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VINYL SIDING INSTITUTE



Certified Insulated Siding:

Quality, Comfort and Energy Performance







Presented by
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About the Vinyl Siding Institute (VSI)

- VSI is the trade association for manufacturers of vinyl and other polymeric siding and suppliers to the industry
- Located in Washington, DC
- VSI priority programs
  - Product and color retention certification
  - Installation, including the Certified Installer Program
  - Technical work
  - *America Sides with Vinyl (ASwV)* marketing initiative
  - Code and regulatory projects



Learning Objectives

At the end of this presentation, you will be able to:

- Define insulated siding
- Understand R-value testing of insulated siding
- Describe proper installation of insulated siding
- Comply with energy codes
- Understand building energy performance program and software recognition

Poll

What is your role in energy-efficient construction?



Introduction











Insulated Siding: An Introduction

- Insulated siding is vinyl siding that is engineered to incorporate a substantial thickness of insulation
  - Most commonly used insulation is expanded polystyrene (EPS), a material manufactured to the specifications of *ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*
  - Adhesives used in insulated siding are permanently flexible, allowing for the normal expansion and contraction that occurs in vinyl siding
  - As opposed to “vinyl siding with drop in backers,” insulated siding has insulation that is integral to the specific panel



Insulated Siding: An Introduction

- Early 1990s: First field tests conducted in the southern United States
- Mid 1990s: Improvements in design and manufacturing
- 1997: First commercial insulated siding introduced
- Since then, product developments have allowed insulated siding to experience consistent growth and recognition as home insulation
- Insulated siding standard now complete
  - ASTM D7793
  - Product certification to begin in mid-2013



R-value Testing











R-value

- R-value: the ability of a material to resist the flow of heat (thermal resistance)
- Any company involved in marketing home insulation (insulated siding included) must comply with the spirit of Federal Trade Commission regulations
  - The claimed or labeled R-value must be tested in compliance with ASTM C1363 *Standard Test Method for the Thermal Performance of Building Materials and Envelope Assemblies*

R-value Testing

- ASTM C1363 (aka, the “Hot Box”)
  - ASTM C1363 testing determines insulated siding’s specific R-value
  - Insulated siding testing is based on real-world conditions; produces realistic R-values
    - Wall assembly
    - Wind application
- The wall assembly is placed between two chambers (one side representing indoor conditions, the other representing cooler, outdoor conditions)
  - Amount of energy needed to maintain the “indoor” temperature is measured



R-value Testing

- Installation details for specific products are not included in ASTM C1363
- The VSI Technical Committee specified test conditions that reflect actual field performance of insulated siding
- The test method and specified conditions include:
  - Installation configuration
  - Environmental conditions; wind is directed against the siding
  - Procedures



U-factor

- The U-factor of an entire wall assembly takes into account the combined insulating effects of air films, interior gypsum, siding, structural sheathing, framing and insulation
- Insulated siding can help builders and designers meet or exceed *International Energy Conservation Code* (*IECC*) requirements for whole wall U-factors, which are climate-dependent
- R-values are used to calculate whole wall U-factors





Certification for Insulated Siding

- ASTM standard specification for insulated siding is now established, ASTM D7793
  - Published July 2012
  - Product certification to begin mid-2013



- Certification requires the described testing and a **minimum** R-value of 2.0, among other tests for
  - Weatherability
  - Wind resistance
  - Impact resistance
- A minimum R-value of 2.0 is consistent with the minimum R-value required for insulated sheathing in the *IECC*

Poll

Are you currently using, promoting or specifying insulated siding?



Installation





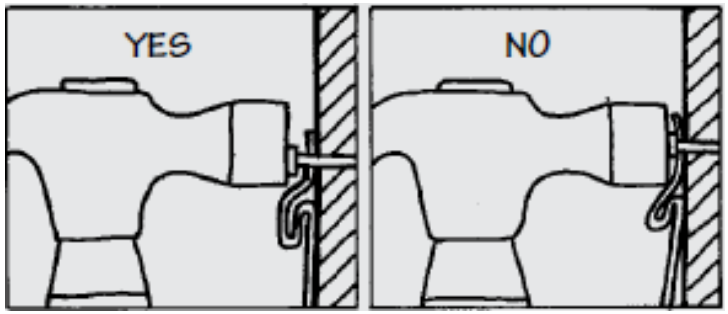






Installation

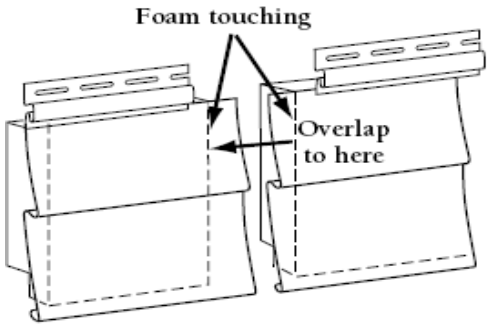
- General tips for vinyl siding and insulated siding:
  - When cutting insulated siding, use a circular saw with a fine-tooth (plywood) blade inserted backwards; cut slowly
  - Do not drive the head of the fastener tightly against the siding nail hem; allow approximately 1/32”clearance (thickness of a dime)
  - When installing a panel, it is critical that the lock is fully engaged with the piece below it
  - Fasten nails or other fasteners in the center of the nailing slot; make sure the fastener penetrates a minimum of 3/4” into a nailable surface





Installation

- Insulated siding is thicker than vinyl siding alone
  - Use accessories that accommodate the full thickness of the insulated siding
- Insulated siding tip:
  - No gap is needed between the foam and the ends of insulated siding panels
  - Be sure to butt each piece of foam together when installing panels



Installation



- Remodeling
  - Inspect for water damage
    - If found, remedy water source
  - For insulated siding to qualify as home insulation, it must be installed directly over a water-resistive barrier and sheathing
    - Insulated siding installed over furring strips would not be considered home insulation

Poll

Where are you doing business?



Energy Codes and Building Energy Performance Programs

David Brignati, LEED AP, AIA
Newport Ventures









Energy Codes and Code +

- Energy programs and codes acknowledge the ability of rigid or board insulation (such as insulated siding) to improve the energy efficiency of homes
  - U.S. EPA/ENERGY STAR®
    - Insulated siding is on the checklist of building products that can help qualify new homes to earn a label under ENERGY STAR Qualified Homes Version 3
    - Thermal bridging = energy transfer through building materials
  - U.S. DOE CHALLENGE HOME
  - *International Energy Conservation Code* (*IECC*)



Energy Codes











Complying with Energy Codes

- Energy codes have become increasingly stringent
- Builders and designers are looking for cost-effective ways to specify and build walls with higher thermal performance
- Insulated siding meets the requirements of the *IECC*



International Energy Conservation Code

- 2009 IECC
  - Widely adopted by states and jurisdictions
  - Credits insulated siding's R-value in calculating the whole wall U-factor
- 2012 IECC
  - Likely to be adopted by several states in 2012
  - Lists insulated siding as an option to meet continuous insulation R-value requirements
  - Credits insulated siding's R-value in calculating the whole wall U-factor



International Energy Conservation Code

IECC Compliance Approach	*IECC* Section	Documentation Required	Notes
Prescriptive R-value	402.1.1	R-value of insulated siding (see Chapter 3 of this guide for more information on determining the R-value)	*2009 IECC:* Table 402.1.1 recognizes "insulated sheathing." To determine if "insulated siding" is approved for compliance with Table 402.1.1, check with the local building official. *2012 IECC:* In footnote h of Table 402.1.1, insulated siding is considered to be interchangeable with other forms of continuous insulation.
Prescriptive U-factor	402.1.3	U-factor of wall assembly, including insulated siding*	In computing wall U-factors, the designer can use the thermal benefit of insulated siding.
Prescriptive UA (U-factor times the area of the wall)	402.1.4	U-factor of wall assembly, including insulated siding*	
Performance	405	U-factor of wall assembly, including insulated siding*	

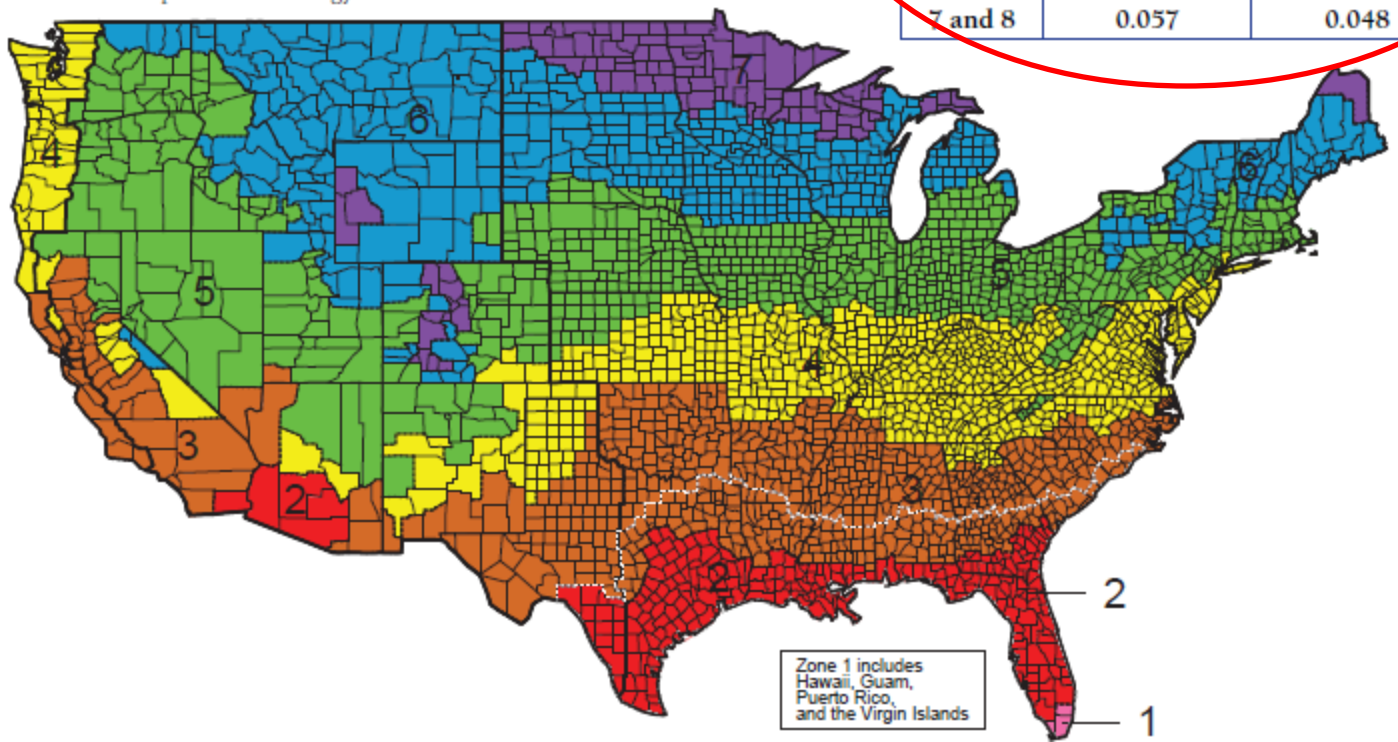
Energy Code Compliance in Various Climate Zones

Climate Zone	Frame Wall U-factor requirements	
	2009 IECC	*2012 IECC*
1-2	0.082	0.082
3	0.082	0.057
4 except Marine	0.082	0.057
5 and Marine 4	0.057	0.057
6	0.057	0.048
7 and 8	0.057	0.048

All of Alaska is in Zone 7 except for the following Boroughs in Zone 8:

Bethel
Dellingham
Fairbanks N. Star
Nome
North Slope
Northwest Arctic
Southeast Fairbanks
Wade Hampton
Yukon-Koyukuk

Source: U.S. Department of Energy





Energy Code Compliance in Various Climate Zones

Table 6.3 Wood Framed Wall, Whole Wall U-factors								
Continuous Insulation R-value	Cavity Insulation R-value							
	16" on Center				24" on Center			
	2"x4" Construction		2"x6" Construction		2"x4" Construction		2"x6" Construction	
	R-13	R-15	R-19	R-21	R-13	R-15	R-19	R-21
R-0 (No Continuous)	0.082	0.077	0.060	0.057	0.080	0.074	0.059	0.056
R-2.0	0.073	0.068	0.056	0.052	0.071	0.066	0.055	0.051
R-2.5	0.070	0.066	0.055	0.051	0.068	0.064	0.053	0.049
R-3.0	0.067	0.063	0.053	0.049	0.066	0.062	0.052	0.048
R-3.5	0.065	0.061	0.051	0.048	0.063	0.059	0.050	0.047
R-4.0	0.063	0.059	0.050	0.047	0.061	0.058	0.049	0.045
R-4.5	0.061	0.057	0.049	0.045	0.059	0.056	0.048	0.044
R-5.0	0.059	0.055	0.047	0.044	0.058	0.054	0.047	0.043

U ≤ 0.082 2009: CZ 1-4 (except Marine); 2012: CZ 1-2

U ≤ 0.057 2009: CZ 5-8 (& Marine 4); 2012: CZ 3-5

U ≤ 0.048 2012: CZ 6-8

Sample Wall Assembly for *2009 IECC*

***Design Goal**:* Comply with *2009 IECC* wall U-factor requirements across all Climate Zones;
Use R-19 insulation

U ≤ 0.057 Zones 1-8

Exceeds *2009 IECC* Requirements for

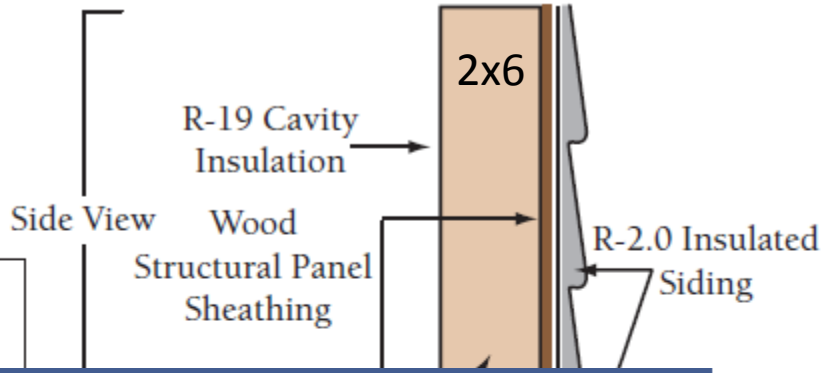


Table 6.3 Wood Framed Wall, Whole Wall U-factors

Continuous Insulation R-value	Cavity Insulation R-value							
	16" on Center				24" on Center			
	2"x4" Construction		2"x6" Construction		2"x4" Construction		2"x6" Construction	
	R-13	R-15	R-19	R-21	R-13	R-15	R-19	R-21
R-0 (No Continuous)	0.082	0.077	0.060	0.057	0.080	0.074	0.059	0.056
R-2.0	0.073	0.068	0.056	0.052	0.071	0.066	0.055	0.051
R-2.5	0.070	0.066	0.055	0.051	0.068	0.064	0.053	0.049
R-3.0	0.067	0.063	0.053	0.049	0.066	0.062	0.052	0.048
R-3.5	0.065	0.061	0.051	0.048	0.063	0.059	0.050	0.047
R-4.0	0.063	0.059	0.050	0.047	0.061	0.058	0.049	0.045
R-4.5	0.061	0.057	0.049	0.045	0.059	0.056	0.048	0.044
R-5.0	0.059	0.055	0.047	0.044	0.058	0.054	0.047	0.043

resistive
rrier



Sample Wall Assembly for *2009 IECC*

Design Goal: Comply with *2009 IECC* wall U-factor requirements across all Climate Zones

Use 2x4 wall

U ≤ 0.057 Zones 1-8

Meets *2009 IECC* Requirements for Climate Zones 1 to 8 and *2012 IECC* Requirements for Climate Zones 1 to 5

U-factor of .057

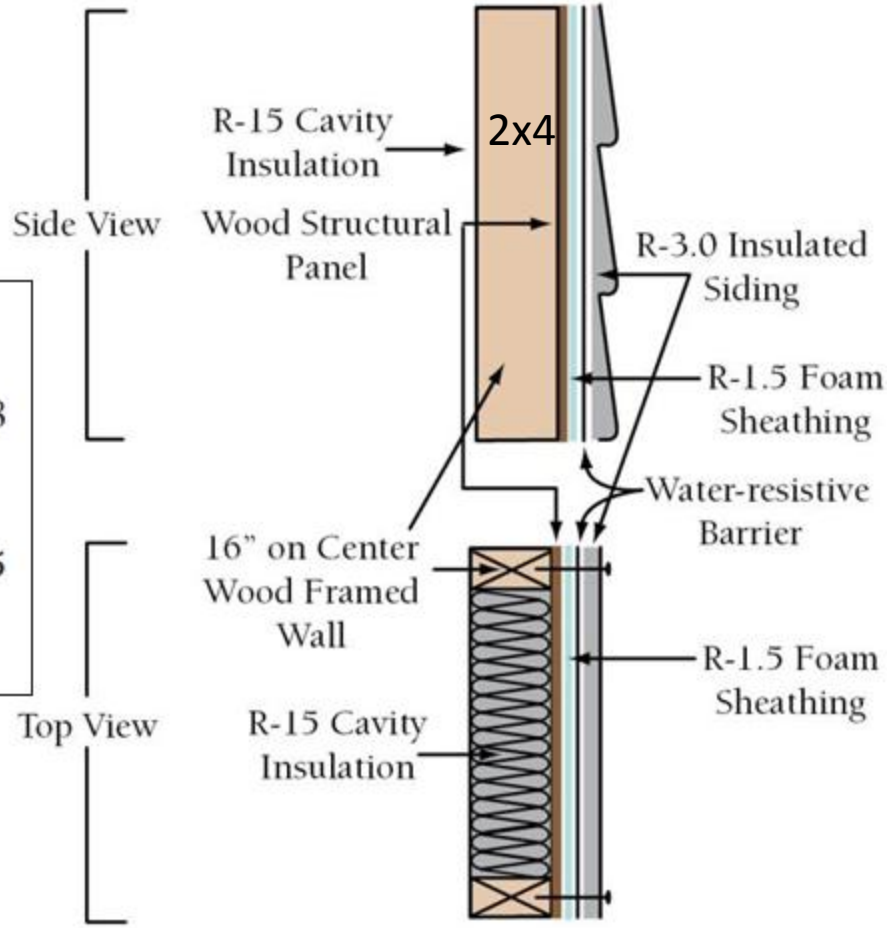


Table 6.3 W								
Continuous Insulation R-value	2"x4" Constru							
	R-13							
R-0 (No Continuous)	0.082							
R-2.0	0.073							
R-2.5	0.070							
R-3.0	0.067							
R-3.5	0.065							
R-4.0	0.063							
R-4.5	0.061	0.057	0.049	0.045	0.059	0.056	0.048	0.044
R-5.0	0.059	0.055	0.047	0.044	0.058	0.054	0.047	0.043



Sample Wall Assembly for *2012 IECC*

***Design Goal**:* Comply with *2009 & 2012 IECC* wall U-factor requirements across all Climate Zones;

U ≤ 0.048 Zones 1-8

Exceeds *2009* and *2012 IECC* Requirements for Climate Zones 1 to 8

U-factor of .048

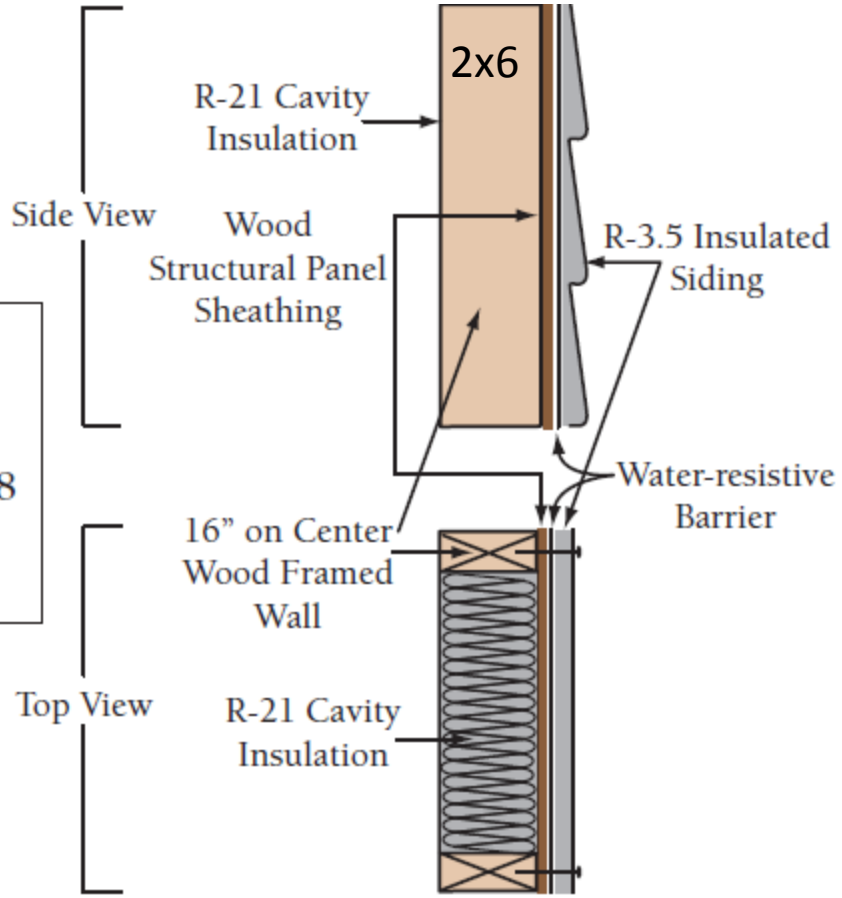


Table 6.3								
Continuous Insulation R-value	2"x4" Cons							
	R-13							
R-0 (No Continuous)	0.082							
R-2.0	0.073							
R-2.5	0.070							
R-3.0	0.067							
R-3.5	0.065							
R-4.0	0.063							
R-4.5	0.061	0.057	0.049	0.045	0.059	0.056	0.048	0.044
R-5.0	0.059	0.055	0.047	0.044	0.058	0.054	0.047	0.043



Poll

Did this section help you understand how insulated siding can be used with the energy code?



Building Energy Performance Programs











Insulated Siding and Energy Performance Programs

- Two of the most popular energy efficiency programs for residential builders—EPA's ENERGY STAR Qualified Homes and DOE CHALLENGE HOME—use a home energy rating system (HERS) to develop a score (HERS Index)
  - Insulated siding can be used in compliance with these programs to help improve a home's HERS Index
- HERS Index was reported for 40% of new homes in 2011.

ENERGY STAR Qualified Homes Version 3

- Due to its ability to reduce thermal bridging, insulated siding has been added to the checklist of building products that can help new homes earn a label under ENERGY STAR Qualified Homes Version 3
  - V3 is required for all new homes earning the label as of July 2012
  - Minimum R-value for insulated siding:
    - R-3.0 for Climate Zones 1-4
    - R-5.0 for Climate Zones 5-8*



"ENERGY STAR Qualified Homes can include a variety of 'tried-and-true' energy-efficient features that contribute to improved home quality and homeowner comfort, and to lower energy demand and reduce air pollution."

**Can be met with a combination of insulating sheathing and insulated siding*



ENERGY STAR Qualified Homes Version 3

ENERGY STAR Qualified Homes Version 3 (Rev. 05) Thermal Enclosure System Rater Checklist

4. Reduced Thermal Bridging				
4.1 For insulated ceilings with attic space above (i.e., non-cathedralized), Grade I insulation extends to the inside face of the exterior wall below at these levels: CZ 1-5: ≥ R-21; CZ 6-8: ≥ R-30 [11]	☐	☐	☐	☐
4.2 For slabs on grade in CZ 4 and higher, 100% of slab edge insulated to ≥ R-5 at the depth specified by the 2009 IECC and aligned with thermal boundary of the walls [4,5]	☐	☐	☐	☐
4.3 Insulation beneath attic platforms (e.g., HVAC platforms, walkways) ≥ R-21 in CZ 1-5; ≥ R-30 in CZ 6-8	☐	☐	☐	☐
4.4 Reduced thermal bridging at above-grade walls separating conditioned from unconditioned space (rim / band joists exempted) using one of the following options: [12,13]				
4.4.1 Continuous rigid insulation, insulated siding, or combination of the two; ≥ R-3 in Climate Zones 1 to 4, ≥ R-5 in Climate Zones 5 to 8 [14,15], **OR**;	☐	☐	☐	☐
4.4.2 Structural Insulated Panels (SIPs), **OR**;	☐	☐	☐	☐
4.4.3 Insulated Concrete Forms (ICFs), **OR**;	☐	☐	☐	☐
4.4.4 Double-wall framing [16], **OR**;	☐	☐	☐	☐
4.4.5 Advanced framing, including all of the items below:				
4.4.5a All corners insulated ≥ R-6 to edge [17], **AND**;	☐	☐	☐	☐
4.4.5b All headers above windows & doors insulated [18], **AND**;	☐	☐	☐	☐
4.4.5c Framing limited at all windows & doors [19], **AND**;	☐	☐	☐	☐
4.4.5d All interior / exterior wall intersections insulated to the same R-value as the rest of the exterior wall [20], **AND**;	☐	☐	☐	☐
4.4.5e Minimum stud spacing of 16 in. o.c. for 2x4 framing in all Climate Zones and, in Climate Zones 5 through 8, 24 in. o.c. for 2x6 framing unless construction documents specify other spacing is structurally required [21]	☐	☐	☐	☐



Energy Software Programs

- REM/Rate and Energy Gauge USA software allow for the inclusion of insulated siding within their calculations
- Go to www.insulatedsiding.info to learn how to apply insulated siding with:
  - EnergyGauge® USA
  - REM/Rate™



Insulated Siding and Energy Performance Programs

- Prototypical two-story home modeled using EnergyGauge USA software
  - Configured to meet minimum prescriptive and mandatory requirements of *2009 IECC*
  - Modeled in each *IECC* climate zone
  - Calculated the HERS Index and projected energy use of each home
  - Reran the simulations with insulated siding installed (R-2.0, R-2.5 and R-3.0)

HERS Index Improvements with Insulated Siding

- Improvements to the HERS Index and projected energy use for homes using R-values for insulated siding of 2.0, 2.5 and 3.0 show insulated siding can provide up to a 3 point improvement versus a *2009 or 2012 IECC* compliant home
- This can account for up to 23 percent of the improvement necessary over a *2009 IECC* compliant home to achieve compliance with ENERGY STAR Qualified Homes Version 3





HERS Index Improvements with Insulated Siding

Climate Zone	City	*2009 IECC* Minimum Home		*2009 IECC* Minimum Home + R-2.0 Insulated Siding		*2009 IECC* Minimum Home + R-2.5 Insulated Siding		*2009 IECC* Minimum Home + R-3.0 Insulated Siding		ENERGY STAR V3 HERS Index Target
		Wall U-factor	HERS Index	Wall U-factor	HERS Index Improvement v. *2009 IECC*	Wall U-factor	HERS Index Improvement v. *2009 IECC*	Wall U-factor	HERS Index Improvement v. *2009 IECC*	
1	Miami	0.082	85	0.073	1	0.070	1	0.067	1	70
2	Phoenix	0.082	87	0.073	2	0.070	3	0.067	3	71
3	Dallas	0.082	85	0.073	1	0.070	2	0.067	2	70
4	Baltimore	0.082	84	0.073	2	0.070	2	0.067	3	70
5	Denver	0.059	85	0.054	1	0.052	1	0.050	2	69
6	Burlington	0.059	86	0.054	1	0.052	1	0.050	2	65
7	Duluth	0.057	87	0.052	2	0.051	2	0.049	2	63
8	Fairbanks	0.057	85	0.052	2	0.051	2	0.049	2	59



Energy Savings Improvements with Insulated Siding

Climate Zone	City	*2009 IECC* Minimum Home Wall U-factor	*2009 IECC* Minimum Home + R-2.0 Insulated Siding		*2009 IECC* Minimum Home + R-2.5 Insulated Siding		*2009 IECC* Minimum Home + R-3.0 Insulated Siding	
			Wall U-factor	Percent Heating and Cooling Energy Savings Improvement over *2009 IECC*	Wall U-factor	Percent Heating and Cooling Energy Savings Improvement over *2009 IECC*	Wall U-factor	Percent Heating and Cooling Energy Savings Improvement over *2009 IECC*
1	Miami	0.082	0.073	2%	0.070	3%	0.067	2%
2	Phoenix	0.082	0.073	2%	0.070	3%	0.067	4%
3	Dallas	0.082	0.073	3%	0.070	4%	0.067	6%
4	Baltimore	0.082	0.073	4%	0.070	6%	0.067	7%
5	Denver	0.059	0.054	3%	0.052	4%	0.050	5%
6	Burlington	0.059	0.054	2%	0.052	3%	0.050	4%
7	Duluth	0.057	0.052	3%	0.051	3%	0.049	4%
8	Fairbanks	0.057	0.052	2%	0.051	3%	0.049	3%



Improving Existing Homes' Energy Efficiency



- Replacing a home's exterior cladding with insulated siding can improve the walls' thermal performance
  - Improves R-value of existing walls, reduces energy use and utility bills
  - Can be specified as part of a whole-house solution for energy retrofit programs
  - Helps comply with the Building Performance Institute's Envelope Professional Standard
  - Can be effective in weatherization programs that require calculation of savings-to-investment ratios



Insulated Siding Energy Performance Study

- To help validate insulated siding's performance in home retrofits, Newport Ventures conducted the *Insulated Siding Energy Performance Study.* The study examined the energy performance of insulated siding in four home re-siding projects in five different parts of the country.
- Newport Ventures completed the study in June 2013, which showed the following results:
  - An average air tightness improvement of 11 percent across the five homes after the insulated siding was installed
  - Analysis of pre- and post-retrofit utility bill data showed energy savings at all five sites, with an average savings of 5.5 percent
  - An improvement (reduction) of 2.0 to 8.0 points in the homes' HERS index through the installation of a weather-resistive barrier and insulated siding based on building energy simulation results.

Poll

Will you be constructing or specifying homes under ENERGY STAR Qualified Homes Version 3?





Learning Objectives

You are now able to:

- Define insulated siding
- Understand R-value testing of insulated siding
- Describe proper installation of insulated siding
- Comply with energy codes
- Understand building energy performance program and software recognition

Poll

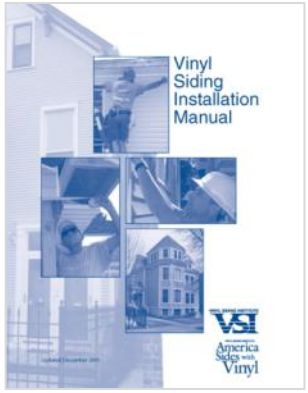
What other programs should we focus on to further educate on insulated siding as home insulation?

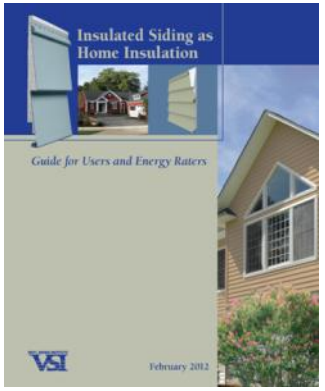
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Resources

- Many of insulated siding's attributes and installation techniques are the same as those of vinyl siding
  - Always follow the manufacturer's instructions
  - Consult the VSI *Vinyl Siding Installation Manual*
  - www.vinylsiding.org/installation/manual
- *Insulated Siding as Home Insulation: Guide for Users and Energy Raters* contains installation tips specific to insulated siding
  - Includes supplemental installation instructions for insulated siding
  - www.insulatedsiding.info





Questions?

To complete this course, please click on the link below to take a quick survey:
https://www.surveymonkey.com/s/KRSLVQL









For more information on the life cycle of vinyl siding plus other benefits of vinyl siding visit www.vinylsiding.org