

Air Sealing Attached Garage

Last Updated: 12/29/2014

Scope



Air seal and insulate the rim and band joists of walls separating an attached garage from the home's conditioned space.

Ensure that the garage is separated from the conditioned space by a continuous rigid air barrier. Seal all seams, gaps, and holes in the air barrier with caulk or foam before installing the insulation.

DOE Zero Energy Ready Home Notes

The U.S. Department of Energy (DOE) [Zero Energy Ready Home](#) program requires that builders comply with the U.S. Environmental Protection Agency (EPA) [Indoor airPLUS program criteria](#). The Indoor airPLUS checklist (Item 4.3) requires that builders not locate air handling equipment or ductwork in garages but notes that ducts and equipment may be located in building cavities adjacent to garage walls or ceilings if the cavities are separated from the garage space with a continuous air barrier. The Indoor airPLUS Construction Specifications (Item 5.4) requires that homes with exhaust-only whole-house ventilation either are equipped with an exhaust fan or that the builder verify that the garage-to-house air barrier can maintain a pressure difference of greater than 45 Pascals while the home maintains a 50 Pascal pressure difference with respect to the outdoors, with all doors and windows closed during the blower door test.

ENERGY STAR Certified Homes Notes

The [ENERGY STAR Certified Homes Thermal Enclosure Checklist](#) requires (in Item 3 Fully Aligned Air Barriers) that a complete air barrier that is fully aligned with insulation be installed at each insulated location of the home including at the interior or exterior surface of ceilings in Climate Zones 1 through 3 and at the interior surface of ceilings in Climate Zones 4 through 8; at the exterior surface of walls in all climate zones and at the interior surface of walls in Climate Zones 4 through 8; and at the interior surface of floors in all climates zones. It specifically indicates several areas requiring a complete air barrier including (item 3.1.8) the garage rim/band joint adjoining conditioned space. The air barrier must be located at the exterior surface of the walls in all climate zones. EPA highly recommends, but does not require, inclusion of an interior air barrier at rim and band joists in Climate Zones 4 through 8 (Footnote 7). The ENERGY STAR Certified Homes Thermal Enclosure Checklist requires (in Item 5 Air Sealing) that (5.1) all penetrations to unconditioned space be fully sealed with blocking, flashing, caulk, or foam; and that (5.2) cracks in the building envelope be fully sealed. See the Compliance tab for additional ENERGY STAR notes.

Description

Isolating attached garages from the living space is critical for preventing the potential infiltration of carbon monoxide and other contaminants into the dwelling. Open joist bays above the garage that extend into living spaces are an unwanted air pathway. Cracks between and around the boards of the rim joist, the top plate, and the sill plate-foundation wall intersections are other areas where air can flow through if seams aren't adequately sealed. In addition, certain conditions in the home can cause the home to become depressurized, making it even more likely for garage air to be drawn into the home through leaks in and around the rim joists. Depressurization can occur when the house is airtight and an exhaust fan, range hood, clothes dryer, or combustion appliance is operated, if adequate makeup air is not provided to the house through a fresh air intake (a duct that brings outside air to the return side of the air handler).



Figure 1. Walls and ceilings shared by the garage and living space must be air sealed and insulated. (Image courtesy of CARB)

Walls and floors adjoining garage spaces need to be sheetrocked (typically with 1/2-inch-thick Type X gypsum board) in accordance with local fire codes, but this is not the same as air sealing. All ceiling and wall penetrations (wiring, piping, ductwork, etc.) need to be sealed with appropriate materials, such as caulk or spray foam. All joist cavities between the garage and adjoining living spaces should be blocked with rigid material or the framing should be designed so that rim joists or floor joists will serve as a naturally occurring air block at the shared wall. These same air-sealing concepts apply to overhangs and porch roofs.

To provide an air barrier between the garage and the adjoining conditioned space, solid blocking is often used to air seal joist bay openings spanning over the garage and conditioned space. A rigid material like rigid foam board, drywall, OSB, or plywood can be cut to fit each joist bay opening. Each piece must be cut to fit then nailed and caulked or spray foamed into place, which is a labor-intensive process.

The best option would be to design the home to isolate the attached garage through the use of framing members. Ideally the framing would be designed so that ceiling joists above the garage run parallel to the shared wall so that a ceiling joist can serve as a solid air barrier above the shared wall. Where open bays would span the shared walls, the floor joists can be cut so that they terminate on either side of a rim joist installed over the shared wall. The joints between the mud sill and rim joist at the foundation line of the garage-to-house wall should be sealed. The drywall separating the garage from the house should be sealed to the framing members at the top plate, bottom plate, corners, and seams.

How to Air Seal between the Garage and Living Space

In all instances discussed below, additional air sealing of seams and cracks in framing with an appropriate material is still required.

1. Air seal the rim joist of the wall shared by the garage and the house. (See the guide [Garage Rim Band Joist for more details](#).)
 - a. Design walls adjoining garages so that the rim joist board runs parallel to the common wall, providing a continuous natural air barrier.
 - b. Where ceiling joists run perpendicular to the adjoining wall (see Figure 2), one option is to install a continuous rim joist to separate the two areas with separate but aligned ceiling joists on each side of the rim joist (see Figure 3 and Figure 4).

c. Another option is to install solid blocking material in the joist bays over the common wall. Cut rectangles of rigid blocking material (plywood, polyisocyanurate, extruded polystyrene, etc.) to fit each floor joist bay cavity. Install a backstop for the blocking material by tacking furring strips to the joists in line with the foundation or house wall. Insert rigid pieces into each joist bay and fasten with caulk or nails (Figure 5). When using I-joists, make sure to cut the blocking to fill the irregular shape of the opening (Figure 6). Also seal holes in open-web floor trusses at the shared wall, if needed (Figure 7). Use caulk or spray foam to air seal all four edges in each bay (Figure 8). Make sure to completely air seal around the rigid air barrier to prevent moist air from reaching and condensing on the rim joist.

d. Insulate the rim joist with additional rigid foam that is caulked or foamed into place or with spray foam. Use urethane spray foam insulation to cover the rim joist, and seams with the top plate below and subfloor above (see Figure 9). Medium-density (closed-cell, 2 pounds/cubic foot) or low-density (open-cell, 0.5 pounds/cubic foot) foams provide acceptable results. Open-cell foams might require additional vapor and condensation control measures in IECC Climate Zone 6 and higher. Foam can be applied by a spray foam subcontractor or use two-part spray foam kits.

Spray foam in band joists is typically concealed between floors so no other thermal barrier is required; however, the International Residential Code (IRC) allows the spray foam at rim joists to be exposed in basement and crawlspace applications (i.e., without a 15-minute thermal barrier such as drywall) as long as the thickness is less than 3.25 inches (see 2009 IRC R314.5.11). Closed-cell, 2-PCF spray foams were approved in the 2003 IRC and open-cell 0.5-PCF foams were approved in the 2009 IRC, along with any intermediate densities ([BSC 2009](#)).

Climate Note: Although open-cell spray foam is acceptable in this application per code, closed-cell spray foam is preferred in hot-humid or extreme cold climates (IECC Climate Zones 1A, 2A, 7, and 8) ([CARB 2009](#)).

2. Caulk or spray foam the garage slab-foundation wall junction. (See the guide Reduce Pest Intrusion for more on foundation sealing.)

3. Seal all penetrations through the common wall and ceiling. Use gaskets, airtight drywall technique, etc., to make the common wall and ceiling airtight. Consider a “flash” seal approach - spray foam the entire ceiling and/or inter-zonal walls of the garage to air seal any cracks, holes, or seams. Then add batt or blown insulation to meet the insulation R-value requirement (Figure 10), at a cost savings compared to using spray foam alone to meet the insulation requirement. Cover the ceiling insulation with taped and mudded drywall.

4. Other Important Considerations:

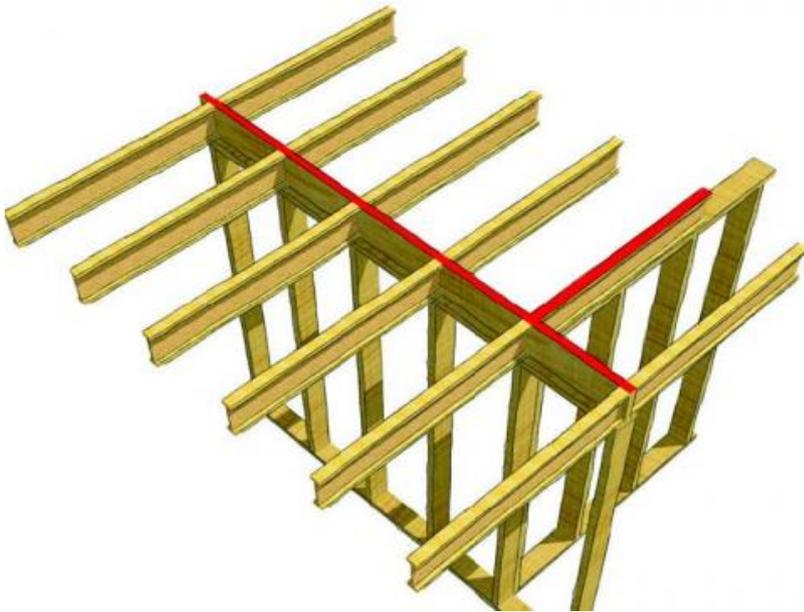
a. Install a self-closing, insulated, metal, fire-rated door with a good weather seal between the living space and the garage.

b. If the air handler for a central furnace must be located in the garage, it needs to be in an air-sealed closet. (See the report [Air Sealing Mechanical Closets in Slab-On-Grade Homes](#).) Do not have supply or return registers in the garage. If ductwork is located in the garage ceiling to service rooms above, make sure it is encapsulated with closed-cell spray polyurethane foam to ensure a complete air barrier. (See the report [Buried and/or Encapsulated Ducts](#).)

c. Install a passive vent to keep the garage at a neutral pressure in relationship to the house or consider installing a timer-operated exhaust fan that vents to the outside.



Figure 2. When ceiling joists over a garage run perpendicular to the adjoining wall, the joist bays must be blocked and sealed to prevent garage fumes from entering the living space. (Image courtesy of CARB)



Reference

Figure 3. A continuous rim joist separates the garage from the living space. Image not found
https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_ico

Figure 4. The I-joist is continuous along the shared wall and serves as a natural air barrier between the garage and the house. (Image courtesy of CARB)

Figure 5. Insert rigid blocking pieces into each joist bay and fasten with caulk or nails. (Image courtesy of CARB)

Figure 6. When using I-joists, make sure to fill in the gaps on each side of the blocking material to air seal the joist bay. (Image courtesy of CARB)

Figure 7. Foam holes in open-web floor trusses to completely seal the rim joist. (Image courtesy of CARB)

Figure 8. Use caulk or spray foam to air seal all four edges of the blocking material in each joist bay. (Image courtesy of CARB)

Figure 9. Spray foam insulates the rim joist and air seals the subfloor-rim joist and rim joist-top plate connections. Image not found
[Reference: https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_ico](https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_ico)



Figure 10. Use a flash and batt approach to insulate and air seal the garage ceiling. Image not found
[Reference: https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_ico](https://basc.pnnl.gov/sites/all/themes/pnnl_btp/images/REF_ico)

Ensuring Success

If the home has an attached garage, visually inspect for cracks or improper sealing along the rim joist above walls separating the garage from the home. For joist bays that extend from over the garage ceiling to over or under living areas of the house, the joist bay cavities should be blocked off, air sealed, and insulated. Rim joists that run parallel to the shared wall should be air sealed and insulated at the rim joist.

Blower door testing conducted as part of the whole-house energy performance testing can indicate whether the rim joists have been successfully air sealed. Blower door testing can also help determine if the home is depressurized compared to the garage; if so, a means of supplying makeup air to the home may be called for to prevent garage fumes from being pulled into the home.

The following actions are also recommended to ensure that garage air is separated from house air:

- Visually inspect for cracks along the base of garage walls that adjoin living space and along sill plates on top of foundation walls on adjoining walls.
- Visually inspect that all penetrations through adjoining walls and garage ceilings below living spaces are sealed.
- Test the seal tightness of doors linking the garage with the rest of the home.
- Best practice is to not install HVAC equipment in the garage. If a furnace is installed in the garage, it should be sealed combustion and direct vent. Visually inspect that the furnace cabinets and ducts are air sealed with mastic or metal tape or, preferably, that the furnace is installed in an air-sealed closet. No return air registers should be installed in the garage. Any ducts installed in the garage should be sealed with mastic and tested for air tightness.

Climate

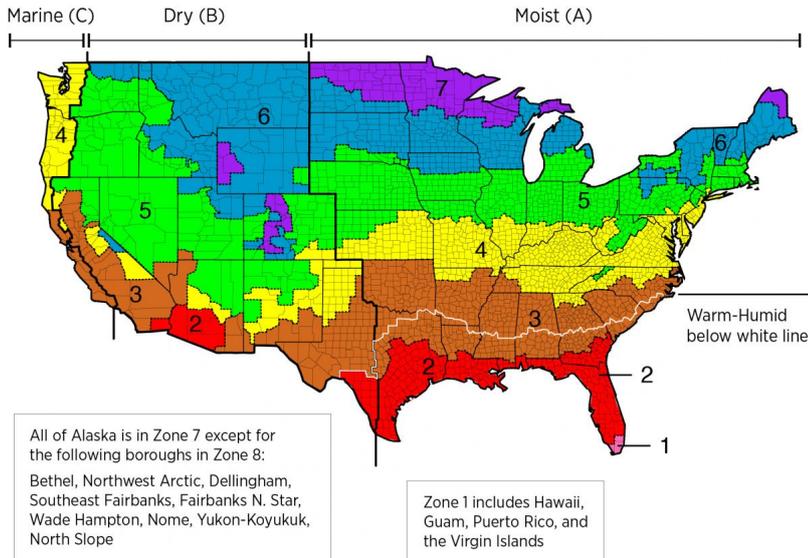
If the rim joists are to be sealed with spray foam, although both open-cell and closed-cell spray foam are acceptable in this application, closed-cell spray foam is preferred in hot-humid or extreme cold climates (IECC Climate Zones 1A, 2A, 7, and 8) (CARB 2009).

[ENERGY STAR Certified Homes \(Version 3, Rev. 07\)](#)

Thermal Enclosure Checklist, Fully-Aligned Air Barriers. A complete air barrier shall be provided that is fully aligned with the insulation at exterior surface of walls in all climate zones; and also at the interior surface of walls for Climate Zones 4-8.

[DOE Zero Energy Ready Home](#)

The DOE Zero Energy Ready Home Target Home Exhibit 2 specifies that homes be whole house leakage tested and meet the following infiltration limits: Zones 1-2: ≤ 3 ACH50; Zones 3-4: ≤ 2.5 ACH50; Zones 5-7: ≤ 2 ; Zone 8: ≤ 1.5 .



Training

Right and Wrong Images



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Courtesy Of: [Consortium for Advanced Residential Buildings \(CARB\)](#)



Display Image: [DS144_AirSealingAttachdGarage-R3_CARB_5-12-14.jpg](#)
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Reference: [Thermal Enclosure System Rater Checklist Guidebook](#)

Author(s): EPA

Organization(s): EPA

Guide describing details that serve as a visual reference for each of the line items in the Thermal Enclosure System Rater Checklist.



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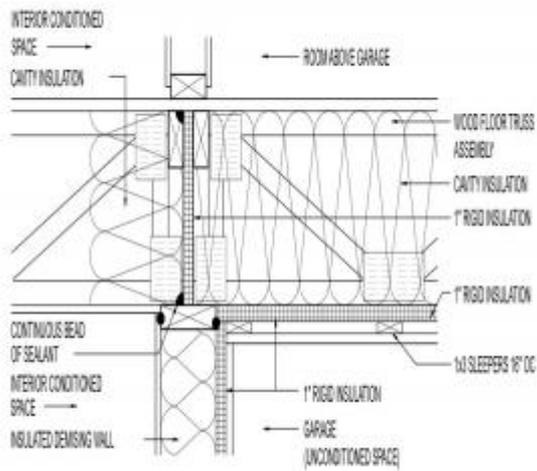
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CAD



CAD FILE: [318 CAD 1-2 air barrier garage band 1-inch rigid foam 1x3 furring 5-01002_GBA 1-31-12.dwg](#)

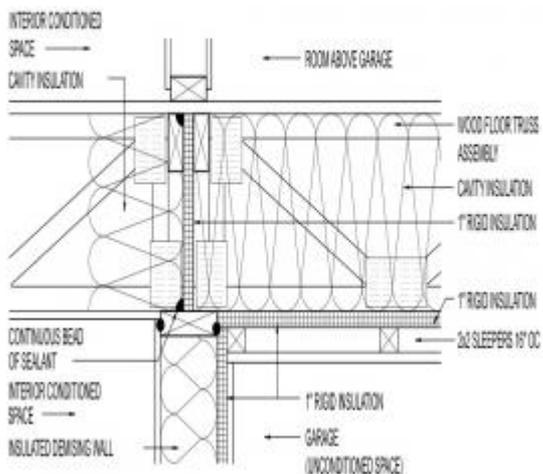
PDF: [318 CAD 1-2 air barrier garage band 1-inch rigid foam 1x3 furring 5-01002_GBA 1-31-12.pdf](#)

Reference: [Building Plans for Advanced Framing](#)

Author(s): Green Building Advisor

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Website providing CAD files and drawings of advanced framing details.



CAD FILE: [318 CAD 1-2 air barrier garage band joist 1-inch rigid foam 2x2 furring 5-01003_GBA 1-31-12.dwg](#)

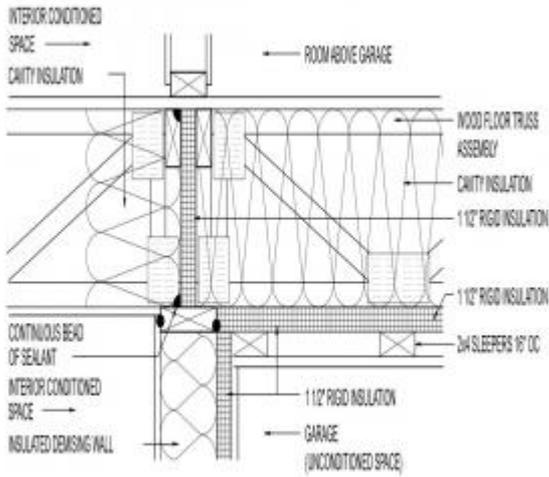
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CAD FILE: [318 CAD 1-2 Air barrier garage band joist 1-5-inch rigid foam 2x4 sleeper 5-01001_GBA_1-31-12.dwg](#)
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Compliance

The Compliance tab contains both program and code information. Exact code language is copyrighted and 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.

[DOE Zero Energy Ready Home](#)

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The DOE Zero Energy Ready Home Target Home Exhibit 2 specifies that homes be whole house leakage tested and meet the following infiltration limits: Zones 1-2: ≤ 3 ACH50; Zones 3-4: ≤ 2.5 ACH50; Zones 5-7: ≤ 2 ; Zone 8: ≤ 1.5 . Envelope leakage must be determined by an approved verifier using a RESNET-approved testing protocol.

[ENERGY STAR Certified Homes](#)

The ENERGY STAR Certified Homes Thermal Enclosure Checklist requires (in Item 3m Fully Aligned Air Barriers) that a complete air barrier that are fully aligned with insulation be installed in at each insulated location of the home including at the interior or exterior surface of ceilings in Climate Zones 1-3 and at the interior surface of ceilings in Climate Zones 4-8; at the exterior surface of walls in all climate zones and also at the interior surface of walls in Climate Zones 4-8; at the interior surface of floors in all climate zones. It specifically indicates several areas requiring a complete air barrier including (item 3.1.8) the garage rim/band joist adjoining conditioned space. The air barrier must be located at the exterior surface of the walls in all climate zones. EPA highly recommends, but does not require, inclusion of an interior air barrier at rim and band joists in Climate Zones 4 through 8 (Footnote 7).

The ENERGY STAR Certified Homes Thermal Enclosure Checklist requires (in Item 5 Air Sealing) that (5.1) all penetrations to unconditioned space be fully sealed with blocking, flashing, caulk, or foam; and that (5.2) cracks in the building envelope be fully sealed.

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. ENERGY STAR recommends, but does not require, rigid air barriers. Open-cell or closed-cell spray polyurethane foam qualify as an air barrier when installed to the appropriate thickness indicated by the manufacturer (refer to the evaluation services report to find the required spray thickness). 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 inch 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.

ENERGY STAR highly recommends, but does not require, inclusion of an interior air barrier at band joists in [IECC Climate Zone 4 through 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, with the exception of adiabatic walls in multifamily dwellings. All insulated ceiling surfaces, regardless of slope (e.g., cathedral ceilings, tray ceilings, conditioned attic roof decks, flat ceilings, sloped ceilings), must meet the requirements for ceilings.

[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.

[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 IECC](#)

Table 402.4.2 Air Barrier and Insulation Inspection Component Criteria, Garage separation: Air sealing is installed between the garage and conditioned spaces.* Table 402.4.2, 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.*

[2009 IRC](#)

Table N1102.4.2 Air Barrier and Insulation Inspection Component Criteria, Garage separation: Air sealing is installed between the garage and conditioned spaces.* 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 IECC](#)

Table R402.4.1.1 Air Barrier and Insulation Installation, Garage separation: Air sealing is installed between the garage and conditioned spaces.* Table R402.4.1.1, 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.*

[2012 IRC](#)

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*Due to copyright restrictions, exact code text is not provided. For specific code text, refer to the applicable code.

[Air Sealing and Insulating Garage Walls - Code Compliance Brief](#)

Overview:

The intent of this brief is to provide code-specific information about air sealing and insulating garage walls to help ensure that the measure will be accepted as being in compliance with the code. Providing notes for code officials on how to plan reviews and conduct field inspections can help builders or remodelers with proposed designs and installations and provide jurisdictional officials with information for acceptance. Providing the same information to all interested parties (e.g., code officials, builders, designers, etc.) is expected to result in increased compliance and fewer innovations being questioned at the time of plan review and/or field inspection.

As in other parts of the home, sealing and insulating the walls and ceiling of your garage can be an effective way to improve energy efficiency in a home. In addition, properly isolating and air sealing attached garages from the living space is critical for preventing the potential infiltration of carbon monoxide and other contaminants into the home. Open joist bays above the garage that extend into living spaces need to be blocked and air sealed at the garage wall. Seams along the rim joist, top plate, sill plate, and foundation wall should be caulked or sealed. If there is living space above the garage, extra care should be taken to seal all seams and any holes in the subfloor, and any doors between the house and the garage should be weather stripped and have a tight-fitting threshold sweep.

Insulation and air-sealing requirements for garage walls shared with conditioned space are found in the International Energy Conservation Code (IECC) and International Residential Code (IRC). Even though each version of the 2009, 2012, and 2015 IECC/IRC codes has included provisions that the *building thermal envelope*¹ should be durably sealed to limit infiltration, the language related to air barriers and insulation in the 2009 version was somewhat vague and did not specify specific components of the *building thermal envelope*. The 2012 IECC/IRC added more specific language regarding areas of the *building thermal envelope* that should be sealed and expanded upon those areas that are now included in the 2015 IECC/IRC as well. This brief provides an overview of the 2009 through 2015 IRC/IECC code requirements related to air sealing and insulating attached garage walls.

¹"Building Thermal Envelope" is defined as the basement walls, exterior walls, floor, roof, and any other building elements that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.

Plan Review:

Per the **IECC/IRC, Section R103.3/R106.3 Examination of documents**. The code official/building official must examine or cause to be examined construction documents for code compliance.

This section lists applicable code requirements and details helpful for plan review regarding the provisions to meet the requirement for insulated and air sealed attached garage walls.

- **Construction Documentation.** Review the construction documents for details describing garage wall insulation, installation and construction techniques.
 - **2015 IECC/IRC, Section R103.2/N1101.5 Information on Construction Documents.** Construction documents should include:
 - insulation materials and their R-values
 - manufacturer specifications on garage door leading into conditioned space including rated and labeled U-factor
 - air sealing details
- **Air Leakage and Insulation.** Review the construction documents and confirm that the insulation material, R-value, and air-sealing technique meet applicable code requirements.

- **2015 IECC/IRC, R402.4./N1102.4. Air Leakage.** The building thermal envelope should be constructed to limit air leakage.
 - **R402.4.1/N1102.4.1 Building Thermal Envelope.** The sealing methods between dissimilar materials should allow for differential expansion and contraction.
 - **R402.4.1.1/N1102.4.1.1 Installation.** The components listed in the Air Barrier and Insulation Installation Table² should be installed in accordance with the manufacturer's instructions and the criteria listed as the applicable method of construction. Below are the General Requirements and components from the table that are applicable to sealing and insulating attached garage walls.
 - **R402.4.1.1/N1102.4.1.1 Air Barrier and Insulation Installation Table**
 - **Air Barrier General Requirements.** A *continuous air barrier*³ should be installed in the building envelope. The exterior thermal envelope contains a *continuous air barrier*. Breaks or joints in the *air barrier*⁴ should be sealed.
 - **Air Barrier Criteria:**
 - **Walls** – The junction of the foundation and sill plate should be sealed. The junction of the top plate and top of exterior walls should be sealed.
 - **Floors (including above garages)** – The air barrier should be installed at any exposed edge of insulation.
 - **Garage separation** – Air sealing should be provided between the garage and conditioned space.
 - **Insulation Installation:**
 - **Walls** – Cavities within corners and headers of frame walls should be insulated by completely filling the cavity with a material having a thermal resistance of R-3 per inch minimum. Exterior thermal envelope insulation for framed walls should be installed in substantial contact and continuous alignment with the air barrier.
 - **Floors (including above garages)** – Floor framing cavity insulation should be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation should be permitted to be in contact with the top side of sheathing, or continuous insulation installed on the underside of the floor framing and extends from the bottom to the top of all perimeter floor framing members.
 - **Narrow cavities** – Batts in narrow cavities should be cut to fit, or narrow cavities should be filled by insulation that on installation readily conforms to the available cavity space.
 - **2012 IECC/IRC, R402.4/N1102.4 Air Leakage.** The building thermal envelope should be constructed to limit air leakage.
 - **R402.4.1/N1102.4.1 Building Thermal Envelope.** The sealing methods between dissimilar materials should allow for differential expansion and contraction.
 - **R402.4.1.1/N1102.4.1.1 Installation.** The components listed in the Air Barrier and Insulation Installation Table should be installed in accordance with the manufacturer's instructions and the criteria listed as the applicable method of construction. Below are the components from the table that are applicable to sealing and insulating attached garage walls.
 - **R402.4.1.1/N1102.4.1.1 Air Barrier and Insulation Installation Table**
 - **Walls** – Corners and headers should be insulated and the junction of the foundation and sill plate should be sealed. The junction of the top plate and top of exterior walls should be sealed. Exterior thermal envelope insulation for framed walls should be installed in substantial contact and continuous alignment with the air barrier.
 - **Garage Separation** – Air sealing should be provided between the garage and conditioned spaces.
 - **Floors (including above-garage floors)** – Insulation should be installed to maintain permanent contact with underside of subfloor decking. The air barrier should be installed at any exposed edge of insulation.
 - **Narrow Cavities** – Batts in narrow cavities should be cut to fit, or narrow cavities should be filled by insulation that on installation readily conforms to the available cavity space.
 - **2009 IECC/IRC, 402.4.1 Air leakage, Building Thermal Envelope**
 - The *building thermal envelope* should be constructed to limit air leakage. The sealing methods between dissimilar materials should allow for differential expansion and contraction. Sources of infiltration should be caulked, gasketed, weather stripped, or otherwise sealed with an air barrier material, suitable film, or solid material:
 - All joints, seams, and penetrations
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