

MBCEA 2017 National Conference New Orleans



Energy Codes 101

IECC 2015 & ASHRAE 90.1 2013 Major Changes

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How the code cycle works

ASHRAE vs. IECC

Confusion Between The Two

- Different (3) year cycles
 - IECC follows behind ASHRAE by (2) years
- IECC adopts the latest ASHRAE standard plus any addendums and new data
 - ASHRAE provides a standard, **NOT** an energy code
 - IECC develops the code and **references** the ASHRAE standard



The Next Code Cycle

- IECC 2015 with ASHRAE 90.1 2013 option
- Major changes in ASHRAE 90.1 2013
- U-Values are in line with IECC 2015
- Reductions for Purlins less than 52"
- Reduction for Purlin Bridging
- Reduced U-Values for single and double layers

Some Changes

Roof Solar Reflectance Climate Zones 1-3

- Solar Reflectance of 0.55
- Thermal Emittance of 0.75
- Exemptions- Steep Slopes roofs $<2:12$

Skylight Requirement

- 3% of roof area climate zones 1-5 buildings over 2,500 S/F
- There are exemptions

Non-Conditioned Buildings

Air Barriers Mandatory

C 402.5 Air Leakage Thermal Envelope Mandatory:

- Must be continuous throughout thermal envelope
- Can be interior, exterior, or somewhere within the assembly
- Must comply with ASTM E779 assembly testing
- A checklist item on COMcheck™

5.4.3.1 [FR15] ¹	Continuous air barrier is wrapped, sealed, caulked, gasketed, and/or taped in an approved manner, except in semiheated spaces in climate zones 1-6.			<input type="checkbox"/> Complies <input type="checkbox"/> Does Not <input type="checkbox"/> Not Observable <input type="checkbox"/> Not Applicable
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States Currently at IECC 2015

- Maine
- Massachusetts
- Vermont
- Texas
- New York
- New Jersey
- Utah
- Illinois
- Florida
- Alabama
- Maryland
- Oregon
- Washington
- All other states will change

The R-13 + R-13 CI Breakdown

Table C 402.1.3 Metal Building Walls

- This is a suggested method

Section C 402.1.4 U-Factor Alternative

- Gives us options to use any system tested with an assembly U-Value equal to or better than code
- This includes Board Insulation, Insulated Metal Panels and Fiberglass Liner Systems

Air Barrier Design & Detail



What is a U-Factor?

R-Values vs. U-Factors

Once Installed the material is compressed and other materials are added to the thermal envelope

- U-factors measure the complete roof and wall assemblies - the net performance of all components in the thermal envelope **assembly**
- U-factors considered more relevant because measure the amount of energy passing through the assembly over time
- U-Factor Units are **BTU /hr /sf /°F**, so the lower the number, the less thermal transmission occurs.

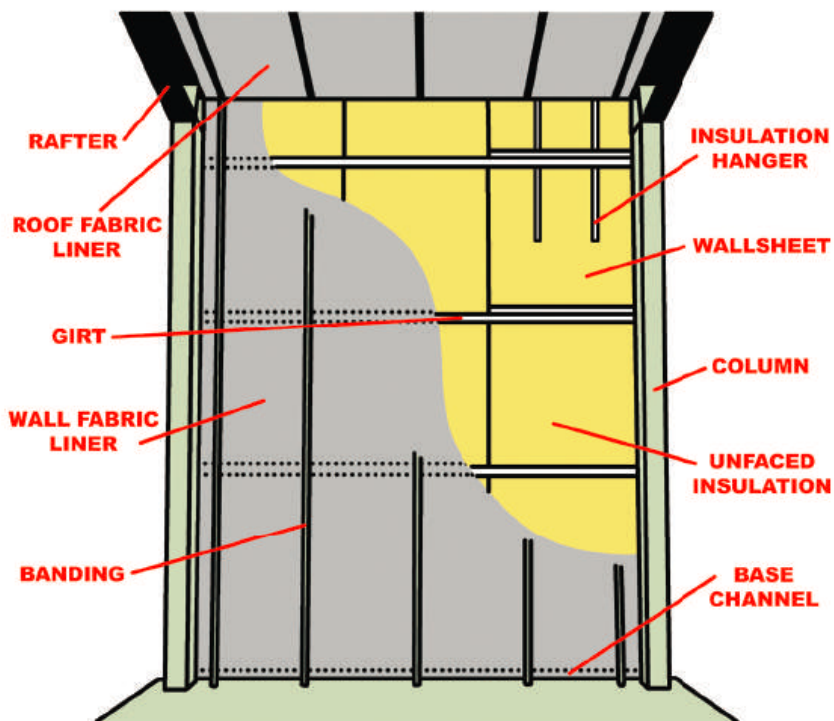


Numerically speaking, U-Factors and R-Values are the reciprocal of each other ($1/R = U$, $1/U = R$)

R-Value = rating of a given material

U-Value = rating of an assembly including compression and all components.

U-Factor Alternative



Wall Assembly U-Values

Thermal Break	Cavity Insulation	Wall U-Factor ¹
None	R-15 MBI+	0.074
None	R-19 MBI+	0.066
1/8" Foam	R-25 MBI+	0.057
1/8" Foam	R-30 MBI+	0.049
Certified R-13	R-30 MBI+	0.042

¹ Calculations based on Owens Corning™ OptiLiner® system; 8" girts spaced 5' on center.

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ASHRAE 90.1 CL 3

TABLE 5.5-3 Building Envelope Requirements For Climate Zone 3 (A,B,C) (I-P)*

	NONRESIDENTIAL			RESIDENTIAL			SEMIHEATED		
OPAQUE ELEMENTS	Assembly Maximum	Insulation Min. R –Value		Assembly Maximum	Insulation Min. R –Value		Assembly Maximum	Insulation Min. R –Value	
Roofs									
Insulation Entirely above Deck	U- 0.039	R-25 c.i.		U- 0.039	R-25 c.i.		U- 0.119	R-7.6 c.i.	
Metal Building ^a	U- 0.041	R-10 + R-19 FC		U- 0.041	R-10 + R-19 FC		U- 0.096	R-16	
Attic and Other	U- 0.027	R-38		U- 0.027	R-38		U- 0.053	R-19	
Walls, Above Grade									
Mass	U- 0.123	R-7.6 c.i.		U- 0.104	R-9.5 c.i.		U- 0.580	NR	
Metal Building	U- 0.094	R-0 + R-9.8 c.i.		U- 0.072	R-0 + R-13 c.i.		U- 0.162	R-13	
Steel Framed	U- 0.077	R-13 + R-5 c.i.		U- 0.064	R-13 + R-7.5 c.i.		U- 0.124	R-13	
Wood Framed and Other	U- 0.089	R-13		U- 0.064	R-13 + R-3.8 c.i. or R-20		U- 0.089	R-13	
Wall, Below Grade									
Below Grade Wall	C- 1.140	NR		C- 1.140	NR		C- 1.140	NR	
Floors									
Mass	U- 0.074	R-10 c.i.		U- 0.074	R-10 c.i.		U- 0.137	R-4.2 c.i.	
Steel Joist	U- 0.052	R-19		U- 0.032	R-38		U- 0.052	R-19	
Wood Framed and Other	U- 0.033	R-30		U- 0.033	R-30		U- 0.051	R-19	
Slab-On-Grade Floors									
Unheated	F- 0.730	NR		F- 0.540	R-10 for 24 in.		F- 0.730	NR	
Heated	F- 0.860	R-15 for 24 in.		F- 0.860	R-15 for 24 in.		F- 1.020	R-7.5 for 12 in.	
Opaque Doors									
Swinging	U- 0.700			U- 0.500			U- 0.700		
Non-Swinging	U- 0.500			U- 0.500			U- 1.450		
FENESTRATION	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/ SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/ SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/ SHGC

ASHRAE 90.1 CL 5

TABLE 5.5-5 Building Envelope Requirements For Climate Zone 5 (A,B,C) (I-P)*

OPAQUE ELEMENTS	NONRESIDENTIAL			RESIDENTIAL			SEMIHEATED		
	Assembly Maximum	Insulation Min. R –Value		Assembly Maximum	Insulation Min. R –Value		Assembly Maximum	Insulation Min. R –Value	
Roofs									
Insulation Entirely above Deck	U- 0.032	R-30 c.i.		U- 0.032	R-30 c.i.		U- 0.063	R-15 c.i.	
Metal Building ^a	U- 0.037	R-19 + R-11 Ls or R-25 + R-8 Ls		U- 0.037	R-19 + R-11 Ls or R-25 + R-8 Ls		U- 0.082	R-19	
Attic and Other	U- 0.021	R-49		U- 0.021	R-49		U- 0.034	R-30	
Walls, Above Grade									
Mass	U- 0.090	R-11.4 c.i.		U- 0.080	R-13.3 c.i.		U- 0.151 ^b	R-5.7 c.i. ^b	
Metal Building	U- 0.050	R-0 + R-19 c.i.		U- 0.050	R-0 + R-19 c.i.		U- 0.094	R-0 + R-9.8 c.i.	
Steel Framed	U- 0.055	R-13 + R-10 c.i.		U- 0.055	R-13 + R-10 c.i.		U- 0.084	R-13+R-3.8 c.i.	
Wood Framed and Other	U- 0.051	R-13 + R-7.5 c.i. or R-19 + R-5 c.i.		U- 0.051	R-13 + R-7.5 c.i. or R-19 + R-5 c.i.		U- 0.089	R-13	
Wall, Below Grade									
Below Grade Wall	C- 0.119	R-7.5 c.i.		C- 0.092	R-10 c.i.		C- 1.140	NR	
Floors									
Mass	U- 0.057	R-14.6 c.i.		U- 0.051	R-16.7 c.i.		U- 0.107	R-6.3 c.i.	
Steel Joist	U- 0.038	R-30		U- 0.038	R-30		U- 0.052	R-19	
Wood Framed and Other	U- 0.033	R-30		U- 0.033	R-30		U- 0.051	R-19	
Slab-On-Grade Floors									
Unheated	F- 0.520	R-15 for 24 in		F- 0.510	R-20 for 24 in.		F- 0.730	NR	
Heated	F- 0.688	R-20 for 48 in.		F- 0.688	R-20 for 48 in.		F- 0.900	R-10 for 24 in.	
Opaque Doors									
Swinging	U- 0.500			U- 0.500			U- 0.700		
Non-Swinging	U- 0.500			U- 0.500			U- 1.450		
FENESTRATION	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/ SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/ SHGC	Assembly Max. U	Assembly Max. SHGC	Assembly Min. VT/ SHGC

Semi-Heated

Table 2.3-2: ASHRAE Standard 90.1 Heated Space Criteria - Addendum α - 90.1-2013

Climate Zone	Heating Output, Btu/hr/ft²
1	>5
2	>5
3A, 3B	>9
3C	>7
4A, 4B	>10
4C	>8
5	>12
6	>14
7	>16
8	>19

Reduction in U-Values

Liner System		
R-19 + R-11		0.037
R-25 + R-8		0.037
R-25 + R-11		0.031
R-30 + R-11		0.029
High-R Banded (FC)		
R-10 + R-19		0.041
Liner System No Thermal Blocks		
R-19 + R-11		0.040

Additional Roof U-Values Allowed Based On Lamtec Testing		
High-R Banded (FC)		
R-19 + R-11	U-0.037	
R-25 + R-11	U-0.035	
R-25 + R-19	U-0.029	
ALL REQUIRE 1" THERMAL BLOCK		

New Table A2.3.3 Roof			
Standing Seam Roofs with thermal blocks			
Single Layer			
R-Value			U-Value
R-10			0.115
R-11			0.107
R-13			0.101
R-16			0.096
R-19			0.082
Double Layer			
R-10 + R-10			0.088
R-10 + R-11			0.086
R-11 + R-11			0.085
R-10 + R-13			0.084
R-11 + R-13			0.082
R-13 + R-13			0.075
R-10 + R-19			0.074
R-11 + R-19			0.072
R-13 + R-19			0.068
R-16 + R-19			0.065
R-19 + R-19			0.060

More U-Factor Alternative

Wall System U-Values

Laminated

Single Layer

R6	0.184
R10	0.134
R11	0.123
R13	0.113
R16	0.093
R19	0.084

Double Layer

R6+R13	0.07
R10+R13	0.061
R13+R13	0.057
R19+R13	0.048

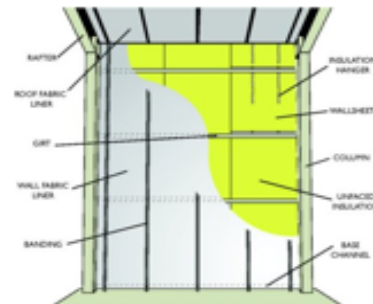


ASHRAE Table A2.3

Liner System

OptiLiner (8" Girt)

R16	0.074
R19	0.066
R25 + 1/8" Foam	0.057
R30 + 1/8" Foam	0.049
R30 + R13	0.042

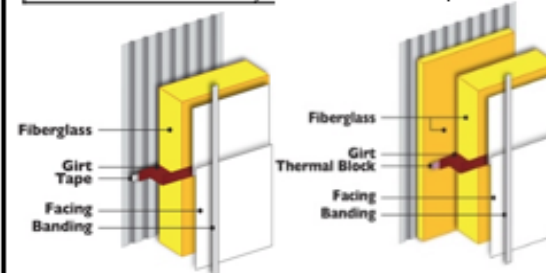


Owens Corning

High-R System

System

R25 + 1/8" Foam Tape	0.059
R30 + 1/8" Foam Tape	0.052
R25 + R16 + 1/8" Foam Tape (8" Girt)	0.037
R25 + R13 + 1" Thermal Block (8" Girt)	0.036
R25 + R16 + 1/8" Foam Tape (10" Girt)	0.036
R25 + R13 + 1" Thermal Block (10" Girt)	0.035



Lamtec

MBMA

Industry working together with ASHRAE to provide input on
Metal Building Systems



Building manufacturers



Laminators committee

U'-Values

- Hot Box Testing
- Computer Modeling

Other Input

- Economical
- Constructible
- Fair treatment with other construction types



Fiberglass manufacturers

Liner System Walls



Insulated Metal Panels



Proper Connections



Fiberglass Solutions

Liner Systems

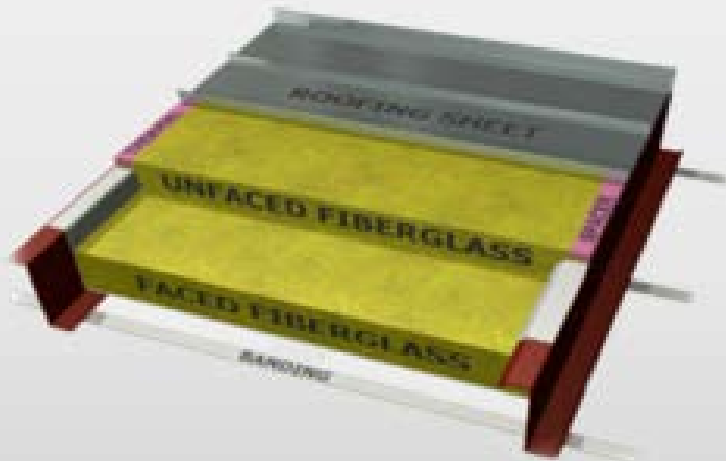
Long Tab



Long Tab must use Alternative U-Value

Long Tab Banded System

- ▶ Benefits and highlights
 - ▶ Economical high-R system
 - ▶ Alternative to meet IECC energy codes
 - ▶ Multiple vapor barrier choices
 - ▶ Leaves purlins exposed for mounting



Tested U-Values

R-11 + R-19	R-30	U-0.037*
R-19 + R-25	R-44	U-0.029*

*Data from LAMTEC Hot Box Test

COMcheck™

- IECC 2015 and ASHRAE 90.1 2013 require a COMcheck™ must be run for every job
- U-Values are stringent for the roof and walls
- Trade-Off becomes difficult based on U-Values
- Doors, windows, fenestrations have increased levels of performance
- Cannot trade off SHGC for windows
- Windows must meet or exceed SHGC ratings

MBMA

The MBMA [YouTube](#) channel now includes Part 4 of the *Energy Code Compliance for Metal Building Systems - Webinar Series* to address the topic of COMcheck. A complete list of the energy code related webinars are listed below.

[Part 1 - Insulation Prescriptive Compliance, Introduction](#) (30 minutes)

This webinar provides a broad overview of both the IECC and ASHRAE Standard 90.1.

[Part 2 - Insulation Prescriptive Compliance, 2015 IECC](#) (50 minutes)

This webinar provides a detailed review of meeting the insulation requirements via the prescriptive method within the 2015 IECC.

[Part 3 - Insulation Prescriptive Compliance, ASHRAE Standard 90.1-2013](#) (34 minutes)

This webinar is similar to Part 2, but focuses in on applying the R-value and U-factor method within ASHRAE Standard 90.1-2013.

[Part 4 - Trade-Off Method, DOE COMcheck - Part A](#) (48 minutes) **NEW**

This webinar instructs how to use the software with specific application to the metal building roof and wall insulation options called out in the MBMA Energy Design Guide - 2nd Edition.

[Part 4 - COMcheck Case Studies - Part B](#) (29 minutes) **NEW**

This webinar includes various case studies that compare IECC code compliant metal buildings via the R-value method to selected options afforded via the trade-off method.

Future Code Cycle

ASHRAE 90.1 2016 is published

Some changes for walls are:

- Liner System wall options are part of the ASHRAE table
- A wall calculator is allowed for wall assemblies
- No changes to the envelope requirements
- We have maxed out on Metal Building Envelopes
- IECC 2018 will finish soon
- No major envelope changes

Thank You



Questions?
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