Walls Behind Showers and Tubs

Last Updated: 03/14/2016

Scope

Install an air barrier behind showers and tubs installed on exterior walls.

- Install insulation without misalignments, compressions, gaps, or voids in all exterior wall cavities behind tubs and showers.
- Cover the wall cavities with a rigid air barrier or other supporting material to prevent cavity insulation from sagging and to create a continuous thermal barrier.
- Seal all seams, gaps, and holes in the air barrier with caulk or foam before tub/shower installation. Rigid air barrier materials for use behind showers and tubs include fiber-cement, fiber-reinforced gypsum, glass mat gypsum, or fiber mat-reinforced cementitious backer panels. See the guide [WM.4.2] Moisture-Resistant Backing Material at Walls Behind Tubs and Showers for more information.

See the Compliance Tab for related codes and standards requirements, and criteria to meet national programs such as DOE’s Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.
Description

When tubs and showers are installed on exterior walls, builders may forget to insulate and air seal the exterior wall behind the tub or shower surround. Neglecting to insulate and air seal here can result in significant heat loss and complaints from homeowners about tubs, showers, and bathrooms that are always cold. The insulation behind the tub or shower should be equivalent to the insulation in the rest of the exterior walls and should be covered with an air barrier of cement backer board, rigid foam insulation, or non-paper-faced drywall that is sealed at the edges and seams to provide a continuous air seal. Any type of insulation may be installed as long as it completely fills the void and will be in full contact with the air barrier. These materials may be installed by insulators, framers, or subcontractors or vendors hired specifically to install the tub or shower. This task should be included in the contract for the appropriate trade depending on the workflow at specific job sites.

Air barrier effectiveness is measured at the whole-house level. High-performance branding programs and the IECC code require that builders meet specified infiltration rates at the whole-house level. See the “compliance” tab for these specified infiltration rates.

How to Install a Fully Aligned Air Barrier on the Walls behind Showers and Tubs

1. Install exterior rigid foam sheathing. Fill the entire wall cavity with insulation to the R-value required by local code or higher.
2. Install 2x4 blocking between the wall studs, if needed, to support the air barrier.
3. Cut cement board, fiber cement board, paperless gypsum board, Thermo-Ply, or other thin barrier material to size to cover area behind tub (see Figures 1 and 2). Apply a thick bead of caulk to the surface of exposed studs, wood blocking, and bottom plate. Nail or screw the thin-profile air barrier material to the studs. Note: moisture-resistant gypsum board or “green board” is not recommended. Cement board is not waterproof; it must be coated with a fluid-applied waterproofing, or a water-resistive barrier must be applied behind it that allows drainage. (See the guide Cement Board Installed Behind Tile and Panel Tub and Shower Enclosures.)
4. Use caulk or foam to seal seams and any holes made through the air barrier material.
5. Install the new tub.
6. Block holes around the tub drain with sheet goods and spray foam.
7. Finish the walls by installing fiberglass wall panels or tiling the surface.

Figure 1 - Draft stopping and air barrier at tub enclosure ? side view
Figure 2 - Draft stopping and air barrier at tub enclosure? plan view
Ensuring Success

Blower door testing conducted as part of building performance testing may help indicate whether air leakage behind a bathtub or shower has been successfully sealed. An infrared camera can be used in conjunction with the blower door testing to inspect the insulation and to detect air leakage behind the tub or shower, especially if the tub or shower is installed on an exterior wall. Insulation and air barrier installation should be inspected by the site supervisor.
Climate

ENERGY STAR Certified Homes, Version 3/3.1 (Rev. 09)

Rater Field Checklist

Thermal Enclosure System.

2. Fully-Aligned Air Barriers. At each insulated location below, a complete air barrier is provided that is fully aligned as follows:

- Walls: At exterior vertical surface of wall insulation in all climate zones; also at interior vertical surface of wall insulation in Climate Zones 4-8.
- 2.2 Walls behind showers, tubs, staircases, and fireplaces.

DOE Zero Energy Ready Home (Revision 07)

Exhibit 2 DOE Zero Energy Ready Home Target Home.

The U.S. Department of Energy’s Zero Energy Ready Home program allows builders to choose a prescriptive or performance path. The DOE Zero Energy Ready Home prescriptive path requires builders to meet or exceed the minimum HVAC efficiencies listed in Exhibit 2 of the National Program Requirements (Rev 07), as shown below. The DOE Zero Energy Ready Home performance path allows builders to select a custom combination of measures for each home that is equivalent in performance to the minimum HERS index of a modeled target home that meets the requirements of Exhibit 2 as well as the mandatory requirements of Zero Energy Ready Home Exhibit 1.

Exhibit 2, Insulation and Infiltration) Whole house leakage must be tested and meet the following infiltration limits:

- Zones 1-2: ≤ 3 ACH50;
- Zones 3-4: ≤ 2.5 ACH50;
- Zones 5-7: ≤ 2 ACH50;
- Zone 8: ≤ 1.5 ACH50;
- Attached dwellings: ≤ 3 ACH50.

IECC Climate Zone Map

All of Alaska is in Zone 7 except for the following boroughs in Zone 8:
Bethel, Northwest Arctic, Delta-mah, Southeast Fairbanks, Fairbanks N. Star, Wade Hampton, Nome, Yukon-Koyukuk, North Slope

Zone 1 includes Hawaii, Guam, Puerto Rico, and the Virgin Islands
Training

Right and Wrong Images

Display Image: ES_TESRC_3.1.1_PG56_25b_102811_0.jpg
CEMENT BACKER BOARD
TUB SURROUND FINISH
TUB UNIT
TUB SURROUND (BEYOND)
CONTINUOUS BEAD OF SEALANT
PROVIDE BLOCKING AT STUD CAVITY AT TUB AT EXTERIOR WALL
INSULATED EXTERIOR STUD WALL
THIN-PROFILE WALL SHEATHING
CONTINUOUS BEAD OF SEALANT
EXPANDING FOAM
WOOD FRAME
FLOOR ASSEMBLY

CAD FILE: 311_CAD_2-1_Air_seal_tub_thin_profile_sheathing_5-01009_GBA_1-31-12 (2).dwg
PDF: 311_CAD_2-1_Air_seal_tub_thin_profile_sheathing_5-01009_GBA_1-31-12.pdf
INTERIOR VERTICAL CHASE

PROVIDE INTERIOR SHEATHING AT EXTERIOR WALL PRIOR TO INTERIOR WALL ASSEMBLY

INTERIOR WALL

LADDER BLOCKING AS REQUIRED

INSULATED EXTERIOR WALL

CAD FILE: 311_CAD_2-1_Air_seal_corner_vertical_chase_5-02020_GBA_1-31-12.dwg
PDF: 311_CAD_2-1_Air_seal_corner_vertical_chase_5-02020_GBA_1-31-12.pdf
Compliance

The Compliance tab contains both program and code information. Code language is excerpted and summarized below. For exact code language, refer to the applicable code, which may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

ENERGY STAR Certified Homes, Version 3/3.1 (Rev. 09)
Rater Field Checklist

Thermal Enclosure System.
2. Fully-Aligned Air Barriers. At each insulated location below, a complete air barrier is provided that is fully aligned as follows:
   - Walls: At exterior vertical surface of wall insulation in all climate zones; also at interior vertical surface of wall insulation in Climate Zones 4-8.
   - 2.2 Walls behind showers, tubs, staircases, and fireplaces.

Footnote 6) For purposes of this Checklist, an air barrier is defined as any durable solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. EPA recommends, but does not require, rigid air barriers. Open-cell or closed-cell foam shall have a finished thickness ≥ 5.5 in. or 1.5 in., respectively, to qualify as an air barrier unless the manufacturer indicates otherwise. If flexible air barriers such as house wrap are used, they shall be fully sealed at all seams and edges and supported using fasteners with caps or heads ≥ 1 in. diameter unless otherwise indicated by the manufacturer. Flexible air barriers shall not be made of Kraft paper, paper-based products, or other materials that are easily torn. If polyethylene is used, its thickness shall be ≥ 6 mil.

Footnote 8) All insulated vertical surfaces are considered walls (e.g., above and below grade exterior walls, knee walls) and must meet the air barrier requirements for walls. The following exceptions apply: air barriers recommended, but not required, in adiabatic walls in multifamily dwellings; and, in Climate Zones 4 through 8, an air barrier at the interior vertical surface of insulation is recommended but not required in basement walls or crawlspace walls. For the purpose of these exceptions, a basement or crawlspace is a space for which ≥ 40% of the total gross wall area is below-grade.

Please see the ENERGY STAR Certified Homes Implementation Timeline for the program version and revision currently applicable in your state.

DOE Zero Energy Ready Home (Revision 07)

Exhibit 1 Mandatory Requirements.
Exhibit 1, Item 1) Certified under the ENERGY STAR Qualified Homes Program or the ENERGY STAR Multifamily New Construction Program.
Exhibit 2, Item 2) Ceiling, wall, floor, and slab insulation shall meet or exceed 2015 IECC levels and achieve Grade 1 installation, per RESNET standards. See the guide 2015 IECC Code Level Insulation – DOE Zero Energy Ready Home Requirements for more details.

Exhibit 2 DOE Zero Energy Ready Home Target Home.
The U.S. Department of Energy’s Zero Energy Ready Home program allows builders to choose a prescriptive or performance path. The DOE Zero Energy Ready Home prescriptive path requires builders to meet or exceed the minimum HVAC efficiencies listed in Exhibit 2 of the National Program Requirements (Rev 07), as shown below. The DOE Zero Energy Ready Home performance path allows builders to select a custom combination of measures for each home that is equivalent in performance to the minimum HERS index of a modeled target home that meets the requirements of Exhibit 2 as well as the mandatory requirements of Zero Energy Ready Home Exhibit 1.

Exhibit 2, Insulation and Infiltration) Insulation levels shall meet the 2015 IECC and achieve Grade 1 installation, per RESNET standards. Whole house leakage must be tested and meet the following infiltration limits:

- Zones 1-2: ≤ 3 ACH50;
- Zones 3-4: ≤ 2.5 ACH50;
- Zones 5-7: ≤ 2 ACH50;
- Zone 8: ≤ 1.5 ACH50;
- Attached dwellings: ≤ 3 ACH50.

Footnote 12) Building envelope assemblies, including exterior walls and unvented attic assemblies (where used), shall comply with the relevant vapor retarder provisions of the 2015 International Residential Code (IRC).
Footnote 23) Envelope leakage shall be determined by an approved verifier using a RESNET-approved testing protocol.

American Society for Testing Materials (ASTM) E1677-11
Standard Specification for Air Barrier (AB) Material or System for Low-Rise Framed Building Walls. This specification covers minimum performances and specification criteria for an air barrier material or system for framed, opaque walls of low-rise buildings. The provisions are intended to allow the user to design the wall performance criteria and increase air barrier
specifications for a particular climate location, function, or design.

Air Barrier Association of America (ABAA) 07261
Self-Adhered Sheet Air Barrier. 2006. Air Barrier Association of America, Walpole, MA. This specification for self-adhered sheet air barriers is developed by a professional association, the Air Barrier Association of America, to provide guidance to the design professional.

ABAA 07262
Fluid-Applied Air and Vapor Barrier. 2012. Air Barrier Association of America, Walpole, MA. This specification for air barriers that are fluid-applied and also act as vapor barriers is developed by a professional association, the Air Barrier Association of America, to provide guidance to the design professional.

ABAA 07263
Closed Cell, Medium-Density Spray Polyurethane Foam Air Barrier. 2011. Air Barrier Association of America, Walpole, MA. This specification for closed-cell, medium-density spray polyurethane foam air barriers is developed by a professional association, the Air Barrier Association of America, to provide guidance to the design professional.

ABAA 07265
Fluid-Applied Vapor Permeable Air Barrier. 2012. Air Barrier Association of America, Walpole, MA. This specification for fluid-applied vapor permeable air barriers is developed by a professional association, the Air Barrier Association of America, to provide guidance to the design professional.

2009 International Energy Conservation Code (IECC)
Table 402.4.2 Air Barrier and Insulation Inspection Component Criteria, Air Barrier and Insulation Installation, Shower/tub on exterior wall: Exterior walls adjacent to showers and tubs are insulated and have air barrier separating the wall from the shower and tubs. Air barrier and thermal barrier: A continuous air barrier is installed in the building envelope including rim joists and exposed edges of insulation. Breaks or joints in the air barrier are sealed. Air permeable insulation is not used as a sealing material.

2012 IECC
Table R402.4.1.1 Air Barrier and Insulation Installation, Shower/tub on exterior wall: Exterior walls adjacent to showers and tubs are insulated and have air barrier separating the wall from the shower and tubs. Air barrier and thermal barrier: A continuous air barrier is installed in the building envelope including rim joists and exposed edges of insulation. Breaks or joints in the air barrier are sealed. Air-permeable insulation is not used as a sealing material.

2015 and 2018 IECC
Table R402.4.1.1 Air Barrier and Insulation Installation. Shower/tub on exterior wall: Exterior walls adjacent to showers and tubs are insulated and have an air barrier separating the wall from the shower and tubs. General requirements: A continuous air barrier is installed in the building envelope including rim joists and exposed edges of insulation. Breaks or joints in the air barrier are sealed. Air-permeable insulation is not used as a sealing material.

Section R101.4.3 (Section R501.1.1 in 2015 and 2018 IECC). Additions, alterations, renovations, or repairs shall conform to the provisions of this code, without requiring the unaltered portions of the existing building to comply with this code. (See code for additional requirements and exceptions.)

2009 International Residential Code (IRC)
Table N1102.4.2 Air Barrier and Insulation Inspection Component Criteria, Shower/tub on exterior wall: Insulation exists between showers/tubs and exterior wall. Air barrier and sealing exists on common walls between dwelling units, on exterior walls behind tubs/showers, and in openings between window/door jambs and framing. Table N1102.4.2, Air barrier and thermal barrier: Exterior wall insulation is installed in substantial contact and continuous alignment with the air barrier. Air permeable insulation is not used as a sealing material.

2012 IRC
Table N1102.4.1.1 Air Barrier and Insulation Installation, Shower/tub on exterior wall: Exterior walls adjacent to showers and tubs are insulated and have an air barrier separating the wall from the shower and tubs. Table N1102.4.1.1, Air barrier and thermal barrier: A continuous air barrier is installed in the building envelope including rim joists and exposed edges of insulation. Breaks or joints in the air barrier are sealed. Air permeable insulation is not used as a sealing material.

2015 and 2018 IRC
Table N1102.4.1.1 Air Barrier and Insulation Installation, Shower/tub on exterior wall: Exterior walls adjacent to showers and tubs are insulated and have an air barrier separating the wall from the shower and tubs. General requirements: A continuous air barrier is installed in the building envelope including rim joists and exposed edges of insulation. Breaks or joints in the air barrier are sealed. Air permeable insulation is not used as a sealing material.

Section N1101.3 (Section N1107.1.1 in 2015 and 2018 IRC). Additions, alterations, renovations, or repairs shall conform to the provisions of this code, without requiring the unaltered portions of the existing building to comply with this code. (See code for additional requirements and exceptions.)

Appendix J regulates the repair, renovation, alteration, and reconstruction of existing buildings and is intended to encourage their continued safe use.
More Info.

Access to some references may require purchase from the publisher. While we continually update our database, links may have changed since posting. Please contact our webmaster if you find broken links.

Case Studies
None Available

References and Resources*

1. Air Barriers - Tub, Shower and Fireplace Enclosures
   Author(s): Building Science Corporation
   Organization(s): Building Science Corporation
   Publication Date: May, 2009
   Brochure about creating an air barrier at tub, shower and fireplace walls.

2. High Performance Building Details: Insulation and Air Sealing II
   Author(s): Steven Winter Associates
   Organization(s): CARB, Steven Winter Associates, SWA
   Publication Date: July, 2010
   Brochure with details on insulation and air sealing.

3. Thermal Enclosure System Rater Checklist Guidebook
   Author(s): U.S. Environmental Protection Agency
   Organization(s): EPA
   Publication Date: October, 2011
   Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.

*Publication dates are shown for formal documents. Dates are not shown for non-dated media. Access dates for referenced, non-dated media, such as web sites, are shown in the measure guide text.

Contributors to this Guide

The following authors and organizations contributed to the content in this Guide.

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