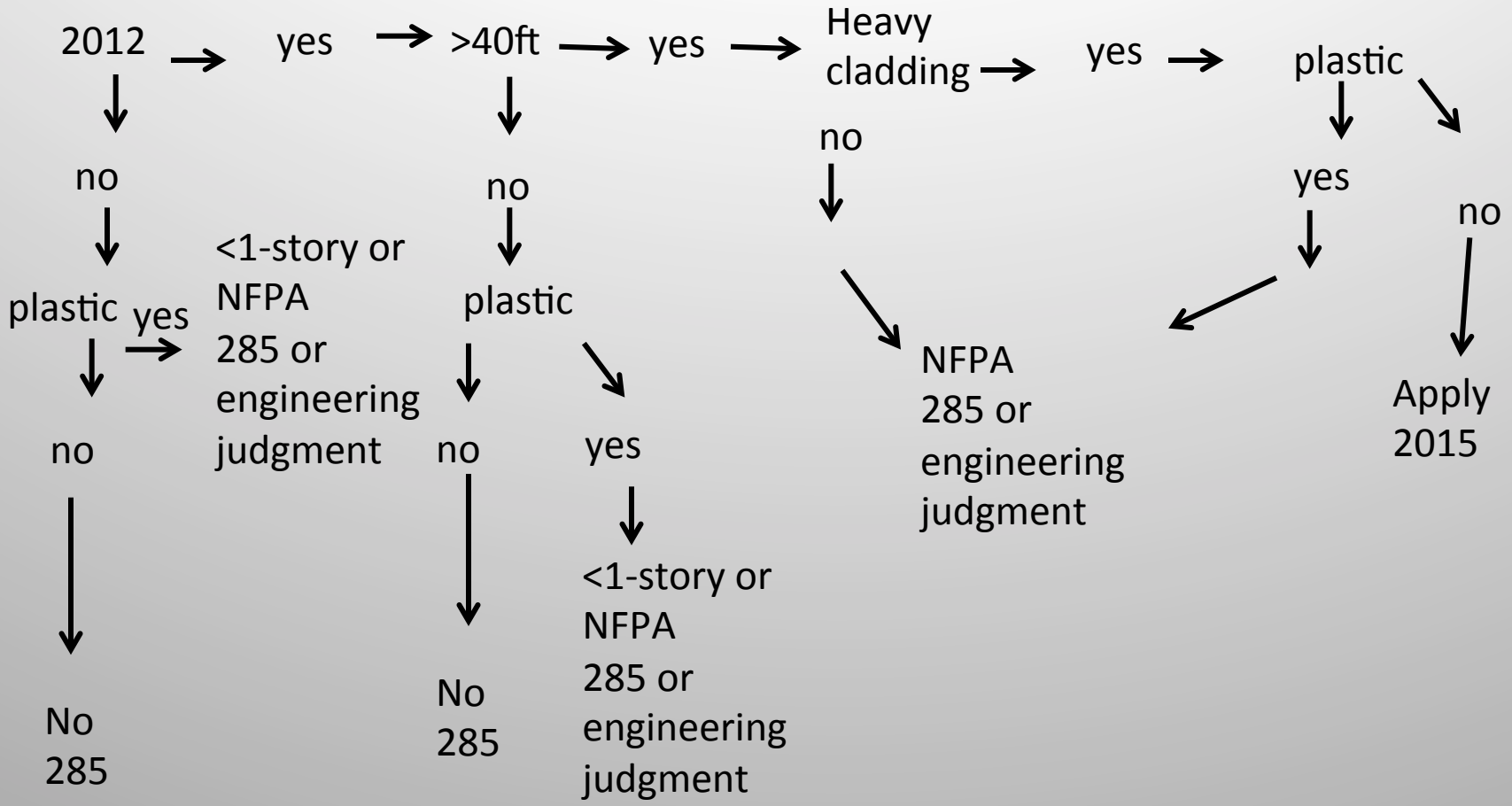
Construction defect water injection



State-of-the-Art EIFS

- Notched trowel adhesive for drainage
- Vapor permeable water-resistive barrier
- Vapor permeable insulation

- NFPA 285 Wall Assembly Fire Testing
- Mineral Wool Insulation
- Vapor Permeability & Drying


2012
yes
>40ft
yes
Heavy cladding
yes
plastic
no
yes
no
plastic
yes
<1-story or NFPA 285 or engineering judgment
no
plastic
no
yes
<1-story or NFPA 285 or engineering judgment
no
No 285
No 285
NFPA 285 or engineering judgment
Apply 2015

NFPA 285 Walls Assembly Fire Testing

- 2000: Plastic foam insulation wall assemblies must be fire tested
- 2012 Wall assemblies with water-resistive barriers must be fire tested
- 2015 Wall assemblies with water-resistive barriers need not be fire tested in most cases

Elevator briefing

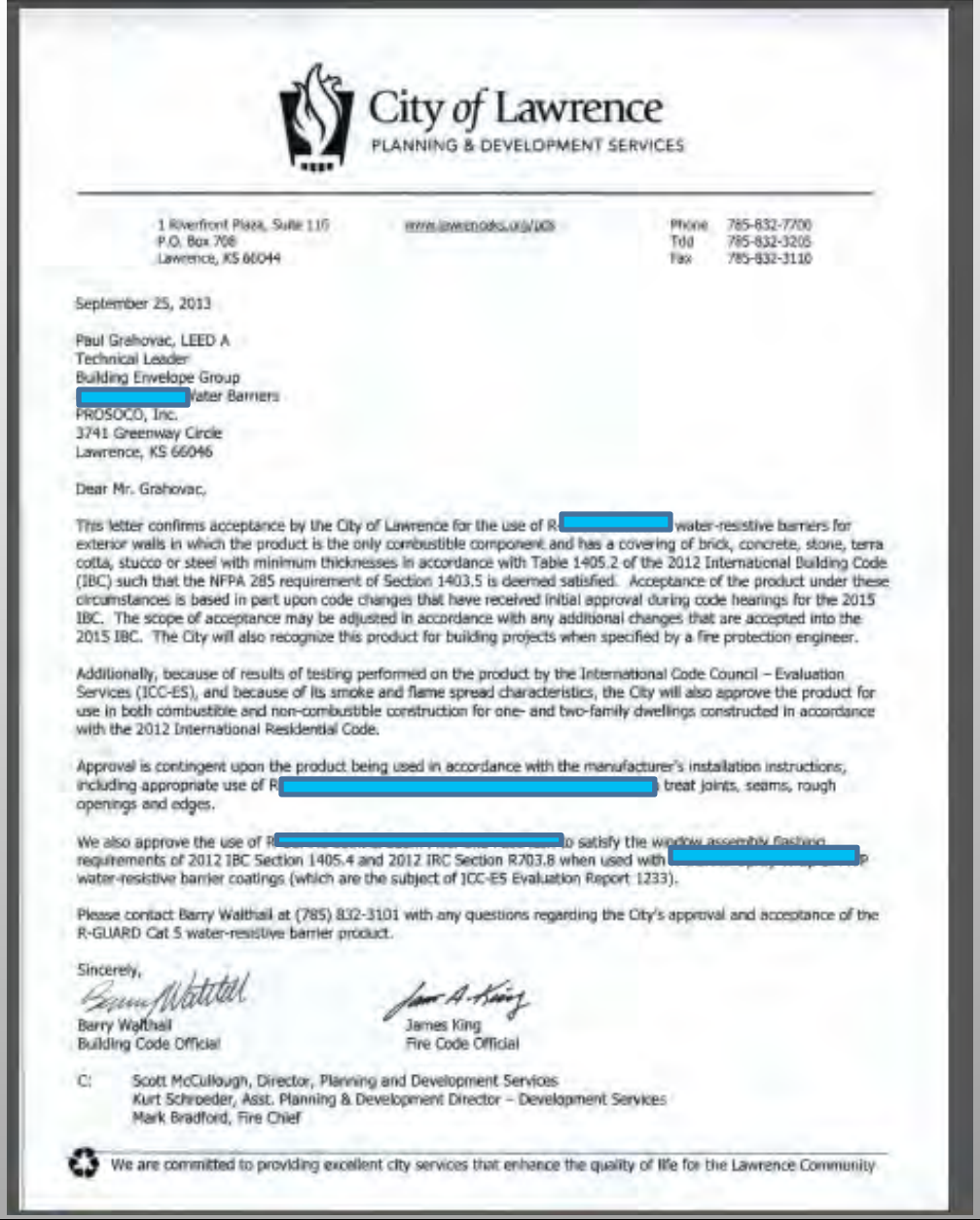
- No one paid much attention to foam insulation fire testing requirement
- 2012 WRB requirement driving architects and manufacturers crazy
  - Work around: interpret with 2015 amendments
- 2012 IECC exterior insulation requirements raise the plastic foam problem
- Manufacturers are not doing the multi-million dollar testing that is required
- Work arounds:
  - Engineering analysis
  - Mineral Wool

NFPA 285 Walls Assembly Fire Testing

See e-mail text for inquiries from architects and local code officials

This letter confirms acceptance by the City of Lawrence for the use of xxxxxx as water-resistive barriers for exterior walls in which the product is the only combustible component and has a covering of brick, concrete, stone, terra cotta, stucco or steel with minimum thicknesses in accordance with Table 1405.2 of the 2012 International Building Code (IBC) such that **the NFPA 285 requirement of Section 1403.5 is deemed satisfied.**

Acceptance of the product under these circumstances is **based in part upon code changes that have received initial approval during code hearings for the 2015 IBC**. The scope of acceptance may be adjusted in accordance with any additional changes that are accepted into the 2015 IBC



City of Lawrence
PLANNING & DEVELOPMENT SERVICES

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Lawrence, KS 66044

www.lawrenceks.org/pds

Phone 785-832-7700
TDD 785-832-3205
Fax 785-832-3110

September 25, 2013

Paul Grahovac, LEED A
Technical Leader
Building Envelope Group
[redacted]Water Barriers
PROSOCO, Inc.
3741 Greenway Circle
Lawrence, KS 66046

Dear Mr. Grahovac,

This letter confirms acceptance by the City of Lawrence for the use of R[redacted] water-resistive barriers for exterior walls in which the product is the only combustible component and has a covering of brick, concrete, stone, terra cotta, stucco or steel with minimum thicknesses in accordance with Table 1405.2 of the 2012 International Building Code (IBC) such that the NFPA 285 requirement of Section 1403.5 is deemed satisfied. Acceptance of the product under these circumstances is based in part upon code changes that have received initial approval during code hearings for the 2015 IBC. The scope of acceptance may be adjusted in accordance with any additional changes that are accepted into the 2015 IBC. The City will also recognize this product for building projects when specified by a fire protection engineer.

Additionally, because of results of testing performed on the product by the International Code Council – Evaluation Services (ICC-ES), and because of its smoke and flame spread characteristics, the City will also approve the product for use in both combustible and non-combustible construction for one- and two-family dwellings constructed in accordance with the 2012 International Residential Code.

Approval is contingent upon the product being used in accordance with the manufacturer's installation instructions, including appropriate use of R[redacted] treat joints, seams, rough openings and edges.

We also approve the use of P[redacted] to satisfy the window assembly flashing requirements of 2012 IBC Section 1405.4 and 2012 IRC Section R703.8 when used with [redacted] water-resistive barrier coatings (which are the subject of ICC-ES Evaluation Report 1233).

Please contact Barry Walthall at (785) 832-3101 with any questions regarding the City's approval and acceptance of the R-GUARD Cat 5 water-resistive barrier product.

Sincerely,

Barry Walthall
Building Code Official

James King
Fire Code Official

C: Scott McCullough, Director, Planning and Development Services
Kurt Schroeder, Asst. Planning & Development Director – Development Services
Mark Bradford, Fire Chief

We are committed to providing excellent city services that enhance the quality of life for the Lawrence Community

Detroit Building Enclosure Council Symposium

October 15, 2013

"We're working with the state code officials' organization to make sure the 2012 IBC comes in with the 2015 amendment as to WRBs and NFPA 285 wall assembly fire testing."

NFPA 285 Walls Assembly Fire Testing

- 2000: Plastic foam insulation wall assemblies must be fire tested
- 2012 Wall assemblies with water-resistive barriers must be fire tested
- 2015 Wall assemblies with water-resistive barriers need not be fire tested in most cases

NFPA 285 Walls Assembly Fire Testing

- 2000: Plastic foam insulation wall assemblies must be fire tested
- Work arounds: Engineering analysis

- Issues: 10 WRBs from 7 manufacturers
- ABAA lists 37 manufacturers
- 4,032 wall assemblies

Mineral Wool

- Noncombustible
- No NFPA 285 wall assembly fire testing requirement

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BSI-068: Rocks Don't Burn

By Joseph Lstiburek

Created: 2013/05/06

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If you take rocks and melt them and blow air through them you get fluffy rocks. And fluffy rocks don't burn. If you take gypsum and make it into sheets you get "sheet rock". And guess what? Rocks don't burn.[1] Also, metals don't burn. You can look that up. OK, some metals burn, but you get the idea. If you take wood, which burns, and add rocks and metals to the wood,[2] you get wood that does not burn. We could be on to something here.

There are all kinds of places where we have to deal with wildfires and all kinds of places where we build right next to our neighbors. Where we build next to our neighbors we have kind of decided that it is a good idea that if they are on fire that we should not be on fire. And vice versa. This makes things very interesting if we want to vent our roofs or if we want to use continuous insulation on the exterior of our buildings or if we want to do both. And things get even more interesting if we want to vent our claddings.

You want to see a fireman's head explode mention roof vents, particularly the soffit kind, or air spaces behind siding. It seems that even after 140 odd years the fire folks can't seem to get over Mrs. O'Leary's cow.[3] Truth be told, good for them. We have the best fire codes bar none in the industrialized world. But every now and then things get irritating code wise if we also want to control other things besides just fire – like water and energy.

With wildfires soffit vents are a problem because burning embers get drawn into the soffit vents and you end up losing the roof. Roof ventilation is prohibited in many wildfire zones for this reason. And it is a good reason. We have the technology to build unvented roofs. The codes allow them. We have covered this before (BSD-102: Understanding Attic Ventilation). So what is the problem?

Well, in places where it snows a lot we need attic ventilation to address ice damming. You can't just do it with a highly insulated airtight unvented roof. The R-value of the snow cover will raise the snow-roof cladding interface surface temperature above the melt point of the snow even with a "super insulated" unvented roof. We have also covered this before (BSI-046: Dam Ice Dam).

Related Documents

RR-1311: Evaluation of Two CEDA Weatherization Pilot Implementations of an Exterior Insulation and Over-Clad Retrofit Strategy for Residential Masonry Buildings in Chicago

BSD-102: Understanding Attic Ventilation

BSI-046: Dam Ice Dam

BSI-001: The Perfect Wall

BSI-057: Hockey Pucks and Hydrostatic Pressure

RR-1104: Hygrothermal Analysis of Exterior Rockwool Insulation

BA-1204: External Insulation of Masonry Walls and Wood Framed Walls

Related Products

James Hardie Siding

The water control layer and air control layer and vapor control layer in Figure 3 needs to have some vapor resistance. It should be at minimum a Class III vapor retarder (1.0 to 10 perms) or less to handle the inward vapor drive out of the fiber cement "reservoir cladding."

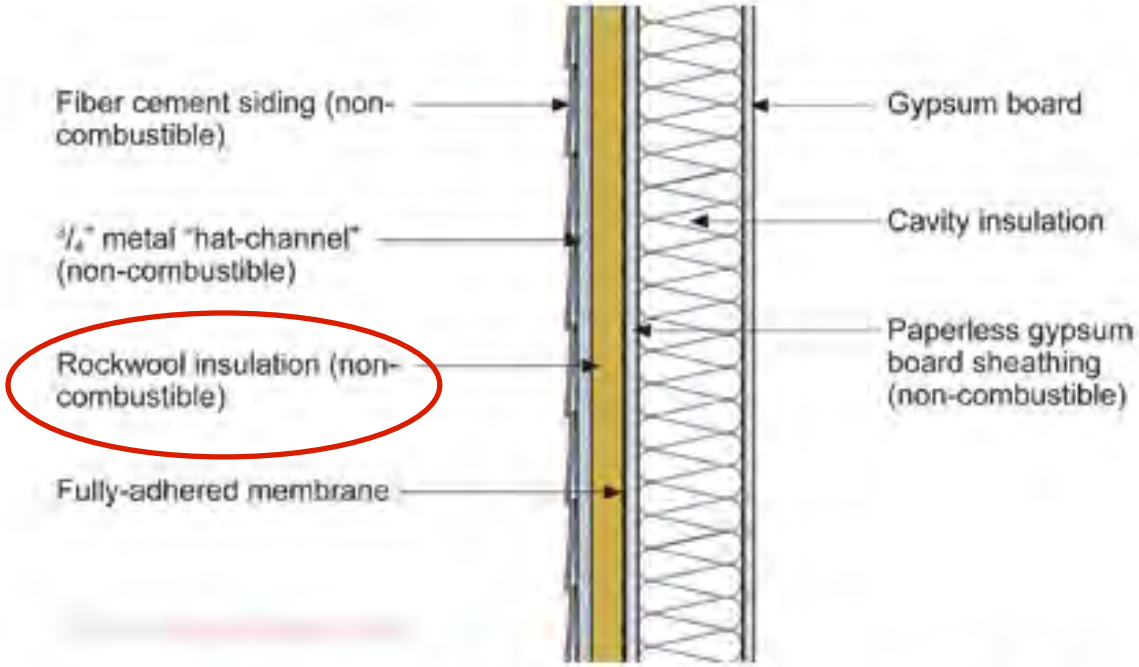
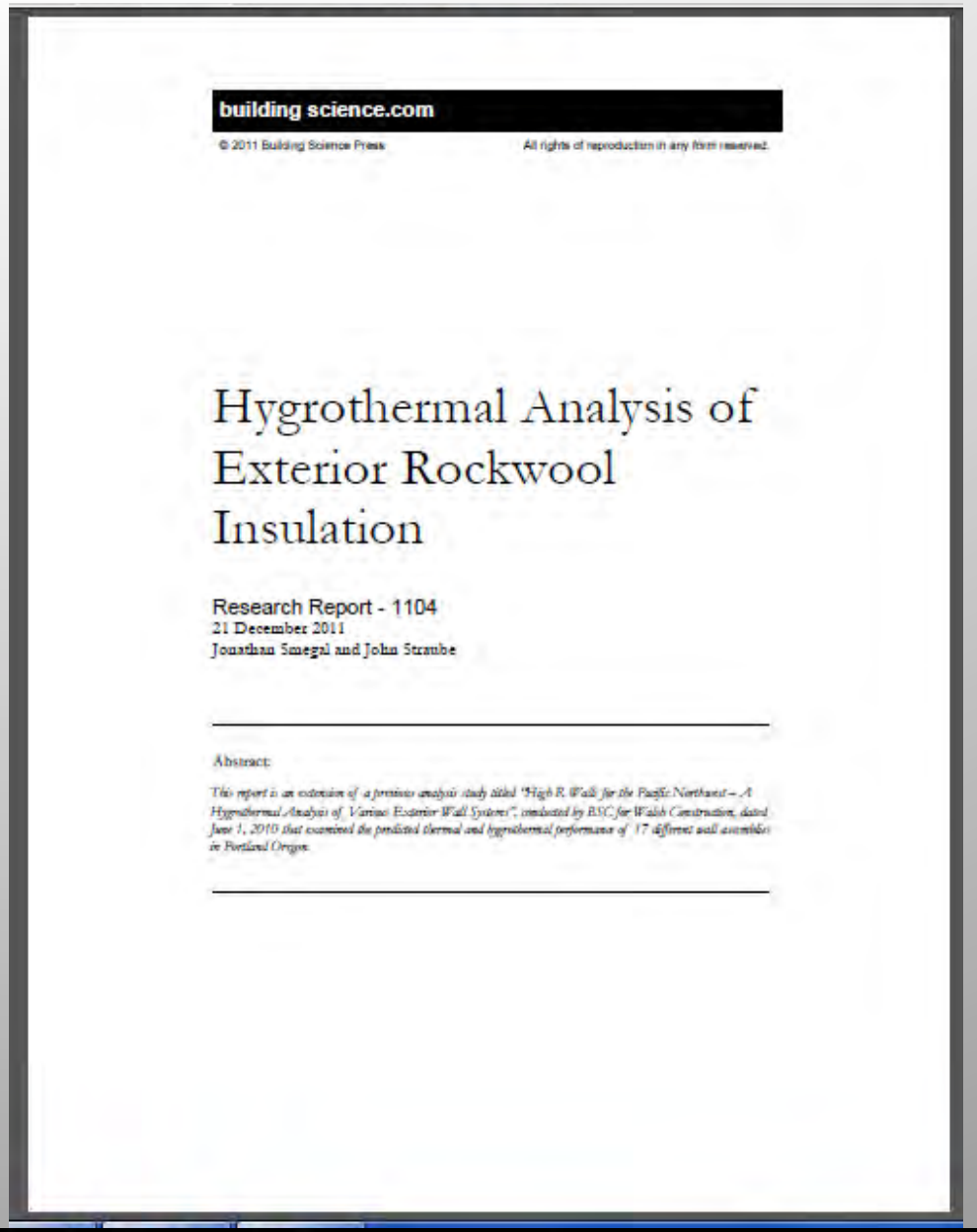


Figure 3: My Gift to Chicago—Paperless exterior gypsum board (a "sheet rock" – recall that rocks don't burn) is used as an exterior sheathing to support a fully-adhered membrane (or a liquid applied membrane) water control, air control layer and vapor control layer. Over these three control layers goes the rockwool thermal control layer. Recall that "fluffy rocks" don't burn. A non-combustible fiber cement cladding is attached through the rockwool thermal control layer using a ¾ inch metal "hat-channel" furring/spacer strip. Yes, this metal spacer can be replaced with fire retardant treated wood furring. But check with the fire folks first.

"There were improvements in the drying potential of the plywood sheathing in both January and June when exterior rockwool insulation was used in place of exterior XPS, and the plywood was wet to approximately 50% moisture content."



building science.com

Hygrothermal Analysis of Exterior Rockwool Insulation

Research Report - 1104
21 December 2011
Jonathan Smegal and John Straube

Abstract:

This report is an extension of a previous analysis study titled "High R Walls for the Pacific Northwest – A Hygrothermal Analysis of Various Exterior Wall Systems", conducted by BSC for Walsh Construction, dated June 1, 2010 that examined the predicted thermal and hygrothermal performance of 17 different wall assemblies in Portland Oregon.

Mineral Wool

Top-10 Green Building Product of 2014

BuildingGreen.com

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Publisher
(800) 861-0954
walter@buildinggreen.com

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BuildingGreen, Inc.
122 Birge St
Brattleboro, VT 05301

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BuildingGreen Announces 2014 Top-10 Green Building Products

g+1 1 Like 32

Brattleboro, VT (November 12, 2013)—BuildingGreen, Inc., publisher of GreenSpec and *Environmental Building News* (*EBN*) today announced this year's winners of its annual Top-10 awards. The winners were featured over a live BuildingGreen webcast and will be presented at the U.S. Green Building Council's Greenbuild convention in Philadelphia on Thursday, November 21. Now in its twelfth year, the Top-10 awards go to the most innovative green building products handpicked by BuildingGreen editors from among the hundreds of new and innovative products reviewed over the previous twelve months.

"The products we're recognizing this year are remarkable in their diversity and innovation," said Alex Wilson, founder of BuildingGreen. "We are thrilled to call attention to these products, which are helping to create more sustainable, greener buildings throughout North America."

The 2014 selections emphasize how a focus on simplicity and quality enable today's green products to contribute to sustainable and resilient design goals. This year's winners include a commercial composting system, dimension stone that utilizes quarry waste, and an engineered wood product

- Rigid enough to be used as exterior insulation, and it provides an affordable alternative to foam-plastic insulation.
- Retains thermal resistance when damp.
- The R-value ranges from 4.0 to 4.2 per inch.
- Extremely low emissions.
- LEED-NC v2009 Credit relevance: EA Prerequisite 2: Minimum Energy Performance: Design & Construction EA Credit 1: Optimize Energy Performance: Design & Construction MR Credit 4: Recycled Content

Mineral Wool Technical Bulletins

Stone Wool Delivers Stable R-Values at Extreme Temperatures

Mineral wool insulation has been successfully used in exterior wall applications in harsh cold and wet environments for over 50 years in Northern Europe and for 20+ years in Canada. Mineral wool insulation is a tried, tested and proven insulating material that is suitable for use in exterior walls where moisture is a concern.

The End