



Energy Codes and Standards

Air Leakage and Prescriptive Wall Insulation Requirements

Energy Codes and Standards

Owens Corning® Enclosure Solutions has a variety of insulation, air barrier, and air/water sealing accessory options that make it easy to specify compliance with energy codes and standards. ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings¹, 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 Code² (IECC) is a similar standard that is also widely adopted. The International Green Construction Code³ (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 189.1⁴, 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, such as the United States Army Corps of Engineers (USACE), choose to design to their goals of greater sustainability.

Limiting Air Leakage

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/ft² at a pressure of 75 Pa (1.57 psf) when tested in accordance with ASTM E2357⁵. Owens Corning® Enclosure Solutions provides multiple options for air barrier systems that meet these requirements while also meeting the NFPA 285 resistance to

fire propagation standard. It is always recommended to verify performance with the air barrier manufacturer. For complete information regarding installing Owens Corning® FOAMULAR® XPS with taped joints as the air and water resistive barrier, see the Owens Corning® Enclosure Solutions technical bulletin CMU-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/ft² at a pressure differential of 75 Pa (1.57 psf) when tested in accordance with ASTM E779⁶. 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 Mass Walls, Above Grade" charts R by climate zone for mass (concrete masonry unit, CMU) walls as listed in ASHRAE 90.1, the IECC, and ASHRAE 189.1 when used as an alternate to the IgCC.

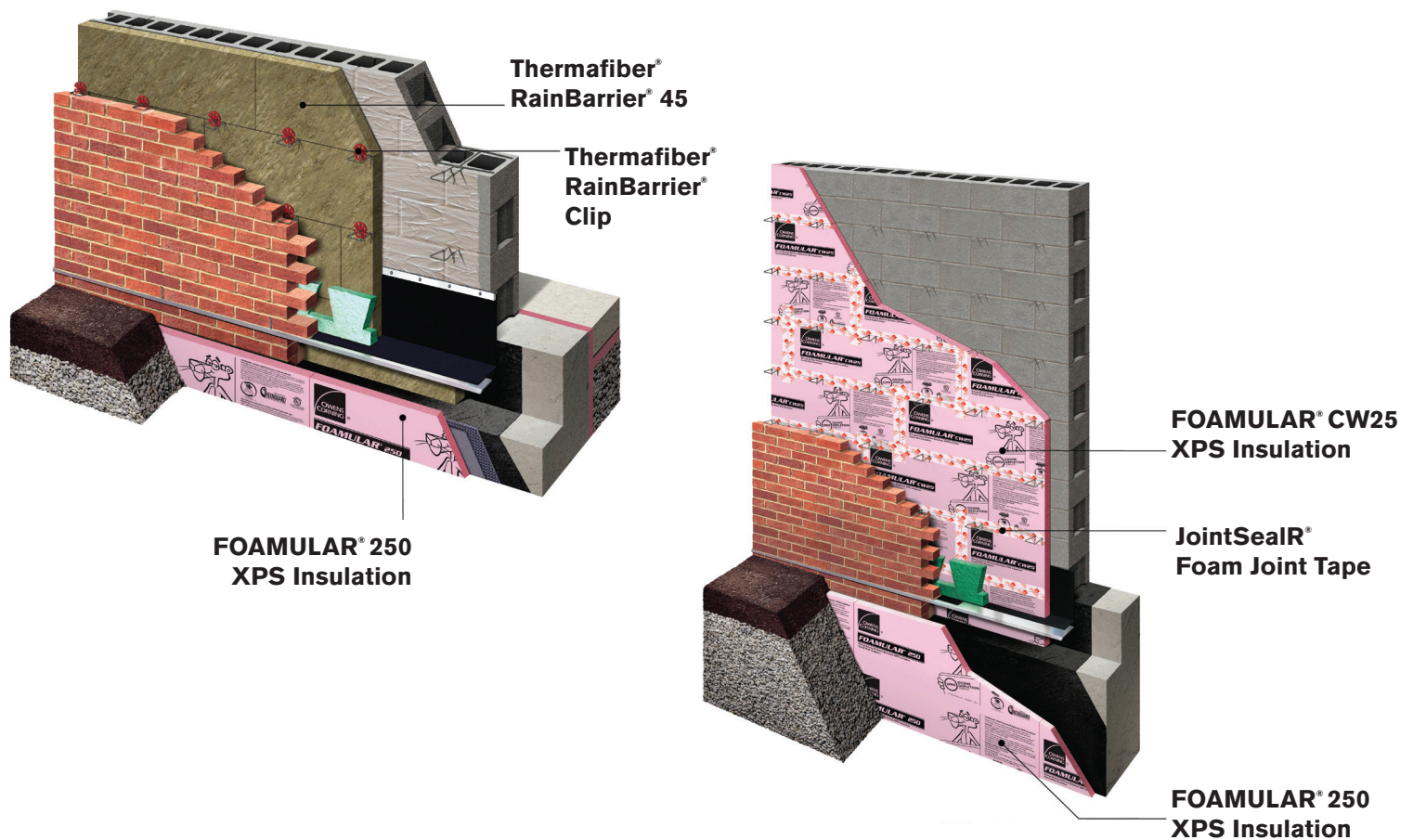
Because the edition adopted varies by jurisdiction, several 90.1 editions are summarized including 2004, 2007, 2010 and 2013. The IECC-2012 and 2015, and ASHRAE 189.1 2011 and 2014 editions are also summarized. The table shows prescribed continuous insulation R-value. The table shows only the prescriptive 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 Concrete Block 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	NR	5.7	NR	5.7	NR	5.7	5.7	5.7	5.7	5.7	5.7	7.6	NR	5.7
2	NR	5.7	5.7	7.6	5.7	7.6	5.7	7.6	5.7	7.6	7.6	9.5	5.7	7.6
3	5.7	7.6	7.6	9.5	7.6	9.5	7.6	9.5	7.6	9.5	9.5	11.4	7.6	9.5
4	5.7	9.5	9.5	11.4	9.5	11.4	9.5	11.4	9.5	11.4	11.4	13.3	11.4	13
5	7.6	11.4	11.4	13.3	11.4	13.3	11.4	13.3	11.4	13.3	13.3	15.2	13	15.2
6	9.5	11.4	13.3	15.2	13.3	15.2	13.3	15.2	13.3	15.2	15.2	20	15.2	19.6
7	11.4	13.3	15.2	15.2	15.2	15.2	15.2	15.2	15.2	15.2	20	20	19.6	19.6
8	13.3	15.2	15.2	25	19	19	25	25	25	25	20	31.3	22	22

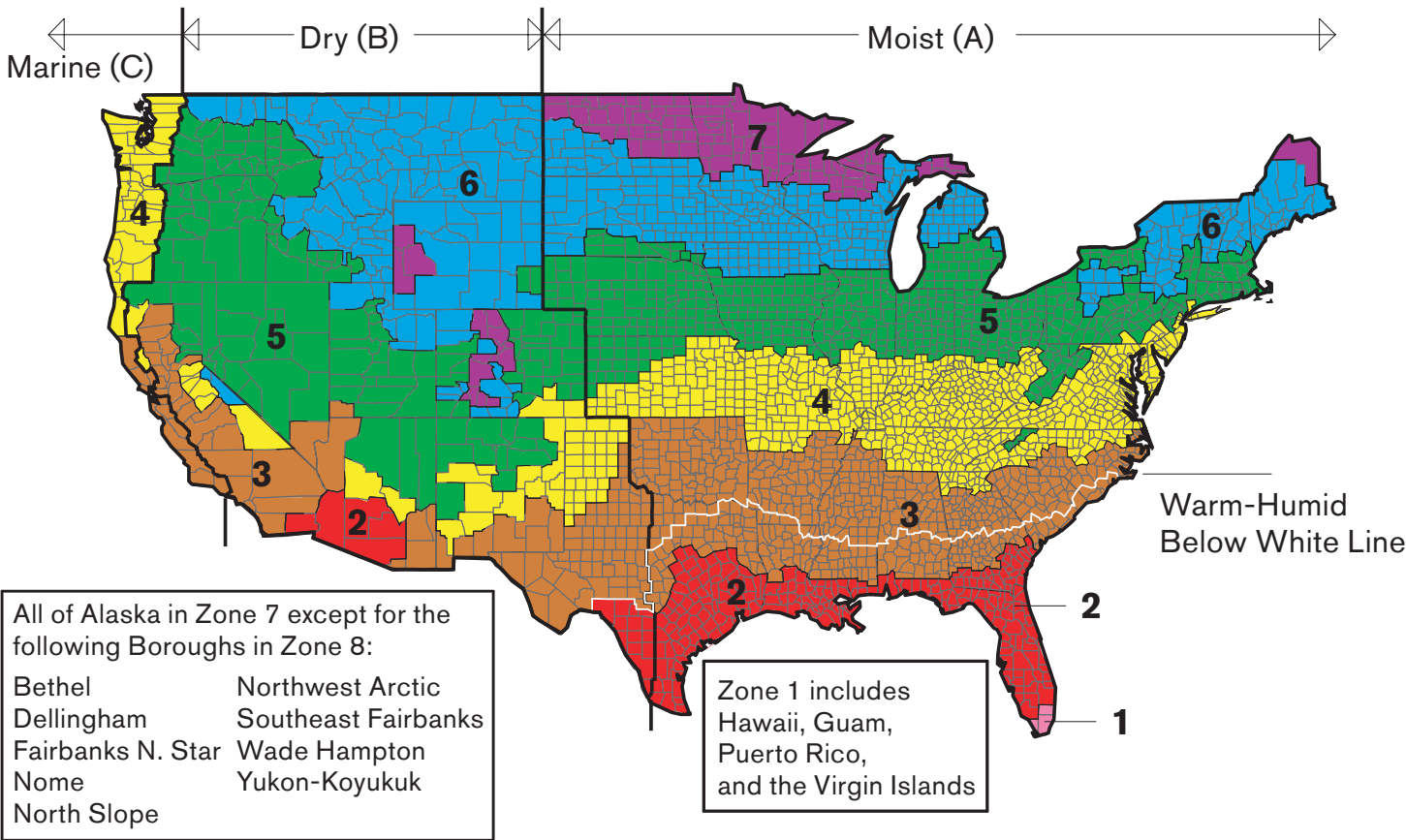
*Section 605.1.1 of the IgCC-2012, regarding "Building Envelope Systems, Prescriptive Compliance", states that when the IgCC is used, the building thermal envelope R shall exceed the requirements of the IECC by not less than 10%.



Owens Corning® Enclosure Solutions and Energy Code Compliance

Owens Corning® Enclosure Solutions includes components and details to create systematized NFPA 285 complaint assemblies that meet energy codes and standards verified by the designer. EcoTouch® FiberGlas™ Batt, FOAMULAR® XPS, and Thermafiber® RainBarrier® may be used to meet or exceed the thermal requirements of any of the energy codes. Owens Corning has one of the most thorough lists of air barrier options including the use of FOAMULAR® XPS taped with JointSealR® to meet air leakage requirements. Owens Corning also provides a comprehensive list of detail drawings and specifications to ensure successful installation and energy efficient buildings.

United States Climate Zones



References

- 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
- International Energy Conservation Code; International Code Council, Inc.; 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795
- International Green Construction Code; International Code Council, Inc.; 4051 West Flossmoor Road, Country Club Hills, IL 60478-5795
- 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
- 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
- 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