Rainscreen Walls
Integration of New Building Envelope Systems

International Masonry Institute

team IMI

Rick Filloramo

Version 03-05-18

This is a 30-minute presentation and will be delivered at WARP Speed

International Masonry Institute

PRESENTER: RICHARD FILLORAMO

Director of Industry Development and Technical Services at International Masonry Institute

Cell: 860-202-8444 / Email: rfilloramo@imiweb.org / www.imiweb.org

Richard Filloramo is Area Director of Market Development and Technical Services for the International Masonry Institute New England Region - Connecticut Office. He holds a Bachelor of Science Degree in Architecture from Ohio State University and an Associate's Degree in Construction Technology from Wentworth Institute of Technology. He has more than 41 years of experience in the masonry industry: 11 years as a mason contractor, 10 years as Director of the Masonry Institute of Connecticut and 21 years as Director of Marketing and Technical Services for the International Masonry Institute - New England Region. He also served as the national IMI liaison for building codes and standards. Mr. Filloramo is a member of the Masonry Standards Joint Committee, the code writing body responsible for the Masonry 530 Code. He has served on numerous committees and has been a member of The Masonry Society, American Institute of Architects, National Concrete Masonry Association, Brick Institute of America, Construction Specification Institute, Building Safety Seismic Committee of NEHRP, American Society of Civil Engineers, American Concrete Institute, ASTM, and ICC. He has written many technical papers, spearheaded efforts to educate the industry on new masonry codes and design requirements for masonry construction, and lectured across the country. Mr. Filloramo has been involved with the design, construction and inspection of more than 5,000 building projects. He has created and presented numerous seminars on masonry construction and is a specialist in project management, technical issues, detailing, and building inspections.

International Masonry Institute

International Union of Bricklayers and Allied Craftworkers

International Masonry Institute

team IMI

The International Masonry Institute (IMI) is a strategic alliance between the International Union of Bricklayers and Allied Craftworkers and the contractors who employ those members. Through education, technical support, research and training the IMI works to provide a more efficient construction delivery system.

- Apprenticeship & Training
- Industry Development
- Technical Services
- Research & Development
- Labor / Management Relations

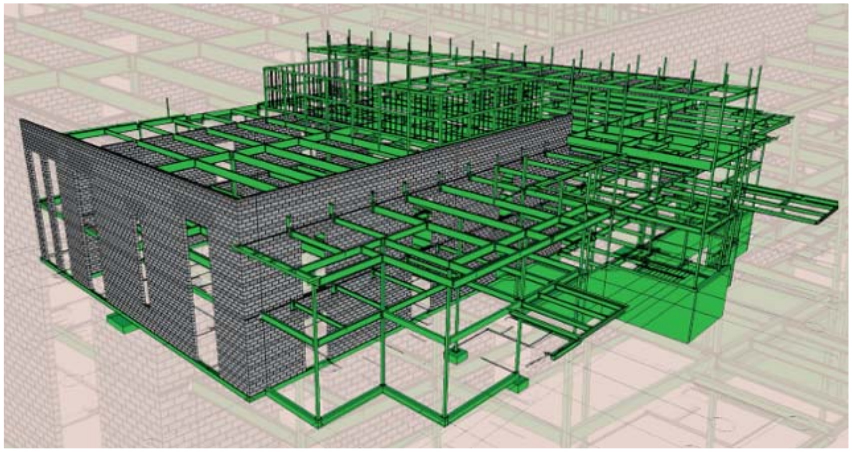
TEAM IMI

International
Masonry
Institute

team IMI

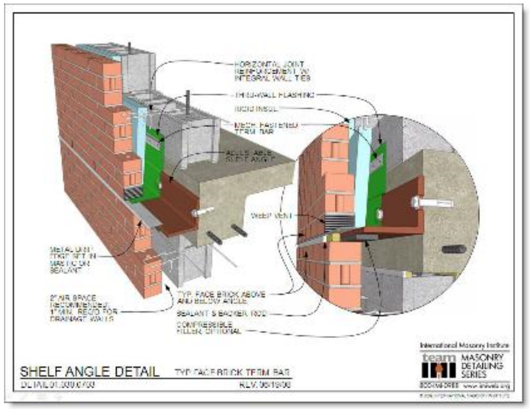
- Rainscreen Wall Systems
- Brick
- Cement & Plastering
- Concrete Masonry
- Stone
- Tile, Marble,Terrazzo
- Restoration, Waterproofing
- Pointing, Caulking, Cleaning
- Plastering
- Related Masonry Crafts

IMI PROGRAMS

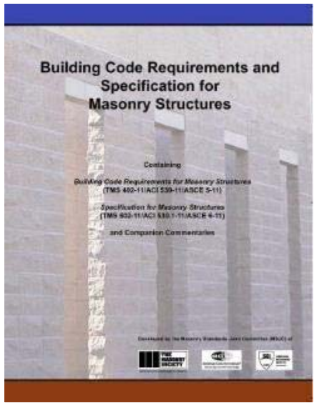


BIM For Masonry

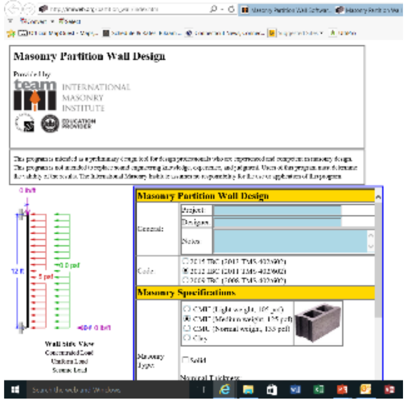
Education – 10,000 Annually



Masonry Detailing



Codes



Design Programs

International Masonry Institute

IMI National Headquarters & Training Center in Bowie, MD

AIA-CES Credits | IMI Information

Credit earned on completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with **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.

This presentation is intended for the use of industry professionals who are competent to evaluate the significance and limitations of the information provided herein. This publication should not be used as the sole guide for masonry design and construction, and IMI disclaims any and all legal responsibility for the consequences of applying the information.

It is important to note that details and construction practices vary based on geographical requirements and area practice. Masonry walls and elements must be adapted for each specific project. There are many typical details and practices, however, designers and contractors need to coordinate each detail with the unique elements of the building.

BEST 5 CONFERENCE
Building Enclosure Science & Technology
Science Meets Design
Design Meets the Realities of Construction

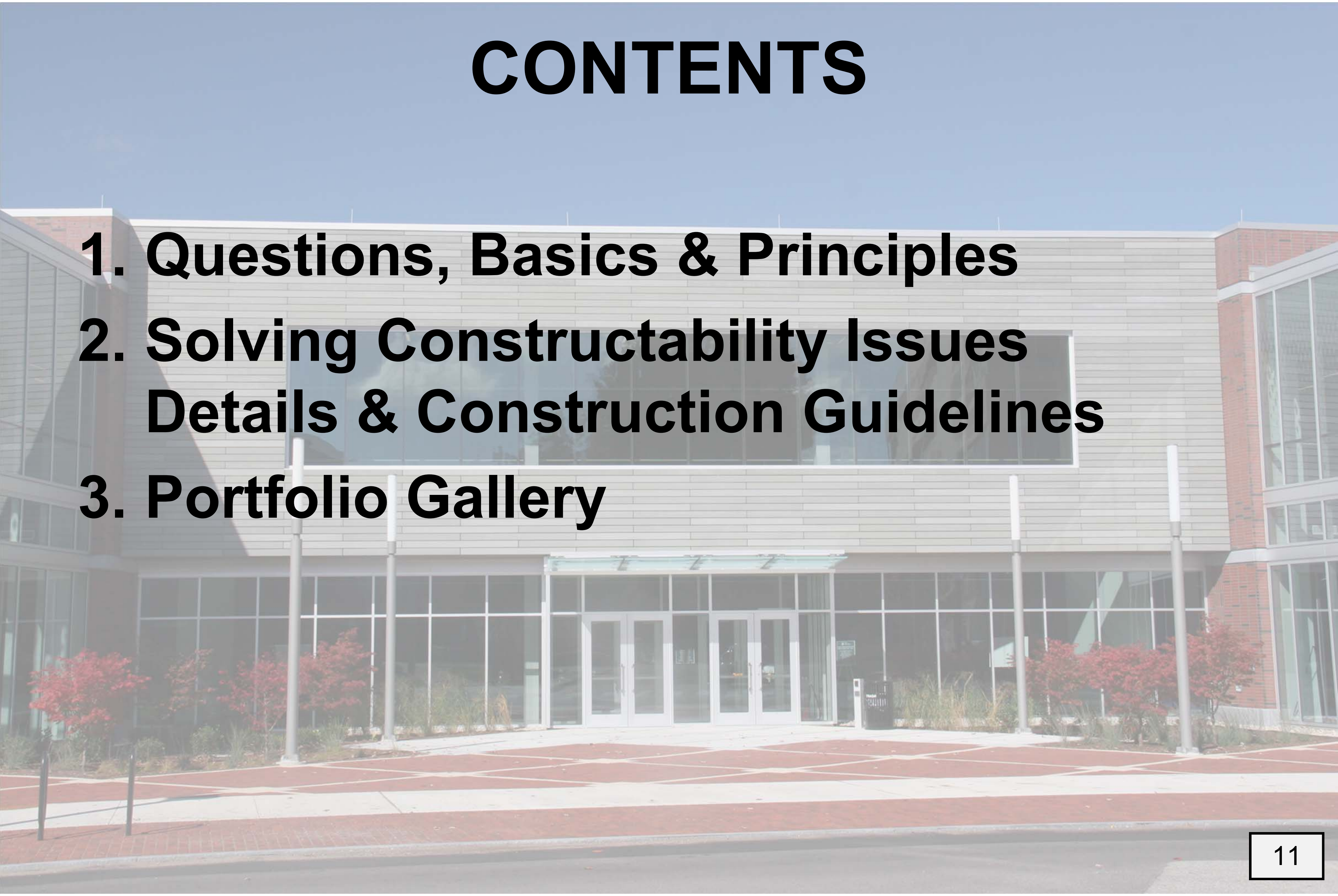
- *During this three-day Conference, look back on the history of buildings to gain inspiration on ways to achieve innovative strategies for energy efficiency and resiliency in existing and future building enclosures.*

Rainscreen Walls
Integration of New Building Envelope Systems

International Masonry Institute

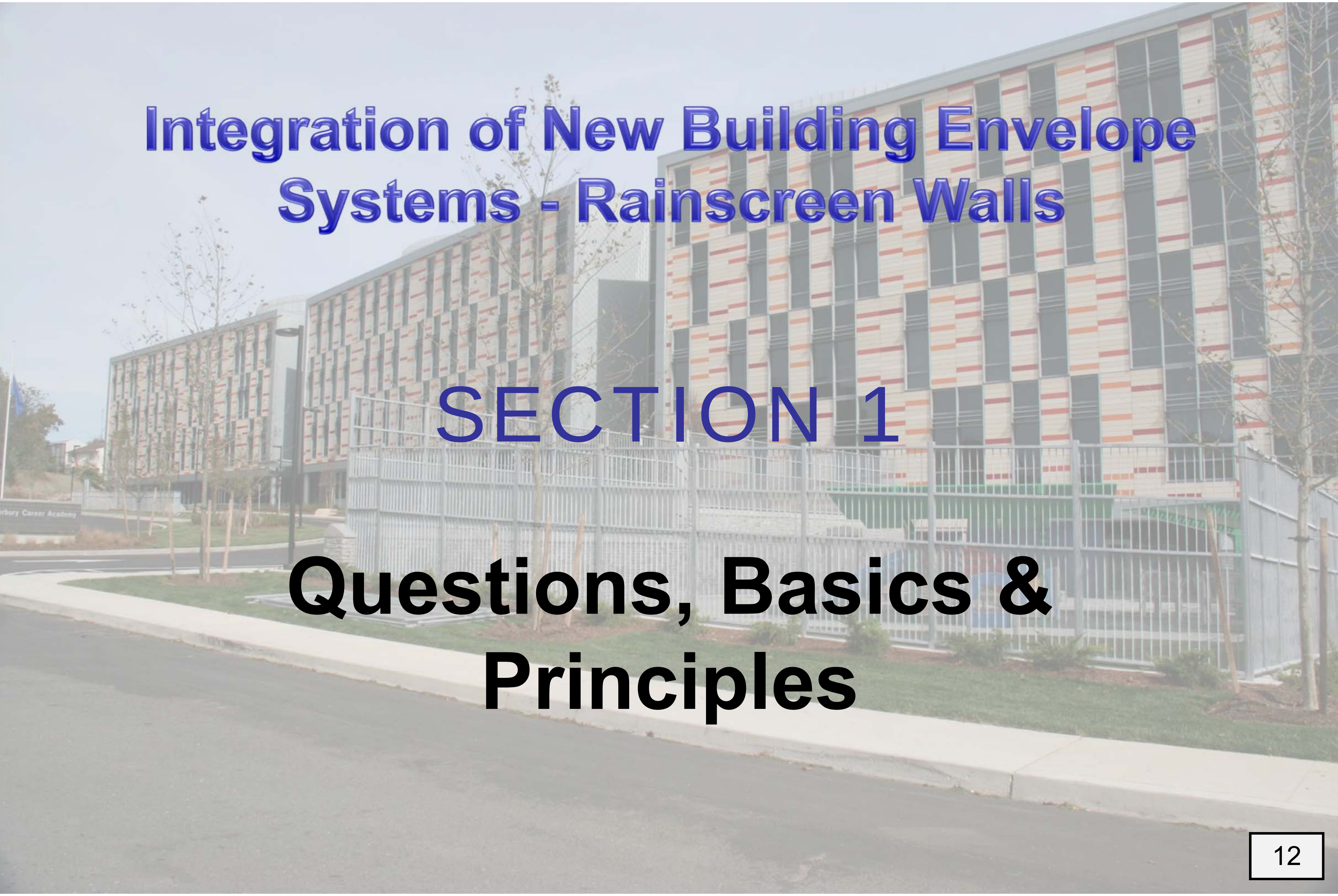
Rick Filloramo

Version 03-05-18



CONTENTS

1. Questions, Basics & Principles
2. Solving Constructability Issues
   Details & Construction Guidelines
3. Portfolio Gallery



Integration of New Building Envelope Systems - Rainscreen Walls

SECTION 1

Questions, Basics & Principles


RAINSCREEN
SCIENCE
?

Questions

- What is a Rainscreen?
- What is a Ventilated Facade?
- Do Pressure Equalized Rainscreens exist?
- How much open air ventilation is required?
- How wide should the air space be?
- Are Rainscreens really more energy efficient?
- What about construction tolerances?
- What constructability issues have evolved?

WHAT IS THE MOST IMPORTANT CONSIDERATION (QUESTION) RELATED TO THE SCIENCE, DESIGN AND CONSTRUCTION FOR THE INTEGRATION OF NEW BUILDING ENVELOPE SYSTEMS - RAINSCREEN WALLS?

Integration of New Building Envelope Systems - Rainscreen Walls

Science Meets Design

Design Meets the Realities of Construction

What is the Initial Cost of Rainscreen Wall Systems?

$


WHAT IS A
RAINSCREEN?
17

Rainscreen Timeline

- 1946 The Influence of Moisture on the Heat Conductance of Brick *(C.R. Johansson)*
- 1953 Engineering Institute of Canada *(N.B. Hutcheon)*
- 1962 Norwegian Building Institute *(Birkeland)*
- 1963 Rain Penetration and Its Control (National Research Council Canada, G.K. Garden)
- 1994 Brick Masonry Rainscreen Walls *(Brick Industry Association Technical Note 27-Revised)*
- 1998 Pressure Equalization in Rainscreen Wall Systems *(Institute for Research in Construction Canada)*
- Today Modified Rainscreen Systems
- Today **Ventilated Facades**
- (AAMA 509-09) "Drained and Backed Ventilated RSW

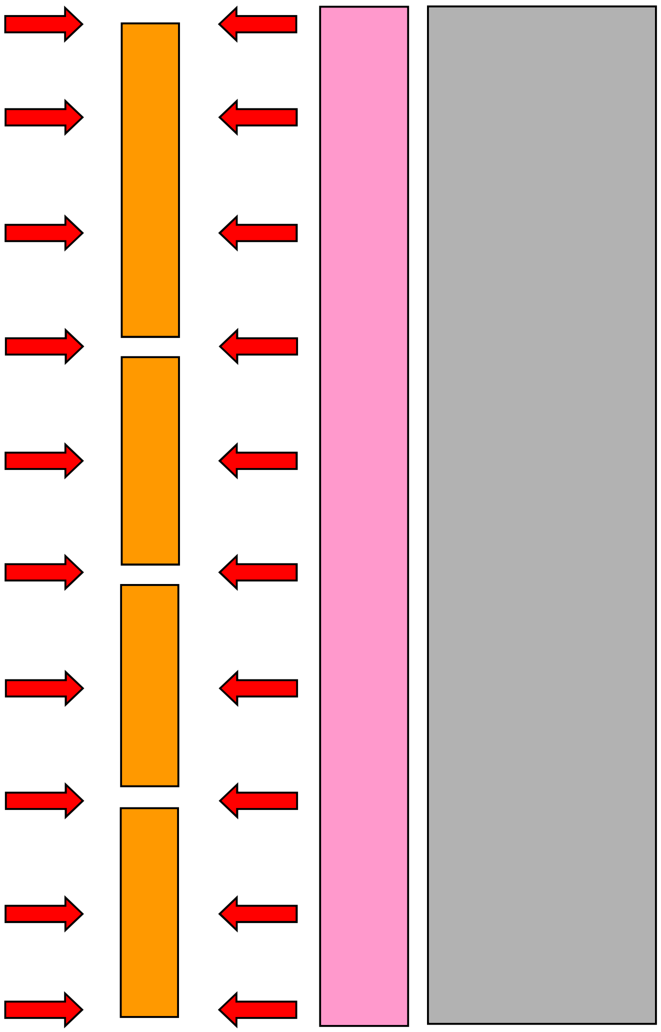
Rainscreen Wall Principal

Prompted by Birkeland, in 1963, Canadian National Research Council's Division of Building Research published Canadian Building Digest (CBD) 40, "Rain Penetration and Its Control”.

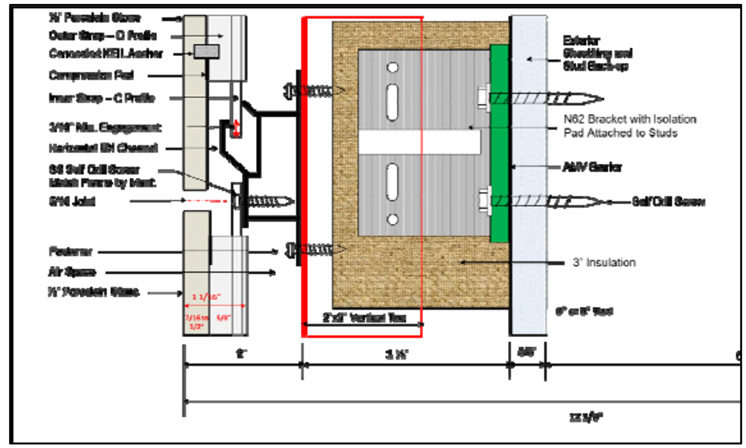
This publication, which remains a prime reference source on the subject, popularized the term rainscreen principle. G. K. Garden, who authored CBD 40 on wind-induced moisture penetration wrote:

"It is not conceivable that a building designer can prevent the exterior surface of a wall from getting wet nor that he can guarantee that no openings will develop to permit passage of water. It has, however, been shown that through-wall penetration of rain can be prevented by incorporating an air chamber into the joint or wall where the air pressure is always <u>equal</u> to that on the outside. In essence, the outer layer (wythe) is then an open rainscreen that prevents wetting of the actual wall or air barrier of the building”.

Pressure-Equalized Rainscreen Wall



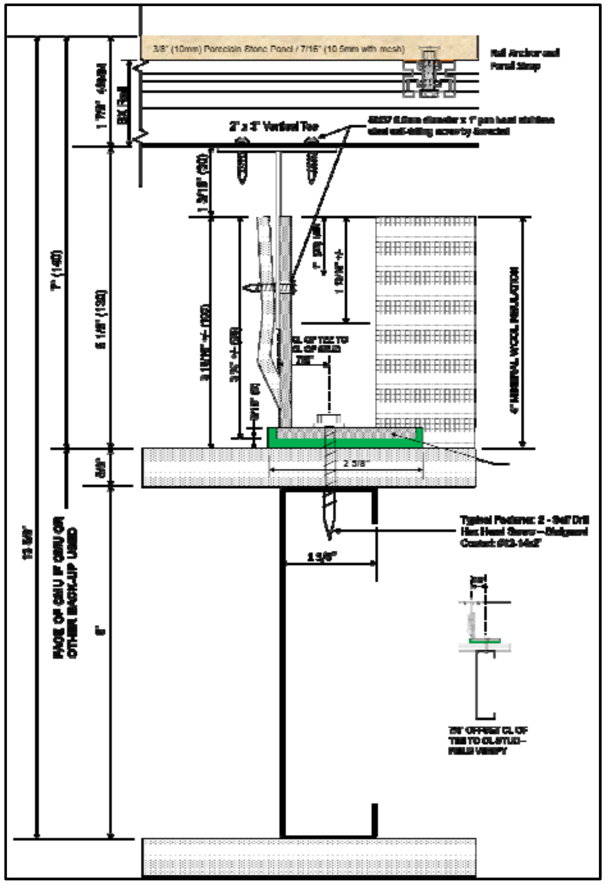
Open joints

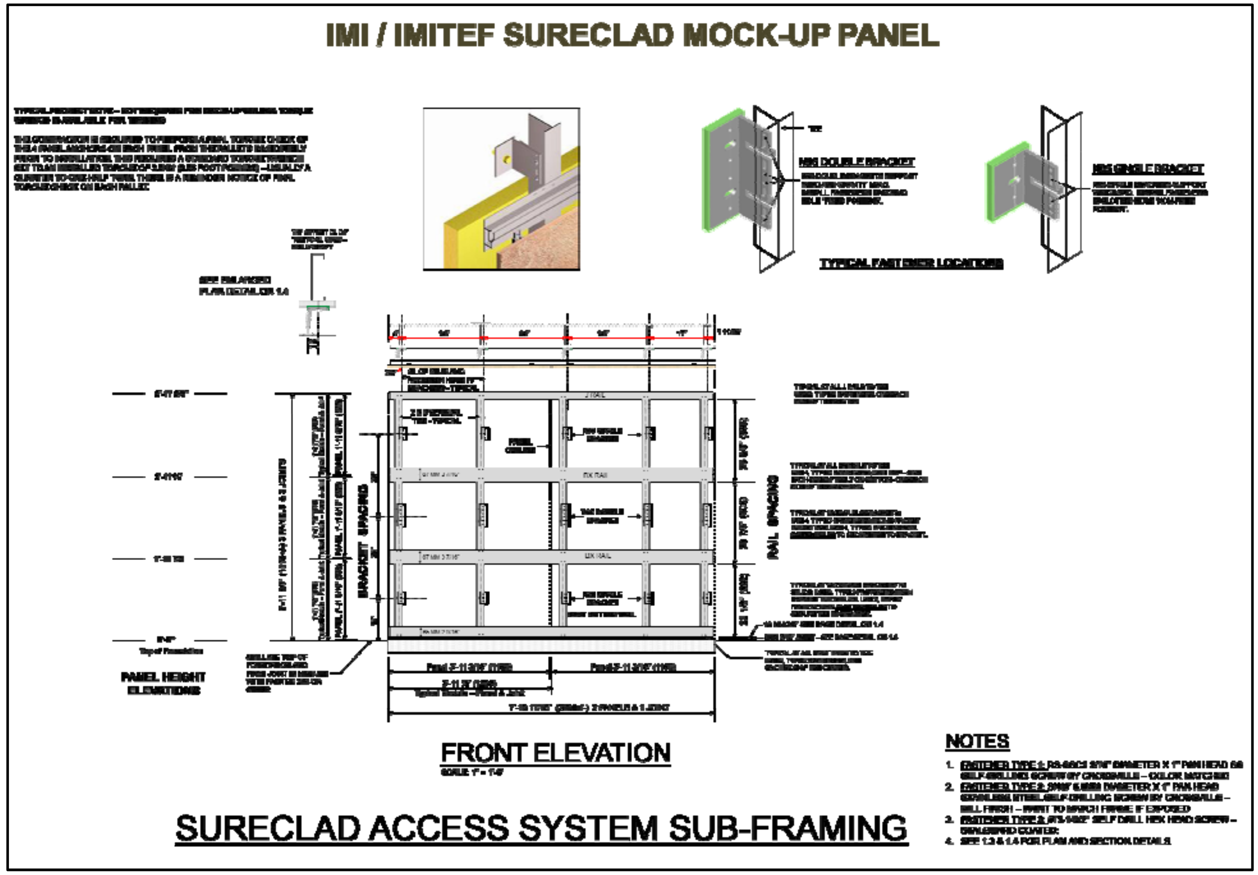


Pressure-Equalized rainscreens require compartments in order to create pressure equalization. This is difficult to achieve with sub-frame systems and open joints and is expensive.

In general, conventional-modified rainscreens are NOT pressure equalized.

Complexities of Rainscreen Design





Conventional – Modified Rainscreens

Pressure-Equalized rainscreens require compartments in order to create pressure equalization. This is difficult to achieve with open joints and is expensive.

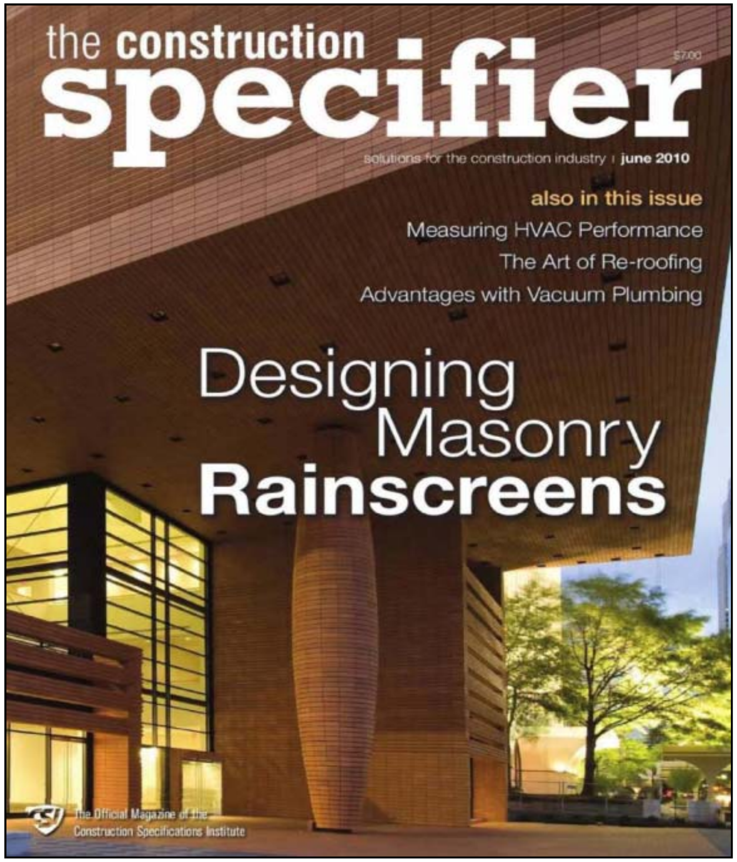
In general, conventional-modified rainscreens are NOT pressure equalized.

The original rainscreen wall (1946) consisted of a lightweight protective cladding installed on the outside of a drained and vented air space on the exterior of a structural wall.

A second line of defense against rain ingress is provided. Such walls are considered to be rainscreen walls. (Statement is based on 1946 original definition and modified conditions)

Evolution of Wall Design for Controlling Rain Penetration
Construction Technology Update No. 9, Dec. 1997
by G.A. Chown, W.C. Brown and G.F. Poirier

Conventional – Modified Rainscreens



"When the cladding was separated from the support wall…

to break the capillary forces of moisture thru a masonry mass wall…

the rain screen wall concept was born."

Sovinski & Conway
International Masonry Institute
The Construction Specifier 2010

WHY Modified Rainscreen Walls?

- New building materials – Thin Claddings
- The need for thinner walls
- Initial cost considerations
- New energy codes – more insulation
- New fire codes – NFPA 285

Whenever a modification is made, the overall performance of the assembly must be assessed to ensure that the individual components and the assembly as a whole are capable of handling the water to which they will be exposed in their service environments over their design service lives.

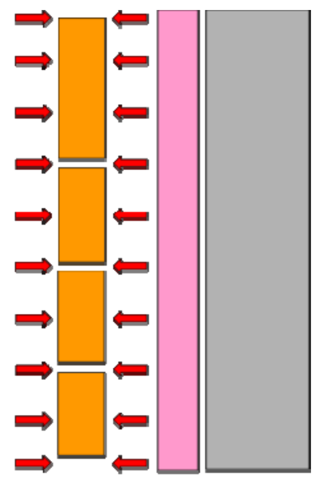
Evolution of Wall Design for Controlling Rain Penetration - Construction Technology Update No. 9, Dec. 1997 **by G.A. Chown, W.C. Brown and G.F. Poirier**

Understanding Rainscreens

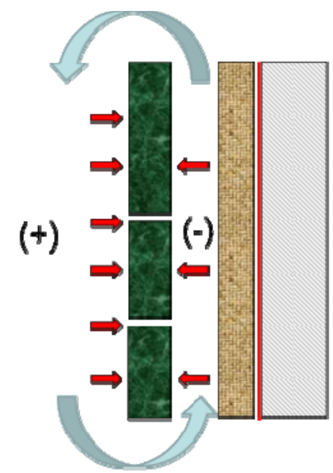
A "rainscreen wall" is designed and built according to what Kirby Garden referred to as the "open rainscreen principle, whose basic premise is the control of **ALL forces** that can carry rain to the inside. (Air Pressure)

A cavity wall or any wall with an air space that is vented (top and bottom) is a modified rainscreen or a ventilated facade, not a PER.

These walls have only partial pressurization and would require compartments to be a true PER.

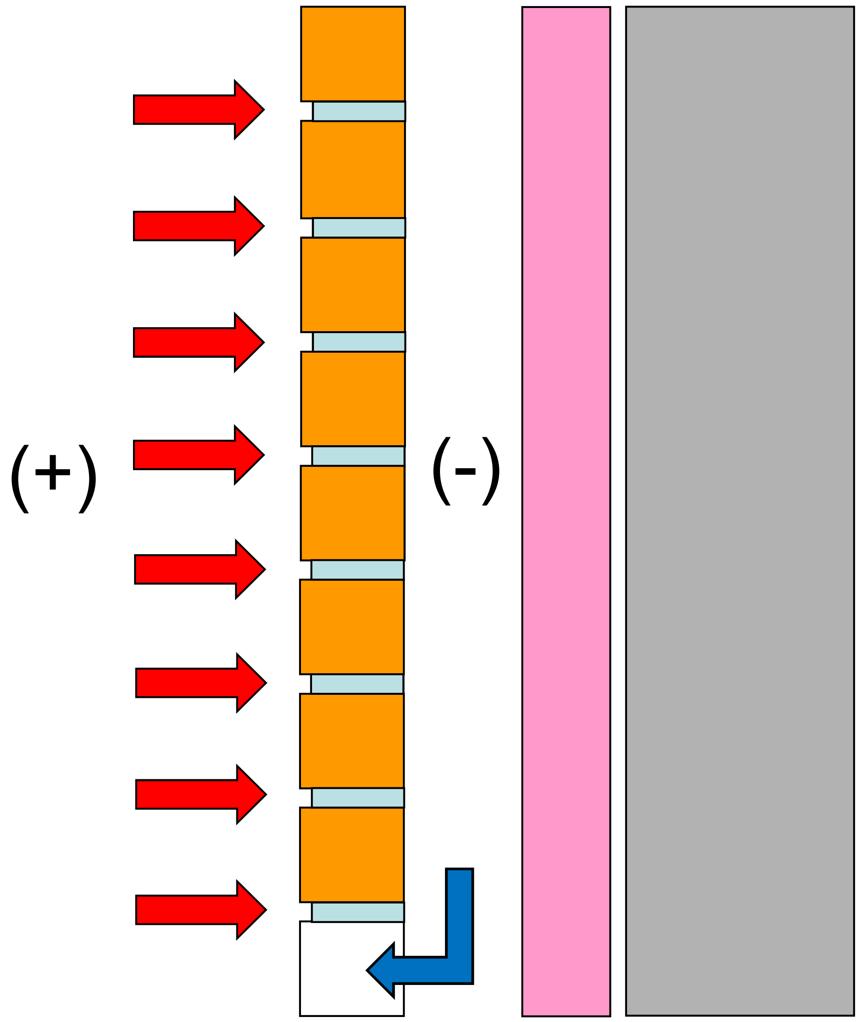


Pressure Equalized

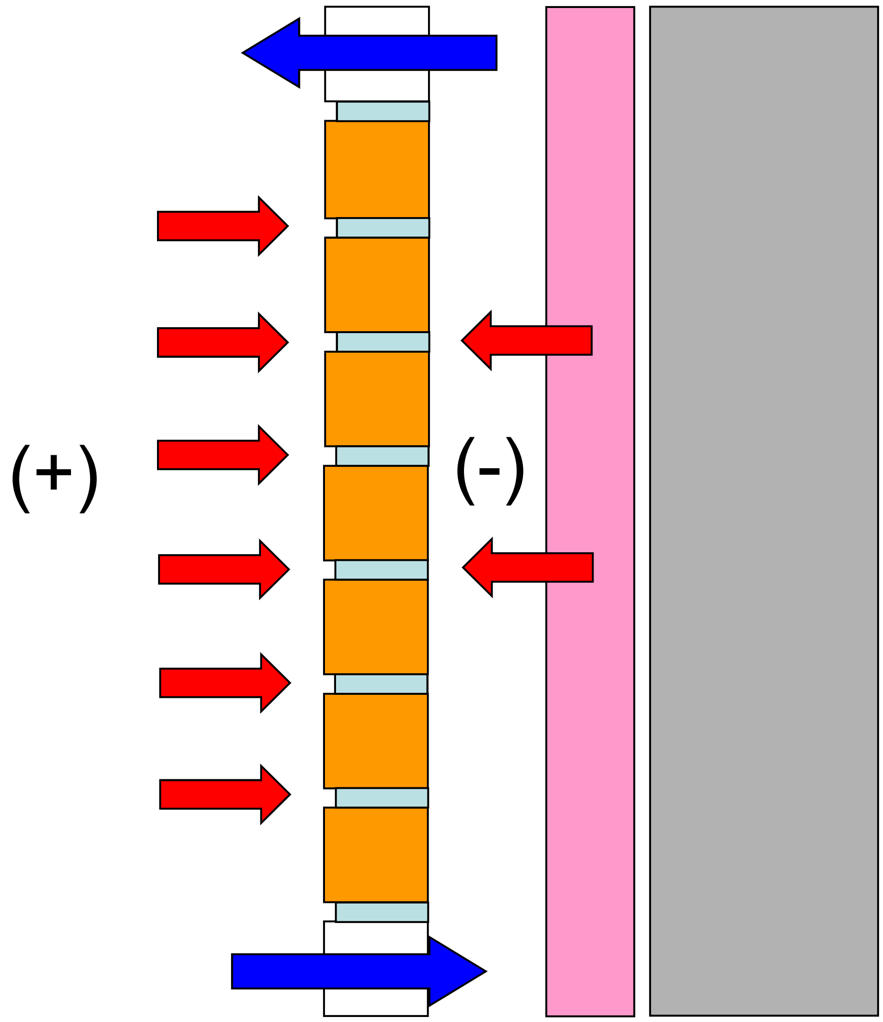


Ventilated Facade

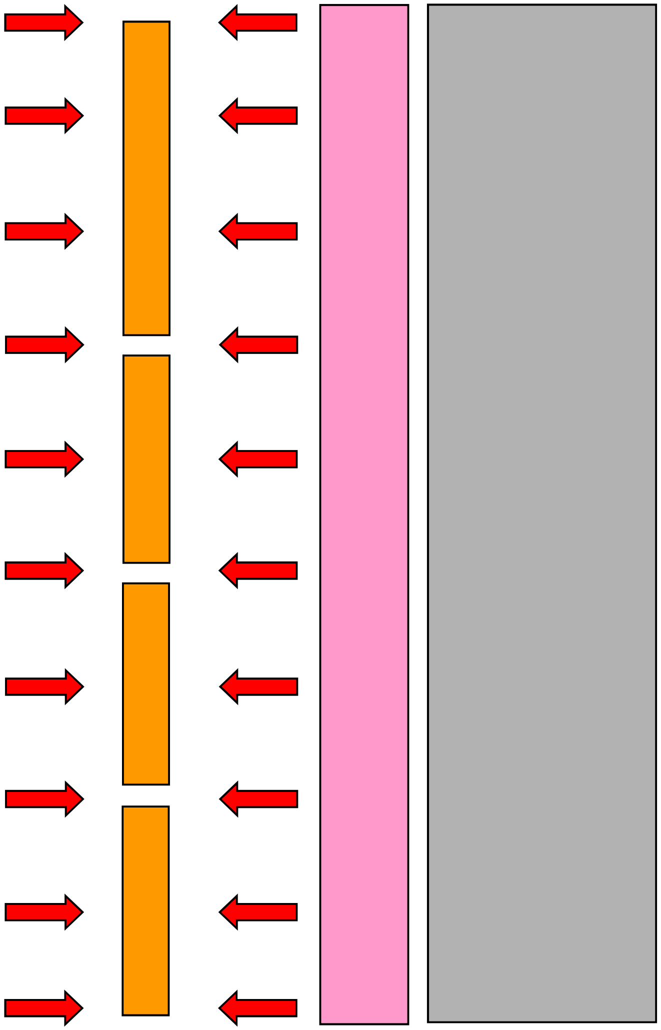
Typical Drainage Wall



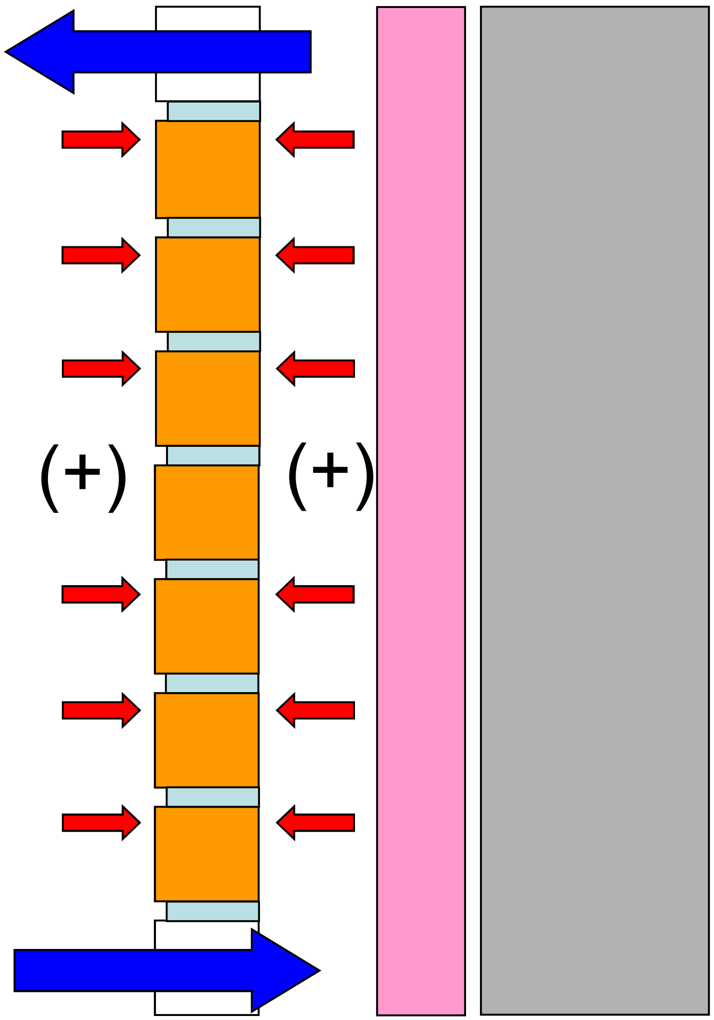
Ventilated Drainage Wall



Pressure-Equalized Rainscreen Wall



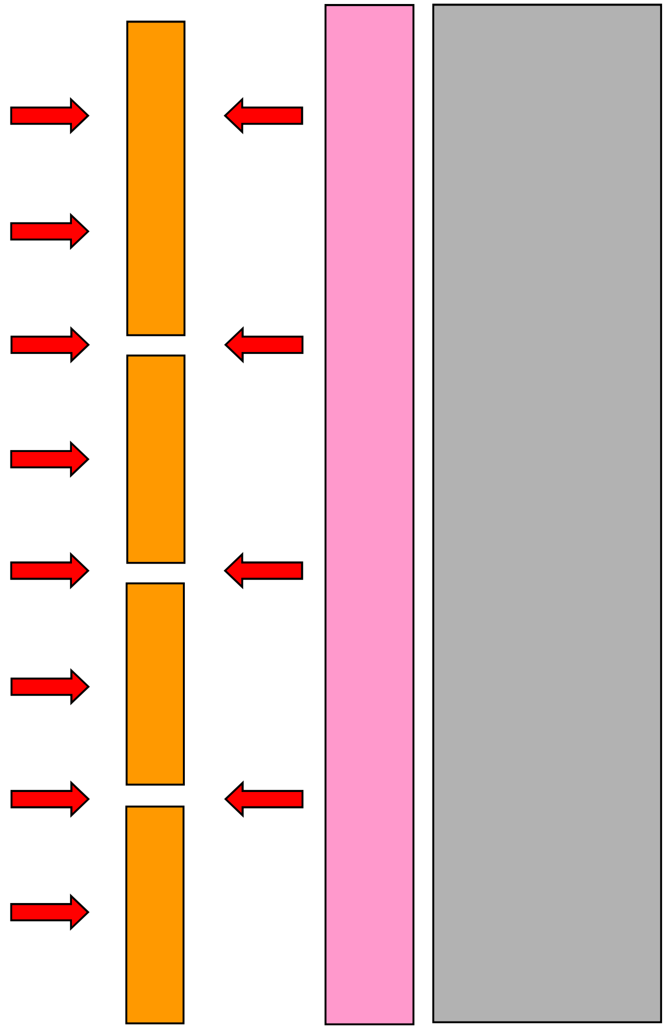
Open joints



Closed joints – openings top and bottom

Ventilated Facade - Rainscreen Wall

Only Partial Pressurization



Most common type of rainscreen

Summary - Rainscreen Walls

Elements of Rainscreen Wall System

- Vented Cladding
- Air Space
- Air / Moisture/ Vapor Barrier on Support Wall
- A means for Drainage
- Air Space Compartmentalization for Pressure Equalized Rainscreens

Building Code Requirements

Prescriptive Design

SECTION 1403 - PERFORMANCE REQUIREMENTS

- **1403.2 Weather protection.**
  - Exterior walls shall provide the building with a **(1)** weather-resistant *exterior wall envelope*.
  - The *exterior wall envelope* shall include **(2)** flashing.
  - The *exterior wall envelope* shall be designed and constructed in such a manner as to **(3)** prevent the accumulation of water within the wall assembly by providing a **(4)** *water-resistive barrier* behind the exterior veneer, as described in Section 1404.2, **(5)** <u>and a means for draining water</u> that enters the assembly to the exterior.
  - Protection against **(6)** condensation in the *exterior wall* assembly shall be provided in accordance with Section 1405.3.
  - Exceptions: Alternative Design

Building Code Requirements

Alternative Design

Exceptions:

1. A weather-resistant *exterior wall envelope* shall not be required over concrete or masonry walls designed in accordance with Chapters 19 and 21, respectively.
2. Compliance with the requirements for a means of drainage, and the requirements of Sections 1404.2 and 1405.4, shall not be required for an *exterior wall envelope* that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E 331 under the following conditions:
   - 2.1. *Exterior wall envelope* test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.
   - 2.2. *Exterior wall envelope* test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size.
   - 2.3. *Exterior wall envelope* assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m^2).
   - 2.4. *Exterior wall envelope* assemblies shall be subjected to a minimum test exposure duration of 2 hours.

   The *exterior wall envelope* design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the *exterior wall* envelope, joints at the perimeter of openings or intersections of terminations with dissimilar materials.
3. Exterior insulation and finish systems (EIFS) complying with Section 1408.4.1.

1. Exception: IBC Code indicates exterior wall envelope is not required with masonry backing designed by Chapter 19 & 21. However, MSJC and industry references still require water penetration resistance.

2. Exception for drainage, flashing and WRB: Proprietary systems for exterior walls that have demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with adjacent dissimilar materials in accordance with ASTM E 331(1) under the following conditions: ...

(1) ASTM E 331: Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference

Alternate Design – IBC 2012

- IBC 104.11 Alternate materials design….
  - Equivalent: Quality, strength, effectiveness, fire resistance, durability and safety per code
  - Submit: Research reports, test data, engineering, calculations, and as required

AT METAL STUD BACK-UP
USE VERTICAL TEES AT 32" O.C. MAX. (EVERY OTHER STUD)

Check BX wall rail for bi-axial bending ASD
T-6063 Aluminum, F_{bx} = 15000 psi, F_{by} = 20000 psi

Assume panel fastener is at mid-span of rail
Mx = 30 x 32/4 = 240 in-#
My = 48 x 2 x 32/4 = 768 in-#

Sx = 0.25 in^3
Sy = 0.14 in^3

f_{bx} = 240/0.25 = 960 psi
f_{by} = 768/0.14 = 5485 psi

Check interaction
960/15000 + 5485/20000 = 0.34 < 1.0 OK

Assume panel fastener is at end of 12" cantilever
Mx = 30 x 12 = 360 in-#
My = 48 x 2 x 12 = 1152 in-#

Sx = 0.25 in^3
Sy = 0.14 in^3

f_{bx} = 360/0.25 = 1440 psi
f_{by} = 1152/0.14 = 8228 psi

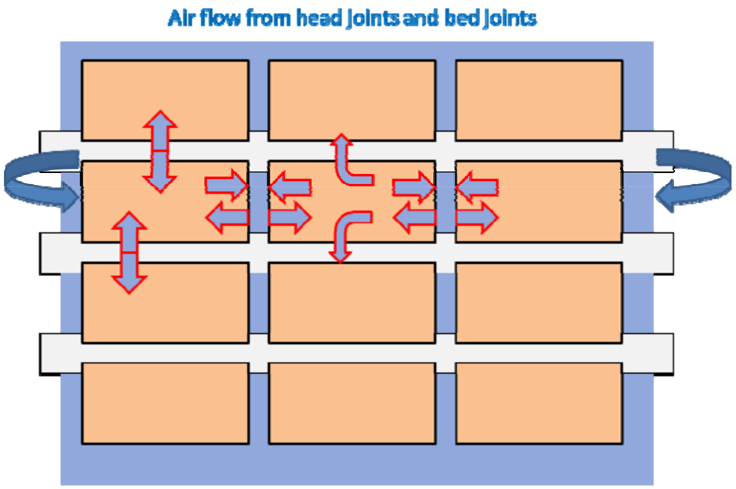
TECHNICAL DATA	NORM	INTERNATIONAL STANDARDS ASTM	PORCELAIN STONE® AVERAGE VALUE
COEFFICIENT OF LINEAR THERMAL-EXPANSION	ASTM C372	-	$\partial \frac{400}{31} - 7.35 \times 10^{-6}\,°C^{-1}$
FROST RESISTANCE	ASTM C1026	NO DAMAGE	NO DAMAGE
CHEMICAL RESISTANCE	ASTM C650	NO DAMAGE	NO DAMAGE
RESISTANCE TO STAINS	UNI EN ISO 10545-14	-	≥ 4
RELATIVE RESISTANCE	ASTM C501	≥ 100	213

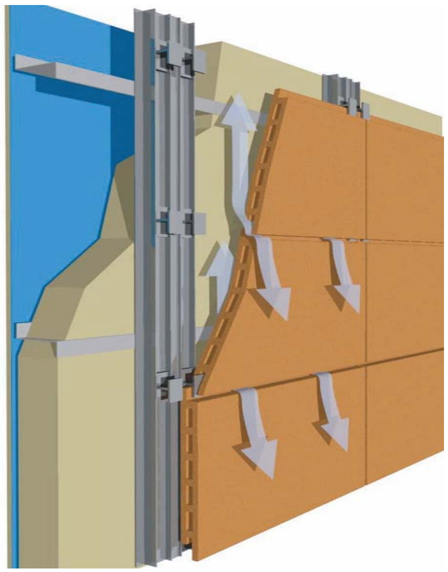

Dynamic water testing AAMA 509


Apparatus for testing deflection under uniform load ASTM E330

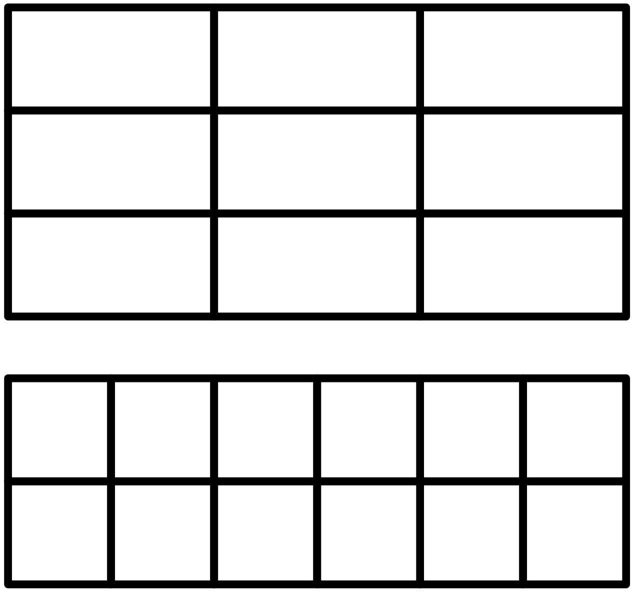
Overall seismic test apparatus for AAMA 501.6 testing

How Much Ventilation – Open Joints?

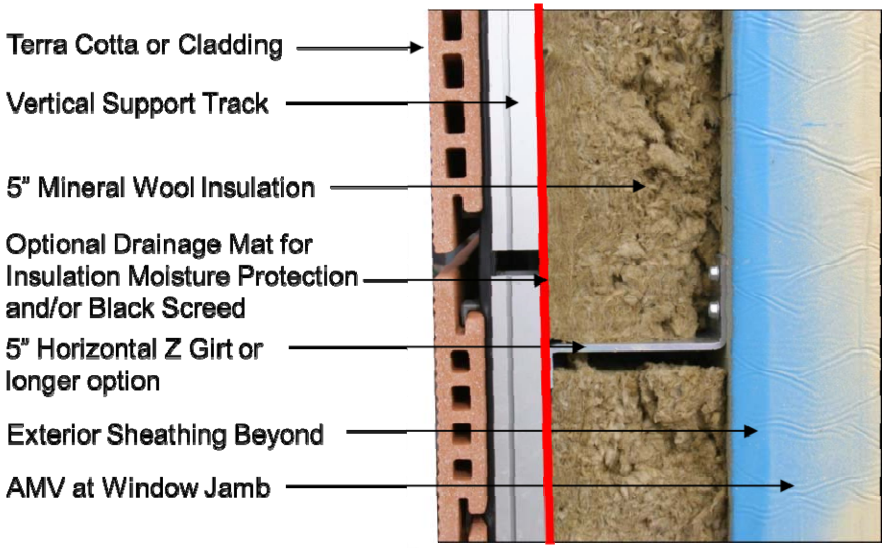


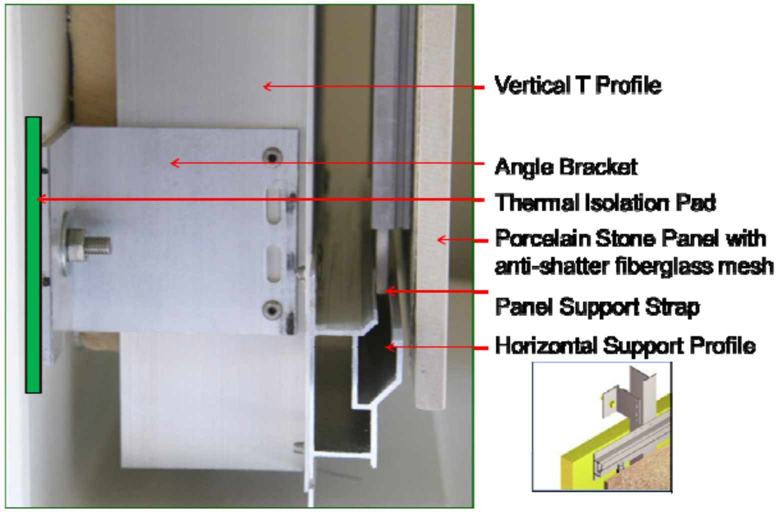


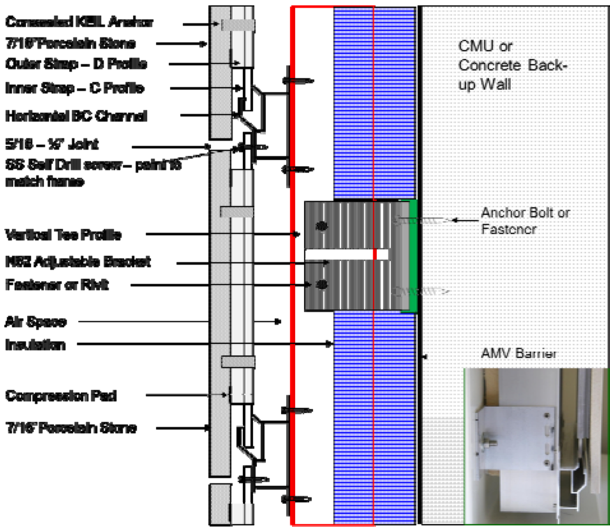
- Ventilation
  - Panel Size
  - Joint Width
  - Panel Lap Configuration
  - Total Area of Open Joints / Total Wall Area



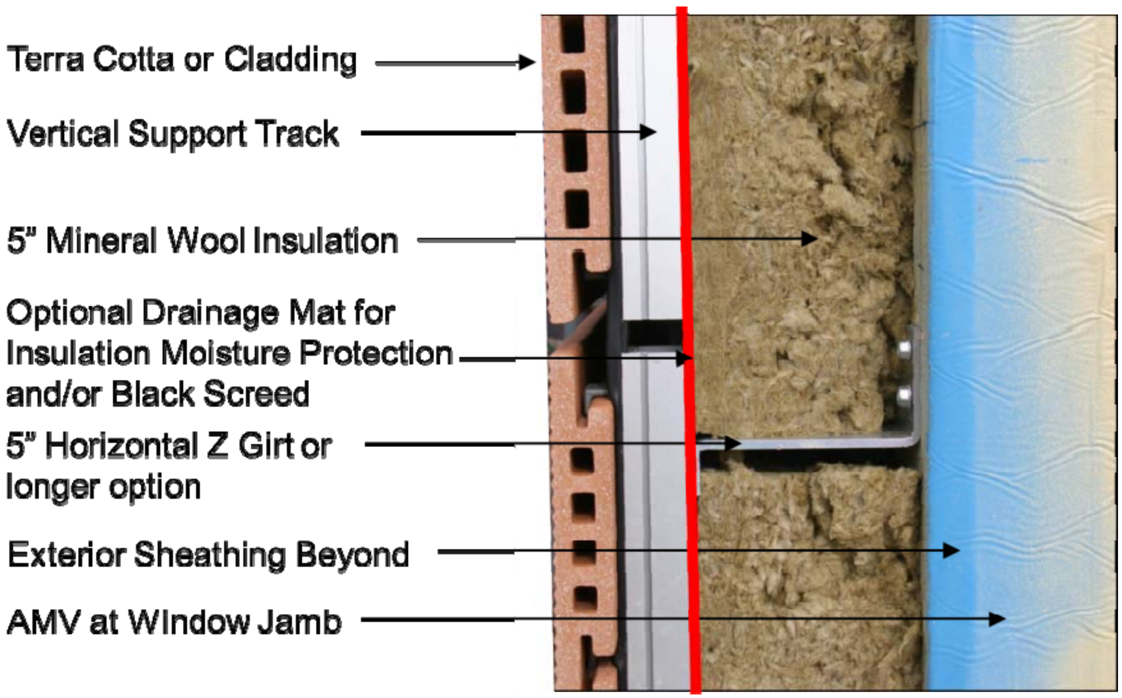
Air Space?


Terra Cotta or Cladding
Vertical Support Track
5" Mineral Wool Insulation
Optional Drainage Mat for Insulation Moisture Protection and/or Black Screed
5" Horizontal Z Girt or longer option
Exterior Sheathing Beyond
AMV at Window Jamb


Vertical T Profile
Angle Bracket
Thermal Isolation Pad
Porcelain Stone Panel with anti-shatter fiberglass mesh
Panel Support Strap
Horizontal Support Profile


Concealed KEIL Anchor
7/16" Porcelain Stone
Outer Strap – D Profile
Inner Strap – C Profile
Horizontal BC Channel
5/16 – ½" Joint
SS Self Drill screw – paint to match frame
Vertical Tee Profile
NBZ Adjustable Bracket
Fastener or Rivet
Air Space
Insulation
Compression Pad
7/16" Porcelain Stone
CMU or Concrete Back-up Wall
Anchor Bolt or Fastener
AMV Barrier

Are Rainscreens more Energy Efficient



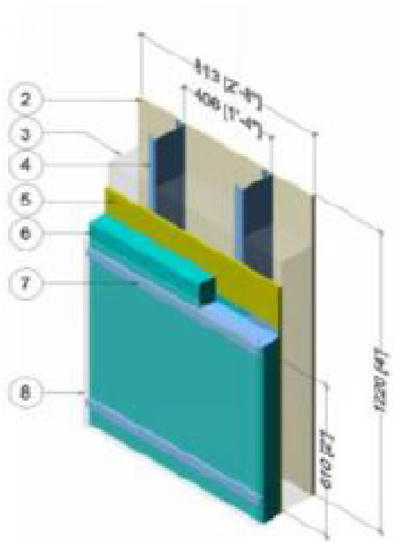
Outside Air Film	0.00
Cladding	0.00
Air Space	0.00
5” Mineral Wool	21.00
Air Barrier	0.01
5/8" Exterior Sheathing	1.32
No Stud Space Insulation	0.00
1/2" Gypsum Board	0.45
Inside Film	0.68
Total R-Value	23.46

U-Factor: 1/R = .042

Thermal Transmittance

5.2 Thermal Transmittance

The basis of calculation and reporting of thermal transmittances is established by three categories of thermal anomalies as summarized below.



Clear Field Anomalies – thermal bridges uniformly distributed by a sufficient amount such that they can be assumed to modify the thermal transmittance of the assembly and are considered not practical to account for on an individual basis for whole building calculations.

Examples are brick ties, girts supporting cladding, and structural framing. A steel stud assembly with horizontal z-girts is shown to the left as an example.

Ref. 3

Types of Rainscreen Wall Systems

- Terra Cotta
- Natural Stone
- Porcelain Stone
- Calcium Silicates
- Metal Panels
- GFRC Panels
- Fiber Cement Composites
- Photovoltaic
- High Pressure Laminates
- Precast Panels
- Brick, CMU & Other
- Resin Panels
- GKD Media Mesh
- LED Lucem Translucent Concrete
- Thin Brick Cladding
- Glass
- Thin stone on aluminum Panels – Stonelite
- Adhered Veneer Systems

Integration of New Building Envelope Systems - Rainscreen Walls

SECTION 2

Science Meets Design
Design Meets the Realities of Construction

SOLVING CONSTRUCTABILITY ISSUES

Constructability Issues

- Tolerances - Variations Metric (SI)
- Tolerances - Wall Alignment
- Tolerances - Windows, Doors and All Openings
- Tolerances - Overall Dimensions
- Tolerances - All Dimensions
- Tolerances - Transitions / AMV Barriers

Basic Wall Components

Exterior

Interior

Cladding / Veneer

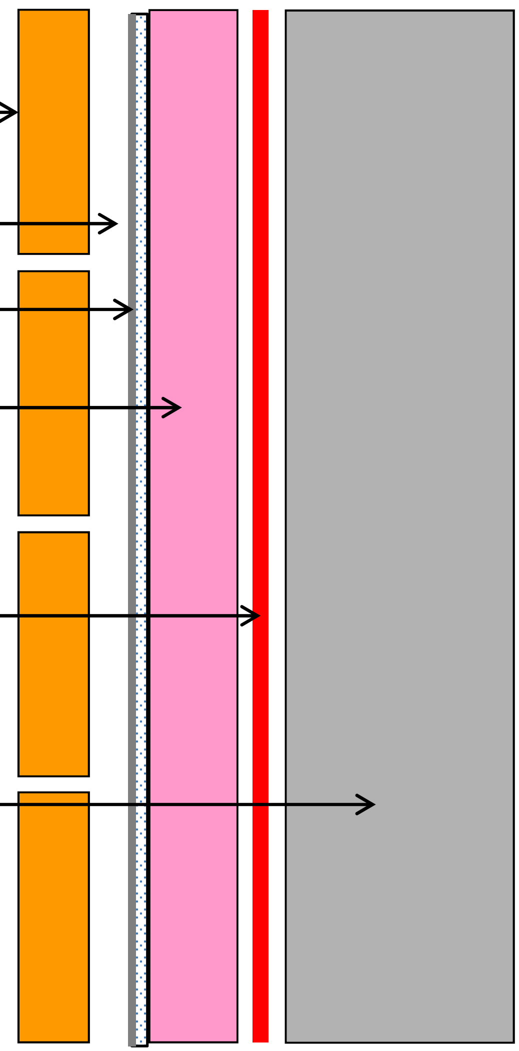
Air/Drainage Space

Optional Drainage Mat

Thermal Control - Insulation

Air / Moisture / Vapor* Control Barrier

Building Structure / Back-up Wall



*Vapor Control Varies

Drainage & Moisture Control

Exterior

Interior

Cladding / Veneer

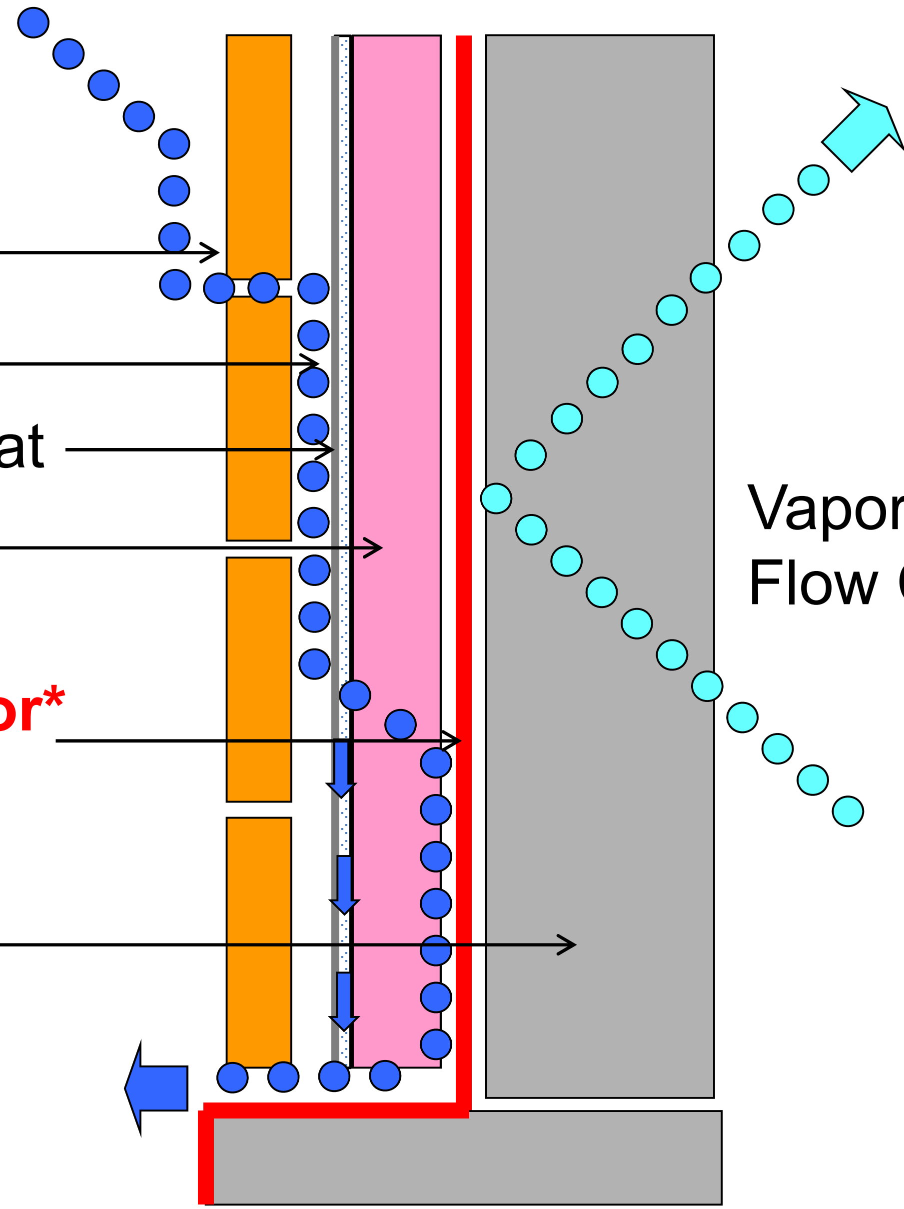
Air/Drainage Space

Optional Drainage Mat

Thermal Control - Insulation

Air / Moisture / Vapor* Control Barrier

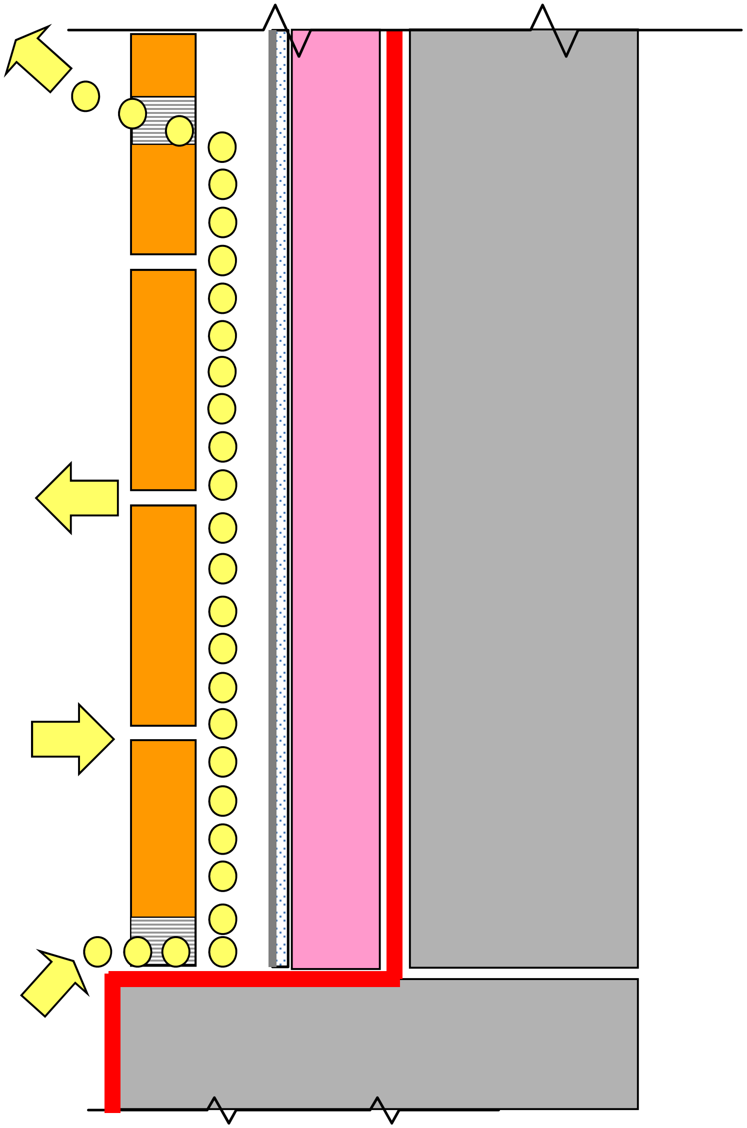
Building Structure / Back-up Wall

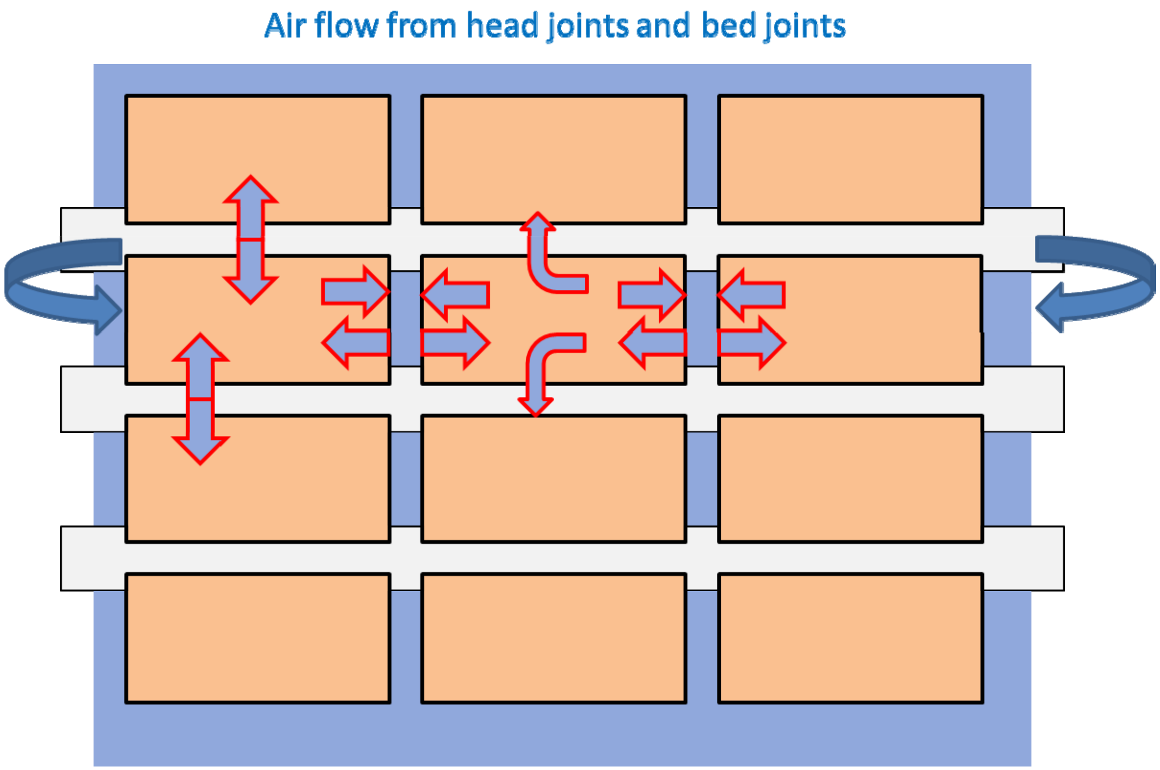


Vapor / Air Flow Control

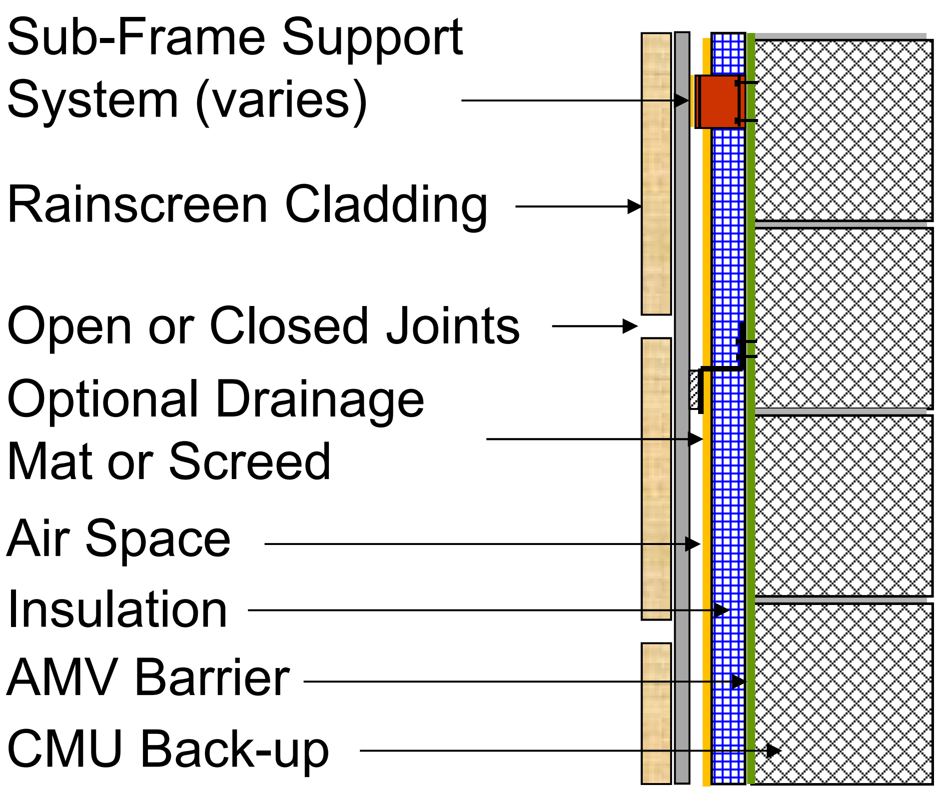
*Vapor Control Varies

Air Flow

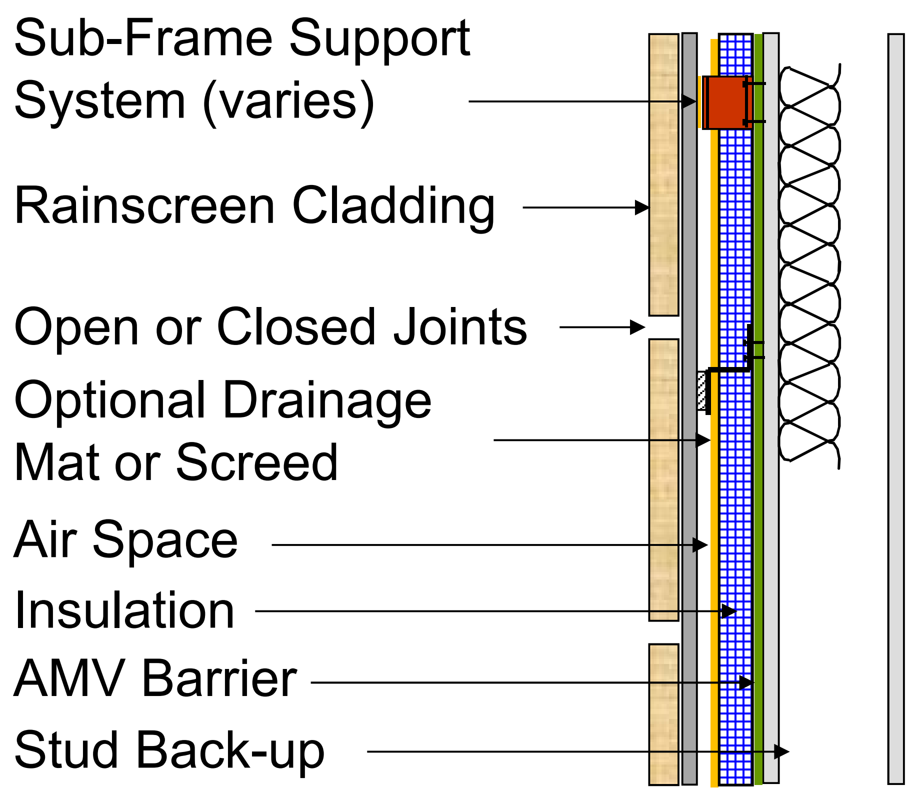




Rainscreen Wall – System Components



CMU Back-up



Stud Back-up

CMU allows for greater flexibility for the attachment of the sub-frame system

Rainscreen Wall Sub-Frame Brackets & Tees

Rainscreen Wall Elements
Brackets, Tees and Rails

Rainscreen Wall Elements

Back-up

Sheathing

A/M/V

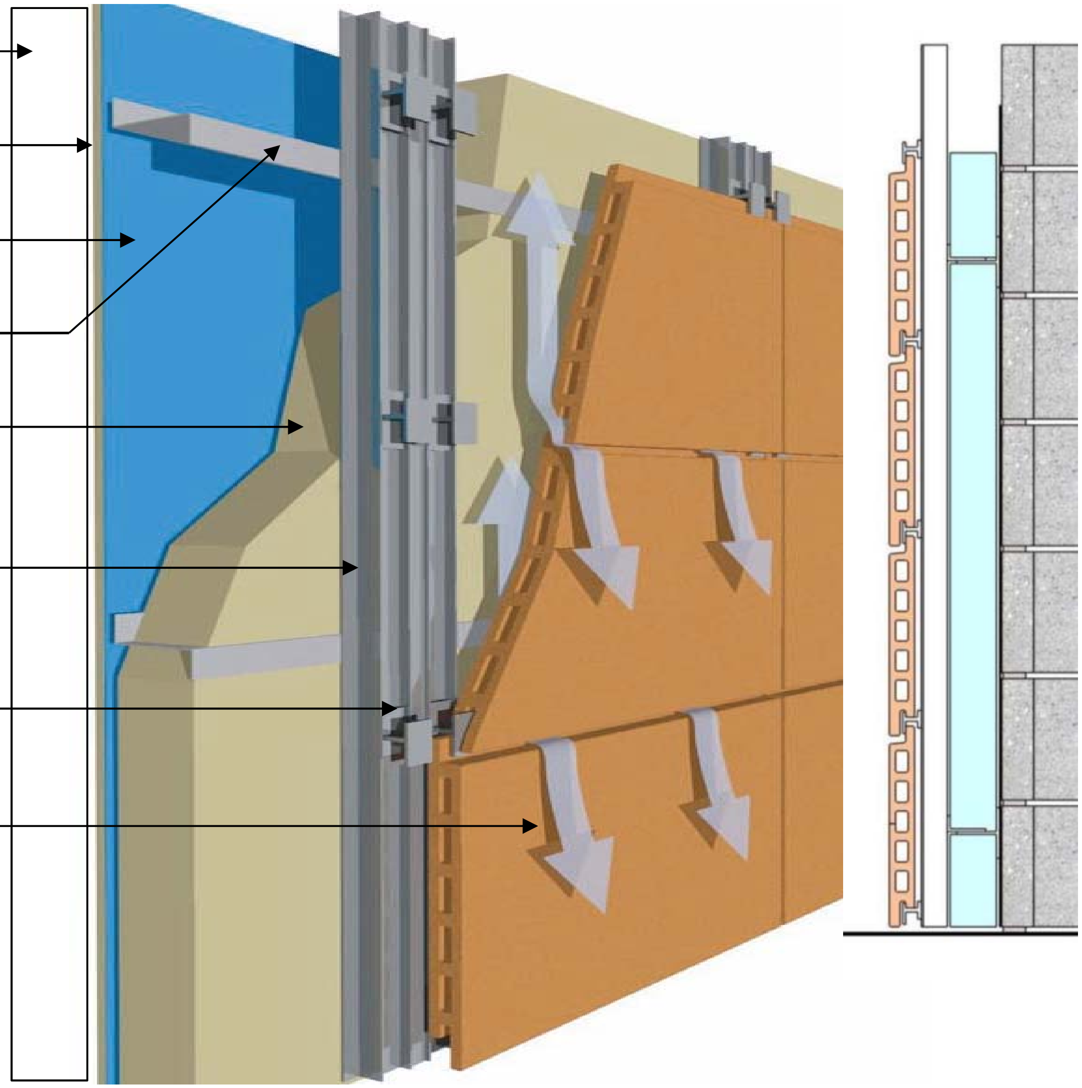
Z-Girts

Insulation

Vertical Supports

Clips

TC Panels



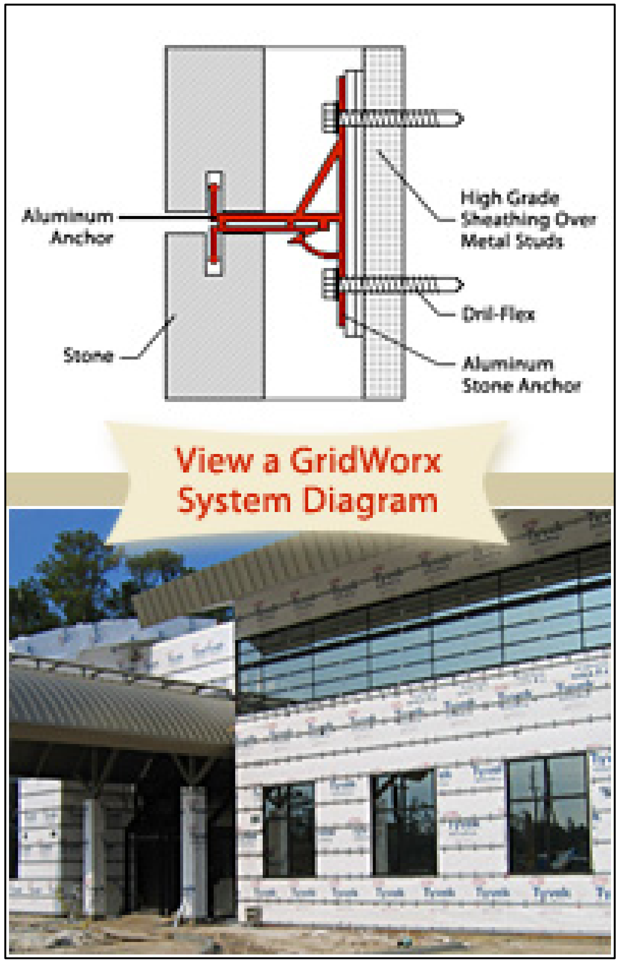
Clips

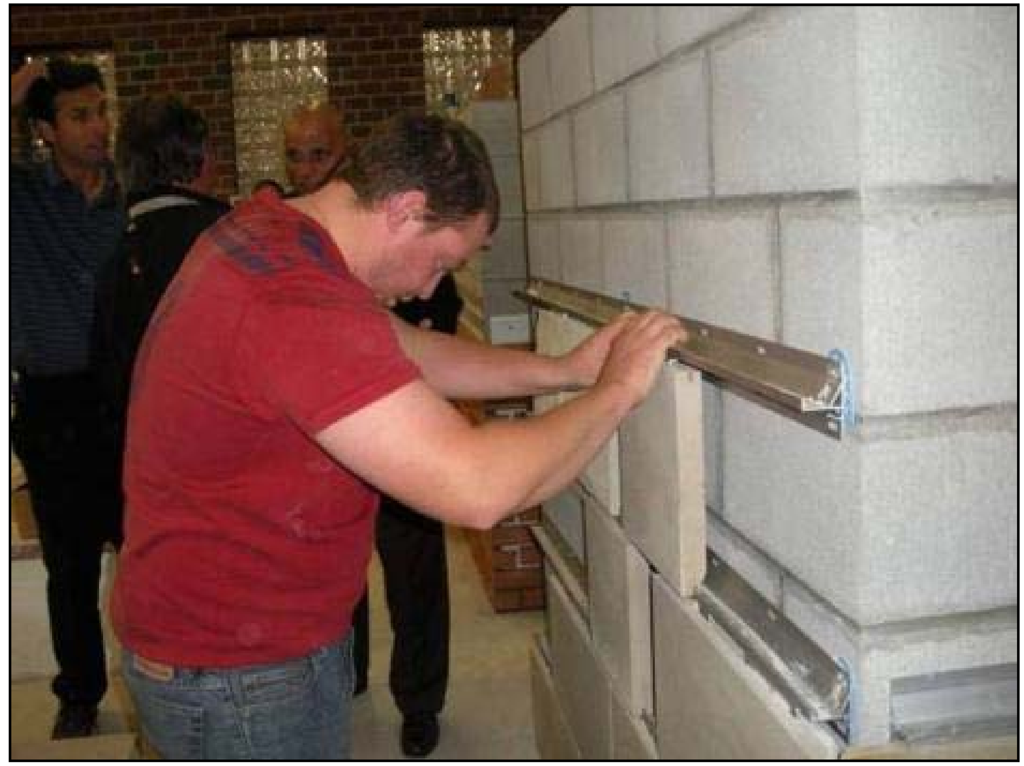
Gaskets

Other Sub-Frame Systems

DOW Knight-Wall System

Other Sub-Frame Systems





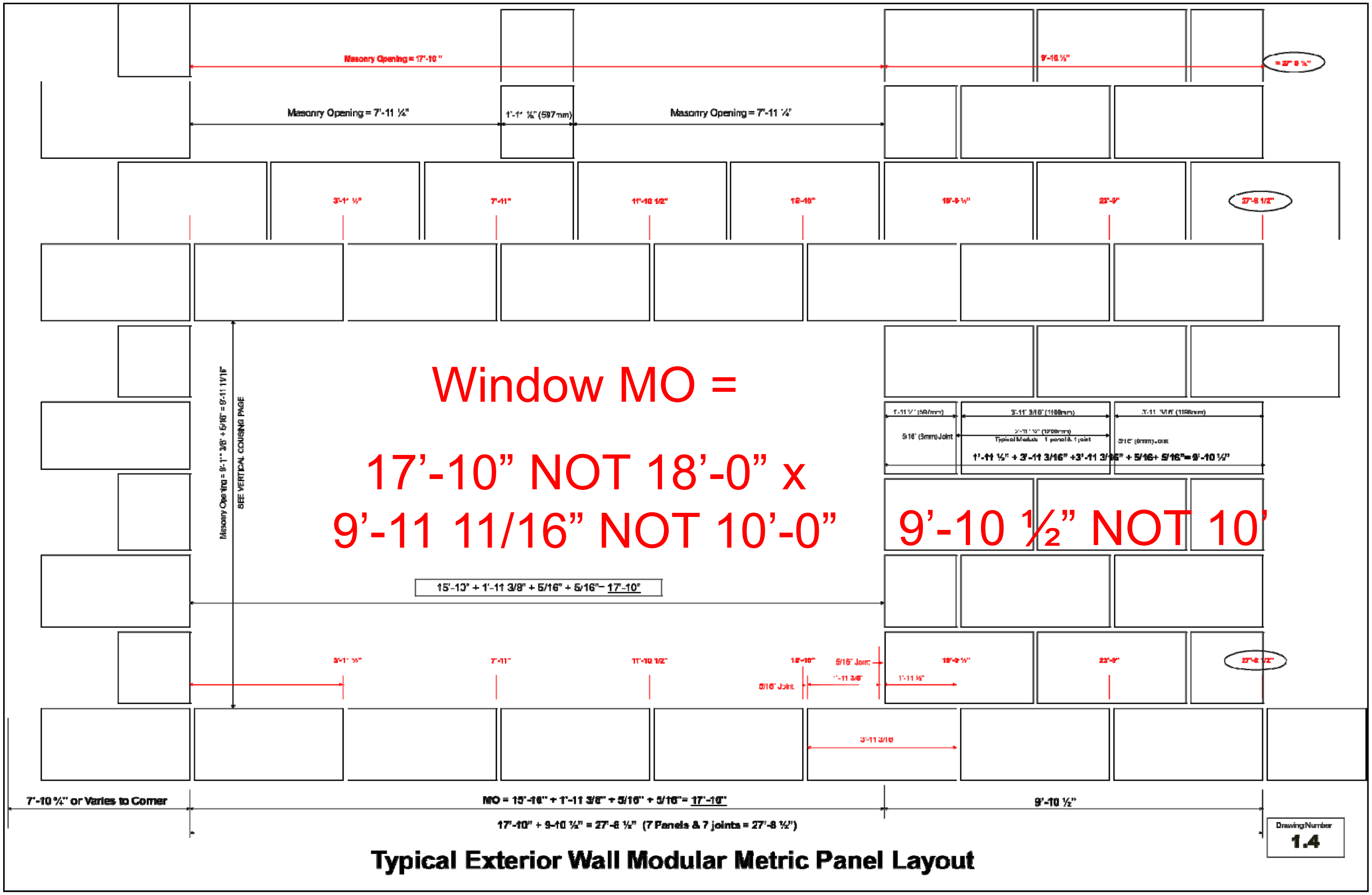
Gridworx

Rendering SEM Architects

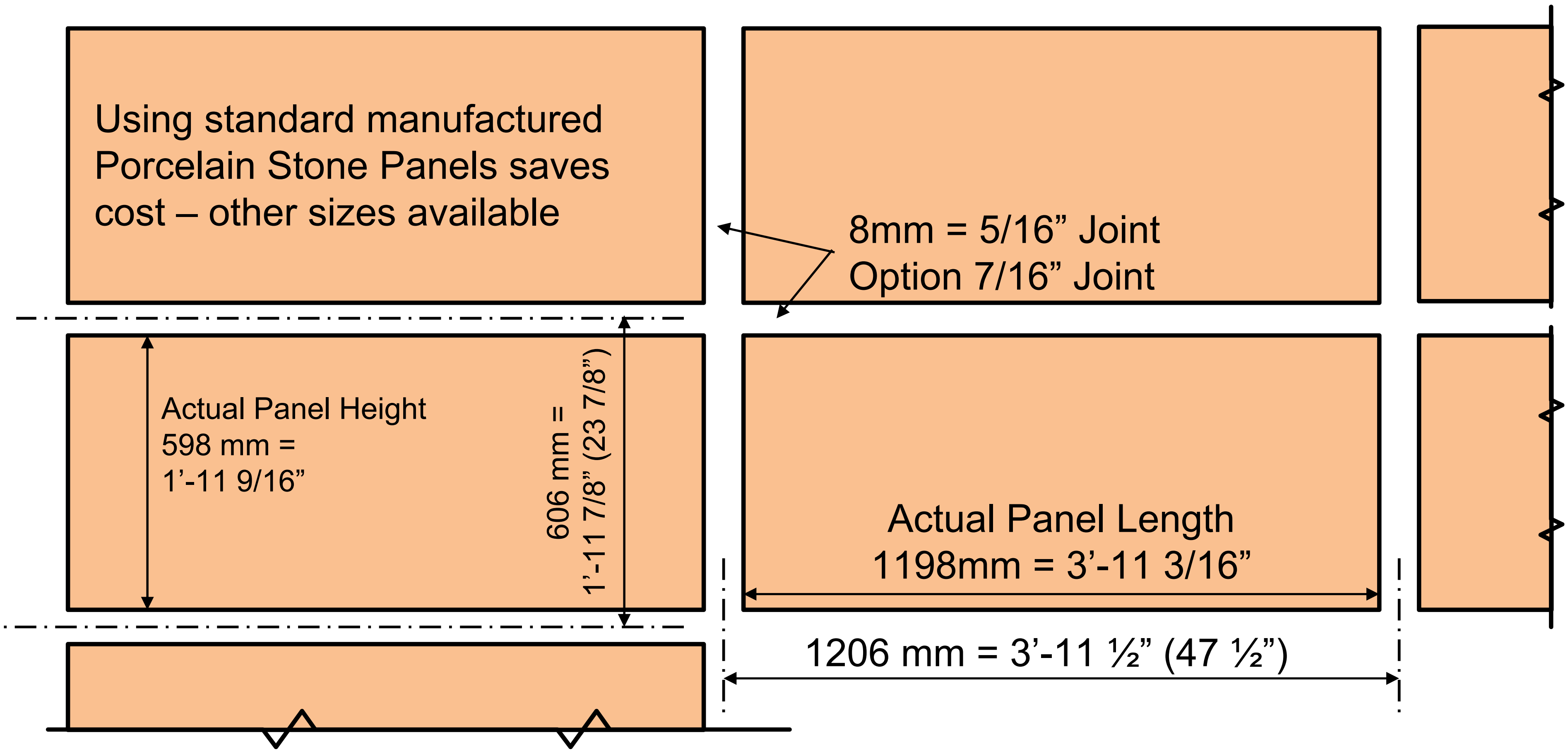
CREC
Schools of Excellence

Project: CREC Museum Academy
Location: Bloomfield, CT
Owner: CREC
Architect: Smith Edwards McCoy
Engineer: Macchi Engineers
Mason Contractor: Joe Capasso Mason Enterprises
Specialty Contractor: AMV Barrier, Waterproofing, Sealants
Advanced Caulking and Restoration, LLC
CM: Bartlett Brainerd & Eacott
Photography: IMI – Richard Filloramo

Modular Layout

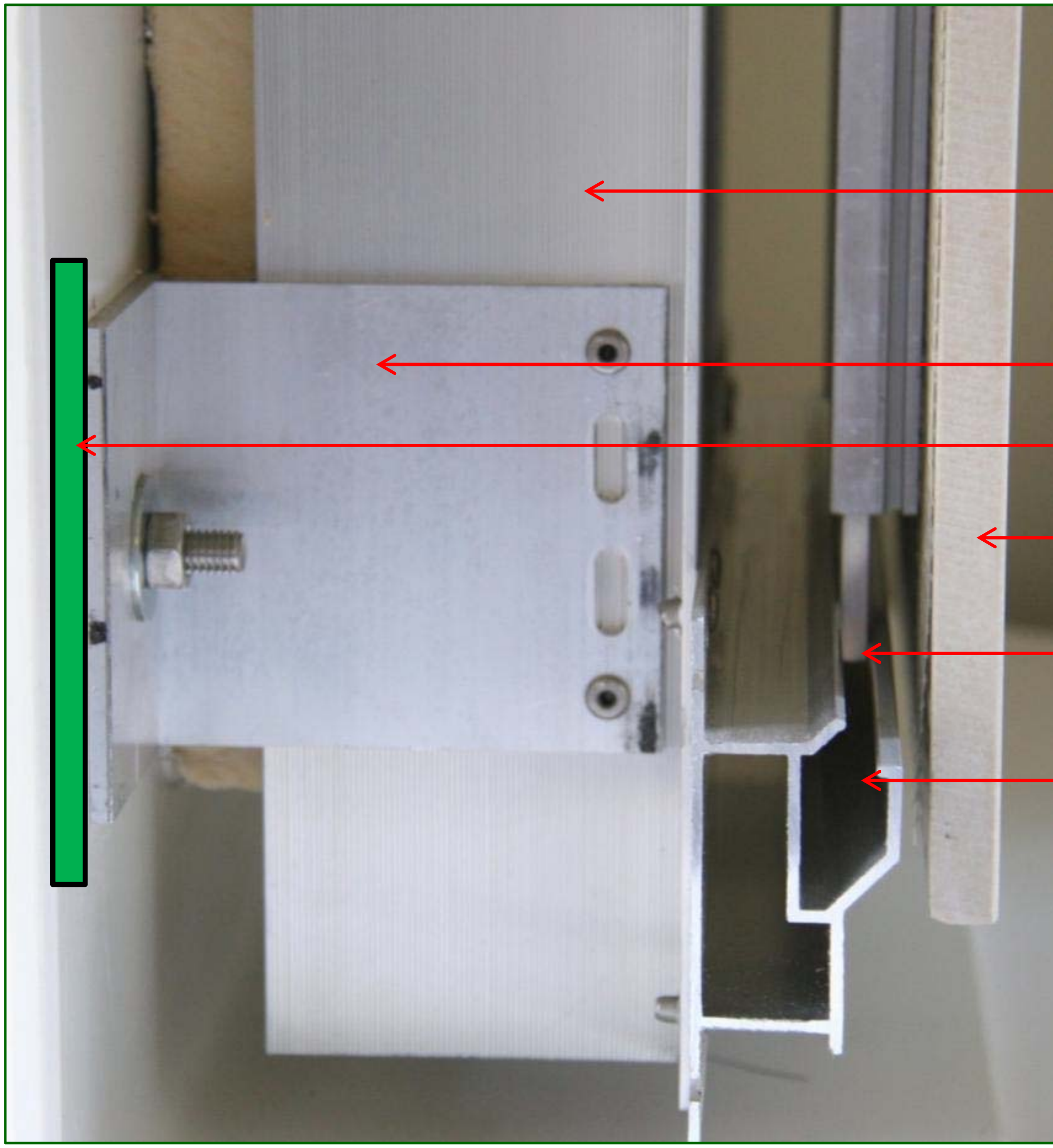


Panels are Metric Sizes – Alert Architects



Standard Thickness Vary: 3/8" to ½" (10mm to 12 mm) up to 1 ¼ " (30 mm)
2'X4' Module (23 7/8" x 47 ½" with 5/16" joints // 24" x 47 5/8" with 7/16" Joints

Porcelain Stone Ventilated Access System



Vertical T Profile

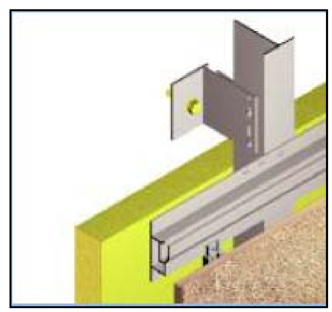
Angle Bracket

Thermal Isolation Pad

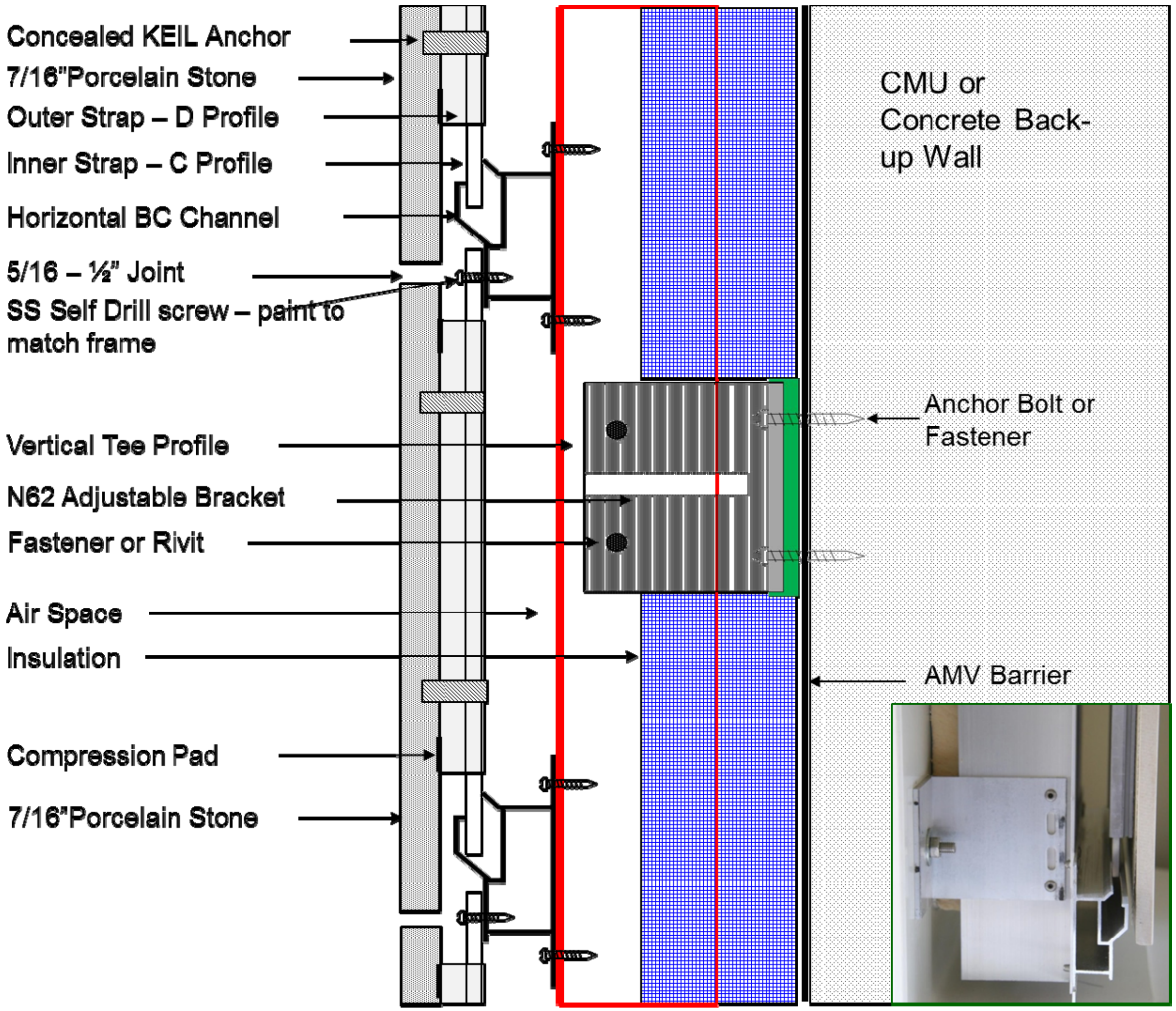
Porcelain Stone Panel with anti-shatter fiberglass mesh

Panel Support Strap

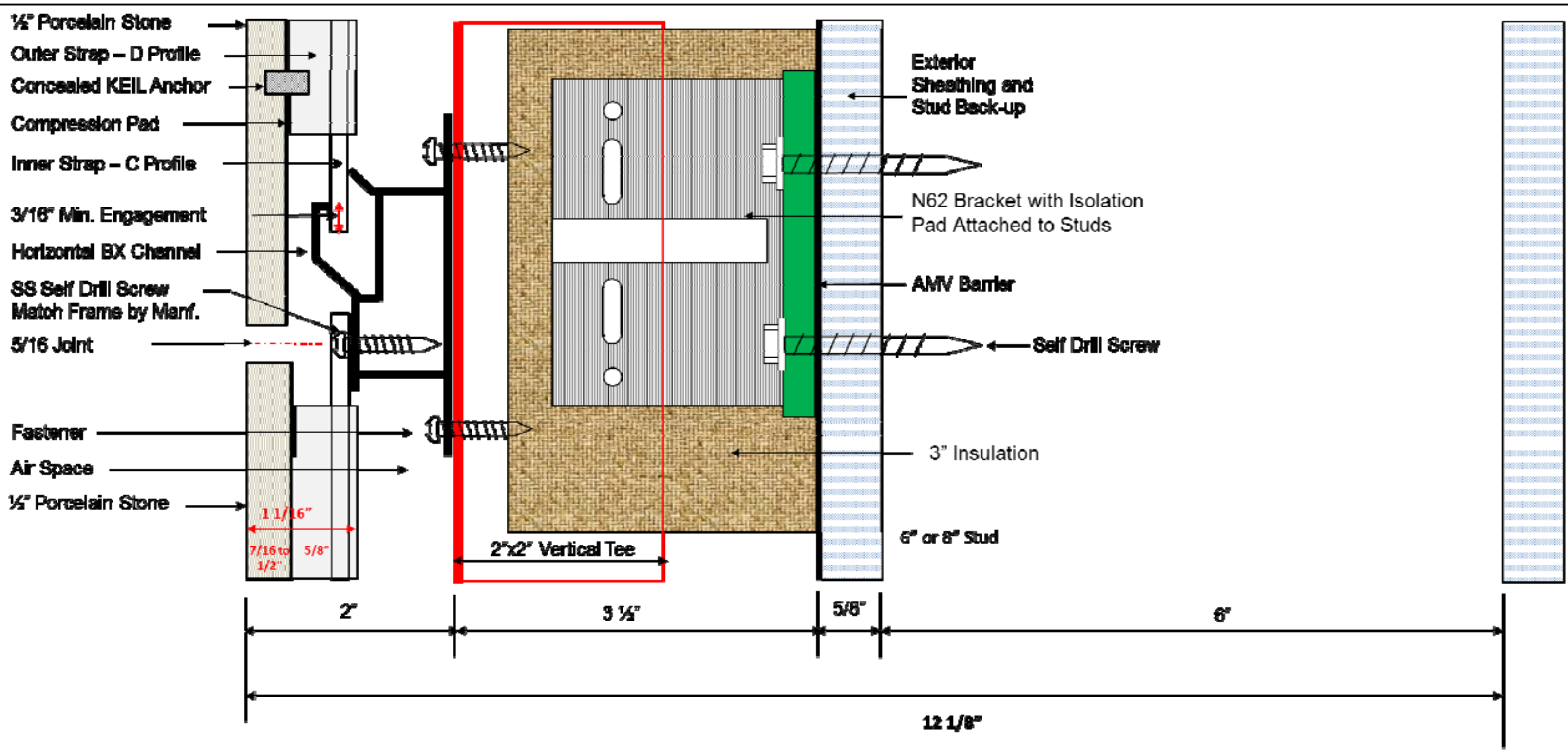
Horizontal Support Profile



Porcelain Stone Tile Ventilated Facades

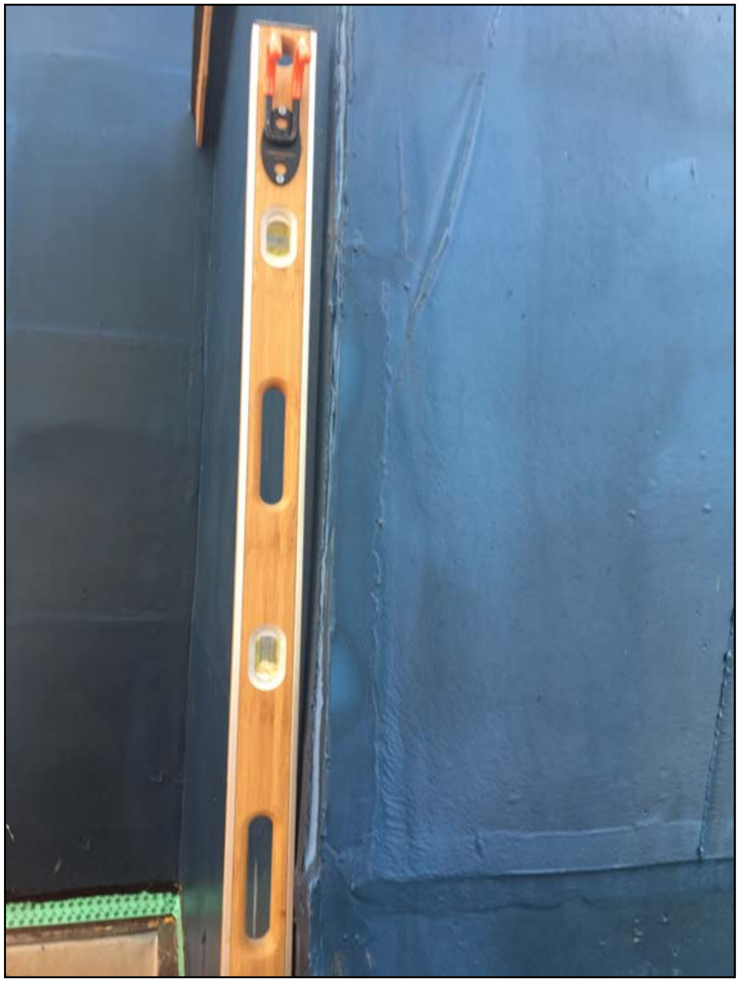


Typical Wall Section

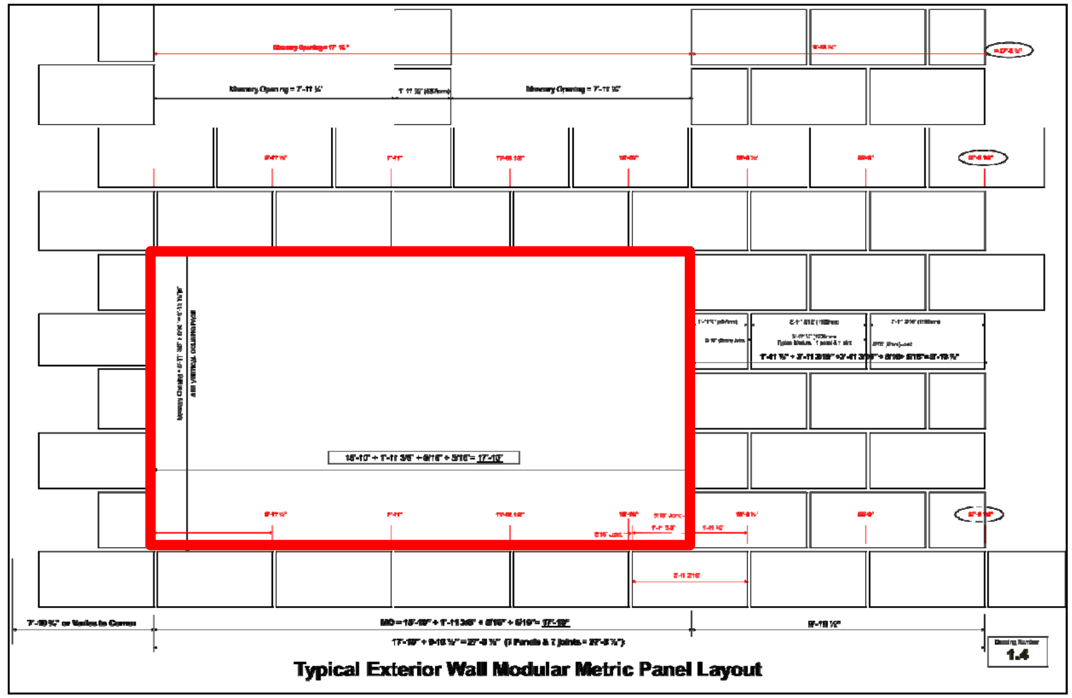


Typical Exterior Wall Section
N62 Bracket with 2"x2" T
Full Scale

1 – Check Stud Wall Installation Tolerances



PLUMB / LEVEL



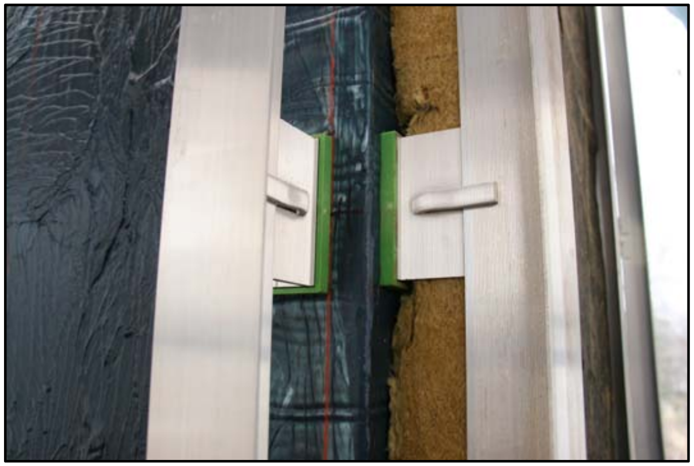
ALL OPENINGS AND DIMENSIONS

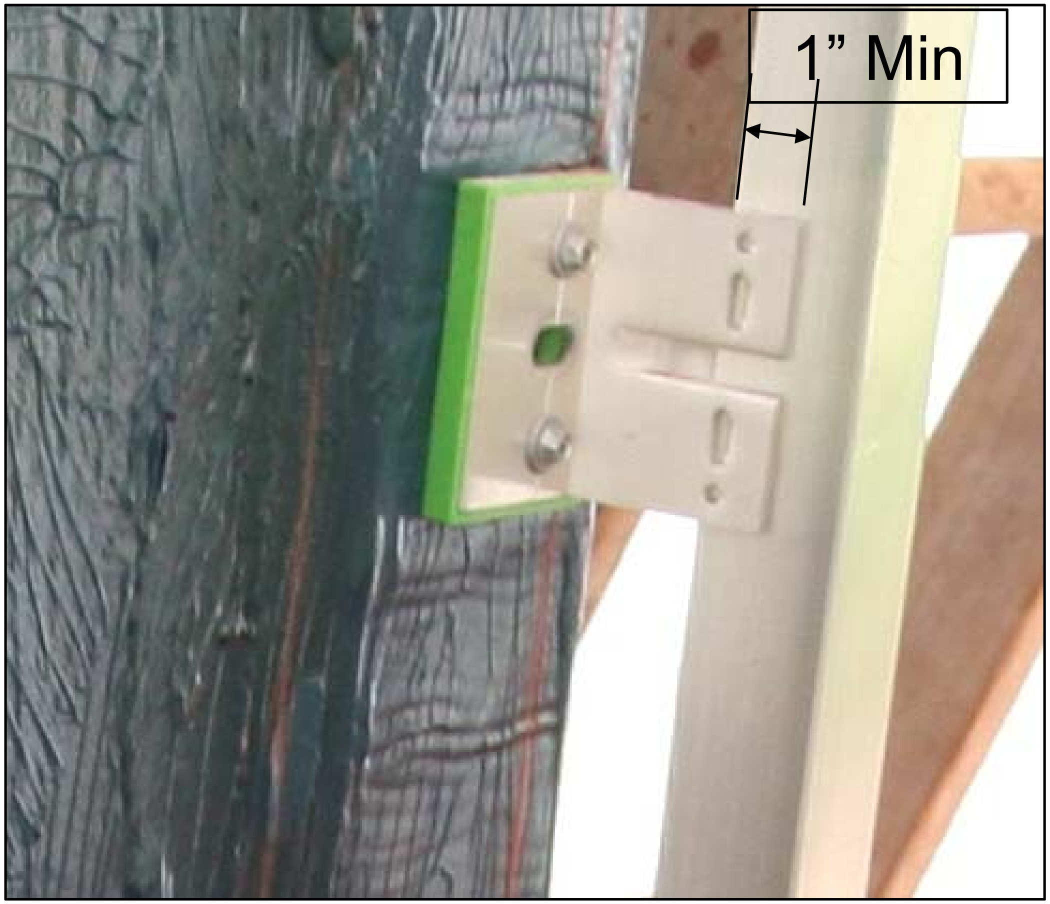
REPORT
DEFICIENCIES

2 – Air / Moisture / Vapor Barrier & Flashing

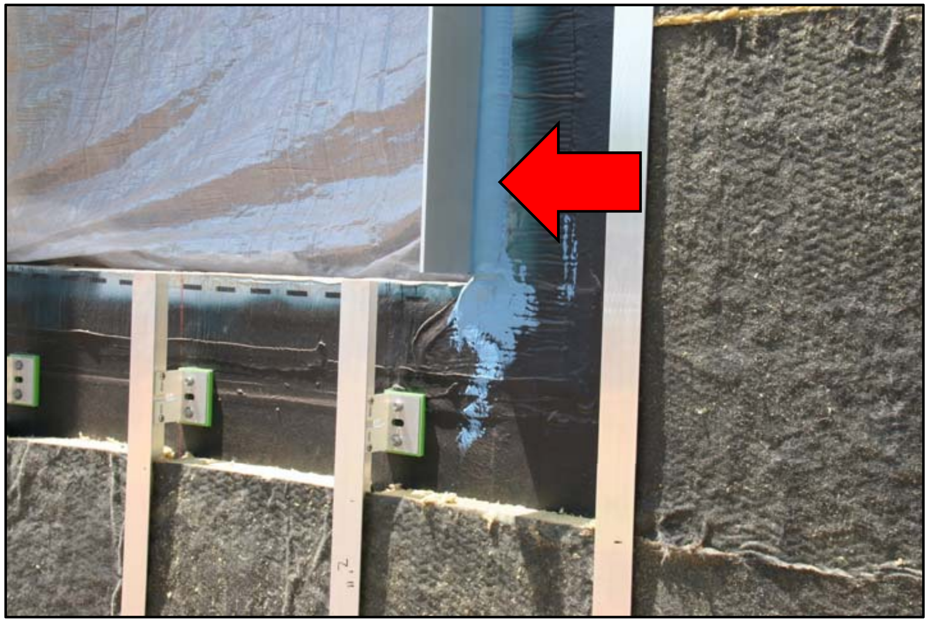
3 – Bracket Installation

4 – Tee Installation





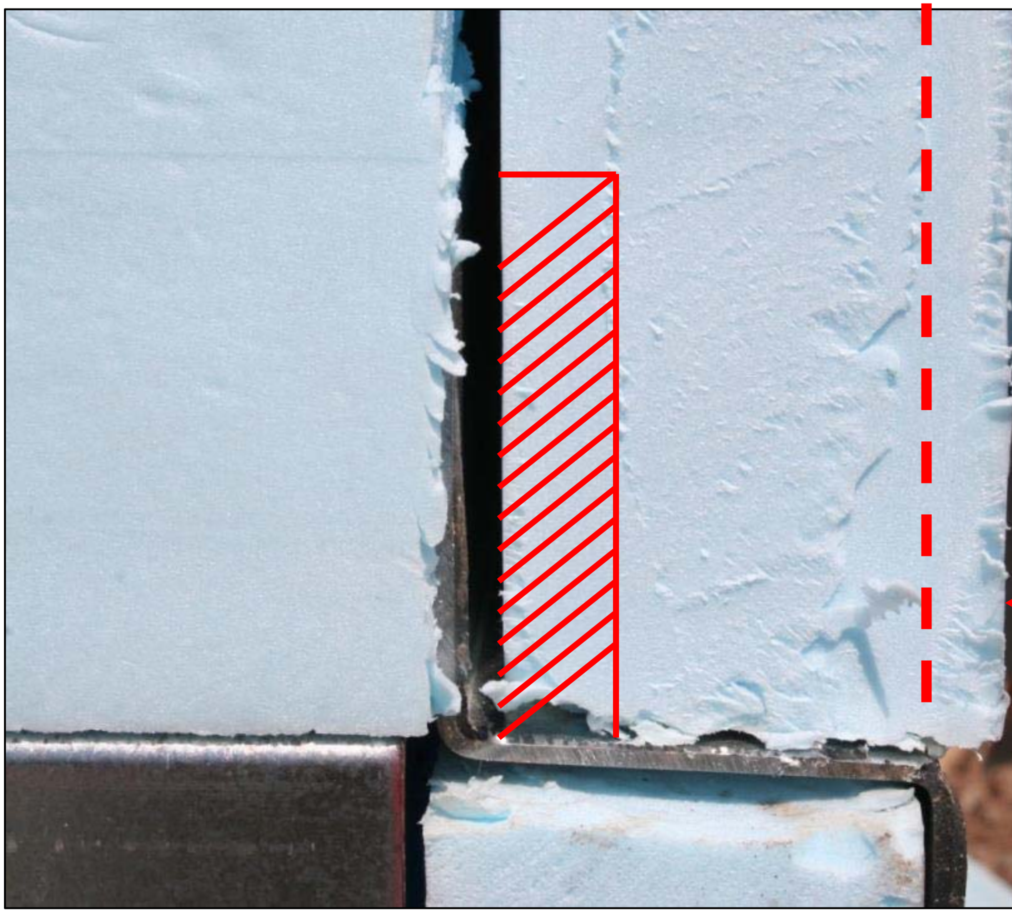
5 - Insulation & 6 – AVB Transitions



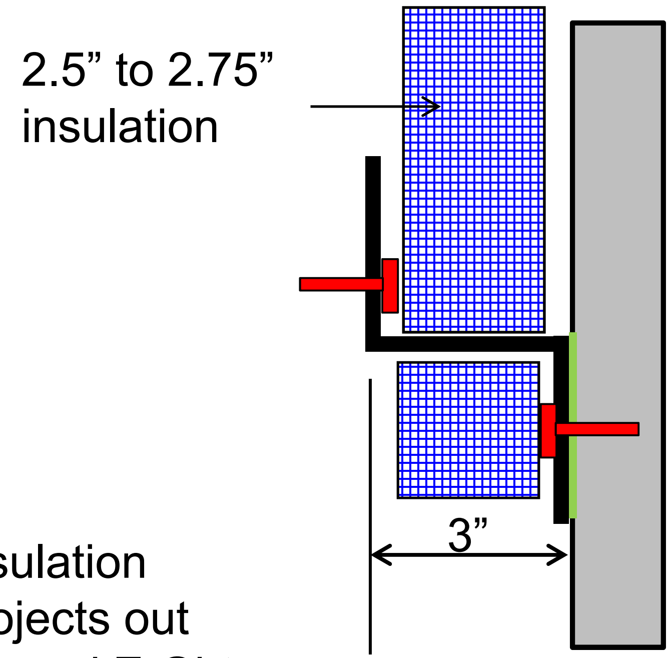
AVB Transitions at Openings

7 - Horizontal Rails and 8 - Panels

Rigid Insulation & Z-Girts



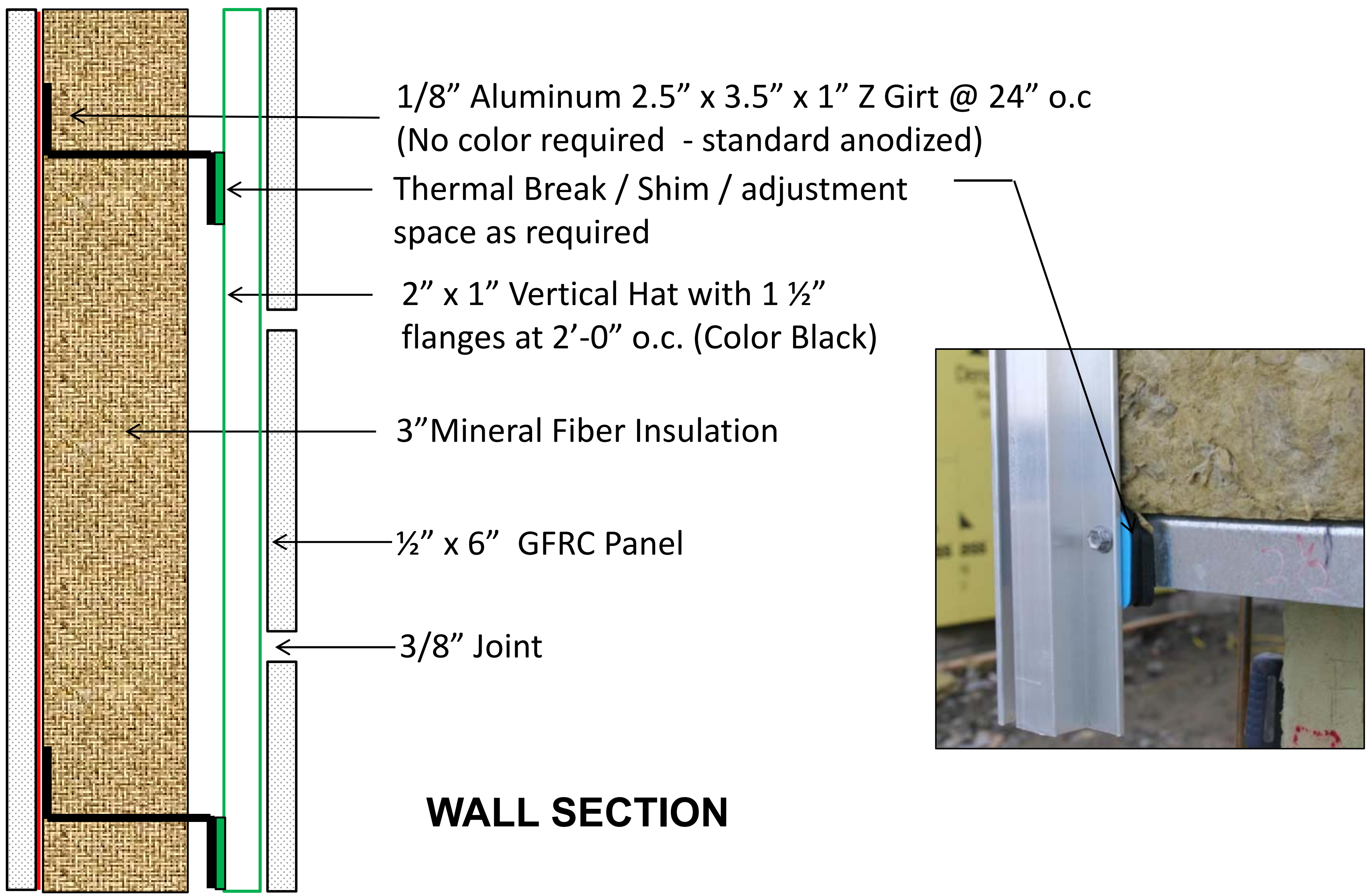
Insulation projects out beyond Z-Girt – Vertical track can not be installed.



Thermal Break Considerations

Rigid Insulation: Z-Girt should be ½” longer than insulation to allow for Z girt thickness and screw heads or cut will be required.

Engineered Maximum Shim Size



WALL SECTION

Insulation

GAPS IN INSULATION

Insulation

Taped Insulation Joints

Tight Insulation Joints

Insulation Options

Mineral Fiber

Extruded Polystyrene (XPS)

High R - Extruded Polystyrene (XPS)

1.75" = R-10 // 2.125" = R-12

Polyisocyanurate

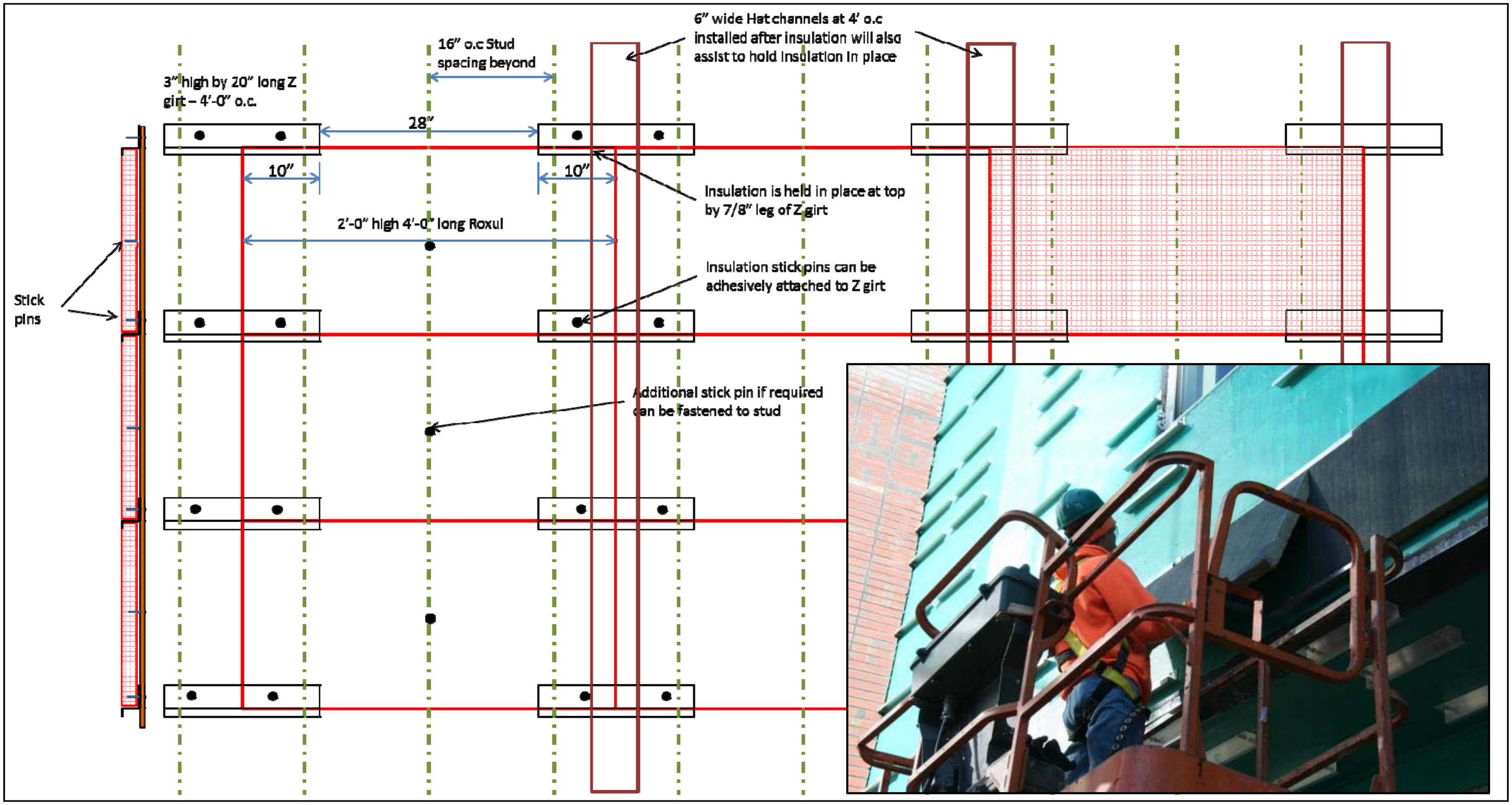
*Value Varies

Spray Polyurethane Foam (SPF)

Check for NFPA 285 Compliance

Insulation

Mineral Wool Insulation – Layout Pattern & Fasteners



Air/Moisture/Vapor Barrier

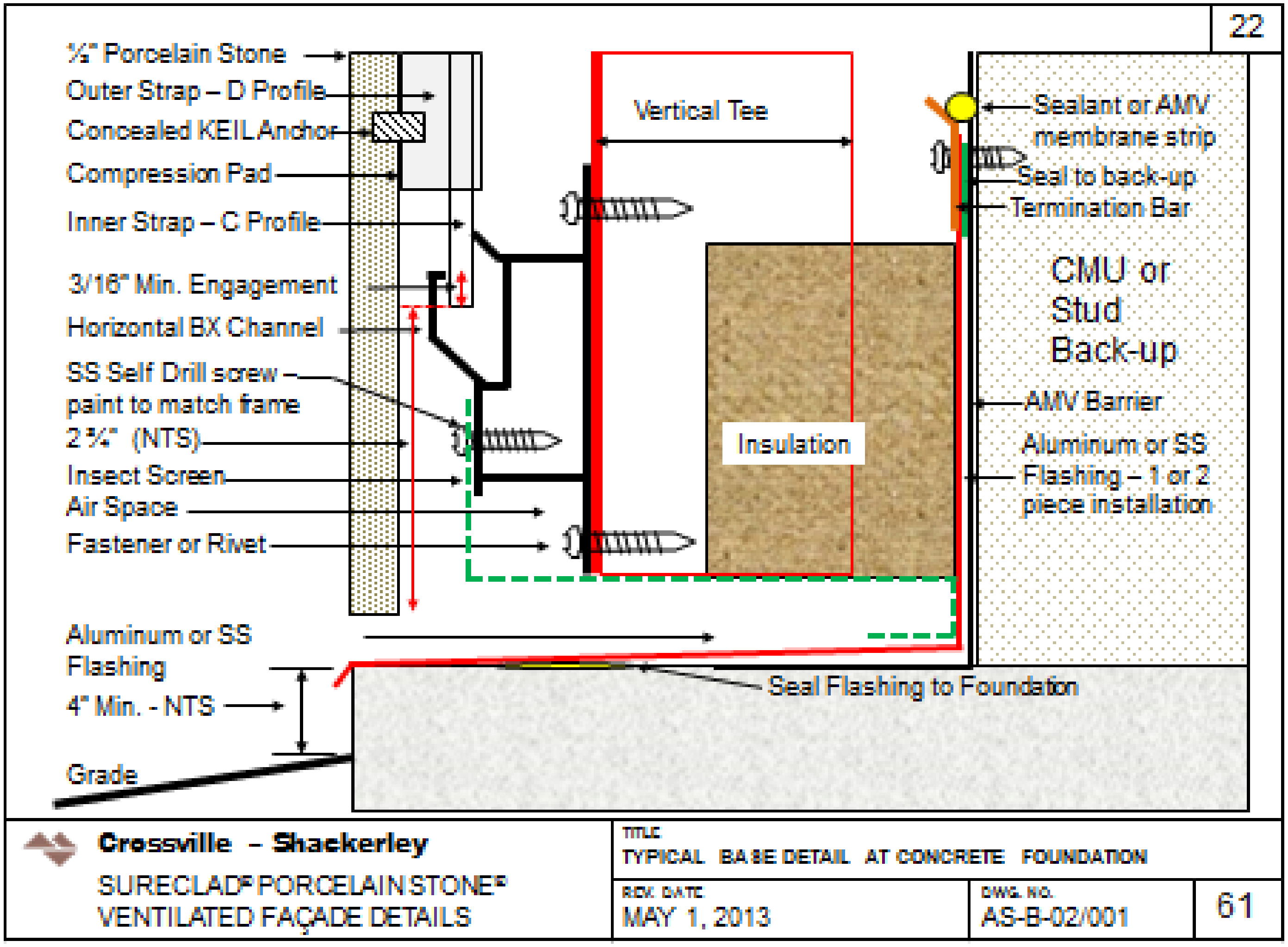
A/M/V Barrier, Transitions
and Flashing

Sub-Frame & Downspout

Hat Channel & Insulation

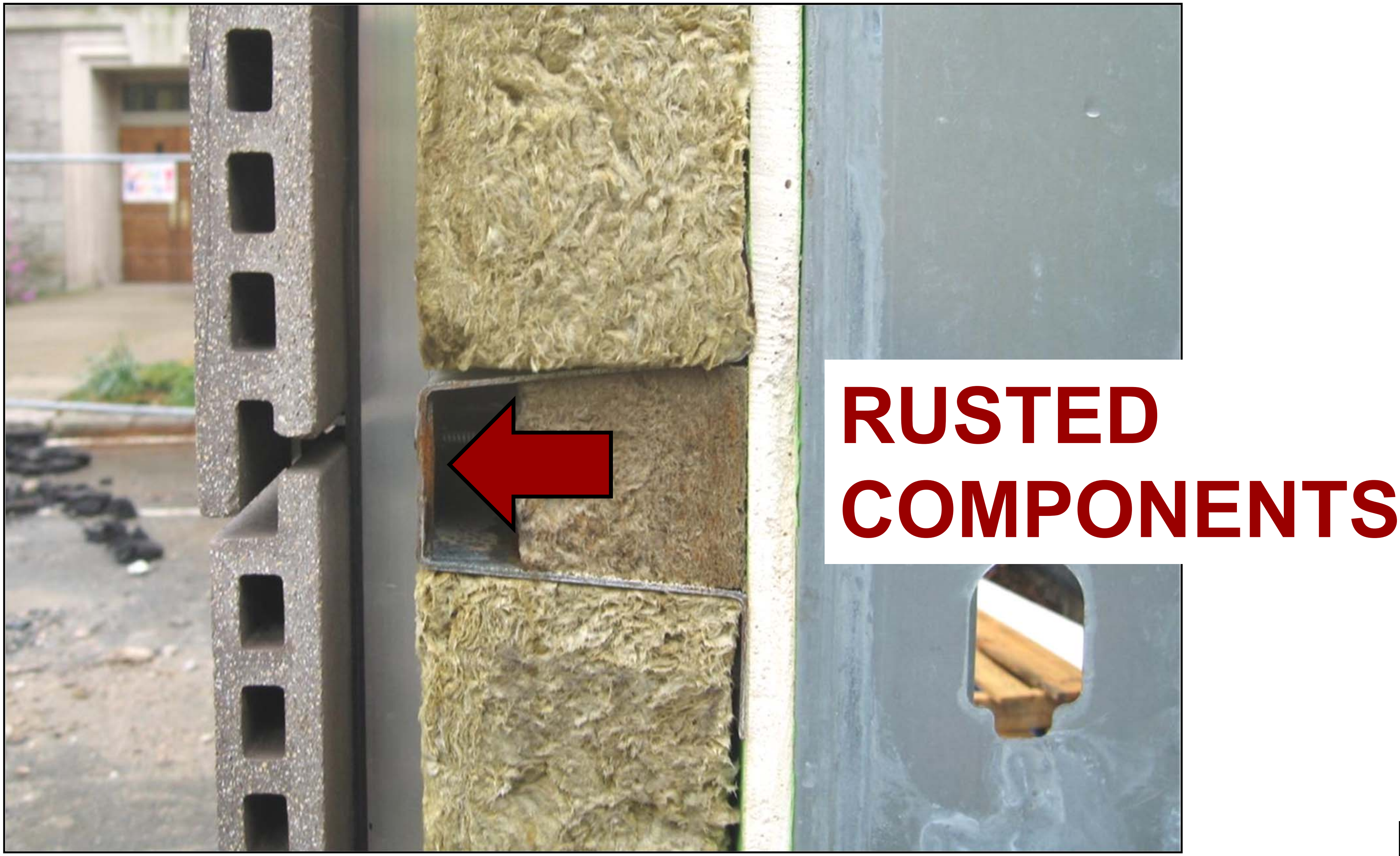
BASE FLASHING

Base Flashing Details



Courtesy – Crossville-Shackerely

Hat Channel & Insulation

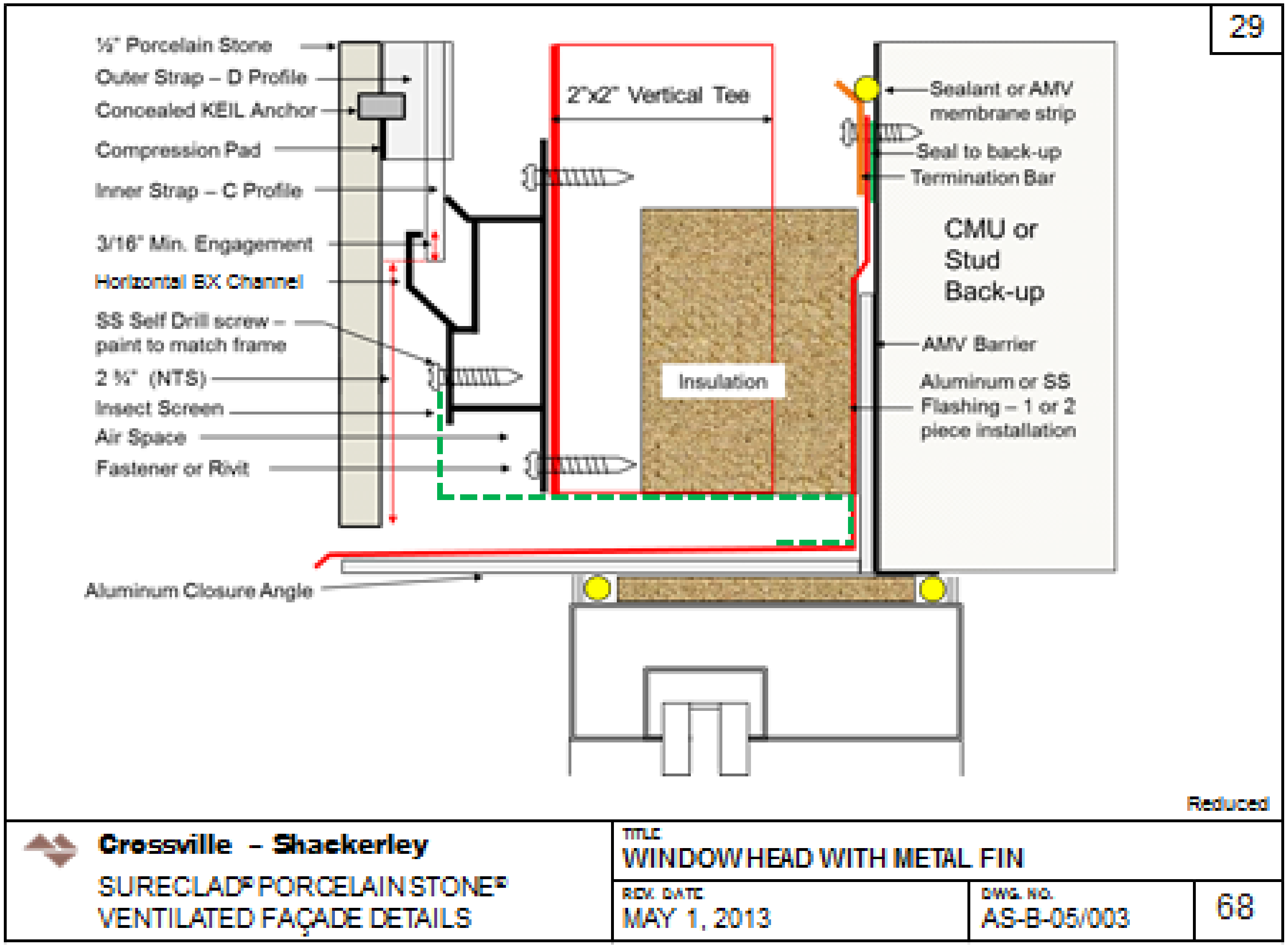


Top of Wall at Sill

NO FLASHING

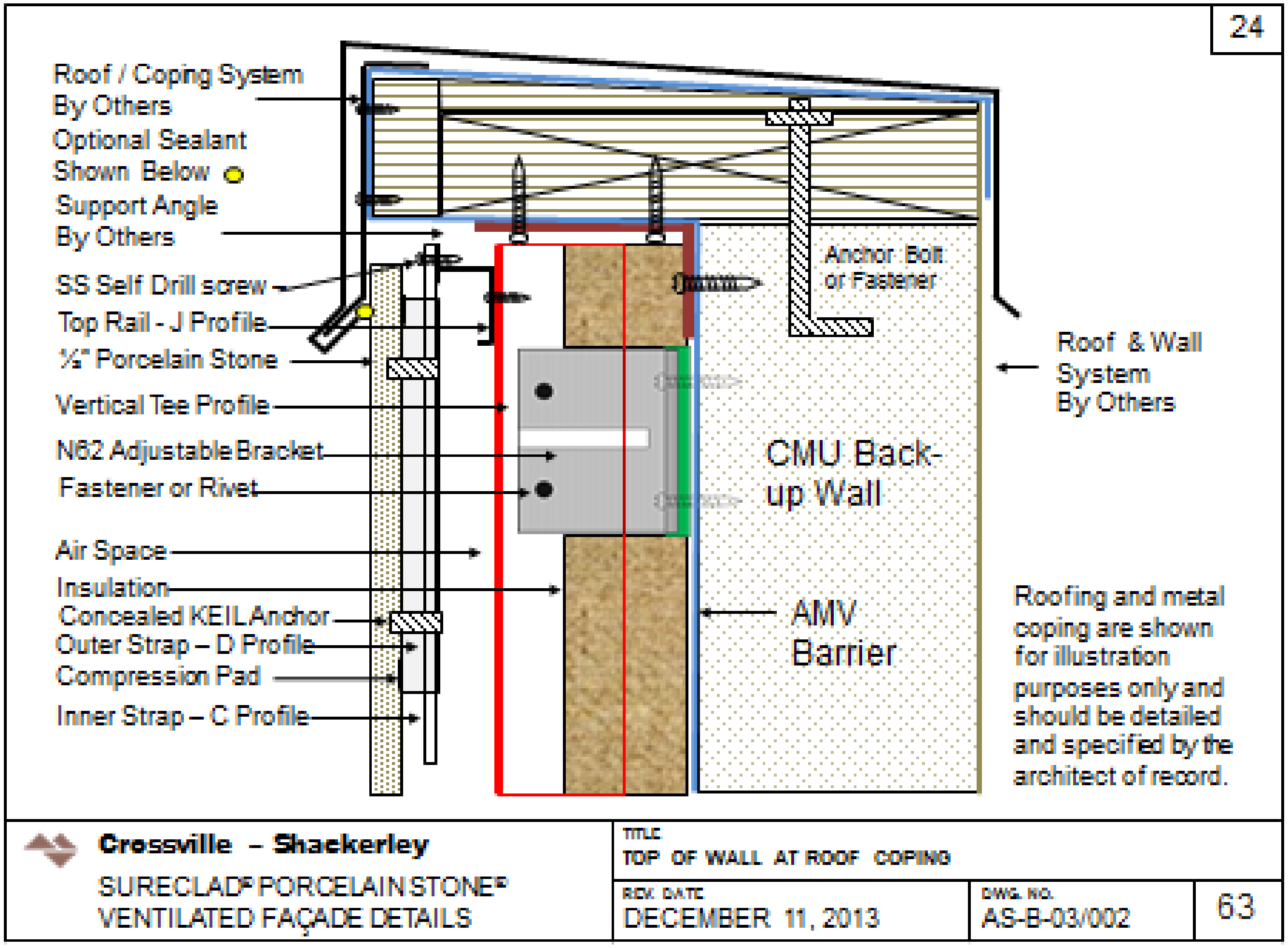
AVB???

Window Head Detail



Courtesy – Crossville-Shackerely

Top Of Wall Detail



Courtesy – Crossville-Shackerely

Waterbury Career Institute
SLAM Collaborative

Joe Capasso Mason
Contractors

TOLERANCES

TOLERANCES

Windows

Sacred Heart Student Center

One Contractor – The Entire System

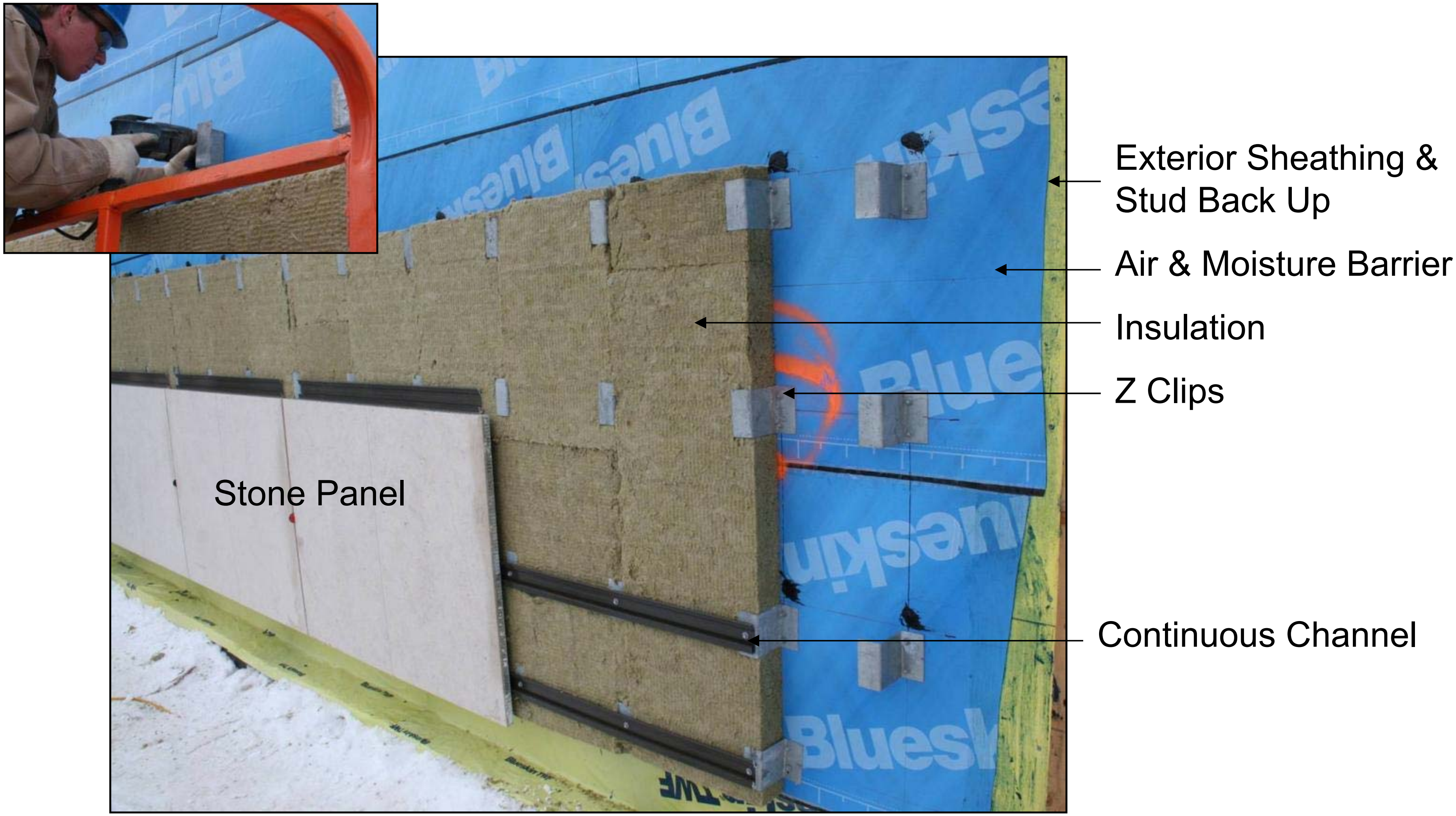
Joe Capasso Mason Enterprises installed the entire aluminum support rainscreen system for the stone façade.

SACRED HEART UNIVERSITY STONE RAINSCREEN FACADE

Bryant University Chapel

One Contractor – The Entire System

Bryant University Chapel



Custom Stone Panel System

Rainscreen Wall System

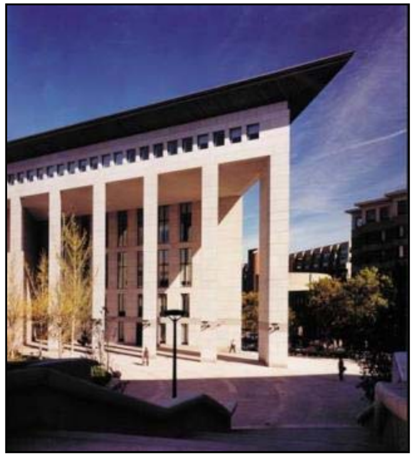
SOLVING CONSTRUCTABILITY ISSUES

Science – Design – FIELD EXPERIENCE

TEAMWORK
Science, Design and Field Experience

Mason / Tile / Rainscreen contractors have been trained by IMI and have installed stone, terra cotta, GFRC and other rainscreen wall systems.

Teamwork & Field Experience

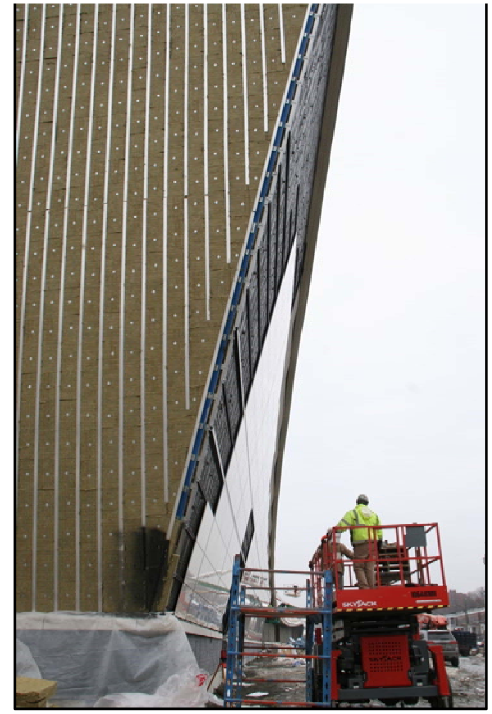


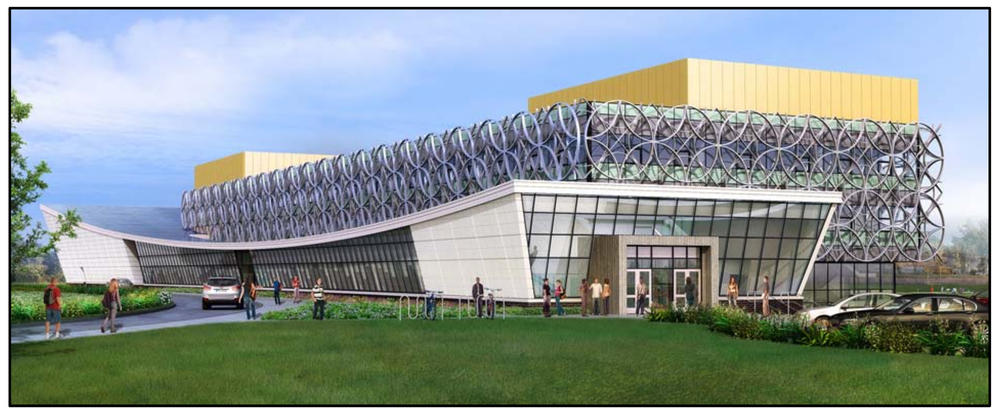
Mason / Stone / Tile Contractors and Craftworkers have been installing cladding systems for many years including new rainscreen wall systems.

Integration of New Building Envelope Systems - Rainscreen Walls

SECTION 3

GALLERY OF PROJECTS





WARREN HARDING HIGH SCHOOL

BRIDGEPORT, CT

PORCELAIN RAINSCREEN FACADE

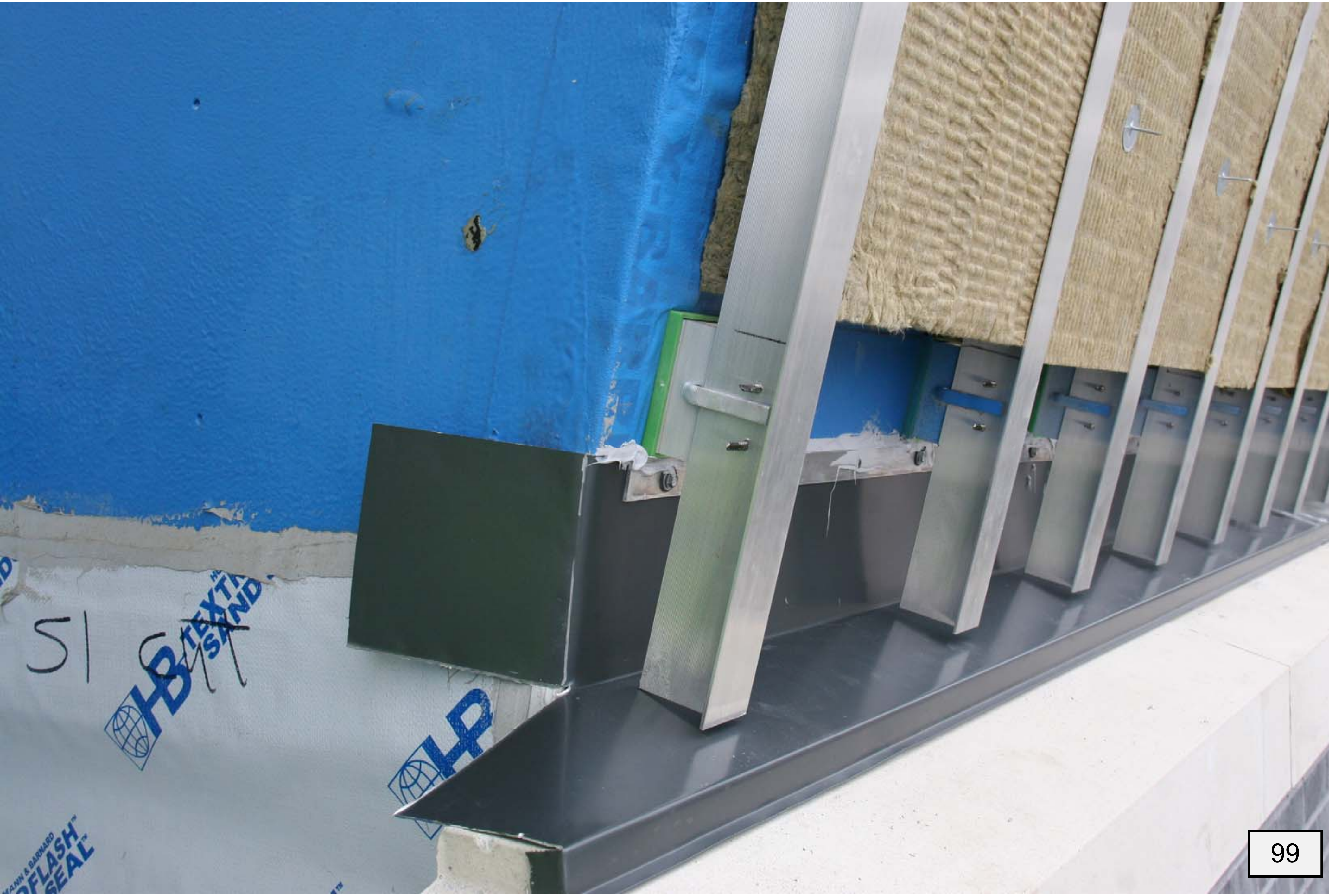
CIVITILLO MASONRY

ARCHITECT: ANTINOZZI ASSOCIATES

CONSTRUCTION PHOTOS 01/11/18

Solving complex design issues – sloping walls on a radius


United Rentals
JLG LIFT
USG

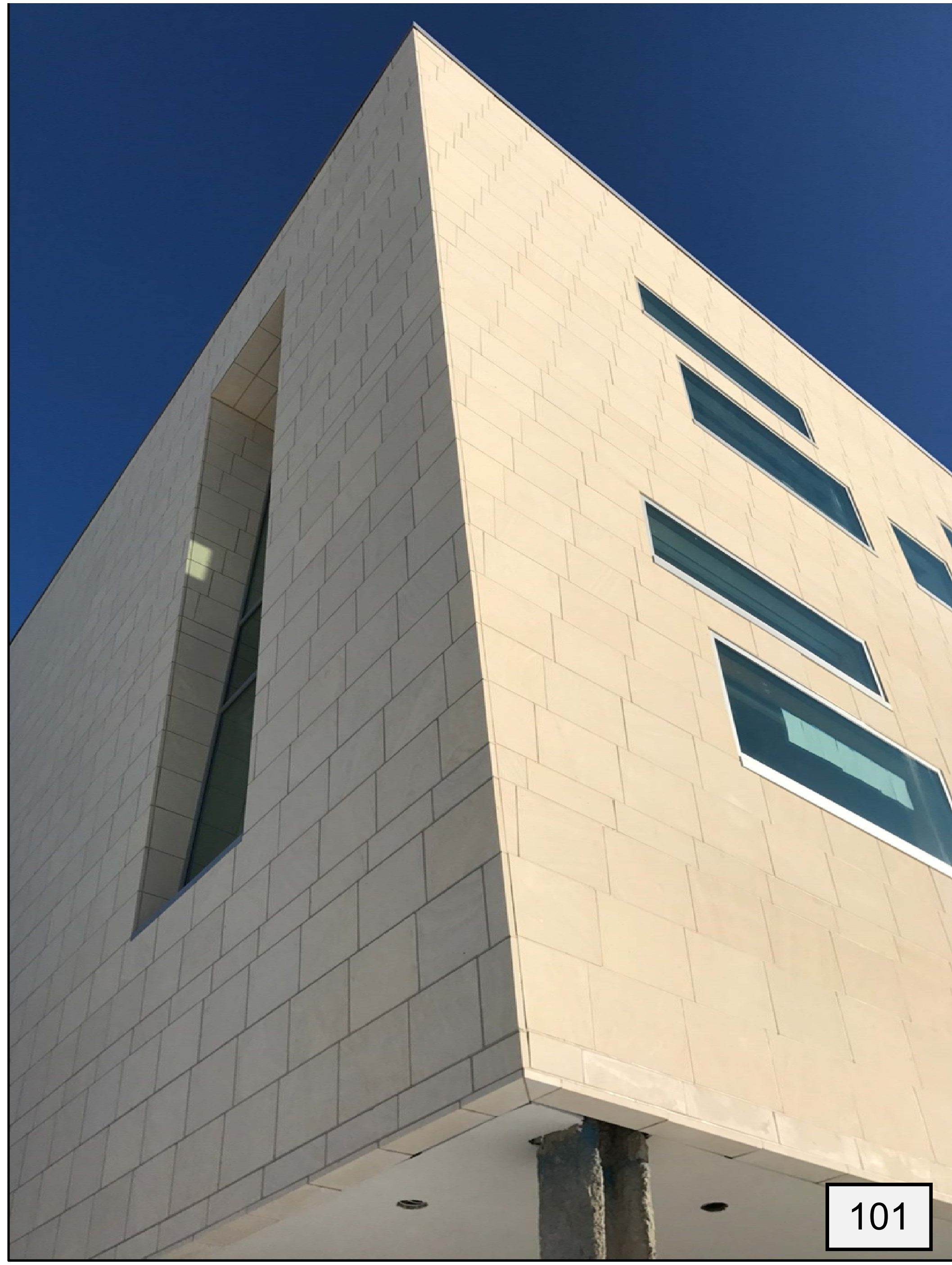


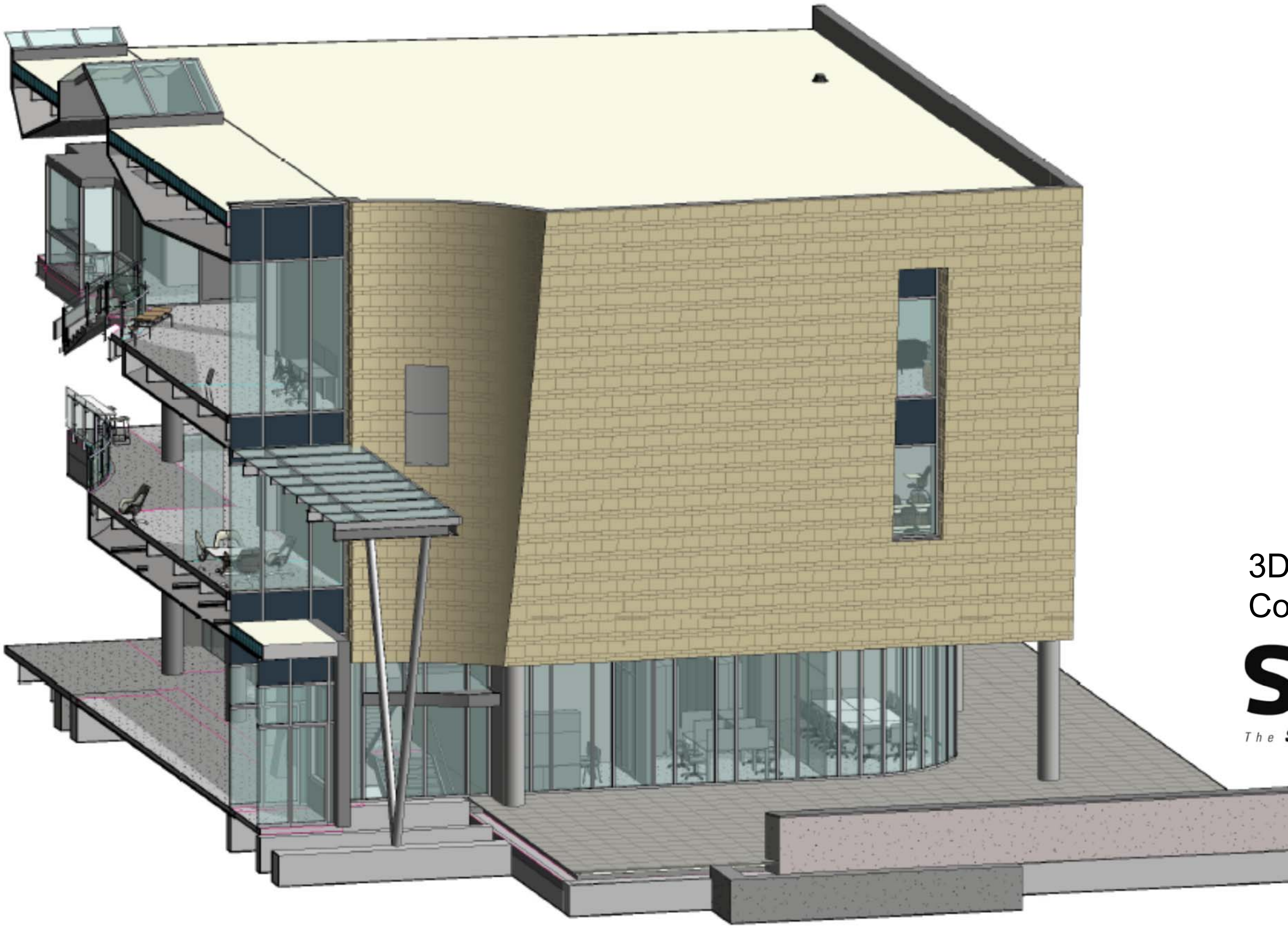
Project: College of Health Professions
Location: Bridgeport, CT
Owner: Sacred Heart University
Architect: SLAM Collaborative
Engineer: SLAM Engineers
Mason Contractor: CT Mason Contractors
CM: Consigli

SACRED HEART UNIVERSITY

COLLEGE OF HEALTH PROFESSIONS

PARK AVENUE
BRIDGEPORT, CT

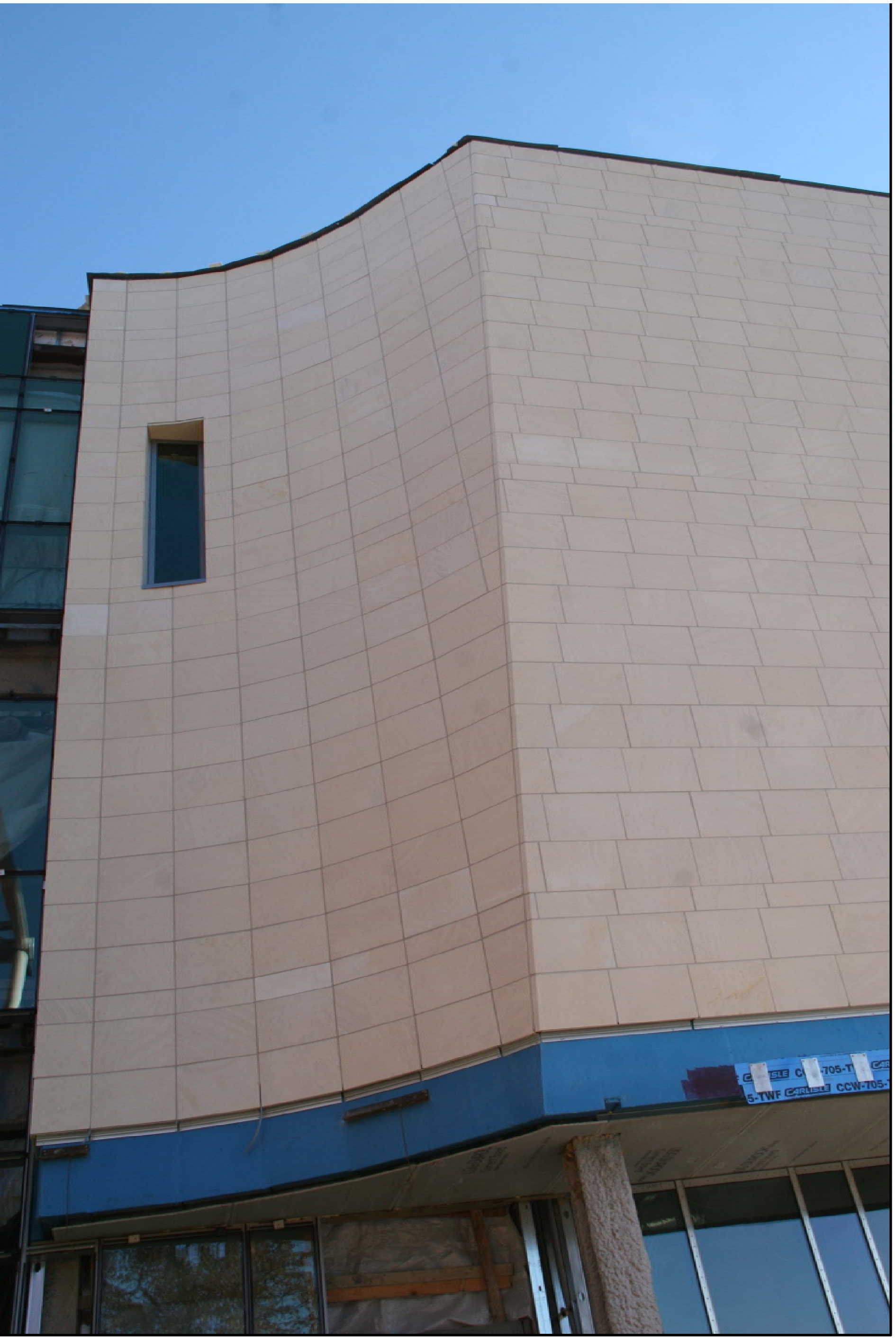


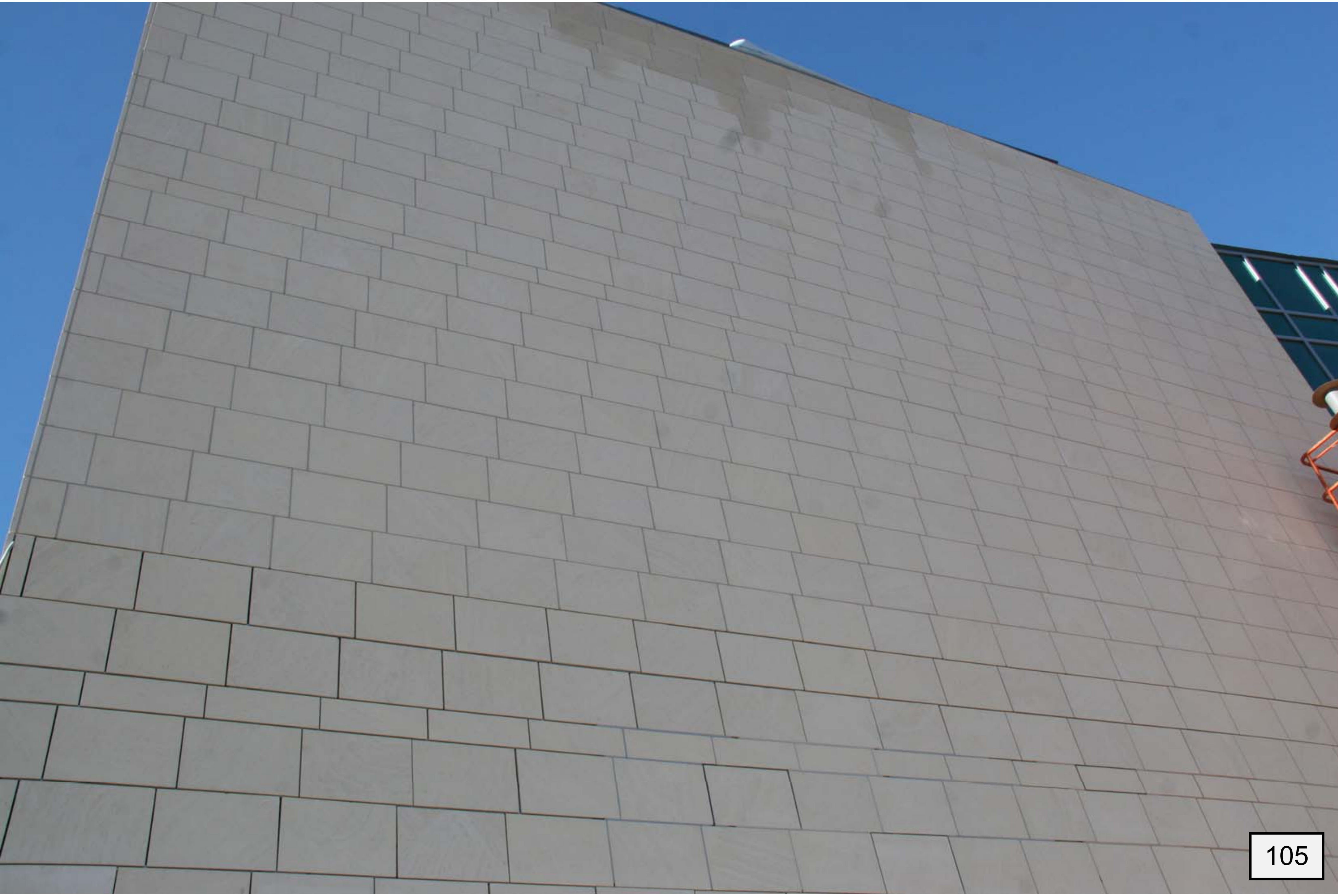


3D Rendering –
Courtesy of

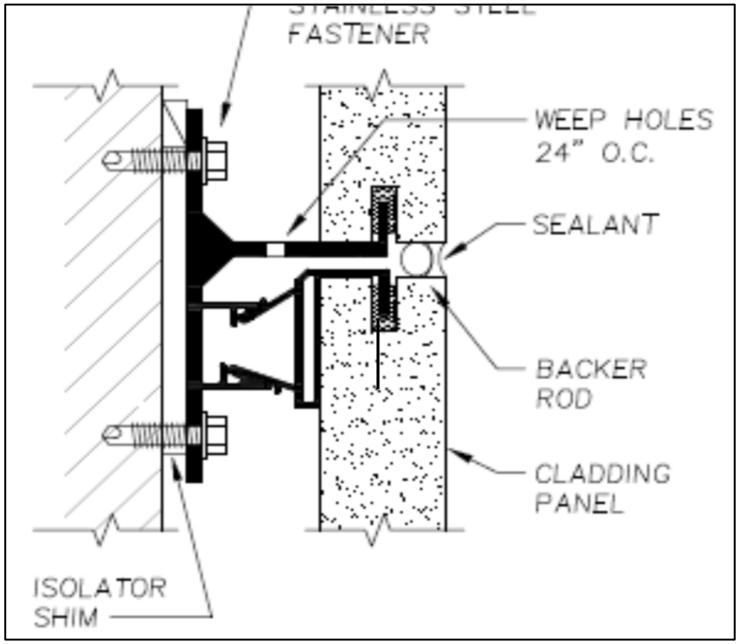
SLAM

The S/L/A/M Collaborative



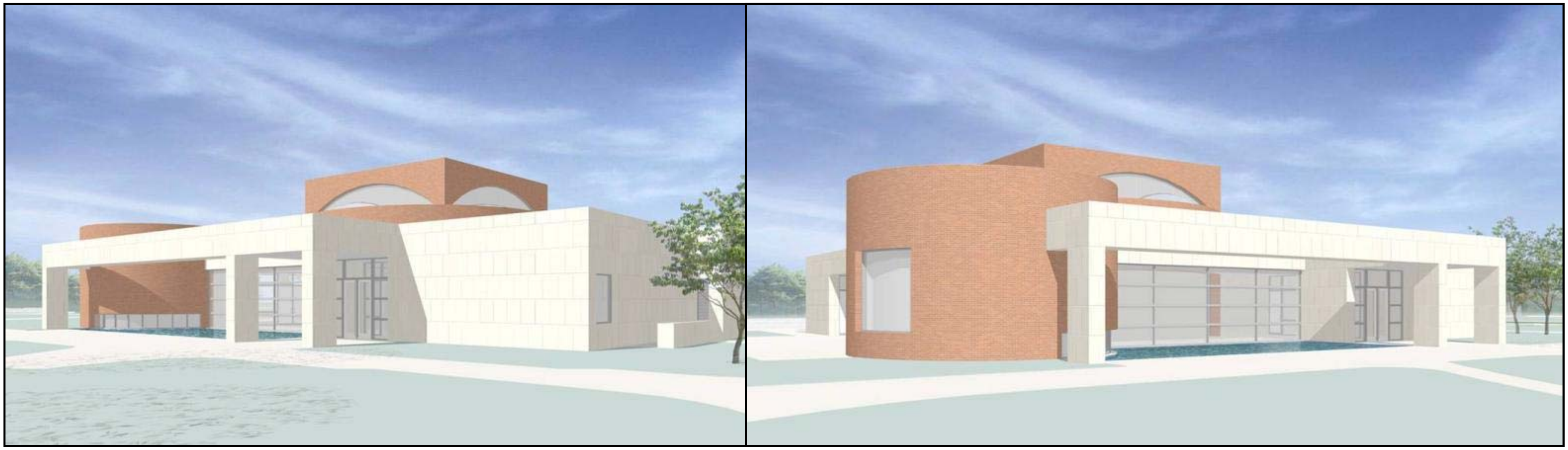


105



Courtesy Fast=Track Systems / Acme Brick

Bryant University Chapel



Thin Stone Panels

Project: Bryant University Chapel

Architect: Gwathmey Siegel & Associates

Mason Contractor: Grande Masonry

CM: Shawmut Design & Construction

Bryant University Chapel

Project: Bryant University Chapel

Architect: Gwathmey Siegel & Associates

Mason Contractor: Grande Masonry

CM: Shawmut Design & Construction

08

Project: Waterbury Career Academy
Location: Waterbury, CT
Owner: City of Waterbury
Architect: S/L/A/M Collaborative
Engineer: S/L/A/M Collaborative
Mason Contractor: Joe Capasso Mason Enterprises
Tile Contractor: Atlantic Masonry Products
CM: Gilbane Building Company

Rendering – S/L/A/M Collaborative

Terra Cotta Rainscreen

Waterbury Career Academy

Rendering - SLAM Collaborative / 3D City

Waterbury Career Academy

Terra Cotta Rainscreen

Quinebaug Valley Middle High School, Danielson, CT
Amenta Emma Architects / B.W. Dexter Mason Contractor

Quinebaug Valley - Terra Cotta

Single Source Responsibility Mason installs: AMV, Insulation, Flashing, Sub-Frame, Related Trim and Cladding


FIRE LANE

Terra Cotta Rainscreen

Annie Fisher School, Hartford, CT
Amenta Emma Architects
Brayman Hollow Masonry

Annie Fisher School

Sacred Heart University Student Center

Project: Sacred Heart University – Gallery Student Center
Location: Fairfield, CT
Owner: Sacred Heart University
Architect: Sasaki Associates, Inc.
Engineer: Simpson Gumpertz & Heger
Mason Contractor: Joe Capasso Mason Enterprises
Specialty Contractor for AMV Barrier, Waterproofing, Sealants & Washdown: Advanced Caulking and Restoration, LLC
Tile Contractor: Coreno Marble & Tile
Terrazzo Contractor: Joseph Cohn & Son
Concrete Contractor: RJB Contracting Inc.
CM: Pavarini N.E. Construction Co. Inc.
Photography: IMI – Richard Filloramo

Stone Rainscreen Facade

Stone Rainscreen Facade

Stone Rainscreen Facade

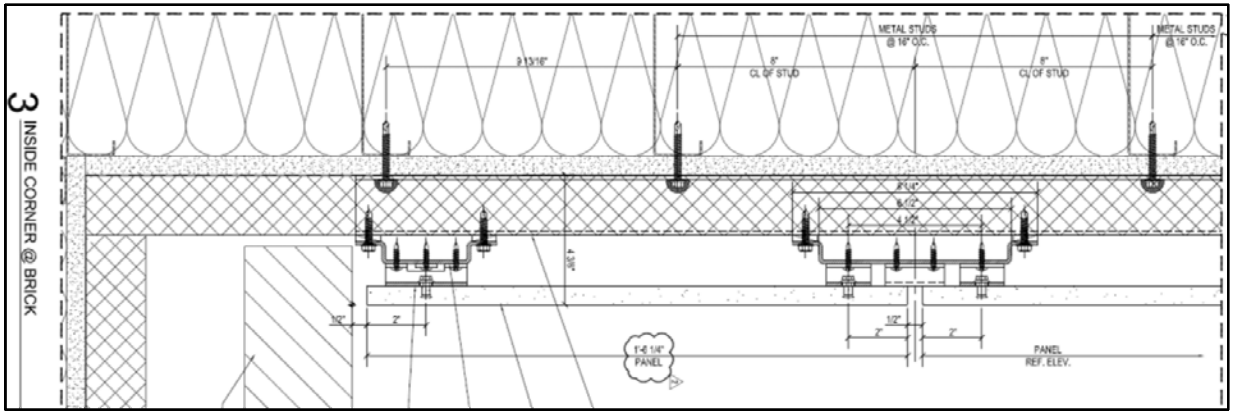
Sacred Heart Student Center

One Contractor – The Entire System

Joe Capasso Mason Enterprises installed the entire aluminum support rainscreen system for the stone façade.

GFRC Plank at UCONN

Planning, Designing, Coordination,
Shop Drawing, Project Management




GFRC at UCONN BB Practice Building

GFRC at UCONN BB Practice Building

GFRC at UCONN BB Practice Building

Rainscreen Walls
Integration of New Building Envelope Systems

International Masonry Institute

Rick Filloramo

Version 03-05-18