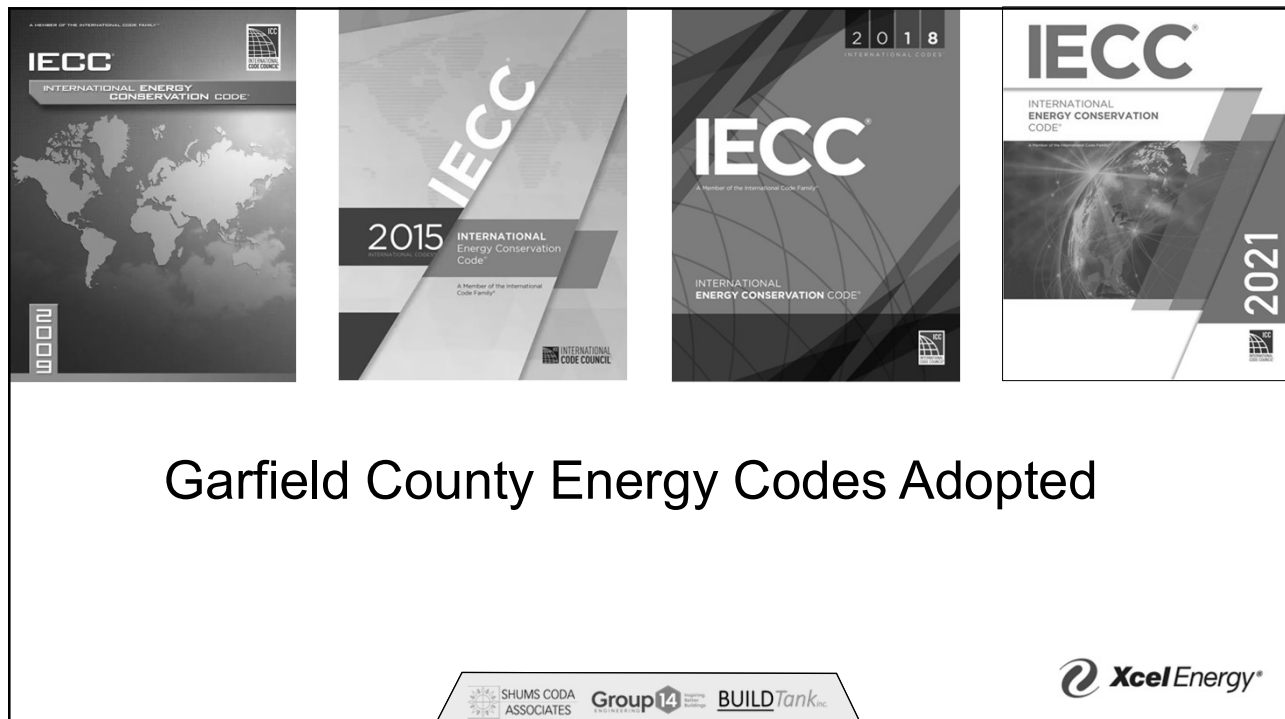
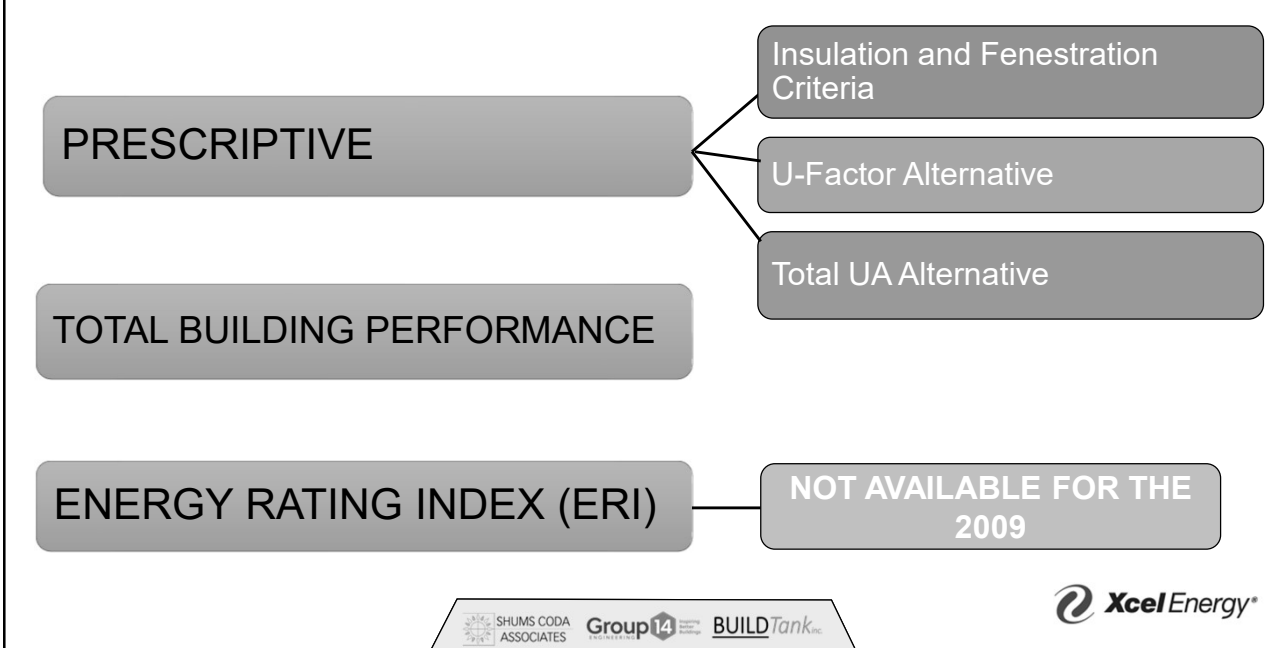


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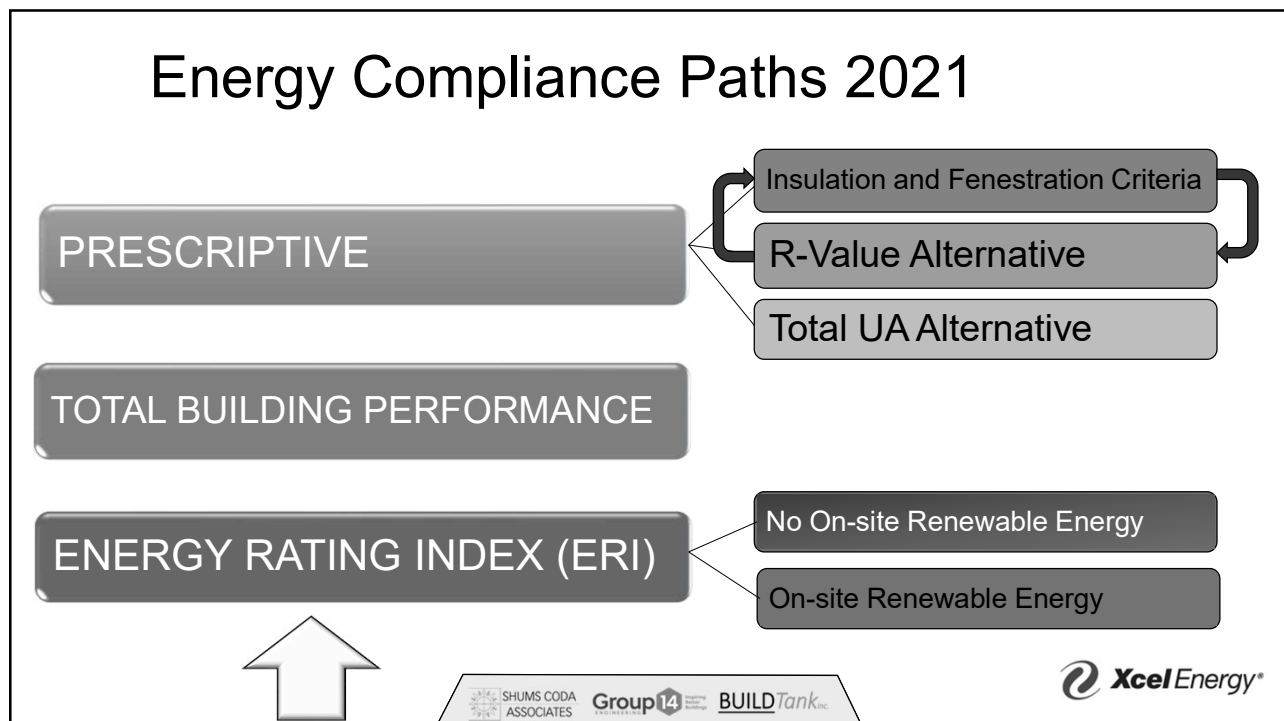
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Energy Compliance Paths 2009, 2015, & 2018



3

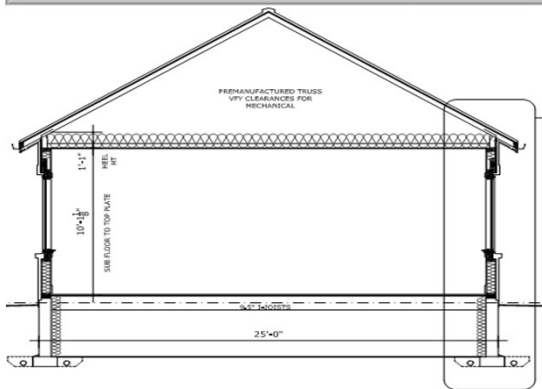
Energy Compliance Paths 2021



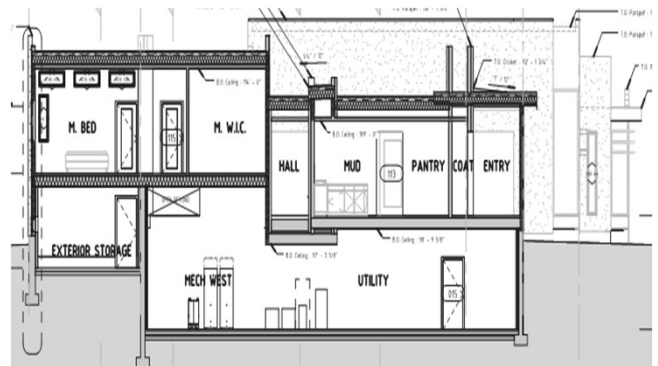
4

DEFINE THE THERMAL ENVELOPE

SIMPLE THERMAL ENVELOPE



MORE COMPLEX THERMAL ENVELOPE



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ARE YOU IN OR OUT?

CRAWLSPACE



GARAGE



FUEL BURNING APPLIANCE ROOMS



ATTIC

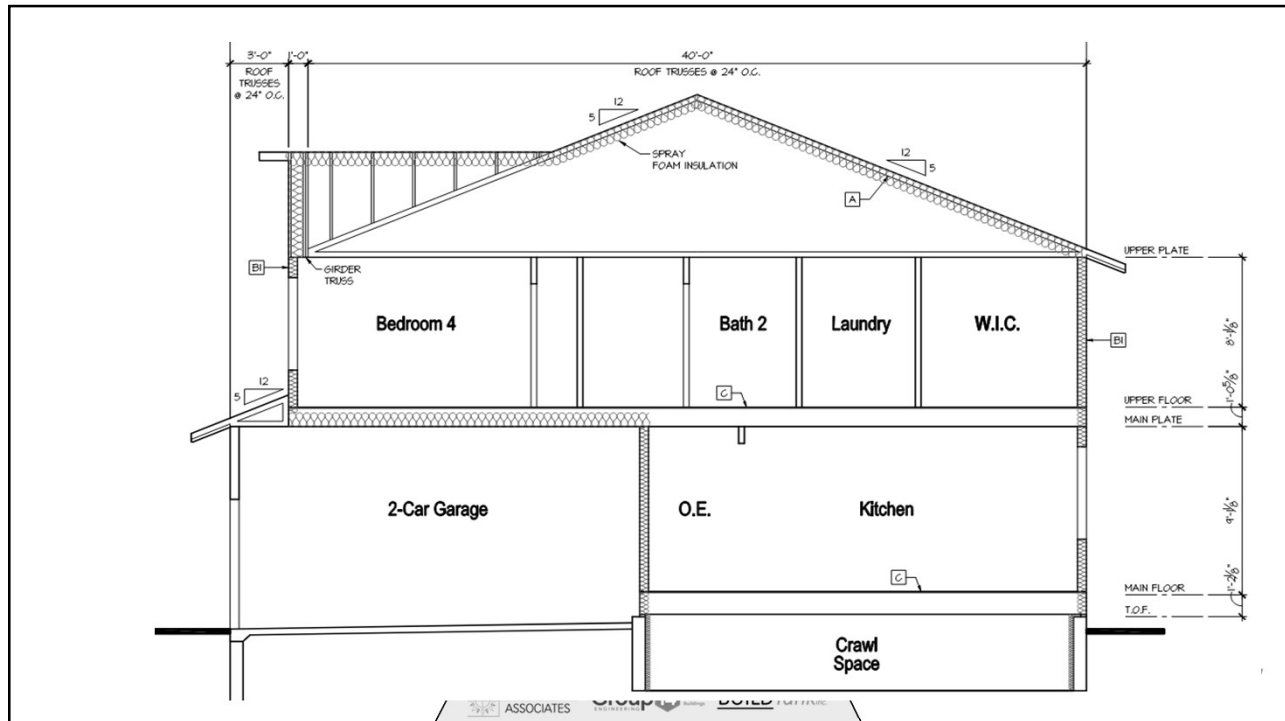
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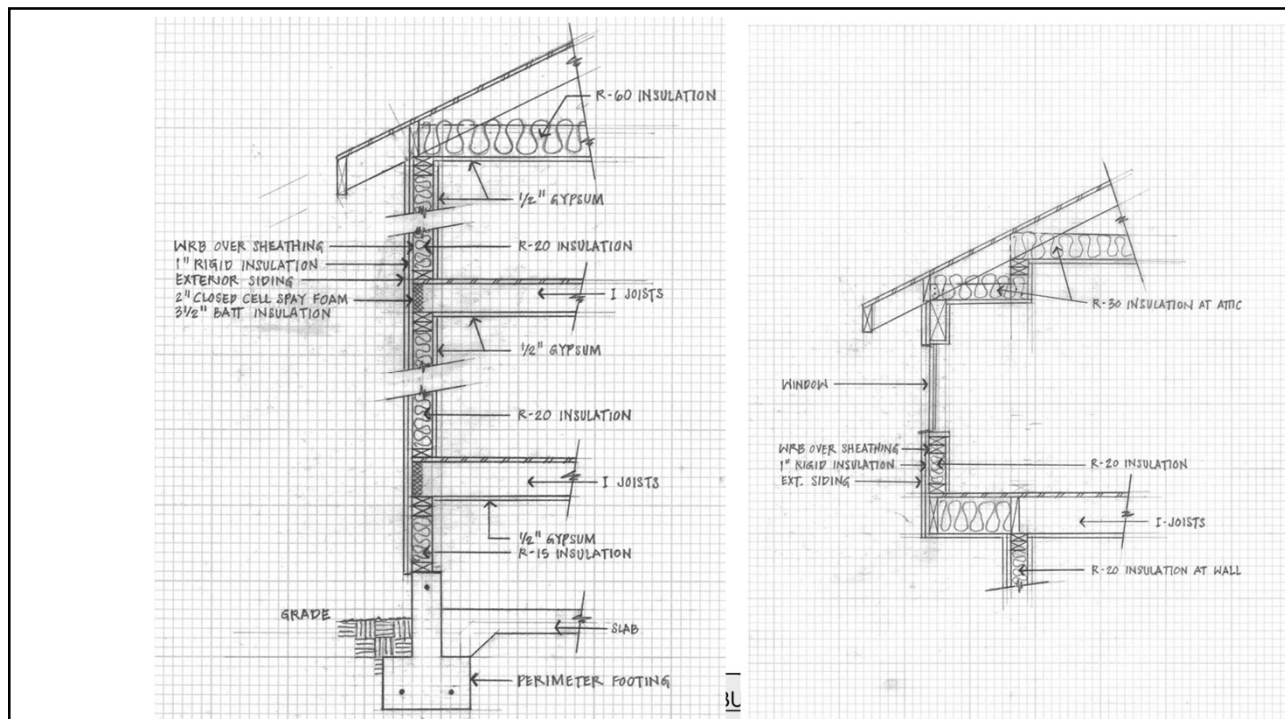
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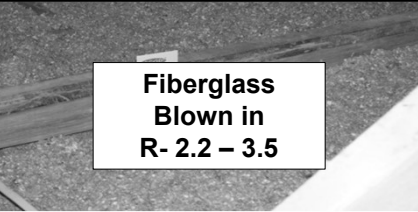

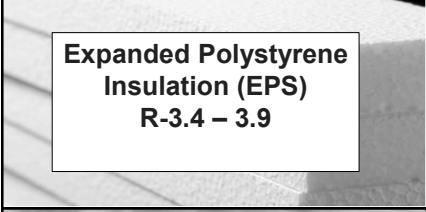
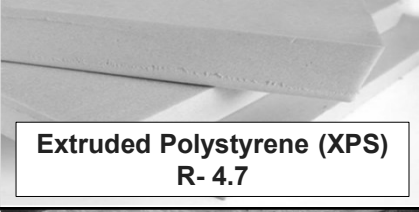
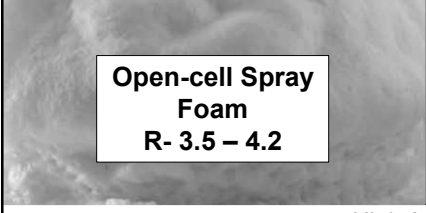
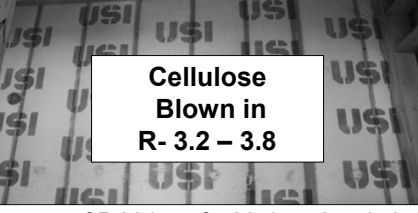
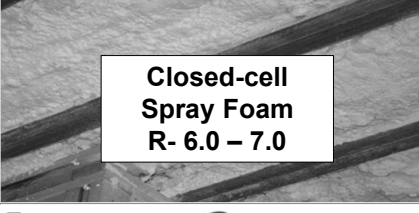

7



8

R-Value Tables and the Values by IECC Edition										
Code Edition	Fenestration U-Factor	Skylight U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement Wall R-Value	Slab R-value & Depth	Crawl Space Wall R-Value
2009	0.35	0.60	NR	38	20 or 13+5	13 or 17	30	10 or 13	10, 2ft	10 or 13
2015	0.32	0.55	NR	49	20 or 13+5	13 or 17	30	15 or 19	10, 2ft	15 or 19
2018	0.30	0.55	NR	49	20 or 13+5	13 or 17	30	15 or 19	10, 2ft	15 or 19
2021	0.30/ 0.32	0.55	0.40	60	30 or 20&5 or 13&10 or 20ci	13 or 17	30	15 or 19	10, 4ft	15 or 19
										

9

 Fiberglass Batts R- 3.0 - 3.8	 Fiberglass Blown in R- 2.2 – 3.5	 Polyisocyanurate R- 6.2 – 7.2
 Expanded Polystyrene Insulation (EPS) R-3.4 – 3.9	INSULATION	 Extruded Polystyrene (XPS) R- 4.7
 Open-cell Spray Foam R- 3.5 – 4.2	 Cellulose Blown in R- 3.2 – 3.8	 Closed-cell Spray Foam R- 6.0 – 7.0
<p>High Average of R-Values for Various Insulation Types</p> 		

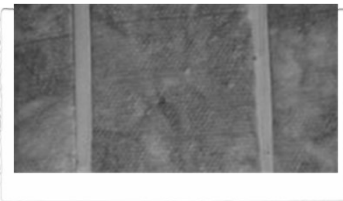
10



11

Grading System

Meet ASTM-specified installation requirements in the applicable standards C1015, C1320 and ASTM C1848 – RESNET/ICC



Grade 1

It completely fills the cavity- side to side and top to bottom. In the case of air-permeable insulation is encapsulated on six sides. It's cut around electrical junction boxes, split around wires and pipes, and generally not compressed.

No moderate or substantial defects



Grade 2

There's some imperfections in the installation but overall, it's still not too bad.



Grade 3





It has "substantial gaps and voids."

12



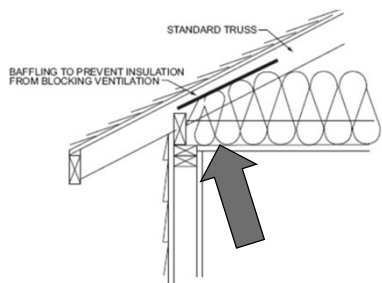
R-Value Tables and the Values by IECC Edition

Code Edition	Fenestration U-Factor	Skylight U-Factor	Glazed Fenestration SHGC	Ceiling R-Value	Wood Frame Wall R-Value	Mass Wall R-Value	Floor R-Value	Basement Wall R-Value	Slab R-value & Depth	Crawl Space Wall R-Value
2009	0.35	0.60	NR	38	20 or 13+5	13 or 17	30	10 or 13	10, 2ft	10 or 13
2015	0.32	0.55	NR	49	20 or 13+5	13 or 17	30	15 or 19	10, 2ft	15 or 19
2018	0.30	0.55	NR	49	20 or 13+5	13 or 17	30	15 or 19	10, 2ft	15 or 19
2021	0.30/ 0.32	0.55	0.40	60	30 or 20&5 or 13&10 or 20ci	13 or 17	30	15 or 19	10, 4ft	15 or 19

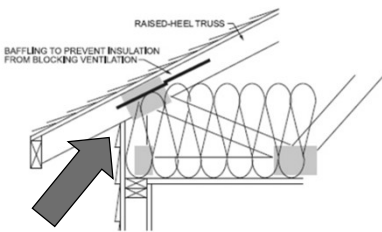





13

R402.2.1 CEILINGS WITH ATTICS.



Commentary Figure R402.2.1(1) TYPICAL ROOF ASSEMBLY



- If Table R402.1.2 requires an R-49 you can use an R-38 if the R-38 extends over the top plate without compression.
- If Table R402.1.3 requires an R-60 you can use an R-38 if the R-49 extends over the top plate without compression.
- Only permitted for R-value option of the prescriptive path




14



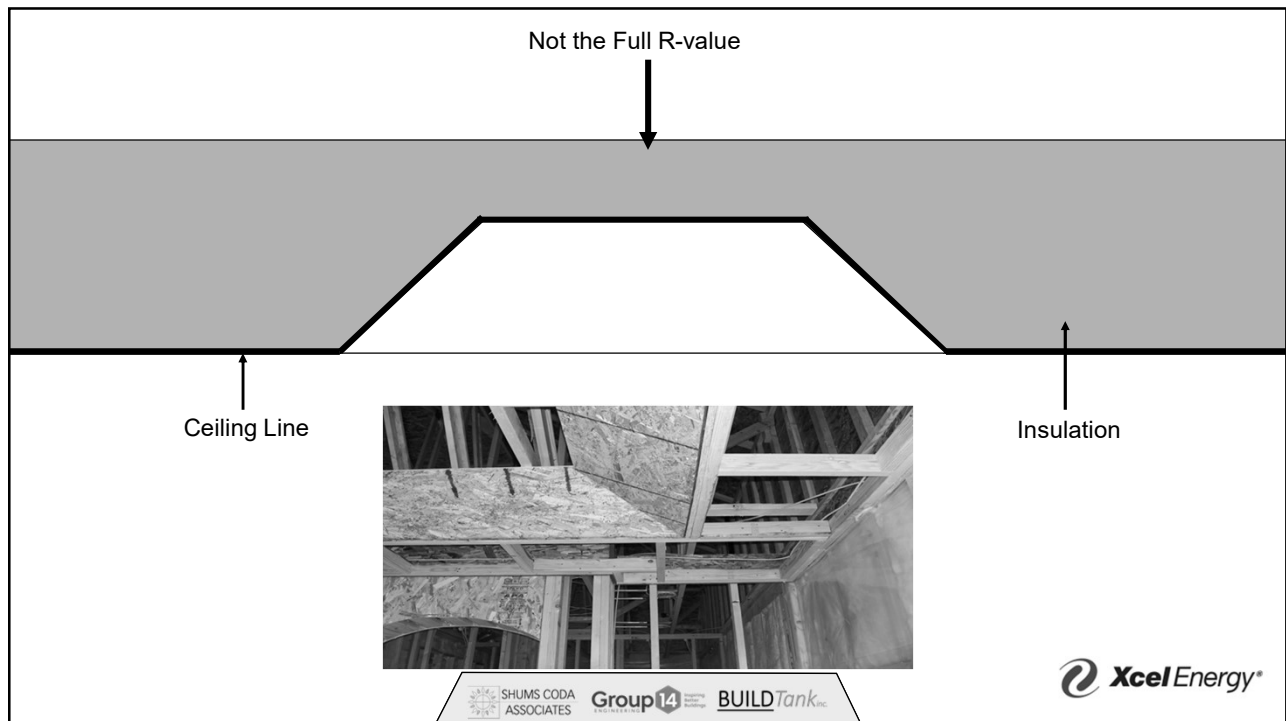
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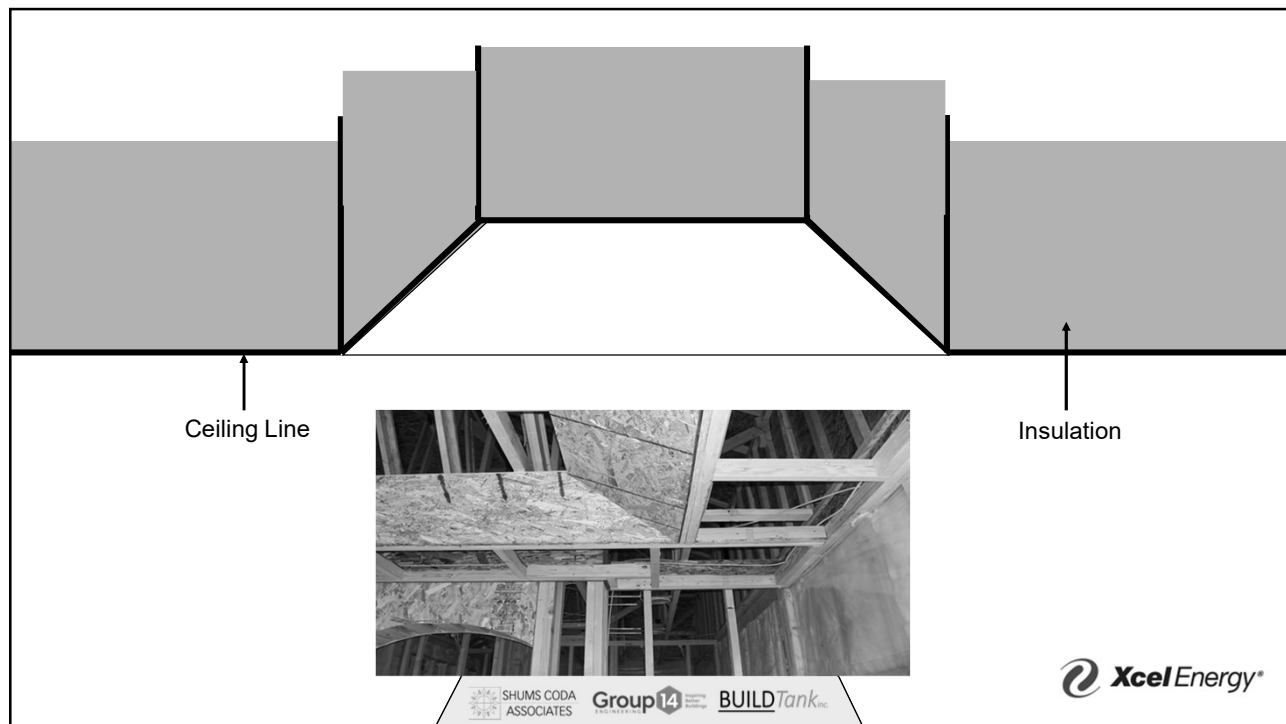
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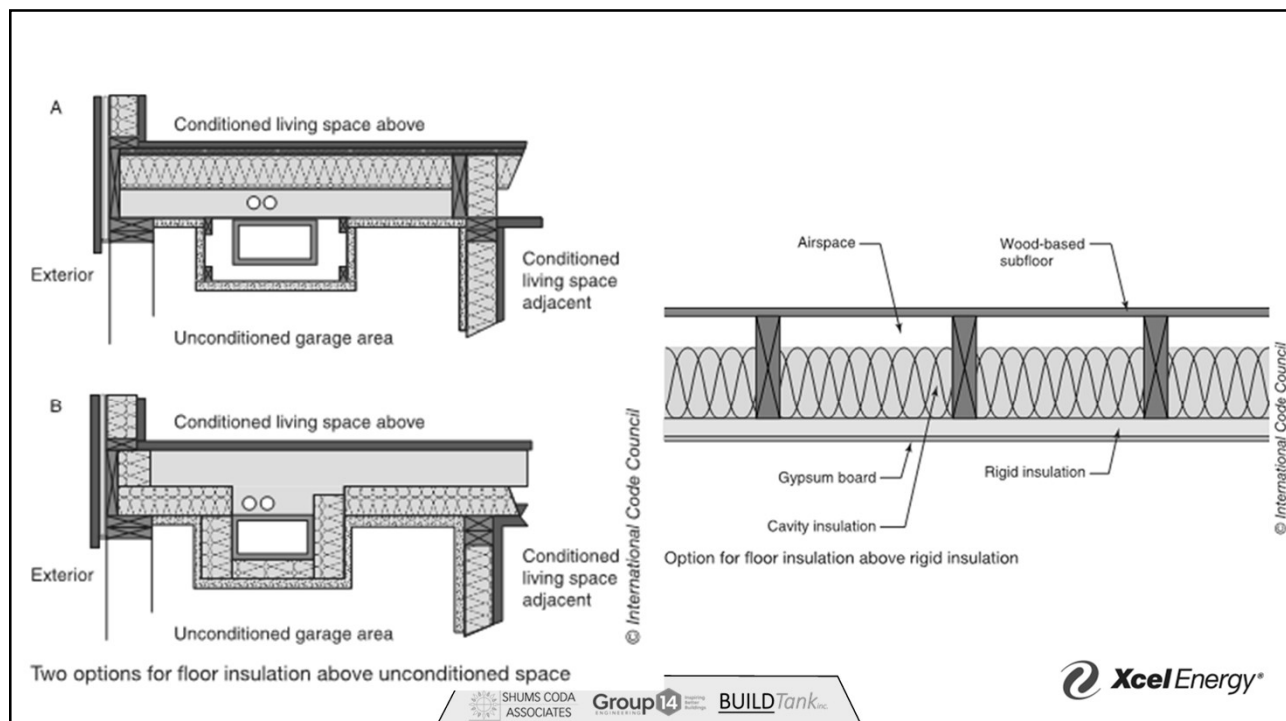
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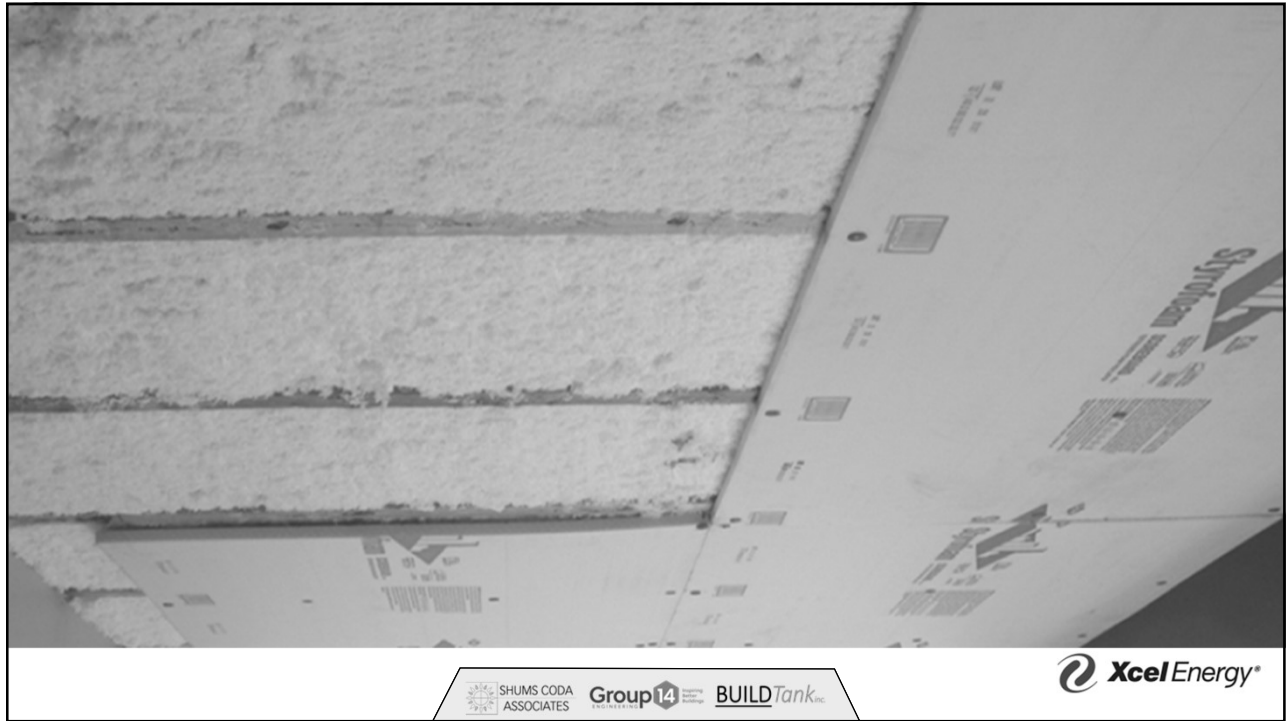
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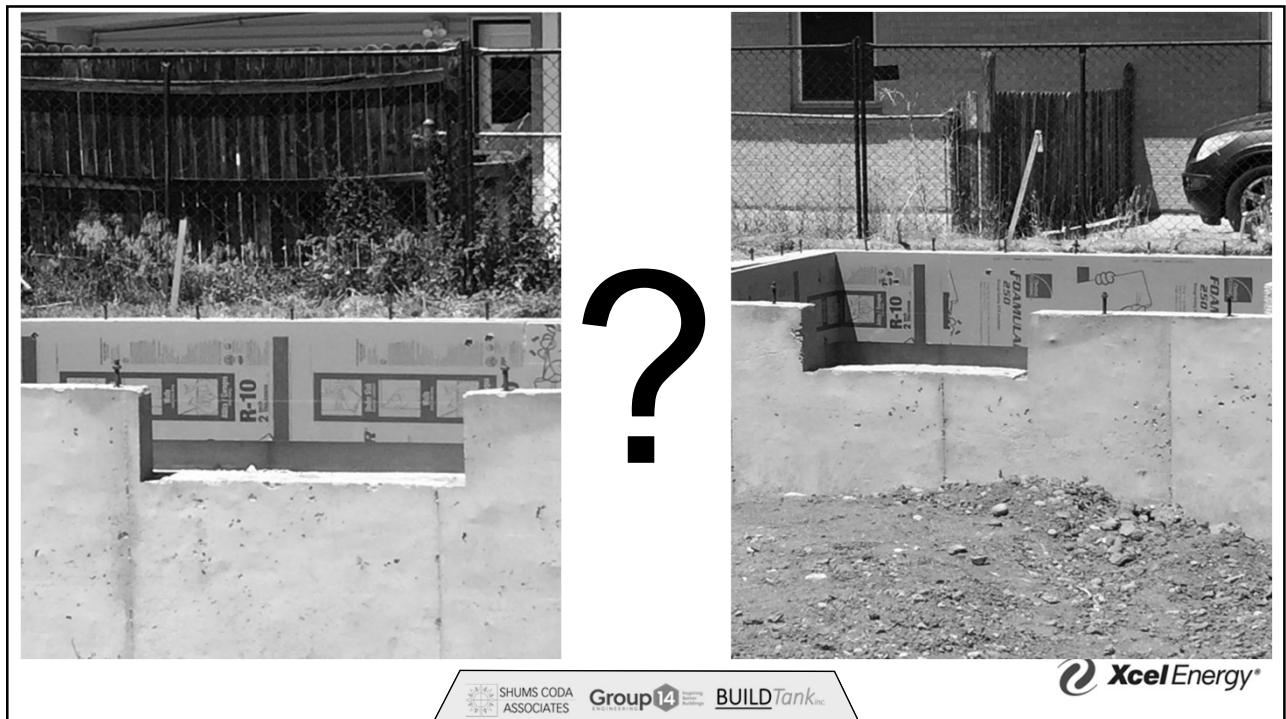
19



20



21



22

Insulation



Insulation traps pockets of air
Stagnate Air Pockets create the R-value

Air Barrier



Stopping the movement of air from scrubbing away the stagnate air pocket

Now it works

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Air barrier and thermal barriers– 2009

- Exterior thermal envelope insulation for framed walls is installed in substantial contact and continuous alignment with the building envelope air barrier.
- Breaks or joints in the air barrier are filled or repaired

General requirements – 2015/2018

- A continuous air barrier shall be installed in the building envelope.
- The exterior thermal envelope contains a continuous air barrier.
- Breaks or joints in the air barrier shall be sealed.

General requirements - 2021

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

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18. Durably seal thermal envelope to limit air infiltration. The following shall be caulked, gasketed, weatherstripped, or otherwise sealed with an air barrier material, suitable film, or solid material.
- All joints, seams, and penetrations. Any breaks or joints in the air barrier shall be sealed.

AIR SEALING NOTE:

A CONTINUOUS AIR BARRIER SHALL BE INSTALLED IN THE BUILDING ENVELOPE USING THE AIRTIGHT DRYWALL APPROACH. ALL JOINTS AND SEAMS TO BE TAPED AND SEALED.



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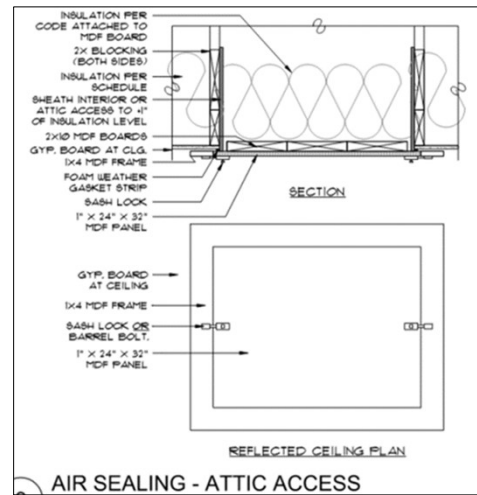
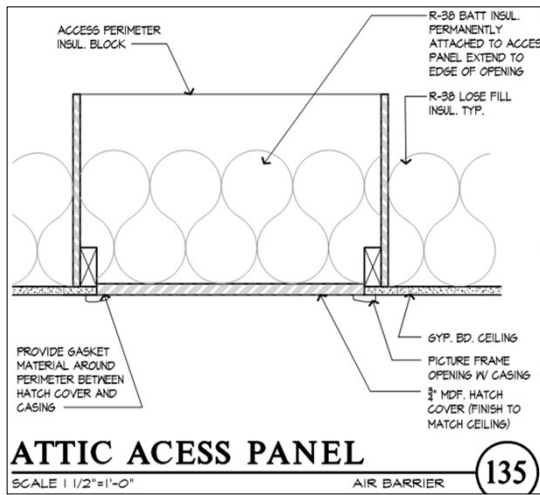
Ceiling/attic – 2009

- The air barrier in any dropped ceiling/soffit is substantially aligned with the insulation and any are sealed.
- Attic access (except unvented attic), knee wall door, or drop down stair is sealed.

Ceiling/attic – 2015/2018 and 2021

- 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.

28



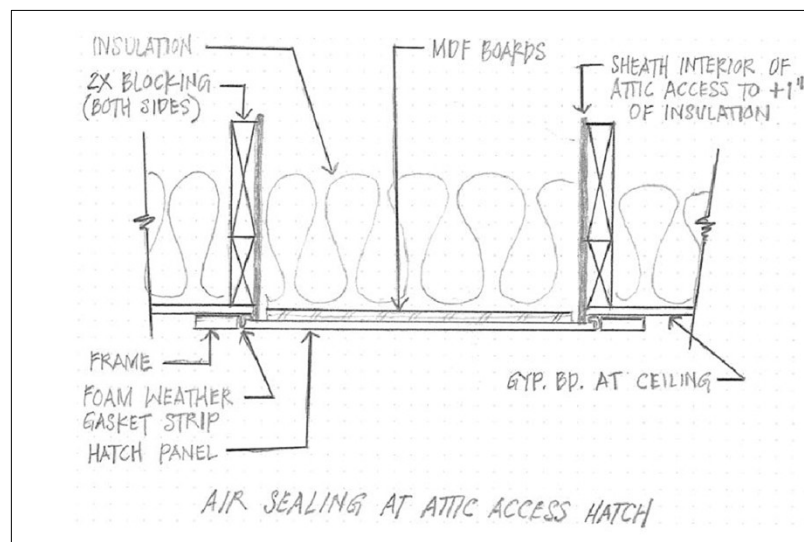
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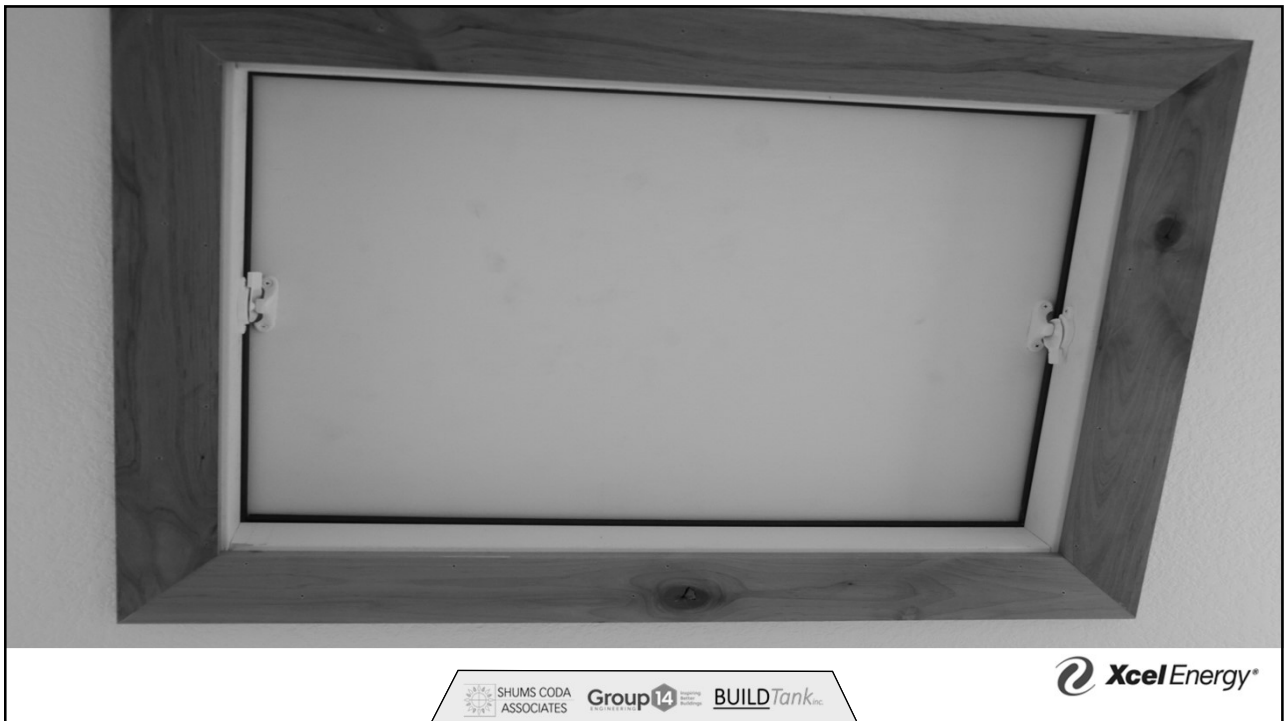
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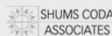
32

Walls – 2009

- Junction of foundation and sill plate is sealed

Walls – 2015/2018 and 2021

- 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.



33

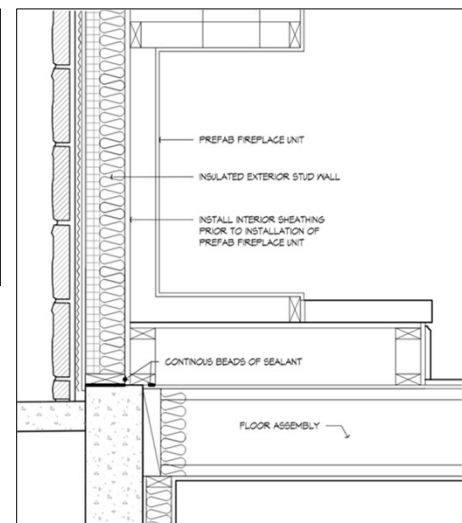
AIR SEALING NOTE:

A CONTINUOUS AIR BARRIER SHALL BE INSTALLED IN THE BUILDING ENVELOPE USING THE AIRTIGHT DRYWALL APPROACH. ALL JOINTS AND SEAMS TO BE TAPED AND SEALED.

ALL INTERIOR GYPSUM BOARD SHALL BE AIR SEALED TO FRAMING WITH CONTINUOUS BEADS OF OWENS CORNING ENERGY COMPLETE SYSTEM OR SIMILAR AT THE FOLLOWING LOCATIONS:

1. ALL TOP PLATES ADJOINING AN ATTIC SPACE
2. ALL SEAMS, GAPS AND CRACKS, O.S.B. JUNCTIONS & CORNERS ON GARAGE SEPARATION WALL

FOAM SEALANT AT SILLS, GAPS IN FRAMING, OUTLETS, PENETRATIONS INTO ATTIC.



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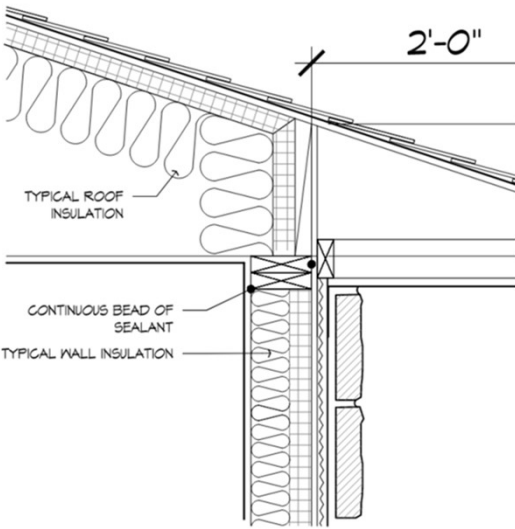
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ALL INTERIOR GYPSUM BOARD SHALL BE AIR SEALED TO FRAMING WITH CONTINUOUS BEADS OF OWENS CORNING ENERGY COMPLETE SYSTEM OR SIMILAR AT THE FOLLOWING LOCATIONS:


1. ALL TOP PLATES ADJOINING AN ATTIC SPACE
2. ALL SEAMS, GAPS AND CRACKS, O.S.B. JUNCTIONS & CORNERS ON GARAGE SEPARATION WALL

FOAM SEALANT AT SILLS, GAPS IN FRAMING, OUTLETS, PENETRATIONS INTO ATTIC.



2 Air Seal @ Attic Eave and Soffit

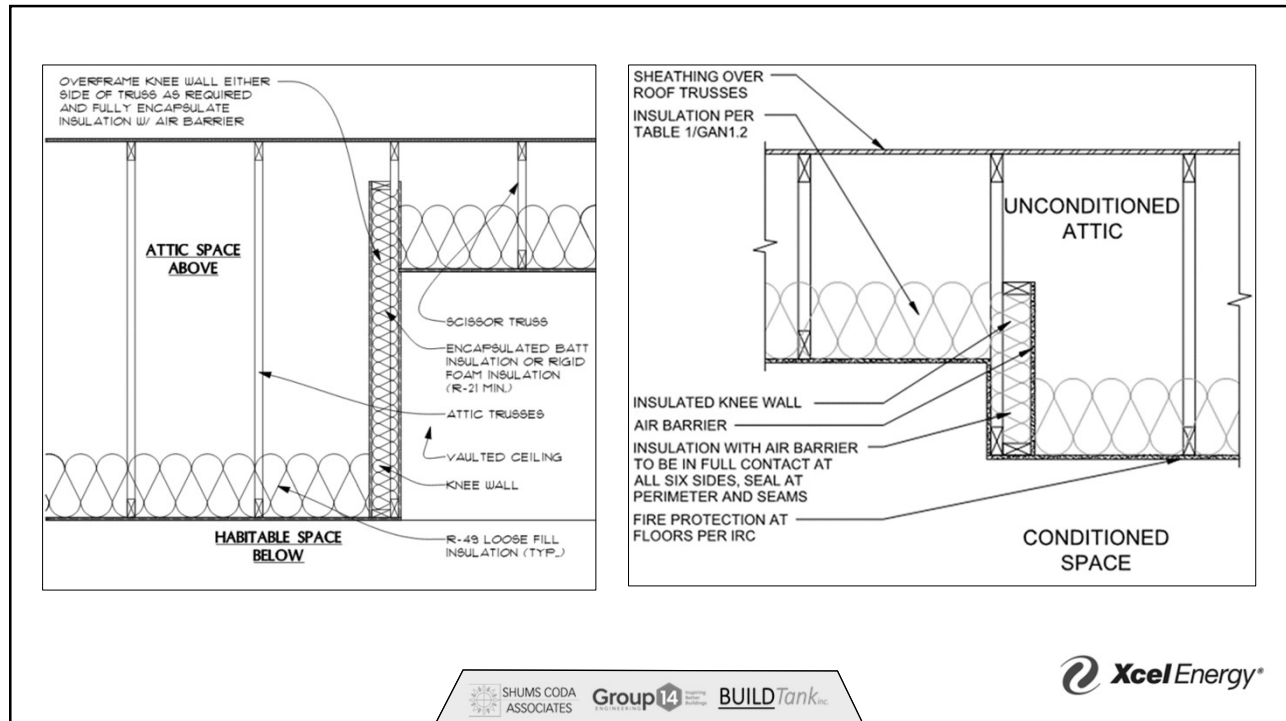






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Windows, skylights and doors – 2009

- Space between window/door jamb and framing is sealed.

Windows, skylights and doors – 2015/2018 and 2021

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

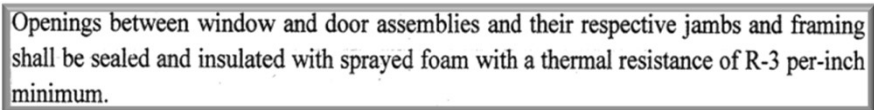
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Rim joists – 2009

- Rim joists shall include the air barrier.

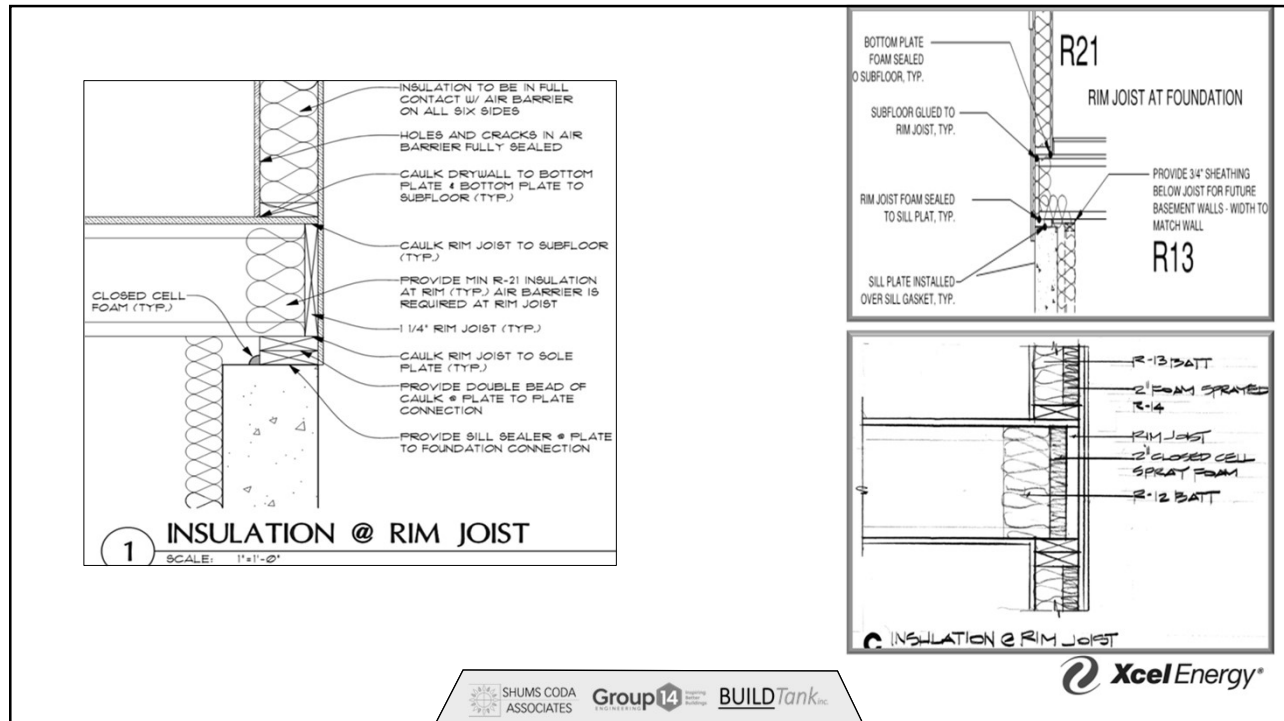
Rim joists – 2015/2018

- Rim joists shall include the air barrier.

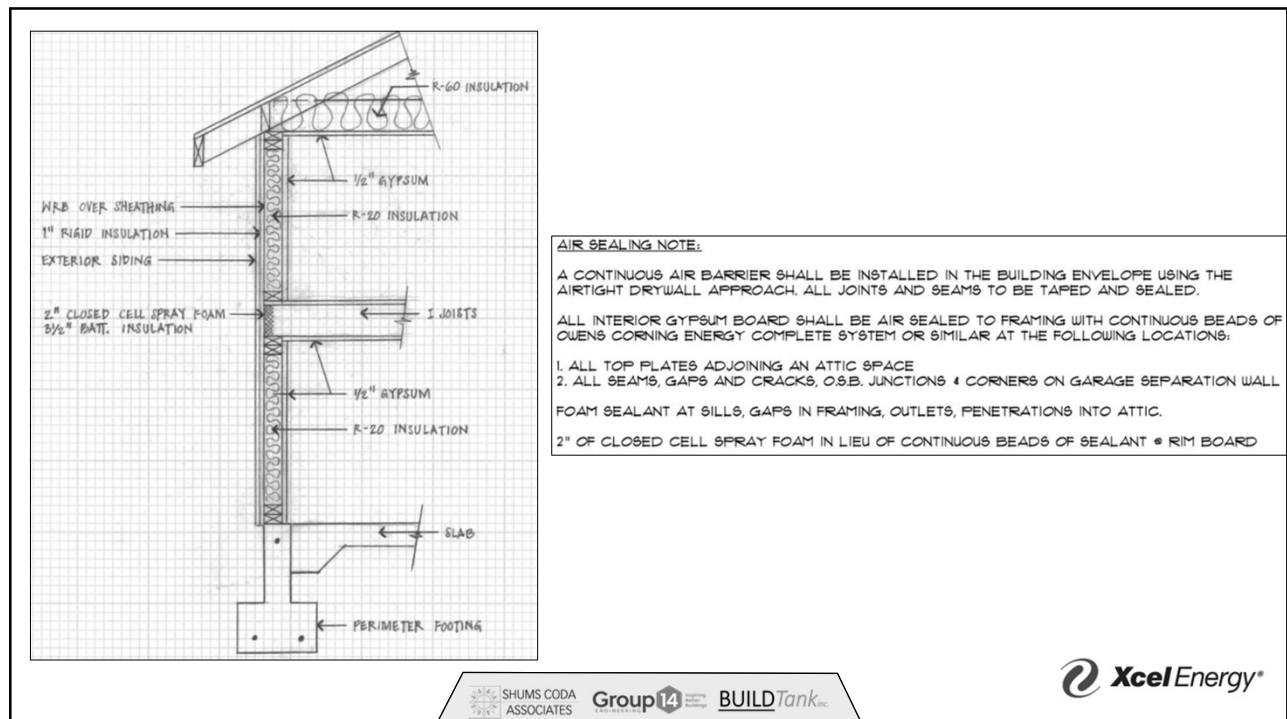
Rim joists - 2021

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

46



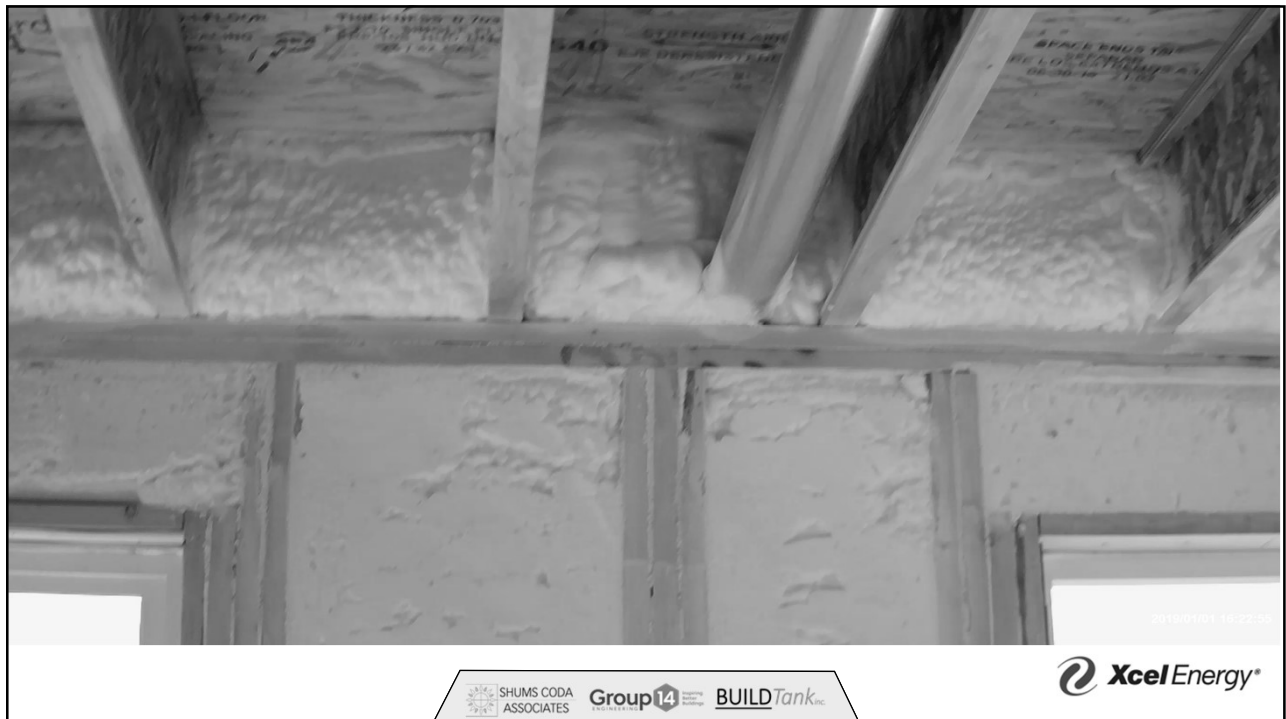
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Floors, including cantilevered floors and floors above garages – 2009

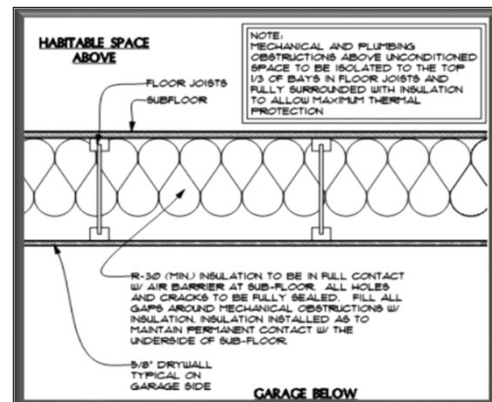
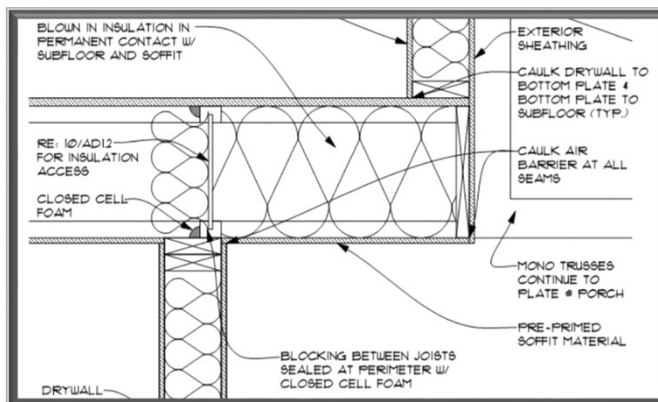
- Air barrier is installed at and exposed edge of insulation.

Floors, including cantilevered floors and floors above garages – 2015/2018 and 2021

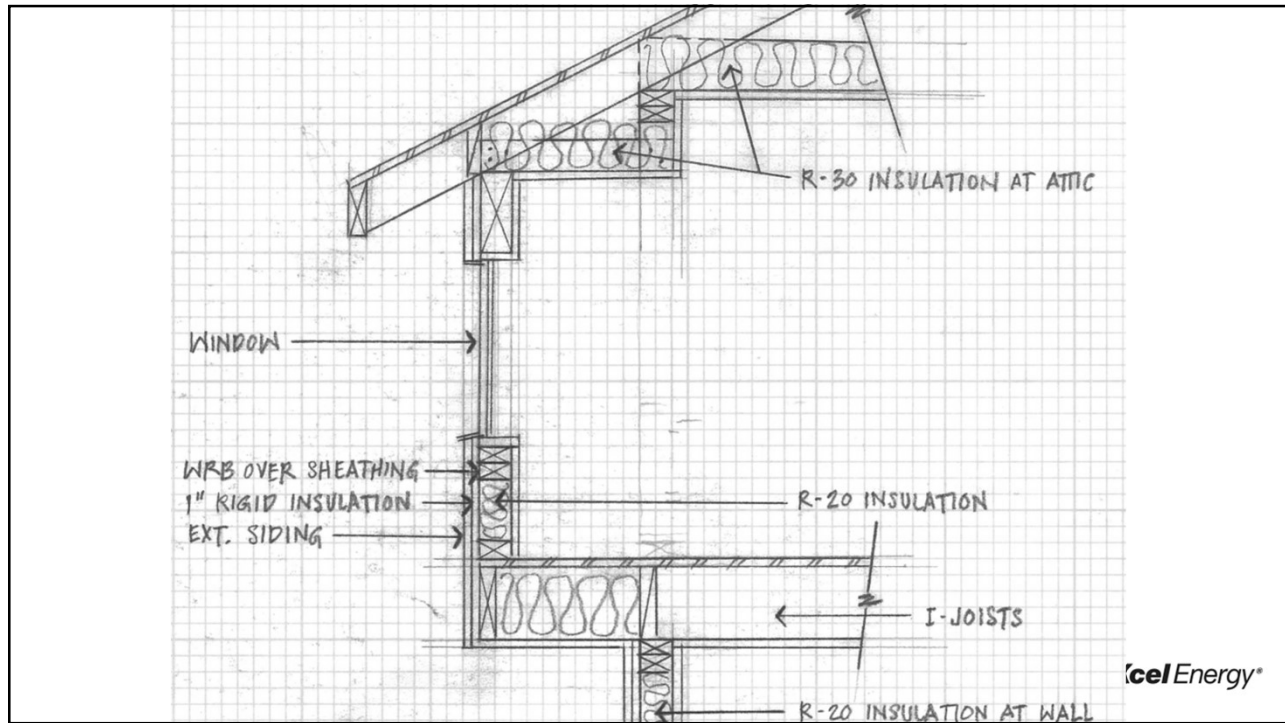
- The air barrier shall be installed at any exposed edge of insulation.



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Crawl space walls – 2009

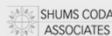
- Exposed earth in unvented crawl spaces is covered with Class I vapor retarder with overlapping joints taped.

Crawl space walls – 2015/2018

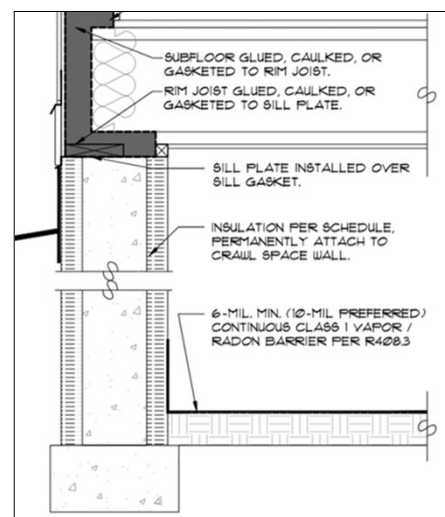
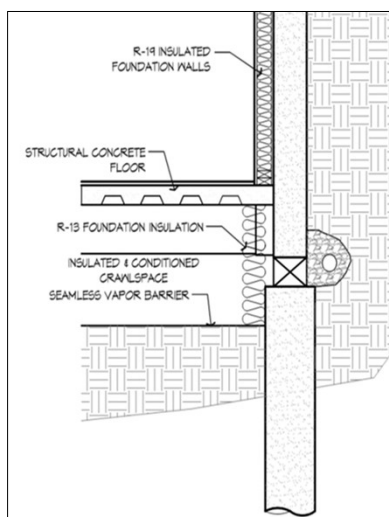
- Exposed earth in unvented crawl spaces shall be covered with a Class I vapor retarder with overlapping joints taped.

Crawl space walls - 2021

- 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.



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Shafts, penetrations – 2009

- Duct shafts, utility penetrations, knee walls and flue shafts opening to exterior or unconditioned space are sealed.

Shafts, penetrations – 2015/2018

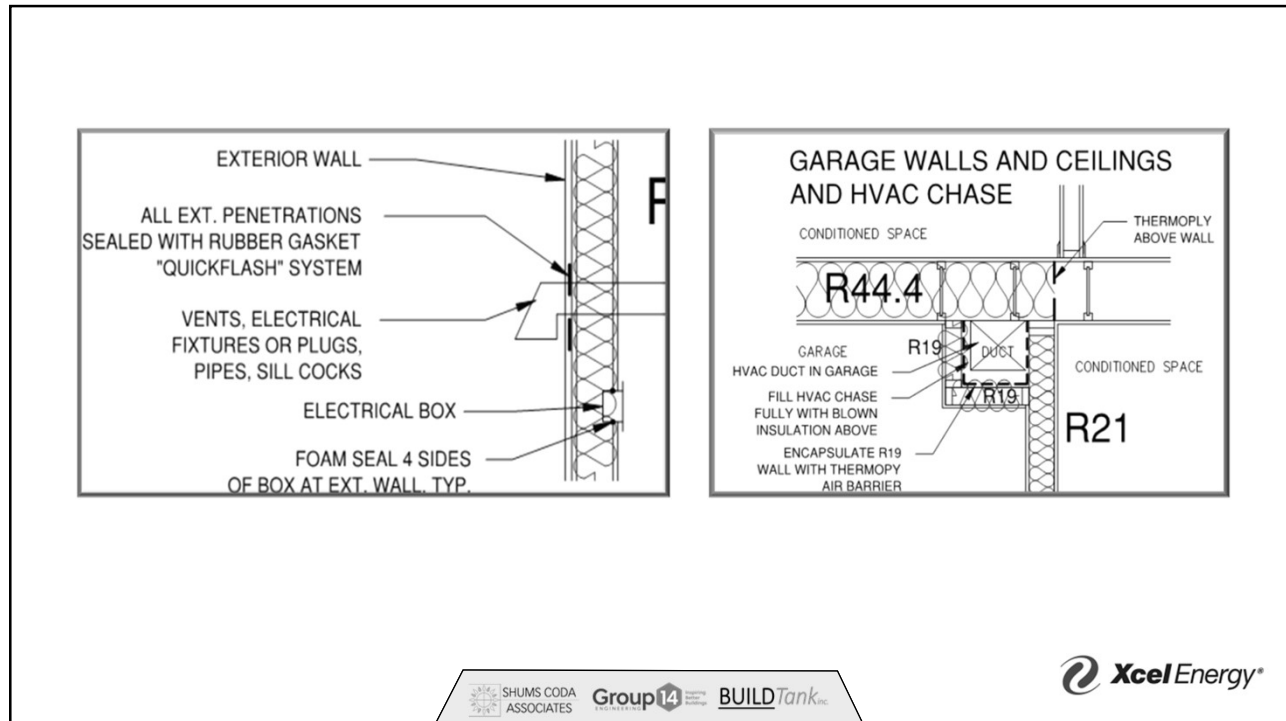
- Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.

Shafts, penetrations - 2021

- 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.

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Narrow cavities – 2009/2015/2018

- No requirement for air sealing just insulation requirements

Narrow cavities - 2021

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

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NARROW CAVITIES SHALL HAVE BATTS CUT TO FIT, OR FILLED BY INSULATION THAT ON INSTALLATION READILY CONFORMS TO THE AVAILABLE CAVITY SPACE.

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Garage separation – 2009

- Air sealing is provided between the garage and conditioned spaces.

Garage separation – 2015/2018 & 2021

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

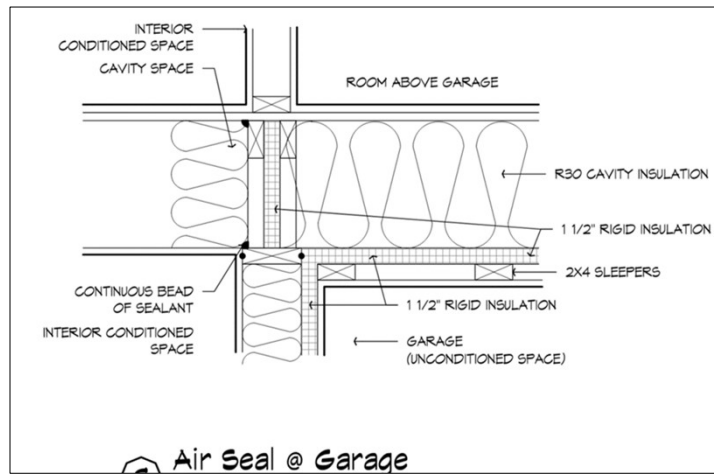
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Recessed lighting - 209

- Recessed light fixtures are air tight, IC rated, and sealed to drywall.
Exception – fixtures in conditioned space.

Recessed lighting - 2015

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

Recessed lighting - 2018

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

Recessed lighting - 2021

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

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AIR SEALING - RECESSED LIGHTS

UNCONDITIONED ATTIC SPACE ABOVE

HABITABLE SPACE BELOW

NOTE:
PROVIDE UL-APPROVED AIRTIGHT, IC-RATED RECESSED LIGHT FIXTURES TO UNCONDITIONED ATTIC MEETING ASTM E283. SEAL (CAULK) ALL GAPS BETWEEN FIXTURE AND DRYWALL.

RECESSED LIGHTING INSTALLED IN THE THERMAL ENVELOPE SHALL BE SEALED WITH A GASKET OR CAULK BETWEEN THE HOUSING AND THE INTERIOR WALL OR CEILING COVERING, BE IC-RATED AND LABELED AS HAVING AN AIR LEAKAGE RATE NOT MORE THAN 2.0 CFM PER IRC.

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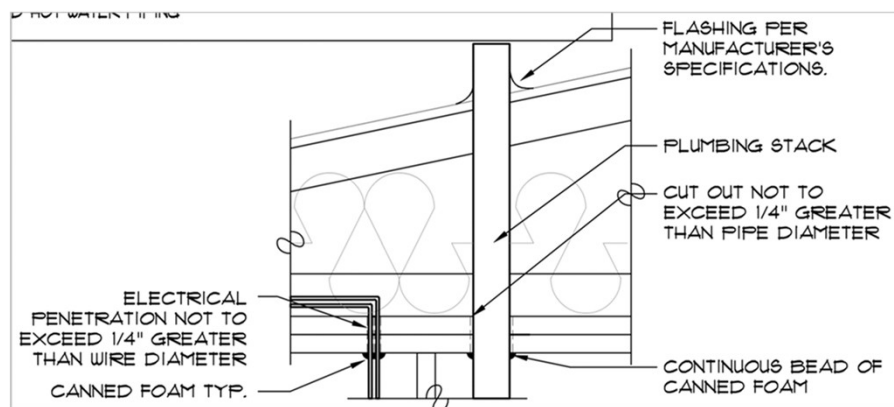
Plumbing, and wiring – 2009/2015/2018

- No requirement for air sealing only requirements for insulation installation

Plumbing, wiring, or other obstructions- cavities - 2021

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

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FOAM SEALANT AT SILLS, GAPS IN FRAMING, OUTLETS, PENETRATIONS INTO ATTIC.

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Shower/tub on exterior wall 2009

- Shower and tubs on exterior walls have insulation and an air barrier separating them from the exterior wall

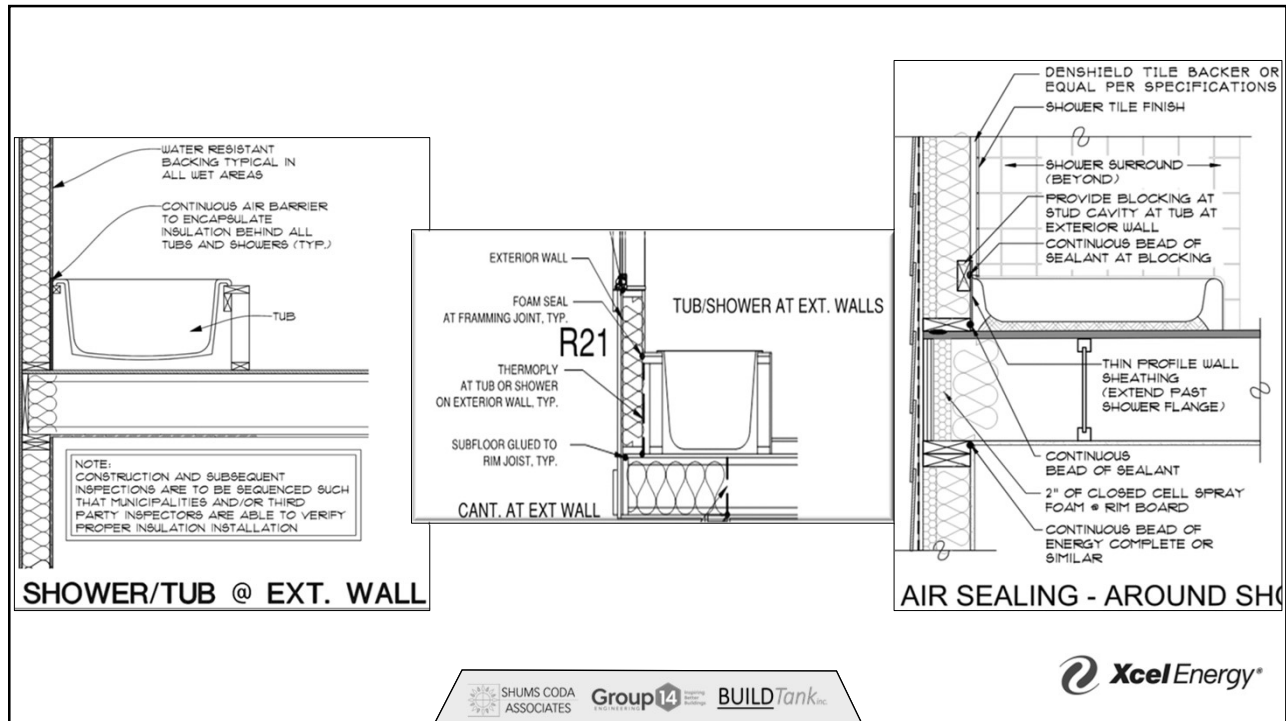
Shower/tub on exterior wall 2015

- The air barrier installed at exterior walls adjacent to showers and tubs shall separate them from the showers and tubs.

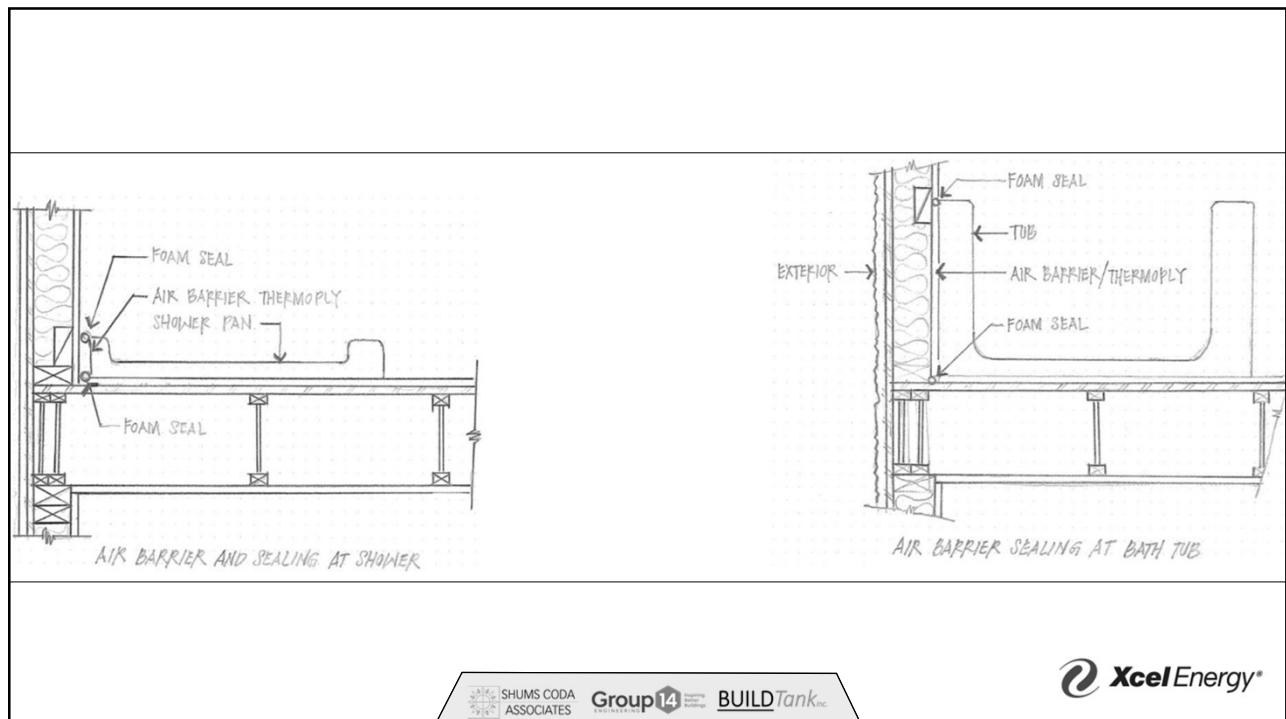
Shower/tub on exterior wall 2018 & 2021

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

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Electrical/phone box on exterior walls - 2009

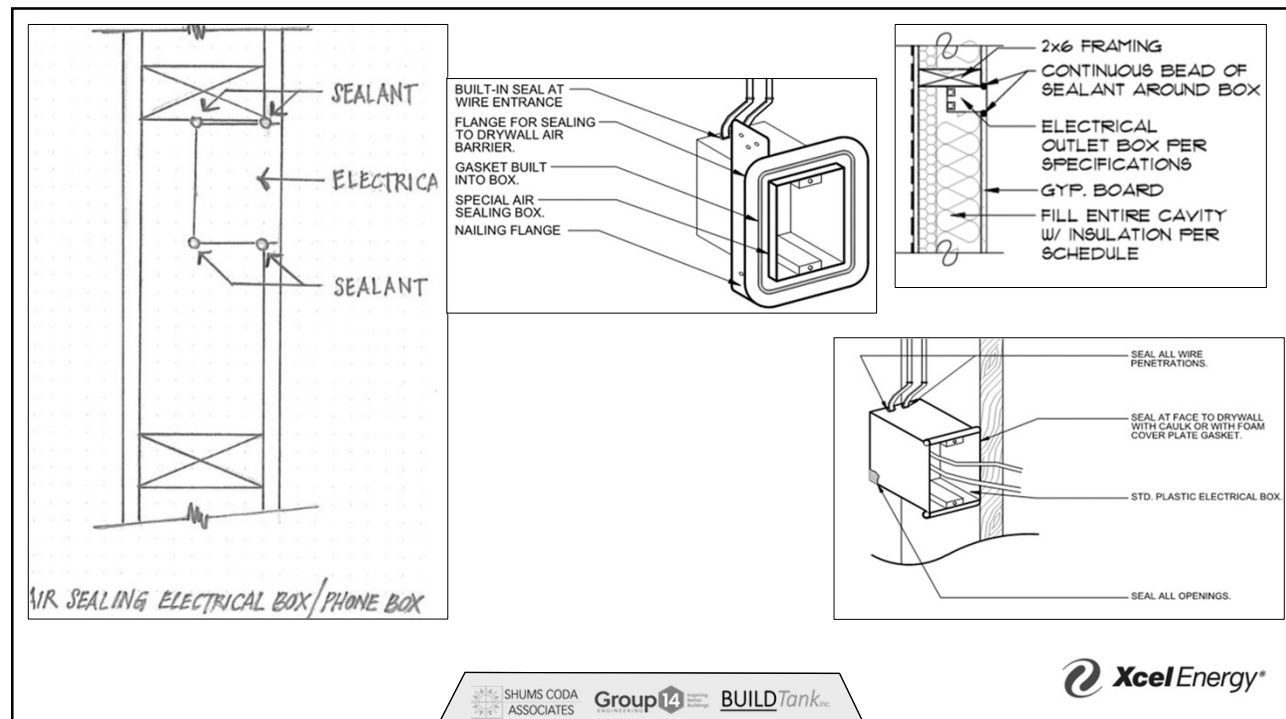
- Air barrier extends behind boxes or air sealed boxes are installed.

Electrical/phone box on exterior walls – 2015/2018 & 2021

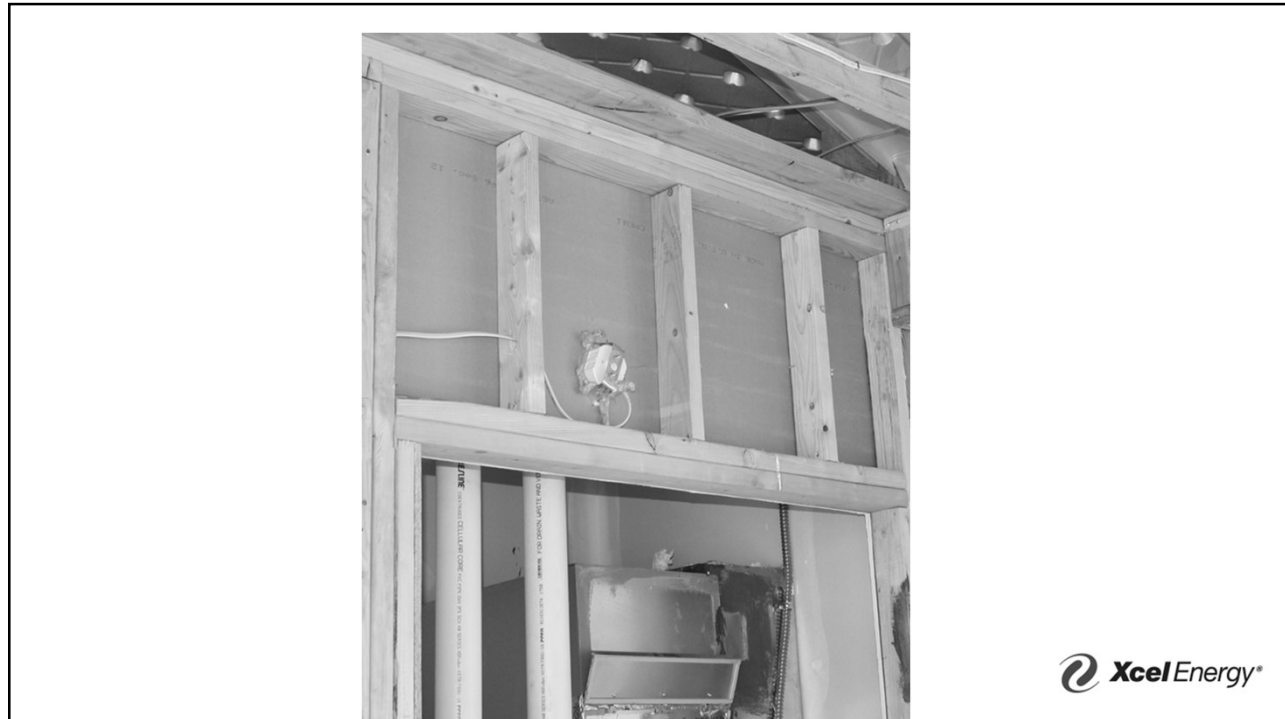
- The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.



81



82



83

HVAC register boots - 2009

- HVAC register boots that penetrate building thermal envelope are sealed to subfloor or drywall.

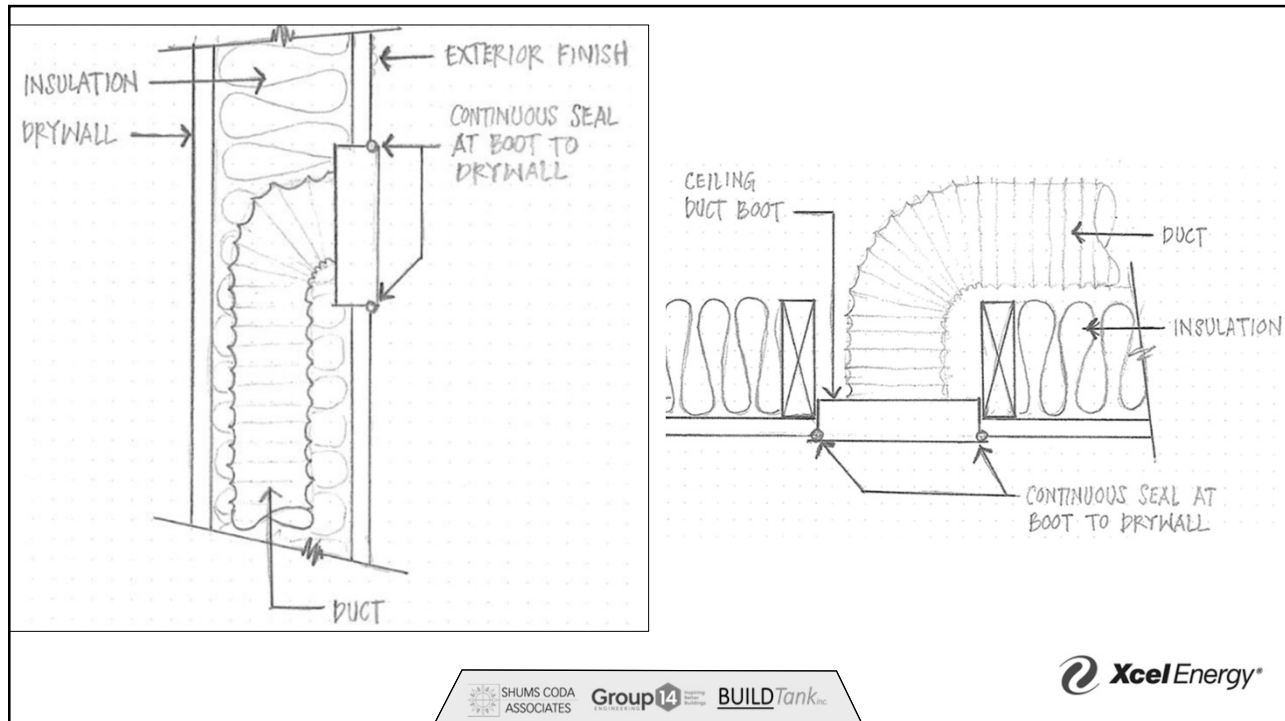
HVAC register boots - 2015

- HVAC register boots that penetrate building thermal envelope are sealed to subfloor or drywall.

HVAC register boots – 2018 & 2021

- 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.

84



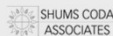
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Concealed sprinklers 2015/2018 & 2021

- 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.



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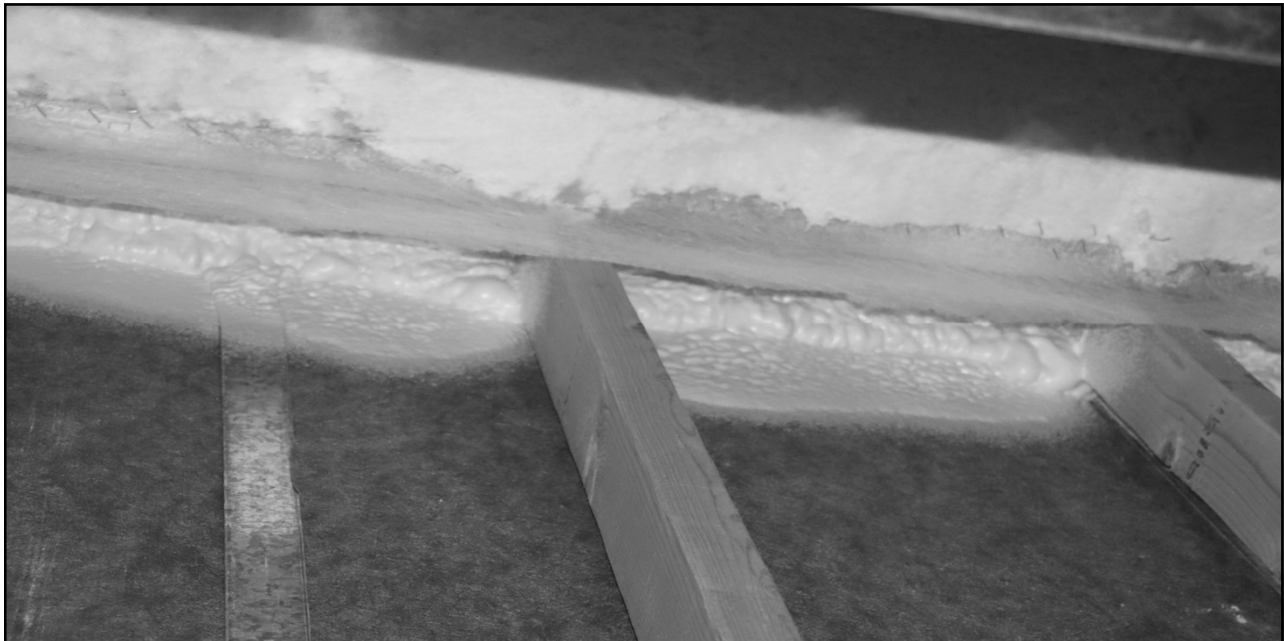
90

Common wall – only 2009

- Air barrier is installed in common wall between dwelling units



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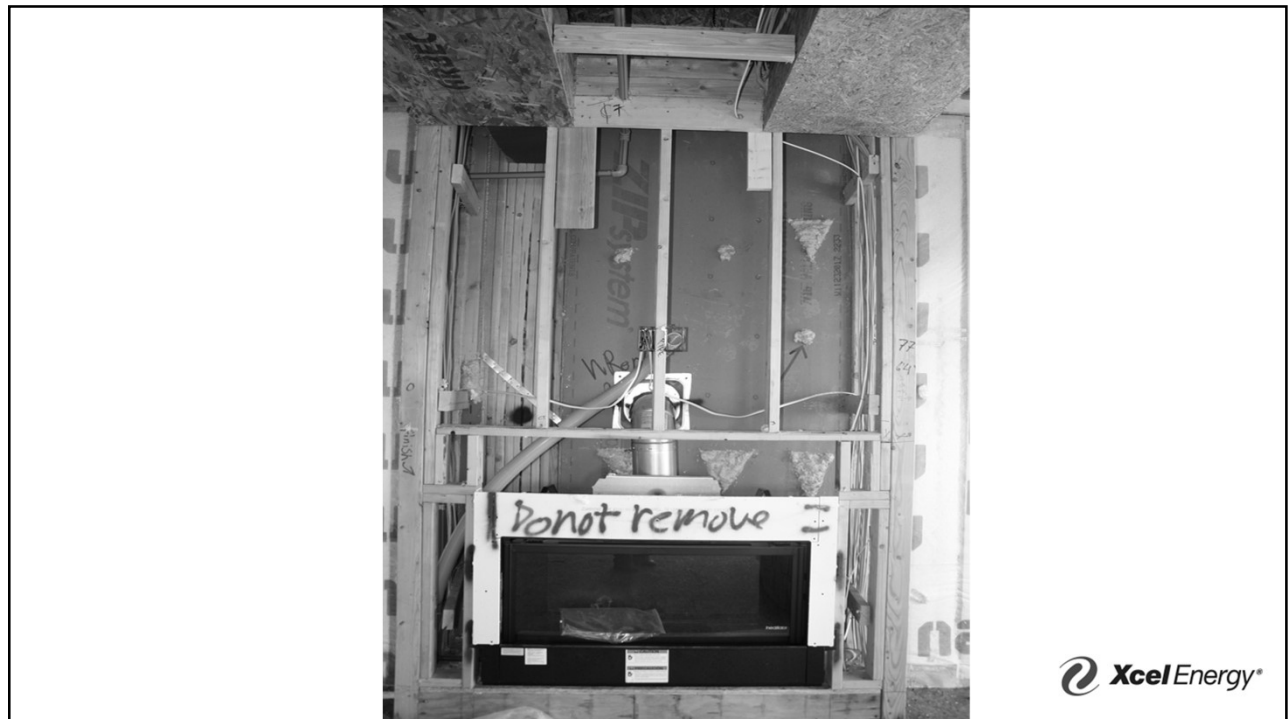
92

Fireplace – only 2009

- Fireplace walls include an air barrier.



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Upcoming Training Scheduled For 2023

10/2/2023 – Commercial Multi-Family and the Energy Code

10/16/2023 & 10/17/2023 – Mechanical Energy Plan Review – 2 day event

10/30/2023 - Commercial Wall Assembly- More Than Holding Up the Roof

11/8/2023 – Resources for Energy Compliance

**** 2018 IECC Focused Series**

9/27 - Resources and Tools for Energy Compliance

10/11 - What Are my Options- Insulation

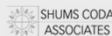
10/25 - REScheck Basics

11/8 - Residential Plans part 1

11/22 - Residential Plans part 2

WEDNESDAY WEBINARS 2023 12-1

- **9/20/2023** - 2021 Updates for Mechanical and Lighting- Residential
- **10/4/2023** - Whole House Mechanical Ventilation*** Just added
- **10/18/2023** - Economizers
- **11/15/2023** - Fire Resistant Rated Construction
- **12/20/2023**- TBD TOPIC DETERMINED BY SURVEYS



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Colorado Codes Helpline



Accessible through the Code Adoption Toolkit or www.coloradocodes.happyfox.com/new



Anyone in Colorado can submit questions on the following:

- Any Year of the International Codes
- Jurisdiction Amendments
- Reach Codes
- Plan Review or Inspection Items
- Compliance Process
- General Building Code Questions



Scan here!

... and a Subject Matter Expert will reply within a couple business days!

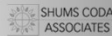
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Tell us what you think!

You should receive an email from survey monkey asking you take a feedback survey

- Please let us know if you do not receive a survey, and we can email you the link

We really appreciate you taking about 5 minutes to provide your thoughts on the webinar to help Xcel Energy and the Shums Coda Associates Team to better support the building industry.



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THANK YOU!

Hope Medina
Shums Coda Associates
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