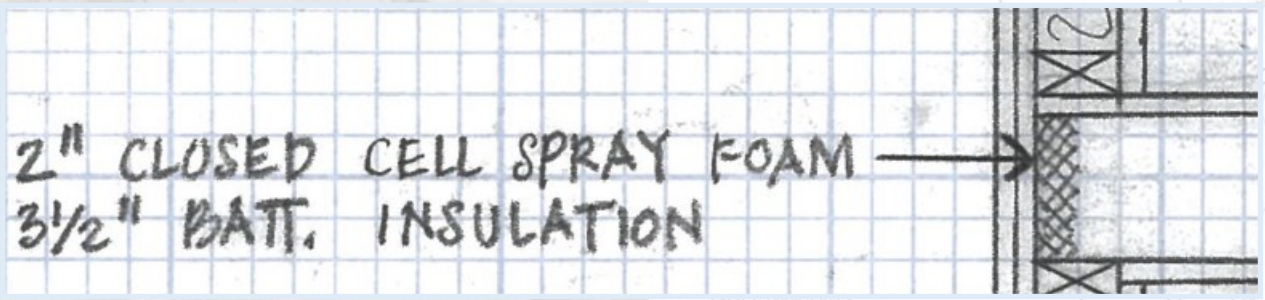
Xcel Energy®

What to Look for Series
Air Barriers for Inspection

What are the requirements?

How should they be installed for inspection?

What should I be looking for?



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What are the requirements?
Air Barriers for Inspection

Air Leakage / Air Barrier Requirements

R103.2 (2018 & 2021)

Required to be placed on the plans

- Air sealing details

R402.4 Air Leakage (2018 & 2021)

- Limit air leakage with the thermal envelope assembly, including air barrier
- Sealing methods must account for expansion and contraction
- Components of the thermal envelope must comply with Table R402.4.1.1
- Testing must be performed in accordance with R402.4.1.2
- Testing air leakage rate can not exceed the values in R402.4.1.3

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What to Look for Series Air Barriers for Inspection

2018 IECC Table R402.4.1.1	2021 IECC Table R402.4.1.1
• General requirements	• General requirements
• Ceiling/attic	• Ceiling/attic
• Walls	• Walls
• Windows, skylights and doors	• Windows, skylights and doors
• Rim joists	• Rim joists
• Floors, including cantilevered floors and floors above garages	• Floors, including cantilevered floors and floors above garages
• Crawl space walls	• Basement crawl space and slab foundations
• Shafts, penetrations	• Shafts, penetrations
• Narrow cavities	• Narrow cavities
• Garage separation	• Garage separation
• Recessed lighting	• Recessed lighting
• Plumbing and wiring	• Plumbing, wiring or other obstructions
• Shower/tub on exterior wall	• Shower/tub on exterior wall
• Electrical/phone box on exterior walls	• Electrical/phone box on exterior walls
• HVAC register boots	• HVAC register boots
• Concealed sprinklers	• Concealed sprinklers

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Air Barriers for Inspection
General Requirements

2018 & 2021

- A continuous air barrier shall be installed in the building envelope
- Breaks or joints in the air barrier shall be sealed

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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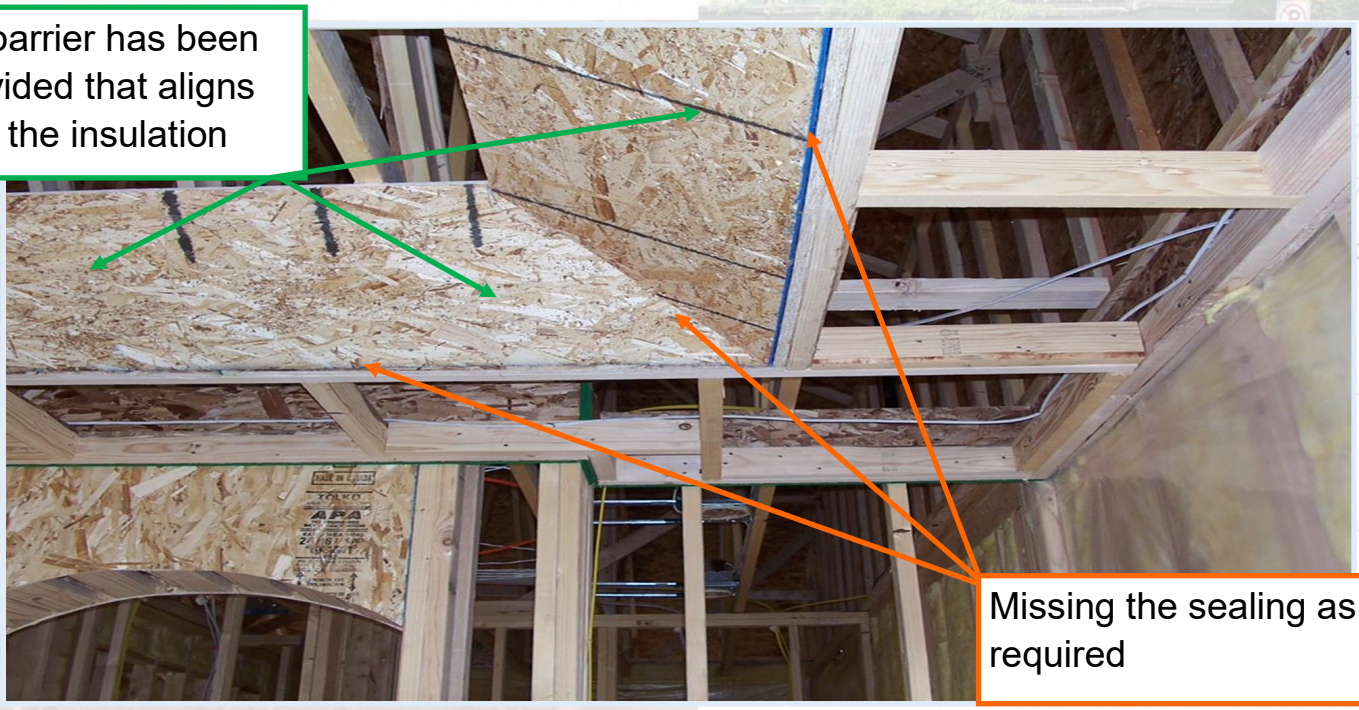
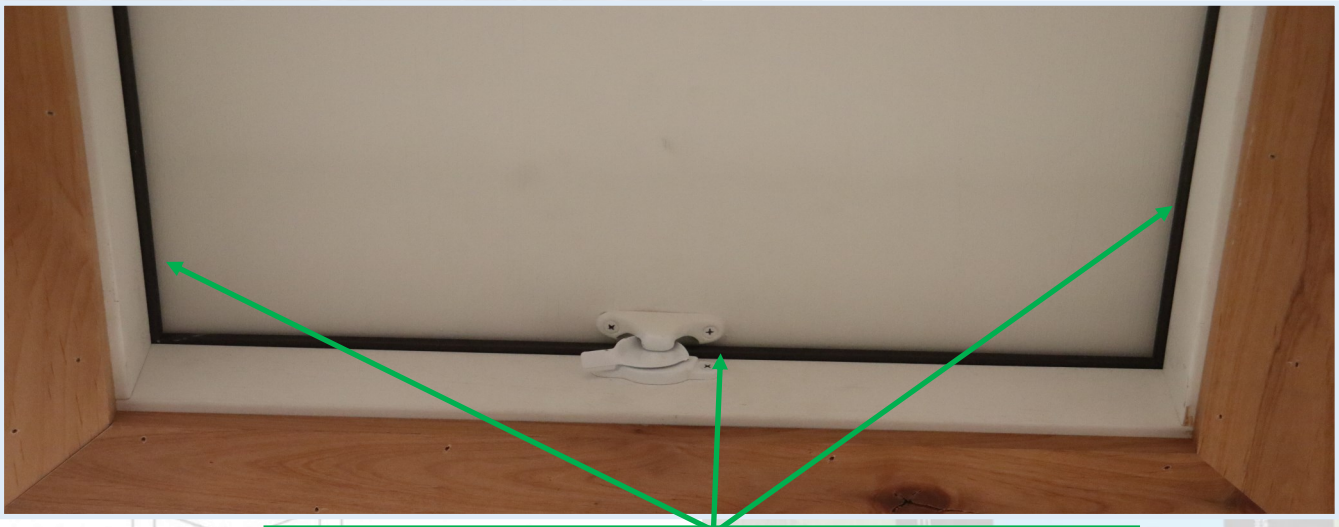
Air Barriers for Inspection Ceiling/Attic

- 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.





Air Barriers for Inspection 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

Air Barriers for Inspection
Windows, Skylights, and Doors

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

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

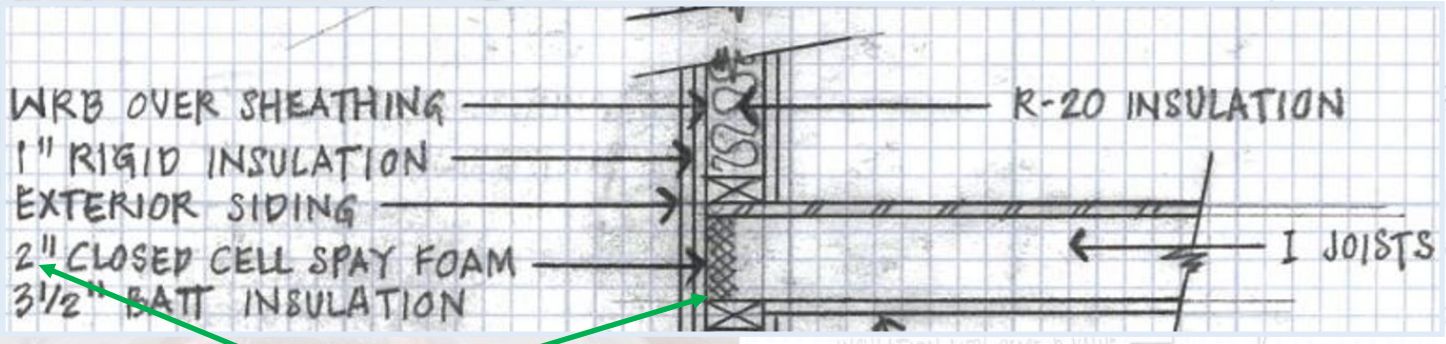
Air Barriers for Inspections
Rim Joists

2018 IECC

- Rim joists shall include the air barrier.

2021 IECC

- 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.

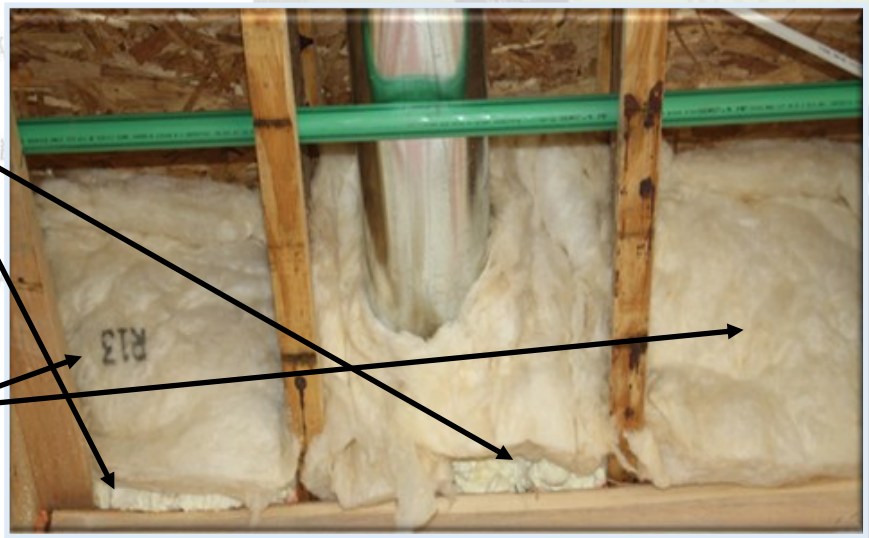


Closed cell spray foam can be considered an air barrier if installed to a certain thickness.

Closed cell spray foam can be both an air barrier and part of the above grade wall insulation R-value.

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

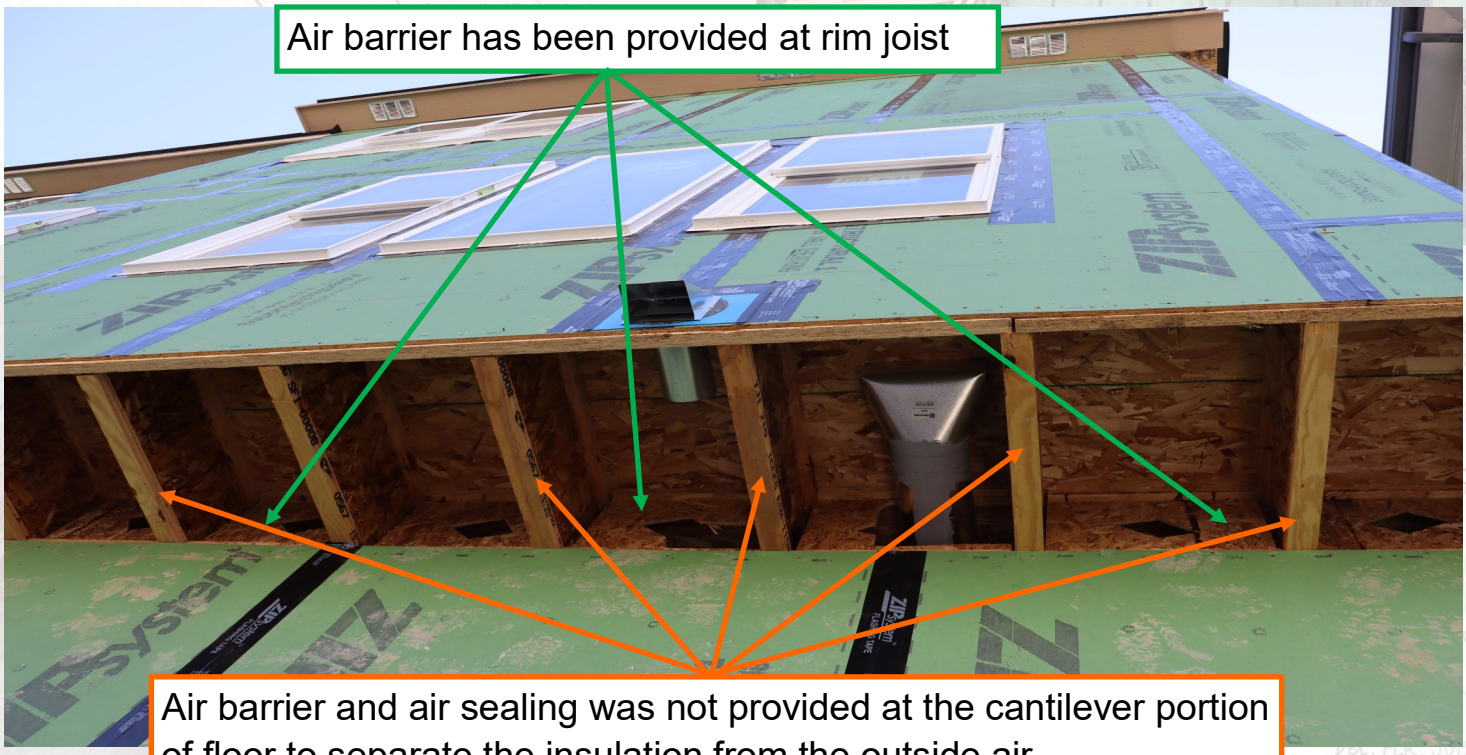
Batt insulation makes up remainder of R-value for wall.

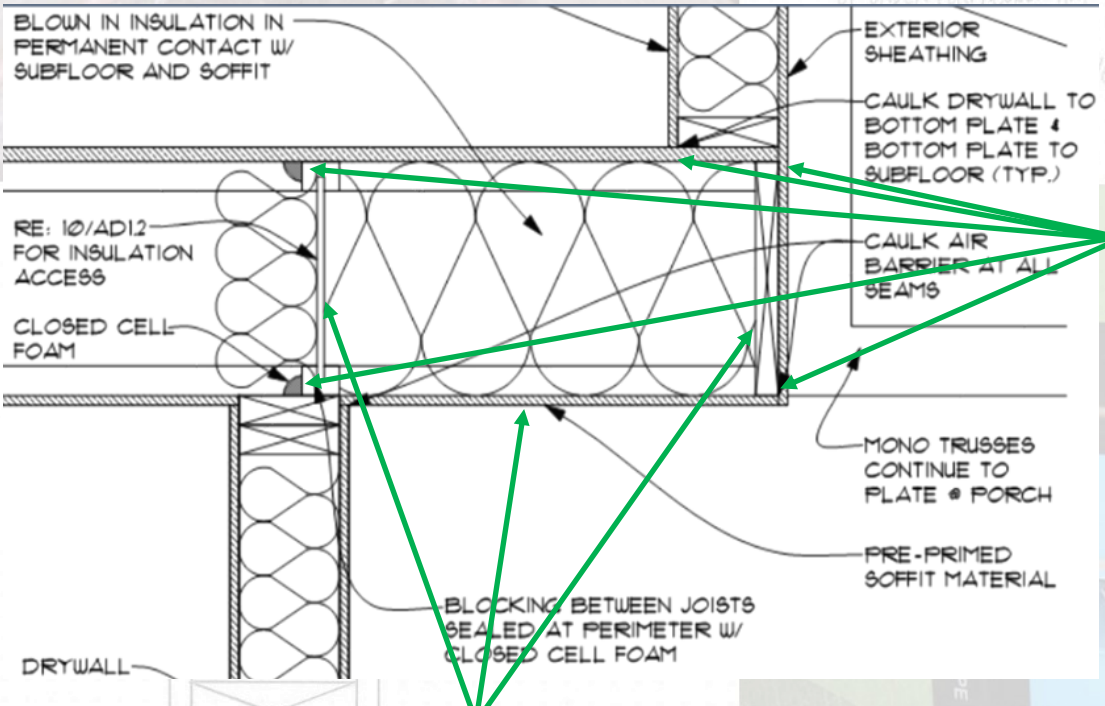


Air Barriers for Inspection

Floors, including cantilevered floors and floors above garages

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





Air Barriers for Inspections

Basement Crawl Space and Slab Foundations

2018 IECC

- Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.

2021 IECC

- 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.

Air Barriers for Inspection Shafts, Penetrations

2018 IECC

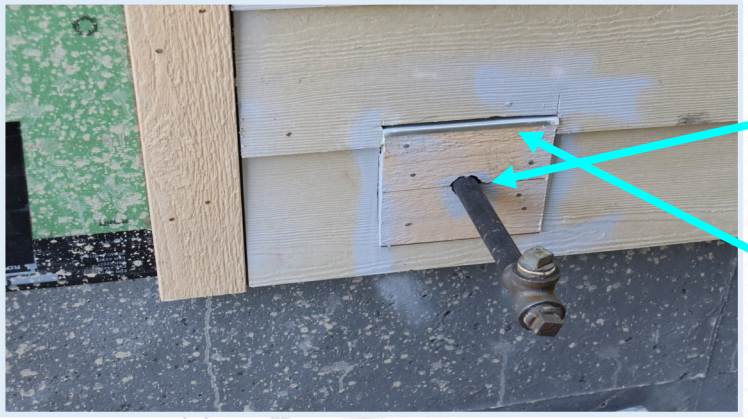
- Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.

2021 IECC

- 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.

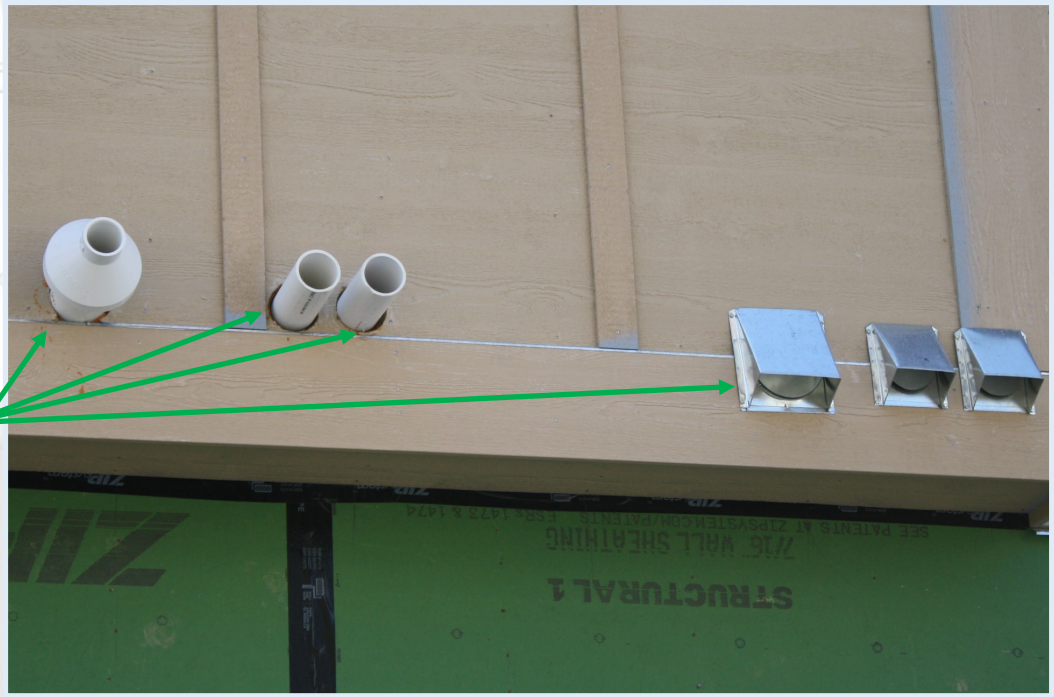
Exhaust duct sealed by the spray foam used in the rim joist because it meets or exceed the required thickness to be an air barrier.



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

If the make shift cover has penetrated the air barrier the joints and seams will also need sealing.

Air Barriers for Inspection 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?

Air Barriers for Inspection
Narrow Cavities

2021 IECC

- 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.

Air Barriers for Inspection
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. It does still separate the garage from the conditioned space.

An air barrier is being installed to separate the garage from the dwelling space.

This is a larger process then utilizing spray foam (closed cell– usually 2” and open cell– usually 4.5”) to achieve air barrier and air sealing.

The edges of the air barrier will still be required to be sealed.

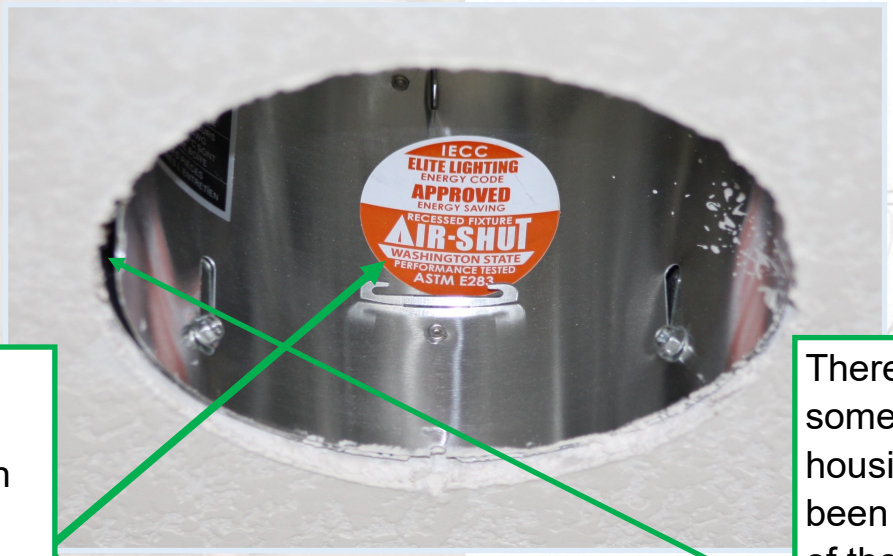
Air Barriers for Inspection
Recessed Lighting

2018 IECC

- Recessed light fixtures installed in the building thermal envelope shall be sealed to the finished surface.

2021 IECC

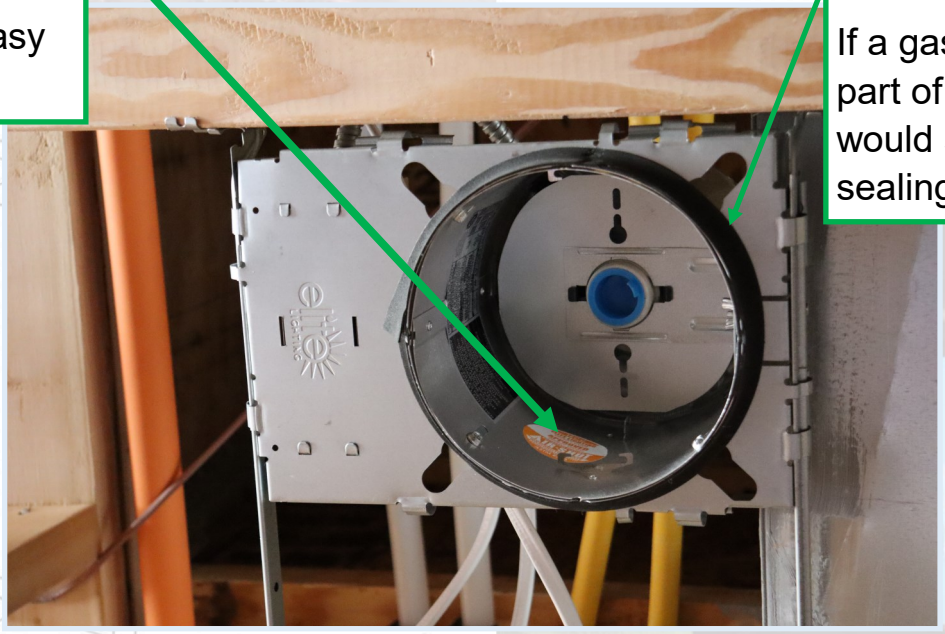
- Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.4.5.



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.



Air Barriers for Inspection

Plumbing, Wiring or other Obstructions

2021 IECC

- 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 air sealing

Air Barriers for Inspection
Shower/Tub on exterior wall

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

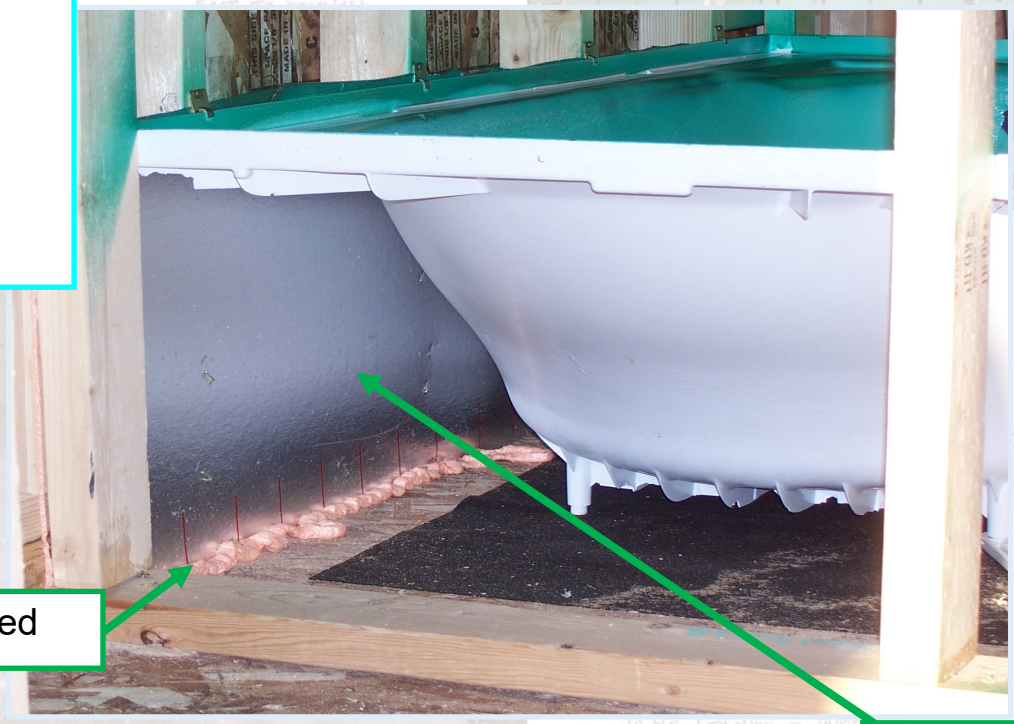
Assembly order :

Sheathing

Insulation

Air barrier

Tub/shower



Sealing provided

Air barrier provided

Sealing has not been provided yet

Air Barriers for Inspection

Electrical/phone box on exterior walls

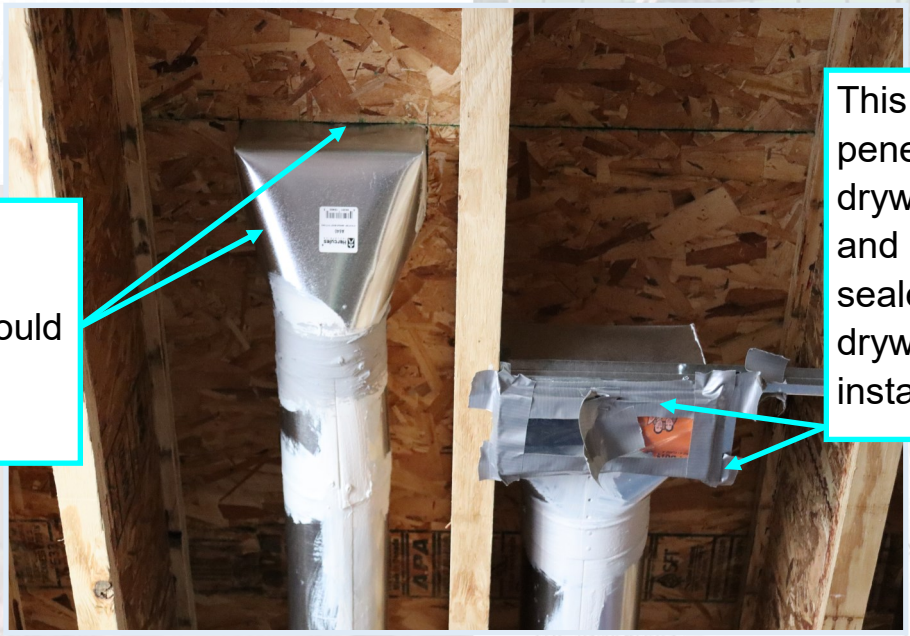
- The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.

This electrical box is penetrating at the ceiling drywall which is where the thermal envelope and air barrier are located. The wires entering the electrical box have been sealed.

REMEMBER—there are electrical boxes that are located on the exterior of the building that is also penetrating the continuous air barrier. These will also require to be sealed to maintain the integrity of the air barrier assembly. These used a flashing system, but other types of sealing can be utilized.

Air Barriers for Inspection
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.

This register will be penetrating the drywalled ceiling, and should be sealed to the drywall when installed.

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

Air Barriers for Inspection
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 an inspector, contractor, or builder you will need to ask for the manufacturer's recommendations on how to correctly install or inspect them.