DEVELOPING MASONRY STRUCTURES TO MEET THE 7TH EDITION OF THE 2020 FLORIDA BUILDING CODE

Presented by Masonry Association of Florida, Oldcastle APG and Fi-Foil Company, Inc.

WHO ARE OUR PRESENTERS?

Lisa Pelham, CSI CDT

Oldcastle APG – Coastal

MAF Past President

Commercial Sales & Specifications

Lisa.Pelham@Oldcastle.com

Jan Bradford, CSI CDT

Fi-Foil Company

MAF Board Member

Director of Architectural Sales

JBradford@FiFoil.com

MISSION STATEMENT:

To continue as the trusted leader and innovator of reflective and radiant barrier insulation technologies; advancing sustainability, cost effectiveness, and the energy efficiency of buildings.

Masonry Association of Florida

WHO WE ARE

The Masonry Association of Florida (MAF) is a not-for-profit trade association dedicated to expanding the market share of masonry construction in Florida. Masonry construction dominates the construction industry because of its adaptability to the Florida climate. One of the most durable building products available, masonry resists storms, termites and mold, while reducing energy costs, maintenance and noise. The MAF is a coalition of Florida masonry industry professionals who believe it's time to bring our industry together.

THE MAF OFFERS

- Professional Education (Architects, Engineers, Contractors & Building Inspectors
- Masonry Apprentice Training
- Technical Assistance through our Engineering Help Desk & Technical Library

- For more: www.floridamasonry.com

Florida Concrete Masonry Education Council

Masonry Education and Advocacy

The Florida Concrete Masonry Education Council was created as a non-profit corporation under Rick Scott. Operating as a direct-support organization of the Dept. of Economic Opportunity.

Its directives include:

- Plan, implement and conduct programs of education in the field of concrete masonry
- Develop and improve access to education for individuals seeking employment in the field of concrete masonry
- Develop and implement outreach programs to ensure diversity among individuals trained in the programs
- Coordinate educational programs with national programs and programs of other states
- Inform and educate the public about the sustainability and economic benefits of concrete masonry products
- Develop, implement and monitor a system for the collection of self-imposed voluntary assessment on each concrete masonry unit produced and sold by the concrete manufacturers in the state

Block Strong Initiative

www.blockstrong.com

Designed to make sure everyone - consumer, construction professional and designer understand the vital link between quality building materials and the health and safety of people living and working in the homes and structures that they design and build. It also aids prospective homebuyers in their search for knowledge on the best products for their homes.

Oldcastle Divisions

Oldcastle Building Envelope

Oldcastle Infrastructure

Oldcastle APG

Oldcastle Materials

Fi-Foil, Oldcastle APG and MAF are registered providers with the American Institute of Architects Continuing Education Systems. Credit earned upon completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request. This program is registered with the 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. In order to maintain a high-quality learning experience for our members, a REQUIRED, course evaluation will be distributed and collected at the end of this education session.

AIA COURSE DESCRIPTION

Concrete masonry coupled with effective insulation solutions are valuable strategies for the ever-changing design environment. Attendees of this one-hour HSW presentation will gain a better understanding of the compliance paths used for meeting the 7th Edition of the 2020 Florida Building Code, regarding mass wall assemblies.

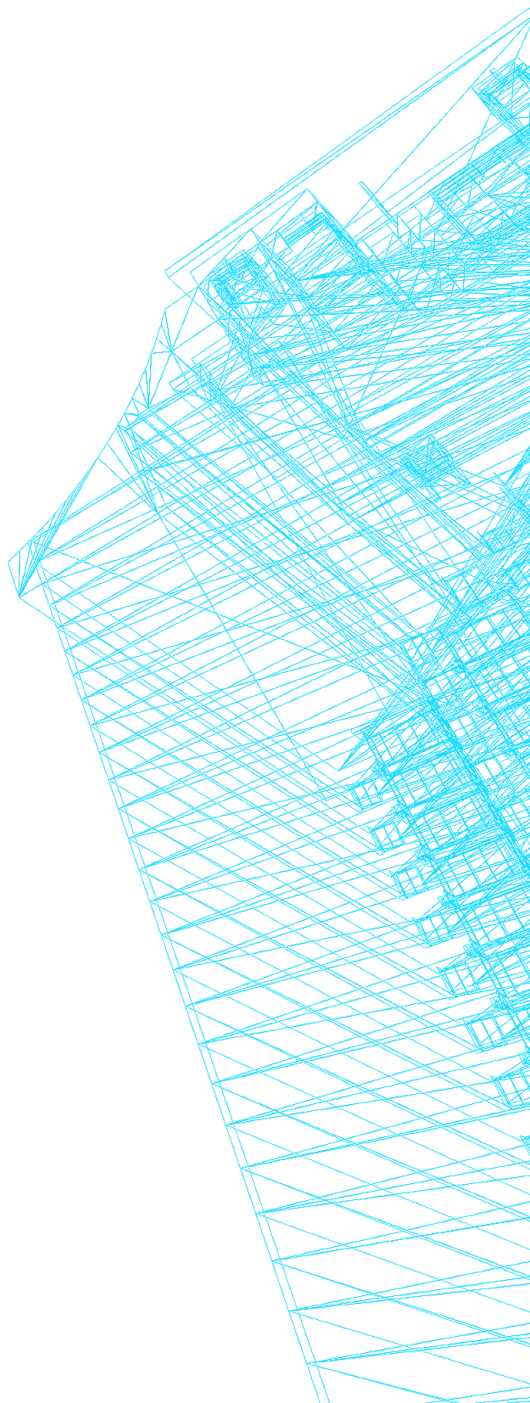
In addition, this course reviews the criteria for selecting proper insulation remedies, while addressing air and vapor transmission. Lastly, participants will understand methods and procedures to ensure a more sustainable and resilient building envelope.

LEARNING OBJECTIVES

- Design an effective and economical thermal envelope that meets the requirements outlined in the 7th Edition of the 2020 Florida Building Code.
- Select the best insulation solutions for energy efficient mass walls.
- Address vapor transmission and air leakage within the thermal envelope.
- Utilize strategies discussed to achieve a more sustainable, resilient and overall robust building envelope.

LEARNING OBJECTIVE 1

Design an effective and economical thermal envelope that meets the requirements outlined in the 7th Edition of the 2020 Florida Building Code.



THE PATH TO IECC COMPLIANCE

KEY CONSIDERATIONS

Commercial v. Residential Project

Climate Zone

Wall Type

Compliance Path

IECC ENERGY CODE – THE BASICS

WHAT IS THE IECC?

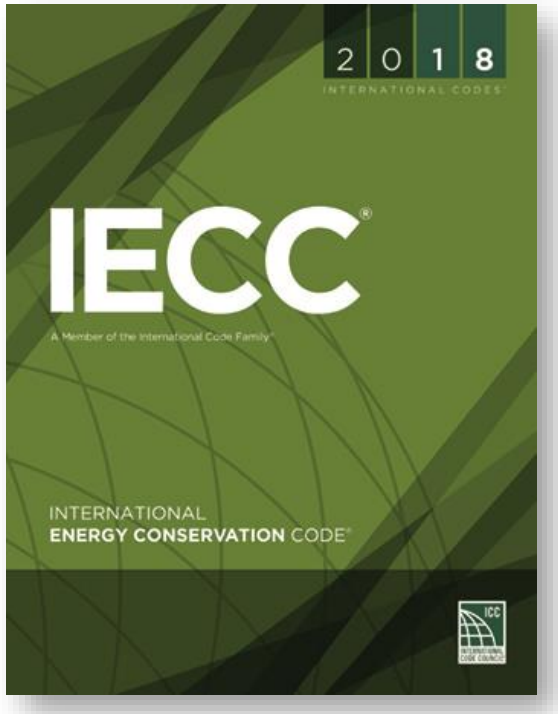
International **Energy Conservation** Code

Incorporated by International Building Code (IBC)

Related to International **Residential** Code

Applies to both **commercial** and **residential**

Draws on **ANSI/ASHRAE/IESNA Standard 90.1** – key standard adopted by Department of Energy



IECC ENERGY CODE – THE BASICS

Classifies the buildings Use and Occupancy, to help identify fire safety and relative hazard involved.

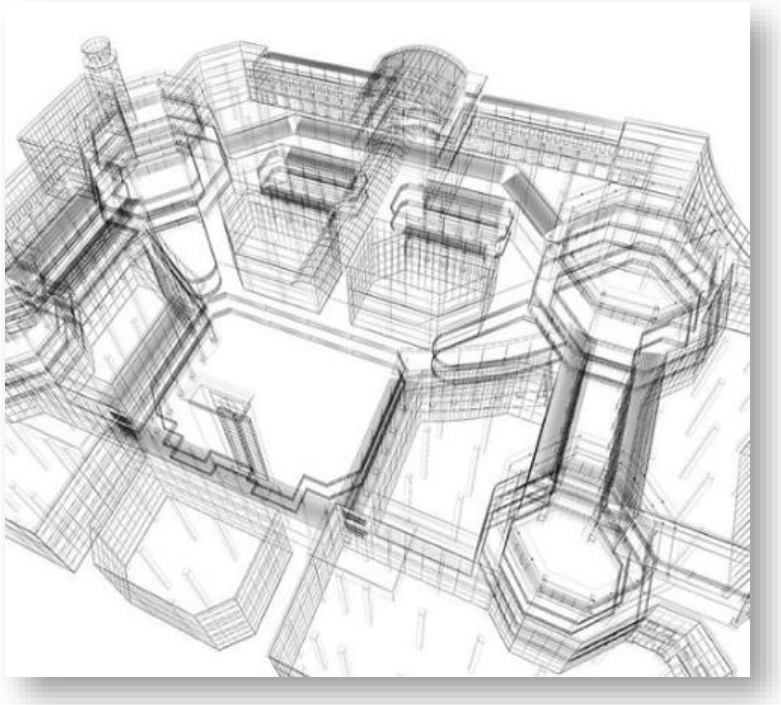
SECTION 310 - RESIDENTIAL GROUP R

R1 Hotels and Motels

R2 Apartments and Dormitories

R3 Single Detached Houses and Duplexes

R4 Assisted Living & Care Facilities
(5 – 15 occupants)



DEFINING RESIDENTIAL GROUP R OCCUPANCY CLASSIFICATION

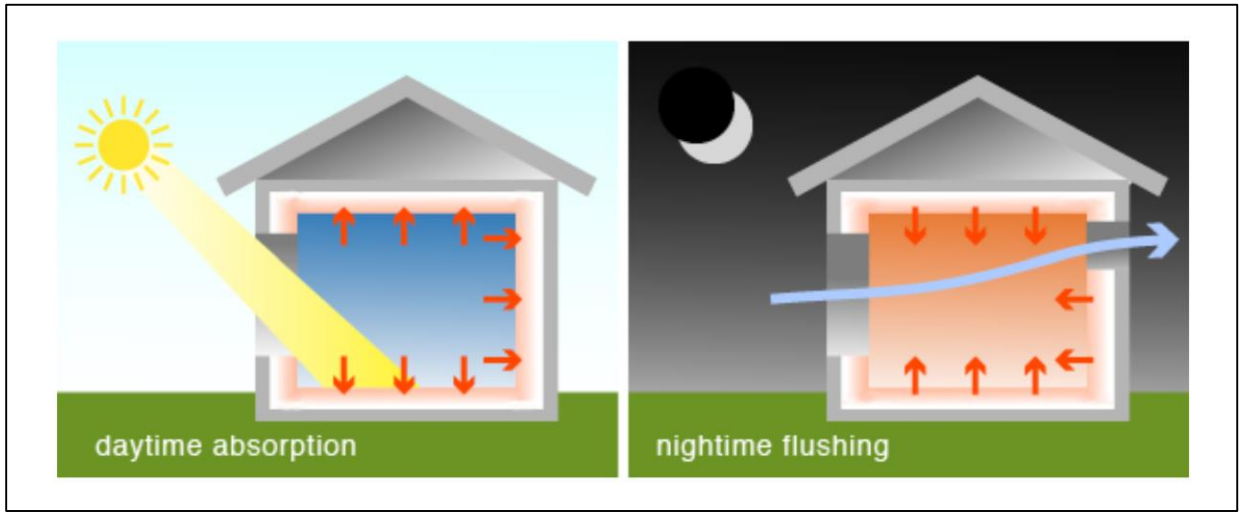
- **Residential Group R-1**. Residential Group R-1 occupancies containing sleeping units where the occupants are primarily transient in nature.
- **Residential Group R-2**. Residential Group R-2 occupancies containing sleeping units or more than two dwelling units where the occupants are primarily permanent in nature.
- **Residential Group R-3**. Residential Group R-3 occupancies where the occupants are primarily permanent in nature, not covered under R-1, R-2 or R-4.
- **Residential Group R-4**. Residential Group R-4 occupancy shall include buildings, structures or portions thereof for 5-15 persons, who reside on a 24-hour basis in a supervised residential environment and receive custodial care.

HOW DOES CMU ADDRESS ENERGY EFFICIENCY IN THE BUILDING ENVELOPE?

- Thermal Mass
  - The ability for a material to absorb heat energy.
    - Applicable to all Zones, but greater benefits are found in warmer climates
- Thermal Resistance
  - Steady State Thermal Characteristics
    - Size, Type and Density of CMU
    - Insulation
    - Finish Materials
    - Grouting
- Thermal Conductivity
  - The rate at which heat passes through
    - Size, Type and Density of CMU
    - Temperature
    - Moisture Content

WHAT IS THERMAL MASS?

Due to concrete masonry units thermal mass, a building constructed with concrete block holds heat longer in cool weather, and cool air inside for longer periods, even in the dead of summer. With airtight walls, concrete block also reduces wall leaks, which prevents energy loss and could lower your heating and cooling bills by 50 percent.



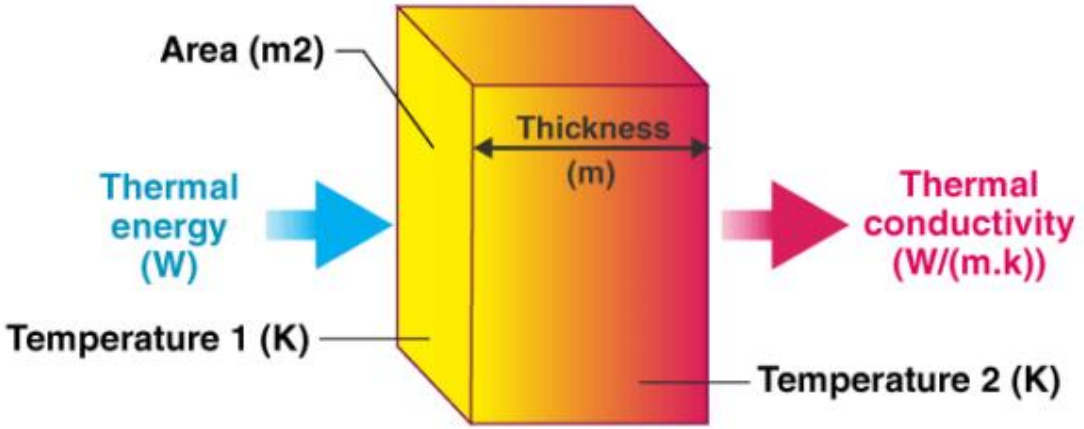
WHAT IS THERMAL RESISTANCE?

Thermal mass is not to be confused with R-value, also known as thermal resistance. R-value is expressed as the thickness of the material divided by the thermal conductivity.[2] R-values and U factors (thermal transmittance) do not take into account the effects of thermal mass, and by themselves are inadequate in describing the heat transfer properties of construction assemblies with significant amounts of thermal mass such as concrete masonry.

WHAT IS THERMAL CONDUCTIVITY?

Thermal Conductivity is the rate at which heat passes through a material; the conductivity is dependent on the temperature, density and moisture content of the product. The thermal conductivity for concrete masonry units is much higher than the thermal conductivity of air.

The energy consumption of buildings is dependent on the thermal conductivity of the building materials.



WHAT ARE THE TWO COMPLIANCE METHODS FOR FL COMMERCIAL CODE?

- Prescriptive requirements have pre-assigned minimums for each component of the building.

  [Outlined in Section C402]

- Performance-based compliance allows customization and assigns points for each selection.

  [Outlined in Section C407]

COMMERCIAL R-VALUE METHOD TABLE
COMMERCIAL U-FACTOR METHOD TABLE

TABLE C402.1.3 OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD[a]

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-35ci	R-35ci	R-35ci	R-35ci
Metal building[a, b]	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS	R-30 + R-11 LS
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49	R-49	R-49	R-49
Walls, above grade																
Mass	R-5.7ci[c]	R-5.7ci[c]	R-5.7ci[c]	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci	R-13.3ci	R-15.2ci	R-15.2ci	R-15.2ci	R-25ci	R-25ci
Metal building	R-13+ R-6.5ci	R-13 + R-6.5ci	R13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13+ R-19.5ci	R-13 + R-13ci	R-13+ R-19.5ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-15.6ci	R-13 + R-7.5ci	R-13+ R17.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R-13 + R-7.5ci or R-20 + R-3.8ci	R13 + R-15.6ci or R-20 + R-10ci	R13 + R-15.6ci or R-20 + R-10ci

TABLE C402.1.4 OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD[a, b]

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6		7		8	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs																
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.028	U-0.028	U-0.028	U-0.028
Metal buildings	U-0.044	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.031	U-0.029	U-0.029	U-0.029	U-0.029
Attic and other	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.027	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021	U-0.021
Walls, above grade																
Mass	U-0.151	U-0.151	U-0.151	U-0.123	U-0.123	U-0.104	U-0.104	U-0.090	U-0.090	U-0.080	U-0.080	U-0.071	U-0.071	U-0.061	U-0.061	U-0.061
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052	U-0.052
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.057	U-0.064	U-0.052	U-0.045	U-0.045
Wood framed and other[c]	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.051	U-0.051	U-0.051	U-0.051	U-0.036	U-0.036

WAIT, WHAT'S A "MASS WALL"?

MASS WALLS CHARACTERISTIC OPTIONS:

(IECC 2006 – 2015)

Weight of ≥ 35 lb./ft^2

Weight of ≥ 25 lb./ft^2 where material weight is ≤ 120 lb./ft^3

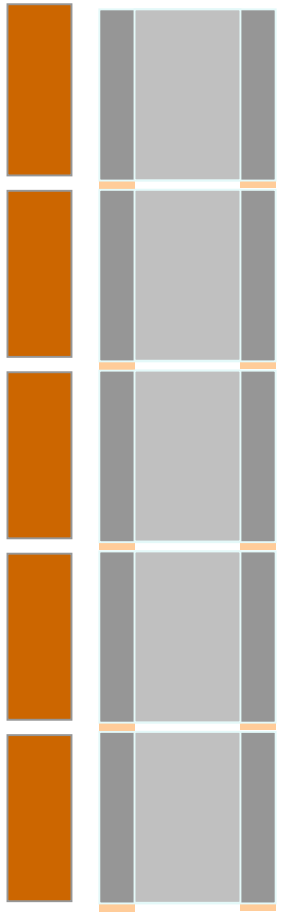
(IECC 2015)

Heat capacity > 7 BTU/ft^2 (°F)

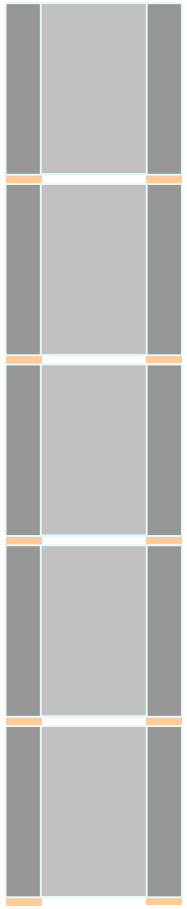
Heat capacity > 5 BTU/ft^2 (°F) where material weight is ≤ 120 lb./ft^3

NATIONAL NCMA CONCRETE MASONRY ASSOCIATION

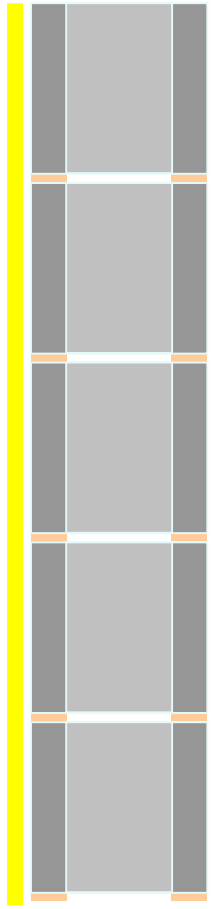
TYPES OF MASS WALLS



Double Wythe

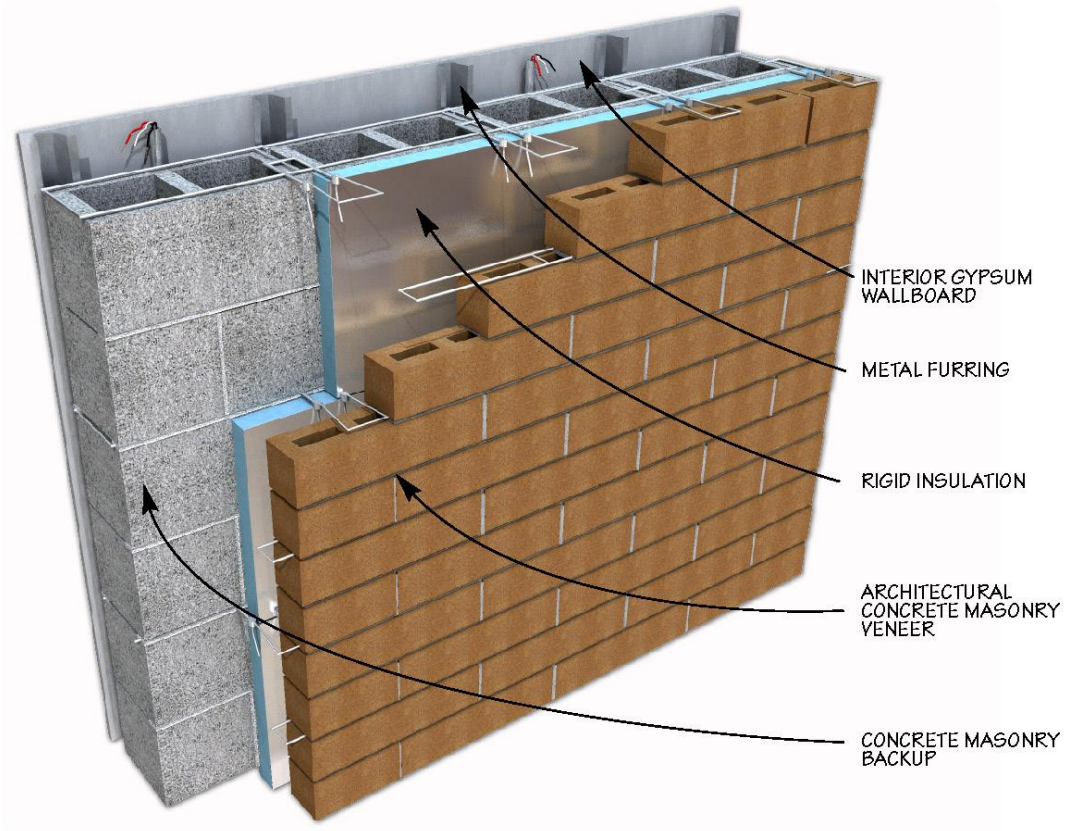


Single Wythe



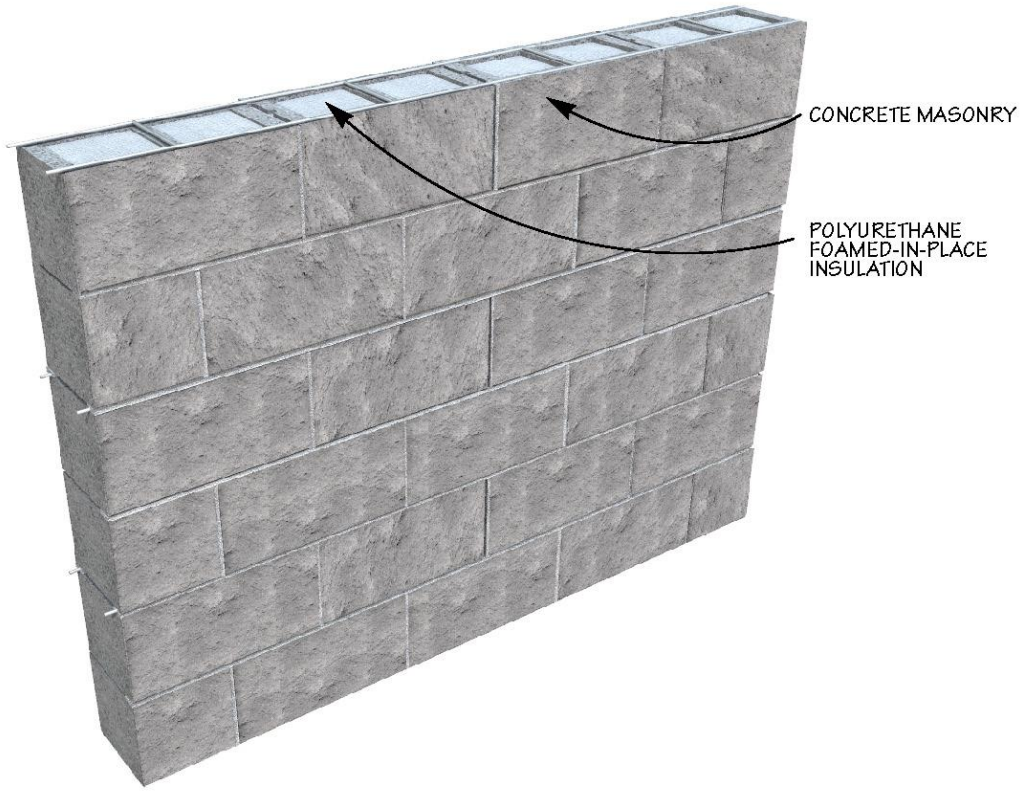
Surface Bonded

INSULATED CAVITY WALL



- R-Value
- Continuous Insulation
- Water Management
- Cost

INSULATED IN THE CELLS SINGLE WYTHE



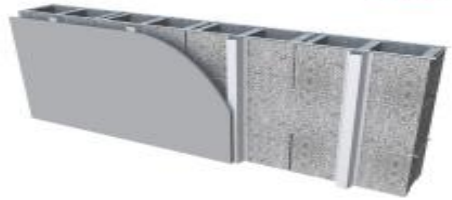
R-Value

Continuous Insulation

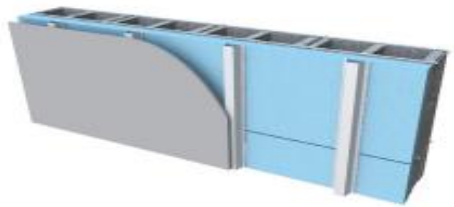
Water Management

Cost

Table 4—R-Values of Finish Systems[A]



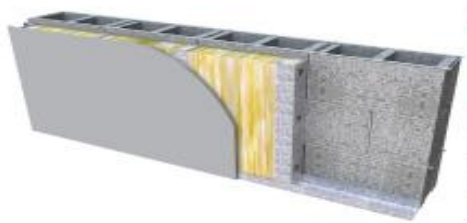
Gypsum wallboard:	R-value, hrft²·°F/Btu·in
½ in. gypsum board on furring [B]	1.1
½ in. foil-faced gypsum board on furring [C]	2.9



Continuous rigid insul., ¾-in. min. furring (for electrical rough-in) & ½-in. gypsum:	R-value, hrft²·°F/Btu·in
¾ in. extruded polystyrene[B]	4.9
¾ in. polyisocyanurate[C]	7.4
1 in. extruded polystyrene[B]	6.1
1 in. polyisocyanurate[C]	9.0
1½ in. extruded polystyrene[B]	8.6
1½ in. polyisocyanurate[C]	12.8
2 in. extruded polystyrene[B]	11.1
2 in. polyisocyanurate[C]	16.7
2½ in. extruded polystyrene[B]	13.6
2½ in. polyisocyanurate[C]	20.1
3 in. extruded polystyrene[B]	16.1
3 in. polyisocyanurate[C]	23.5

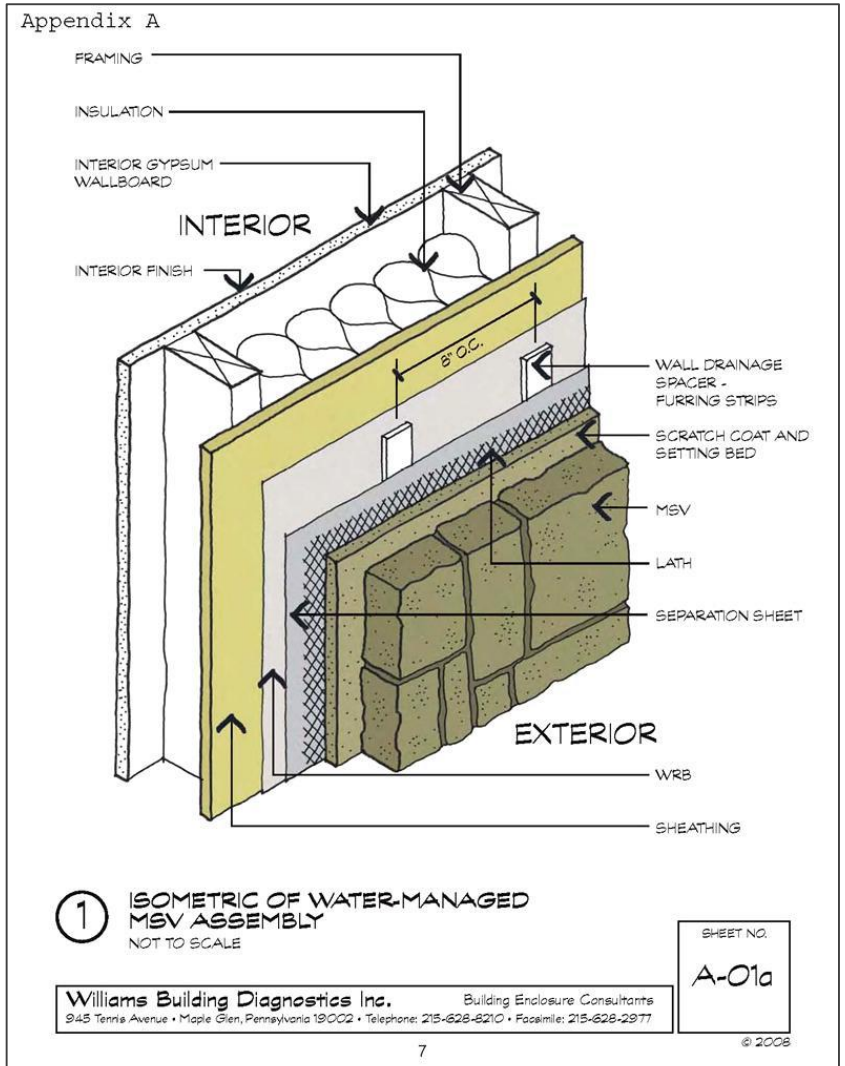
Continuous polyisocyanurate, heavy duty (HD) (joints taped or butt caulked) attached directly to masonry:	R-value, hrft²·°F/Btu·in
2 in.	13.0
2½ in.	15.8
3 in.	19.0
3½ in.	22.0

EIFS (rigid insulation and 5/16 in. (7.9 mm) synthetic stucco):	R-value, hrft²·°F/Btu·in
1 in. polyisocyanurate (glass fiber faced)	6.8
1½ in. expanded polystyrene	6.3
2 in. expanded polystyrene	8.3
2 in. extruded polystyrene	10.3
2 in. polyisocyanurate (glass fiber faced)	13.3
2½ in. extruded polystyrene	12.8
3 in. expanded polystyrene	12.3
3 in. polyisocyanurate (glass fiber faced)	19.3



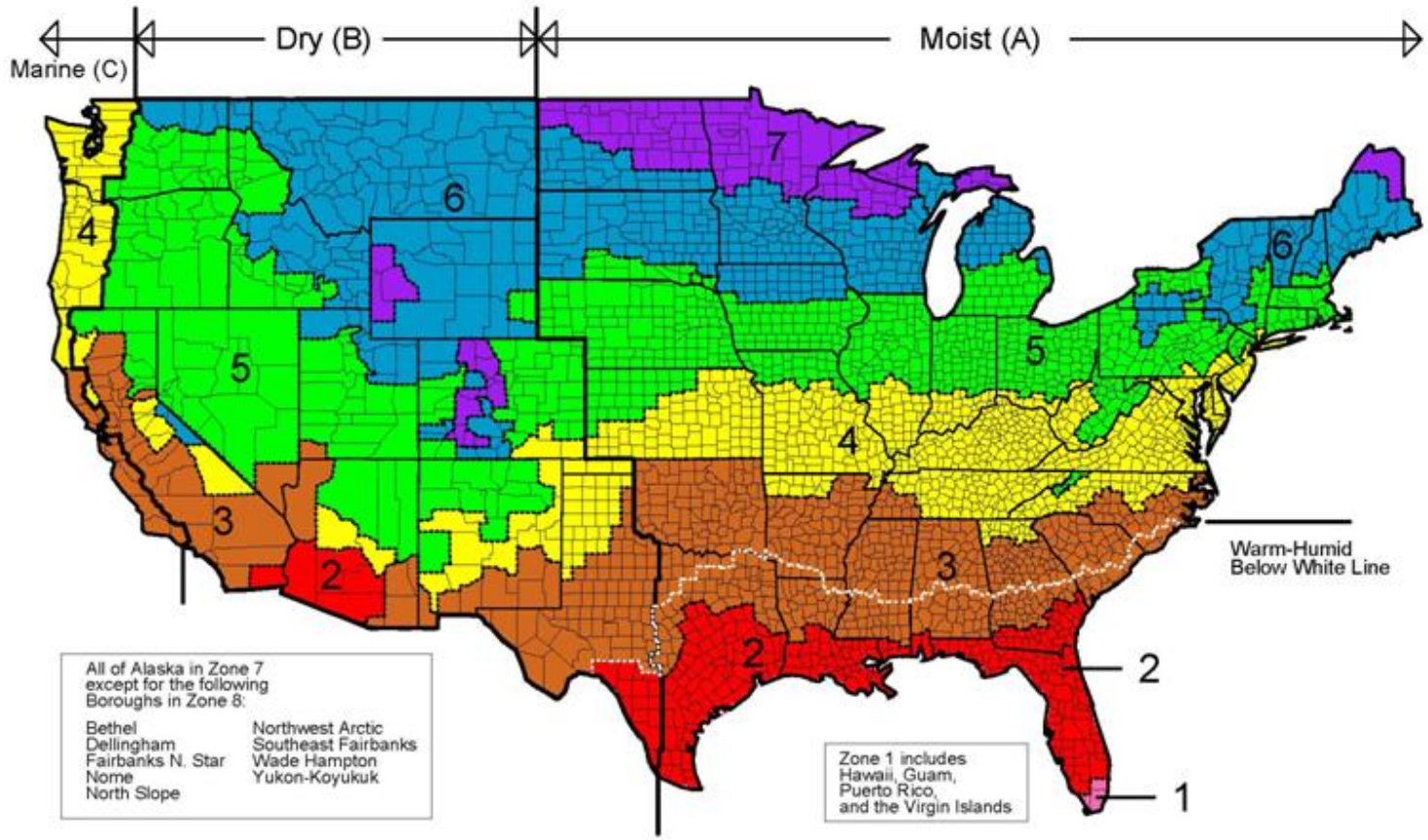
Metal furring at 24 in. o.c., insulation (between furring), and ½ in. gypsum wallboard[D]:	R-value, hrft²·°F/Btu·in
R-11 batt [E]	6.6
R-13 batt [E]	7.2
R-15 batt [E]	7.8
R-19 batt [E]	8.6
R-21 batt [E]	9.0

ADHERED VENEER



- R-Value
- Continuous Insulation
- Water Management
- Cost

Climate Zones in United States of America



R-VALUE/U-FACTOR METHOD TABLE C402 MASS WALL INSULATION REQUIREMENTS

Table C402.1.3 – Opaque Thermal Envelope Insulation Component Minimum Requirements, R-Value Method:

- Zone 1 /Group R = R-5.7ci*
- Zone 2/Group R = R-7.6ci*

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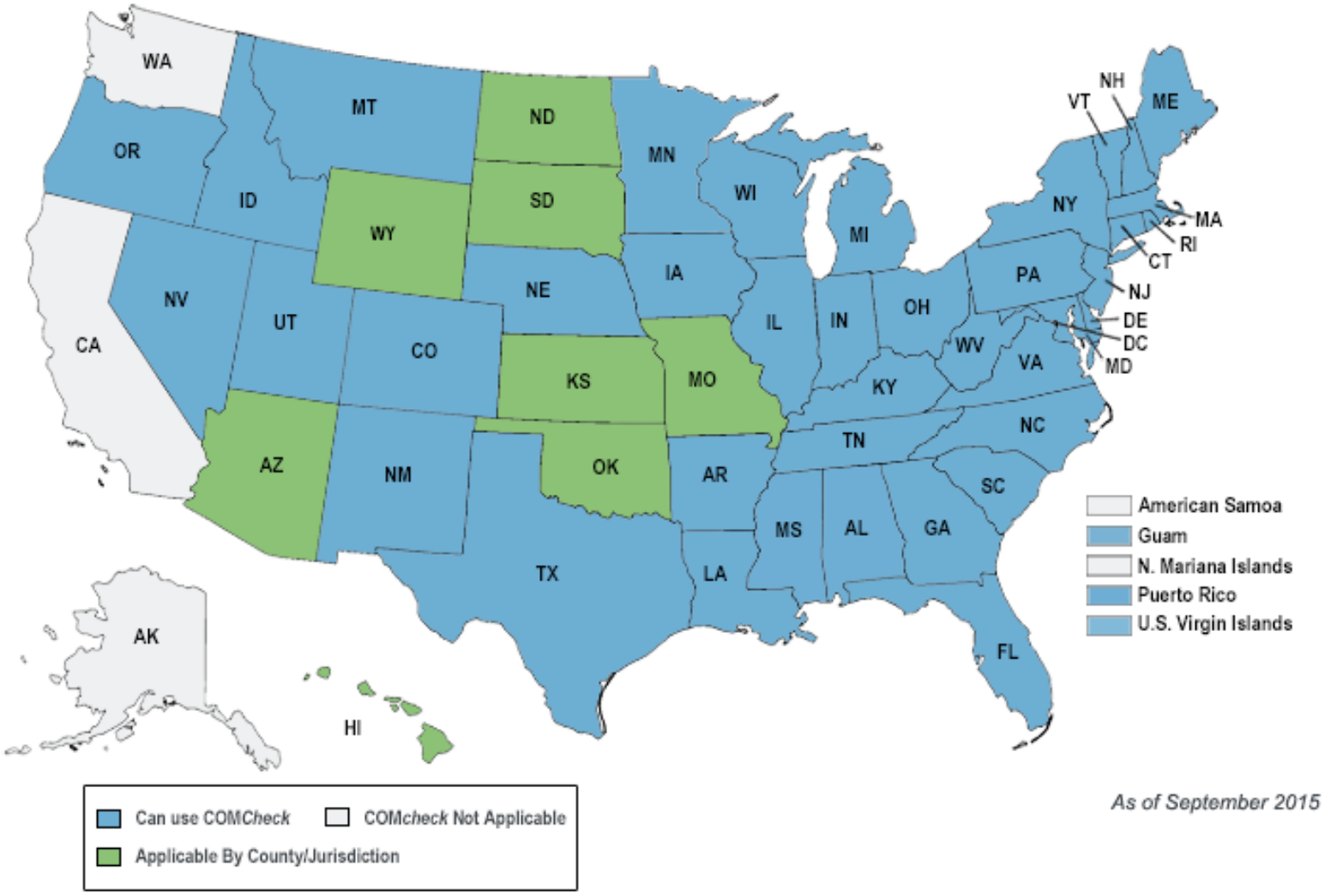
*ci = continuous insulation

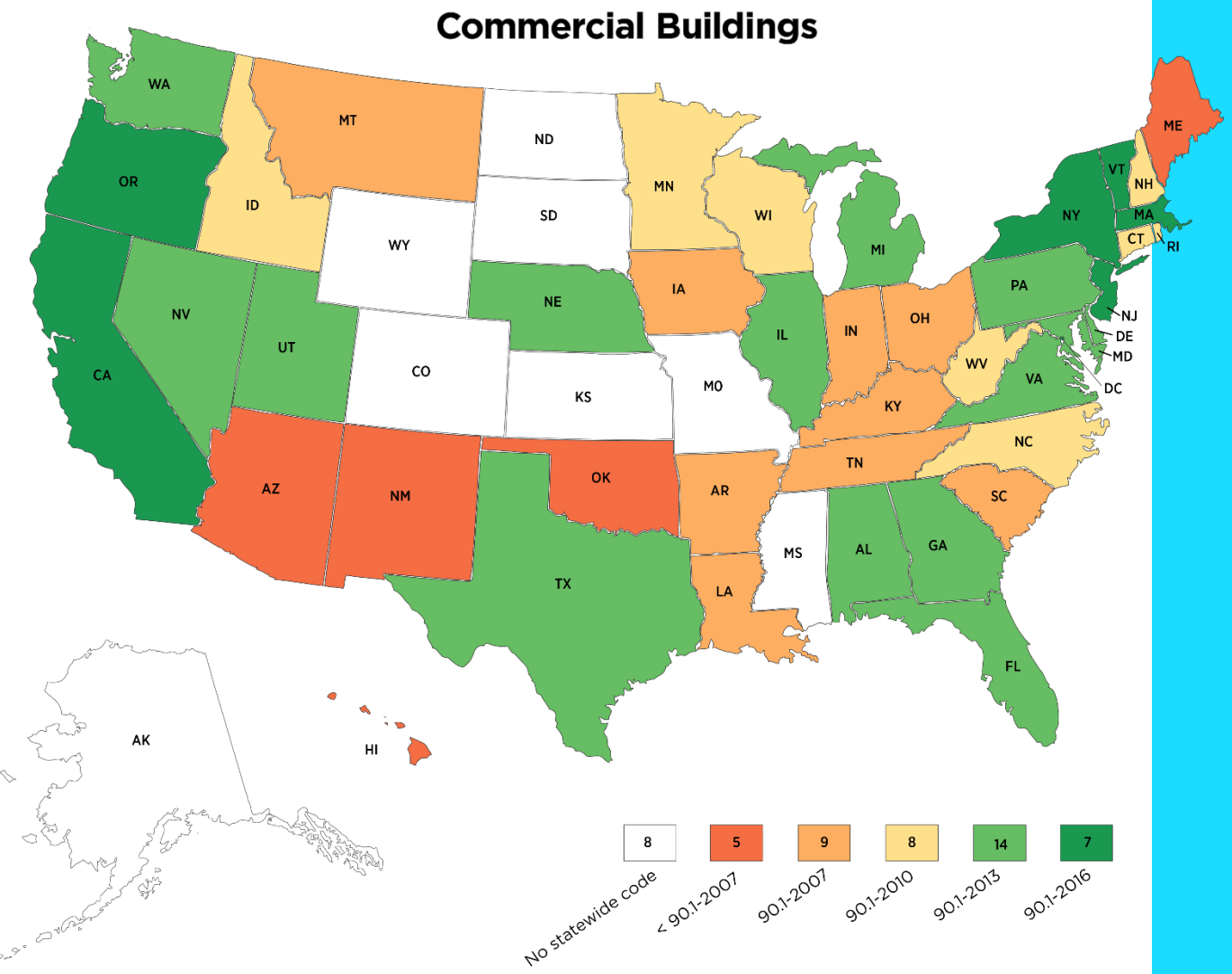
Table C402.1.4 – Opaque Thermal Envelope Assembly Maximum Requirements, U-Factor Method:

- Zone 1 /Group R = U-0.151
- Zone 2/Group R = U-0.123

STATES THAT CAN USE COMCHECK



EnergyGauge Summit

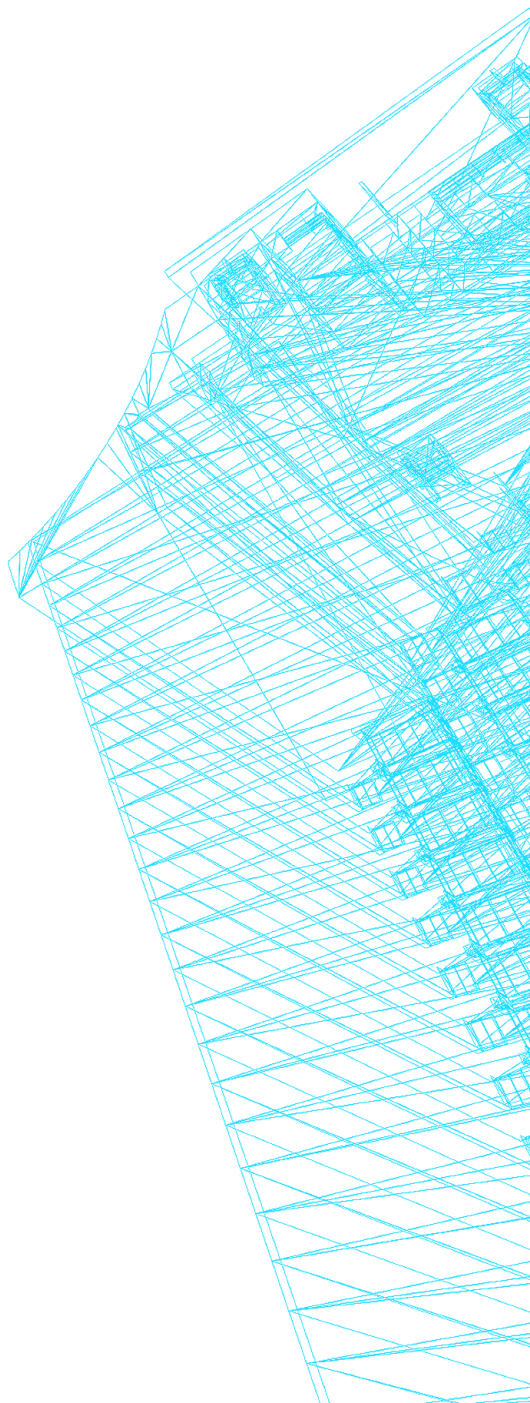


ENERGY CODES

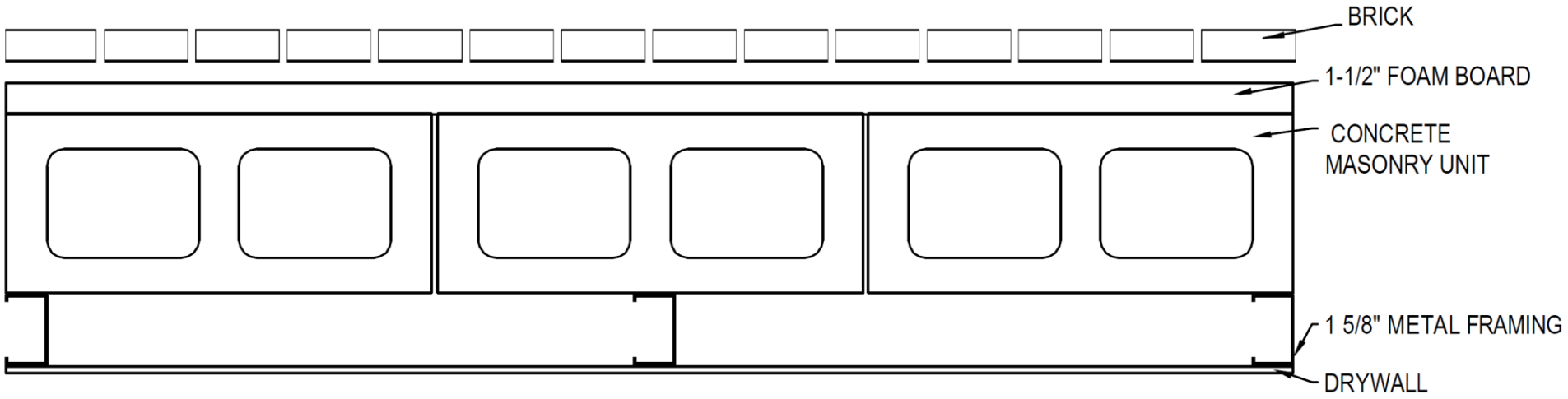
- Energy cost savings to Florida resulting from the state updating its commercial and residential building energy codes in accordance with federal law are significant estimated to be on the order of nearly $720 million annually by 2030.
- Building energy codes will save US homes and business owners an estimated $126 Billion and 814 metric tons of avoided carbon dioxide emissions through 2040.

LEARNING OBJECTIVE 2

Select the best insulation solutions for energy efficient mass walls.



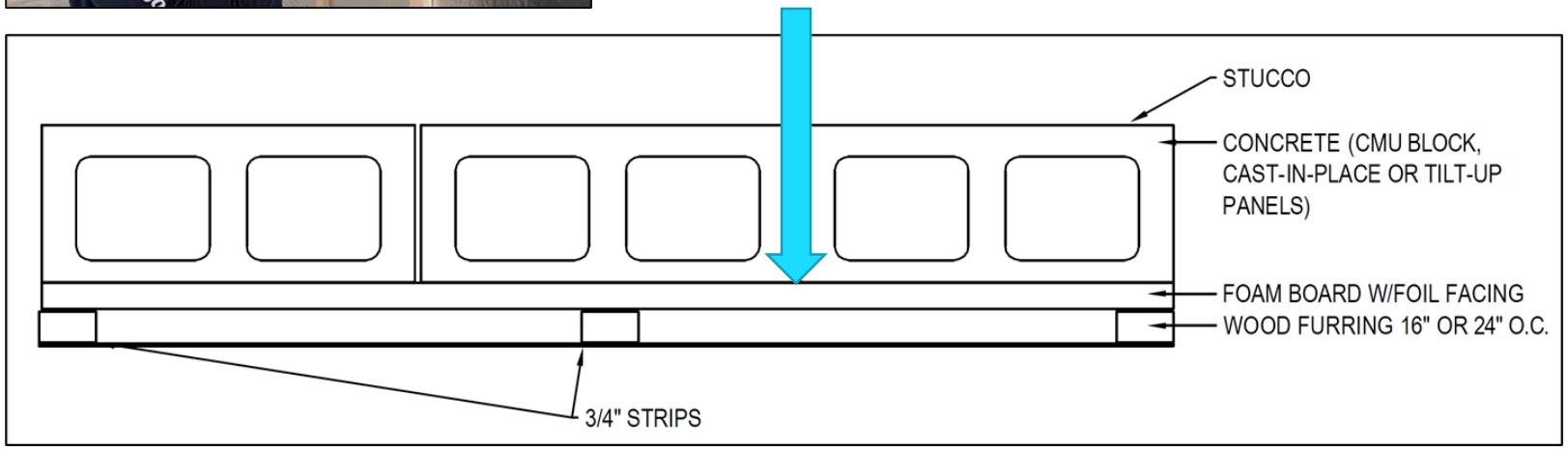
MEETING PRESCRIPTIVE CODE, R-VALUE METHOD (DOUBLE WYTHE)



Zone 2/Group R = R-7.6ci;
Includes 1-1/2 foam board adhered to the exterior of CMU block wall

MEETING PRESCRIPTIVE CODE, R-VALUE METHOD (SINGLE WYTHE)

Zone 2/Group R = R-7.6ci;
Includes 1-1/2” foil-faced foam board adhered to the CMU block wall, and wood furring is installed over the foil-faced foam board.
Note: Foil surface must face the air space.



HOW R-VALUES ARE GENERATED WITH FOIL-FACED FOAM BOARD?

PERFORMANCE DATA

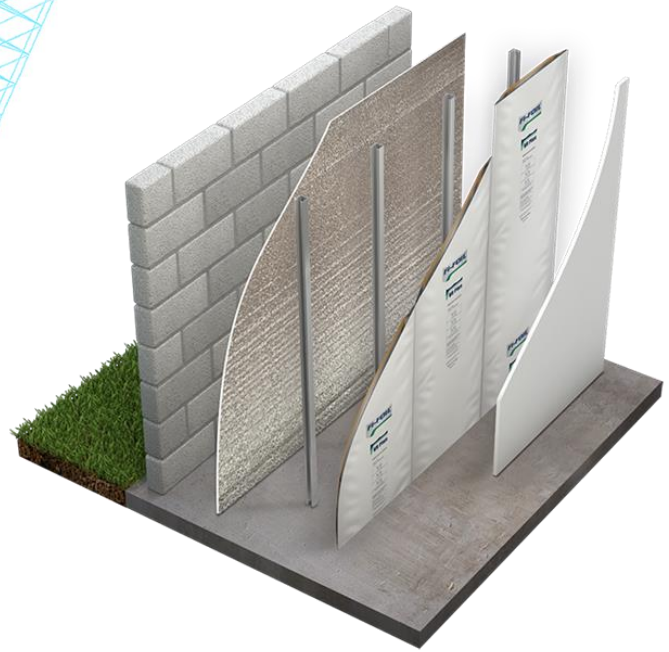
Table 1: Thermal Performance

THICKNESS (in)	R-VALUE U.S.[1] (°F•ft²•h/BTU)	THICKNESS (mm)	RSI-VALUE[1] (°K•m²/W)	BOARD SIZE (ft)	R-VALUE WITH REFLECTIVE AIR SPACE[2]		
					½" Air Space	¾" Air Space	1" Air Space
0.50	2.7	13	0.48	4 x 8, 9, or 10	5.2	5.5	5.4
0.62	3.5	16	0.62	4 x 8, 9, or 10	6.0	6.3	6.2
0.75	5.0	19	0.88	4 x 8, 9, or 10	7.5	7.8	7.7
1.00	6.0	25	1.06	4 x 8, 9, or 10	8.5	8.8	8.7
1.20	7.5	31	1.32	4 x 8, 9, or 10	9.9	10	10
1.50	9.3	38	1.63	4 x 8, 9, or 10	12	12	12
1.55	9.6	39	1.69	4 x 8, 9, or 10	12	12	12
1.65	10	42	1.82	4 x 8, 9, or 10	13	13	13
2.00	13	51	2.21	4 x 8, 9, or 10	15	15	15
2.50	16	64	2.79	4 x 8, 9, or 10	18	19	19
3.00	19	76	3.36	4 x 8, 9, or 10	22	22	22
3.50	22	89	3.94	4 x 8, 9, or 10	25	25	25
4.00	26	102	4.52	4 x 8, 9, or 10	28	28	28
4.50	28	114	5.09	4 x 8, 9, or 10	30	31	31

[1] *Aged R-value at 75° F in accordance with ASTM C1289.*
[2] *Only applies when an ideal reflective air space and horizontal heat flow conditions exist. The shiny foil side of product must face the air space. Determined in accordance with FTC 16 CFR Part 460 requirements and published ASHRAE air space R-values. Refer to the 2009 ASHRAE Handbook of Fundamentals, Chapter 25, Table 3, for details.*

- The size of framing determines the size of the reflective air space, which determines the R-value with reflective air space generated.

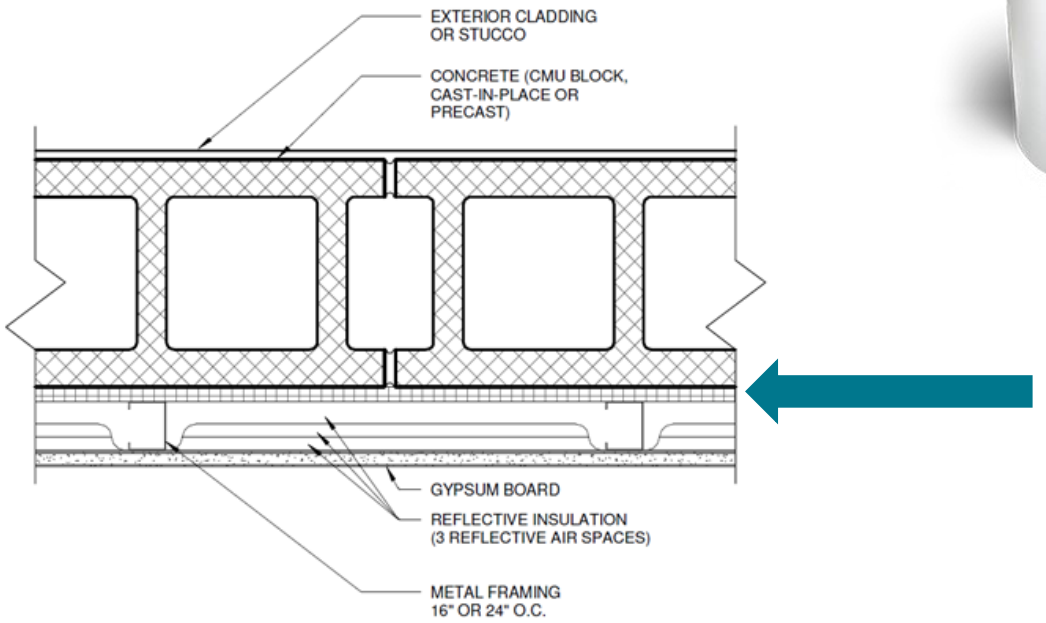
MEETING PRESCRIPTIVE CODE, U-FACTOR METHOD



Zone 2/Group R = U-0.123

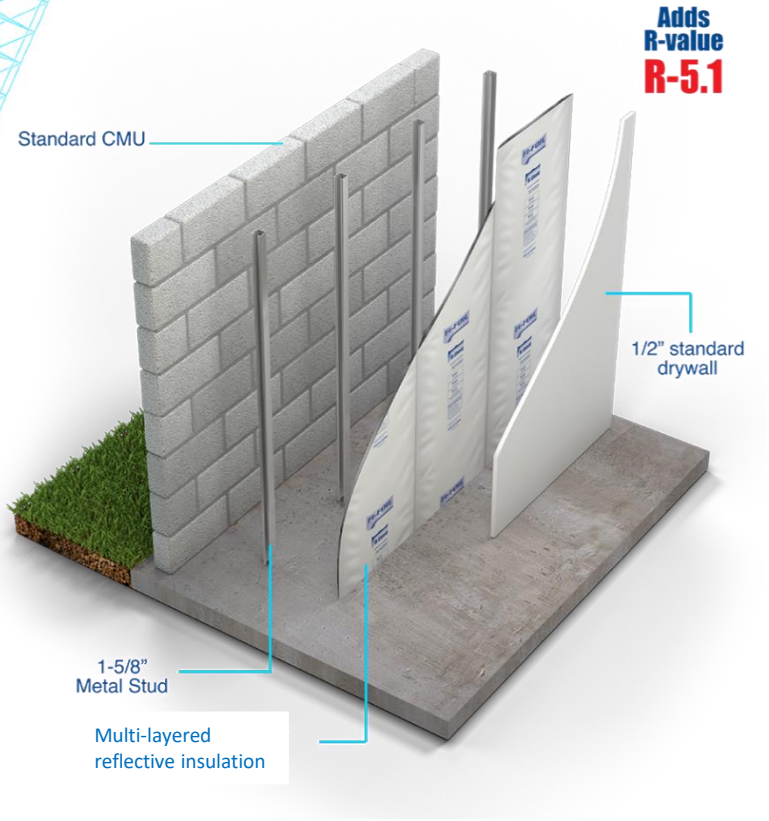
Reflective continuous insulation (R-1.6) adhered to the CMU block wall, and metal framing is installed over the ci. Then a double-layer multi-layered reflective insulation is adhered to the metal framing directly behind the drywall.

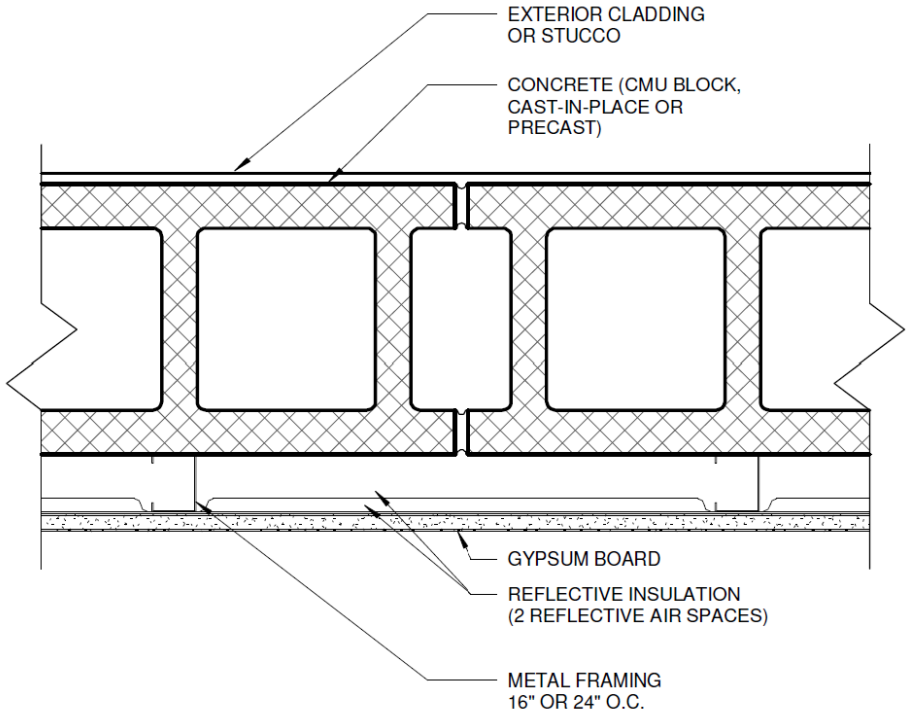
Note: Reflective layers must open into the cavity.



MEETING PERFORMANCE-BASED COMPLIANCE, FOR MASS WALL

R-5.1 over 1-1/2” or 1-5/8” metal Framing;
CMU block wall with metal framing. Then a single-layer multi-layered reflective insulation is adhered to the metal framing directly behind the drywall.
Note: Reflective layers must open into the cavity.

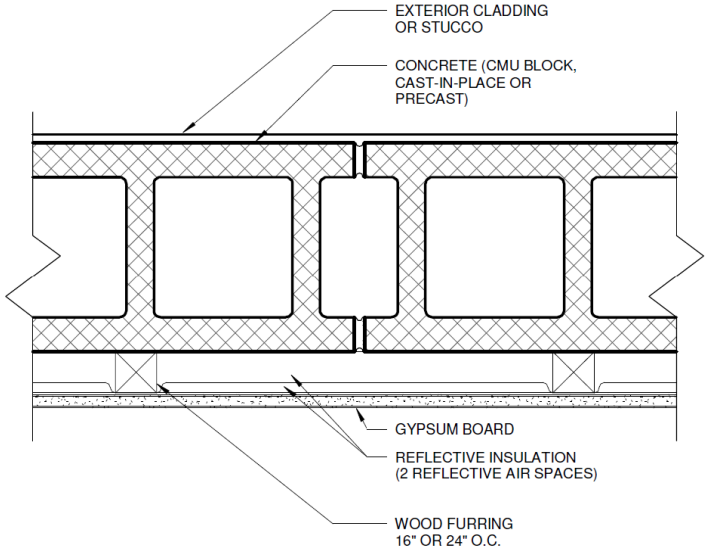


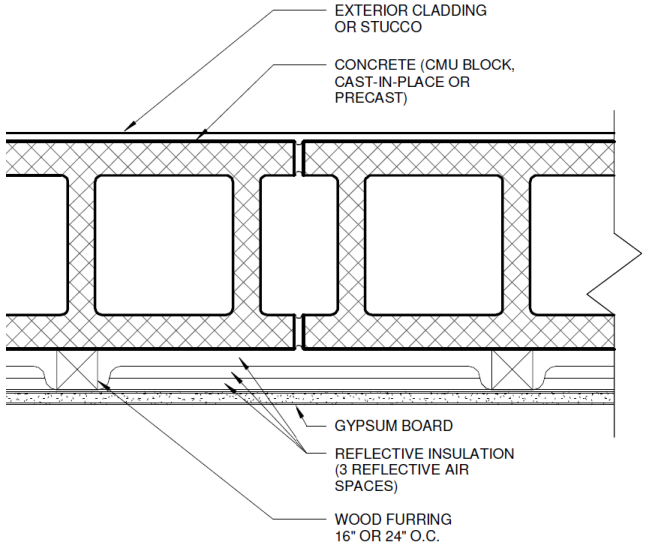


HOW R-VALUES ARE GENERATED WITH MULTI-LAYER REFLECTIVE INSULATION?

ANSWER: The size of framing determines the size of the enclosed air spaces, which determines the R-value generated. The number of low emittance material layers will also change the R-value.

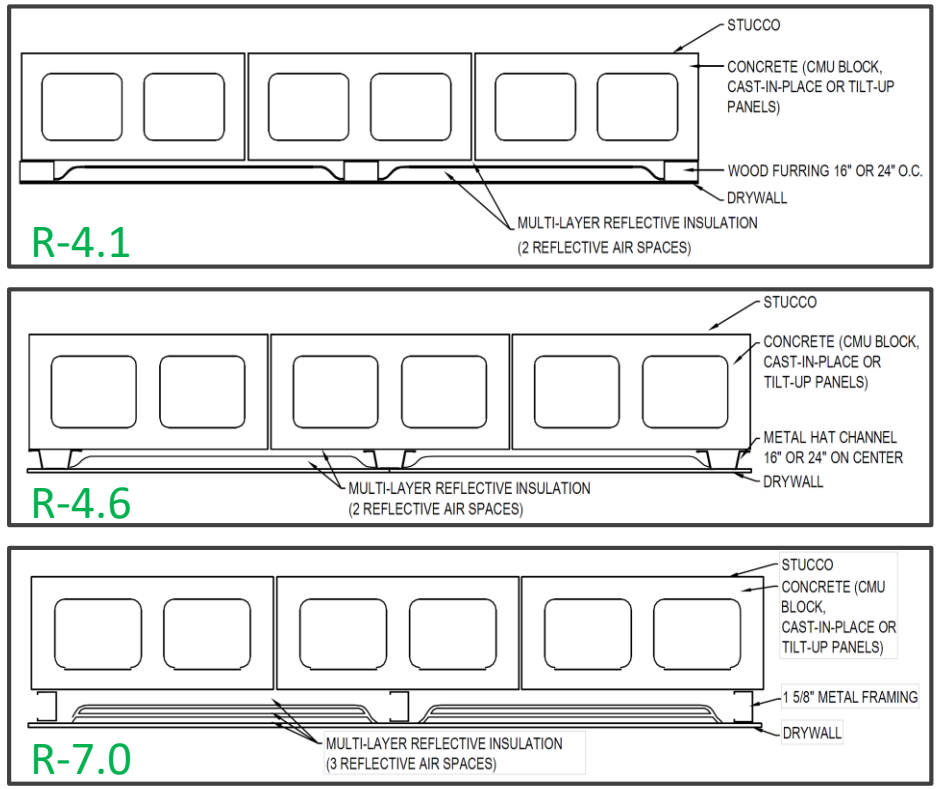
MASONRY WALL INSULATION SYSTEM	
DESCRIPTION	SYSTEM R-VALUE
INSULATION ON 3/4" WOOD FURRING	R-4.1 PERFORATED VERSION
INSULATION ON 1-1/2" WOOD FURRING	R-5.1 PERFORATED VERSION





VASONRY WALL INSULATION SYSTEM	
DESCRIPTION	SYSTEM R-VALUE
INSULATION WITH 1-1/2" WOOD FURRING	R-7.0 PERFORATED VERSION

HANDLING DIFFERENT TYPES OF FRAMING AND DETERMINING R-VALUE

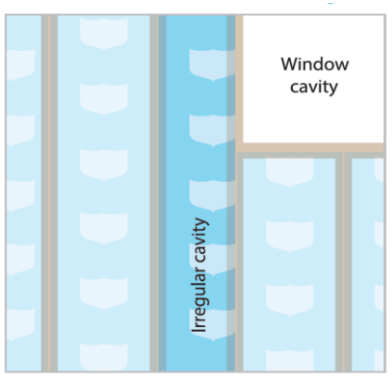


Staple to

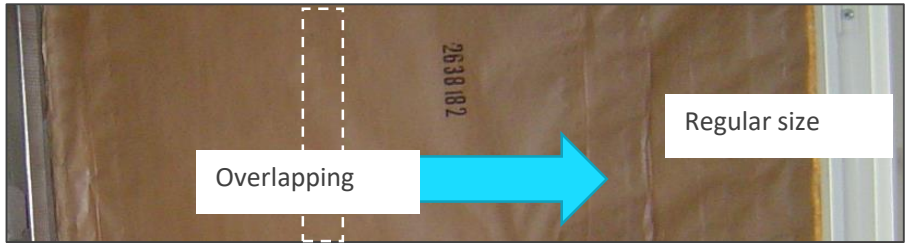
Adhere to Metal

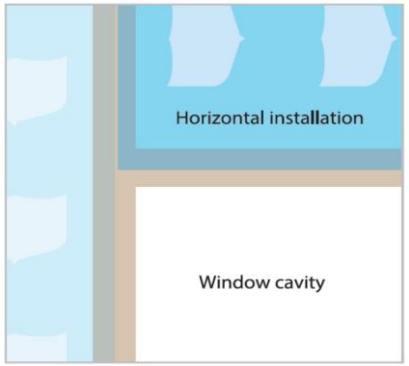
NOTE: Products are available with integrated Tape Tap for projects with metal framing.

GRADE 1 INSTALLATION GUIDELINES FOR MULTI-LAYER REFLECTIVE INSULATION

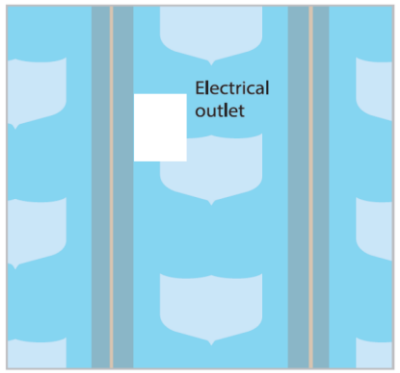


If frame spacing is less than width of material, then install full size section first. Then attach tab to framing on one side and pull over previously installed material and attach with tape or spray adhesive.





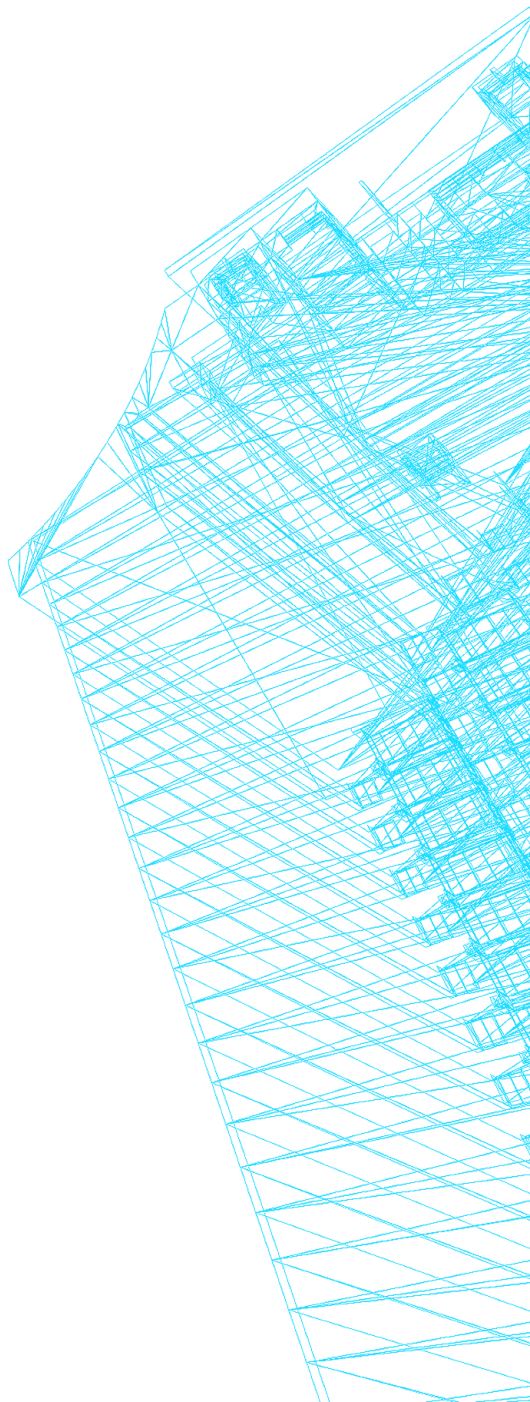
Material can be installed vertically or horizontally, as long as you are following the direction of framing.



Cut insulation to fit snugly around outlets and other cut outs. If you can see back wall, add tape to close gap.

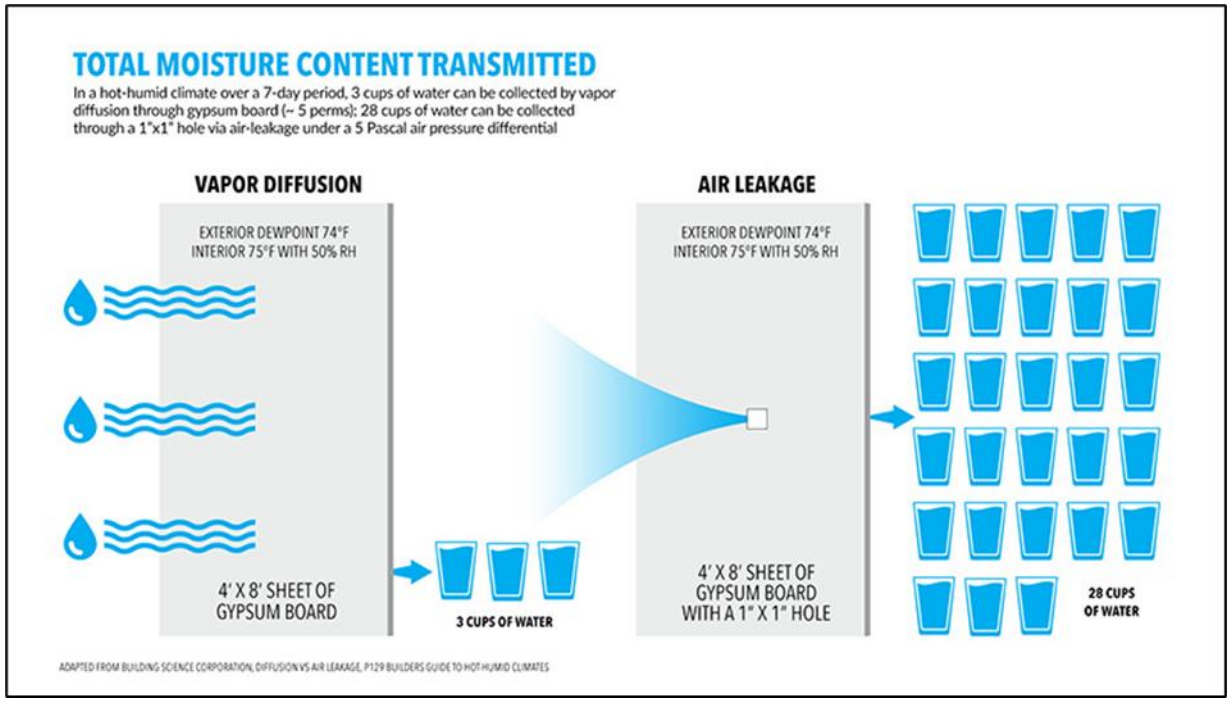
LEARNING OBJECTIVE 3

Address vapor transmission and air leakage within the thermal envelope.



WATER VS. VAPOR TRANSMISSION

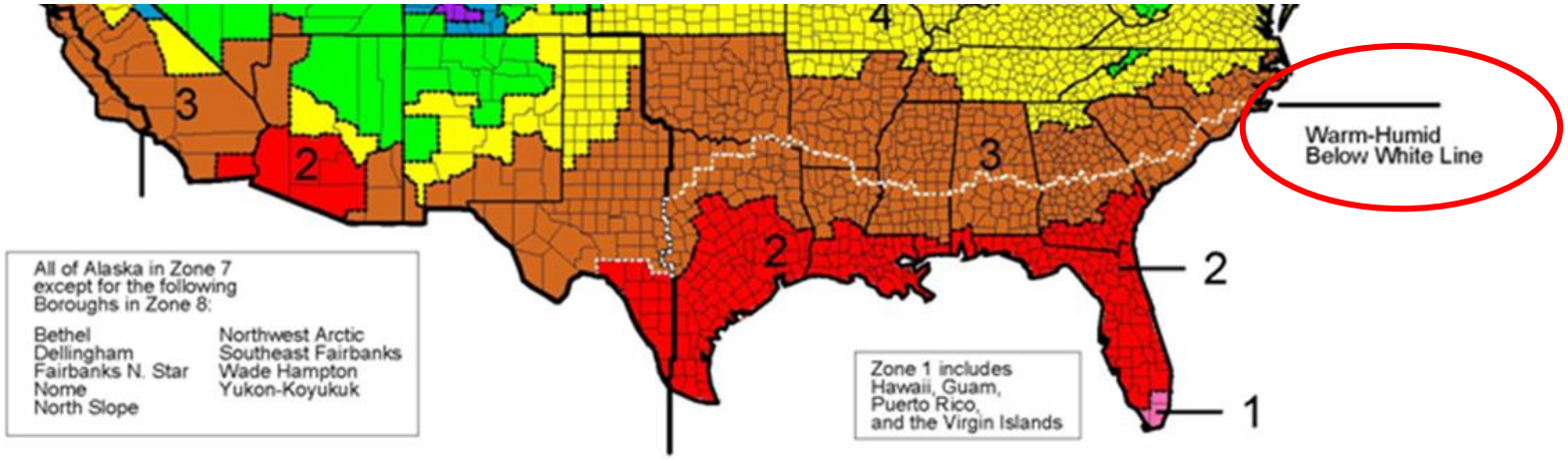
- Water intrusion can wreak havoc on a building and reduce its ability to regulate indoor temperature and maintain its stability and reliability.
- In addition to rain water and flooding, moisture can also get into a building through water vapor transmission.



In a hot humid climate over a 7-day period, 3 cups of water can be collected by vapor diffusion through gypsum board (-5 perms); 28 cups of water can be collected through 1” x 1” hole via air-leakage under a 5 pascal air pressure differential.

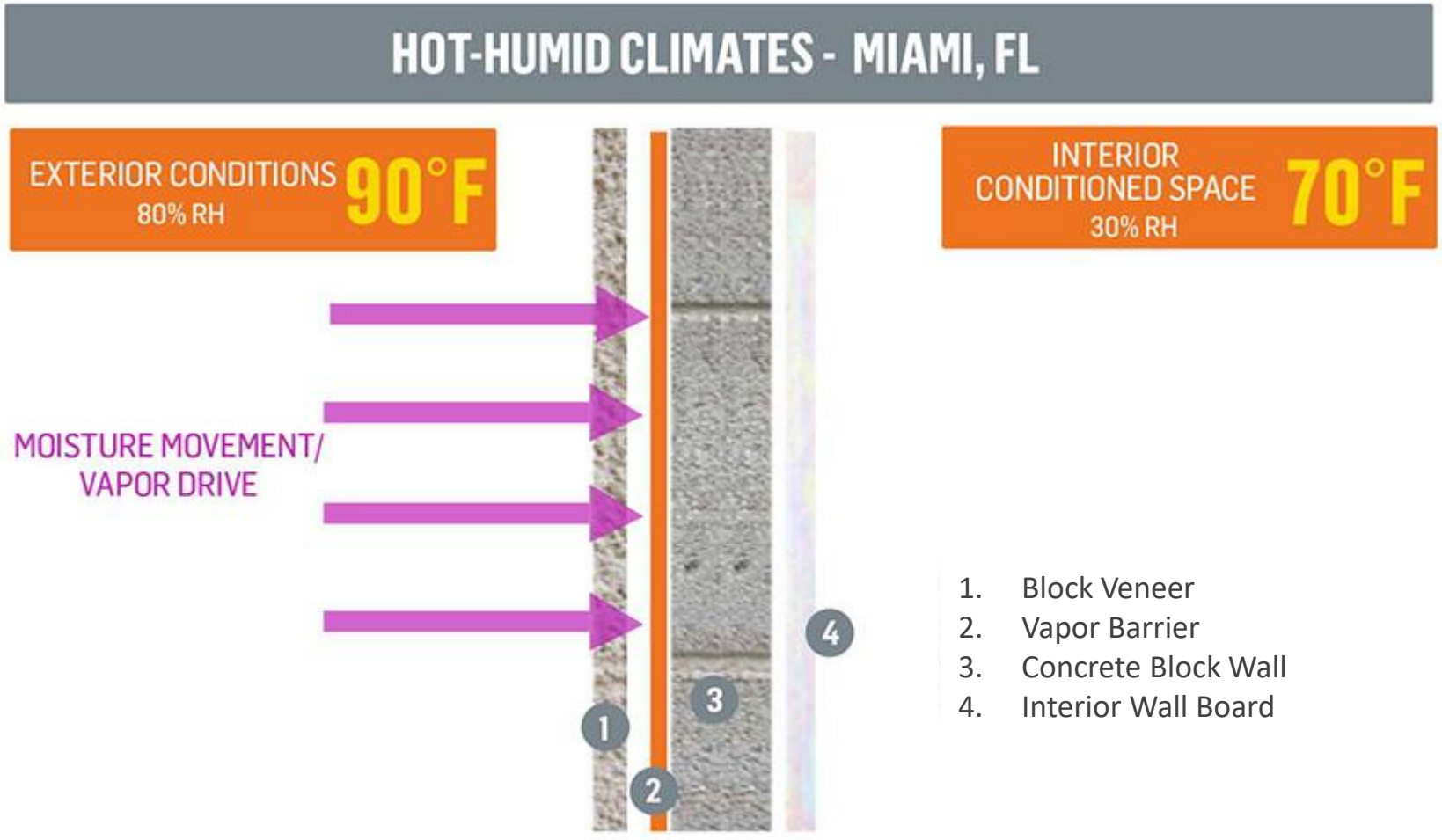
MASONRY WALLS AND VAPOR TRANSMISSION IN HOT-HUMID CLIMATES

- Water vapor moves from warm spaces to cold, necessitating different insulation strategies for different climates
- Hot-humid climates call for permeable and semi-permeable insulation as part of a moisture-control strategy that promotes moisture exfiltration.



- Vapor retarders (if used) should be positioned as close to the building's exterior as possible to prevent humid outside air from infiltrating into wall cavities and living envelopes.

VAPOR RETARDERS IN HOT-HUMID CLIMATES



1. Block Veneer
2. Vapor Barrier
3. Concrete Block Wall
4. Interior Wall Board

UNDERSTANDING VAPOR PERMEABILITY

Q: What is vapor permeability?

ANSWER:
Often referred to as breathability, vapor permeability describes a materials ability to allow moisture to pass through it.

Q. How is vapor permeability measured?

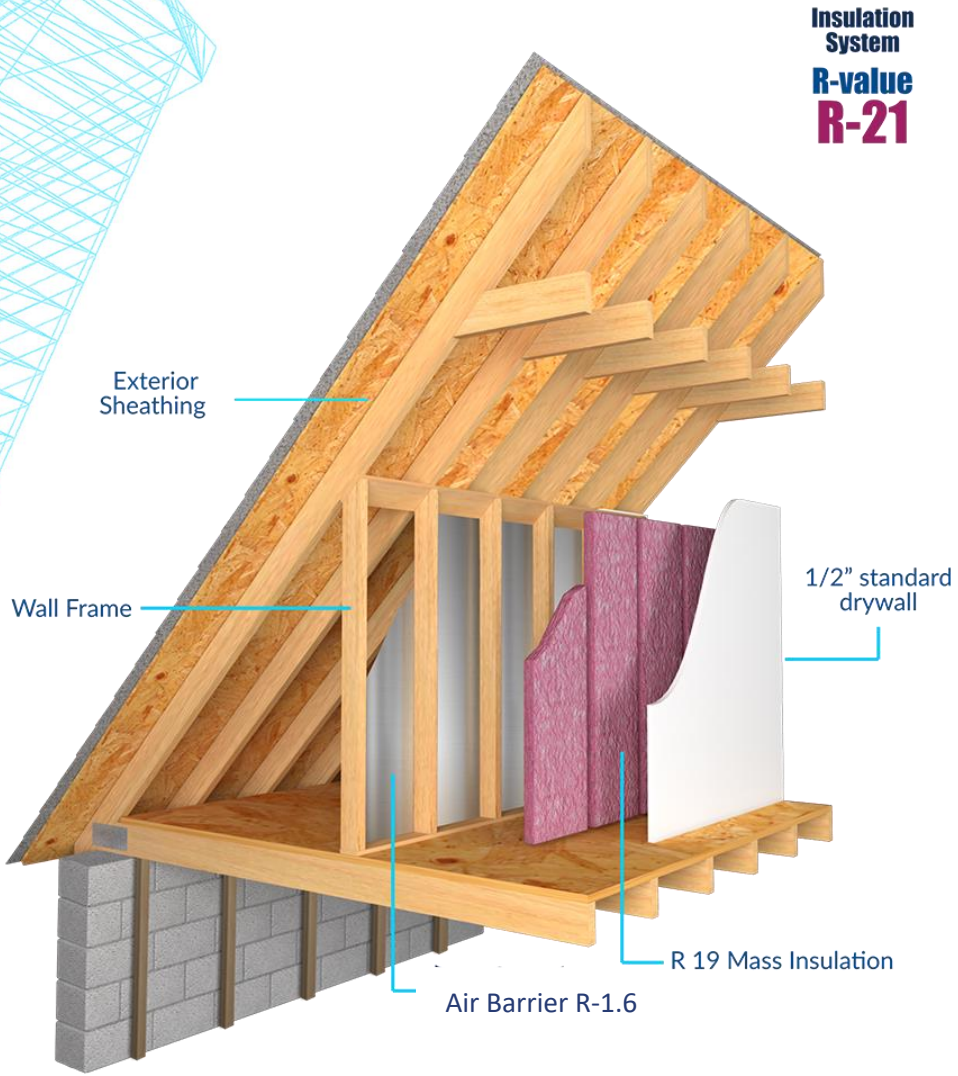
ANSWER:
A material's permeability is measured in units called perms. Standardized tests determine how much moisture can pass through a material in a 24-hour period.

Materials can be "separated into four general classes based on their permeance"*:

Class I Vapor Retarder (vapor impermeable)	≤ 0.1 perm
Class II Vapor Retarder (vapor semi-impermeable)	1.0 < perm ≤ 0.1
Class III Vapor Retarder (vapor semi-permeable)	1.0 < perm ≤10
Vapor permeable	> 10 perm

***Resources** - Building Science Corporation/BSD-106: Understanding Vapor Barriers, by Joseph Lstiburek (4/15/2011), and International Building Code.

INCORPORATING A REFLECTIVE AIR BARRIER



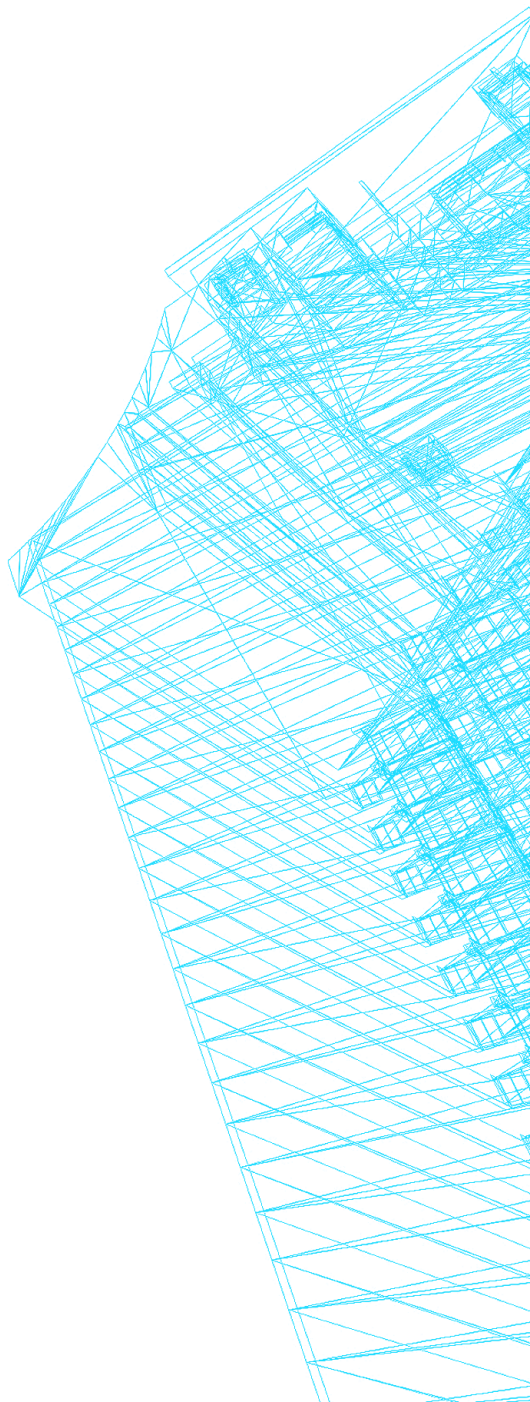
ASTM E2178; The purpose of this test is to measure the air permeance of **flexible sheet*** or rigid panel-type materials. The results of this test may be useful in determining suitability of that material as a component of an air retarder system.

Note: Flexible sheet also includes Reflective Air Barriers made out of flexible materials.

- **Air Permeability (ASTM E2178);** <0.02 L/(s•m^2)@75 Pa
- **Emissivity (ASTM C1371);** <0.25
- **Water Vapor Permeance (ASTM E96);** Solid Version <0.1 and Vapor Transmitting Version >10
- **Flammability (ASTM E84/E2599);** Flame Spread <25 / Smoke Developed <50

LEARNING OBJECTIVE 4

Utilize strategies discussed to achieve a more sustainable, resilient and overall robust building envelope.



MASS WALL ASSEMBLY & SUSTAINABILITY

Reflective Insulation

Low Environmental Impact

Low Life Cycle Costs

Sound Attenuation

Fire Resistance

Resilient Envelope

REFLECTIVE INSULATION & SUSTAINABILITY

- Recycle content
- No paper, no food for mold
- Reduced waste
- Locally manufactured
- Formaldehyde-free
- Added R-value for low cost

AND WHAT ABOUT THE ENVIRONMENTAL IMPACT?

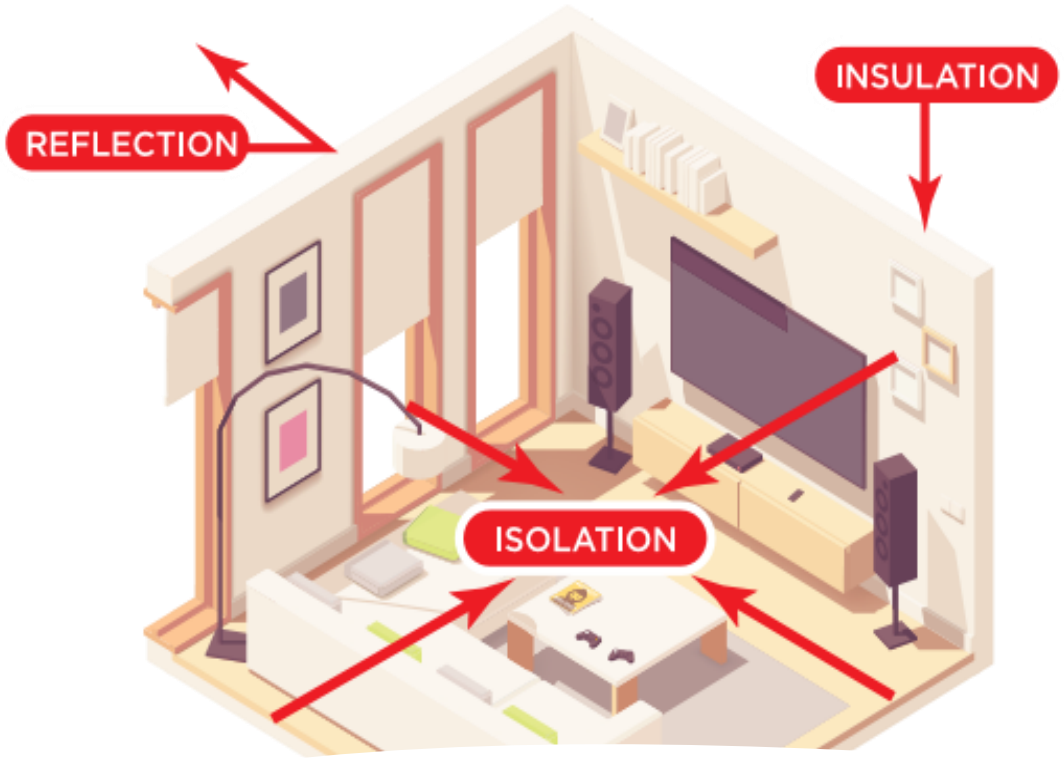
Embodied energy content for various walling products.

- **Low Embodied Energy – from excavation and extraction, to manufacture and shipping**
- **Megajoules of energy/kilogram of a product**

WHAT DOES "LOW LIFE CYCLE COST" REALLY IMPLY?

- Regionally Produced
- Recycled Materials Available
- Reusable
- Respectful of Environment

SOUND ATTENUATION



Reflection
Density of wall materials provides for reflection of noise from outside sources. Concrete block, whether painted or stuccoed, provides excellent sound reflection not allowing it to infiltrate to the inside.

Insulation
Refers to stopping the transmission of sound between living units. Concrete Block ranks at the top of Noise control building materials

Isolation
Isolation means keeping interior noise inside from leaving the room where it is.

ARE CMU BLOCKS NON-COMBUSTIBLE?

ANSWER: YES!

Masonry Noncombustible Construction (ISO) — one of six building construction categories established by Insurance Services Office, Inc. (ISO), in its *Commercial Lines Manual (CLM)* for purposes of developing rates for insuring commercial property, based on susceptibility to damage by fire.

- The *CLM* description of masonry noncombustible construction, followed by the associated ISO construction code, is **exterior walls of masonry material (adobe, brick, concrete, gypsum block, hollow concrete block, stone, tile, or similar materials) with floors and roof of metal or other noncombustible materials, and exterior walls, floors, and roof of masonry or fire-resistive materials with a fire resistance rating of at least 2 hours** (Construction Code 6). The construction code indicates the ranking of this building construction category within the six categories, with 1 as the least fire-resistive and 6 as the most fire-resistive.

BALANCED FIRE RESISTANCE

ACTIVE

1. Automatic Detection Systems
2. Automatic Suppression Systems

PASSIVE

3. Compartmentation:
   Using non-combustible materials (e.g. concrete masonry)

FIRE RESISTANCE RATINGS

PERFORMANCE RATING FOR MASONRY WALLS

Thickness			Minimum Thickness		Solid Volume	Equivalent Solid Thickness	Fire Rating	Weight Per Unit Light
Nominal	Actual	Type	Shell Inches	Web Inches	Percent	Inches	Hours	Weight Pounds
4"	3 5/8"	hollow	1.00	1.00	72	2.61	1	23
6"	5 5/8"	hollow	1.12	1.00	61	3.43	1	29
		semi-solid	1.75	1.00	75	4.25	2	40
8"	7 5/8"	hollow	1.25	1.00	53	4.04	2	40
		semi-solid	2.25	1.25	80	6.10	4	43
10"	9 5/8"	hollow	1.50	1.12	54	5.18	3	51
12"	11 5/8"	hollow	1.50	1.25	52	6.05	4	54

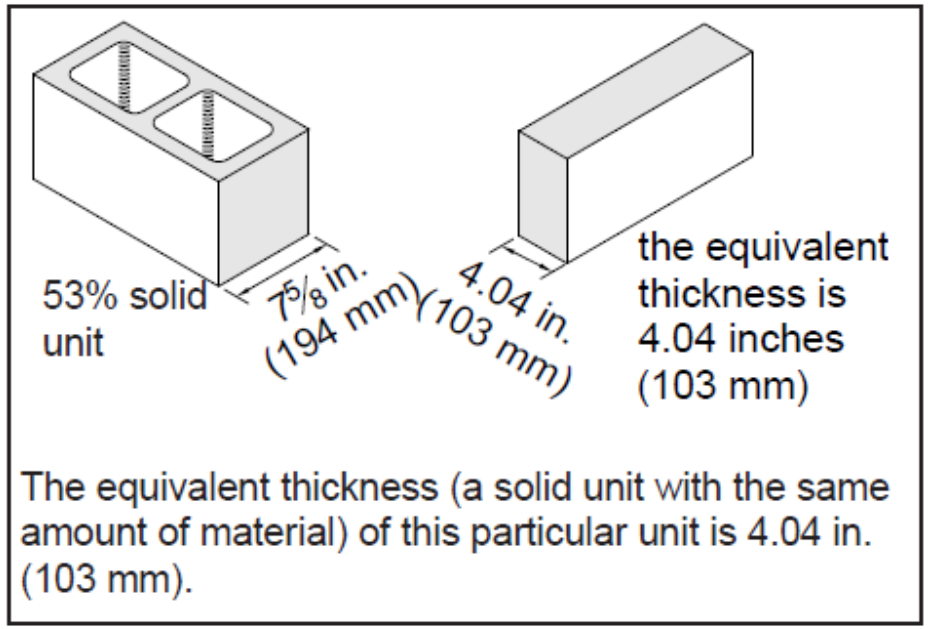
NATIONAL NCMA CONCRETE MASONRY ASSOCIATION

ESTABLISHING EQUIVALENT THICKNESS

Equivalent Thickness:

Measure of the volume of concrete contained in a hollow unit if the holes were removed.

NCMA TEKnote 7-1C



THERMAL-AND-SOUND-INSULATING MATERIALS

- 2020 Florida Building Code/Section 720:
  - **720.1 General**.

    Insulating materials, including facings such as vapor retarders and vapor-permeable membranes, similar coverings and all layers of single and multilayer reflective foil insulations, shall comply with the requirements of this section. **Where a flame spread index or a smoke-developed index is specified in this section, such index shall be determined in accordance with ASTM E84** or UL 723. Any material that is subject to an increase in flame spread index or smoke-developed index beyond the limits herein established through the effects of age, moisture or other atmospheric conditions shall not be permitted.

Typical Class Ratings		
Class	Flame Spread	Smoke Developed
Class A	0 - 25	0 - 450
Class B	26 – 75	0 - 450
Class C	76 – 200	0 - 450

THERMAL-AND-SOUND-INSULATING MATERIALS

- **720.2 Concealed installation**.

  Insulating materials, where concealed as installed in buildings of any type of construction, shall have a flame spread index of not more than 25 and a smoke-developed index of not more than 450.

  720.2.1 Facings.

  Where such materials are installed in concealed spaces in buildings of Type III, IV or V construction, the flame spread and smoke-developed limitations do not apply to facings, coverings, and layers of reflective foil insulation that are installed behind and in substantial contact with the unexposed surface of the ceiling, wall or floor finish.

  Exception: All layers of single and multilayer reflective plastic core insulation shall comply with Section 2613.

MASS WALL ASSEMBLY & SUSTAINABILITY CONCLUSION

Reflective Insulation

Low Environmental Impact

Low Life Cycle Costs

Sound Attenuation

Fire Resistance

Resilient Envelope

RESILIENCY: HOW QUICK CAN WE RECOVER?

NIBS Natural Hazard Mitigation Report (2018)

ENVIRONMENTAL STEWARDSHIP

- Designing an effective yet economical thermal envelope is paramount: addressing energy consumption will ultimately save owners billions of dollars while avoiding hundreds of CO2 emissions.
- Proper insulation of your mass wall structures help save costs, meet the building code and provides a more energy efficient building envelope.
- Incorporating options to address vapor transmission and air leakage will improve your overall building envelope's performance.
- Resiliency has joined sustainability as essential characteristics of new construction; strategies include suitable building materials, good design details, proper construction procedures and progressive building codes.

Lisa Pelham, CSI CDT
Oldcastle APG – Coastal
MAF Past President
Commercial Sales & Specifications
Lisa.Pelham@Oldcastle.com

Jan Bradford, CSI CDT
Fi-Foil Company
MAF Board Member
Director of Architectural Sales
JBradford@FiFoil.com

THANK YOU!!

Any questions??