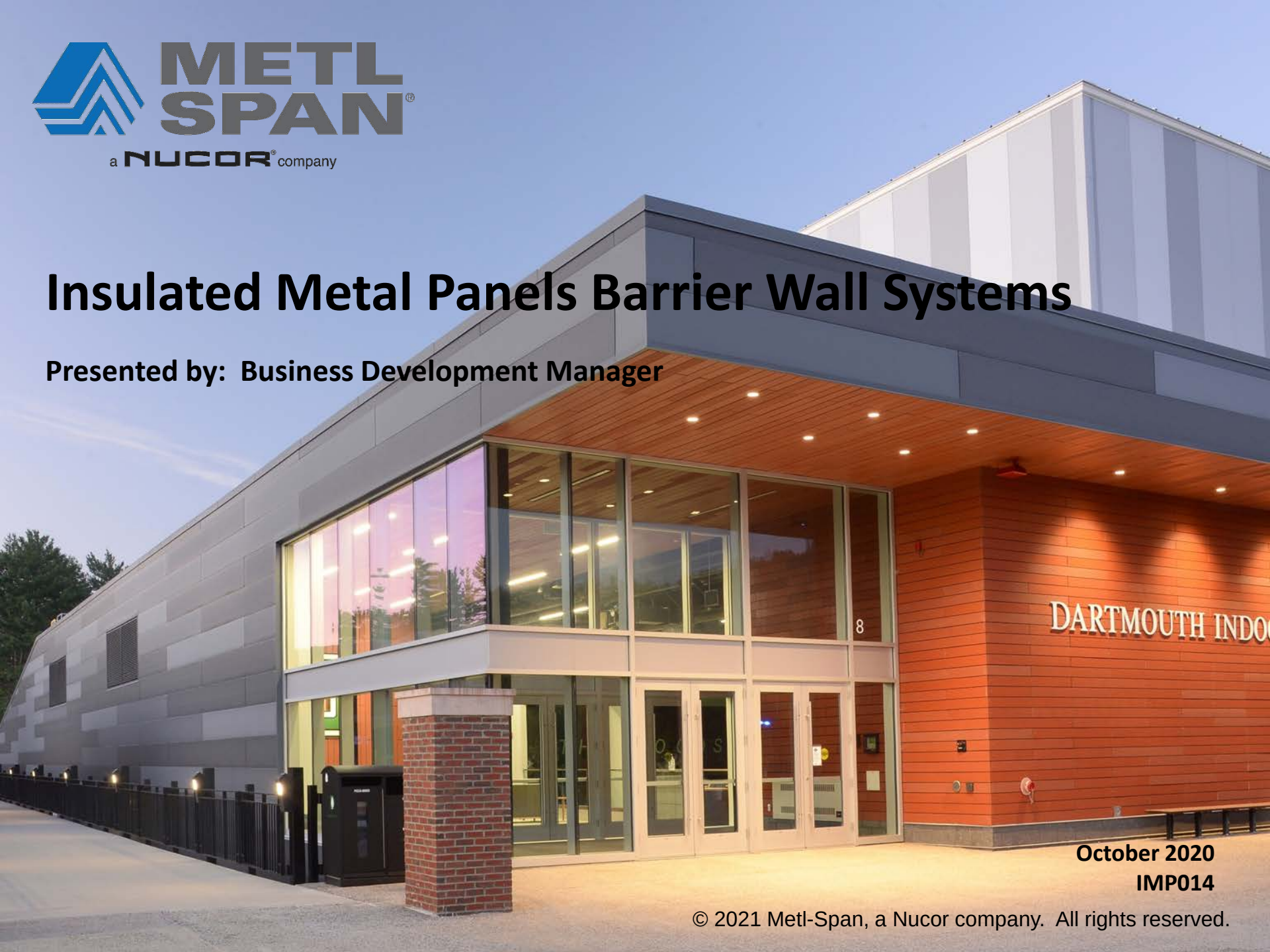


# Insulated Metal Panels Barrier Wall Systems

**Presented by: Business Development Manager**

**October 2020**
**IMP014**

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**Course Number: IMP014 Learning Units: 1 LU/HSW/SD Hour**

# Learning Objectives

- ✓ Acquire knowledge about the history of rainscreen wall design
- ✓ Understand the performance fundamentals of wall design
- ✓ Identify key weaknesses in multi-component backup wall assemblies
- ✓ Explore the advantages of insulated metal panel barrier wall systems

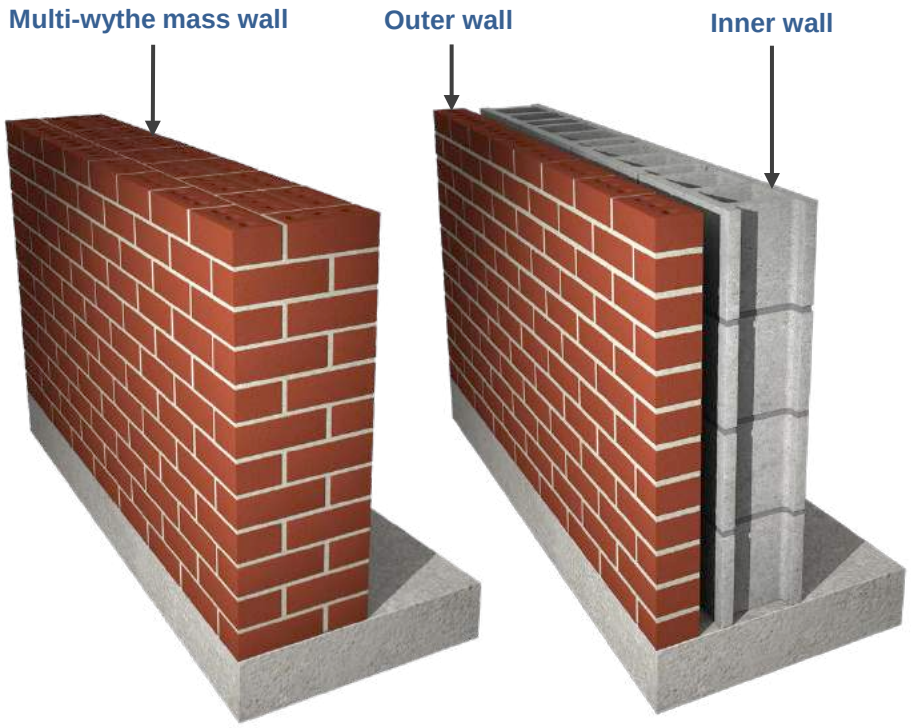

Insulated Metal Panel Barrier Walls
A SIMPLER SOLUTION

# Fundamentals of wall design

# Fundamentals of Wall Design

## Advent of the Cavity Wall

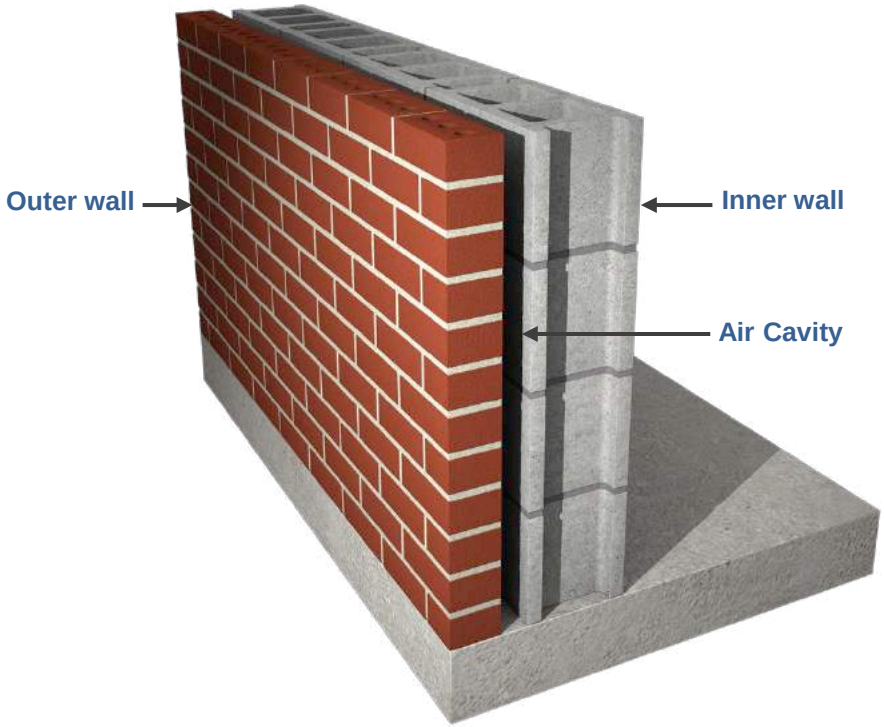
- Developed in the mid-1800s in Europe
- Gained widespread use in the 1920s
- Water driven through the outer brick
  wall down through the coated cavity
- Flashing, wicks and weep holes transport water, leaving the inner wall dry



# Fundamentals of Wall Design

## Inner and Outer Skins

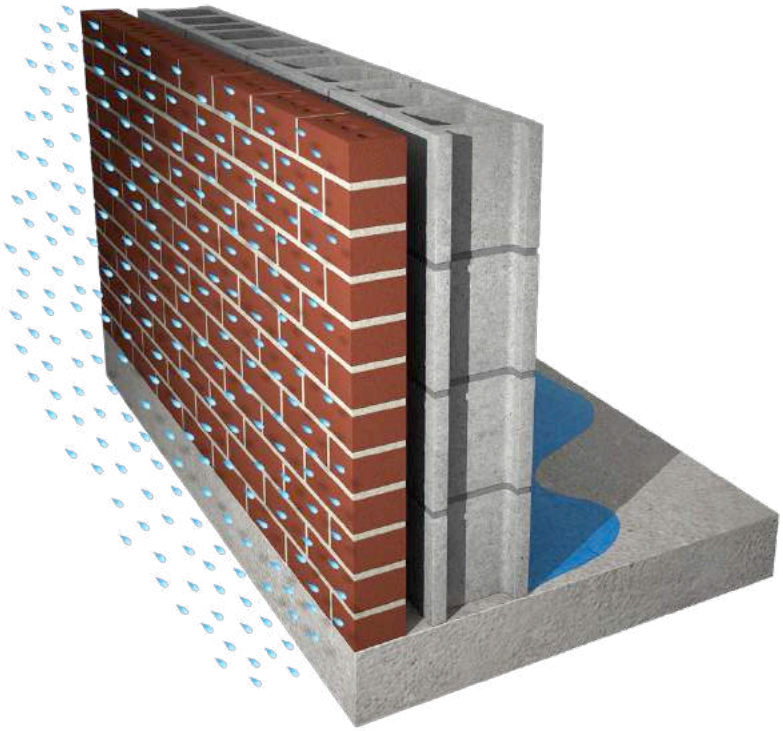
- Helped prevent moisture penetration
- Cavity's air pocket improved thermal insulation
- Forerunner of modern rainscreen design



# Fundamentals of Wall Design

## Double Layer Masonry and Concrete Walls

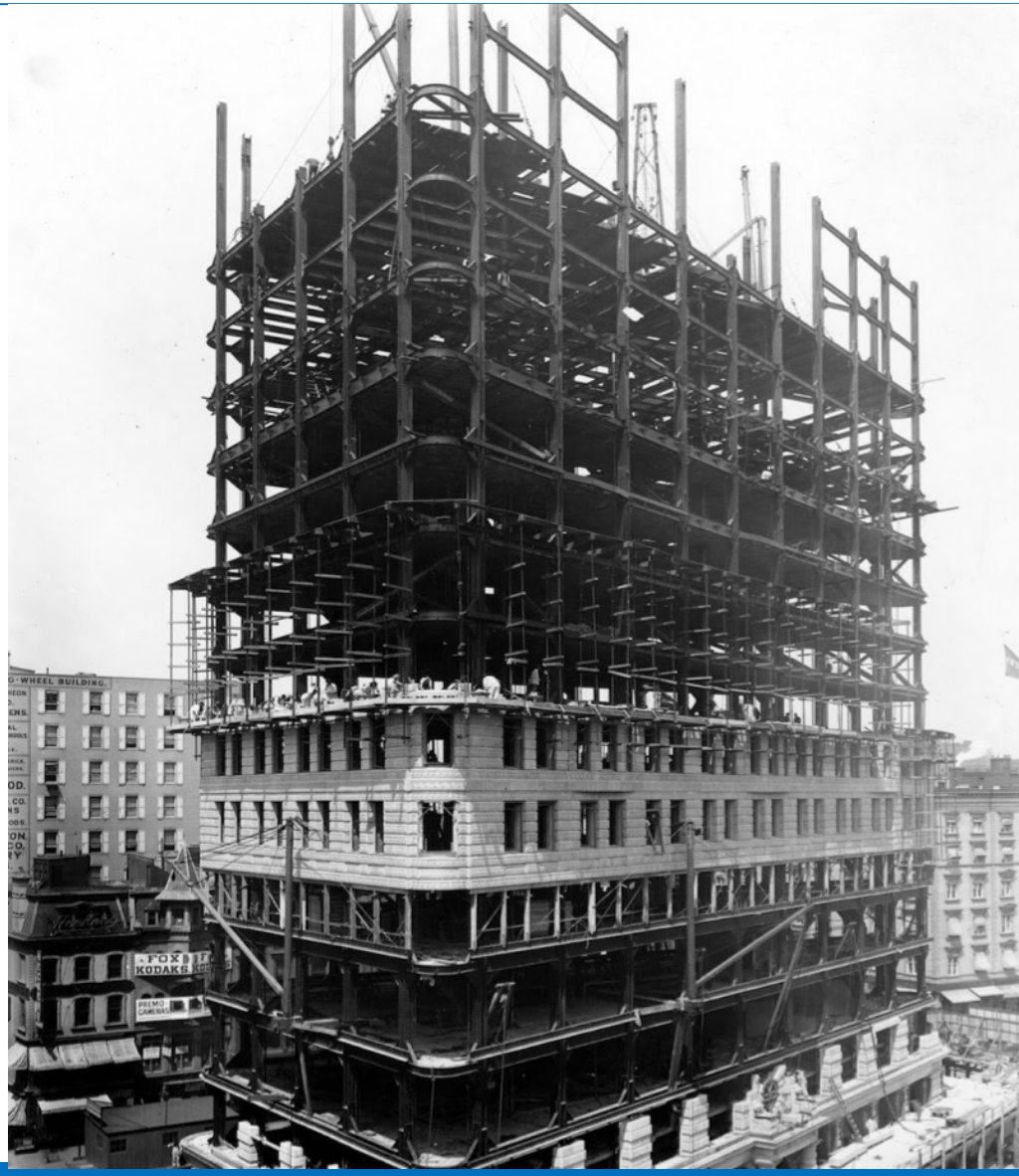
- Inner masonry wall, outer masonry wall and concrete/rebar between
- Very porous
- Potential for material damage and mold
- Not energy efficient



# Fundamentals of Wall Design

## Advent of Iron Construction

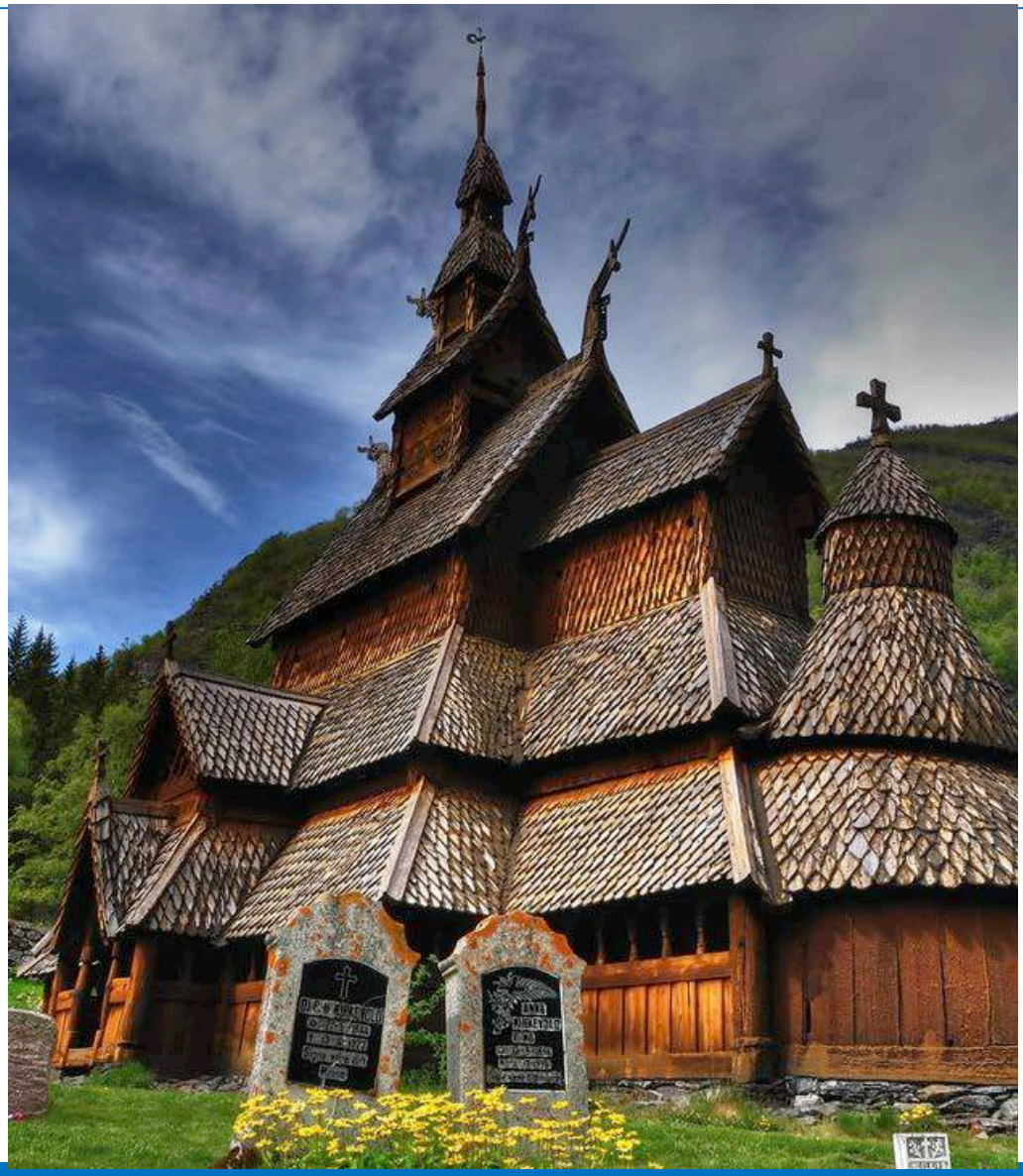
- Buildings could get taller and lighter
- Walls could get thinner
- Mass walls evolved from solid masonry and composite/layered to drained cavity walls



# Fundamentals of Wall Design

## Development of Rainscreens

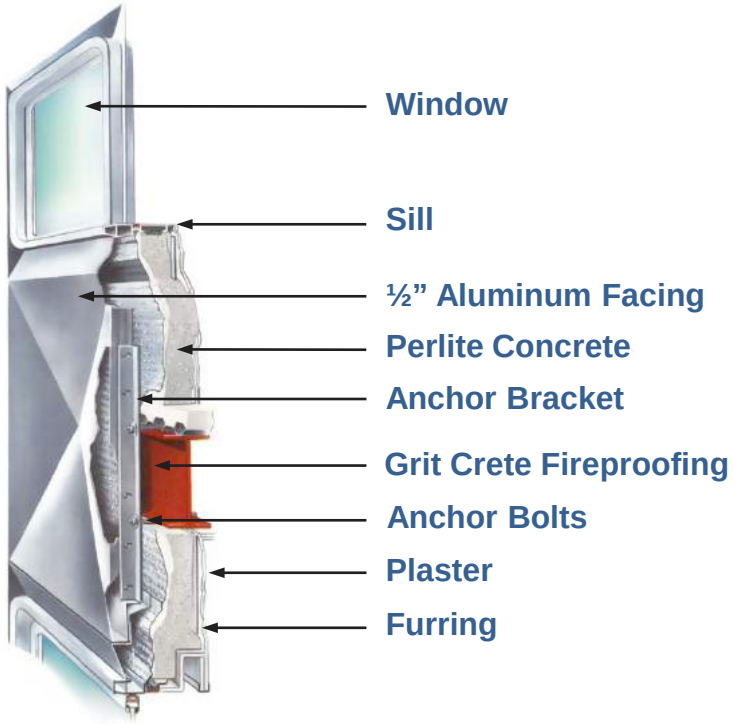
- Medieval Norwegian architecture
- Birkeland theory on equalizing pressure differential
- The term “rainscreen” enters the lexicon in 1963



# Fundamentals of Wall Design

## Development of Rainscreens

Alcoa Building



# Fundamentals of Wall Design

## Development of Rainscreens

- Canadian Building Digest theorizes rain can be prevented by incorporating an air chamber
- Rainscreen wall assemblies continued to be refined and developed, replacing the concept of a barrier wall
- Pressure-equalized joinery developed for horizontal insulated metal panels

# Fundamentals of Wall Design

Over the last 10 years, simple rainscreens have become popular.

# Multi-Component Wall Assembly

## Top Challenges Identified by Wall Consultants

- Will the membrane adhere to the exterior sheathing long term?
- What is the proper roller pressure and temperature for membrane application?
- Will UV exposure during construction cause degradation?
- Are wet-applied applications monitored to ensure the membrane achieves the correct permanence?

# Multi-Component Wall Assembly

## Best Design Approach: Avoid Entrapped Moisture

- Design control layers to take the full water load and pressure differences
- Install a continuous air barrier designed to full structural static load to ensure air tightness
- Carefully select the vapor barrier and location within the wall assembly
- Avoid thermal short circuits where condensation and water entrapment can occur

# Multi-Component Assembly

## The Ideal Barrier Backup Wall System

- Simplified design for quick, all-weather installation
- Superior thermal performance and clear lines of responsibility
- Lightweight yet durable
- Excellent installed costs and value
- Tested and environmentally friendly

# Multi-Component Wall Assembly

## Is the Ideal Wall System Possible?

- Inevitably, multi-component walls come with multiple challenges
- A simpler solution exists:

*Increase performance, efficiency, value and assurance*

# Insulated Metal Panel Barrier Wall System

# Insulated Metal Panel Barrier Wall

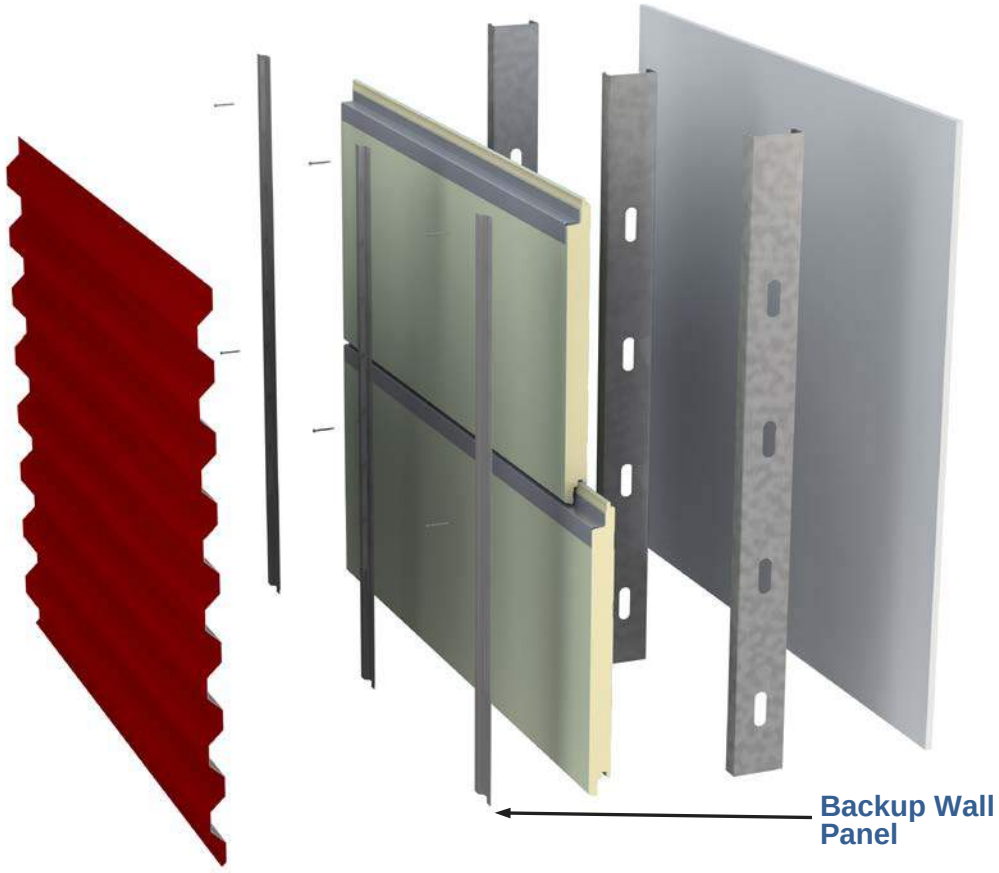
## IMP Barrier System

- In use for half a century as an insulated metal barrier wall in commercial construction
- Employed as a backup wall system on a limited basis
- Application as a backup wall is increasingly being specified

# Insulated Metal Panel Barrier Wall

## Backup vs. Singular Wall

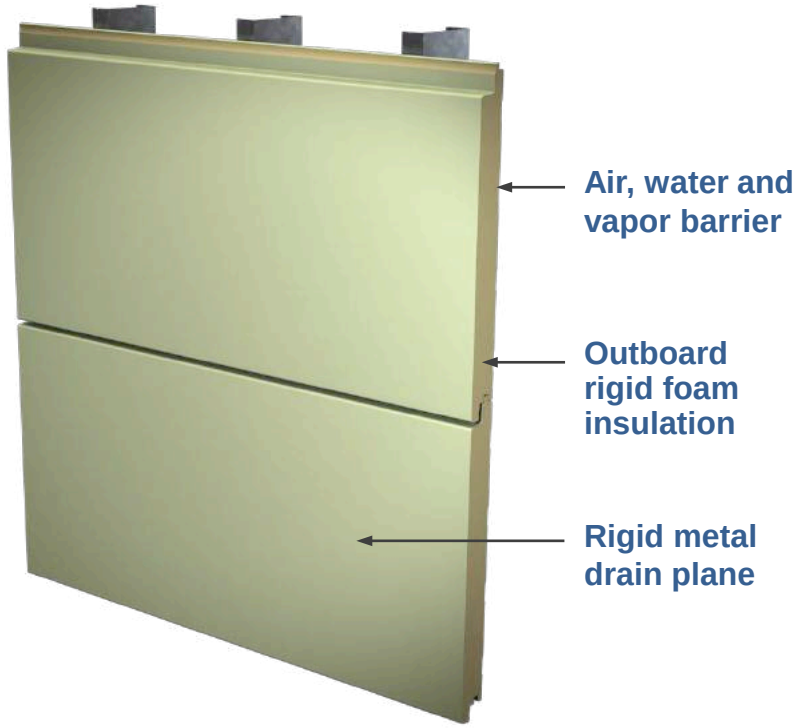
- Steel skins are lighter in gauge
- Coating system is more affordable
- Panels come in standard sizes with a basic configuration



# Insulated Metal Panel Barrier Wall

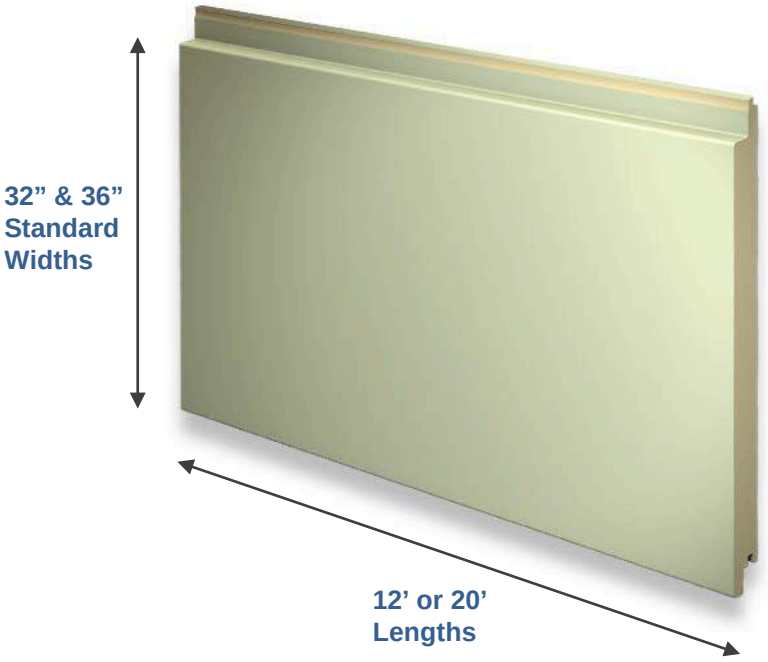
## Single Panel Replaces Four Components

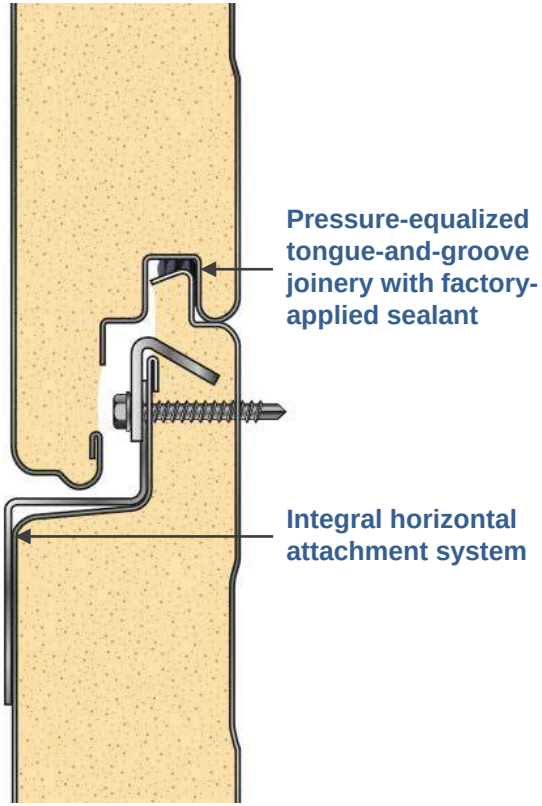
- Air, water thermal and vapor barrier replaces exterior gypsum, building wrap and a separate vapor barrier
- Outboard rigid foam insulation replaces batt insulation within stud cavities
- Rigid metal drain plane created by outer steel skin
- Single panel improves quality assurance process



# Insulated Metal Panel Barrier Wall

## Dimensions and Joinery



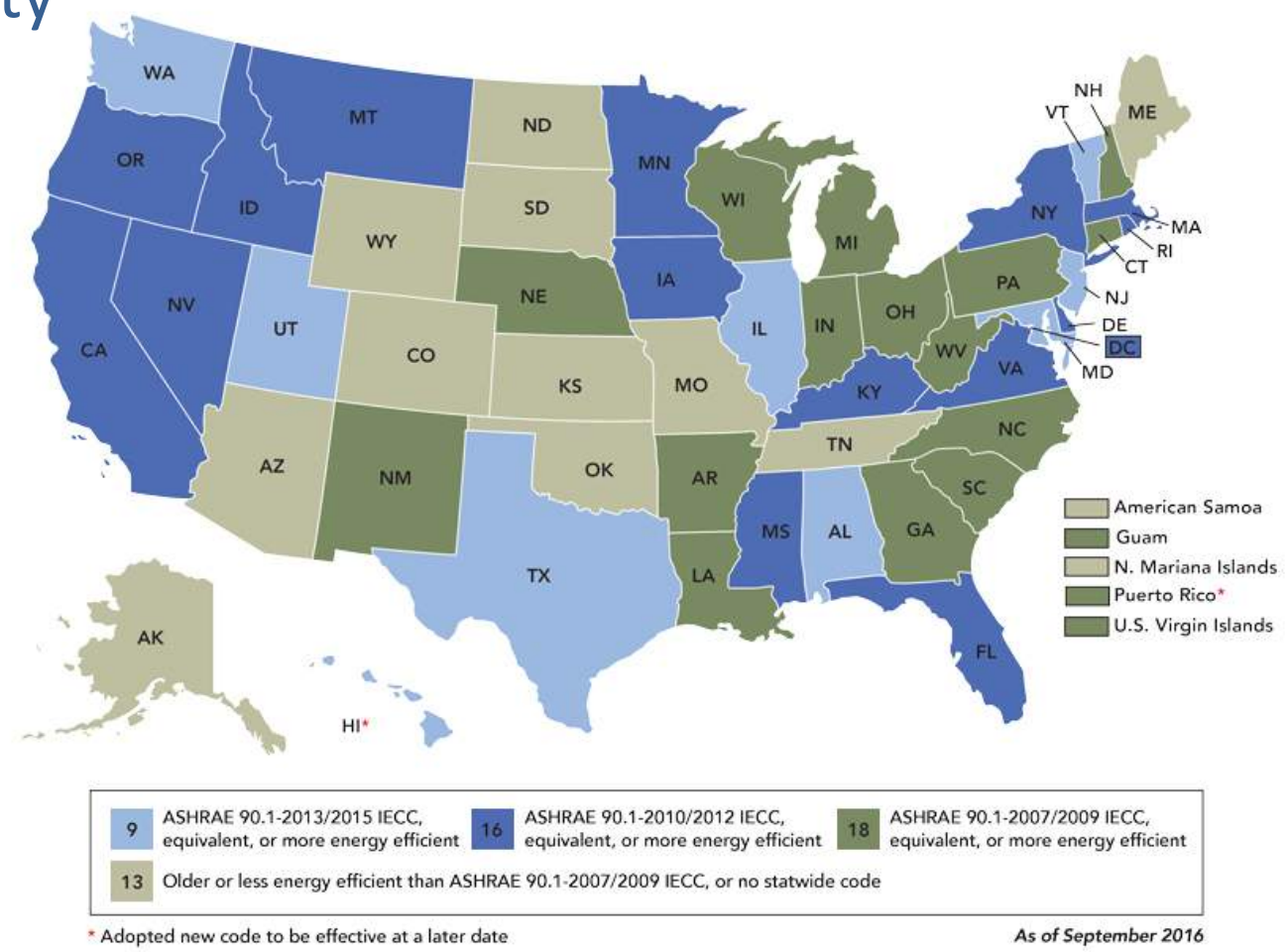



# Insulated Metal Panel Barrier Wall

## Insulating Capability

– 2” thick panel = R-14

– 3” thick panel = R-21



# Insulated Metal Panel Barrier Wall

## Thermal Performance: Meeting Demands

- Single-component backup wall systems are best positioned to meet the demands of increasing thermal requirements
- IMPs do not meet the definition of continuous insulation (ci) as stated in ASHRAE 90.1

  Any metal encroaching the insulation layer, like the side joint of an IMP (even though there is no through metal conductivity) is interpreted as a “thermal bridge”

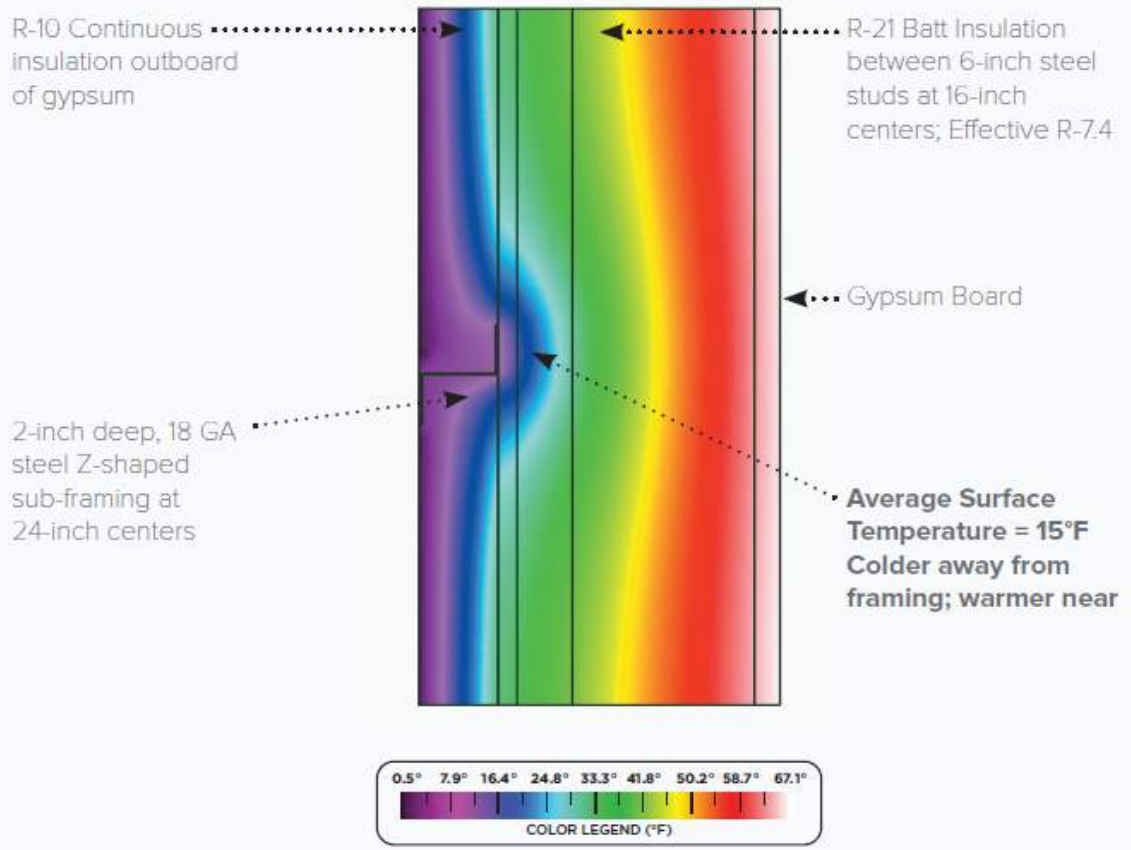
# Insulated Metal Panel BW - Thermal Analysis

## THERMOGRAPHS

The images to the left compare thermally equivalent wall assemblies. The multi-component wall with continuous insulation still requires supplemental steel framing (Zs) to convey the wind load from the rainscreen to the supports.

Required supplemental framing for the multi-component wall leads to a loss in thermal performance and leads to a greater potential for condensation in the cavity.

## MULTI-COMPONENT WALL

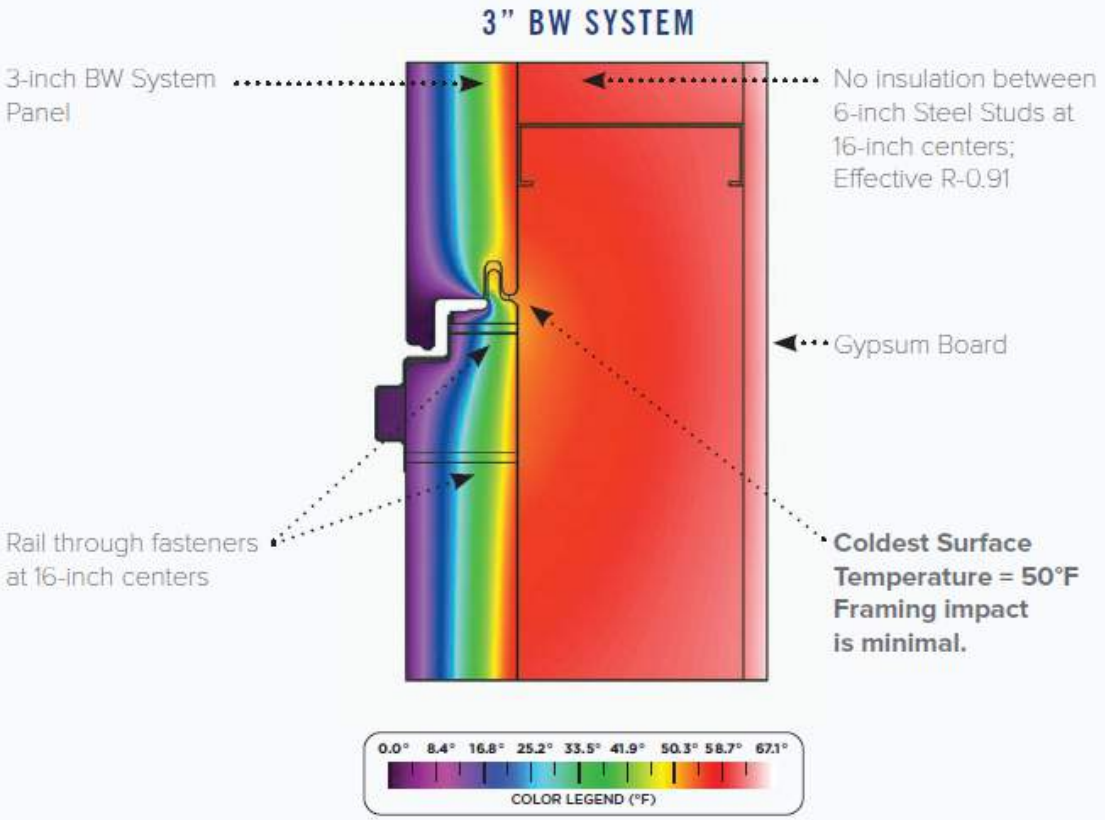


# Insulated Metal Panel BW - Thermal Analysis

BW System exceeds IECC energy performance requirements based on u-factors tested in accordance with ASTM C1363. BW System compliance is based on using the u-factor Alternative Method as published in a table by climate zone in the IECC.

BW has several wall assemblies that pass NFPA 285 and it meets the most rigorous standards in IBC Chapter 26.

BW's single component design provides a simpler, faster and more thermally efficient solution.




Exterior Temperature (0°F), Interior Temperature (70°F)

# Insulated Metal Panel Barrier Wall

## Thermal Performance: Code Compliancy

- ASHRAE 90.1 compliance standard does not “require” ci
- There are alternative methods of determining code compliant thermal performance
- Minimum rated R-value method
- Maximum U-factor assembly method

# Insulated Metal Panel Barrier Wall

| TABLE 5.5-5 Building Envelope Requirements for Climate Zone 5 (A, B, C) | | | | | |
|---|---|---|---|---|---|
| | | Nonresidential | | Residential | |
| | Opaque Elements | Assembly Maximum U-Factor | Insulation Min. R-Value | Assembly Maximum | Insulation Min. R-Value |
| **Roofs** | | | | | |
| | Insulation Entirely Above Deck | U-0.048 | R-20.0c.i. | U-0.048 | R-20.0c.i. |
| | Metal Building | U-0.055 | R-13.0 + R-13.0 | U-0.055 | R-13.0 + R-13.0 |
| | Attic and Other | U-0.027 | R-38.0 | U-0.027 | R-38.0 |
| **Walls, Above-Grade** | | | | | |
| | Mass | U-0.090 | R-11.4c.i. | U-0.080 | R-13.3c.i. |
| | Metal Building | U-0.069 | R-13.0 + R-5.6c.i. | U-0.069 | R-13.0 + R-5.6c.i. |
| | Steel-Framed | U-0.064 | R-13.0 + R-7.5c.i. | U-0.064 | R-13.0 + R-7.5c.i. |
| | Wood-Framed and Other | U-0.064 | R-13.0 + R-3.8c.i. | U-0.051 | R-13.0 + R-7.5c.i. |

# Insulated Metal Panel Barrier Wall

## Potential Lifecycle Energy Savings

- About 40% of total 2015 energy consumption was consumed in residential and commercial buildings in the U.S.
- Conventional energy efficiency measures can reduce annual energy use by 10% to 20% below ASHRAE 90.1-2007 requirements on average without significant alterations to building design

# Insulated Metal Panel Barrier Wall

## Assemblies that Meet All Fire Codes

- Look for compliance with the following:
- IBC CODE Chapter 26 (foam plastic insulation)
- ASTM E84 (Surface Burning Characteristics of Building Materials)
- NFPA 285 (Exterior Non-Load-Bearing Wall Assemblies)

# Insulated Metal Panel Barrier Wall

## Streamline Installation

- Fastens quickly and easily by one contractor rather than multiple trades
- Less potential for installation errors
- Streamline jobsite coordination
- Enclose the building faster in all weather conditions

# Insulated Metal Panel Barrier Wall

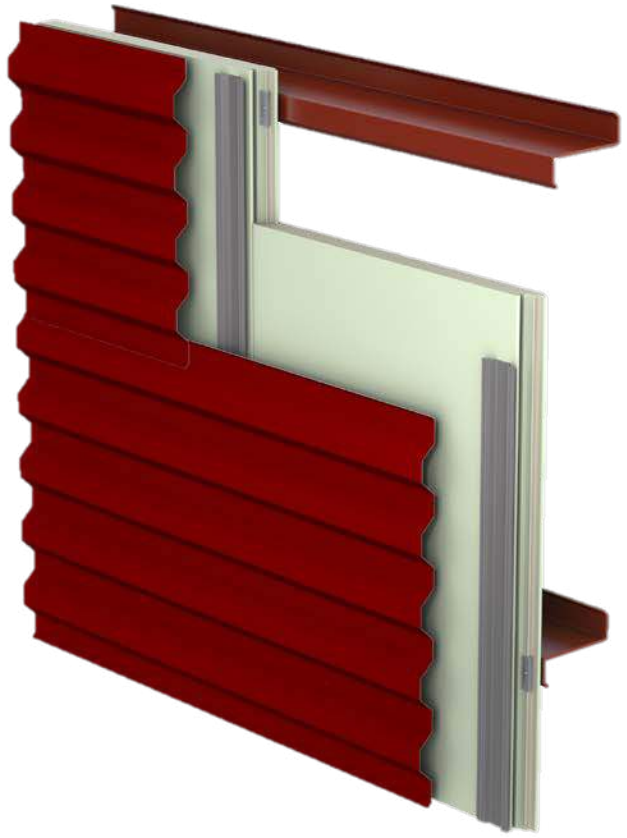
## Steel Stud Framing

- Installed horizontally or vertically on steel-framed construction
- Studs spaced either 16” or 24” O.C.

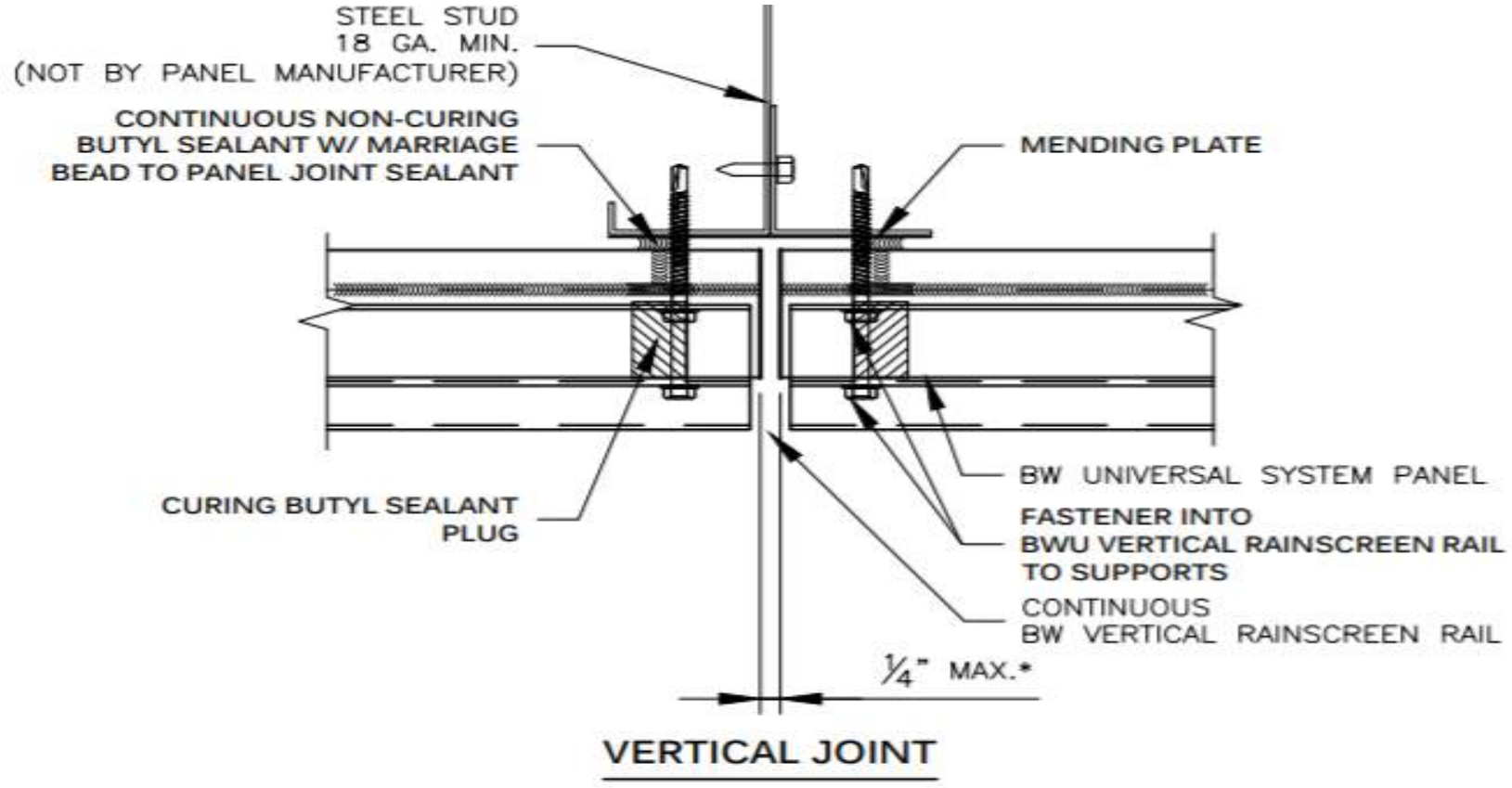
# Insulated Metal Panel Barrier Wall

## Vertical Panels

- Some offerings attach the backup panel system directly to steel girts up to 6’
- These longer spans include panel thicknesses up to 4” for added thermal performance

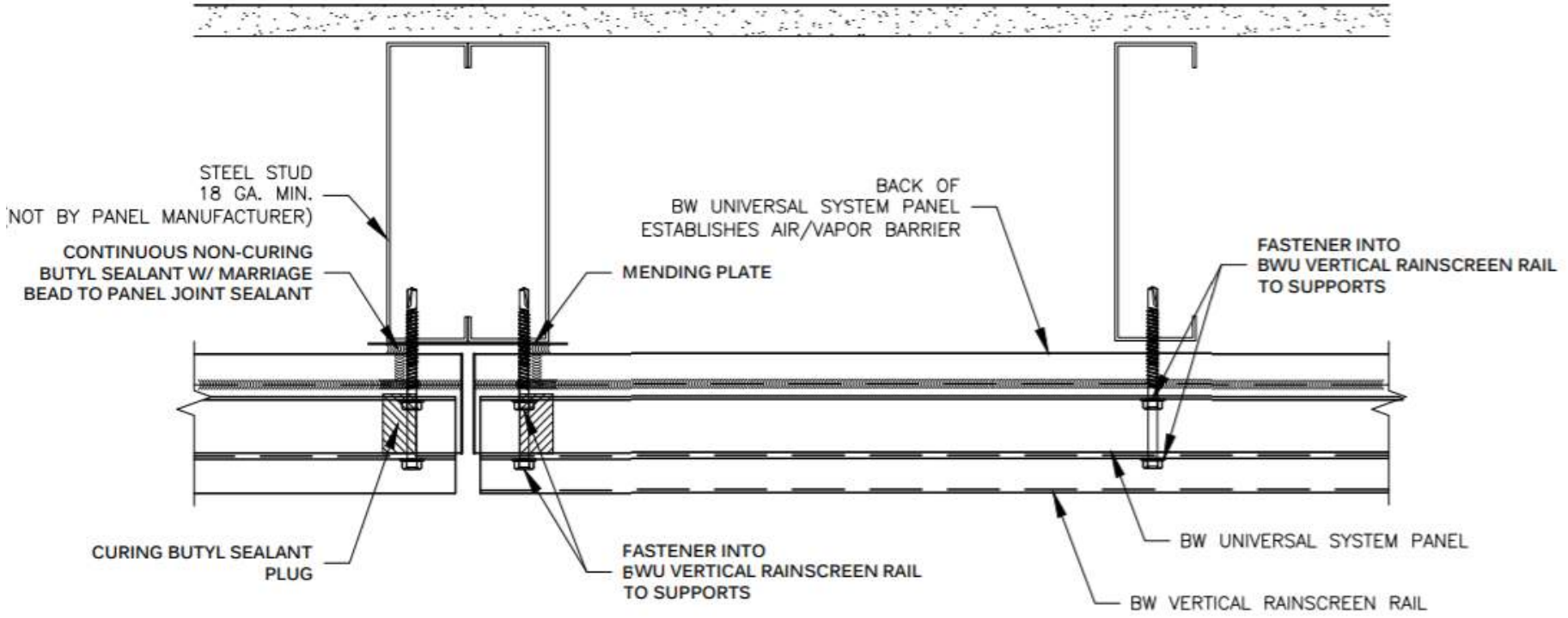


# IMP Detail Sample – Barrier Wall Rail System

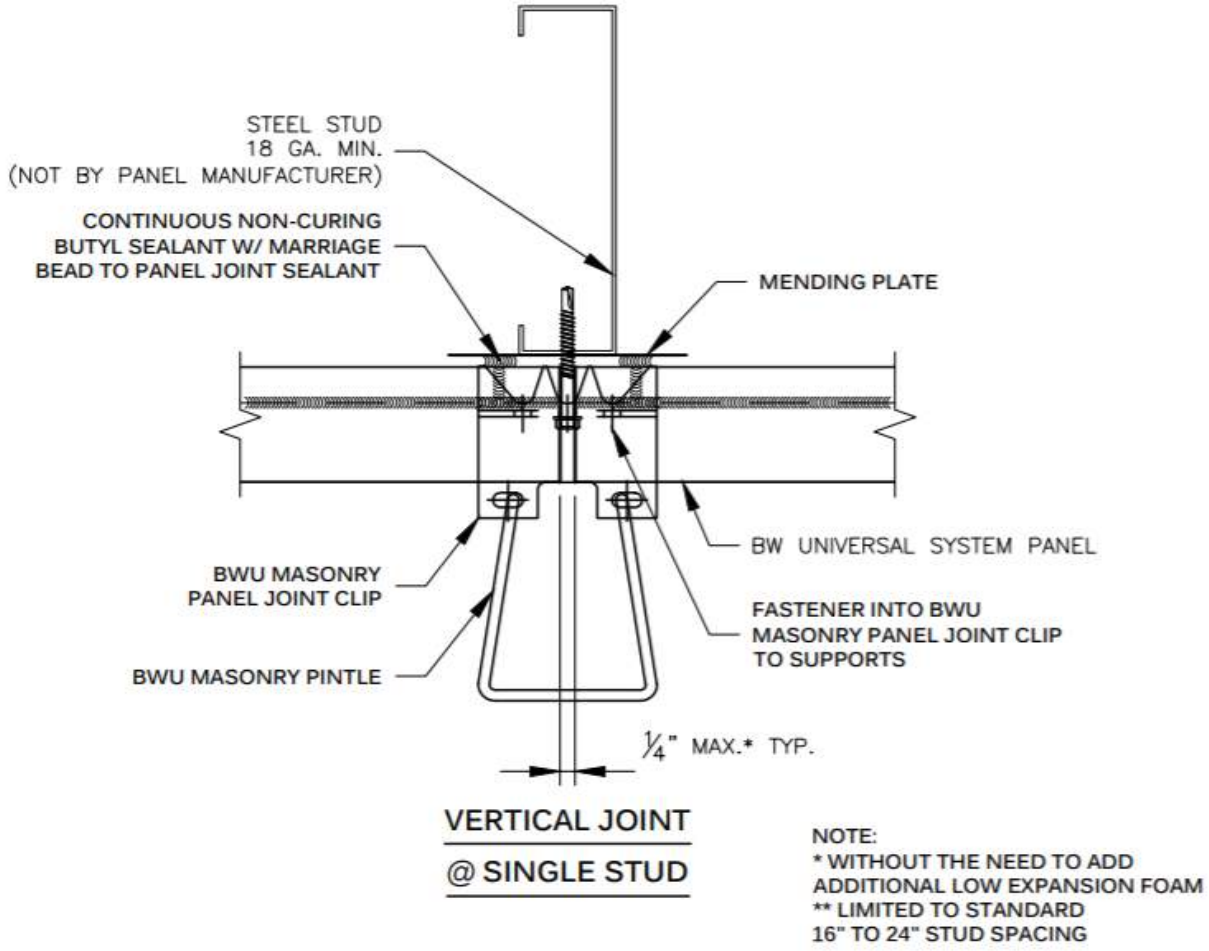



Vertical Rainscreen Rail – Vertical Joint BW Universal System

# IMP Detail Sample – Barrier Wall Rail System

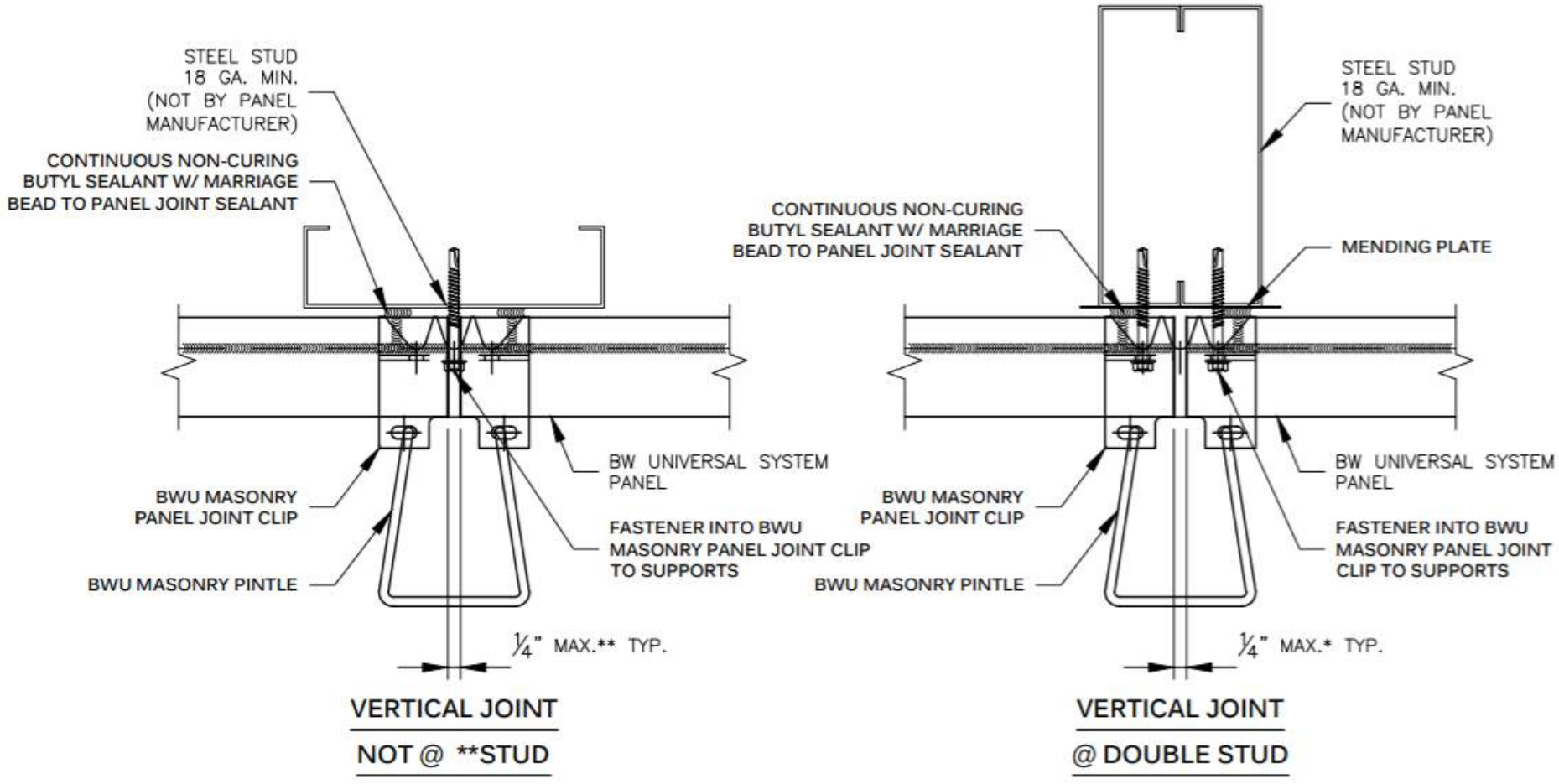


# IMP Detail Sample – Barrier Wall Masonry System




Masonry Panel Joint Clip – Vertical Joint BW Universal System

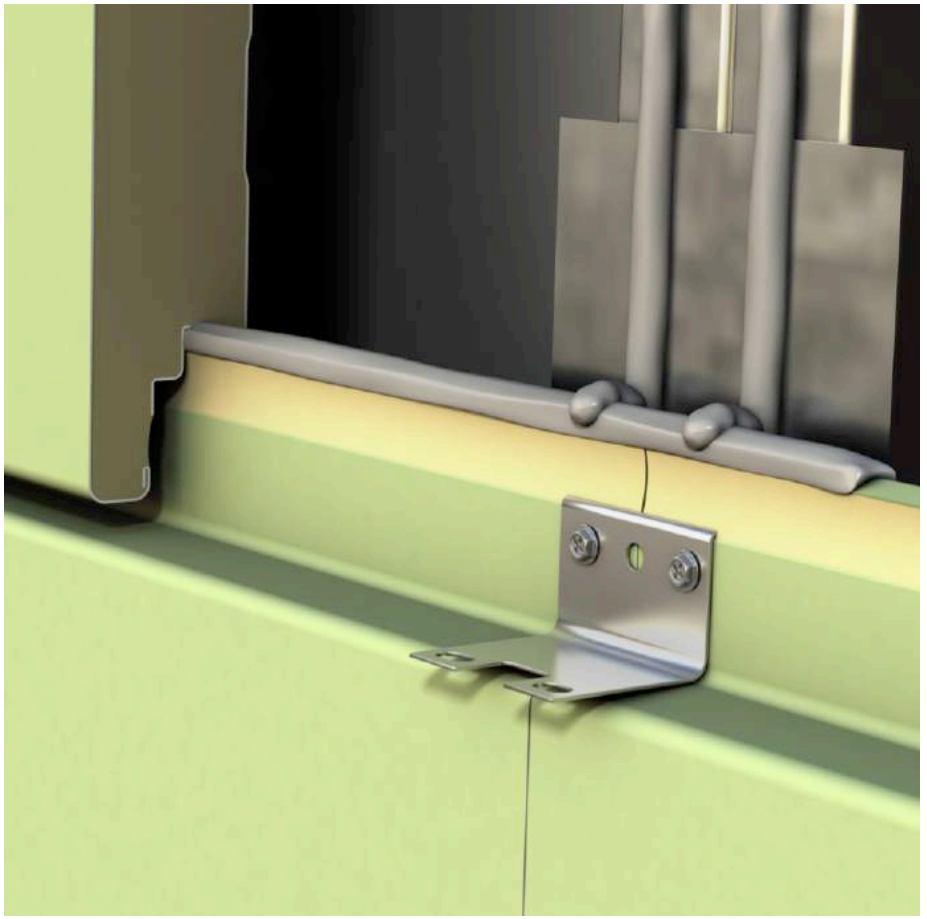
# IMP Detail Sample – Barrier Wall Masonry System



# Insulated Metal Panel Barrier Wall

## Concealed multi-function clip attachments

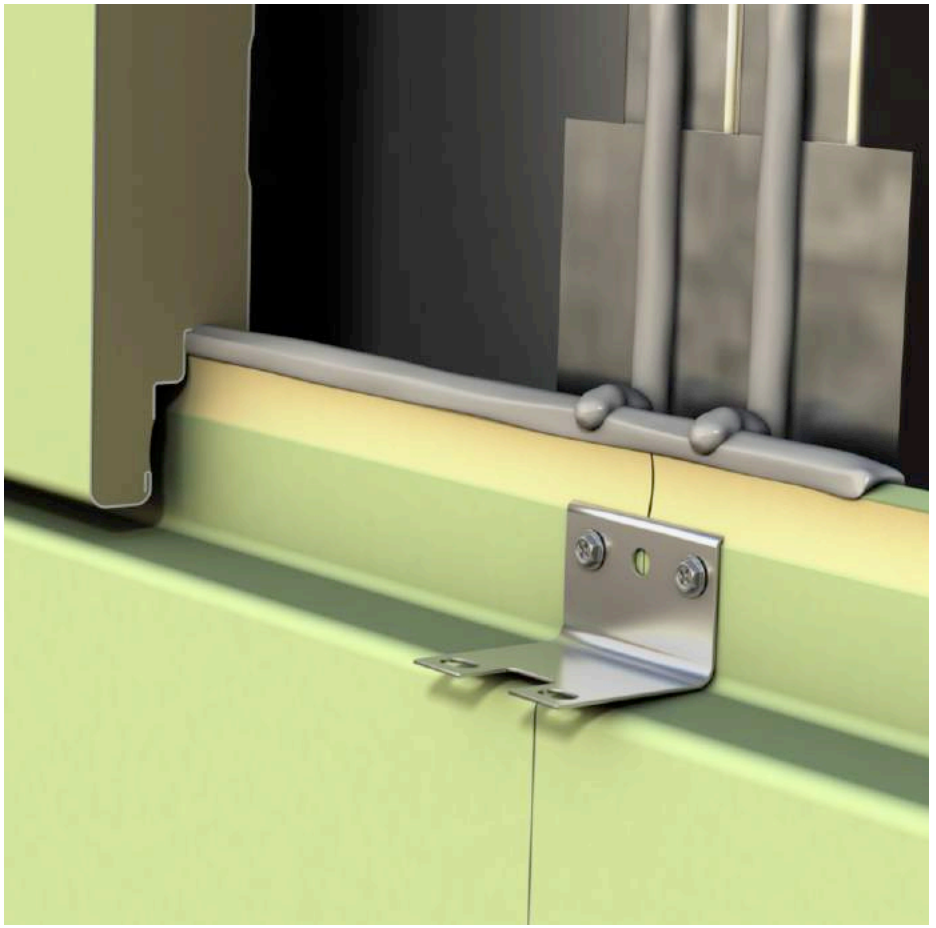
- Clips attach to panel studs
- Panel penetrations occur within pressure-equalized joinery so that water penetration is avoided



# Insulated Metal Panel Barrier Wall

## Sealing

- Cut ends centered over stud with 4” wide steel plate
- 3/8” diameter bead of sealant is applied along entire width of panel
- Marriage bead ties horizontal to vertical seals



# Insulated Metal Panel Barrier Wall

# Insulated Metal Panel Barrier Wall

## Ensuring tightness

- Water spray test
- 30-35 psi along 5’ of joinery for 5 minutes
- No visible leakage should occur
- Ready to install rainscreen

# Insulated Metal Panel Barrier Wall

## Cladding Choices

– Create a modern look with Insulated Barrier Panels

- The system can be installed behind single-skin metal, modular metal panels, terra cotta, ACM panels, brick facades, metal shingles and other rainscreens
- Can integrate with windows and louvers

# Insulated Metal Panel Barrier Wall

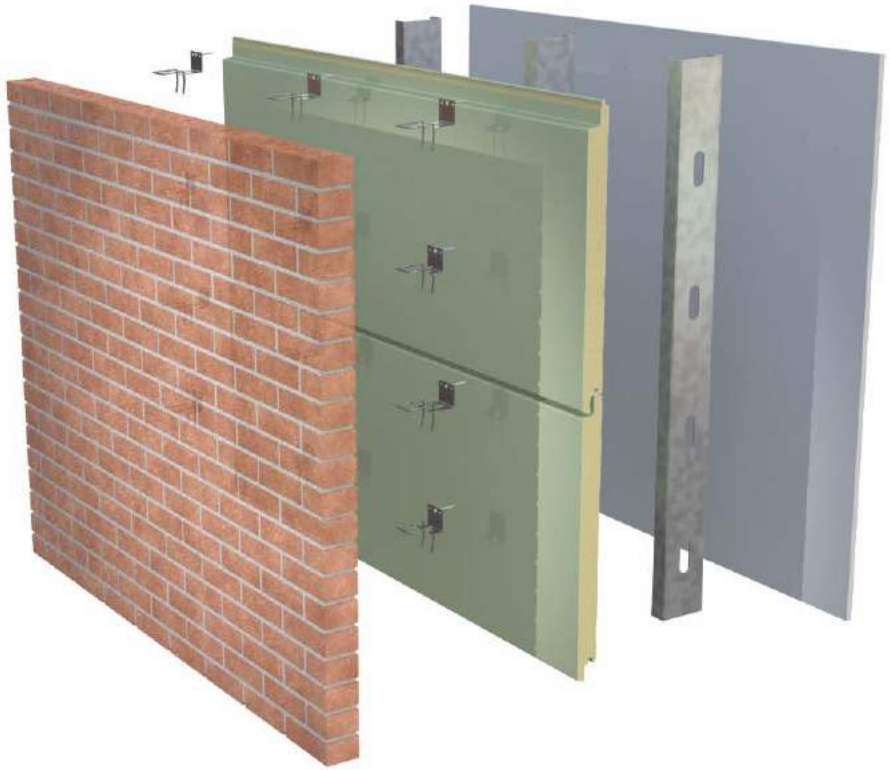
## Envelope Openings

- These panels can easily accommodate windows, doors and architectural louvers (active and inactive)
- Select an integrated window system to enhance air and water performance

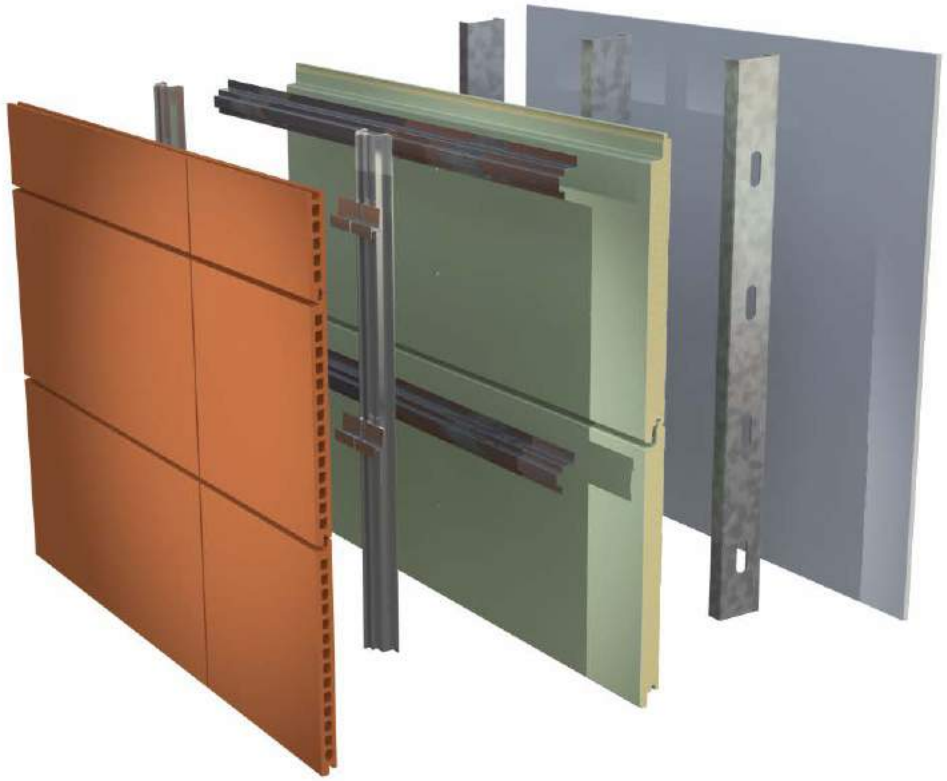
# Retrofit Insulated Metal Panel Barrier Wall

Insulated barrier panels are a perfect fit for retrofit projects where the exterior of the building must complement its existing surroundings

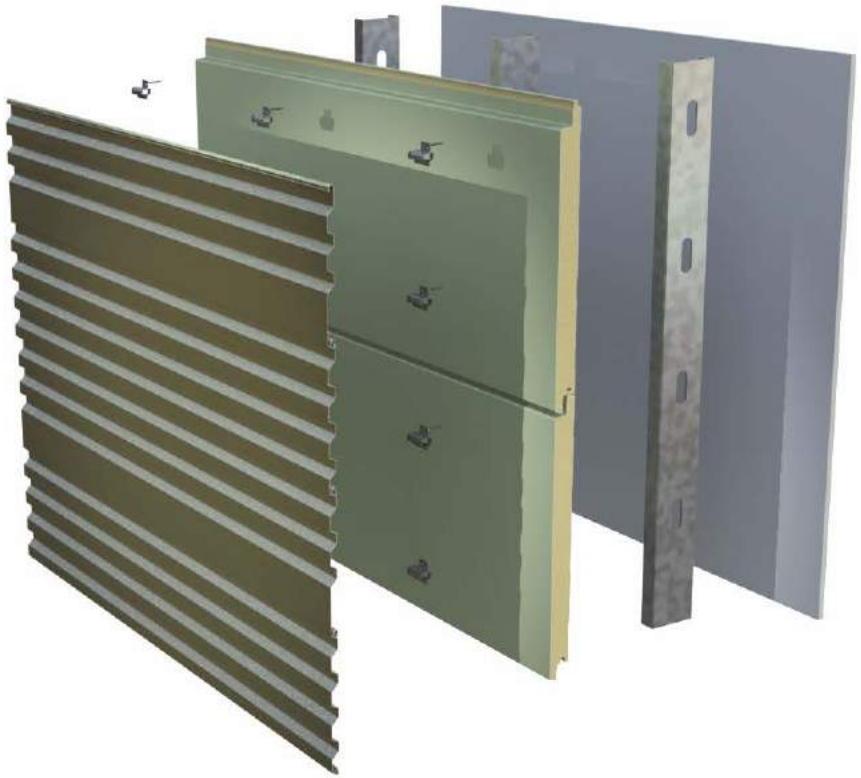
# Installing the Rainscreen: Masonry



# Installing the Rainscreen: Terra Cotta

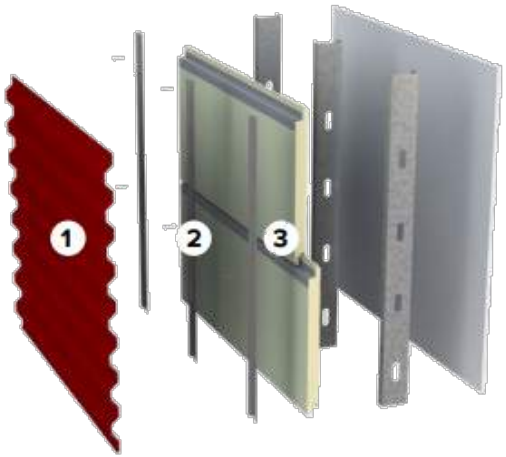


# Installing the Rainscreen- Metal



# Recap – Comparison to Traditional System

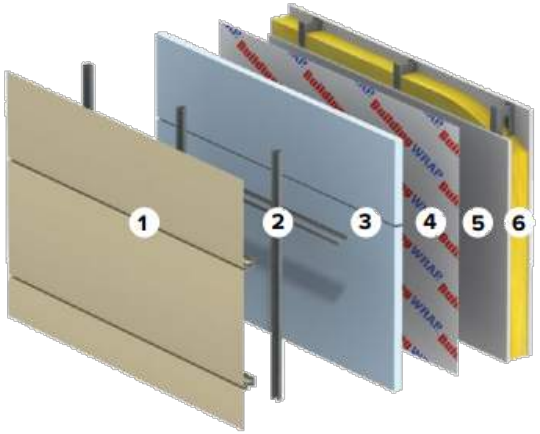
## BW SYSTEMS




1. Exterior Rainscreen
2. Subgirts
3. BW with integral attachment system

VS

## TRADITIONAL BACKUP SYSTEM




1. Exterior Rainscreen
2. Zs Support & Vertical Subgirts
3. Insulation
4. Air and Vapor Barrier
5. Exterior Sheathing
6. Cavity Insulation

# Sustainable Benefits

# Sustainable Benefits

## Material Usage Reductions

**Use just one component instead of four:**

- Exterior gypsum sheathing
- Batt insulation
- Vapor barrier
- Building wrap

# Sustainable Benefits

## Environmental Product Declaration

- UL Certified
- Assesses environmental impacts, including raw material extraction, transportation, manufacturing, packaging, use and end-of-life disposal
- Measures the potential for global warming, ozone depletion and acidification
- Calculates the effect on non-renewable resources, such as fossil fuels

# Sustainable Benefits

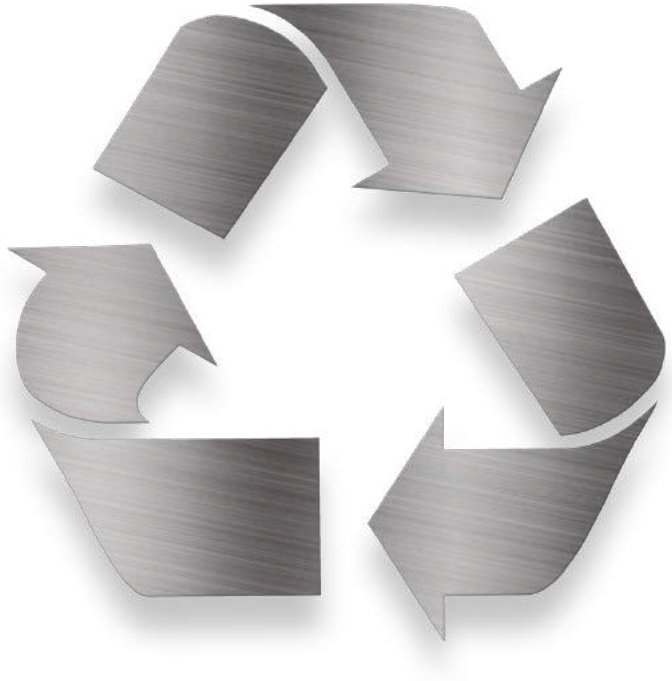
## Lightweight Nature

- Reduces structural requirements
- Provides energy savings in shipping and installation

# Sustainable Benefits

## Recyclability

- Panels are 100% recyclable
- Steel contains a high percentage of recycled material and is easily recyclable
- Foam insulation can be also repurposed
- Prevents thousands of tons of scrap materials from reaching the landfill



# Sustainable Benefits

## Reuse

- Entire panels are reused in new buildings
- Partner with manufacturers that have reclamation programs

# Sustainable Benefits

## LEED v4 BD+C: New Construction Potential Points

### Building Product Disclosure And Optimization

- Environmental product declaration (EPD): 1 point*
- Leadership extraction practices (recycled content): 1 point

### Energy and Atmosphere

- Optimize energy performance: 1-18 points
- Also explore Regional Priority Credits by zip code at USGBC.org

* Must use a minimum of 20 products by five manufacturers to qualify

# Case Studies

# KCP&L Safety and Training Center

## Background

- 53,000-square-foot pre-engineered building
- Tight construction schedule of 18 months working through the winter
- Construction ended late 2015

# KCP&L Safety and Training Center

## IMPB Solution

- Single-component construction fast tracked installation, even through the winter
- Easily integrated with windows and louvers
- Achieved an R-value of 21
- IMPB provides air, water, thermal and vapor shield

# KCP&L Safety and Training Center

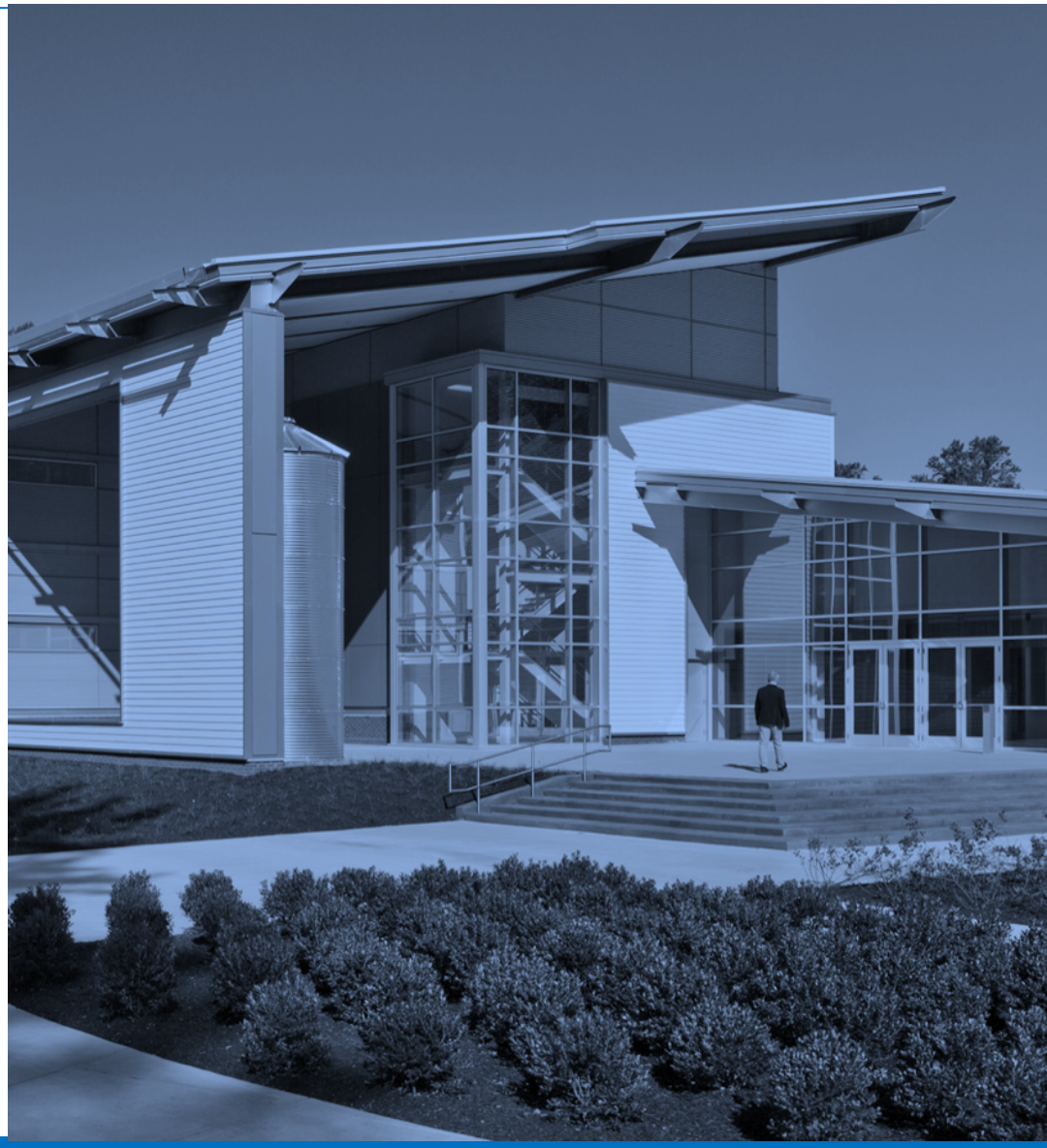
*"With this sheathing system, we weren't required to have three passes by sheathers, insulators and water barrier subcontractors. Everything was under one installer with one pass and few touchups."*

Amy Gilbertson, Project Manager,
Bell/Knott & Associates

# Smithsonian Environmental Research Center Mathias Laboratory

## Background/Problem

- 94,000-square-feet expansion
- Architects need for a modern building that reflected the industrial, agricultural architecture that existed on site



# Smithsonian Environmental Research Center Mathias Laboratory

## Background/Problem

- Envelope walls needed to approach R-30 or greater to achieve high thermal and energy performance and minimize environmental impact

# Smithsonian Environmental Research Center Mathias Laboratory

## IMPB Solution

- Custom, 4” thick IMPBs integrated seamlessly with exterior façade elements
- Designed to exceed ASHRAE 90.1 by 40% and earn LEED Gold

# Smithsonian Environmental Research Center Mathias Laboratory

“We had an interest in metal because we thought it looks both modern and agrarian. We were also interested in metal as a highly recyclable product. [IMBPs] ended up being the element that everything could be based on.”

Jeff Hirsch, AIA, architect and director of the culture practice at Ewing Cole

# Hard Rock Rocksino Northfield Park

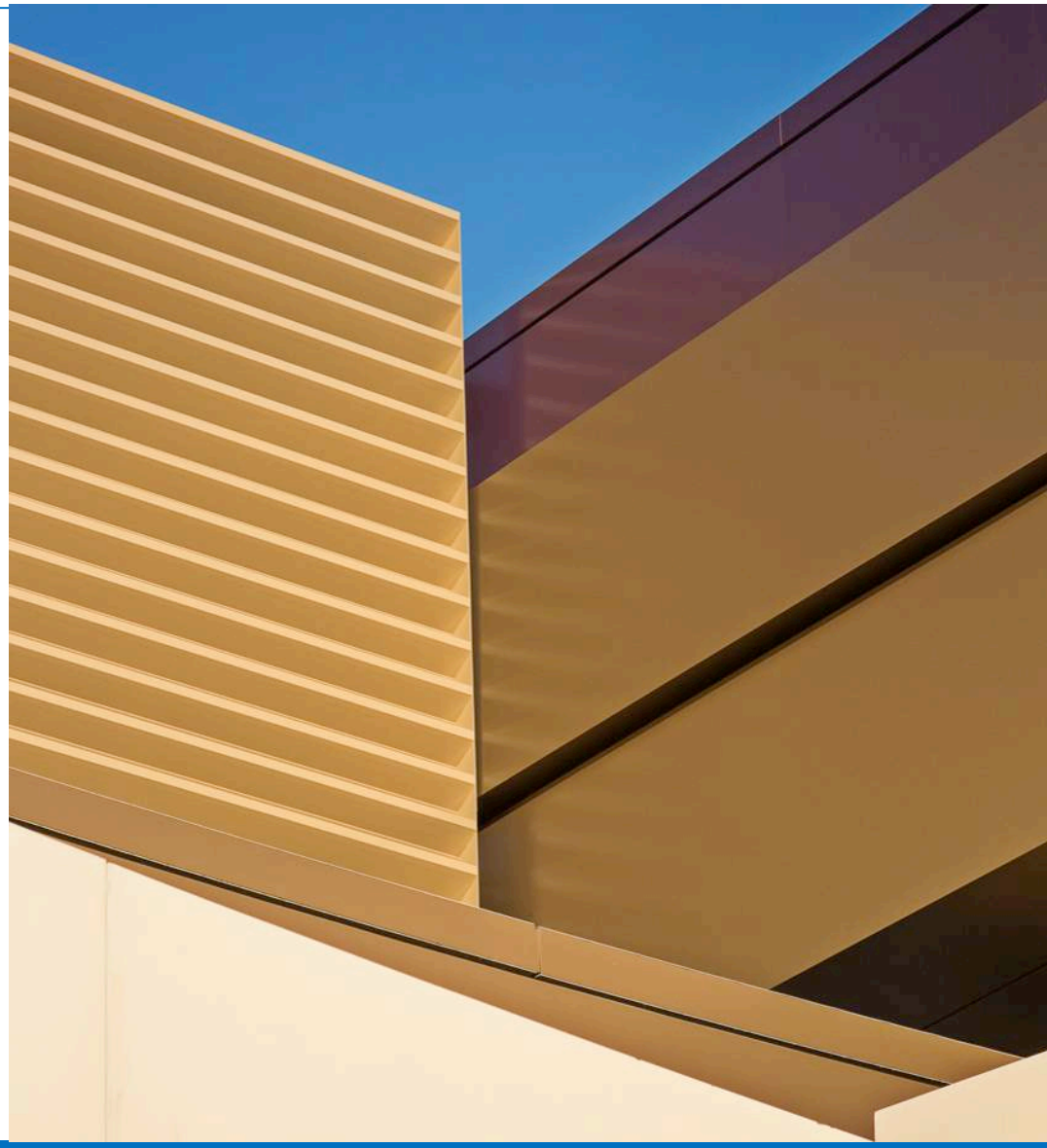
## Background/Problem

- 200,000-square-foot venue flaunts a rock vibe aesthetic
- Architects wanted mixed façade materials to avoid the big box feel of many casinos
- Aggressive schedule spanned one year from design to the ribbon cutting

# Hard Rock Rocksino

## IMPB Solution

- Hall-of-fame-worthy thermal and moisture protection
- 6,000 square feet of panels were installed per day, allowing the structure to be enclosed quickly before harsh winter weather



# Hard Rock Rocksino

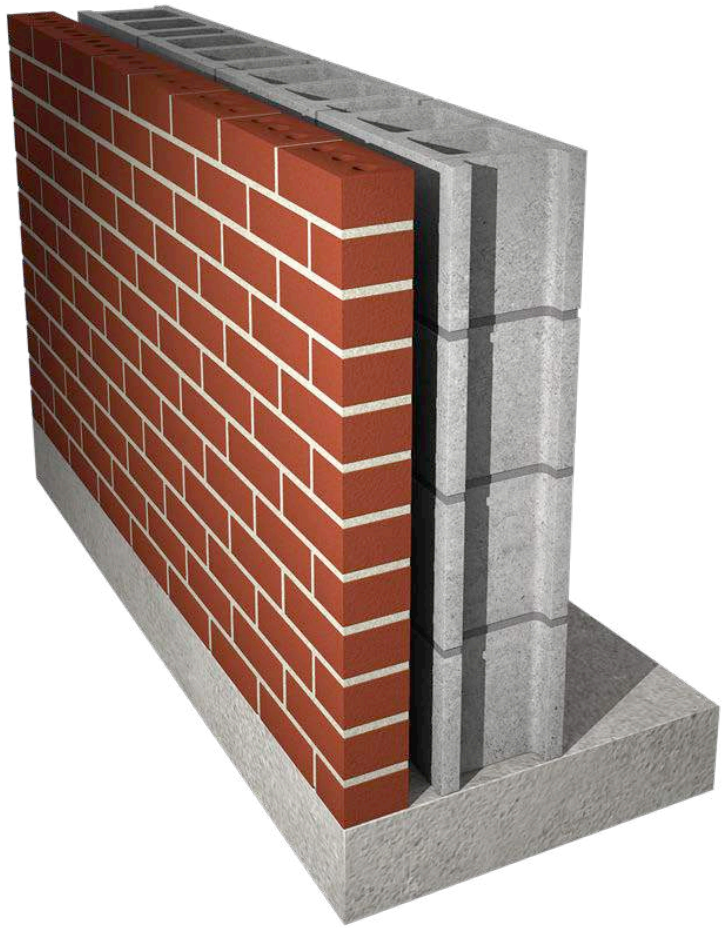
*"Metal was a great material to work with and it provided that Hard Rock vibe on the exterior of the building. And from an installation standpoint, it went up very fast…"*

David Bowen, Principal,
Richard L. Bowen & Associates

# Recap

## Recap of Rainscreen Wall Design and Performance

- The first cavity walls composed of outer and inner wall coated with tar-like substance
- Helped prevent moisture penetration and improved thermal insulation
- Air chamber incorporated into wall design
- Rainscreens continued to develop and have popularized over the last 10 years



# Recap

## Recap of Multi-Component Walls

– Consist of inner and outer element
  - Exterior rainscreen
  - Zee Support & Vertical Subgirts
  - Insulation
  - Air/vapor barrier
  - Exterior sheathing

# Recap

## Recap of Multi-Component Walls

- Requires multiple layers installed by multiple trades
- Increased likelihood that air, water, vapor and thermal barrier will be compromised
- Fastener penetrations can lead to moisture penetration and thermal short circuits

# Recap

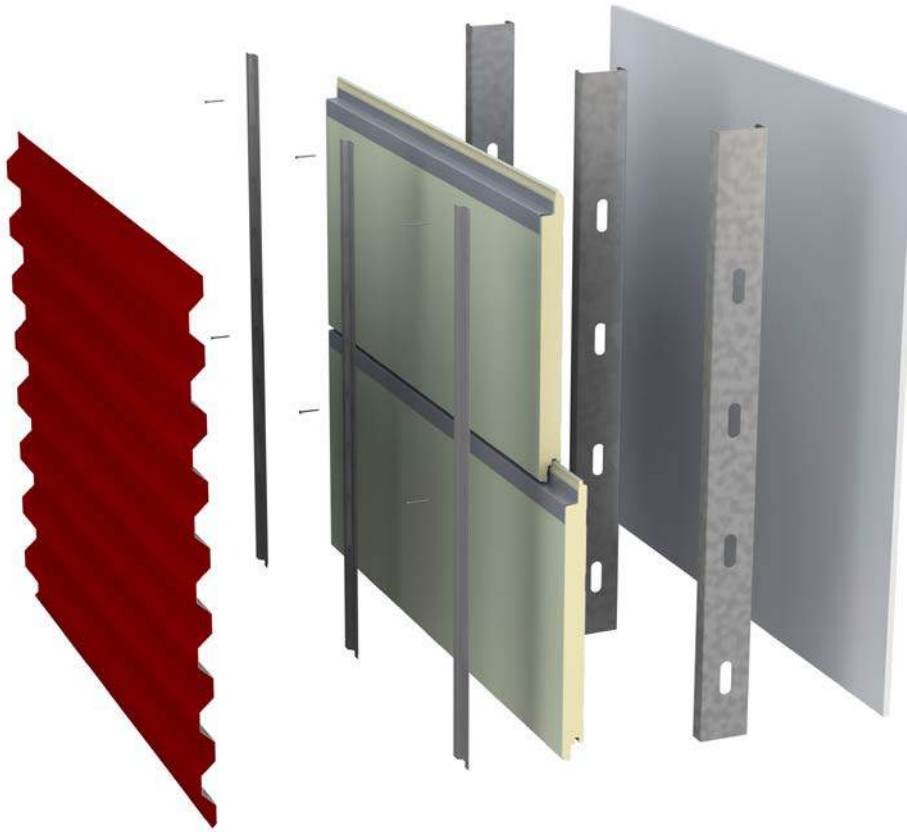
## Recap of IMP BW Benefits

- Superior air, thermal and moisture barrier
  tightness exceeds code requirements
- Full perimeter seals
- Rigid, outboard insulation
- Materials are unaffected by water
- Simplifies complex vapor flow & material performance issues
- Limited penetrations by integrating attachments

# Recap

## Recap of IMP BW Benefits

- Simplified design
- Takes the place of 4 separate materials
- Speeds installation saving time and money
- Reduced installation errors



# Recap

## Recap of IMP BW Benefits

- Single-source responsibility
- Perfect for every climate
- Meets thermal requirements of ASHRAE/IESNA 90.1-2013
- Meets stringent building codes, including fire codes (IBC Chapter 26)
- Made from environmentally conscientious materials

# *Questions?*

## *This concludes the AIA portion of today's program…*


*…We are now free to discuss what Metl-Span can do for you!!!*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