



**INSULATED
METAL
PANELS**

Designing with Commercial/Industrial Insulated Metal Wall Panels

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Course Number: METLA050820 Learning Units: 1 LU/HSW/SD Hour

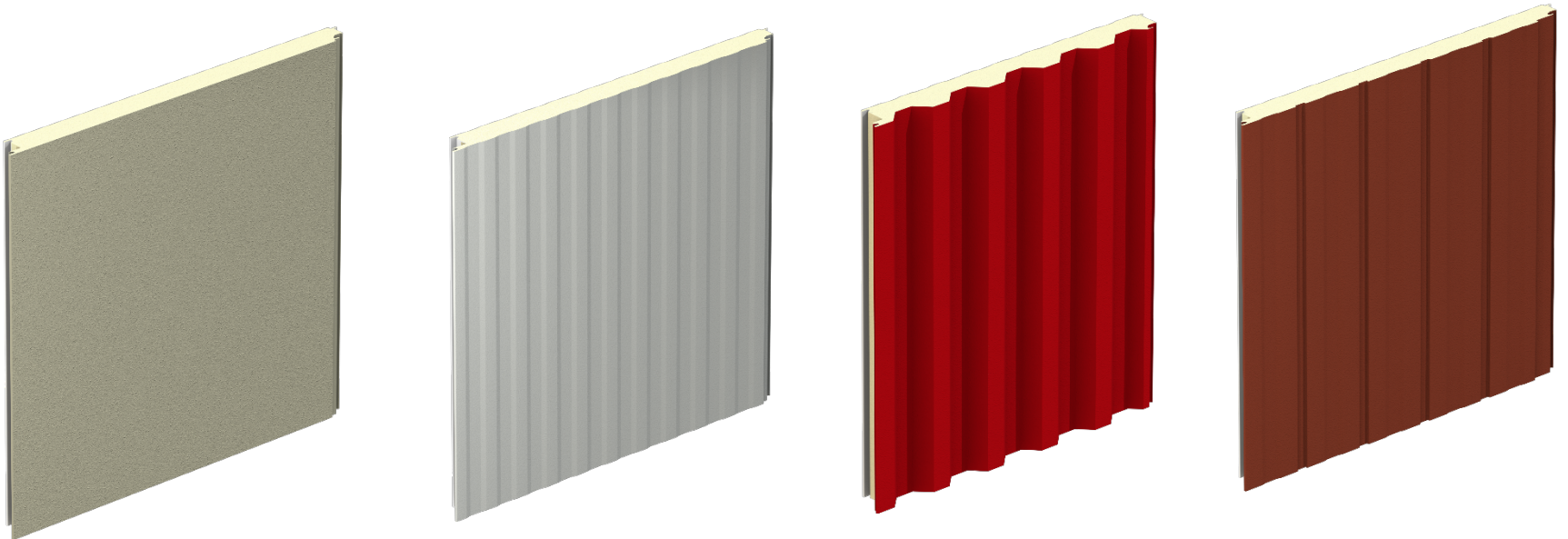


Learning Objectives

- ✓ Understand the characteristics that best describe commercial/industrial insulated metal panels (IMPs) and their design options
- ✓ Visualize the installation process of IMPs, including flashings and sealants while also recognizing the factors affecting panel spans and the relationship of these factors to structural supports.
- ✓ Understand how IMPs provide all necessary air, water, vapor and thermal control layers through a single component
- ✓ Comprehend why IMPs are ideally suited for pre-engineered buildings (PEBs)
- ✓ Knowledge of IMP code compliance and be able to differentiate between the various paint, corrosion, panel and weathertight warranties available with IMPs

What are Insulated Metal Panels?

- Rigid urethane foam sandwiched between two sheets of pre-painted metal
- Single component provides exterior finish, interior finish and ALL building envelope control layers



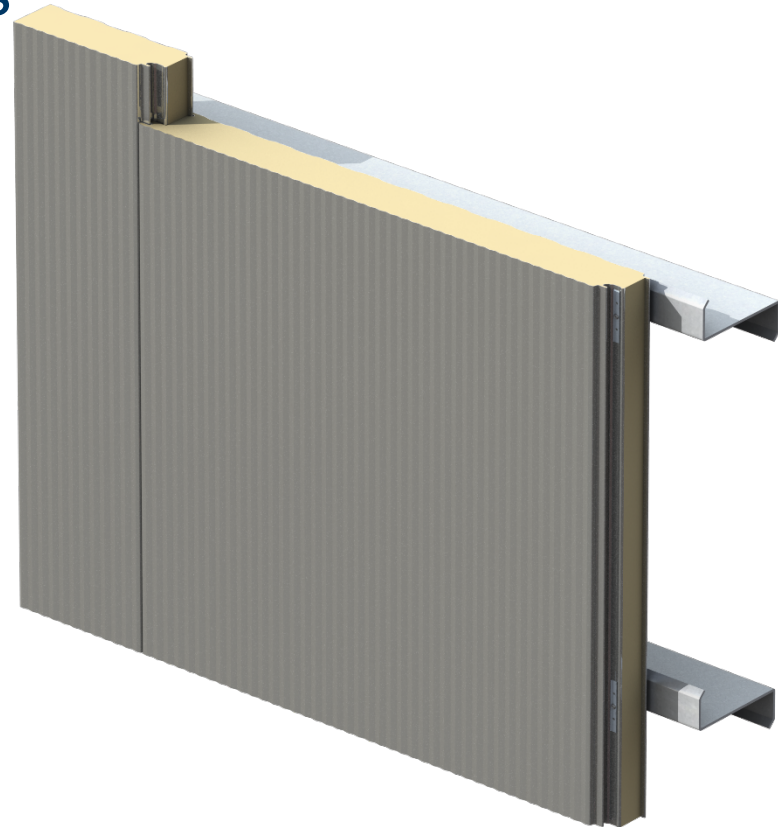
IMP Characteristics

- Functional and attractive
- Lightweight, single step installation
- Factory insulated, provides all finish and control layers
- Economical, energy saving and sustainable



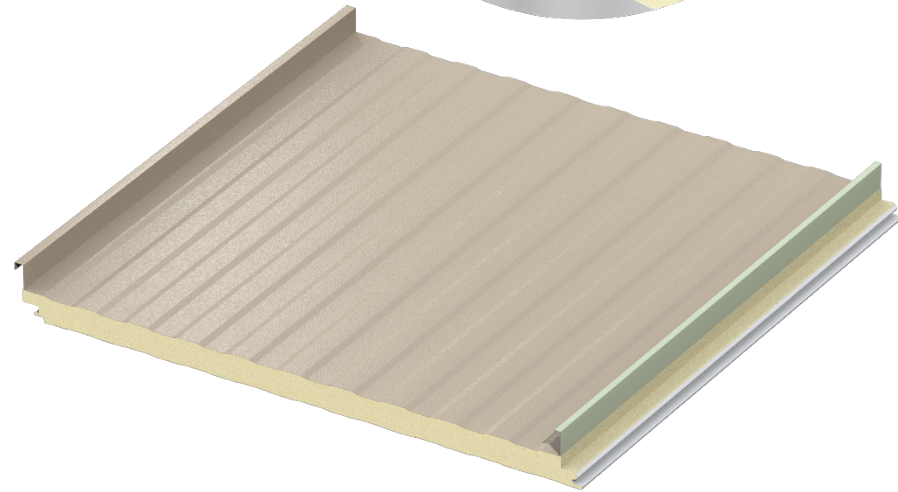
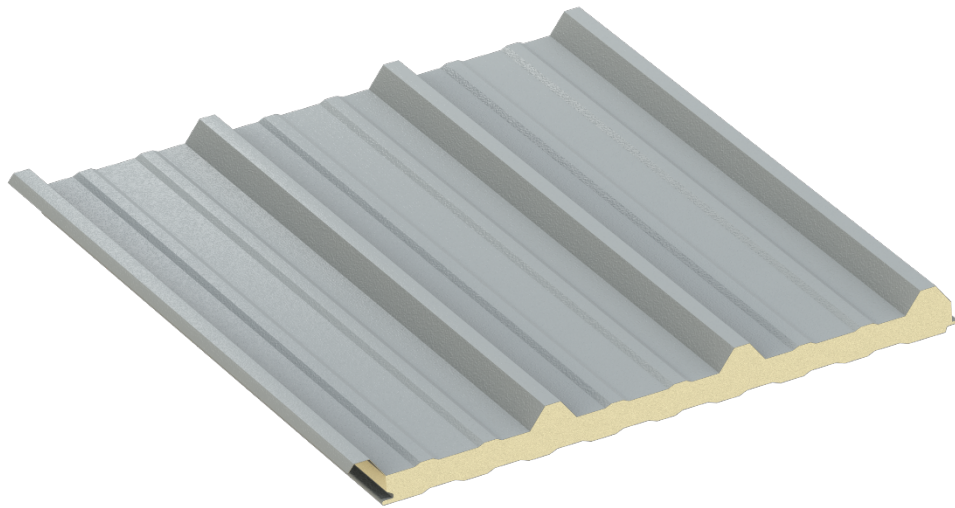
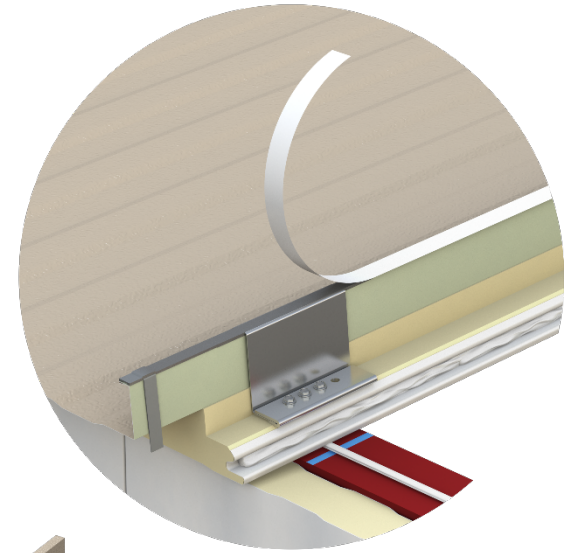
Configurations - Wall

- 2" to 6" thick ($\approx R14 - 45$)
- Standard widths: 42", 36", 30", 24"
- Wide variety of profile and finishes
- Concealed fasteners



Configurations - Roof

- 2" to 6" thick ($\approx R14 - 45$)
- Standard widths: 42", 36"
- Wide variety of finishes
- Concealed and through fastened options



Commercial and Industrial Market Description

Commercial and Industrial wall *panels*:

- Lighter gauge facings (26-22 gauge)
- Profiled and embossed
- Vertical orientation (90%+)
- Standard widths (42" most common)
- Metal flashings more often than aluminum extrusions
- Minimum post-fabrication (bends and folds)



Commercial and Industrial Market Description

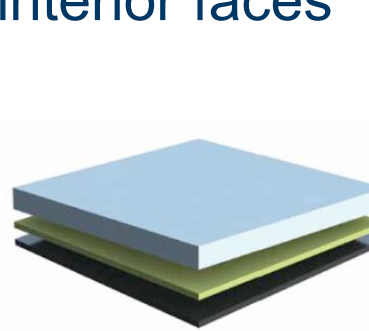
Commercial and Industrial *projects*:

- Balance of performance and aesthetics
- Moderate design sophistication
- Low to moderate budgets
- *Often pre-engineered buildings*
- *Examples: manufacturing plants, distribution centers, box retailers, churches, aviation*

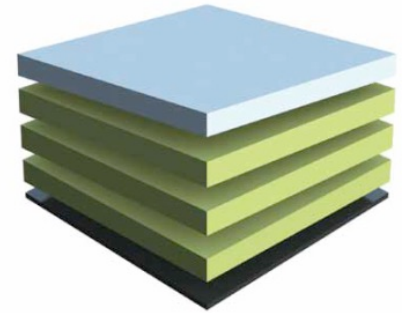


Design Options - Finishes and Coatings

- Prefinished on BOTH exterior and interior faces
- Essentially maintenance free
- Resists UV degradation, corrosion, acid rain, chemicals, pollutants
- 20 Year+ finish warranties
- Smooth, embossed and stucco finish options



Standard 1.0 mil.



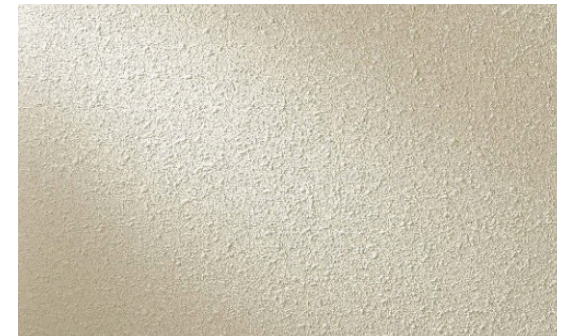
High build 3.2 mil.



Standard
embossing

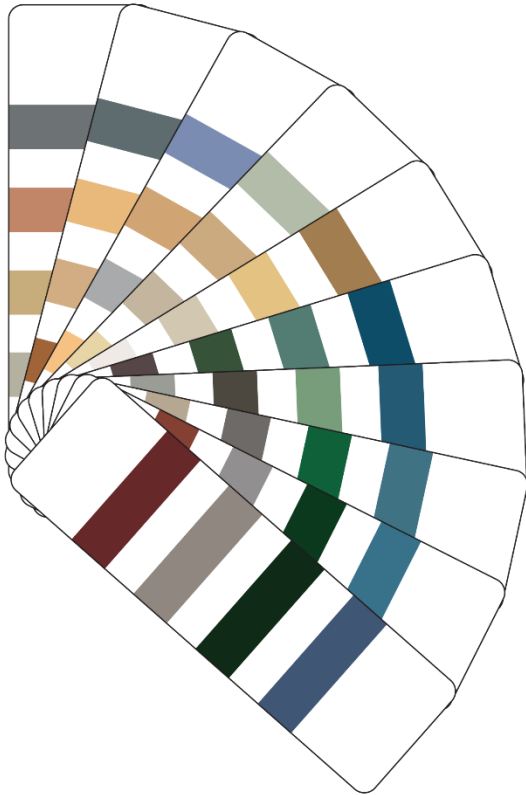


Heavy
embossing

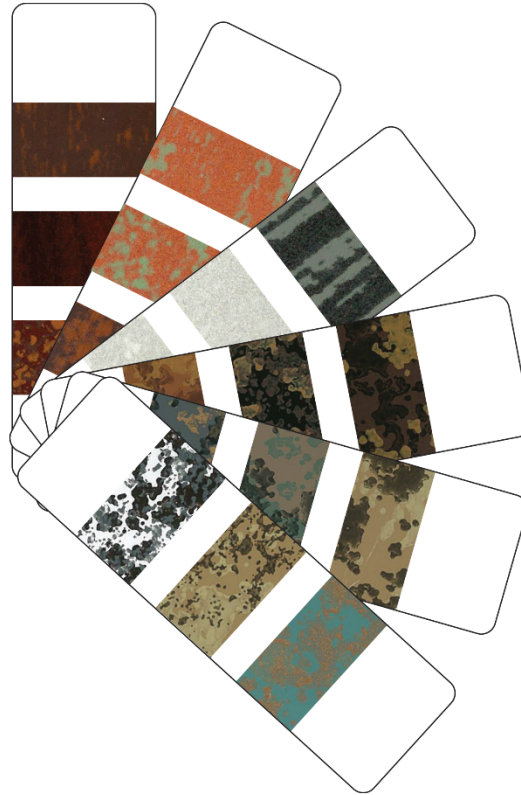


Stucco finish

Design Options - Finishes and Coatings



- Solids
- Micas
- Metallics
- Color shifting



- Weathered metals
- Patinas
- Variegated stone



- Stucco*
- Pre-cast*

**Wall panels only*

Design Options – IMPs and Masonry

Olympic View Middle School
Location: Mukilteo, Washington
Architect: McGranahan
Architects



Design Options – Mosaic Patterns

Huntsville Aquatic Center
Location: Huntsville, Alabama
Architect: Nola VanPeurse
Architects



Design Options – Color and Profile Variations

Land Remediation Inc.

Location: Waterford, New York

Architect: Paone Architecture

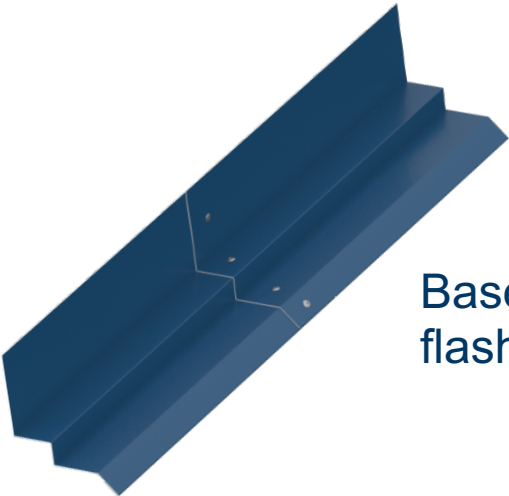


Design Options – Accent Bands

Overmountain Vineyards
Location: Polk County, North
Carolina
Architect: Julie McIntyre



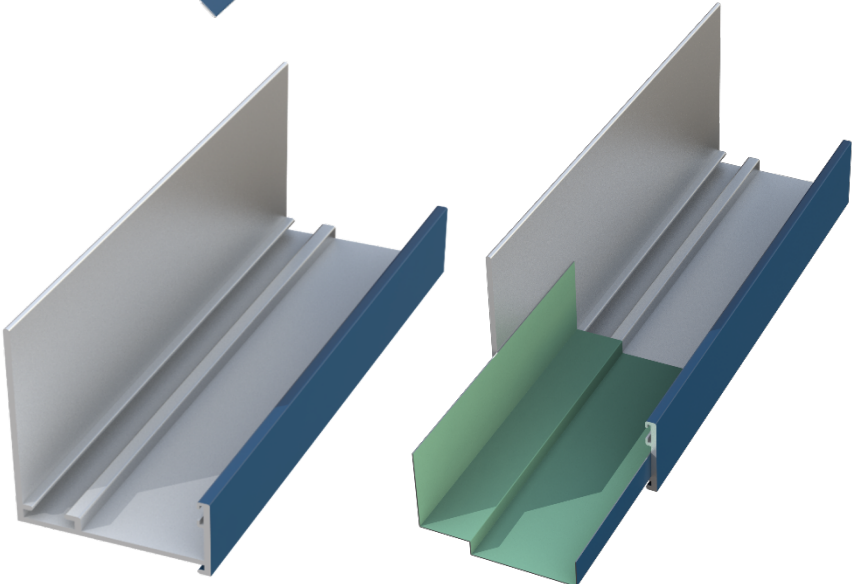
Design Options – Flashings and Extrusions



Base flashing

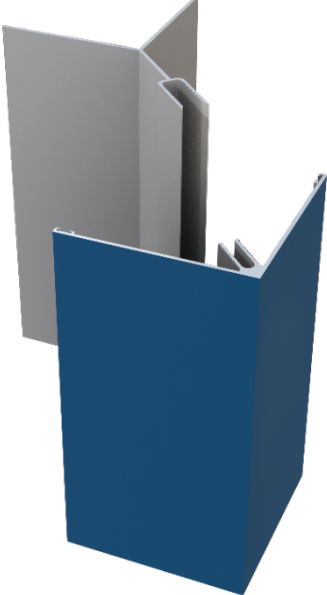


Corner flashing

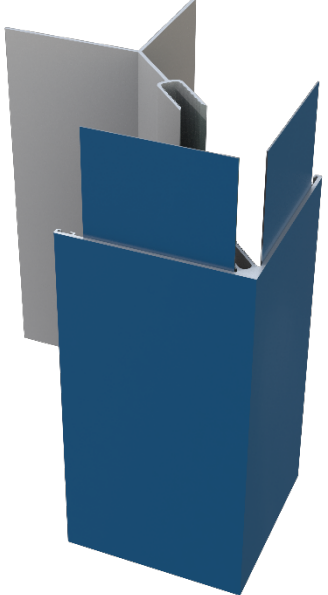


Base extrusion

...w/lap strip



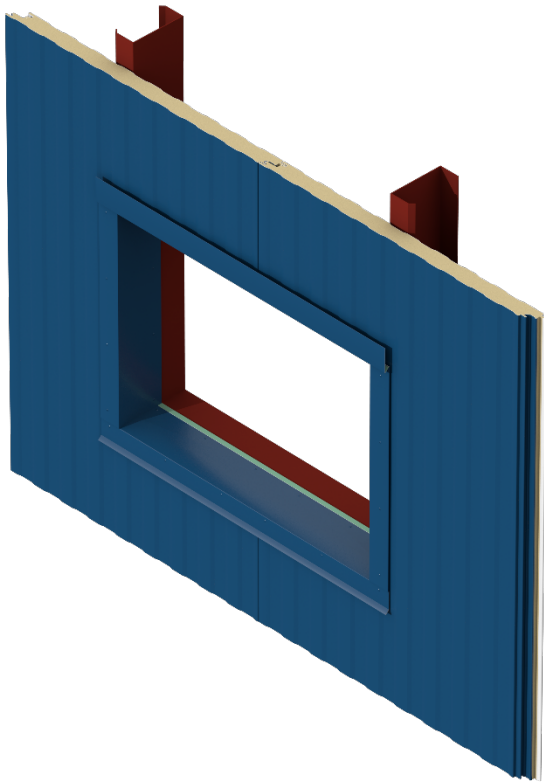
Corner Extrusion (2 pce.)



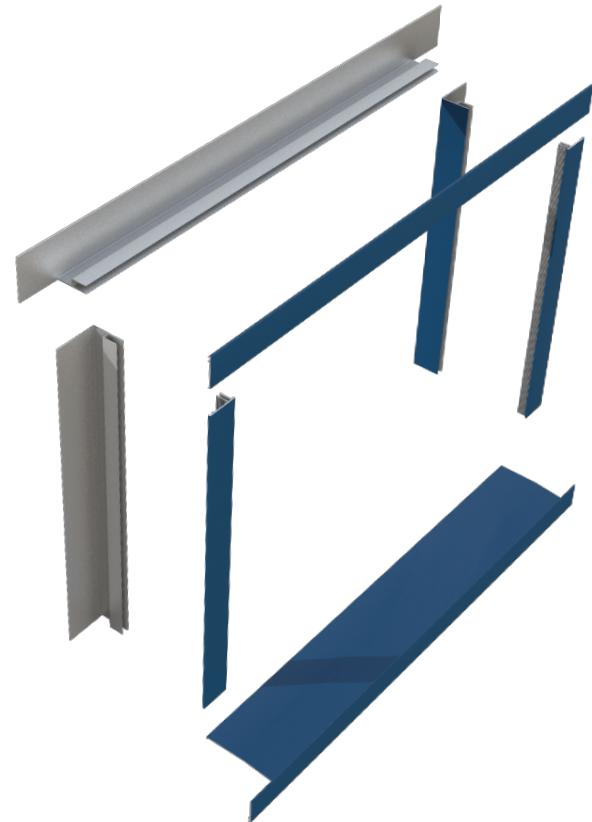
...w/lap strips

Design Options – Flashings and Extrusions

- Metal flashings are most cost effective
- Aluminum extrusions provide superior durability and aesthetics



Window opening with metal flashing



Optional aluminum extrusions

Design Options – Interior Exposed

- Exposed interior ideal for manufacturing, storage or athletic facilities
- Durable, washable, bright interior



Design Options – Interior Finished

- Vertical hat channels installed over girts
- Gypsum sheathing applied to hat channels



Support Structure

Greenville Public Works
Location: Greenville, South
Carolina
Architect: DP3 Architects



Support Structure

Wall panel spans determined by:

- Wind loads (pressures)
- Panel thickness
- Panel facings (profiles and gauges)
- Structural support gauge and spacing
- Deflection criteria



Support Structure

Vertical panels require *horizontal* supports

- Pre-engineered buildings
- Structural steel



Support Structure

Question: Why do IMPs and pre-engineered buildings (PEBs) work so well together?

Answers:

- ✓ Girt spacing and gauges adaptable to IMPs
- ✓ Adjustable girts provide accurate alignment for panels
- ✓ Compatible deflection characteristics
- ✓ Same crews and equipment can be used to install both products
- ✓ IMPs installed *exterior* of girts, eliminates cavity wall condensation
- ✓ Compatible:
 - Flashing and trim details
 - Construction sequence
 - Metals/materials/sealants
 - Engineering requirements
- ✓ Similar distribution channels/market segments

IMPs provide one of the most cost-effective, architecturally attractive and highest performing cladding solutions for pre-engineered buildings. Everything from design flexibility, structural compatibility, contractor/dealer networks to code compliance make PEBs an excellent support structure for IMPs.

Support Structure

Question: Why are IMPs also compatible with structural steel buildings?

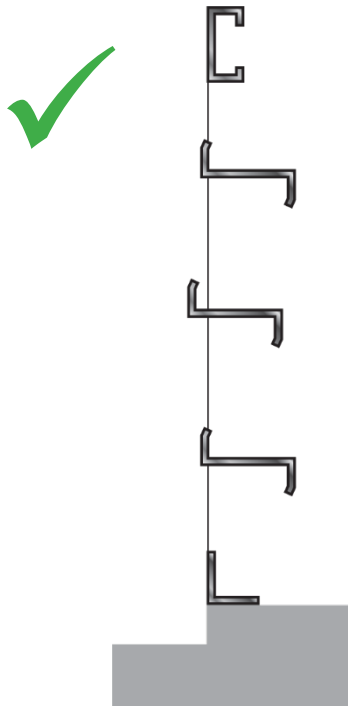
Answers:

- ✓ Heavier girt gauges allow maximum panel spans, saving materials and labor
- ✓ Compatible deflection characteristics
- ✓ Same crews and equipment can be used to install both products
- ✓ IMPs installed *exterior* of girts, eliminates cavity wall condensation
- ✓ Compatible:
 - Flashing and trim details
 - Construction sequence
 - Metals/materials/sealants
 - Engineering requirements

Support Structure

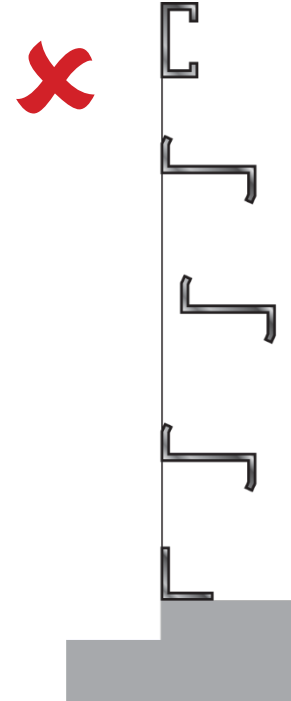
Tolerances

- Horizontal supports should be **adjustable** inwards/outwards of wall plane
- Girt alignment critical to panel appearance
- Slight outward bow = acceptable
- Inward bow = *not* acceptable



$\leq 8'$ spacing: $+1/8''$, $-0''$

$\geq 8'$ spacing: $+1/4''$, $-0''$



Installation

Loudoun Water WTP
Location: Leesburg, Virginia
Architect: CDM Smith



Installation

Faster installation is a primary benefit of IMPs:

- ✓ Factory assembled component
- ✓ One piece wall assembly
- ✓ Lightweight
- ✓ Pre-finished
- ✓ Less affected by weather

The next slide features a video animation of panel installation!



Installation

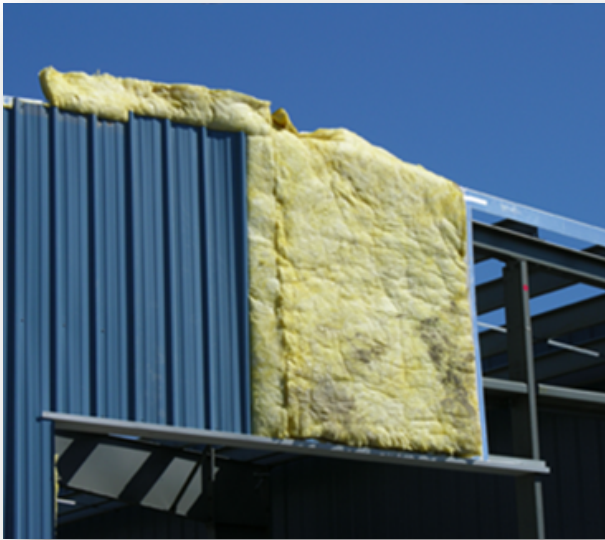
<https://youtube.com/video/Xx2JhUKZLEQ>

IMPs and Building Control Layers

- Hygrothermal is a term building scientists use to describe the loads that heat, air and moisture exert on a building.
- In the following slides, we will describe how IMPs provide all necessary control layers *without* the need for additional materials.

IMPs and Building Control Layers – Water

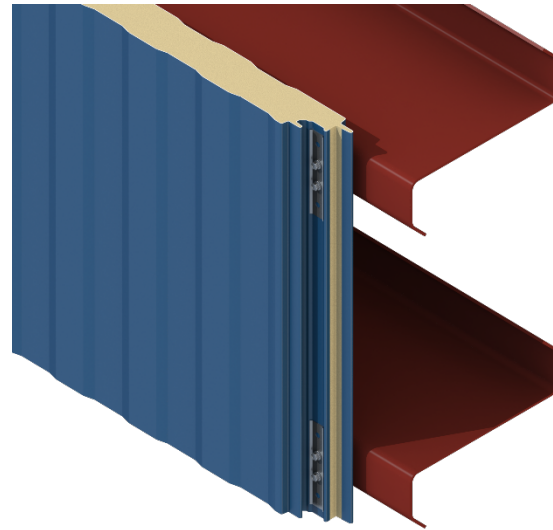
Barrier Walls



Single line of defense:

- Lacks redundancy

Insulated Metal Panels



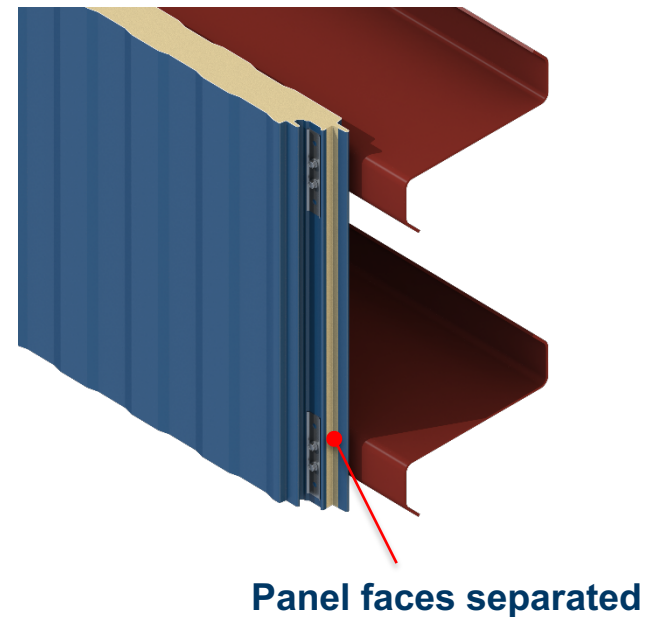
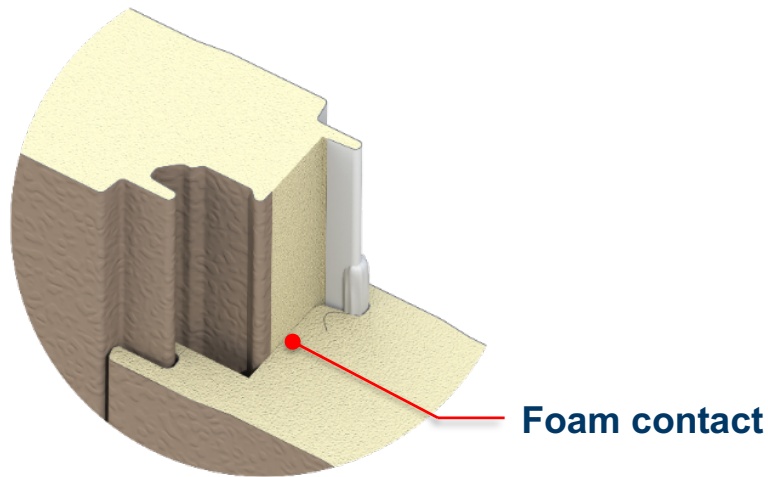
Hybrid technology: barrier AND rainscreen functionality:

- Outer water shedding layer
- Integral joint drainage
- Interior liner side provides redundancy

IMPs and Building Control Layers - Thermal

Insulated Metal Panels Minimize Thermal Bridging

- Panel faces are separated
- Foam to foam edge contact (≥ 2.5 " thick panels) provides continuous insulation
- Panel mounting clips attach to exterior facings only
- R values up to 45+



IMPs and Building Control Layers - AIR

- Protects against air infiltration
- Serves “double duty” as vapor barrier
- Does not require redundant assemblies

Insulated Metal Panel



Replaces need for wraps and fluid applied assemblies



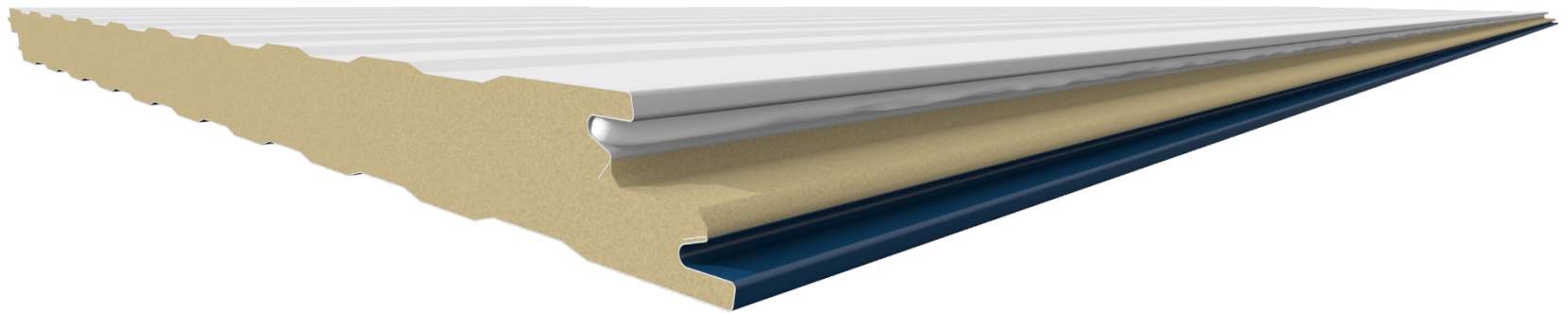
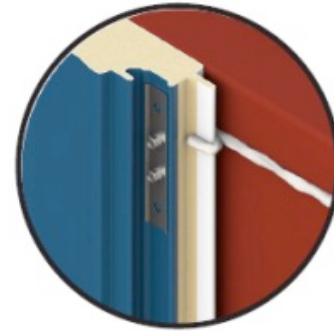
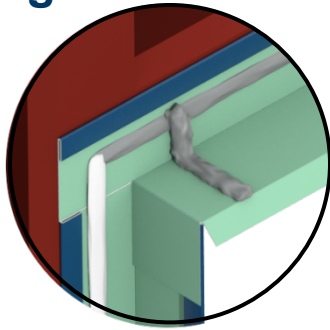
Wraps



Fluid Applied

IMPs and Building Control Layers - Vapor

IMPs provide an integral vapor barrier – panels sealed to structure and flashings



IMPs and Building Control Layers – Barrier Walls

New technology for rainscreen barrier walls

- Metal panel cladding over **IMPs**
 - Minimum continuous 3/8" air gap
- Terracotta tile over **IMPs**
 - Minimum continuous 3/8" air gap
- Brick veneer over **IMPs**
 - 1" air gap



Metal Panel Cladding



Brick Veneer



Terracotta Tile

Retrofitting with IMPs – Case Study



Code Compliance: Fire and Structural

Lander Recreation Center
Location: Battle Mountain, Nevada
Architect: VanWoert Bigotti
Architects



Code Compliance: Fire and Structural

- **FM 4880/4881** (Walls): large scale testing regimen
 - Flame Spread of ≤ 25 , Smoke Developed rating ≤ 450 (Class A)
- **FM 4471** (Roof): large scale testing regimen
 - Class 1A rated assemblies
- **ASTM E-72** - Structural test for positive/negative wind loads
 - Deflection criteria used *exceeds* code requirements
 - L/180 for walls and L/240 for roofs
- **UL 580, FM 4471** - Wind uplift ratings

Code Compliance: Thermal Transmittance

- **R-values** range from ≈ 14 to 45 as tested per **ASTM C518** at 75°F mean temperature (panel core testing)
- **R-value** test data also available per **ASTM C1363** (panel assembly testing)
- **U-value** data also available to assist in code compliance
- **Technical services** can provide data for ALL three energy code compliance pathways:
 - Prescriptive tables
 - Envelope trade-off
 - Building energy cost budget

Code Compliance: Air and Water Penetration

Air infiltration ≤ 0.04 cfm/sf @ 1.57 psf (code):

- IMPs $\leq .01$ cfm/sf @ 20 psf air pressure differential (**ASTM E 283**)

No uncontrolled water leakage @ 6.24 psf (code):

- *Two hour* duration test per **ASTM E 331**
- IMPs no leakage at 20 psf

➤ *IMPs meet or exceed all code requirements for air and water leakage without supplemental control layers.*

IMP Product and Installation Warranties

EFI

Location: Londonderry, New
Hampshire

Architect: Burnell Architects



IMP Product and Installation Warranties

- **Paint finish warranties**
 - Chalk, fade and adhesion
 - Terms for each may NOT be the same
- **Paint system *resin* determines extent of warranties**
 - PVDF (polyvinylidene fluoride) aka Kynar, Hylar
 - FEVE (fluoroethylene vinyl ether)
- **Thicker paint films** help protect against substrate failure but is not a *guarantee*.

➤ *Paint warranties apply to the paint film itself and not the underlying metal. They are NOT the same as corrosion warranties.*

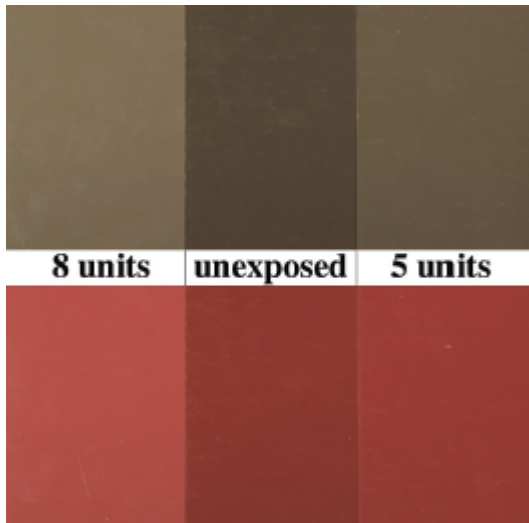
IMP Product and Installation Warranties

- **Chalk** is a gradual breakdown of the paint resin, resulting in a chalk-like powdery appearance.
- **Fade** is measured in delta units, where each unit represents the minimum difference visible to the naked eye.
- **Adhesion** is measured by the use of a scratch test. The panel sample is scratched with a cross hatch pattern, and then tape is used to try and lift off the damaged paint.
- **Coatings**
 - Coatings are tested for, in accordance with, the following:
 - Color Change (ASTM D 2244)
 - Chalk Resistance (ASTM D 4214)
 - Specular Gloss at 60° (ASTM D 523)
 - Dew Cycle Weatherometer Test (ASTM D 366)
 - Humidity Resistance (ASTM D 2247)
 - Salt Spray Resistance (ASTM B 117)
 - T-Bend (ASTM D 4145)
 - Impact Resistance Test, Reverse Impact (ASTM D 2794)
 - Abrasion Resistance Test Falling Sand (ASTM D 968)
 - Pencil Hardness (ASTM D 3363) HB to 2H
 - Cross Hatch Adhesion (ASTM D 3359)

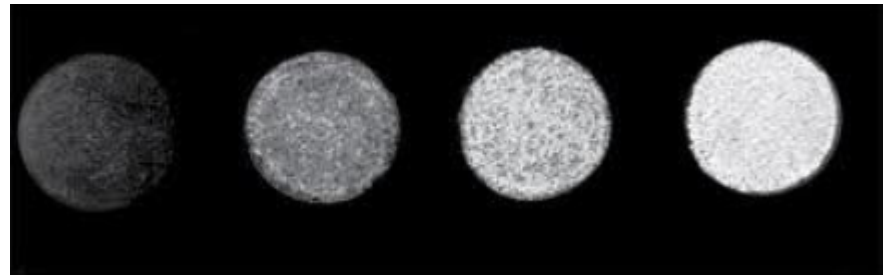
IMP Product and Installation Warranties

Paint terms explained...

Fade

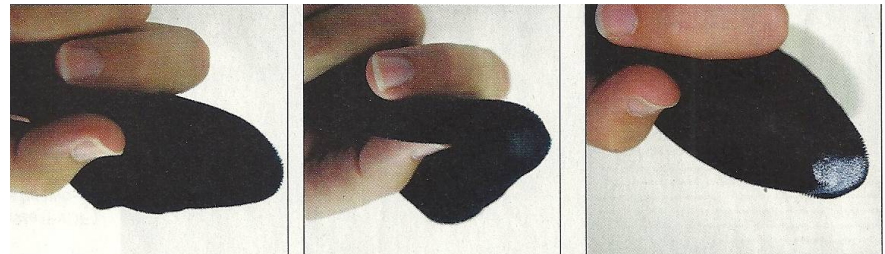


Chalking



Minimum chalking
#8 rating

Lots of chalking
#2 rating



- Good results remember **“chalk high, fade low!”**

IMP Product and Installation Warranties

➤ Corrosion warranties

- Apply to base metal only
- Require the use of AZ-50 coated steel
- Not available with G-90 substrates
- Aluminum substrates recommended for marine environments
- Exclusions
 - Projects within 1,500 feet of marine environment
 - Corrosive environments (chemical processing, waste water plants etc.)
 - Do NOT specify corrosion warranties for projects in corrosive environments, warranties offered by coil suppliers all contain exclusions when the product is used in corrosive environments
 - Consult the IMP manufacturer for the best available substrate and paint system, be aware that corrosion warranties may not apply for certain applications.

➤ *Corrosion warranties are different than paint warranties and apply to the underlying metal substrate, not the paint!*

IMP Product and Installation Warranties

➤ **Weathertight warranties**

- *Most* leaks are *installation* related
- *Some* leaks are *detail/design* related
- *Very few* leaks are product related
- Some IMP manufacturers offer weathertight warranties, but typically require installing contractor participation
- Best bet = weathertight warranty should be provided by General Contractor

- *Manufacturers supply materials and recommended installation details.*
- *Contractors (and sub-contractors) are responsible for proper installation!*

Sustainability and Transparency

- IMPS offer substantial contributions towards various environmental rating systems
 - USGBC LEED® Green Building Rating System
 - Green Globes
 - Living Building Challenge
- Environmental Product Declarations (Type III)
 - Life Cycle Analysis of product's environmental impact
 - Assists Owners/Designers to make informed product decisions
- Health Product Declarations
 - Evaluates product chemistry, potential health risks



Reducing a Carbon Footprint

- IMPs offer some of the highest R values per inch of today's insulation materials.
- IMPs are considered 'green' building products which can contribute to meeting the requirements of many rating, certification and labeling programs and help reduce a building's carbon footprint by reducing energy consumption.
- IMPs can contribute to many LEED credits, including: Integrated Design Process, Rainwater Management (roofs), Heat Island Reduction (roofs), Construction and Demolition Waste Management, Life Cycle Assessments and Environmental Product Declarations.
- Type III Environmental Product Declarations (EPDs) offer users an in-depth look at the environmental impacts of building materials. From raw material extraction to end-of-service life, these reports are helpful in making balanced and informed product decisions.
- Health Product Declarations are a fairly new type of product assessment that deals with the materials used to manufacture construction products. These chemicals and compounds are then cross-referenced against various "chemical red lists" to identify possible health risks and exposure limitations.
- For detailed information about the council, their principles and programs, please visit www.usgbc.org.
- Environmental Product Declarations are available from all major IMP manufacturers.
- Contact your chosen IMP manufacturer for more details on LEED credits, LCAs and EPDs.



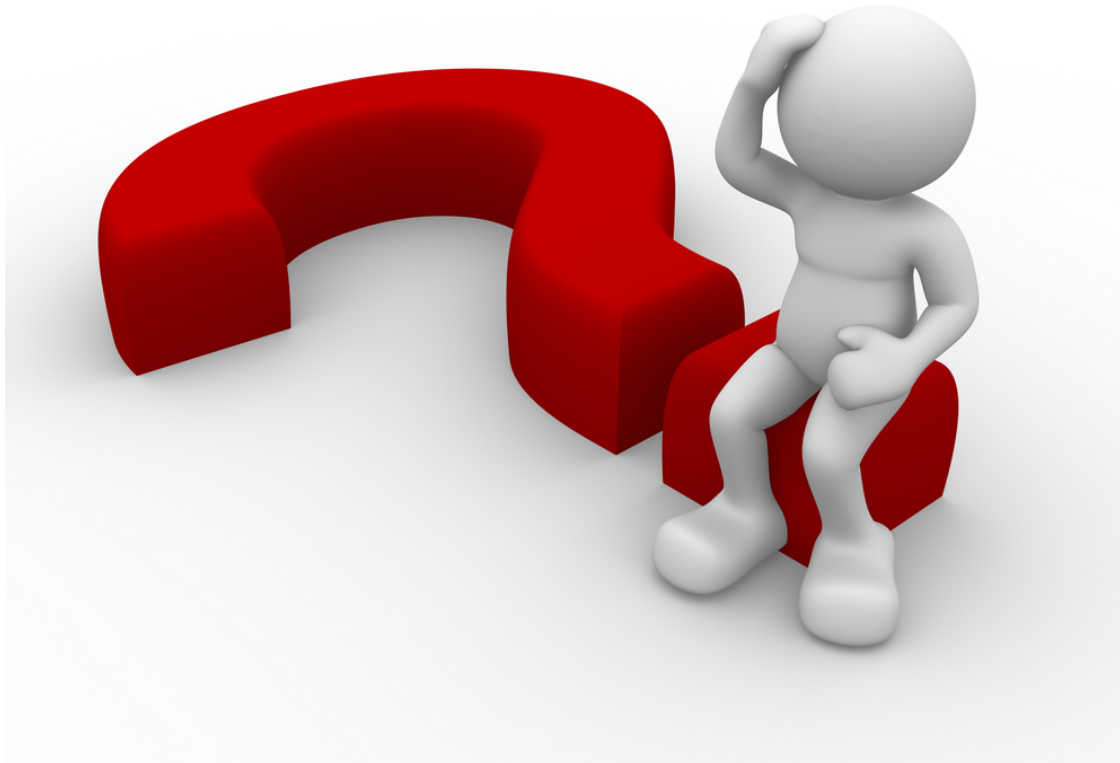
Sustainability and Transparency

Insulated Metal Panels

- Average recycled content of facings \approx 25-35% (mainly post-consumer)
- Average recycled content of foam core \approx 15% (mainly pre-consumer)
- Long life cycle \approx 60 years
- Steel 100% recyclable at end of use
- Environmental cost of foam offset by increased thermal efficiency
- Core can be safely disposed, or ground and used as additives for paving



Questions?



This concludes the AIA portion of today's program...



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



INSULATED METAL PANELS

