



Thermal Boundary

Improving Efficiency, Comfort, and Health in Existing Homes

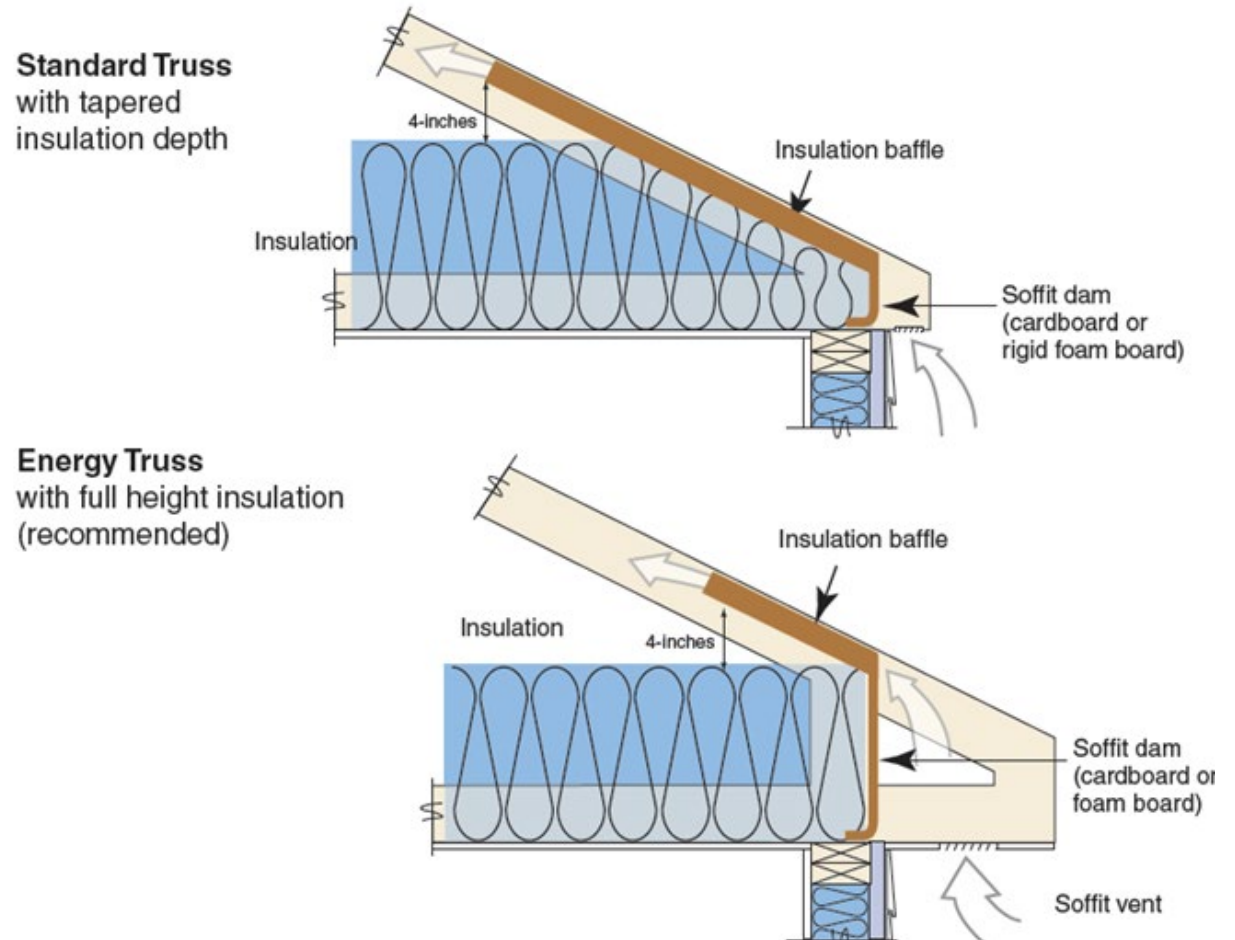
402.2.1 – Ceilings with Attics

- R-49 is the prescriptive requirement in Zones 4 and 5
- Complete coverage of continuous R-38 (raised heel) is deemed to comply
- Rulers required every 300 sq.ft. for blown attic insulation
- First perform attic air sealing and prep, then add insulation
- Okay to install new insulation over existing (unless existing insulation is compromised)



402.2.1 – Ceilings with Attics

- Insulation coverage needs to 100% of the ceiling area
- Best performance is full height, uncompressed R-49 insulation that **extends completely** over the wall top plate at the eaves (meets or exceeds code)

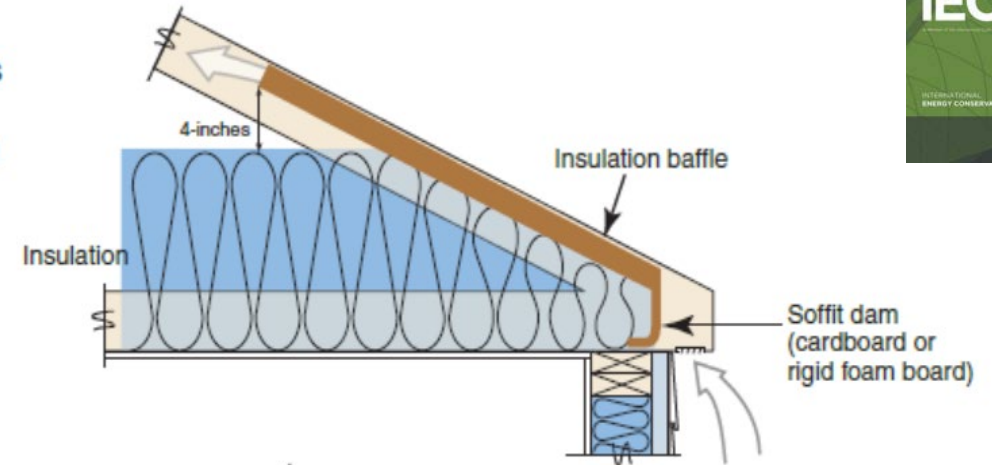


R402.2.1 Ceilings with Attic Spaces

R402.2.1 Ceilings with attic spaces. Where Section R402.1.2 requires R-38 insulation in the ceiling, installing R-30 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-38 wherever the full height of uncompressed R-30 insulation extends over the wall top plate at the eaves. Where Section R402.1.2 requires R-49 insulation in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.4 and the Total UA alternative in Section R402.1.5.

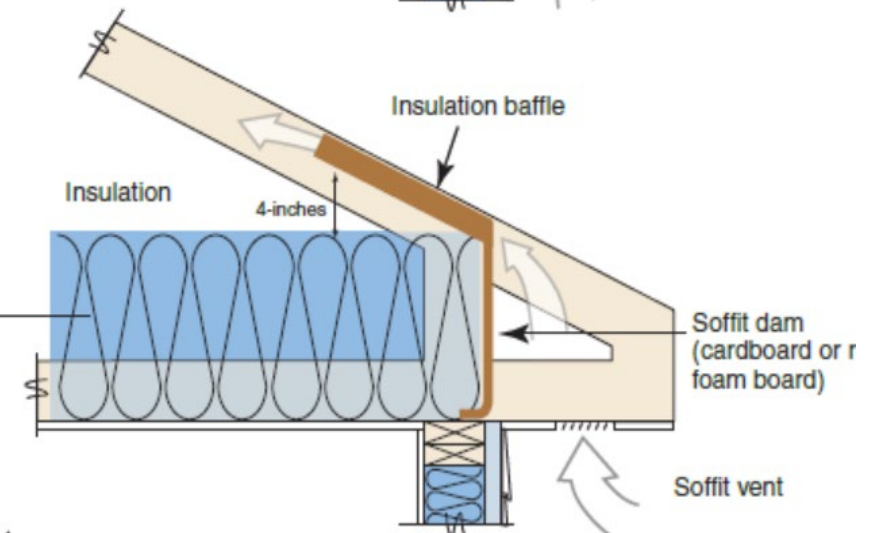


Standard Truss with tapered insulation depth



Energy Truss with full height insulation (recommended)

NOTE:
R-38 complete coverage is deemed equivalent to prescriptive R-49

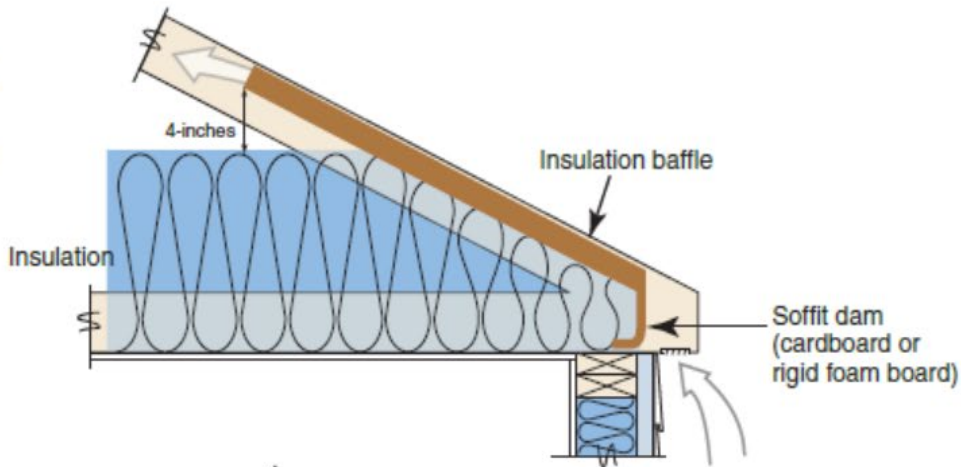


Eave Baffles

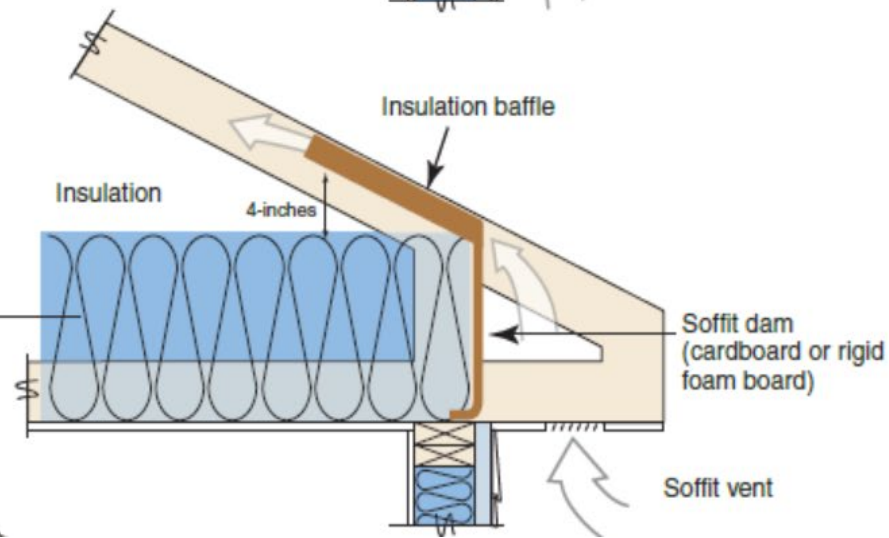
- For air-permeable insulation (fiberglass or cellulose insulation) in vented attics, baffles must be installed adjacent to soffit and eave vents
- At a minimum, 1 inch of space must be provided between the insulation and the roof sheathing and at the location of the vent
- The baffle must extend over the top of the insulation inward until it is ~4 inches vertically above the top of the insulation
- Any solid board material or thin insulating sheathing is permissible as the baffle /insulation dam

R402.2.3 Eave Baffles

Standard Truss
 with tapered
 insulation depth



Energy Truss
 with full height insulation
 (recommended)



NOTE:
 R-38 complete coverage
 is deemed equivalent to
 prescriptive R-49





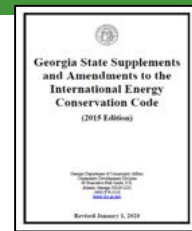
R402.2.2 Ceilings Without Attic Spaces



- If vaulted ceiling design does not allow sufficient space for required insulation, insulation can be reduced to R-30
- The area of the reduced insulation shall be limited to 20 percent of the insulated ceiling, (maximum 500 s.f.)
- For prescriptive path only



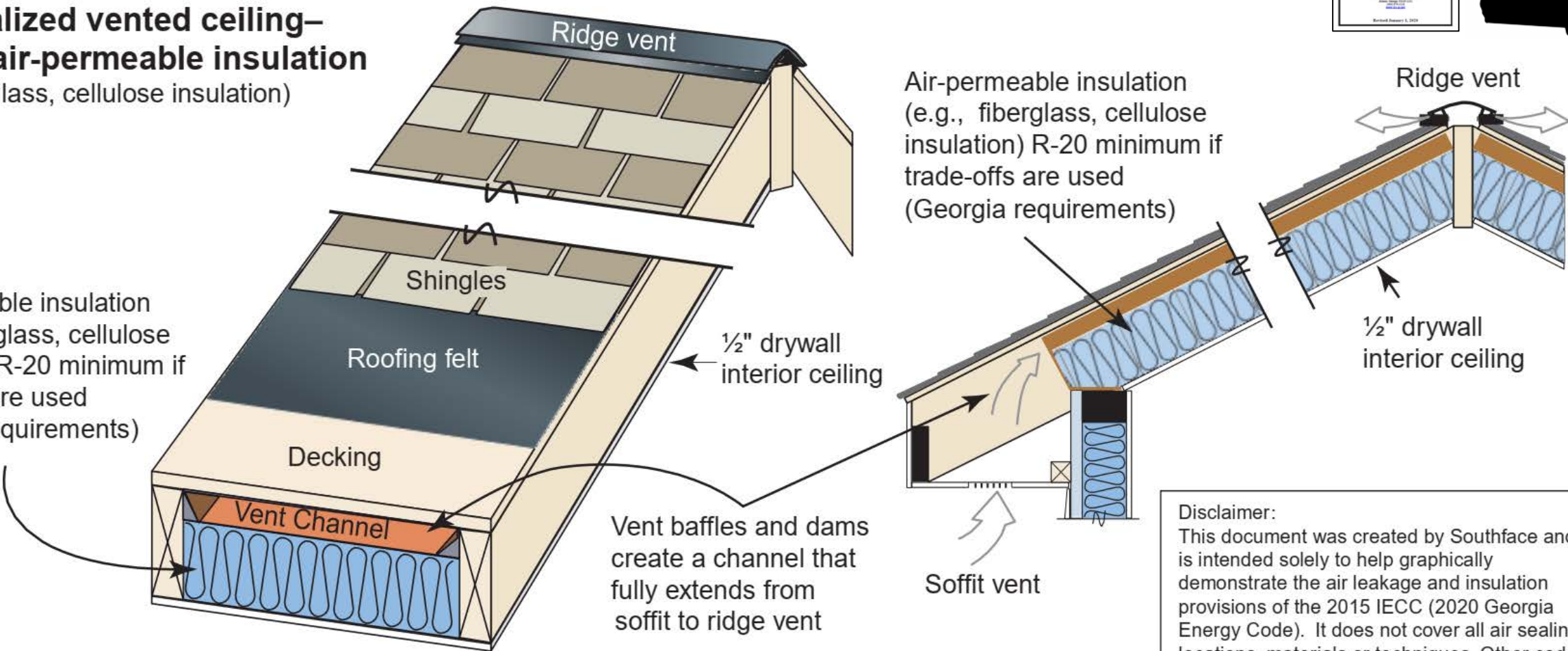
Old School Vault with Vents



**Cathedralized vented ceiling—
roofline air-permeable insulation**
(e.g., fiberglass, cellulose insulation)

Air-permeable insulation
(e.g., fiberglass, cellulose
insulation) R-20 minimum if
trade-offs are used
(Georgia requirements)

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(e.g., fiberglass, cellulose
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Disclaimer:
This document was created by Southface and is intended solely to help graphically demonstrate the air leakage and insulation provisions of the 2015 IECC (2020 Georgia Energy Code). It does not cover all air sealing locations, materials or techniques. Other code provisions may be applicable as well.

Georgia International Energy Conservation Code Supplements and Amendments 2020



Unvented Vault with SPF



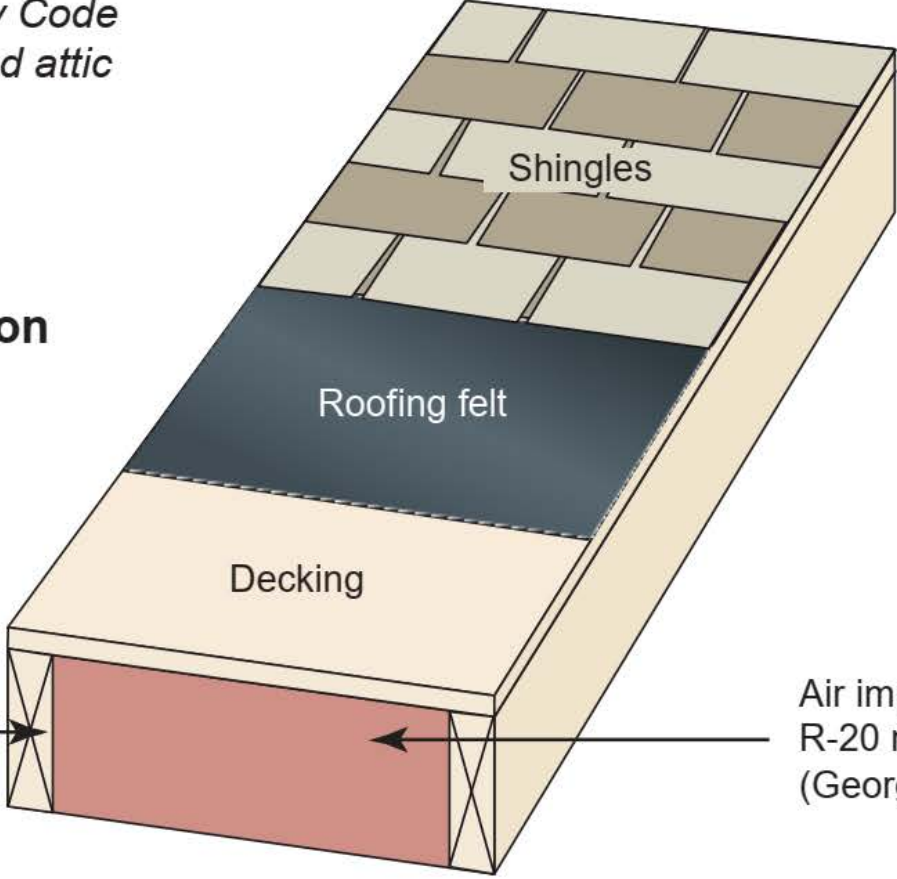
Appendix RA

Roofline Installed Insulation Options

Reference Table 402.1.1 and 402.1.6 in the Georgia Energy Code amendments to the 2015 IECC and Section 806.5 “unvented attic assemblies” in the Georgia Amendments to the 2012 IRC

**Vaulted unvented attic –
roofline air-impermeable insulation**
(e.g., spray foam insulation)

Air impermeable insulation
(e.g., open- or closed-
cell spray foam)



Air impermeable insulation
R-20 minimum if trade-offs are used
(Georgia requirements)



IRC 806.5 Unvented Roof Assemblies



- To reduce risk of condensation, install a certain amount of “air-impermeable” insulation before using an “air-permeable” product in an unvented roof assembly
- Provides Thermal break and also “Condensation break”

**TABLE R806.5
INSULATION FOR CONDENSATION CONTROL**

CLIMATE ZONE	MINIMUM RIGID BOARD ON AIR-IMPERMEABLE INSULATION <i>R</i> -VALUE ^{a, b}
2B and 3B tile roof only	0 (none required)
1, 2A, 2B, 3A, 3B, 3C	R-5
4C	R-10
4A, 4B	R-15
5	R-20
6	R-25
7	R-30
8	R-35

a. Contributes to but does not supersede the requirements in Section N1102.

b. Alternatively, sufficient continuous insulation shall be installed directly above the structural roof sheathing to maintain the monthly average temperature of the underside of the structural roof sheathing above 45°F (7°C). For calculation purposes, an interior air temperature of 68°F (20°C) is assumed and the exterior air temperature is assumed to be the monthly average outside air temperature of the three coldest months.

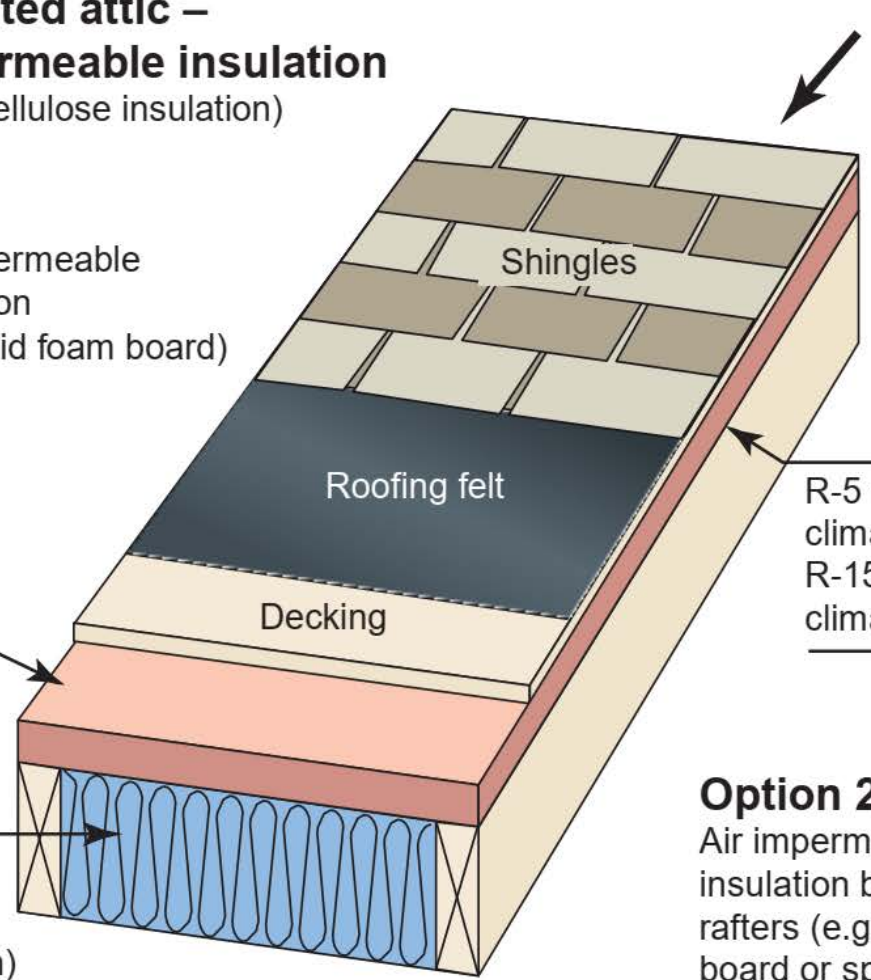


Hybrid Insulation Approaches



Vaulted unvented attic – roofline air-permeable insulation
(e.g., fiberglass, cellulose insulation)

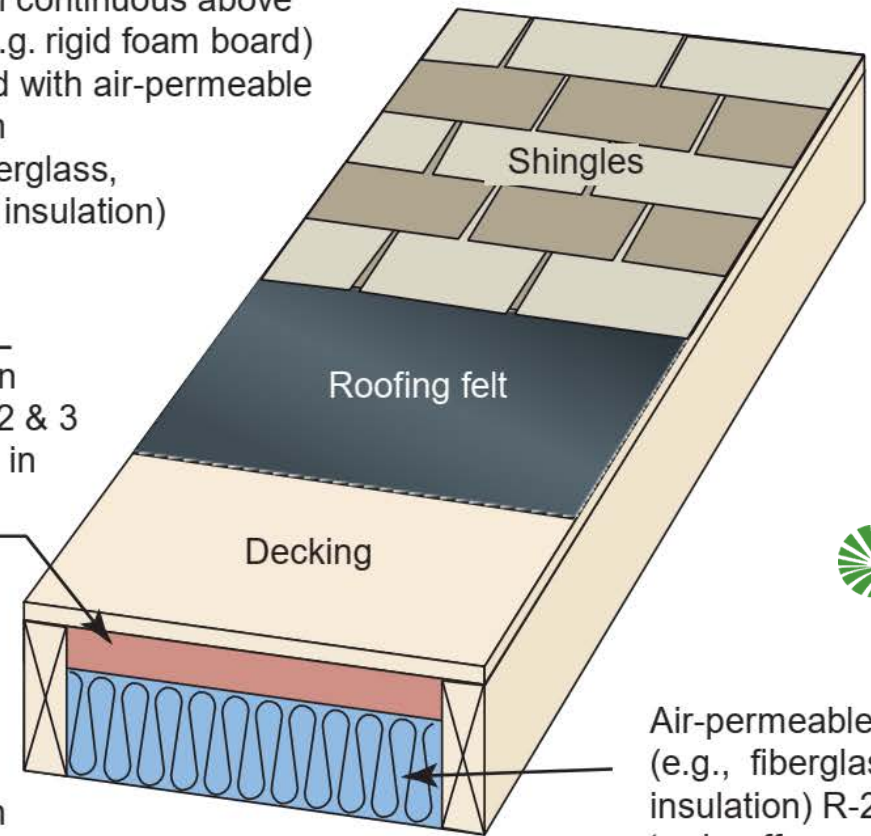
Air impermeable insulation (e.g. rigid foam board)
Air-permeable insulation (e.g., fiberglass, cellulose insulation)
R-20 minimum if trade-offs are used (Georgia requirements)



Option 1
Air impermeable insulation continuous above rafters (e.g. rigid foam board) combined with air-permeable insulation (e.g., fiberglass, cellulose insulation)

R-5 minimum in climate zones 2 & 3
R-15 minimum in climate zone 4

Option 2
Air impermeable insulation between rafters (e.g. rigid foam board or spray foam) combined with air-permeable insulation (e.g., fiberglass, cellulose insulation)



Air-permeable insulation (e.g., fiberglass, cellulose insulation) R-20 minimum if trade-offs are used (Georgia requirements)



5.3. Where preformed insulation board is used as the air-impermeable insulation layer, it shall be sealed at the perimeter of each individual sheet interior surface to form a continuous layer.



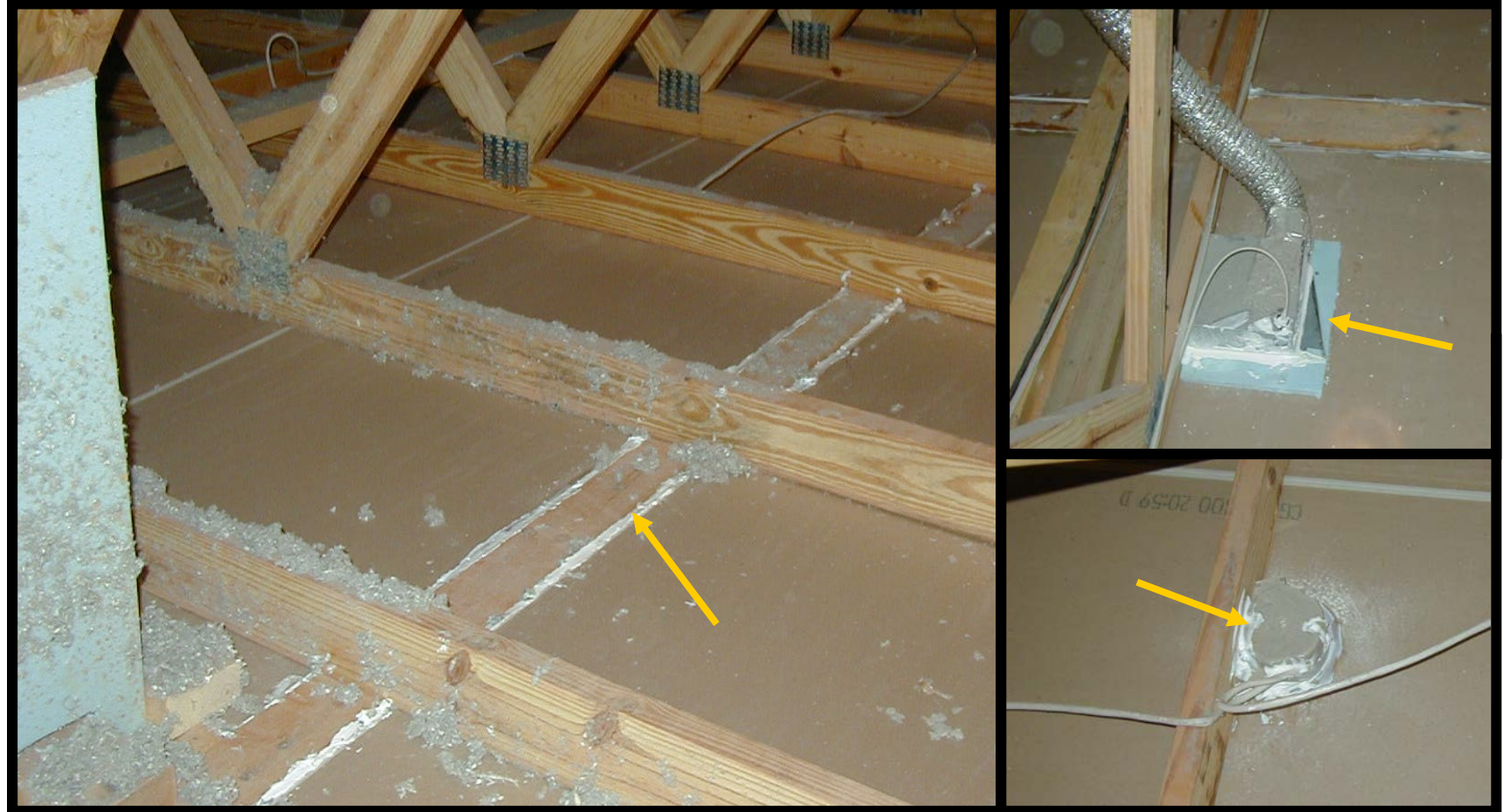
- Dams and baffles at eaves
- Electrical okay
- Air sealing performed
- Bath fans ducted to outdoors
- Decking/ catwalk elevated
- Rulers



- Dams and baffles at eaves
- Electrical okay
- Air sealing performed
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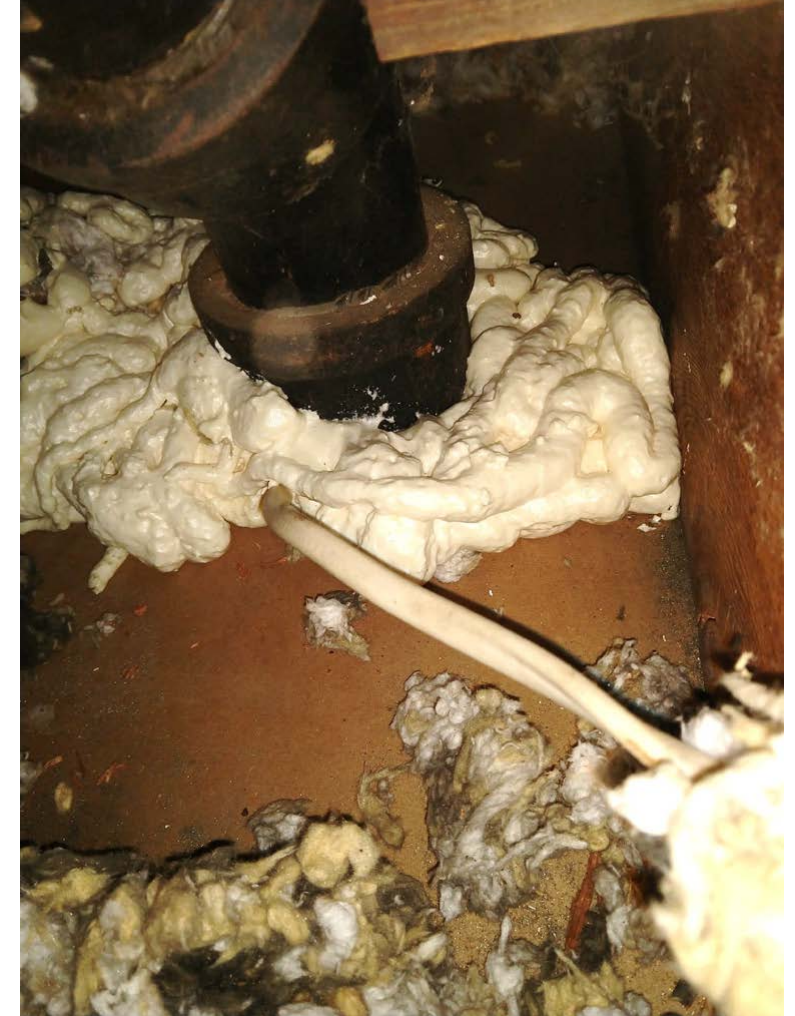
Attic Air Sealing Before Insulation

- Top plate to drywall (interior wall cavities often connect to attic)
- Duct and electrical penetrations



Attic Air Sealing Before Insulation

- Seal plumbing, HVAC, and electrical penetrations



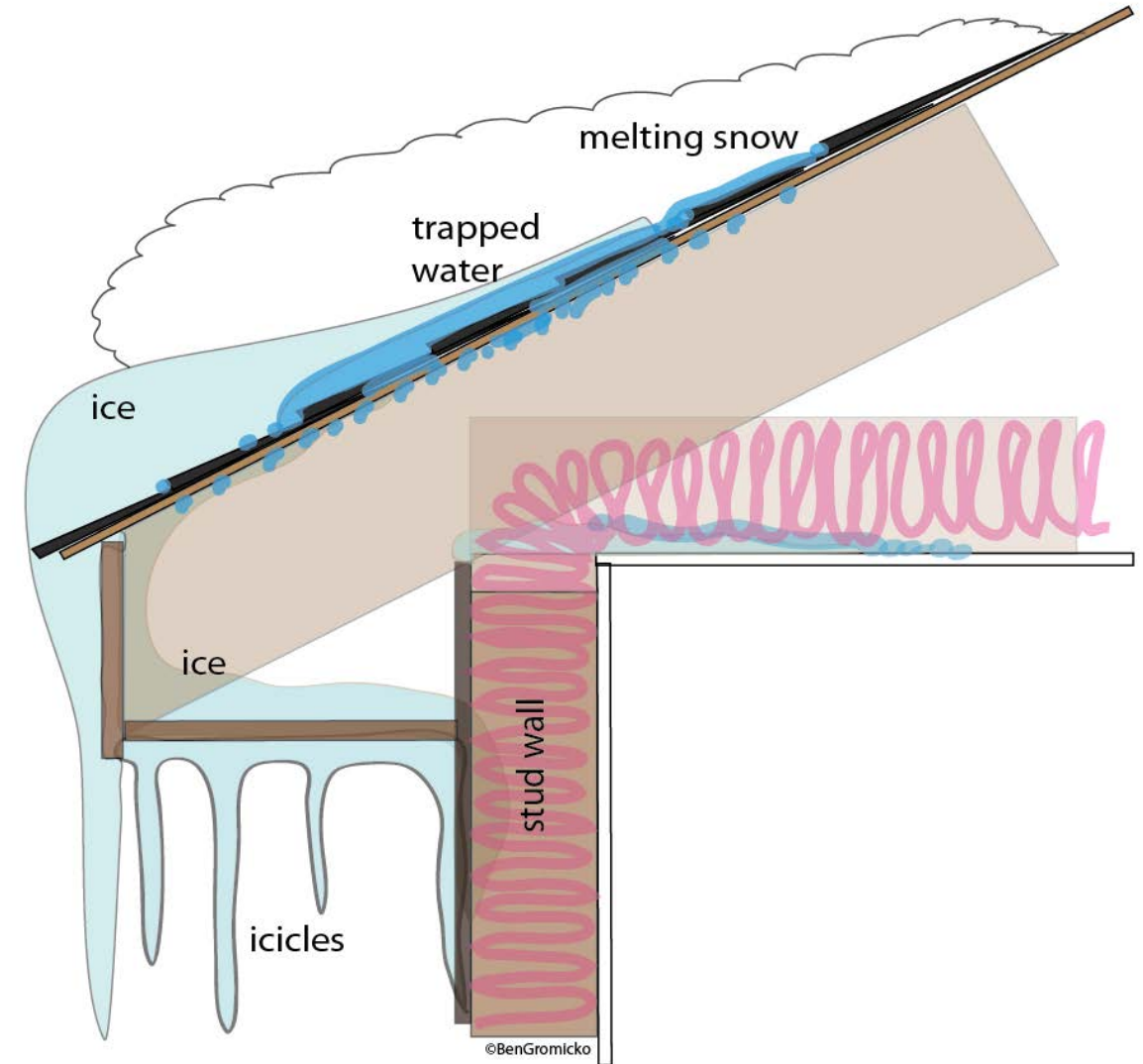


- Dams and baffles at eaves
- Electrical okay
- Air sealing performed
- Bath fans ducted to outdoors
- Decking/ catwalk elevated
- Rulers



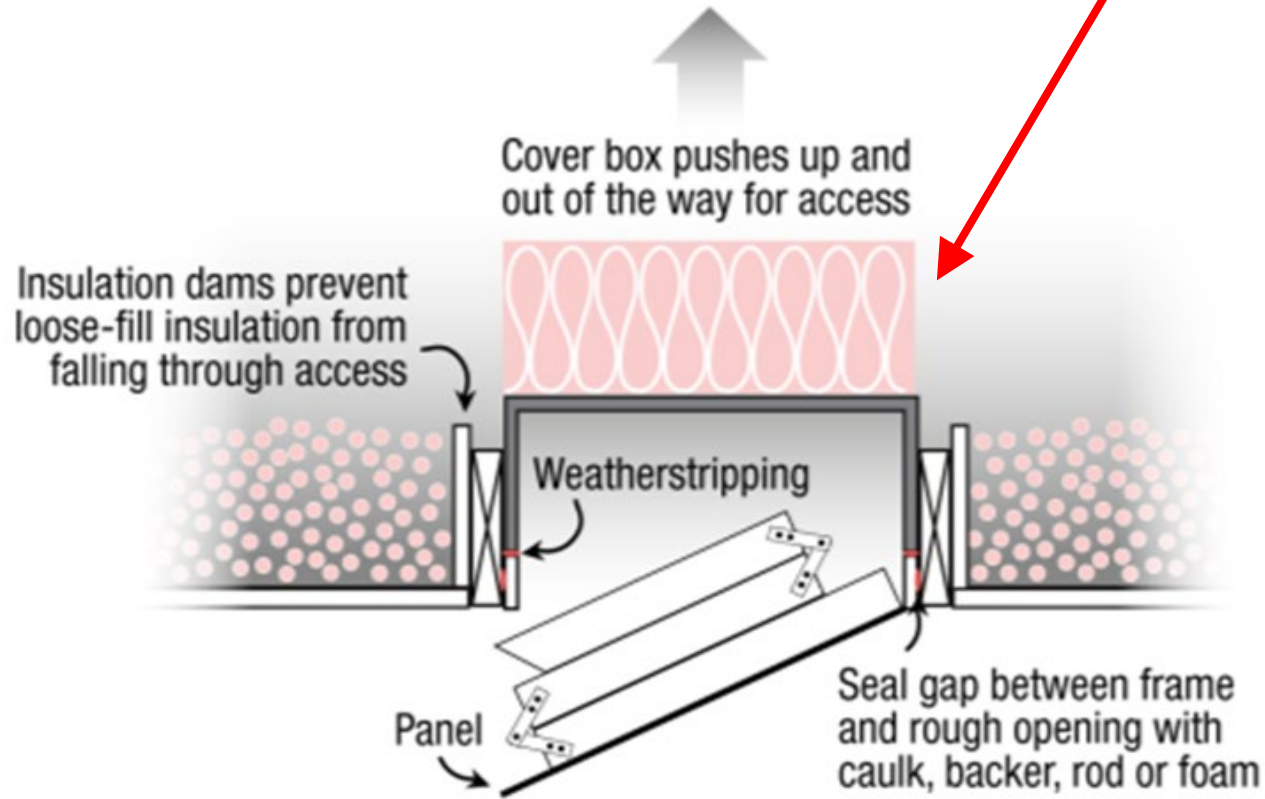
Ice Damming

- If there are air leaks or the insulation is not continuous (e.g., does not cover the top plate), heat from the interior will transfer through the compromised insulation to the roof, causing snow to melt on the roof and cause ice damming



Attic Stairs

Foam board stairs cover
(assembled with mastic
and nails, batt glued to top)



Graphic courtesy of <http://www.energysavers.gov>



Insulation in stairs door



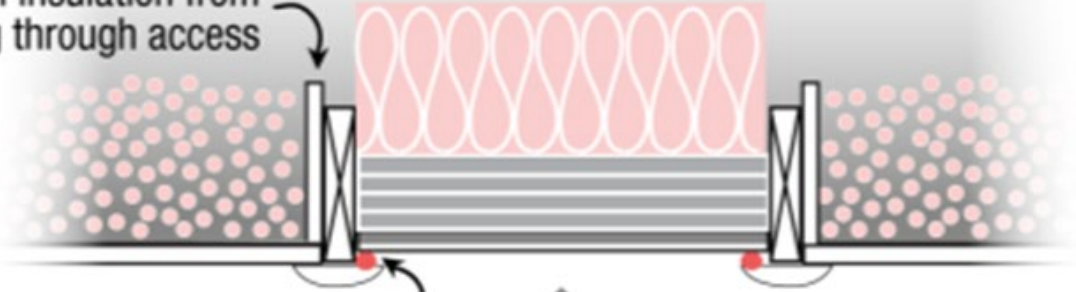
Attic Access Options



Attic Hatches



Insulation dams prevent loose-fill insulation from falling through access



Air seal gasket between trim and panel

Hatch lid pushes up and out of the way for access

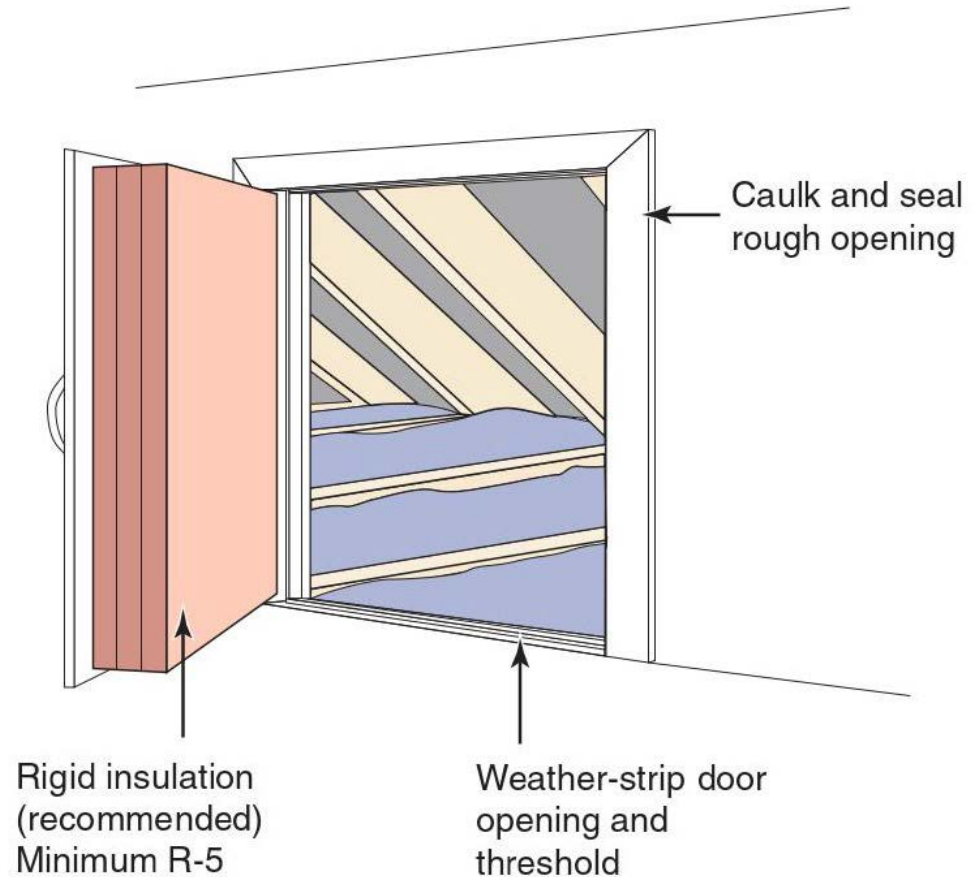
Graphic courtesy of <http://www.energysavers.gov>



Attic Doors

Vertical doors should have a minimum of R-5 and must be weather-stripped for air sealing.

Ideally, should have same R-value as knee wall.



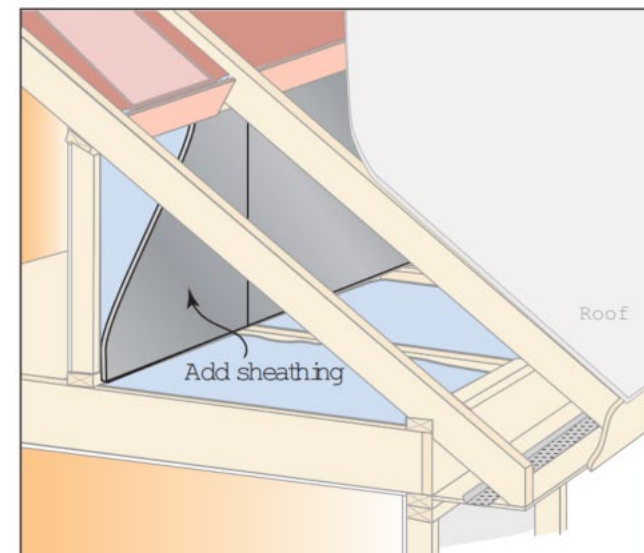
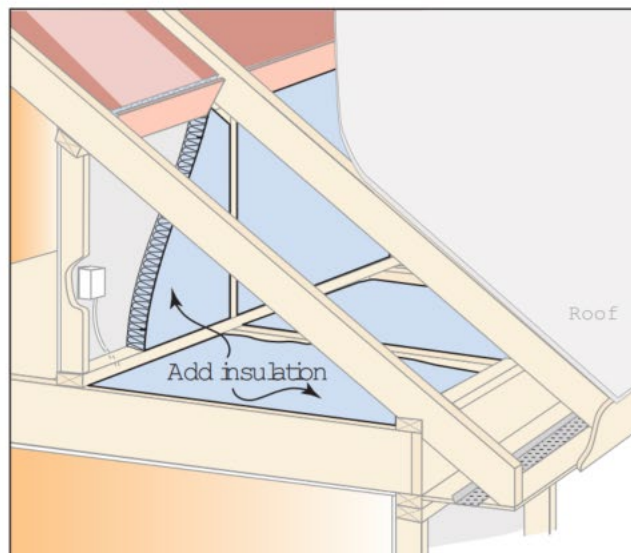
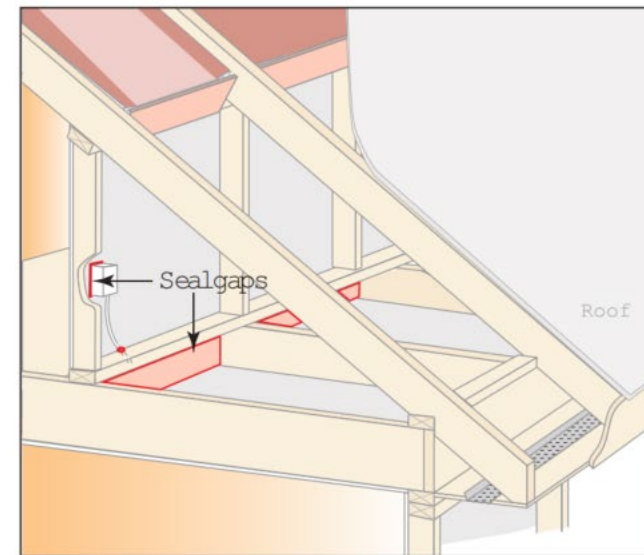
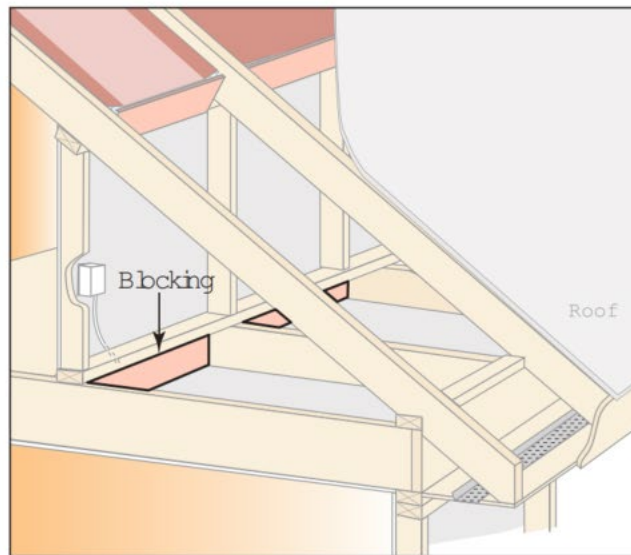
Knee Walls



No blocking under knee walls

Air permeable knee wall insulation needs to be encapsulated on **all** sides

Knee Walls



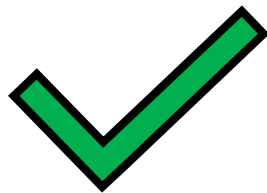
R402.2.8 Floors

- Floor insulation must maintain **permanent** contact with the subfloor.

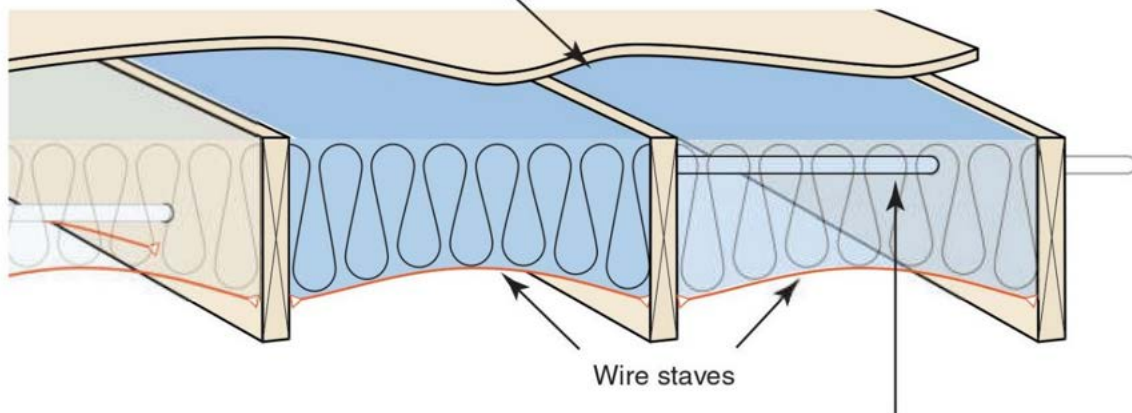


Floor Insulation

GOOD!



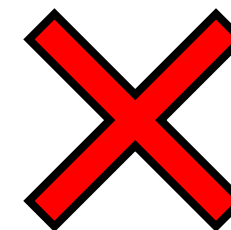
Installed insulation is in complete contact with air barrier (subfloor)



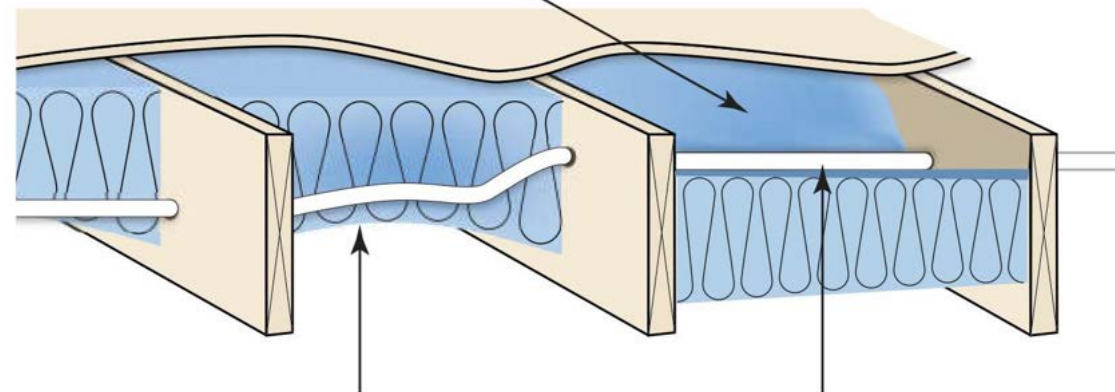
Insulation coverage is complete

Insulation is slit around plumbing and wiring and securely fastened with minimal compression

BAD!



Insulation is not installed in complete contact with air barrier (subfloor)

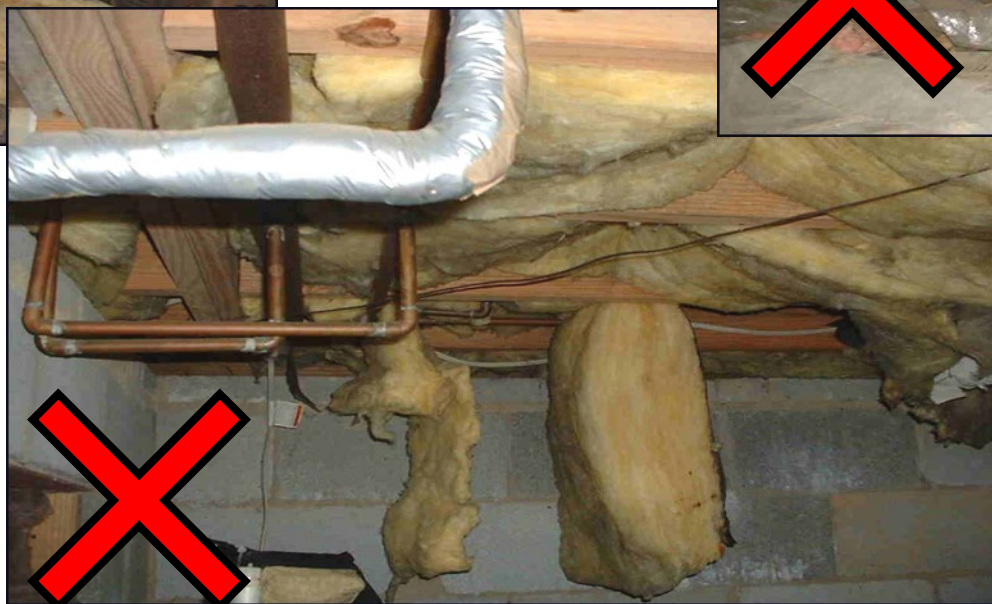
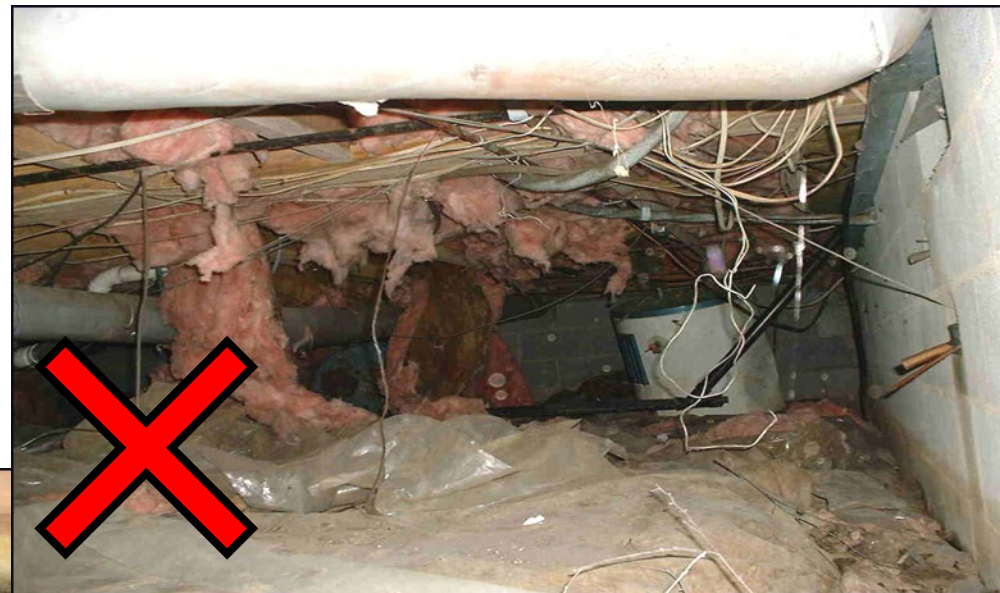


Insulation coverage is incomplete due to obstructions (plumbing, electrical, ductwork, etc.)

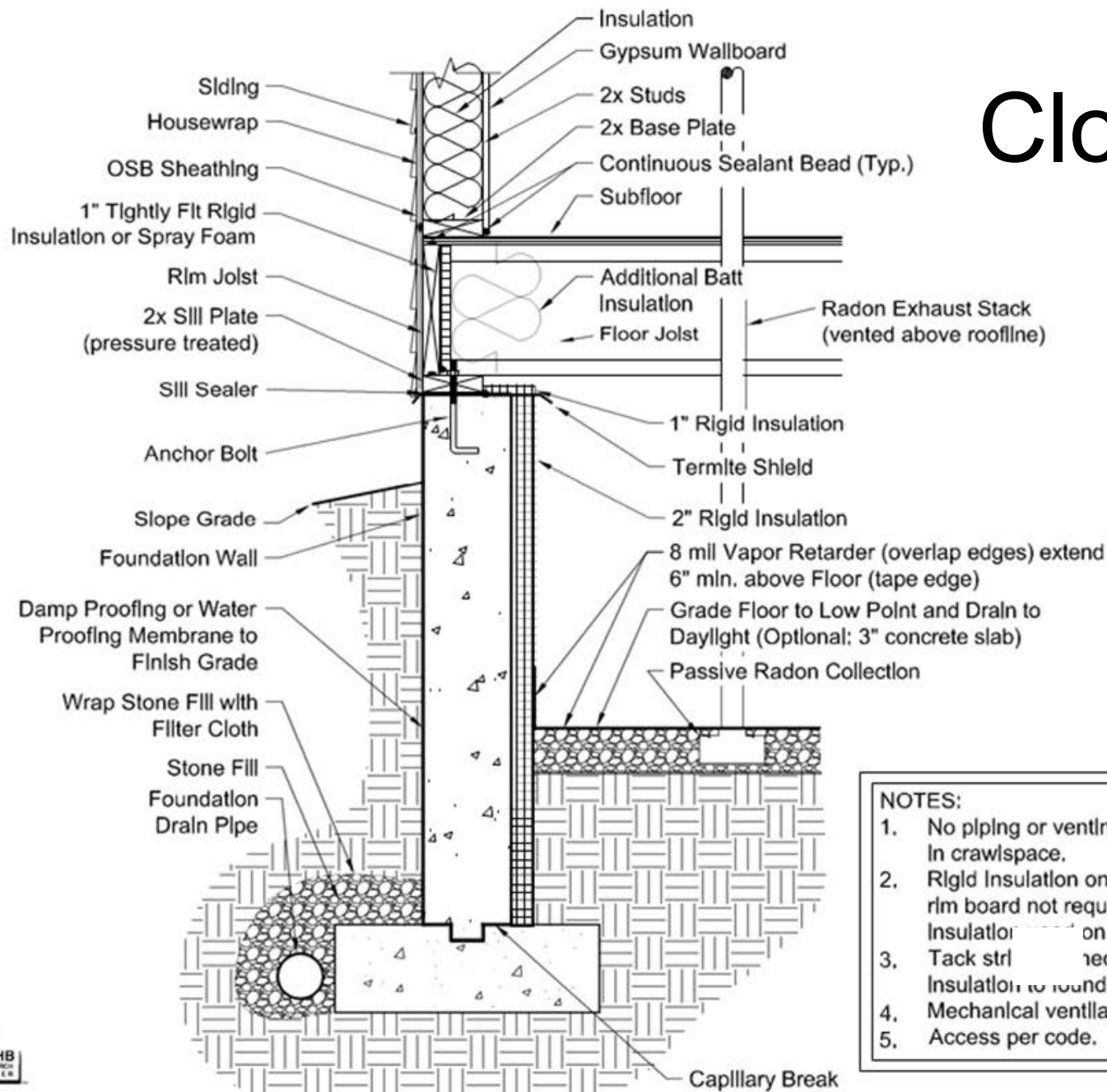
Insulation is compressed around plumbing and wiring and is not securely fastened



Problems with Floor Insulation



Closed Crawlspaces



- In mixed-humid climates, crawlspace encapsulation is an excellent option
- A properly sealed, moisture-protected, and insulated crawlspace will:
 - increase comfort,
 - save on energy costs
 - improve the durability homes
 - reduce moisture intrusion
 - reduce pest entry

NOTES:

1. No piping or venting to terminate in crawlspace.
2. Rigid Insulation on the interior of rim board not required if rigid insulation on the exterior.
3. Tack strip nailed through rigid insulation to foundation wall.
4. Mechanical ventilation per code.
5. Access per code.

