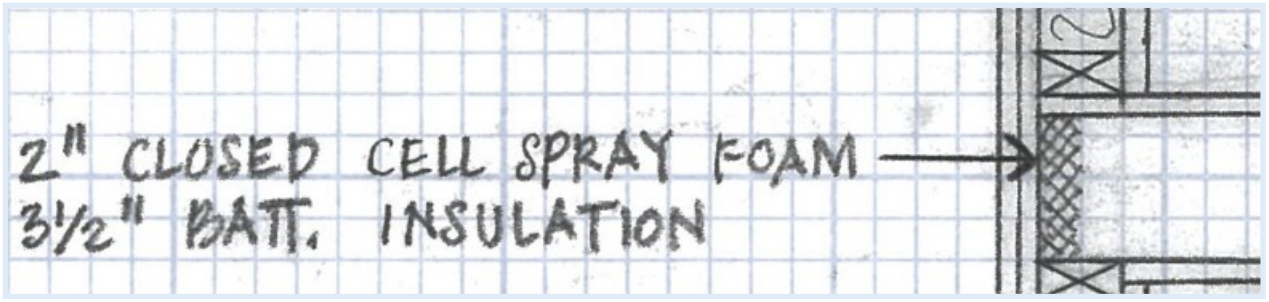
2021 Residential Air Barriers for Contractors and Inspectors

What are the requirements?

How should they be installed for inspection?

What should I be looking for?



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2021 Residential Air Barriers

Air Leakage / Air Barrier Requirements

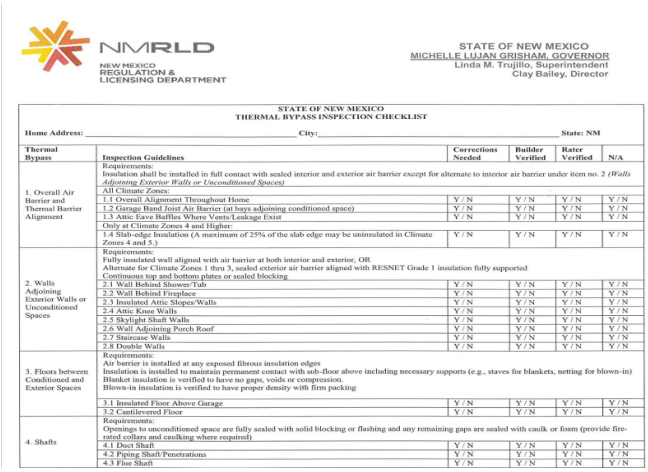
R103.2

Required to be placed on the plans

- Air sealing details

R402.4 Air Leakage

- Limit air leakage with the thermal envelope assembly, including air barriers
- Sealing methods must account for expansion and contraction
- Components of the thermal envelope must comply with Table R402.4.1.1
- Footnote a - Inspection of log walls shall be in accordance with ICC 400.
- Footnote b - Air barrier and insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joints.
- Testing must be performed in the locations listed in R402.4.1.5 in accordance with R402.4.1.2. Locations not listed in R402.4.1.5 are required to comply with Table R402.4.1.1 and the Thermal Bypass Inspection Checklist. (Currently being updated)
- When testing the air leakage rate can not exceed the values in R402.4.1.3



NMRLD
NEW MEXICO REGULATION & LICENSING DEPARTMENT

STATE OF NEW MEXICO
MICHELLE LUJAN GRISHAM, GOVERNOR
Linda M. Trujillo, Superintendent
Clay Bailey, Director

STATE OF NEW MEXICO
THERMAL BYPASS INSPECTION CHECKLIST

Home Address: _____ City: _____ State: NM

Thermal Bypass	Inspection Guidelines	Corrections Needed	Builder Verified	Rater Verified	N/A
1. Overall Air Barrier and Thermal Barrier Alignment	Requirements: Insulation shall be installed in full contact with sealed interior and exterior air barrier except for alternate to interior air barrier under item no. 2 *(Walls Adjoining Exterior Walls or Unconditioned Spaces)* All Climate Zones:				
	1.1 Overall Alignment Throughout Home	Y / N	Y / N	Y / N	Y / N
	1.2 Garage Band Joist Air Barrier (at bays adjoining conditioned space)	Y / N	Y / N	Y / N	Y / N
	1.3 Attic Eave Baffles Where Vents/Leakage Exist	Y / N	Y / N	Y / N	Y / N
	Only at Climate Zones 4 and Higher:				
	1.4 Slab-edge Insulation (A maximum of 25% of the slab edge may be uninsulated in Climate Zones 4 and 5.)	Y / N	Y / N	Y / N	Y / N
2. Walls Adjoining Exterior Walls or Unconditioned Spaces	Requirements: Fully insulated wall aligned with air barrier at both interior and exterior, OR Alternate for Climate Zones 1 thru 3, sealed exterior air barrier aligned with RESNET Grade 1 insulation fully supported Continuous top and bottom plates or sealed blocking				
	2.1 Wall Behind Shower/Tub	Y / N	Y / N	Y / N	Y / N
	2.2 Wall Behind Fireplace	Y / N	Y / N	Y / N	Y / N
	2.3 Insulated Attic Slopes/Walls	Y / N	Y / N	Y / N	Y / N
	2.4 Attic Knee Walls	Y / N	Y / N	Y / N	Y / N
	2.5 Skylight Shaft Walls	Y / N	Y / N	Y / N	Y / N
	2.6 Wall Adjoining Porch Roof	Y / N	Y / N	Y / N	Y / N
	2.7 Staircase Walls	Y / N	Y / N	Y / N	Y / N
	2.8 Double Walls	Y / N	Y / N	Y / N	Y / N
3. Floors between Conditioned and Exterior Spaces	Requirements: Air barrier is installed at any exposed fibrous insulation edges Insulation is installed to maintain permanent contact with sub-floor above including necessary supports (e.g., staves for blankets, netting for blown-in) Blanket insulation is verified to have no gaps, voids or compression. Blown-in insulation is verified to have proper density with firm packing				
	3.1 Insulated Floor Above Garage	Y / N	Y / N	Y / N	Y / N
	3.2 Cantilevered Floor	Y / N	Y / N	Y / N	Y / N
4. Shafts	Requirements: Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam (provide fire-rated collars and caulking where required)				
	4.1 Duct Shaft	Y / N	Y / N	Y / N	Y / N
	4.2 Piping Shaft/Penetrations	Y / N	Y / N	Y / N	Y / N
	4.3 Flue Shaft	Y / N	Y / N	Y / N	Y / N

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2021 Residential Air Barriers for Contractors and Inspectors

Table R402.4.1.1 - General Requirements

- A continuous air barrier shall be installed in the building envelope
- Breaks or joints in the air barrier shall be sealed
- Air permeable insulation can not be used as an air barrier or air sealing material

Common Materials Used

- Continuous rigid insulation on the exterior
- House wrap installed as tested for air barrier
- Zip Panels
- Drywall

All joints and seams have been sealed

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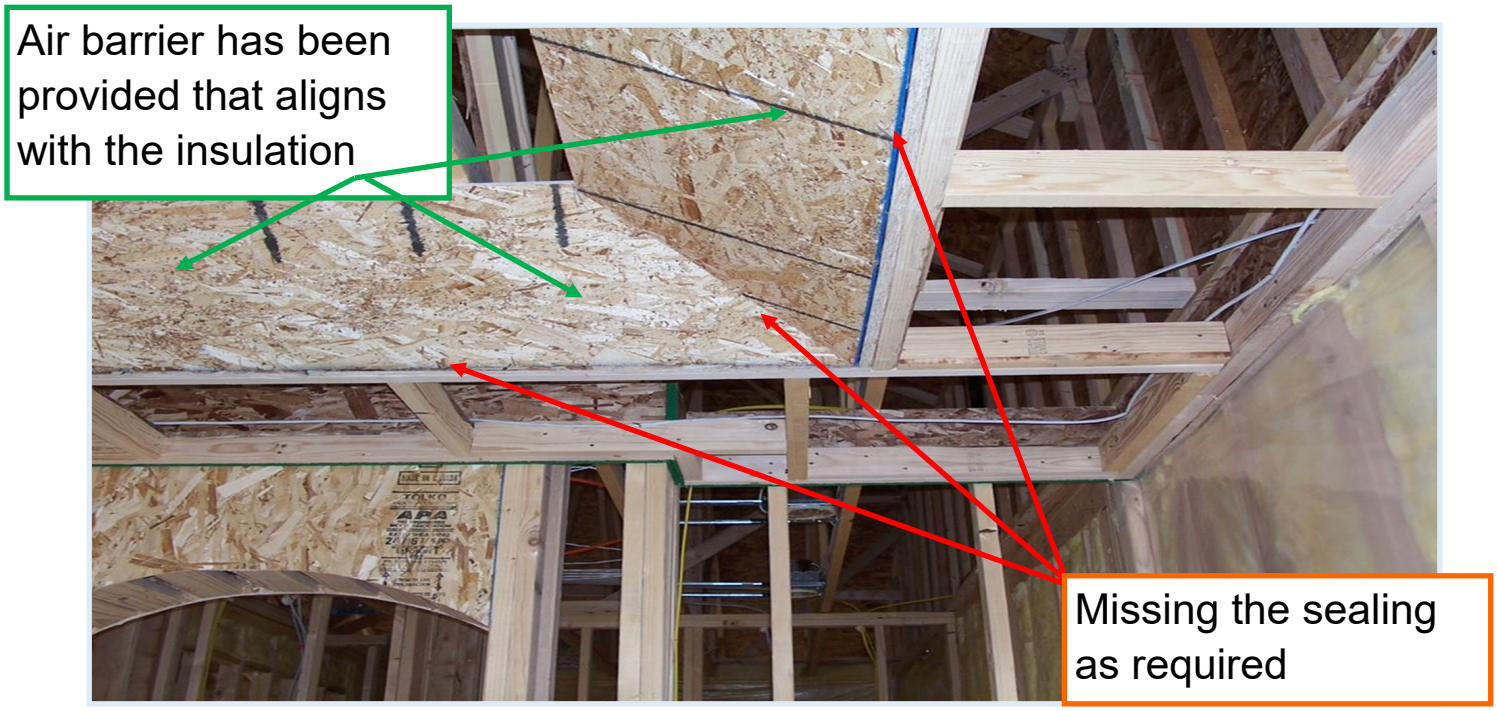
Table R402.4.1.1 - Ceiling/Attic

- The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed.
- Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.



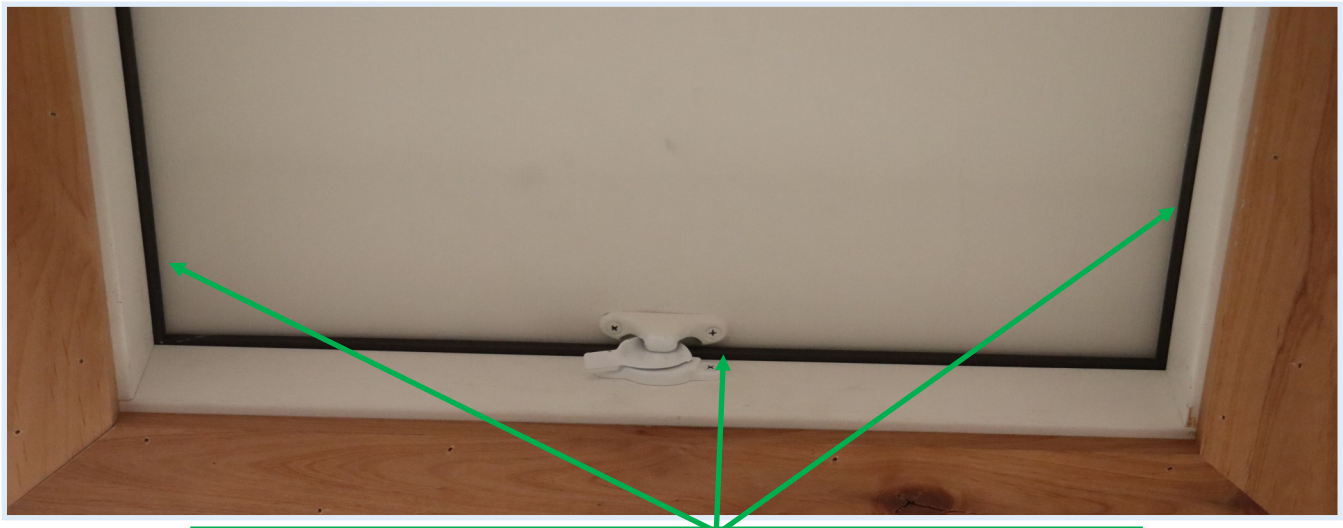


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Table R402.4.1.1 - Walls

- The junction of the foundation and sill plate shall be sealed.
- The junction of the top plate and the top of exterior walls shall be sealed.
- Knee walls shall be sealed.

Sealing provided at bottom (sill) plate and at top plate

Air sealing at the air barrier for the attic knee wall

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Table R402.4.1.1 - Windows, Skylights, and Doors

- The space between framing and skylights, and the jambs of windows and doors, shall be sealed.

Slow expanding foam used to seal at door jamb

Missing the sealing between framing and window

- Air permeable insulation can not be used for air sealing material.
- FYI - The window and door manufacturers do not want fast expanding foam to be used. Foam can be used, just not fast expanding foam.

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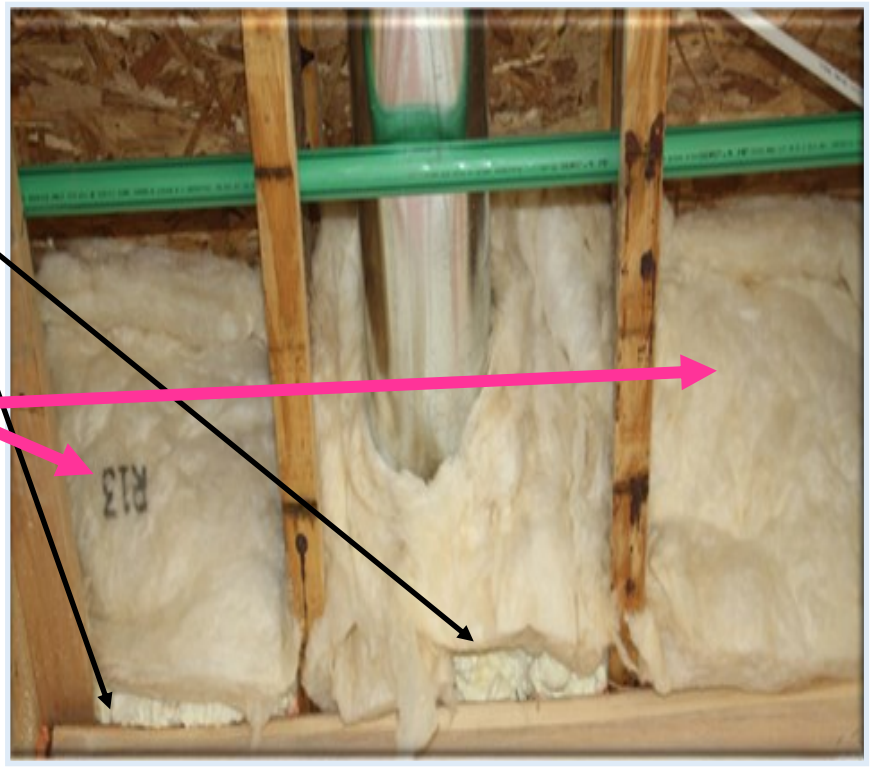
Table R402.4.1.1 - Rim Joists

- Rim joists shall include an exterior air barrier.
- The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.

Spray foams used for air barrier/sealing and as part of the above grade wall R-value.

Batt insulation makes up remainder of R-value for wall.



- Spray foam can be considered an air barrier if installed to a certain thickness.
  - Open cell spray foam 4.5” thickness– unless noted otherwise by manufacturer information
  - Closed cell spray foam 1.5” thickness– unless noted otherwise by manufacturer information
- Closed cell spray foam can be both an air barrier and part of the above grade wall insulation R-value.
- Remember Section 316 of the IRC also applies

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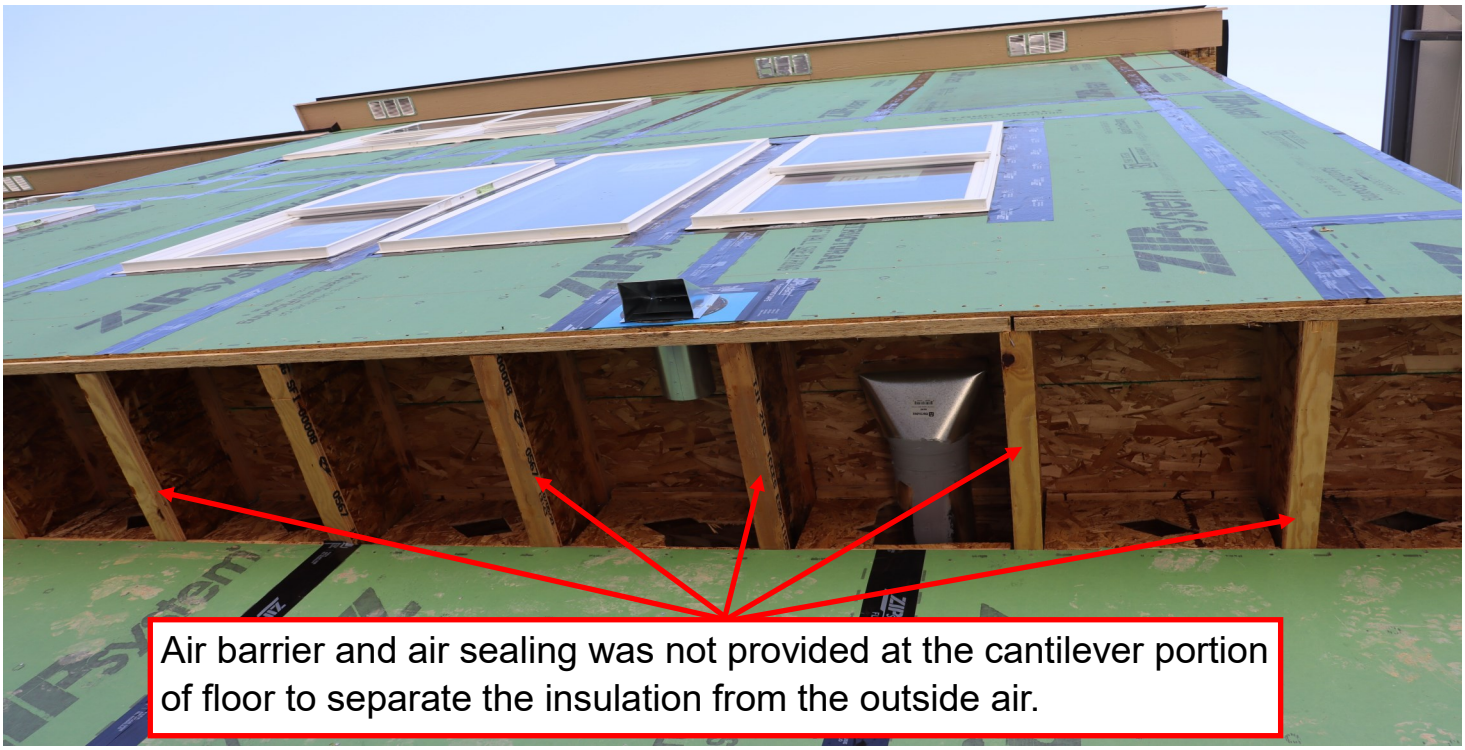
Table R402.4.1.1 - Floors, including cantilevered floors and floors above garages

- The air barrier shall be installed at any exposed edge of insulation.



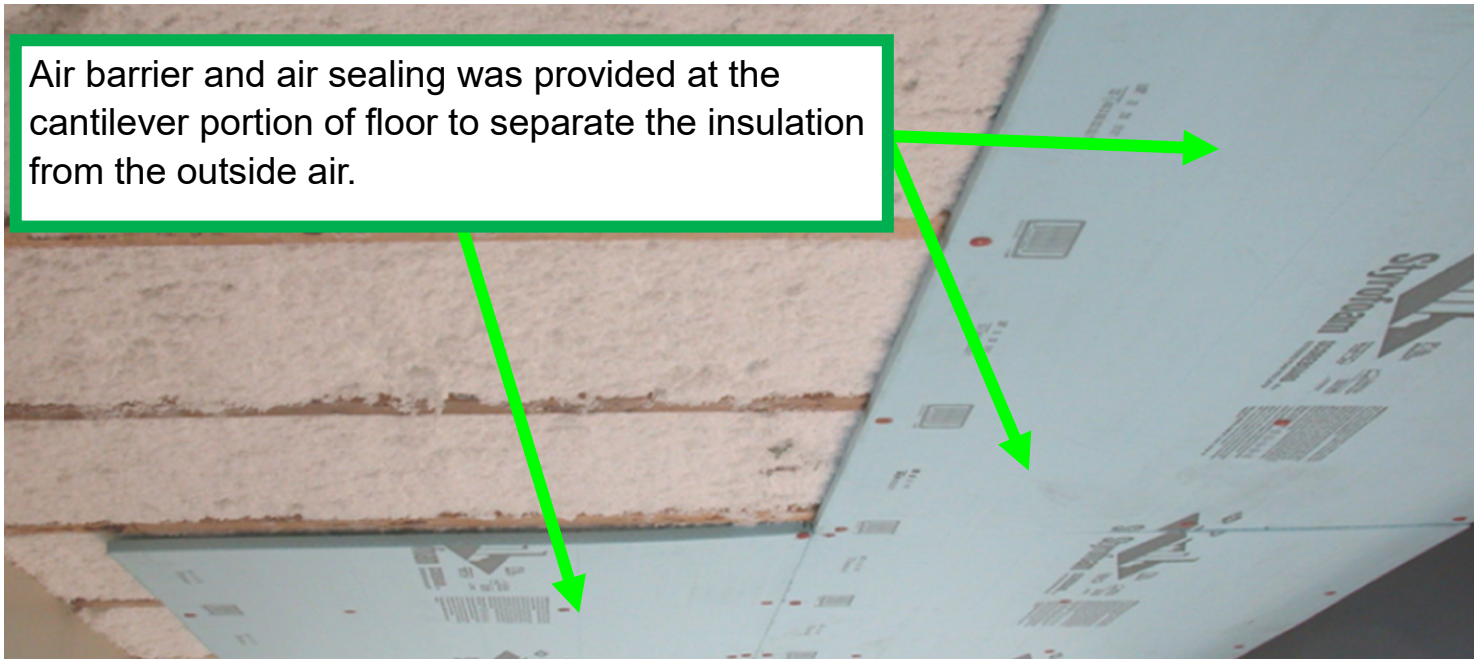


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Table R402.4.1.1 - Basement, Crawl Space, and Slab Foundation

- Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder/air barrier in accordance with Section R402.2.10.
- Penetrations through concrete foundation walls and slabs shall be air sealed.
- Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the International Residential Code.

Either a note or detail might be provided for the new requirement of sealing of penetrations through slab or foundation wall.

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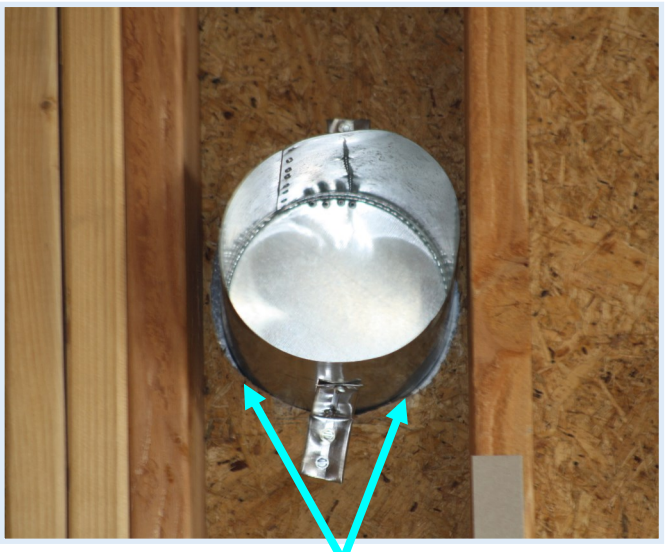
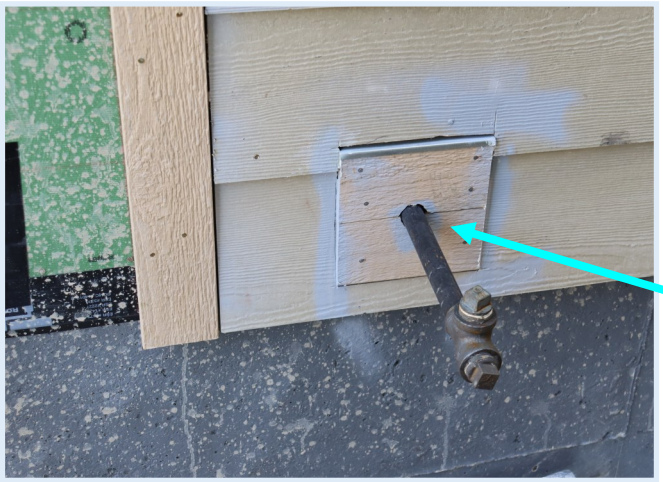
Table R402.4.1.1 - Shafts, Penetrations

- Duct and flue shafts to exterior or unconditioned space shall be sealed.
- Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.



Exhaust duct not sealed on the interior side, but may be sealed on the exterior.

This penetration may at first glance not be sealed, but behind the cover a flashing system is present. (Blue flashing system) The seams of the flashing system have also been sealed and required.



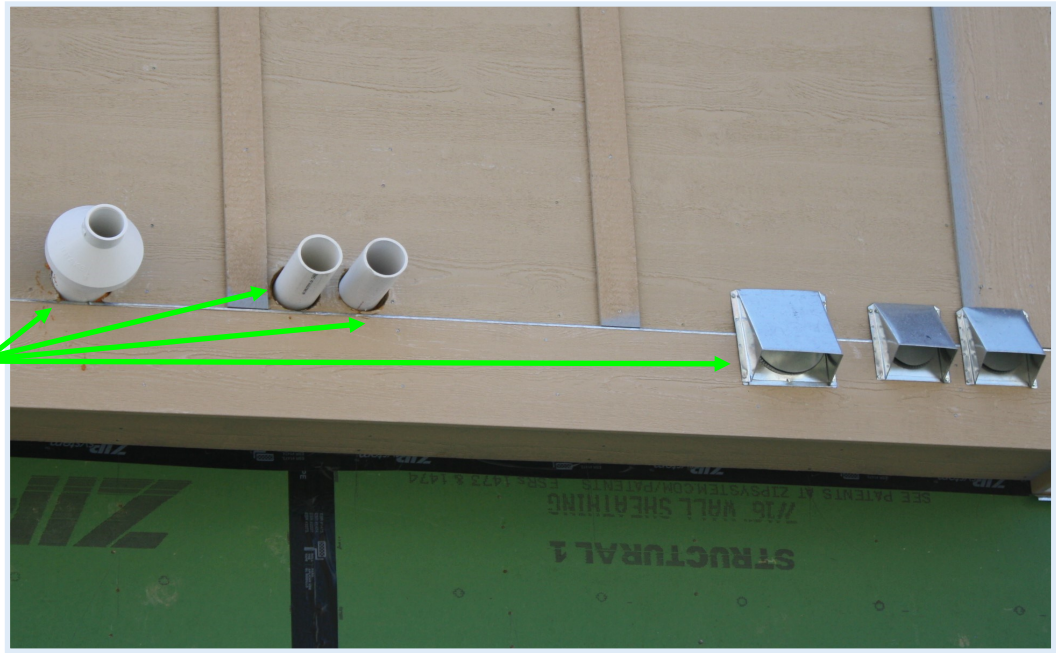
This gas line utility penetration will need to be air sealed to allow for expansion and contraction.

If the field fabricated cover has penetrated the air barrier the joints and seams will also need sealing.

2021 Residential Air Barriers for Contractors and Inspectors

Table R402.4.1.1 - Shafts, Penetrations

This builder paid close attention to the size of penetration in relation to the size of hole for the penetration. This will allow for a better opportunity for a good air sealing that will last.



The hole created for this penetration was larger then it needed to be for the penetration. This penetration is an odd shaped penetration that will require some thought on how to create an air seal which will work and last.

There are several issues that happened here.

The sealant used did not allow for expansion and contraction in the short time from being applied to when inspection happened.

Was the sealant listed for exterior use?

Was the sealant listed for UV exposure?

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Table R402.4.1.1 - Narrow Cavities

- Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.

This is a new requirement in the 2021 IECC.

This may be demonstrated with a note on the plans.

The image below demonstrates the intent of this requirement to seal those locations.

Remember air permeable insulation can not be used as an air sealing material.

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Table R402.4.1.1 - Garage Separation

- Air sealing shall be provided between the garage and conditioned spaces

Spray foam to a thickness that includes it to be used as an air barrier. The spray foam was installed on the side of the dwelling unit and not on the side of the garage. This is code compliant and provides the required insulation value and air tightness for the dwelling unit and garage separation.

This is image demonstrates the difficultly of seeing if there was complete air sealing. The purple arrows shows area of concern. Timing of inspections will be important.

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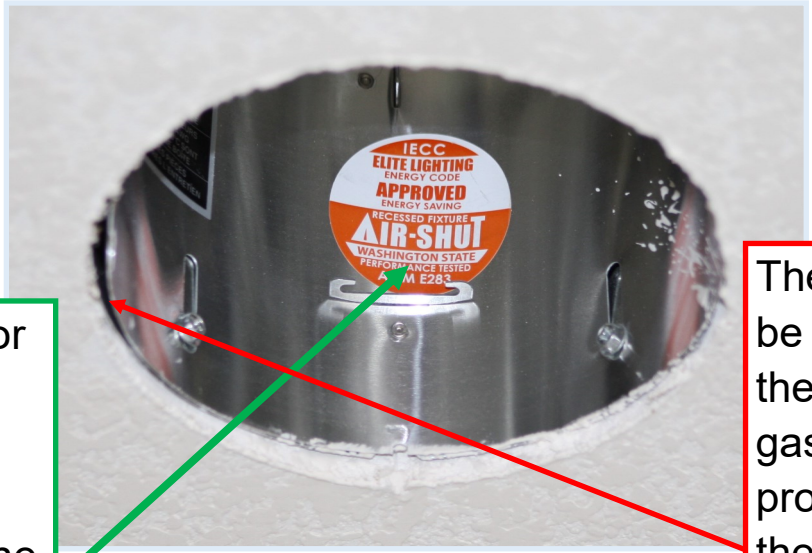
Table R402.4.1.1 - Recessed Lighting

- Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.4.5.

Section R402.4.5

- IC-rated (In Contact with insulation)
- Air leakage rate maximum of 2.0 cfm
- Sealing with gasket or caulking between housing and interior wall or ceiling



The housing for this recessed lighting has been tested to demonstrate the air tightness. The sticker is an easy way to verify.

There does need to be some sealing of the housing. A gasket has been provided as part of the assembly for these.

If a gasket was not a part of this assembly it would still require sealing to be provided.

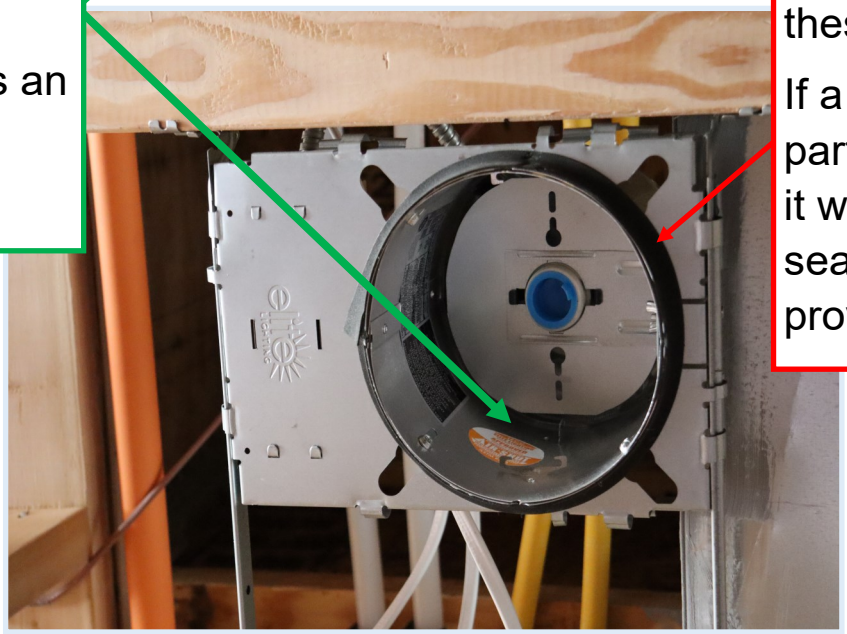


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Table R402.4.1.1 - Plumbing, Wiring, and Other Obstructions

- All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.

Ceiling is location of air barrier:

Plumbing penetrating the top plate must be sealed.

Ceiling is location of air barrier:

Wiring penetrating the top plate and drywall must be sealed.

Ceiling is location of air barrier

The radon piping (Other Obstructions) must be air sealed

FYI the electrical box will also need to follow the table R402.1.1.

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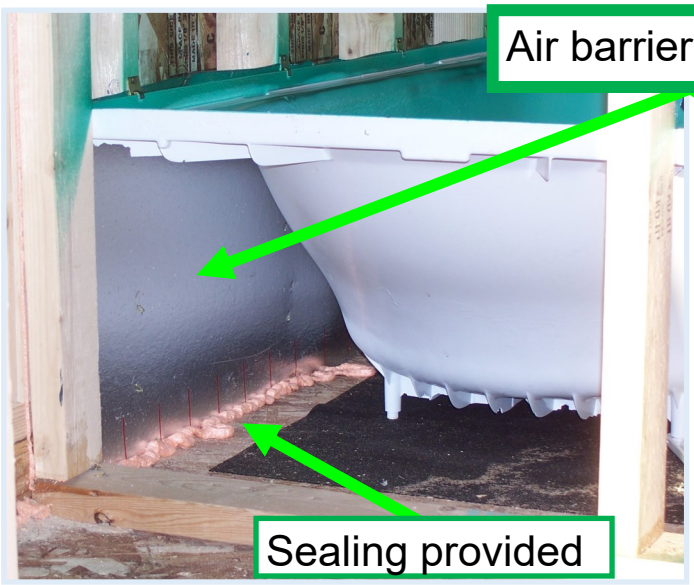
Table R402.4.1.1 - Shower/Tub on exterior walls

- The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.

Wall Assembly Order

- Exterior Sheathing
- Insulation
- Air Barrier
- Tub/Shower



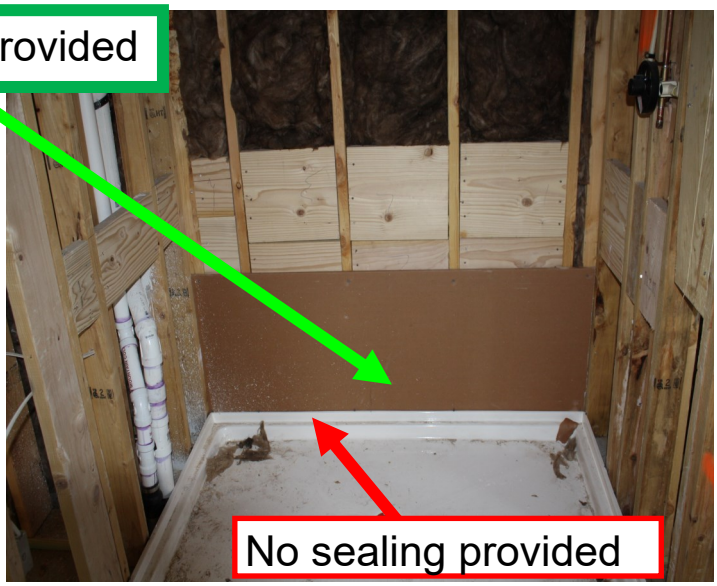


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Table R402.4.1.1 - Electrical/Phone Boxes on exterior walls

- The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.
- When an air seal box is utilized it must comply with R402.4.6

R402.4.6 Electrical and communication outlet boxes

- Tested in accordance with NEMA OS 4
- Air leakage rate 2.0 cfm maximum
- Labeled NEMA OS 4 or OS 4

This electrical box is penetrating at the ceiling drywall which is where the thermal envelope and air barrier are located. This box is now part of the air barrier assembly. The foam is sealing the wire penetration and will need to be sealed around the perimeter after the gypsum board is installed. Or and air tight box could have been used.

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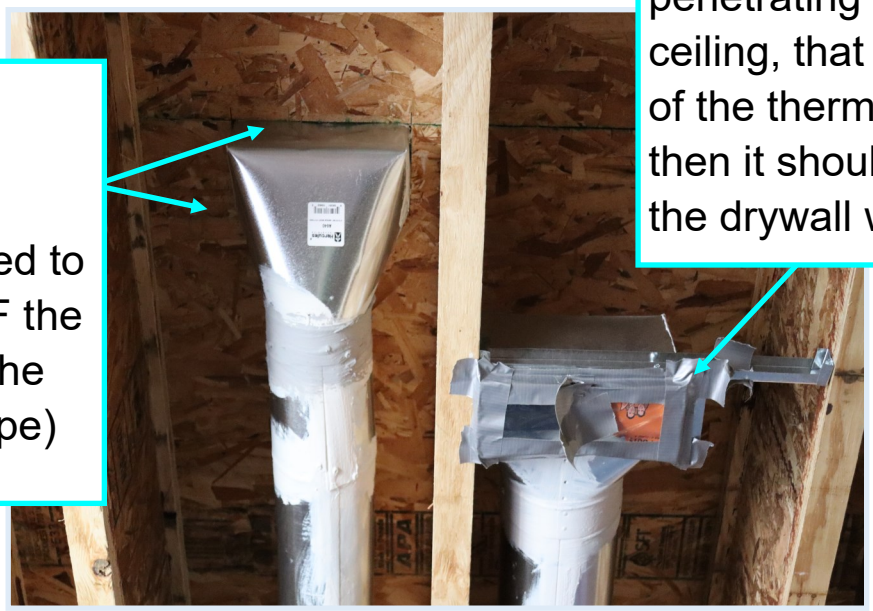
Table R402.4.1.1 - HVAC Register Boots

- HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.

This register is penetrating the subfloor, and should be sealed to the subfloor. (IF the floor is part of the thermal envelope)

If this register will be penetrating the dry wall ceiling, that is the location of the thermal envelope, then it should be sealed to the drywall when installed.



This register has penetrated the subfloor and has been sealed as required.

2021 Residential Air Barriers for Contractors and Inspectors

Table R402.4.1.1 - Concealed Sprinklers

- Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.

No standardized detail can be provided by the designer. It must come from the manufacturer of the concealed sprinkler head. As a plans examiner or architect/designer a request should be made to the manufacturer for the correct detail for air sealing