



# **INSULATED METAL PANELS – INSMP2A**

**1LU/HSW HOUR**

Prepared and presented by MBCI



## BEST PRACTICE

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# LEARNING OBJECTIVES

- Discover business development opportunities available with insulated metal panels (IMPs)
- Better understand IMPs and the important terms associated with them
- Review policies and codes surrounding IMPs, the construction industry and how IMPs can qualify for LEED & tax credits
- Recognize the advantages of using IMPs to increase the energy efficiency of the building envelope
- Take a look at some examples of energy cost savings with the use of IMPs
- Review important specs you should be specifying for IMPs

# INSULATED METAL PANELS

IMPs, comprised of two single-skin metal panels and a non-chlorofluorocarbon (non-CFC) polyurethane foamed-in-place core, are manufactured for both roof and wall applications and are ideal for a wide range of building projects and green building construction.





**INSULATED METAL PANELS**

**BUSINESS  
DEVELOPMENT  
OPPORTUNITIES**

# BUSINESS DEVELOPMENT OPPORTUNITIES

- Public work – federal, state and local government
- Schools
- Hangars
- Commercial facilities
- Food industry
- Power industry
- Waste water treatment facilities
- Mining operations
- Manufacturing and warehousing





# FORT DRUM BASE

PROJECT TYPE:  
Government

LOCATION: Fort Drum,  
New York





# LONDON BRIDGE TRADING COMPANY, LTD

PROJECT TYPE:  
Commercial Office

LOCATION: Virginia  
Beach, NY





# WILLIAM PENN UNIVERSITY

PROJECT TYPE:  
Institutional

LOCATION: Oskaloosa,  
IA



# WS CONSTRUCTION OFFICES

PROJECT TYPE:  
Commercial Office

LOCATION: Versailles,  
KY



# RC DICKENSON YMCA

PROJECT TYPE: Non-Profit

LOCATION: Tulsa, OK



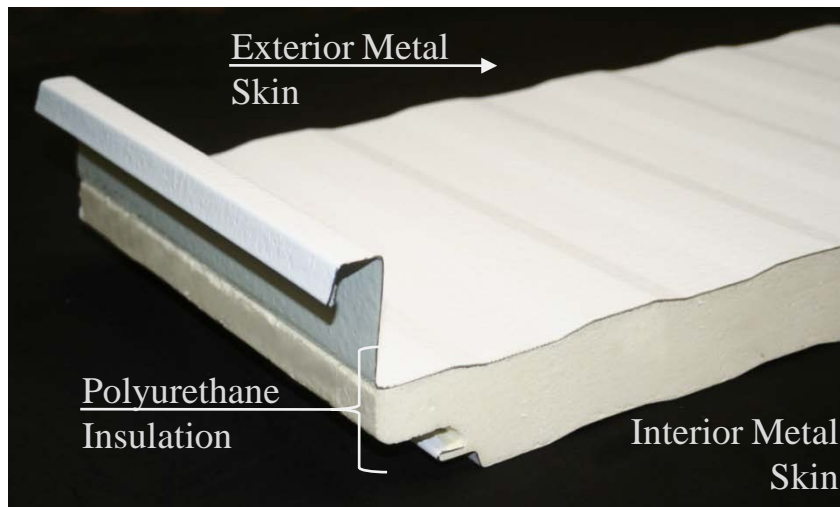


**INSULATED METAL PANELS**

# **UNDERSTANDING IMPS & IMPORTANT TERMS**

# PHYSICAL DESCRIPTION: FOAM CORE

- Continuously foamed in place
- Non-CFC polyurethane
- 92% closed cell structure
- Density – 2.2 lbs/cu.ft. minimum



# SAMPLE INFORMATION

Type of paint and finish

SR & SRI values may also be included

ENERGY STAR Partner Logo

Warranty information

**Signature® 200 PAINT COLORS**

**STANDARD STOCKED COLORS** | Silicized Polyester Standard Gloss  
\*Igloo White is a Straight Polyester.

IGLOO WHITE* *	WINTER WHITE *	LIGHT STONE *	ASH GRAY *
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**STANDARD NON-STOCKED COLORS** | Silicized Polyester  
\*\*Polar White is a Straight Polyester.  
Minimum quantities and/or extended lead times may be required.  
Please inquire.

POLAR WHITE** *	SOLAR WHITE	CRIMSON RED *	RUSTIC RED *	HAWAIIAN BLUE *
BURNISHED SLATE *	CHARCOAL GRAY *	KOKO BROWN *	DESERT SAND *	SADDLE TAN *
FERN GREEN *				

**STANDARD INTERIOR COLORS** | \*Igloo White is a Straight Polyester.

IGLOO WHITE* *
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**Final color selection should be made from metal color chips.**

- See product selection chart for gauge and color availability.
- Heavier gauges, narrower widths and embossing minimize "oil canning."
- Review the sample warranty for complete performance attributes and terms and conditions.
- For locations outside the continental USA and Canada, please inquire.

\* ENERGY STAR® Qualified

# INSULATED METAL PANELS - WALLS



Flat panel with wide, shallow ribs



Flat panel with aztec embossing only



Flat panel with striations



Flat panel with stucco embossing only

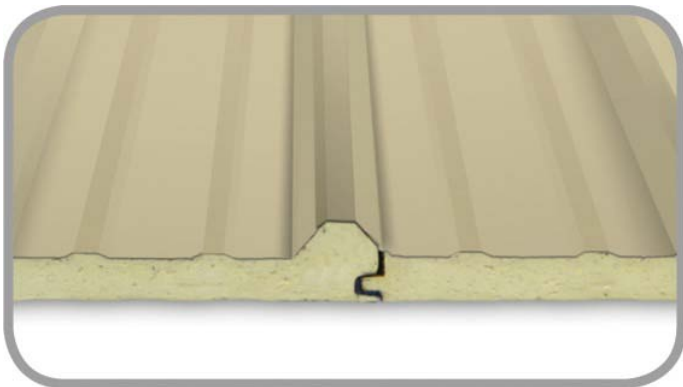


Panel with flutes

# INSULATED METAL PANELS – ROOF & WALL



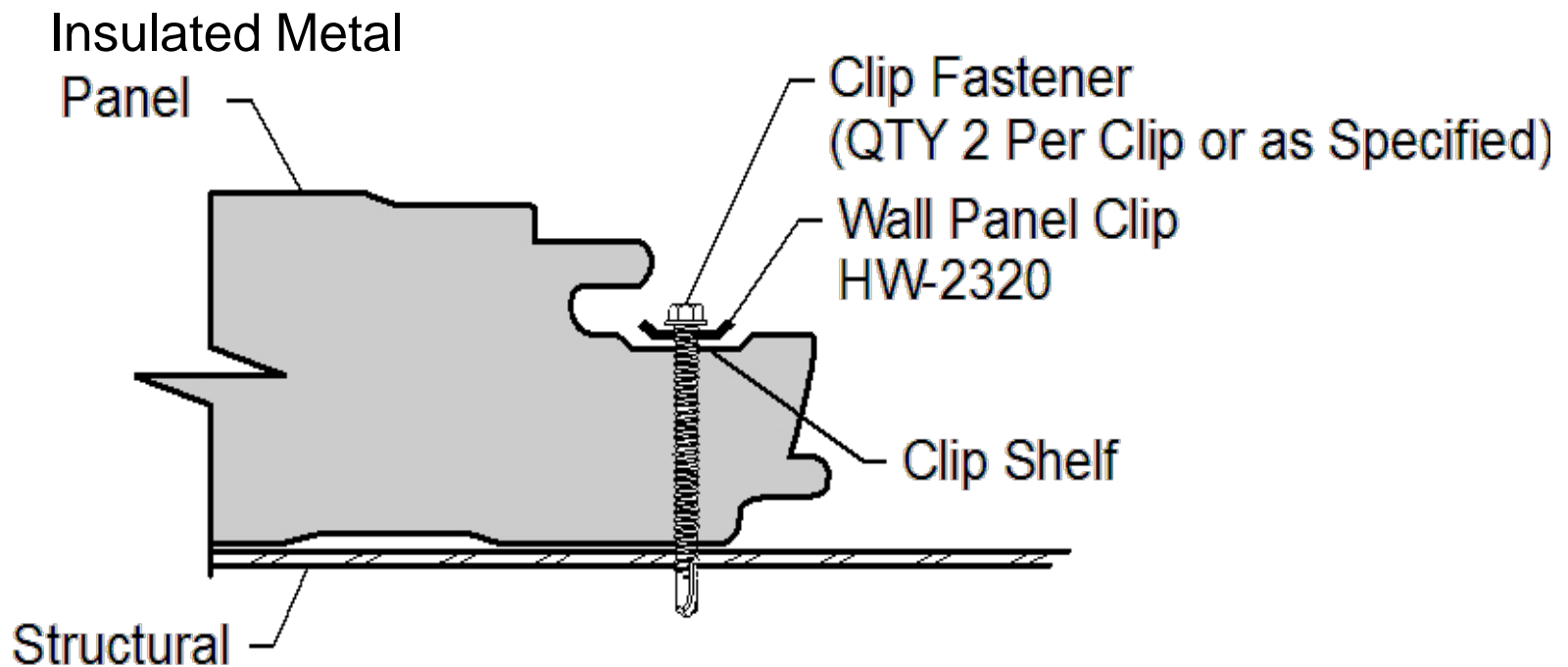
**Standing Seam Roof Panel**



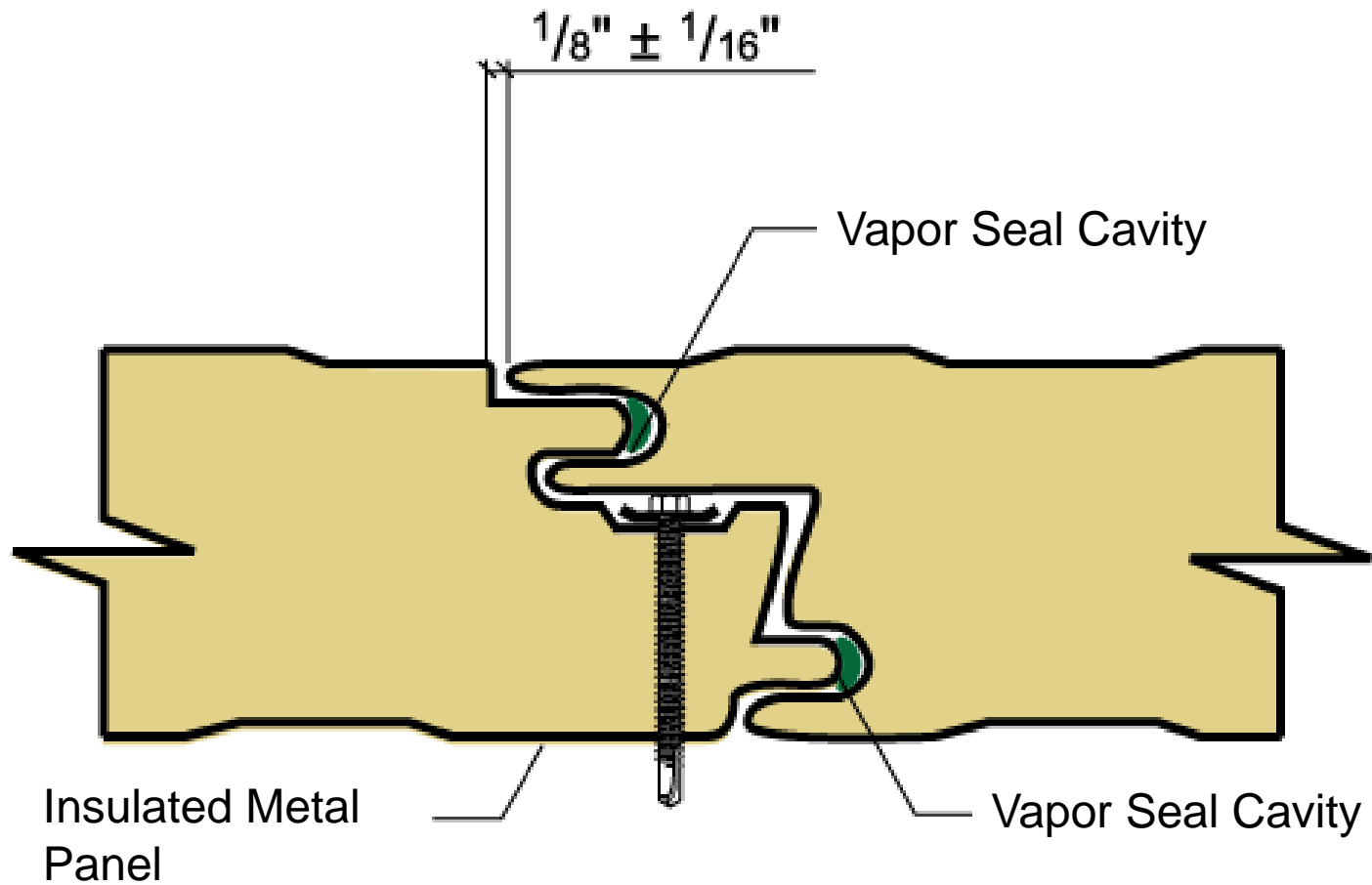
**INSULATED R PANEL**  
INSULATED ROOF & WALL PANEL



# CLIP AND FASTENER ASSEMBLY



# ASSEMBLED SIDE JOINT



\*Option of 0, 1, or 2 vapor sealants factory applied

## R-VALUE

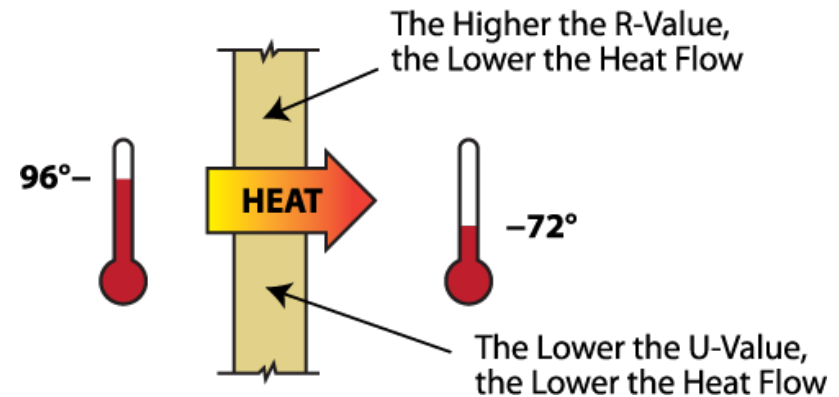
- A measure of the ability to resist heat flow through a material.
- The higher the R-Value, the better the insulator.

## U-FACTOR

- A measure of how much heat is conducted through a material.
- The lower the U-Value, the better the insulator.  $U\text{-Value} = 1 / R\text{-Value}$ .

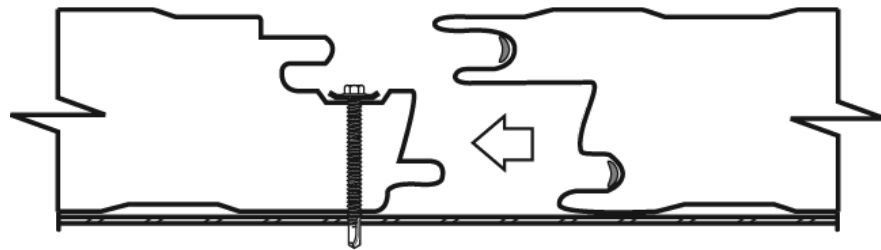
## K-FACTOR

- A measure of a material's ability to transfer heat per unit thickness.
- The lower the K-Value, the better the insulator.
- K-factor (BTU-in/hr-ft<sup>2</sup>-°F)

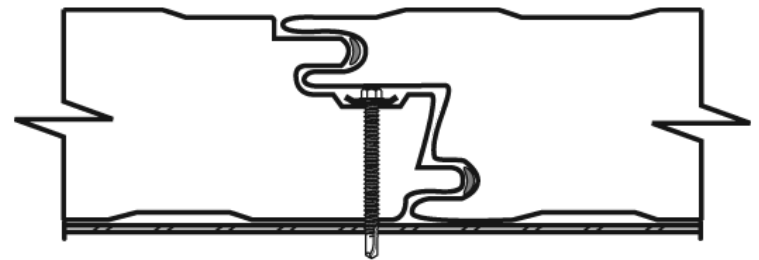


# CONTINUOUS AIR BARRIER (CAB)

The combination of interconnected materials and assemblies joined and sealed together with flexible joints that provide the airtightness of the building envelope above and below grade that separate conditioned from unconditioned space, or from space with conditions that differ by more than 50%.



Clip and Fastener Assembly

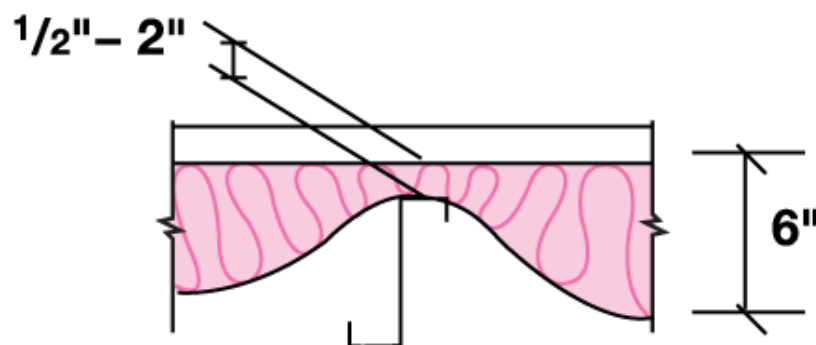


Assembled Side Joint

## CONTINUOUS INSULATION (CI)

Insulation that is continuous across all structural members without thermal bridges other than fasteners and service openings.

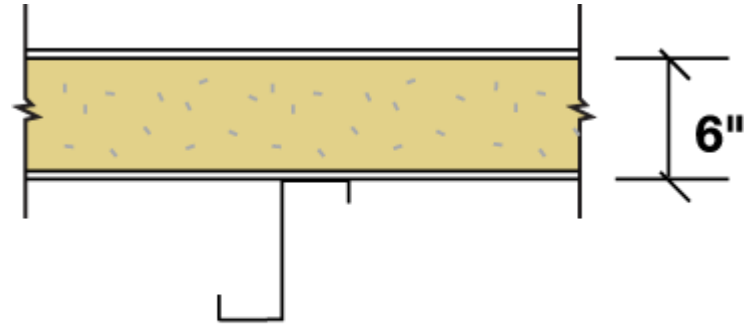
Even small gaps and compressed areas can reduce insulating levels significantly. A study of attic insulation found that just 5% voids in the insulation typical in many installations could reduce the overall R-value by over 40%.



Non-continuous

# CONTINUOUS INSULATION (CI)

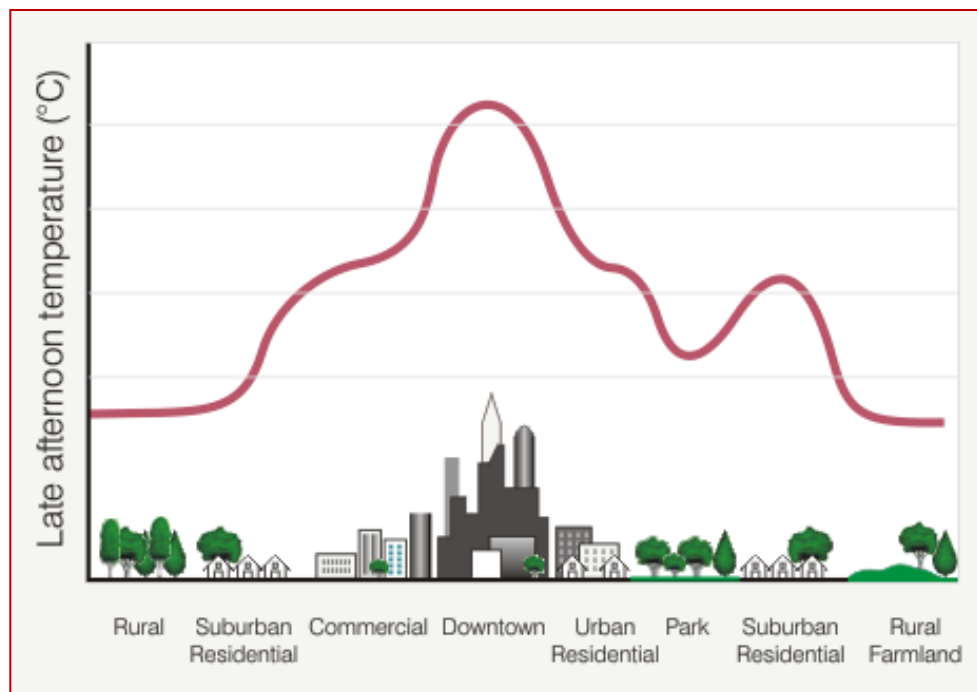
Continuous insulation is important because thermal bridges and discontinuities introduced by compressing non-rigid insulations cause the in-place R-Value of the assembly to be less than the tested R-Value of the insulation used. This effect has become a focus in newer energy efficiency codes such as ASHRAE 90.1 and IECC.



Continuous

# HEAT ISLAND EFFECT

Describes built up areas that are hotter than nearby rural areas. The annual mean air temperature of a city with 1 million people or more can be 1.8–5.4°F (1–3°C) warmer than its surroundings. In the evening, the difference can be as high as 22°F (12°C).



Cool Roof Paint mitigates the Heat Island Effect in urban areas

\*Image owned by EULEB project  
<http://www.ufficius.com/euleb/en/glossary/index.html>

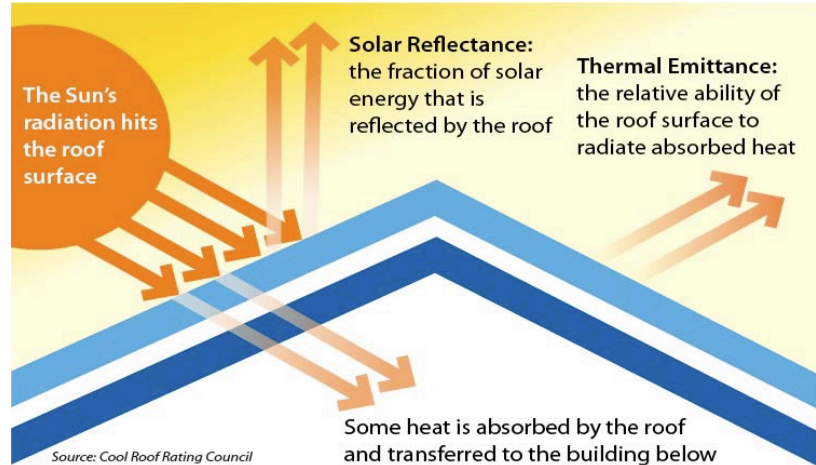
# COOL ROOF

The term “cool roof” refers to an outer layer or exterior surface of a roof that has high solar reflectance and high emittance or low thermal emittance and exceptionally high solar reflectance and reduces heat gain into a building.

Considering the environment and the slope of the roof, a cool roof can reduce energy consumption, providing significant cost savings while helping to mitigate urban heat islands.

The Cool Roof Rating Council (CRRC) provides a neutral 3rd party listing service for these systems.

Source: California Title 24



\*Image owned by Cool Metal Roofing Coalition





# INSULATED METAL PANEL ADVANTAGES

- Come in a wide variety of colors, applied finish offerings, and profiles for buildings to be customized to meet the needs of both design and function.
- High R-Value – 7.0 or more per inch of panel thickness at 75° mean temp
- Qualifies as continuous insulation where required by IECC and ASHRAE 90.1
- Panels sealed at side laps and at all perimeter conditions
- ASHRAE/California compliant Cool Roof colors available as listed on Cool Roof Rating Council's (CRRC) website ([www.coolroofs.org](http://www.coolroofs.org)).



## **INSULATED METAL PANELS**

# **POLICIES, CODES, & QUALIFYING FOR LEED & TAX CREDITS**



# POLICY ISSUING ORGANIZATIONS

IECC – International Energy Conservation Code®

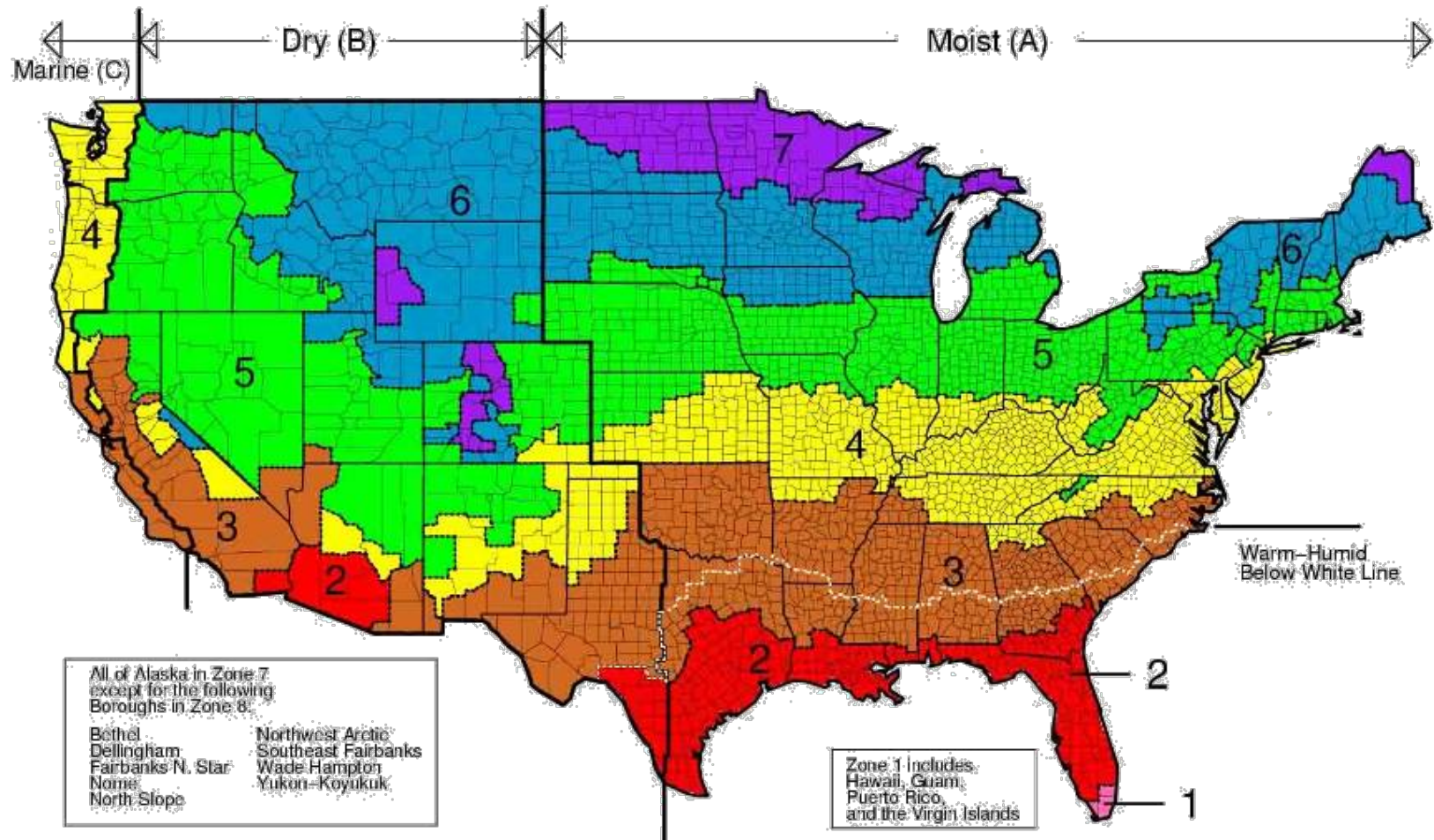
- Establishes provisions that adequately conserve energy, while minimizing any increase in construction costs
- Comprehensive energy conservation code that establishes regulations for energy efficient buildings using prescriptive and performance related provision that adequately protect public health, safety, and welfare

ASHRAE – The American Society of heating, Refrigerating and Air Conditioning Engineers

- ASHRAE, founded in 1894, is a global organization of 55,000 persons. ASHRAE fulfills its mission of advancing heating, ventilation, air conditioning and refrigeration to serve humanity and promote a sustainable world through research, standards writing, publishing and continuing education.

# CLIMATE ZONES—IECC AND ASHRAE 90.1

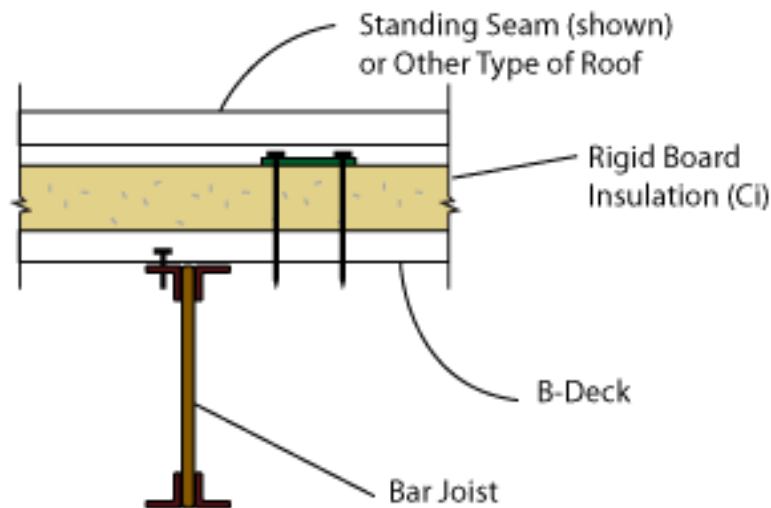
Determining your climate zone is the first step in the process.



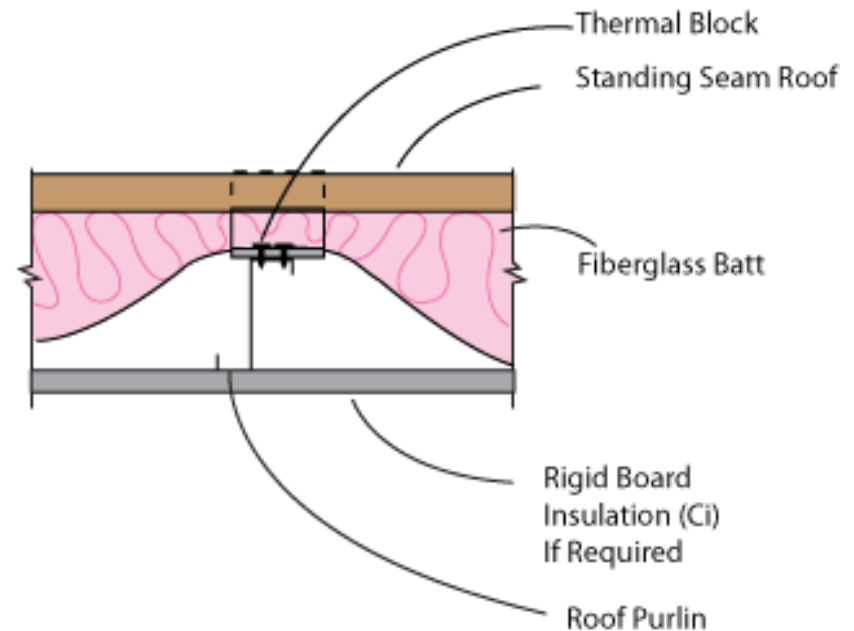
# CONSTRUCTION TYPES—IECC AND ASHRAE 90.1

Determining your construction type is the second step in the process.

## Roofs



**Insulation Entirely Above Deck (Roof)**

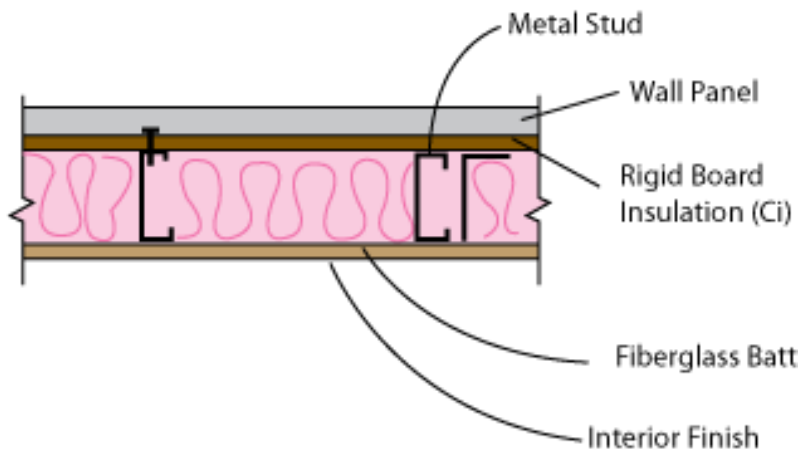


**Metal Building (Roof)**

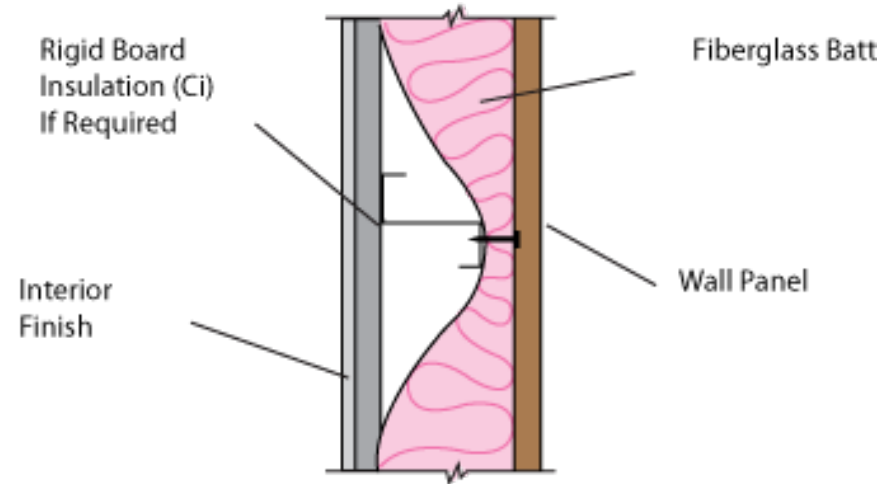
# CONSTRUCTION TYPES—IECC AND ASHRAE 90.1

Determining your construction type is the second step in the process.

## Walls

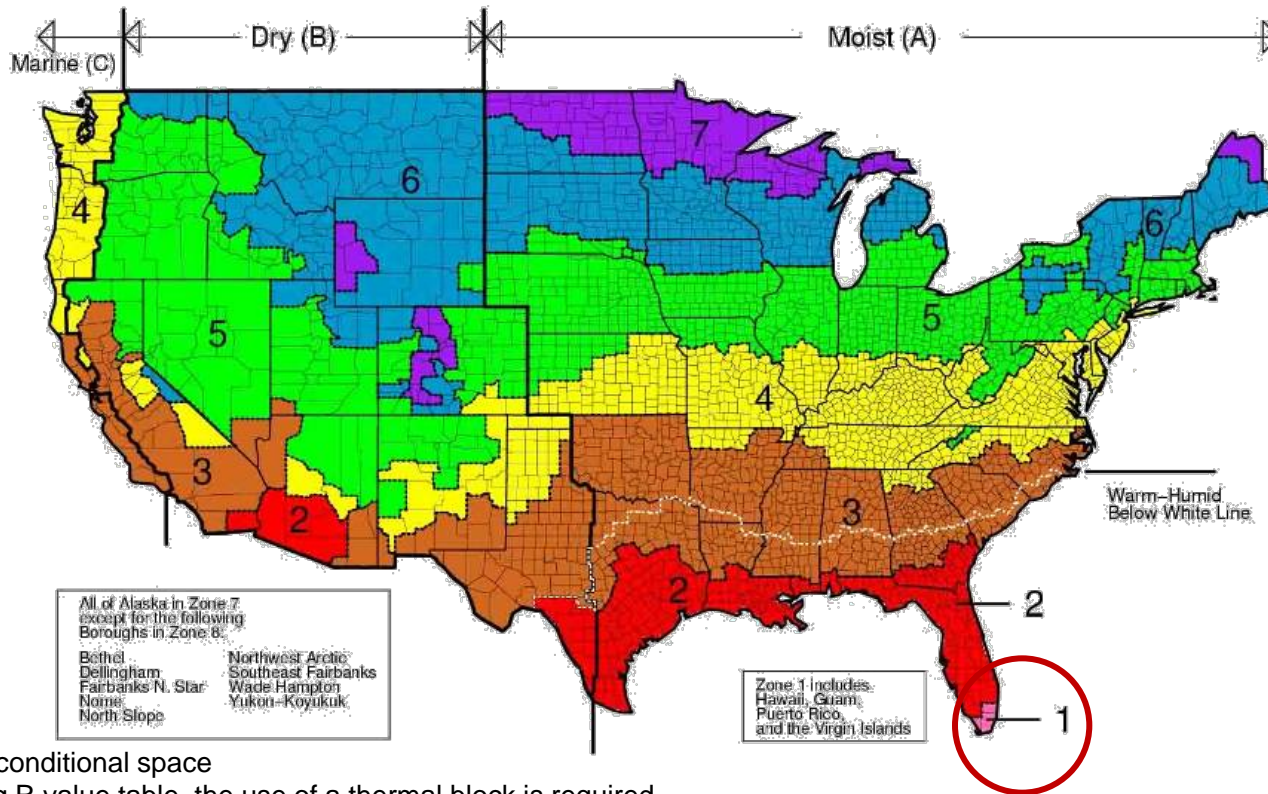


**Metal Frame (Wall)  
(Horizontal Section)**



**Metal Building (Wall)  
(Vertical Section)**

# CLIMATE ZONE ONE — IECC



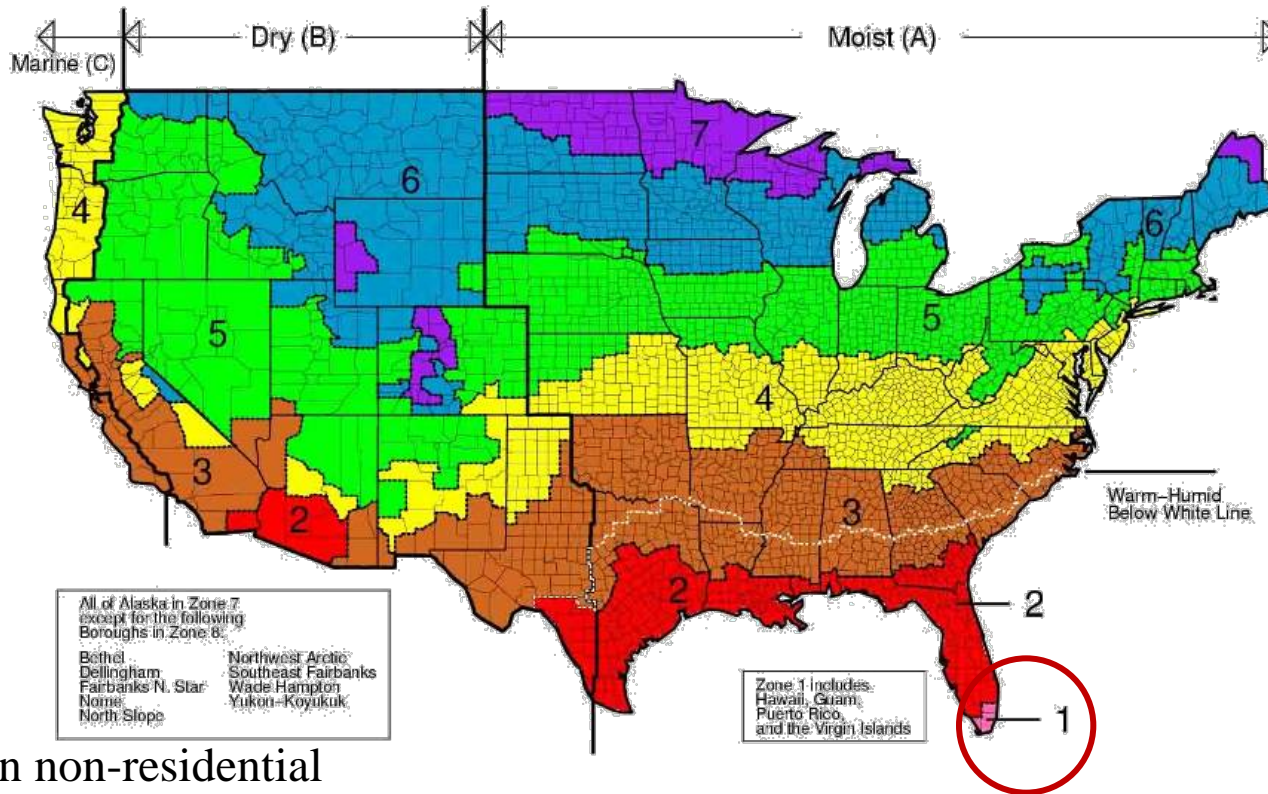
\*based on a conditional space

\*\*When using R value table, the use of a thermal block is required.

Element	Type of Construction	IECC 2015 R-Value	U-Factor	IMP Thickness
Roof	Above Deck	R-20ci	.048	2.5"
	Metal Building	R-19 + R11 LS	.044	3.0"

Element	Type of Construction	IECC 2015 R-Value	U-Factor	IMP Thickness
Wall	Metal Building	R-13 + 6.5ci	.079	2.0"
	Steel Framed	R-13 + R-5ci	.077	2.0"

# CLIMATE ZONE ONE —ASHRAE 90.1



\*Based on non-residential

Element	Type of Construction	ASHRAE 90.1 2013 R-Value	U-Factor	IMP Thickness
Roof	Above Deck	R-20ci	.048	2.5"
	Metal Building	R-10 + R-19 FC	.041	3.0"

Element	Type of Construction	ASHRAE 90.1 2013 R-Value	U-Factor	IMP Thickness
Wall	Metal Building	R-0 + R-9.8 ci	.094	2.0"
	Steel Framed	R-13	.124	2.0"



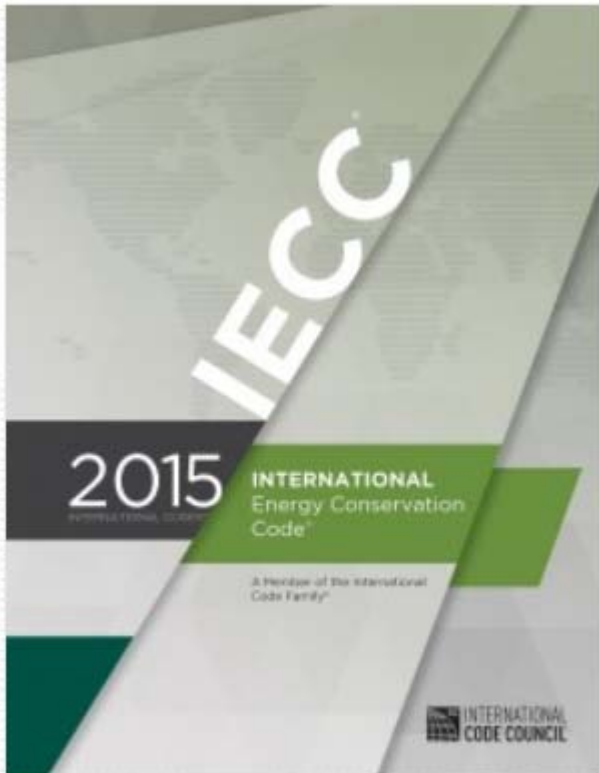
TABLE C402.3

MINIMUM ROOF REFLECTANCE AND EMITTANCE OPTIONS

THREE-YEAR AGED SOLAR REFLECTANCE OF 0.55 AND 3-YEAR AGED THERMAL EMITTANCE OF 0.75

THREE-YEAR-AGED SOLAR REFLECTANCE INDEX OF 64

- a. The use of area-weighted averages to comply with these requirements shall be permitted. Materials lacking 3-year-aged tested values for either solar reflectance or thermal emittance shall be assigned both a 3-year-aged solar reflectance in accordance with section C402.3.1 and a 3-year-aged thermal emittance of 0.90.
- b. Aged solar reflectance tested in accordance with ASTM C 1549, ASTM E 903 or ASTM E 1918 or CRRC-1.
- c. Aged thermal emittance tested in accordance with ASTM C 1371 or ASTM E 408 or CRRC-1.
- d. Solar reflectance index (SRI) shall be determined in accordance with ASTM E 1980 using a convection coefficient of 2.1 btu/h · ft<sup>2</sup> · °f (12w/m<sup>2</sup> · k). Calculation of aged sri shall be based on aged tested values of solar reflectance and thermal emittance.



**C402.3.1 Aged roof solar reflectance.** *Where an aged solar reflectance required by Section C402.3 is not available, it shall be determined in accordance with Equation 4-3.*

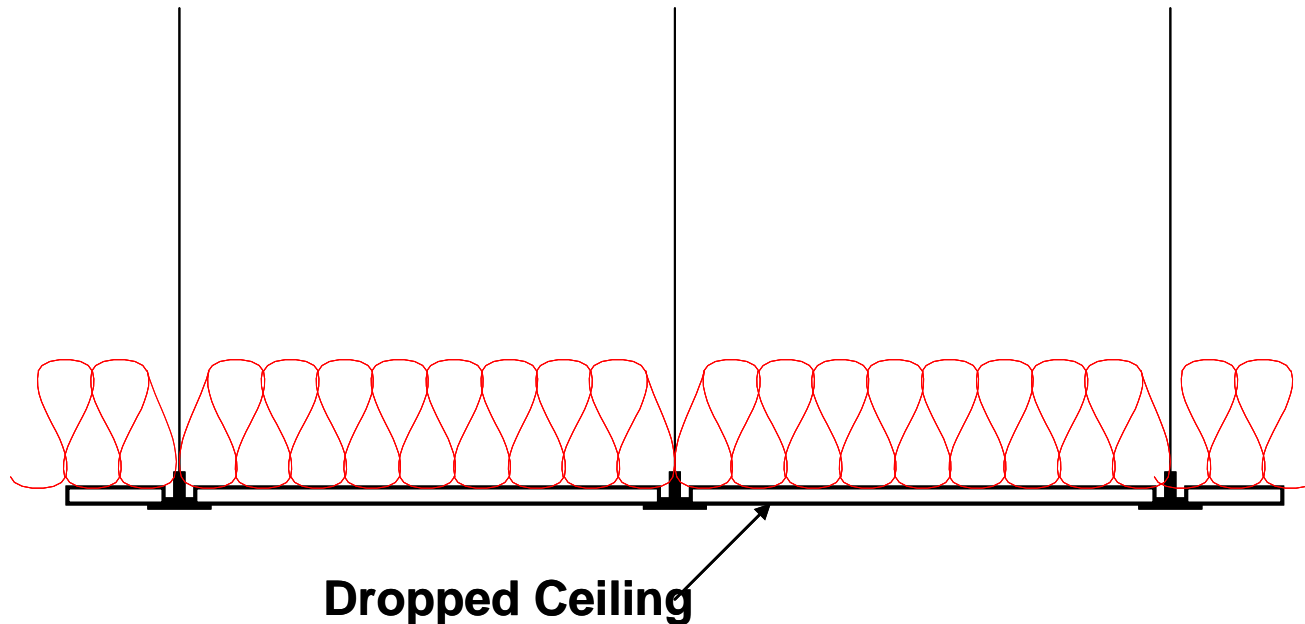
$$R_{aged} = [0.2 + 0.7(R_{initial} - 0.2)] \quad \text{(Equation 4-3)}$$

where:

$R_{aged}$  = The aged solar reflectance.

$R_{initial}$  = The initial solar reflectance determined in accordance with CRRC-1.

# IECC AND ASHRAE 90.1



Insulation placed on suspended ceiling with removable ceiling tiles

- Will not count as roof insulation over conditioned spaces
- Will not comply with sealing requirements



# IMP ADVANTAGES FOR LEED 3.0

Note: New registration for LEED v3.0 ended October 31, 2016. Projects registered under LEED v3.0 must be completed by June 30, 2021. New projects must register under v4.0.

## **SS Credit 7.2: Heat Island Effect, Roof (1 point)**

- Most manufacturers offer a wide variety of colors that meet steep slope roofs (>2:12)
- Most manufacturers offer whites that meet the requirements for low slope roofs (<=2:12)

## **EA Prerequisite 2: Minimum Energy Performance**

### **EA Credit 1, Optimize energy performance (Up to 19 points)**

- Must be at least 10% more energy cost efficient than ASHRAE 90.1 Appendix G baseline building

### **Credit MR 4.1 and 4.2 for Recycled content (Up to 2 points)**

# IMP ADVANTAGES FOR LEED 4.0

## Sustainable Sites: Heat Island Reduction, Roof (1 point)

- Most manufacturers offer a wide variety of colors that meet steep slope roofs (>2:12)
- Most manufacturers offer whites that meet the requirements for low slope roofs (<=2:12)

## Energy and Atmosphere Prerequisite : Minimum Energy Performance (Required)

## Energy and Atmosphere: Optimize energy performance (Up to 18 points)

- Whole building energy simulation: Must show at least 6% improvement over baseline building, for one point. Up to 50% improvement for 18 points

## Materials and Resources: Building Product Disclosure and Optimization – Environment Product Declarations (EPD's)

## Materials and Resources: Building Product Disclosure and Optimization – Sourcing of Raw Materials – Option 2 Recycled Content (1 point)



**INSULATED METAL PANELS**

# **IMPS & THE BUILDING ENVELOPE**

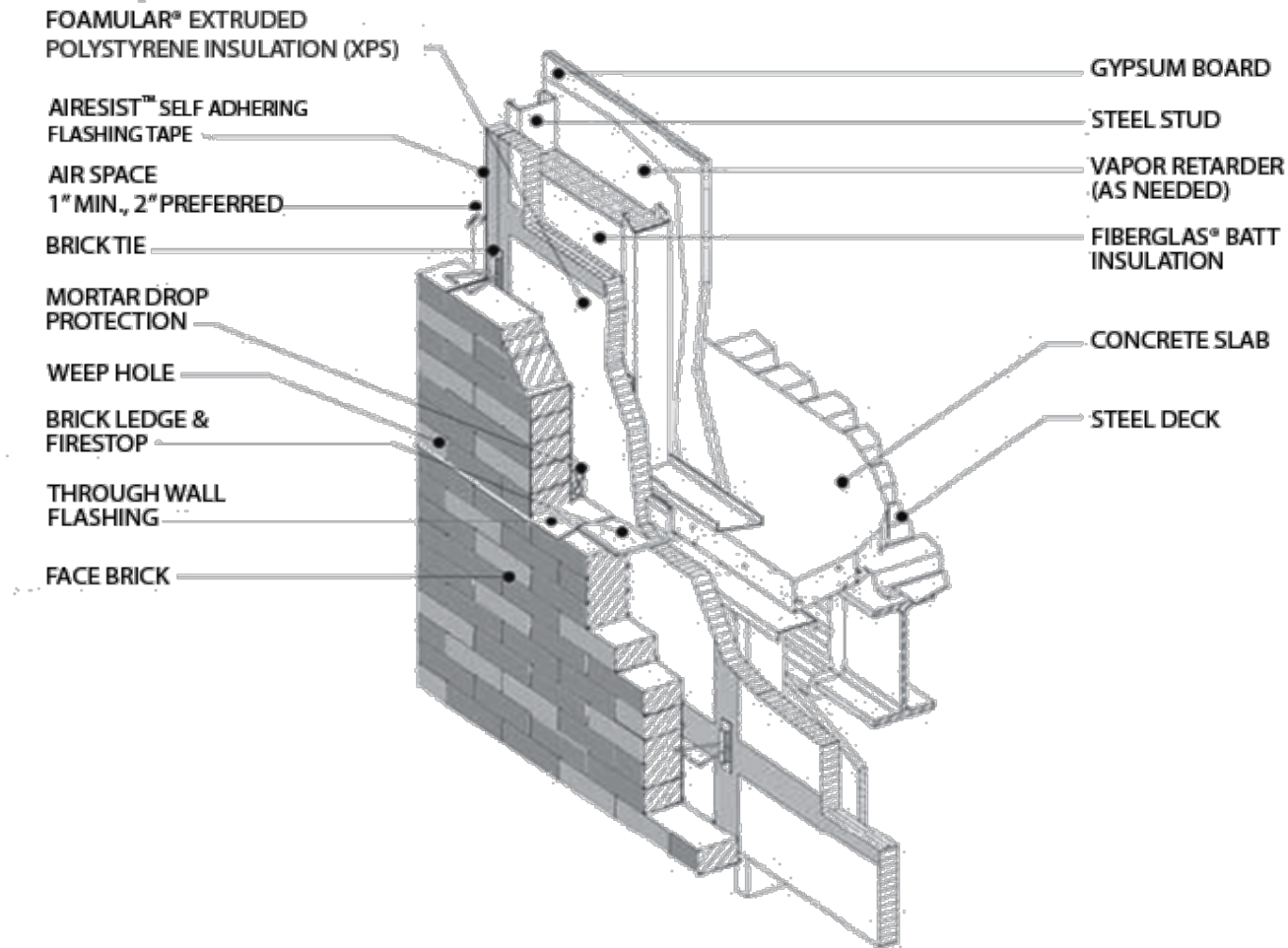


# SEALING OF THE BUILDING ENVELOPE

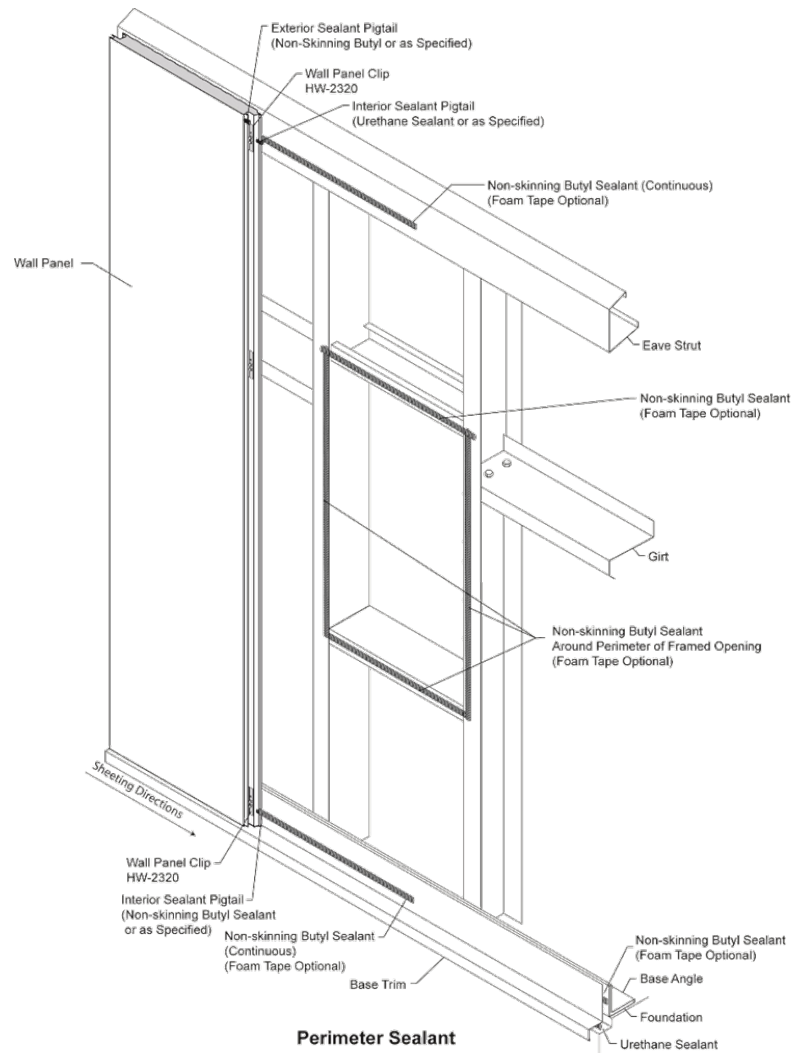
All penetrations, openings, joints and seams in the building envelope must be sealed. Materials that can be used include:

- Caulking
- Gasketing
- Tapes
- Moisture vapor-permeable wrapping material

# MATERIAL REQUIREMENTS FOR CONVENTIONAL WALL CONSTRUCTION

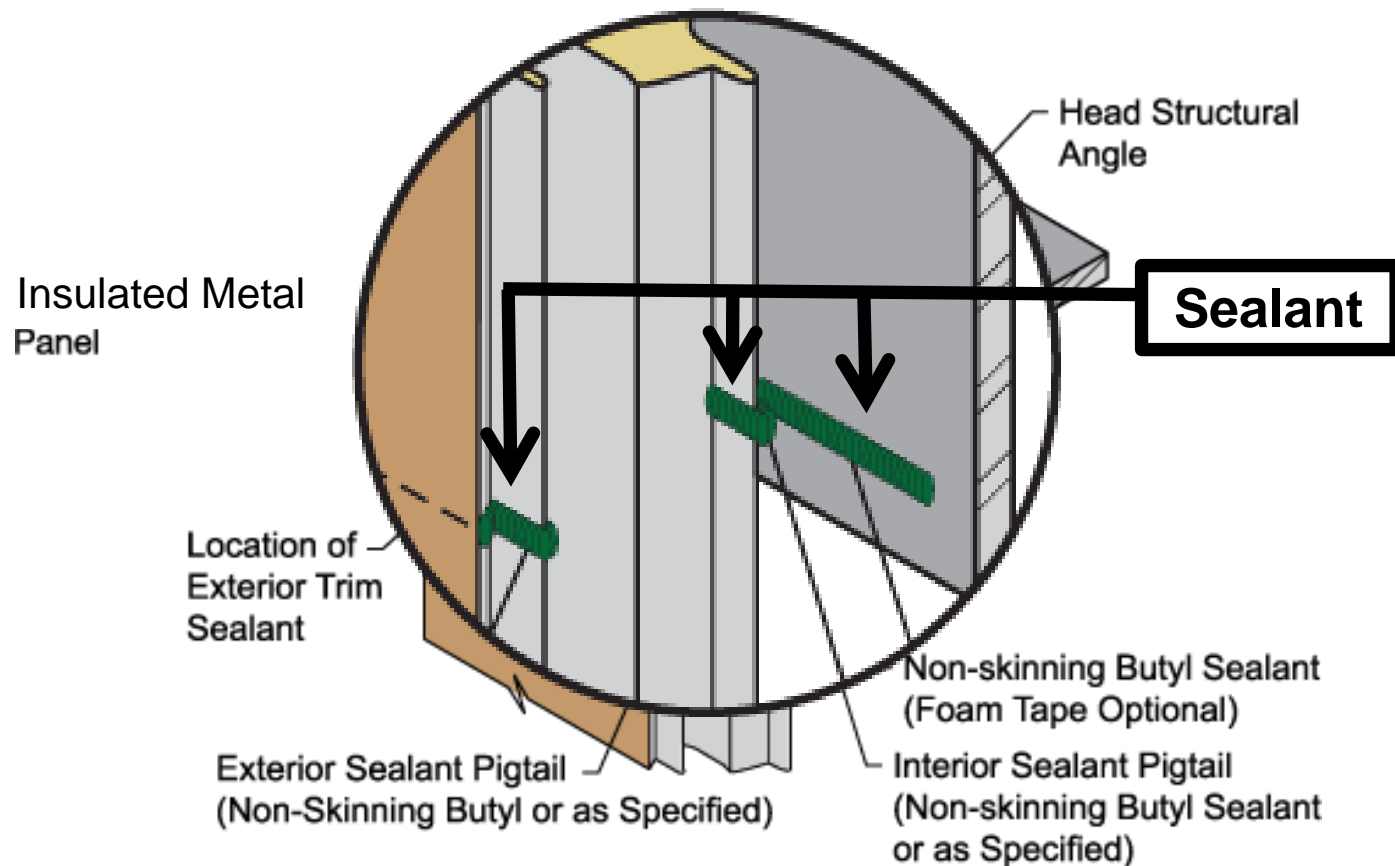


# CONTINUOUS INSULATION AND SEALING THE ENVELOPE: SEALANT DETAIL FOR IMP





# PANEL SEALANT DETAIL: SEALANT PIGTAIL AT HEAD JOINT





## **INSULATED METAL PANELS**

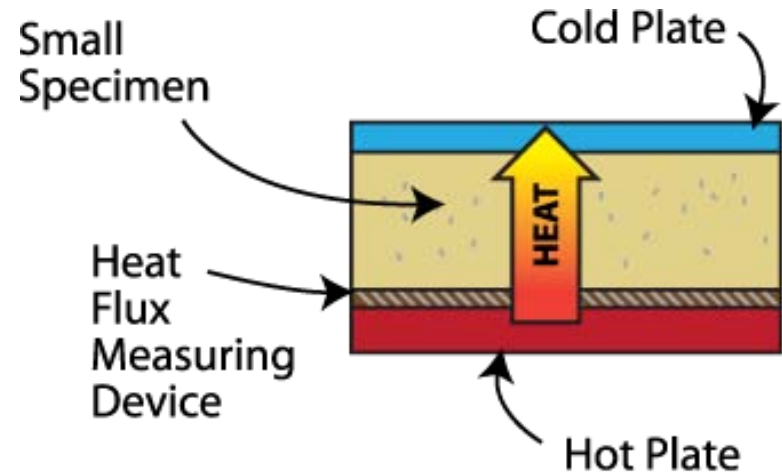
# **IMPORTANT SPECS YOU NEED TO KNOW**

# THERMAL RESISTANCE

One of two tests are commonly specified to determine assembly R-values:

## 1. ASTM C518

- Tests only the insulation in flat form – not profiled like the panel
- Measures one panel and no joints
- Heat flow measured with an electronic device



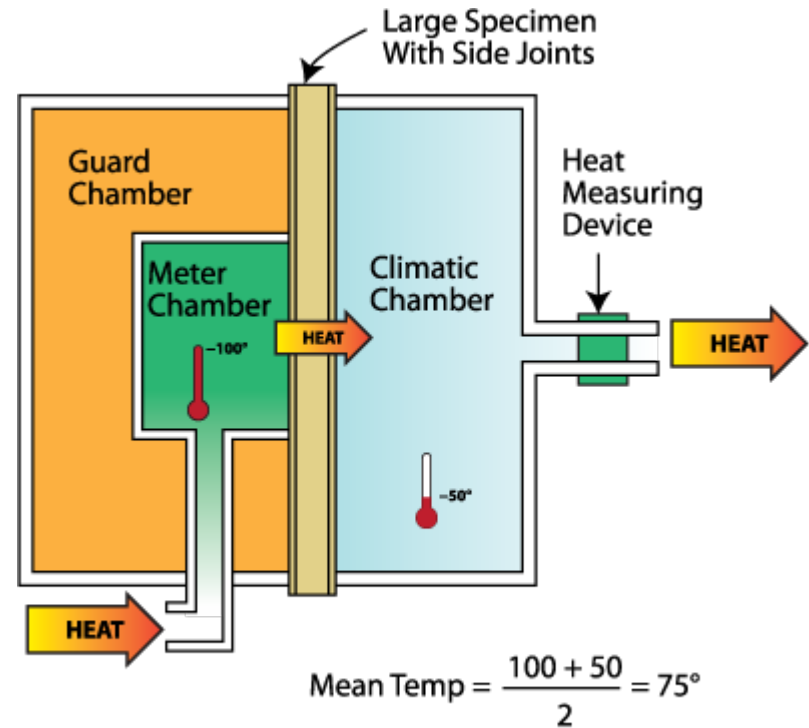
ASTM C518 Apparatus

# THERMAL RESISTANCE

One of two tests are commonly specified to determine assembly R-values:

## 2. ASTM C1363

- Tests a complete panel assembly, including profile effects.
- Measures three panels and two joints. Joint effects are included.
- Performed in a hot box. Heat flow is measured more accurately.



ASTM C1363 Apparatus

# THERMAL PERFORMANCE

## Foam thermal performance

- For a mean temperature of 75°F, IMPs have an R-Value of 7.0 or more per inch of thickness when tested to ASTM C1363
- The mean temperature will affect the results, a colder environment will improve the results
- Some manufacturers report R-Values at different temperatures
- R-Values at temperatures lower than 75°F are appropriate in design of refrigeration facilities, but not conditioned buildings



# AIR AND WATER INFILTRATION

	Air	Water
Roof	<p><b>ASTM E 1680</b></p> <p><b>Result:</b> Less than 0.023 cfm/sf at a static pressure difference of 12 psf</p>	<p><b>ASTM E 1646</b></p> <p><b>Result:</b> No uncontrolled water penetration at a static pressure difference of 12 psf</p>
Wall	<p><b>ASTM E 283</b></p> <p><b>Result:</b> No more than 0.0009 cfm/sf at a static pressure difference of 20 psf</p>	<p><b>ASTM E 331</b></p> <p><b>Result:</b> No uncontrolled water penetration at a static pressure difference of 20 psf</p>

AAMA 501.1 – Water Penetration



# FIRE & ENVIRONMENTAL TESTING

**ASTM E84 Surface Burning Characteristics** – Establish surface burning characteristics of the foam core – Flame Spread <25/Smoke Developed <145

**FM Std. 4880** – Class 1 fire rated insulated wall or wall and roof/ceiling panels, interior finish materials or coatings, and exterior wall systems in wall or wall and roof/ceiling constructions installed to maximum heights of 30 or 50 ft (9.1 or 15.2 m) or unlimited heights when exposed to an ignition source simulating a building fire.

**FM Std 4881,1.1.1** – Exterior wall systems are exposed to a number of natural hazards and must reject rain, wind, hail, water infiltration and other deleterious affects caused from everyday exposure to heat, cold, building movement and sunlight.

**FM Std 4881,1.1.2** – Exterior wall systems are also exposed to fire and must by able to limit fire propagation over and/or through the assembly.



# INSULATED METAL PANEL ADVANTAGES - REVIEW

- Come in a wide variety of colors, applied finish offerings, and profiles for buildings to be customized to meet the needs of both design and function.
- High R-Value – 7.0 or more per inch of panel thickness at 75° mean temp
- Qualifies as continuous insulation where required by IECC and ASHRAE 90.1
- Panels sealed at side laps and at all perimeter conditions
- ASHRAE/California compliant Cool Roof colors as listed on Cool Roof Rating Council (CRRC) Website.





THIS CONCLUDES THE AMERICAN INSTITUTE OF  
ARCHITECTS CONTINUING EDUCATION SYSTEMS PROGRAM

# QUESTIONS?

MBCI thanks you for your participation.

[www.mbc.com](http://www.mbc.com)



# OTHER AIA PRESENTATIONS AVAILABLE

- Standing Seam Metal Roofing Seminar - 1 Hr
- Standing Seam Roof Design Details & Weathertightness - 3 Hr
- The Devil Is In The Details – 1 Hr
- Retrofit Roof Systems – 1 Hr
- Retrofit Metal Roof Systems-Ensuring a Successful Project – 3 Hr
- A Review Of Metal Panel Warranties – 1 Hr