

## Energy Codes and Standards

### Air Barrier and Prescriptive Wall Insulation Requirements

#### Energy Codes and Standards

CavityComplete® Wall Systems have a variety of insulation options, air barrier, and air/water sealing accessories that make it easy to specify compliance with energy codes and standards. ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings<sup>1</sup>, establishes minimum energy efficiency requirements for most commercial buildings including larger residential buildings. Excluded are single-family, multi-family three stories or less above grade, and manufactured homes. The International Energy Conservation Code<sup>2</sup> (IECC) is a similar standard that is also widely adopted. The International Green Construction Code<sup>3</sup> (IgCC) contains building energy performance criteria like the other two standards, but it also covers sustainable design concepts. For building envelope design the IgCC generally prescribes higher energy performance requirements than the other two. ASHRAE 189.1<sup>4</sup>, a design standard for high performance green buildings, is designated in Section 301.1.1 of the IgCC as an alternate to the IgCC.

#### Adoption and Compliance

Many building code jurisdictions in the United States have adopted an edition of either ASHRAE 90.1, or the similar IECC. Compliance paths in general include either a combination of prescriptive/mandatory thermal performance specifications, a combination of mandatory/building envelope trade-off options, or the Energy Cost Budget Method variations on the compliance paths including prescriptive minimum R-values, maximum U-factors, as well as conducting actual thermal testing on assemblies. The IgCC and ASHRAE 189.1 are not as widely adopted, but some architects/owners choose to design to their goals of greater sustainability.

#### Air Barriers

ASHRAE 90.1 (2013 edition, Section 5.4.3.1), the IECC (2015 edition, Section C402.5.1), and the IgCC (2012 edition, Section 605.1.2.1) require that the building envelope be designed and constructed with a continuous air barrier.

The ASHRAE 90.1 and IECC standards require wall assemblies to demonstrate an air leakage rate to not exceed 0.04 cfm/ft<sup>2</sup> at a pressure of 75 Pa (1.57 psf) when tested in accordance with ASTM E2357<sup>5</sup>. The CavityComplete® Wood Stud Wall System was tested per ASTM E2357 with both mineral wool and XPS as well as penetrations far exceeding the requirements of the standard testing the system resulted in a leakage rate of 0.0004 cfm/ft<sup>2</sup>, significantly less than the maximum permitted by the

standards. For complete information regarding air and water resistive barrier performance, see the CavityComplete® Wood Stud Wall System technical bulletin WS-03 regarding ASTM E2357 and ASTM E331 testing.

The IgCC requires the air leakage rate be determined for the entire building thermal envelope. The leakage rate must be less than 0.25 cfm/ft<sup>2</sup> at a pressure differential of 75 Pa (1.57 psf) when tested in accordance with ASTM E779<sup>6</sup>. Entire building thermal envelope testing is conducted after rough-in and after installation of penetrations of the building envelope, including but not limited to utilities, HVAC, plumbing and electrical service and equipment.

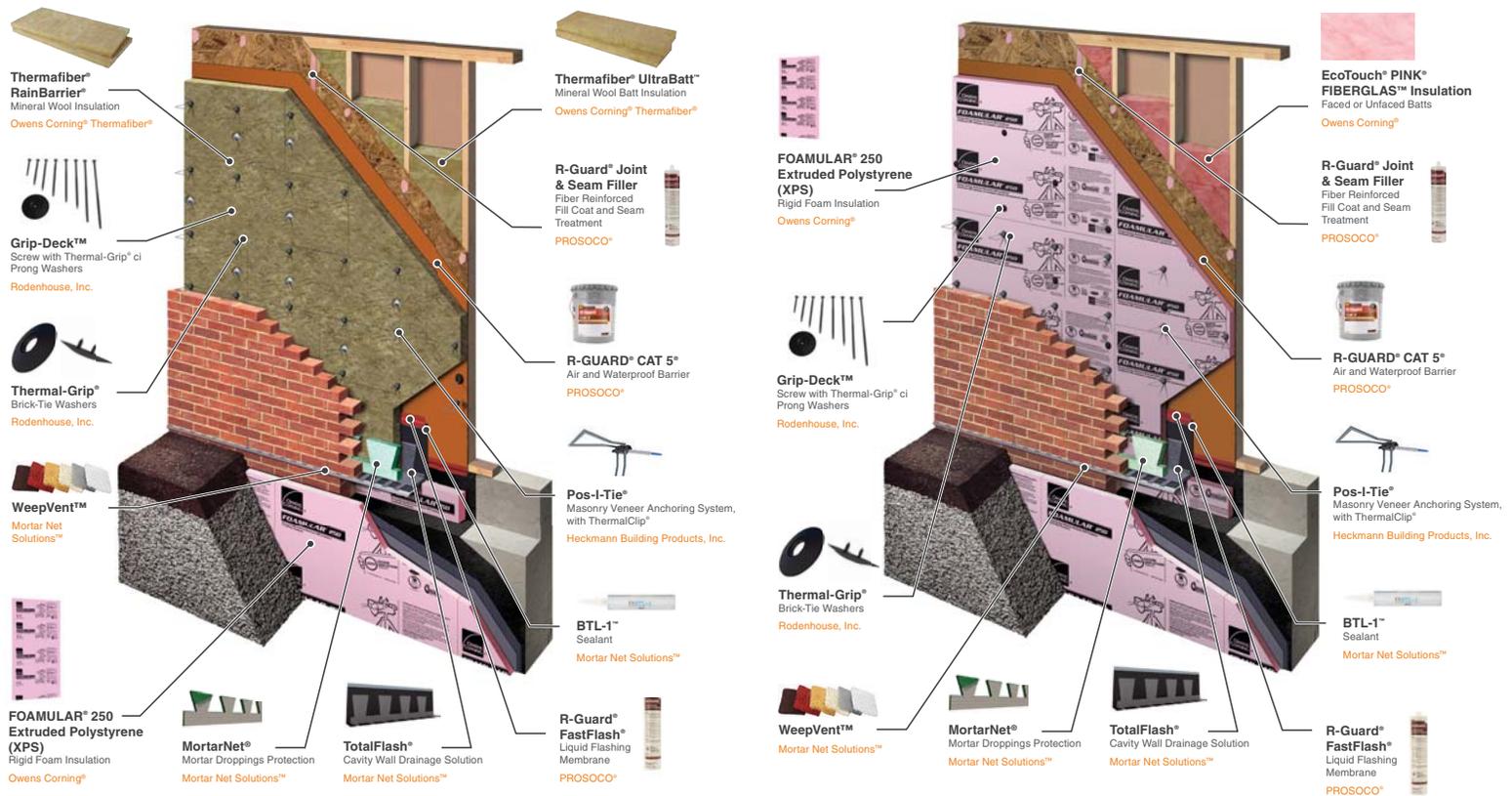
#### Envelope Thermal Performance

The table “Prescriptive R Requirements for Wood Framed Walls, Above Grade” charts R by climate zone for wood stud framed walls as listed in ASHRAE 90.1, the IECC, and ASHRAE 189.1 when used as an alternate to the IgCC. Because the edition adopted varies by jurisdiction, several 90.1 editions are summarized including 2004, 2007, 2010 and 2013. The IECC-2012 and 2015, and ASHRAE 189.1-2011 and 2014 editions are also summarized. The table shows prescribed stud cavity R-value as the first number, and continuous insulation R as the second number. (Example: 13 +7.5). The table shows only the prescriptive requirements for “non-residential” (commercial) and “residential” (as defined by ASHRAE 90.1) buildings and applies to buildings that are heated and/or cooled. The standards also provide prescriptive insulation values for “semi-heated” buildings that are not shown in this table. This technical bulletin does not provide complete design requirements. See the applicable standard for complete building performance and design compliance requirements.

## Prescriptive R (minimum) Requirements for Wood Framed Walls, Above Grade

Zone	ASHRAE 90.1 – 2004		ASHRAE 90.1 – 2007 and 2010		ASHRAE 90.1 – 2013		IECC – 2012		IECC – 2015		ASHRAE 189.1 – 2011 (alternate to IgCC – 2012)*		ASHRAE 189.1 – 2011 (alternate to IgCC – 2015)*	
	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential	Non-Residential	Residential
1	13	13	13	13	13	13	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13	13
2	13	13	13	13	13	13	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13	13
3	13	13	13	13	13	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13	13 + 3.8
4	13	13	13	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 3.8	13 + 7.5	13 + 7.5	13 + 7.5
5	13	13	13 + 3.8	13 + 7.5	13 + 7.5 or 19 + 5	13 + 7.5 or 19 + 5	13 + 3.8	13 + 7.5 or 20 + 3.8	13 + 3.8	13 + 7.5 or 20 + 3.8	13 + 7.5	13 + 10	13 + 12.5	13 + 12.5
6	13	13 + 3.8	13 + 7.5	13 + 7.5	13 + 7.5 or 19 + 5	13 + 7.5 or 19 + 5	13 + 7.5 or 20 + 3.8	13 + 10	13 + 10	13 + 12.5	13 + 12.5			
7	13	13 + 7.5	13 + 7.5	13 + 7.5	13 + 7.5 or 19 + 5	13 + 7.5 or 19 + 5	13 + 7.5 or 20 + 3.8	13 + 10	13 + 10	13 + 12.5	13 + 12.5			
8	13 + 7.5	13 + 7.5	13 + 15.6	13 + 15.6	13 + 18.8	13 + 18.8	13 + 15.6 or 20 + 10	13 + 10	13 + 18.8	13 + 25	13 + 25			

\*Section 605.1.1 of the IgCC-2012, regarding "Building Envelope Systems, Prescriptive Compliance", states that when the IgCC is used, the building thermal envelope R shall exceed the requirements of the IECC by not less than 10%.



\*The CavityComplete® Wood Stud Wall System excludes the masonry veneer, wood studs, interior gypsum board and exterior sheathing. A detailed list of the components is available at [www.CavityComplete.com](http://www.CavityComplete.com).

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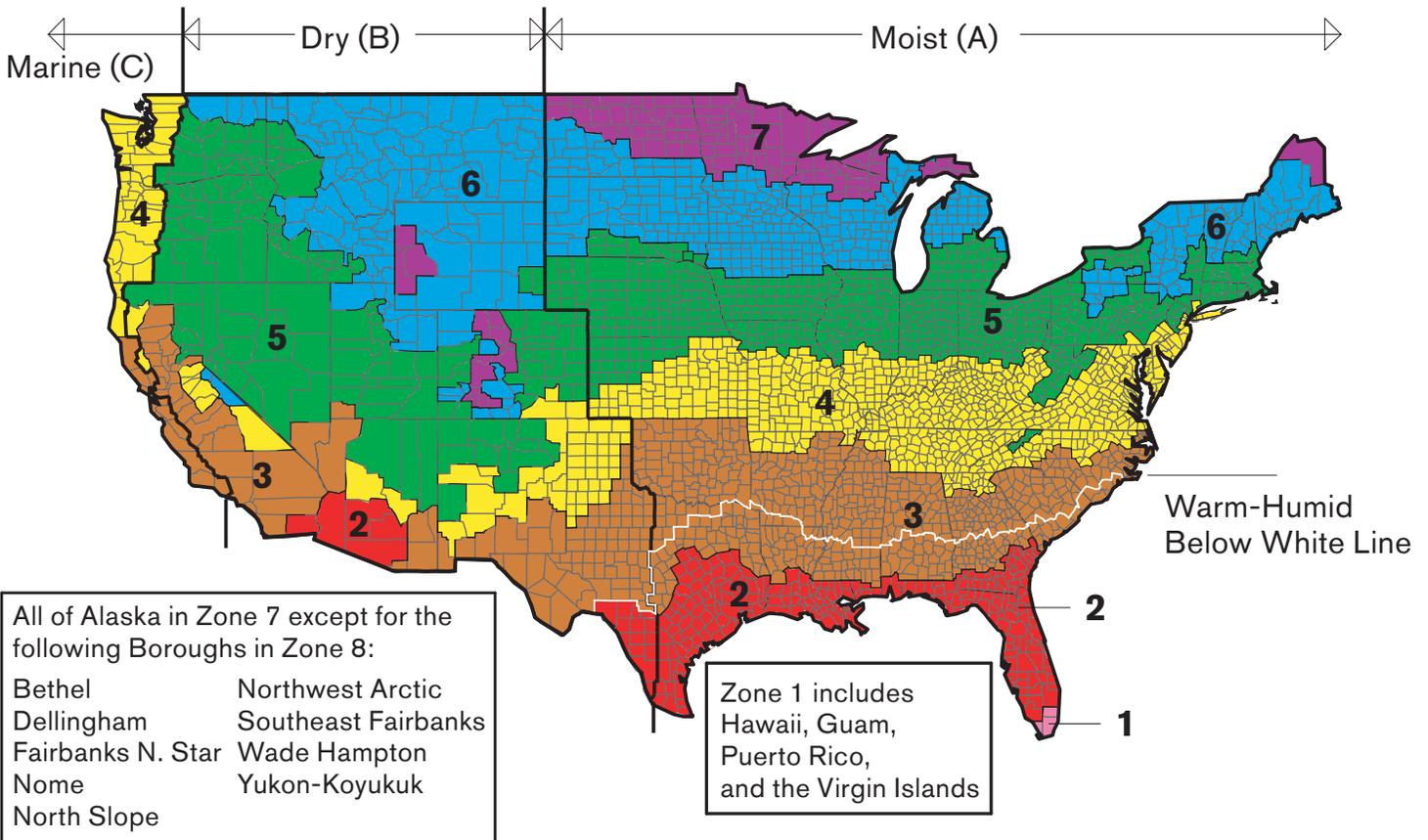
## CavityComplete® Wood Stud Wall System and Energy Code Compliance

The CavityComplete® Wood Stud Wall System includes all of the components and details, completely tested, completely systemized, to demonstrate compliance with national energy codes and standards. EcoTouch® PINK® Fiberglas™ batt, FOAMULAR® XPS, Thermafiber® RainBarrier 45, and Thermafiber® UltraBatt Insulations provide multiple thicknesses and R-values for cavity and continuous insulation options, while PROSOCO R-Guard Cat-5 and Thermal-Grip® washers provide the air barrier performance necessary to meet regional prescriptive standards. Couple that with high performance TotalFlash® and MortarNet® to manage water, and Pos-I-Tie® masonry veneer anchors with ThermalClip® to insure structural integrity, and it really is all in the wall.

## United States Climate Zones

### References

- 1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1791 Tullie Circle NE, Atlanta, GA 30329
- 2 International Energy Conservation Code; International Code Council, Inc.; 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795
- 3 International Green Construction Code; International Code Council, Inc.; 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795
- 4 ASHRAE 189.1, Standard for the Design of High-Performance Green Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1791 Tullie Circle NE, Atlanta, GA 30329
- 5 ASTM E 2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies; ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959
- 6 ASTM E779-10, Standard Test Method for Determining Air Leakage Rate by Fan Pressurization; ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959



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