Providing Content for Solution Center Guides

6/11/13

This document provides guidance on submitting content for Building America Solution Center measure guides (referred to below as Guides). Most Solution Center Guides consist of a tabbed document interface, containing the following eight tabs:

1. Scope of Work
2. Description
3. Ensuring Success
4. Climate-Specific Factors/Details
5. Training (Right and Wrong Images, Presentations, and Videos)
6. Architectural CAD Files
7. Compliance (Codes, Standards or Program Criteria)
8. More Info (Case Studies and References).

As an appendix to all reports, please prepare the Guide elements listed above. Use Microsoft Word for the text. Place graphics and photos in the text showing their proper placement within the text and above their captions. If you do not have data for an element, such as Right and Wrong images or the Climate element, simply state this after the heading. An example of a completed Guide submission, with inline instructions and notes, is provided in Appendix A of this document.

Some reports will include several measures. Please provide content as outlined here for each measure. Also, if a measure changes significantly based on the climate zone (e.g., vapor barriers), either make these climate distinctions very clear within one measure (with clear headings and instructions for each climate zone) or treat each climate distinction as a new measure.

NREL will send the final (reviewed and approved) solution center content to Rose Bartlett (rosemarie.bartlett@pnnl.gov). The teams will be copied on this submission and should send any raw images NREL doesn't already have to Rose. She can send you a link for uploading large files. Please call 509-375-6606 if you have any questions. If Rose cannot be reached, please contact Linda Connell (linda.connell@pnnl.gov or 509-375-5767).

Formatting the Content

Any of the Guide elements described below might include links to publications, presentations, case studies, images, other Solution Center Guides, and other content. Where available, provide complete references (citations) to these content elements in the More Info Tab. For links to unreferenced content, such as website pages or other Guides, the URL can be provided within the text body as a comment or inline (highlighted and in brackets). Be sure to clearly identify the source of the link, either by filename or URL, or if referencing another Guide, by the exact title of the Guide.

Scope of Work

Write the scope to clearly define and bound the measure. Tell builders and remodelers how to perform the work in a way they could use to contractually obligate their subcontractors. Specify the quantity of work expected and the quality of work expected. If the Guide describes a measure that is a Challenge Home or Indoor airPlus requirement, scope language can be pulled from the Challenge Home National Program Requirements[1] or the Indoor airPlus Construction Specifications[2]. Please provide one image or photo depicting the measure. This image will appear on the upper right side of the Scope Tab.

Description

Provide an overall explanation of the measure, including an introduction, issues, pros and cons of each method if more than one technique will be described, materials to use, and who does the work.

Under a "How to …." heading, write out specific, numbered, steps for implementing the measure. If more than one technique will be described in this Guide, provide separate numbered lists for each technique. Use graphics and/or photos to illustrate the steps. See the last section, *Submitting Images*, for guidance on submitting images.

Remember to use the scope to focus your description.

Ensuring Success

Document any health, safety, durability, and performance issues and test-in/test-out requirements that need to be considered when completing this measure.

Climate-Specific Factors/Details

Document climate-specific guidance related to this specific topic. Include climate-specific requirements and guidance from codes and standards, and DOE programs such as ENERGY STAR and Challenge Home. This content may contain some redundancy with other elements, such as Compliance.

Training

Training materials consist of right and wrong images, presentations, and videos.

Right and Wrong Images

Provide photographs showing the building concept applied correctly and incorrectly. Arrows or circles may be included on the image to draw attention to the specific problem or solution, but these details must be incorporated in the image file and not separately applied.

See the last section, *Submitting Images*, for guidance on submitting images.

PowerPoint Presentations

Provide publically available presentations about this topic from sources in which copyright and use will not be an issue. Provide links to the presentations, or provide presentation files directly.

[1] http://www1.eere.energy.gov/buildings/residential/ch_guidelines.html
[2] http://www.epa.gov/iaplus01/construction_specifications.html

- PowerPoint presentations should be submitted in PPT or PDF formats. Although PPTX files can be used and will be accepted, there have been some reported downloading issues and not all users will be able to view them.
- For meeting 508 compliance requirements, document properties should be filled out for both PPT and PDF formats.
- Alternative (alt) text should be identified for any non-text items.
    - To add alt text in PowerPoint, right-click on the item and select format object, format picture, or format chart area, etc. (depending on the type of non-text element). Alt text will be one of the tab choices on the left (usually at the bottom of the dialog box).
    - To add alt text to PDFs where the original PowerPoint is not available, use Adobe Acrobat Pro. Open the PDF, choose Tools, Action Wizard, Create Accessible PDFs, Add Tags to Document. The wizard will walk you through the process.

Videos and Webinars

Provide videos about this topic from sources in which copyright and use will not be an issue. Provide links to the videos or provide video files directly.

- Submit videos and webinars in Windows Media Video (WMV), Flash (FLV or SWF), or Quicktime (AVI) formats. Flash is the most platform-independent, but also has the potential to be the least accessible. Macintosh users will need a plug-in to view WMV files.
- To meet 508 compliance requirements, all video files, regardless of format, should have a transcript companion file (TXT, DOC, or PDF formats are all acceptable). If a transcript is not available for legacy video, you will need to agree to provide one or a suitable alternative if requested by a user. For new videos, closed captions should also be provided, synchronized with the soundtrack.

Architectural CAD Files

For each CAD file, provide an image file suitable for display on a web page (JPG, PNG, or GIF), a PDF of the CAD image, and the corresponding DWG file. The display images should be formatted as other images (see *Submitting Images* below).

Compliance

Provide the specific compliance references applicable to the measure: 2009 International Energy Conservation Code (IECC), 2012 IECC, and/or other applicable standards (e.g., ANSI, ASHRAE), as well as relevant program criteria such as DOE Challenge Home criteria, ENERGY STAR Version 3 (Rev. 06) requirements, etc.

When providing compliance information, include the name of the program, code, or standard and its version or edition year in the title. Include any applicable section titles and section numbers directly below the title. For standards, include a short summary of the topic and the purpose of the requirement. Include verbatim requirement text if available, enclosed in quotation marks. If exact text is not available or is protected by copyright, summarize the requirements in your own words.

If possible, address any codes or standards issues that pertain to your guide. If you know of solutions or work-arounds for those issues, they can be included in this section of the Guide. If not, please ensure the Codes and Standards Innovation (CSI) Team is aware of the issue(s) by calling Pam Cole at 509-375-6787.

More Info

Case Studies

Provide references to case studies that specifically describe or mention the measure. You may reference case studies that are already in the Solution Center, or prepare or provide a case study specific to this topic. Follow the Building America format for either measure-specific or whole-house case studies. One focuses on the specific measure research and the other on research as applied to a whole house or housing development. Indicate the construction type (new or existing construction, or both) and the IECC climate zone(s) to which the case study applies. See the following templates and samples for additional information:

- Whole-House Proven Performance Case Study Template. This template explains how to write a whole-house proven performance case study and contains the accurate design in MS Word, which can be used to design the product.
- Whole-House Proven Performance Case Study Sample – Existing Homes. This sample shows a whole-house proven performance case study for a retrofit project.
- Whole-House Proven Performance Case Study Sample – New Homes. This sample shows a whole-house proven performance case study for a new construction project.
- Measure-Specific Template. This template explains how to write a measure-specific case study and contains the accurate design in MS Word, which can be used to design the product.
- Measure-Specific Sample. This sample shows a measure-specific case study.

References

Compile complete references with URLs for all links within the Guide. References should include complete citations and, if available, the URL for the specific document. Example reference formats are provided below.

Journal Article

Arun, M., and E.G. Tulapurkara. 2005. Computation of turbulent flow inside an enclosure with central partition. *Progress in Computational Fluid Dynamics* 5:455–65.

Standards

ASHRAE. 2001. *ANSI/ASHRAE Standard 52.2-2001, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.* American Society of Heating, Air-Conditioning and Refrigeration Engineers, Inc., Atlanta, https://www.ashrae.org/standards-research--technology/standards--guidelines.

ASHRAE Handbook

ASHRAE. 2005. *2005 ASHRAE Handbook—Fundamentals.* Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

Book

Lstiburek, J. 2010. *Builder's Guide to Hot-Humid Climates*. Building Science Press, http://www.buildingsciencepress.com/.

Report

Baechler MC, TL Gilbride, MG Hefty, PC Cole, and PM Love. 2011. *Building America Best Practices Series Volume 12: 40% Whole-House Energy Savings in the Cold and Very Cold Climates*. PNNL-20139. Prepared by Pacific Northwest National Laboratory for the U.S. Department of Energy, Building America Program, http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/cold_climate_guide_40percent.pdf.

ASHRAE Transactions

Christian, J., P. Childs, P. Pate, and J. Atchley. 2006. Small House with Construction Cost of $100K, Total Energy Cost of $0.88 a Day. *ASHRAE Transations 112(1):982-996*.

Conference Proceedings

Dhinsa, K., C. Bailey, and K. Pericleous. 2005. Turbulence modelling for electronic cooling: A review. *Proceedings of the 7th International Conference on Electronics Materials and Packaging, Tokyo, Japan,* 5:275–81.

Software

LBNL. 1993. DOE-2, Version 2.1E. Lawrence Berkeley National Laboratory, Berkely, CA.

Seminar or Presentation at a Conference

Lu, D.W., X.N. Xu, H.B. Wu, and X. Jin. 2005. A permanent magnet magneto-refrigerator study on using Gd/Gd-Si-Ge alloys. First International Conference on Magnetic Refrigeration at Room Temperature, September 27–30. Montreux, Switzerland.

Internet

Rice, K. 2006. DOE/ORNL heat pump design model, Mark VI Version, last updated August 6, 2006, www.ornl.gov/~wlj/hpdm/MarkVI.shtml.

If no "last updated" date appears on the webpage, use "accessed date" and provide the date you looked at the page.

Submitting Images

The following guidelines apply to all images, regardless of where in the Guide they reside. The Solution Center will eventually support the download of native images that may differ from what is displayed online. Native images may, for example, be much higher resolution than those used for display; or they may be proprietary formats, such as CorelDraw files. Where only a single display image is provided, that will also be used for the download image.

- Display images should be submitted in a resolution suitable for online display.
- Image titles, captions, sources, and filenames should be indicated in the submission document (images in the Scope Tab do not require captions).

- Image captions will be used under pictures in the Guide to provide context to the image within the Guide discussion. Image titles can be more generic, and are used in the Image Gallery, CAD Files browser, and word search.
- Display images under 100 KB are acceptable; under 50 KB is even better. Photo gallery display images may need to be larger. Photo-realistic display images are typically better in JPG format.
- Submit display images as PNG, JPG, or GIF. These are the image formats that are visible on the web.
- Display images must be created in greyscale or RGB format. CMYK will not display correctly.
- All images should be cropped, if necessary to eliminate excessive space around the image.

Appendix A: Example Solution Center Guide Submission

This Appendix provides an example of how to format and submit content for each of the eight tabs within a Guide. Format the text in an MS Word file as you would like to see it in the Solution Center. For brevity, not all text from the example Guide is repeated in the example below.

Guide Title: Continuous Rigid Insulation Sheathing/Siding

Keywords: Thermal enclosure, Walls above grade, Rigid insulation
Climate Zone: All Climate Zones or Zones 1-8. Multiple zones may be indicated.
Construction Type: New Construction, Existing Homes, or Both.

Indicate the keywords (comma-separated), climate zone(s), and construction type associated with this measure.

Scope

A scope image is automatically formatted in the upper right corner of the Scope Tab, and does not include a caption.

Provide the scope image title, source, and filename. If published, repeat the source in the References section of the More Info Tab. If the image is unpublished, provide the contributing author and organization, year produced, and the word "Unpublished." A website URL for the organization can also be provided.

Image Title: Continuous rigid insulation sheathing/siding
Image Source: EPA. 2011. *Thermal Enclosure System Rater Checklist Guidebook*. U.S. Environmental Protection Agency, Washington, D.C.
Display Image Filename: TE44_rigidInsulScope_6-10-13.jpg
Native Image Filename (Optional):

Reduced Thermal Bridging

The Scope Tab includes the taxonomy heading term associated with the Guide.

ENERGY STAR Version 3 (Rev. 06)

Indicate all program requirements the scope pertains to (e.g., ENERGY STAR or Challenge Home).

Continuous rigid insulation, insulated siding, or combination of the two; ≥ R-3 in Climate Zones 1 to 4 or ≥ R-5 in Climate Zones 5 to 8*

A. If utilizing insulated siding that is not a water-resistant barrier, in
before installing siding.

B. If using steel studs, install continuous rigid insulation of ≥ R-3 in Climate Zones 1 to 4 or ≥ R-5 in Climate Zones 5 to 8.

C. Tape and seal all seams of continuous rigid insulation if it is being utilized as a water-resistant barrier.

*Only one item from 4.4.1 through 4.4.5 on the ENERGY STAR checklist must be installed to comply with ENERGY STAR. If the building utilizes steel framing, this requirement must be met.

Notes:

Up to 10% of the total exterior wall surface area is exempted from the reduced thermal bridging requirements to accommodate intentional designed details (e.g., architectural details such as thermal fins, wing walls, or masonry fireplaces; structural details such as steel columns). It shall be apparent to the rater that the exempted areas are intentional designed details or the exempted a documented in a plan provided by the builder, architect, designer, or engineer. The r evaluate the necessity of the designed detail to qualify the home.

Highlight any text you want linked. If the text is to be linked to a website, provide the website URL inline or as a comment.

Mass walls utilized as the thermal mass component of a passive solar design (e.g., a T exempt from this item. To be eligible for this exemption, the passive solar design sha the following five components: an aperture or collector, an absorber, thermal mass, a distribution system, and a control system. For more information, visit the Energy Savers website. [http://energy.gov/public-services/homes/home-design-remodeling]

Mass walls that are not part of a passive solar design (e.g., CMU block or log home enclosure) shall either utilize the strategies outlined in Item 4.4 (of the ENERGY STAR Thermal Enclosure System Rater Checklist). Or, the pathway in the assembly with the least thermal resistance, as determined using a method consistent with the 2009 ASHRAE Handbook of Fundamentals, shall provide ≥ 50% of the applicable assembly resistance, defined as the reciprocal of the mass wall equivalent U-factor in the 2009 IECC – Table 402.1.3. Documentation identifying the pathway with the least thermal resistance and its resistance value shall be collected by the rater and any Builder Verified or Rater Verified box under Item 4.4 (of the ENERGY STAR Thermal Enclosure System Rater Checklist) shall be checked.

If used, insulated siding shall be attached directly over a water-resistive barrier and sheathing. In addition, it shall provide the required R-value as demonstrated through either testing in accordance with ASTM C 1363 or by attaining the required R-value at its minimum thickness. Insulated sheathing rated for water protection can be used as a water resistant barrier if all seams are taped and sealed. If non-insulated structural sheathing is used at corners, advanced framing details listed under Item 4.4.5 (of the ENERGY STAR Thermal Enclosure System Rater Checklist) shall be met for those wall sections. Steel framing shall meet the reduced thermal bridging requirements by complying with Item 4.4.1 of the ENERGY STAR Thermal Enclosure System Rater Checklist.

Description

Continuous rigid insulation is a construction solution that provides a thermally efficient building enclosure. Rigid insulation sheathing is made of a rigid plastic foam that is typically sold in 4x8- or 4x10-foot boards. The boards are available in several thicknesses and R-values; 1-inch and 2-inch thicknesses are common. Rigid insulation provides thermal protection and it can also serve as an air and moisture barrier.

There are three primary types of rigid insulation: expanded polystyrene (EPS), extruded polystyrene (XPS), and polyisocyanurate (polyiso). EPS and XPS are thermoplastics, which are non-cross-linked polymers so they are susceptible to deterioration in high temperatures (BSC 2007). Polyiso is a thermoset, which is made up of cross-linked polymers so it has a much higher melting temperature. While properties can vary among specific products, XPS and polyiso tend to be higher density, value, and lower permeance than EPS (see Table 1).

Type tables as part of the Word file.

Table 1. Insulated Sheathing R-Value, Density, Permeance, and other Properties

	R-value/inch@75 ° F (F.ft2.h/Btu)	Density (pcf)	Permeance (perms)	Water Absorption (% by volume)	Compressive Strength (psi)
Expanded Polystyrene (EPS)	3.2	0.75	5.00	4.0	5
	3.9	1.00	5.00	4.0	10
	4.2	1.50	3.50	3.0	15
	4.4	2.00	2.00	2.0	25
Extruded Polystyrene (XPS)	4.6	1.20	1.10	0.3	15
	5.0	1.30	1.10	0.3	15
	5.0	1.60	1.10	0.3	25
	5.0	2.20	1.10	0.3	60
Polyiso-cyanurate					
Unfaced	6.0	1.60	2.77-4.49	--	--
Foil faced	6.5	2.0	0.03	1.0	25
Glass fiber faced	6.5	2.00	<1.0	1.0	25

When using foam insulation, you'll need to decide whether you intend to use OSB in addition to the rigid foam to serve as the building sheathing or if the rigid foam layer will itself serve as the sheathing, and you'll need to determine what will serve as the drainage plane and where this layer will be. These decisions are determined somewhat by climate.

The wall sections in Figure 1 (BSC 2007) show four options for the drainage plane based on climate factors:

- Wall Section 1 - Insulating sheathing over house wrap over plywood or OSB – for regions with high winds and high rainfall. This strategy is the most durable assembly because the drainage plane (building paper or house wrap) is supported by the plywood sheathing and is protected against wind loading and other environmental factors by the insulating sheathing.
- Wall Section 2 - Insulation sheathing over house wrap over studs – for most rainfall zones but not best in high-wind regions.

- Wall Section 3 – House wrap installed over insulating sheathing over wood studs – ok for most rainfall zones but don't use in high-wind regions. Fasteners used to install house wrap must reach through foam into studs.
- Wall Section 4 - Insulating sheathing as the drainage plane – ok in areas of limited rainfall and exposure. All vertical joints and penetrations must be sealed.

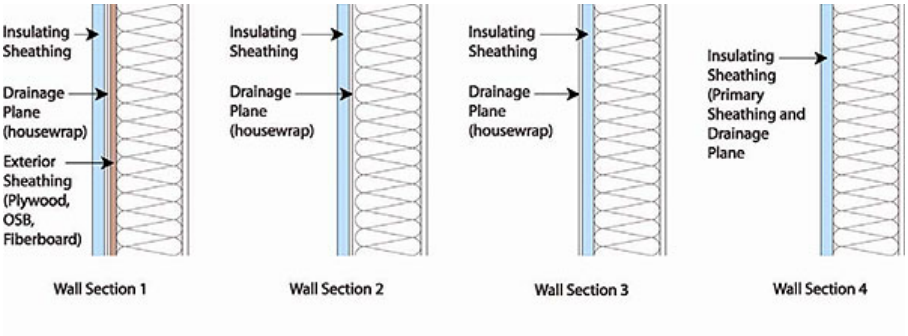
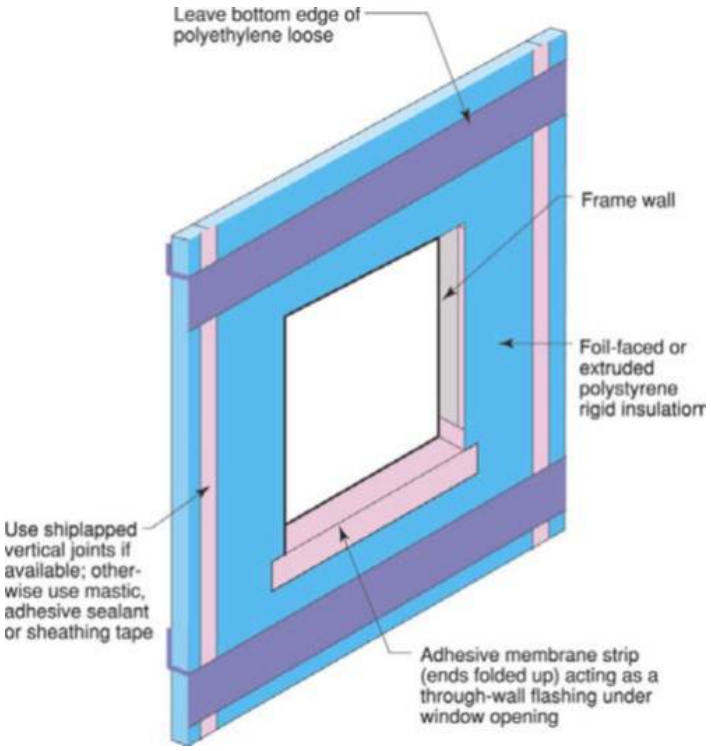


Image Caption: Figure 1. The rigid foam insulated sheathing can be placed exterior of the house wrap, interior of the house wrap, or it can take the place of the house wrap as the wall's drainage plane.
Image Title: The rigid foam insulated sheathing can be placed exterior of the house wrap, interior of the house wrap, or it can take the place of the house wrap as the wall's drainage plane.
Image Source: BSC. 2007. *Guide to Insulated Sheathing,* Prepared by Building Science Corporation for the U.S. Department of Energy Building America Program, http://www.buildingscience.com/documents/guides-and-manuals/gm-guide-insulating-sheathing.
Display Image Filename: TE441_rigidfoam1_BSC2007.jpg

How to Install Rigid Foam

A. Lay Out

1. Lay out the insulating sheathing panels so that vertical joints do not occur at the corners of window and door openings or over window heads if possible (BSC 2007).
2. Install rigid insulating sheathing vertically with long joints in contact with one another per manufacturer's specifications. This is particularly important when the sheathing is structural.
3. Install the rigid insulation so that it extends down to cover the sill plate on the foundation wall and up to the underside of the roof truss. If desired, the insulating sheathing can extend above the top plate (notch around the roof trusses) to act as a wind shield for the attic insulation (BSC 2007).
4. When rigid insulating sheathing is installed directly on the framing, apply a continuous bead of manufacturer-approved caulk sealant (solvent-based sealants are typically not approved by the sheathing manufacturer) to the top and bottom plates to reduce air leakage into the wall cavity.
5. If you are installing more than one layer of rigid foam, then stagger the seams of the second layer to improve airtightness and reduce the chance of thermal bridging. Seams between foam sheets should be sealed with caulk, canned foam, or a compatible tape (Smegal and Lstiburek 2012).
6. If housewrap is installed, it is preferable to install it to the exterior of the rigid foam insulation.



Insert images in their correct location within text, but do not worry about formatting.

Images are automatically sized and formatted in the center of the page.

Image Caption: Figure 2. Lay out the rigid foam sheathing joints so they do not align with the window and door edges.
Image Title: Correct joint alignment at windows and doors
Image Source: BSC. 2006. "Unpublished." http://www.buildingscience.co
Display Image Filename: TE441_jointAlignment_BSC2006.jpg
Native Image Filename (Optional):

Figure captions appear inline within the Guide, and should provide context to the image within the Guide discussion.

Image titles can be more generic, or can be the same as the caption as long as they are less than 128 characters. Image titles appear in the Image Gallery and are used as a tool tips.

Ensuring Success

The HERS rater will inspect to determine if the total amount of wall insulation installed meets the minimum R-value requirement for the climate where the house is located. ENERGY STAR Version 3 (Rev. 6) requires that continuous rigid insulation, insulated siding, or a combination of the two provide ≥ R-3 in Climate Zones 1 to 4 or ≥ R-5 in Climate Zones 5 to 8. The rater should also verify that the wall is designed to provide adequate shear resistance if the foam insulation also serves as the exterior sheathing.

Climate

Precautions should be taken to avoid moldy and water-damaged materials in all climate zones.

The incidence of mold and water damage is higher in wet regions due to the increased chance of rain and snowfall, and slower drying cycles, which will promote mold growth.

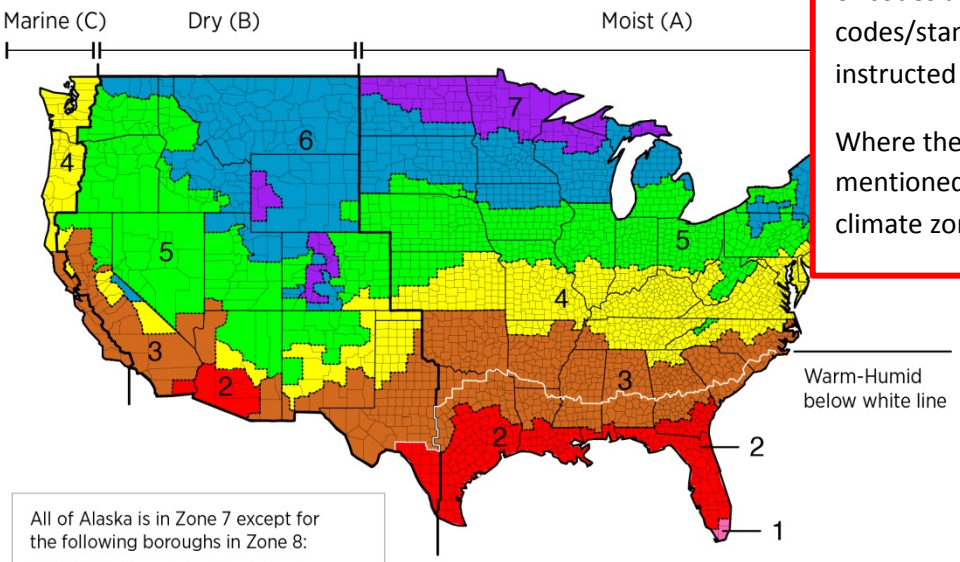
In dry climates, there will be fewer opportunities for rain and snow to wet materials stored on construction sites, and building materials will tend to dry faster, reducing the likelihood of mold growth. However, building materials may become wet from any moisture source, not just climate sources. Efforts to properly store materials and inspect for mold and water damage before installing materials should be taken regardless of the climate zone.

Rigid insulation sheathing can provide a vapor-resisting layer, depending on the thickness and whether the foam is open cell or closed cell. As a general rule for framed construction, the vapor-retarding layer should be placed in the interior of the assembly in cold climates (to prevent water vapor from the higher humidity interior air from diffusing into the assembly). In hot, humid climates, the vapor-retarding layer should be placed to the exterior of the assembly to prevent moisture-laden outside air from coming into contact with the back surface of the interior wall, which may have a temperature below the dew point of the air, resulting in condensation on the interior wall. Year-round dew point temperatures should be taken into account when designing the building's wall assemblies.

ENERGY STAR Version 3, (Rev. 6)
Thermal Enclosure Checklist, Reduced Thermal Bridging. Continuous
combination of the two; ≥ R-3 in Climate Zones 1 to 4, ≥ R-5 in Clima

List climate-specific information, such as construction details, followed by climate-specific requirements from DOE programs, or codes and standards. Format the codes/standards/program information as instructed in the Compliance section.

Where the IECC climate zones are mentioned, the BASC team will add the climate zone map for you.



Training

Right and Wrong Images

1. **Image Title**: Rigid insulation installed correctly
   Image Source: BSC. 2007. *Guide to Insulated Sheathing,* Prepared by Bu
   Corporation for the U.S. Department of Energy Building America Prograr
   http://www.buildingscience.com/documents/guides-and-manuals/gm-g
   sheathing.
   Display Image Filename: TE441_rightWrongImage2.jpeg

2. **Image Title**: Rigid insulation installed with gaps
   Image Source: Steve Easley, Steve Easley & Associates, 2010, Unpublish
   http://www.buildingmedia.com/steve.html
   Display Image Filename: RightWrongImage3.jpg
   Native Image Filename (Optional): TE441_RrightWrongImage3.tif

Presentations

1. **Presentation Title**: Rigid Insulation Installed with Gaps
   Presentation Source: BSC, BSC, 2005, Unpublished.
   Filename: TE441_presentation1_RigidInsulation.ppt

Videos

1. **Video Title**: How to Install Rigid Insulation
   Video Source: BSC, BSC, 2010, Unpublished.
   http://www.buildingscience.com/
   Filename: TE441_rigidInsulationVideo1.wmv
   Transcript: TE441_rigidIndulstionTranscript1.docx

For each image, presentation, video or CAD file, please provide ***EITHER***:

1) A full reference (also included in the More Info Tab), *OR*

2) Author, Organization, Date, and "Unpublished". This information will be used to acknowledge the source of the image or file. You can also provide a URL to the organization's website, which will become a hyperlink from the organization name.

If native image files are provided, they will be made available for download. Otherwise, the display image will also be used for downloads. Use filenames that help associate the display image with the native image.

If a presentation or video is published online, provide a reference title, with a full corresponding reference in the More Info Tab. Otherwise, include the contributing author, organization, date, "Unpublished", and optionally the organization website URL.

Videos should include a video file and a text transcript.

CAD Files

1. **CAD Title**: Air sealing behind shower with cavity rigid insulation
   CAD Source: Green Building Advisor. 2011. Building Plans for the ENERGY STAR Thermal Bypass Checklist. Green Building Advisor, Newtown, Connecticut, The Tanton Press.
   CAD Filenames: TE441_cavityRigidInsulation_Shower.dwg
   TE441_cavityRigidInsulation_Shower.pdf
   TE441_cavityRigidInsulation_Shower.jpg

   CAD submissions include a display image, a PDF, and a DWG file. Use the same filename, with different extensions, for all three files.

2. **CAD Title**: Cavity rigid insulation detail
   CAD Source: Green Building Advisor, Green Building Advisor, 2011, Unpublished.
   Organization URL (Optional): http://www.greenbuildingadvisor.com/
   CAD Filenames: TE441_cavityRigidInsulation_Detail.dwg
   TE441_cavityRigidInsulation_Detail.pdf
   TE441_cavityRigidInsulation_Detail.jpg

Compliance

ENERGY STAR Version 3 (Rev.06)
Thermal Enclosure Checklist, Reduced Thermal Bridging.
"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. If used, insulated siding shall be attached directly over a water-resistive barrier and sheathing. In addition, it shall provide the required R-value as demonstrated through either testing in accordance with ASTM C 1363 or by attaining the required R-value at its minimum thickness. Insulated sheathing rated for water protection can be used as a water resistant barrier if all seams are taped and sealed. If non-insulated structural sheathing is used at corners, advanced framing details listed under item 4.4.5 shall be met for those wall sections. Steel framing shall meet the reduced thermal bridging requirements by complying with Item 4.4.1 of the Checklist. Up to 10% of the total exterior wall surface area is exempted from the reduced thermal bridging requirements to accommodate intentional designed details (e.g., architectural details such as thermal fins, wing walls, or masonry fireplaces; structural details, such as steel columns.) Mass walls that are not part of a passive solar design (e.g., CMU block or log home enclosure) shall either utilize the strategies outlined in Item 4.4 or the pathway in the assembly with the least thermal resistance as determined using a method consistent with the 2009 ASHRAE Handbook of Fundamentals, shall provide ≥ 50% of the applicable assembly resistance, defined as the reciprocal of the mass wall equivalent U-factor in the 2009 IECC – Table 402.1.3. Documentation verifying the pathway with the least thermal resistance and its resistance value shall be collected by the Rater and any Builder Verified or Rater Verified box under Item 4.4 shall be checked. Mass walls utilized as the thermal mass component of a passive solar design (e.g., a Trombe wall) are exempt from this item. To be eligible for this exemption, the passive solar design shall be comprised of the following five components: an aperture or collector, an absorber, thermal mass, a distribution system, and a control system."

DOE Challenge Home, Version 1 (Rev. 02)
Exhibit 1: Mandatory Requirements. Certified under E
"Ceiling, wall, floor, and slab insulation shall meet or
installation, per RESNET standards."

ASTM C 1363 - 11
Standard Test Method for Thermal Performance of Bu
Means of a Hot Box Apparatus.
"This test method establishes the principles for the de
requirements for the determination of the steady sta
when exposed to controlled laboratory conditions. Th
performance of a building material at standardized te

For DOE programs and codes and standards, include the program/code/standard name and edition year in the title. The first line of the text body should provide the applicable section title(s) and section number(s).

If available, include verbatim requirements text and applicable footnotes, enclosed in quotation marks. If exact text is not available or restricted by copyright, summarize the requirement and do not enclose in quotations.

References and URLs for national DOE programs and national codes and standards can be omitted. The BASC team will provide the references and links.

All climate-specific requirements listed in the Climate Tab should be repeated in the Compliance Tab.

If you are aware of codes or standards issues, include work-arounds here. If not, ensure the Codes and Standards Innovation (CSI) Team is aware of the issue(s).

More Info

Case Studies

1. PNNL. 2013. *Building America Efficient Solutions for New Homes: Case Study: Pine Mountain Builders, Pine Mountain, Georgia*. Prepared by the Pacific Northwest National Laboratory for the U.S. Department of Energy Building America Program. http://basc.pnnl.gov/sites/default/files/case-studies/Final_BA_NewResidentialCS_Weekley_042412.pdf

Climate Zone: All Climate Zones or Zones 1-8. Multiple zones may be indicated.
Case Study Type: Measure-Specific or Whole-House Specific
Construction Type: New, Existing, or Both

Indicate the applicable climate zone(s), case study type, and construction type.

2. PNNL. 2012. *Building America Case Study Technology Solutions for New Homes: Preventing Thermal Bypass*. PNNL-SA-91163. Prepared by the Pacific Northwest National Laboratory for the U.S. Department of Energy Building America Program. http://basc.pnnl.gov/sites/default/files/case-studies/Final_BA_NewResidentialCS_Weekley_042412.pdf

Climate Zone: Zone 1, Zone 2, and Zone 3
Case Study Type: Whole-House Specific
Construction Type: New Construction

References

Make sure all references in the Guide text are included in the References list, and easily cross-referenced. If references do not include a URL, please provide a PDF of the reference to upload into the Solution Center. For references that are already in the Building America Publications Library, you may instead provide the publication product ID if it is known.

BSC. 2007. *Guide to Insulated Sheathing,* Prepared by Building S
Department of Energy Building America Program. http://www.b
and-manuals/gm-guide-insulating-sheathing

Holladay, M. 2012. Fastening Furring Strips to a Foam-Sheathed
[Fastenmaster] provides advice on how many screws you need,
2010, updated March 1, 2012. http://www.greenbuildingadvisor.com/book/export/html/18732

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Vinyl Siding Institute. 2012. *Insulated Siding as Home Insulation: Guide for Users and Energy Raters*, Vinyl Siding Institute. http://www.vinylsiding.org/aboutsiding/insulated/guide/Insulated_Siding_as_Home_Insulation_Guide.pdf

WRCLA. 2012. How to install Western Red Cedar siding, The Western Red Cedar Lumber Association. http://www.wrcla.org/pdf/WRCLA_Installing_Siding.pdf