

Getting Cathedral Ceilings Right

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The Q&A page on our web site

Problems with cathedral ceilings loom large on our Q&A page.

- Cathedral ceilings with condensation problems or water stains
- Cathedral ceilings with mold
- Cathedral ceilings that drip
- Cathedral ceilings with ice dam problems
- Cathedral ceilings with evidence of air leakage
- Cathedral ceilings that create funny snow melt patterns
- Rooms with cathedral ceilings that are cold in winter or hot in summer
- Homes with cathedral ceilings that have high fuel bills
- Rotten roof sheathing above a cathedral ceiling

31 problematic ceilings

A sampling of **questions and comments** received on the GBA site.



The cathedral ceiling is sweating

Scott Davis: “I have a newly constructed home in upstate N.Y. with cathedral ceilings throughout, insulated with R-38 batts. After the long winter months have passed, the warmer weather **causes water to come streaming down**. I don't know what to do besides rip down the ceiling.”



Water stains and mold

Aaron H.: “There are **black water stains (probably mold)**. After many days and nights researching what was wrong, I believe my issue is insulation and air leakage. I have called all the insulation and roofing businesses in this area and each says it’s the others’ issue. I am getting a lot of ice damming on the roof.”

Major ice dams

Robert I.: “I have a cathedral ceiling, 2x10 rafters, with a tongue-and-groove ceiling and multiple skylights. There are construction obstructions with a number of ‘dead’ rafter bays and areas, so no venting is possible. **Major ice dams. Help!**”

Ice dams

Randy Bunney: “Our double-walled stovepipe penetrating the cathedral ceiling roof appears to be source of a heat leak, causing **ice dams.**”



Water dripping

Thelma complains that the ceiling is dripping: “The cedar ceiling is nailed to the rafters. There are 2 skylights. The room has a ventless gas fireplace. We also have pot lights in the ceiling.”

Condensation – spray foam is too thin

John Hunt: “For my unvented cathedral roof, I used **1 inch of spray foam** and R-30 Roxul under that. I am in northern Vermont. As soon as we finished putting up the tongue-and-groove pine ceiling I had a gut feeling I was going to have problems. Not long into winter I was getting condensation running off my ceiling.”

Ceiling stains

John Haskill: “We have 13 recessed can lights. We have **water stains on our ceiling.** Our builder hopes the issue will go away.”



Signs of air leakage

Gerald DeArman: “At our house in Florida, we have cathedral ceilings covered in cedar planks. I had to pull some of these planks down. I found bunched-up insulation and **a line of dust on the insulation everywhere there was a seam between the planks** – so there is plenty of air penetration.”

Condensation issues

Kristopher

McMenamon: “At this house with an unvented cathedral ceiling, the homeowner had **condensation issues** before the roof repair, but now the condensation issue is worse.”



Low R-value – room is cold in winter

Apollo S.: “I have very high and steep cathedral roof in my living room, built in '78. Rafters are 8 inches deep and currently I have windswept fiberglass there. I have no idea how bad that kills the insulation value, but looking at **how fast the indoor temperature drops** in that room gives me the sense that it isn't good.”



Condensation on cathedral ceiling

Albert Orchard: “The house has a cathedral ceiling throughout, with tongue-and-groove boards attached directly to the rafters. There are old fiberglass batts up there for insulation, right on the tongue-and-groove boards. We had problems with **large amounts of condensation** forming at the ridge of the ceiling, dripping down from the center ridge beam and dripping down the walls.”

Dripping tongue-and-groove ceiling

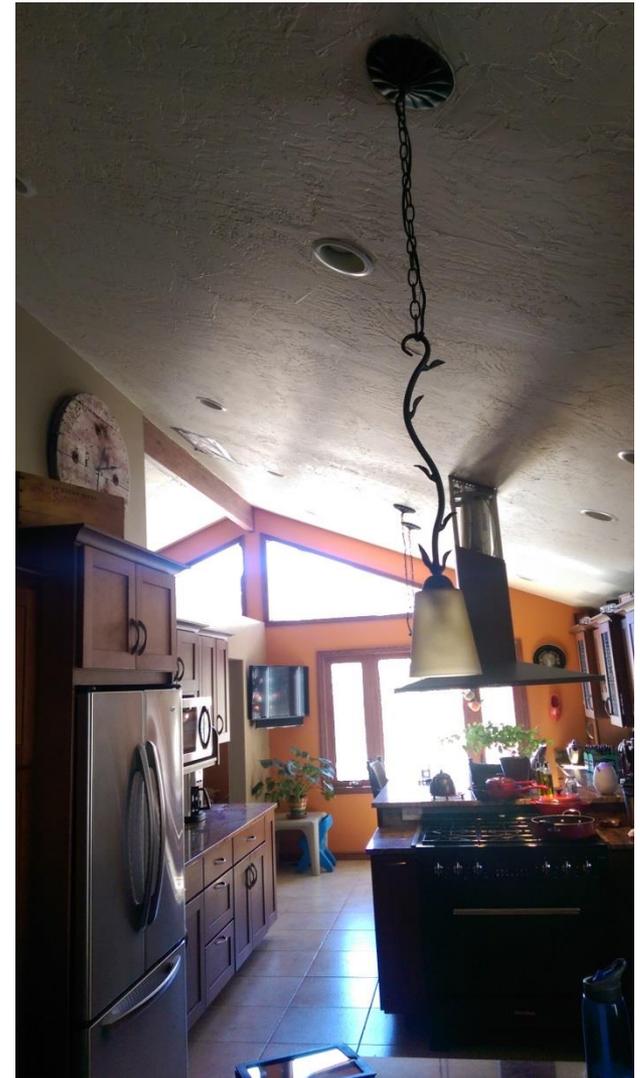
Gregory Erickson: “We have a ‘70s-era cathedral ceiling with 2x8 rafters. Cedar T&G boards were applied directly to the bottoms of the rafters when the house was constructed. After a recent week of sub-freezing weather, we had a sudden rise in outside temperature resulting in **multiple drips** in the the living spaces, no doubt the result of the melting of frozen condensation on the underside of the sheathing.”

Rotten roof sheathing

David Koeberlein: “I have a 1980s cathedral ceiling with **soft sheathing problems**. Hence, I need to remove the sheathing and re-roof.”

Mold and moisture problems

Scott Buchanan: “I have 900 sq. ft. of cathedral ceiling in Zone 7. No venting. Several recessed lights. There is **mold and moisture.**”



Snow melts above cathedral ceiling

Mark Fredericks: “I live in a 1950s Cape in Nova Scotia. The roof line is insulated with very thin batts. The weak point is the sloped ceiling. When it snows, **the area above the insulated sloped ceiling is always the first to melt.**”



Poorly insulated cathedral ceilings

Brian K.: “We have a Cape-style house. We had an energy company come out and dense pack the cathedral ceiling with cellulose. They have been back multiple times to fix their blunders. They missed the bay closest to the chimney and when they came back to fill it they found **the insulation was soaked.**”

Room is hot in the summer

Dan Bailey: “We have a cathedral ceiling that is poorly insulated. The current fiberglass insulation batts (probably R-11) are thin. **The rooms are hot in the summer.**”

Condensation and mildew

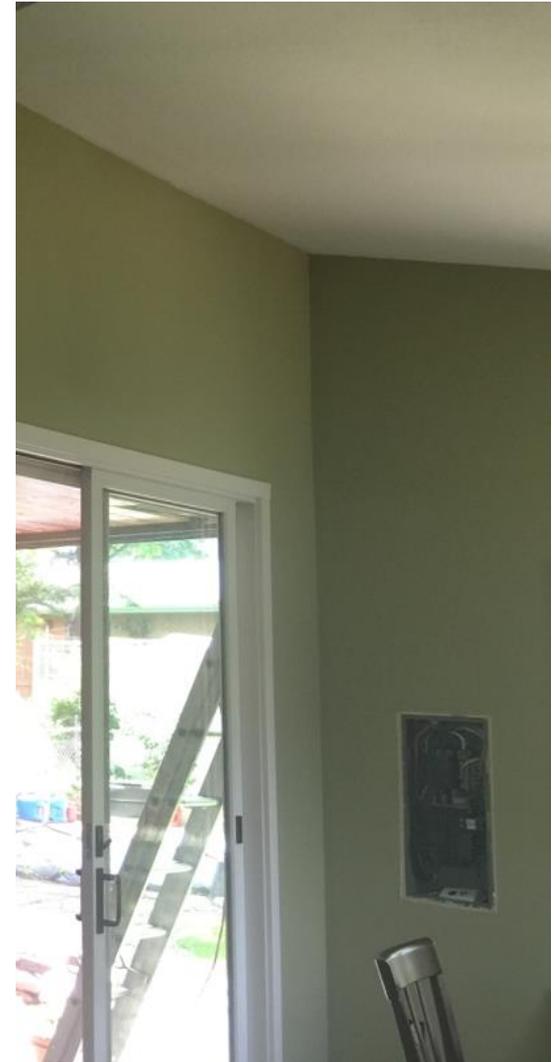
James More: “Our builder insulated our cathedral ceilings with dense-pack insulation. Now we are having **condensation and mildew** problems. The roof is not vented. The condensation is at the peaks. We were told that it's because the insulation has slid down.”

“Vented” cathedral ceiling

Richard Cohn: “The cathedral ceiling is framed with 2x10s, which currently have about 10 inches of fiberglass batts. There is no vent channel against the roof, so **I assume the air just moves through the fiberglass.** Though I know this is considered a no-no, I plan to put in recessed lighting.”

Room is cold in the winter

John Gifford: “The dining area of our addition has a cathedral ceiling insulated with fiberglass batts. The ceiling is unvented. The addition is **cold in the winter.**”



A moisture-laden home

Cameron Morris: “The dehumidifier runs constantly. The cathedral ceiling has R-3 fiberglass batts.”

Nasty ice dams

Kacey Zach: “I've got a cathedral ceiling built of 2x12s, currently insulated with R-38 fiberglass batts with no regard to air sealing. The red circle shows where we had **nasty ice dams** last winter.”



Recessed can light question

Larry: “I have a cathedral insulation with poor insulation (no ridge vent). There is **condensation**. Is it possible for a recessed can light to cause condensation in a cathedral ceiling?”

Vent channel in the wrong place

Chip Young: “We have a cathedral ceiling finished with tongue-and-groove boards. We have 2x10 rafters filled with fiberglass batts. There is a ventilated air channel (soffit vents and ridge vent) between the top of the fiberglass and the roof deck. Then **3 inches of polyiso above the roof deck**. After finishing the roof, I noticed moisture streaming down when the outside temps dropped to around 20 degrees.”

Unvented rafter bays are moist

Steven Pereira: “I have an attic converted to living space with a cathedral ceiling. Most rafter bays are vented from soffit to ridge and are insulated with fiberglass, but there are some areas where the rafter bays are interrupted and there is only a ridge vent. In these areas I'm having **a ton of ice and moisture** on the sheathing. I also have a damp basement.”

High fuel bills and icicles

Howard Gentler: “My 22-year-old home in northern Vermont has a great room with cathedral ceilings. From inside it is V-groove pine and 12-inch fiberglass with kraft paper. There is a 1½-inch deep ventilation channel above the fiberglass, with soffit and ridge vents. One can see **ice and icicles** on the roof, and the place takes **a lot of wood (and propane) to heat.**”

Adding soffit and ridge vents makes things worse

Michael Lee: “I live in New Hampshire. I am trying to make some efficiency improvements to a room with a cathedral ceiling. The 2x10 ceiling is insulated with fiberglass batts. I recently made the situation worse by adding soffit vents and a ridge vent to this section of the house. When the ridge was cut, the plywood showed signs of **moisture trouble**. Now I can feel that the ceiling and wall tops are **quite cold** around the air intake vent areas.”

Awful ice dams

Bernie Simon: “I have house just north of Boston. It is a contemporary home built in 1983 with nearly 100% cathedral ceilings. The roof is 6/12 pitch with asphalt shingles. The rafters are 2 x 10s, and I suspect the fiberglass insulation has very little if any ventilation gap. I experience **awful ice dams** and icicles.”

Condensation and icicles

Scott D.: “The design of my cathedral roof system was a recipe for failure. I have R-30 insulation with air chutes and a ridge vent, but I’m getting **condensation** in the roof. I have icicles on the exterior side of the siding, near the eaves.”

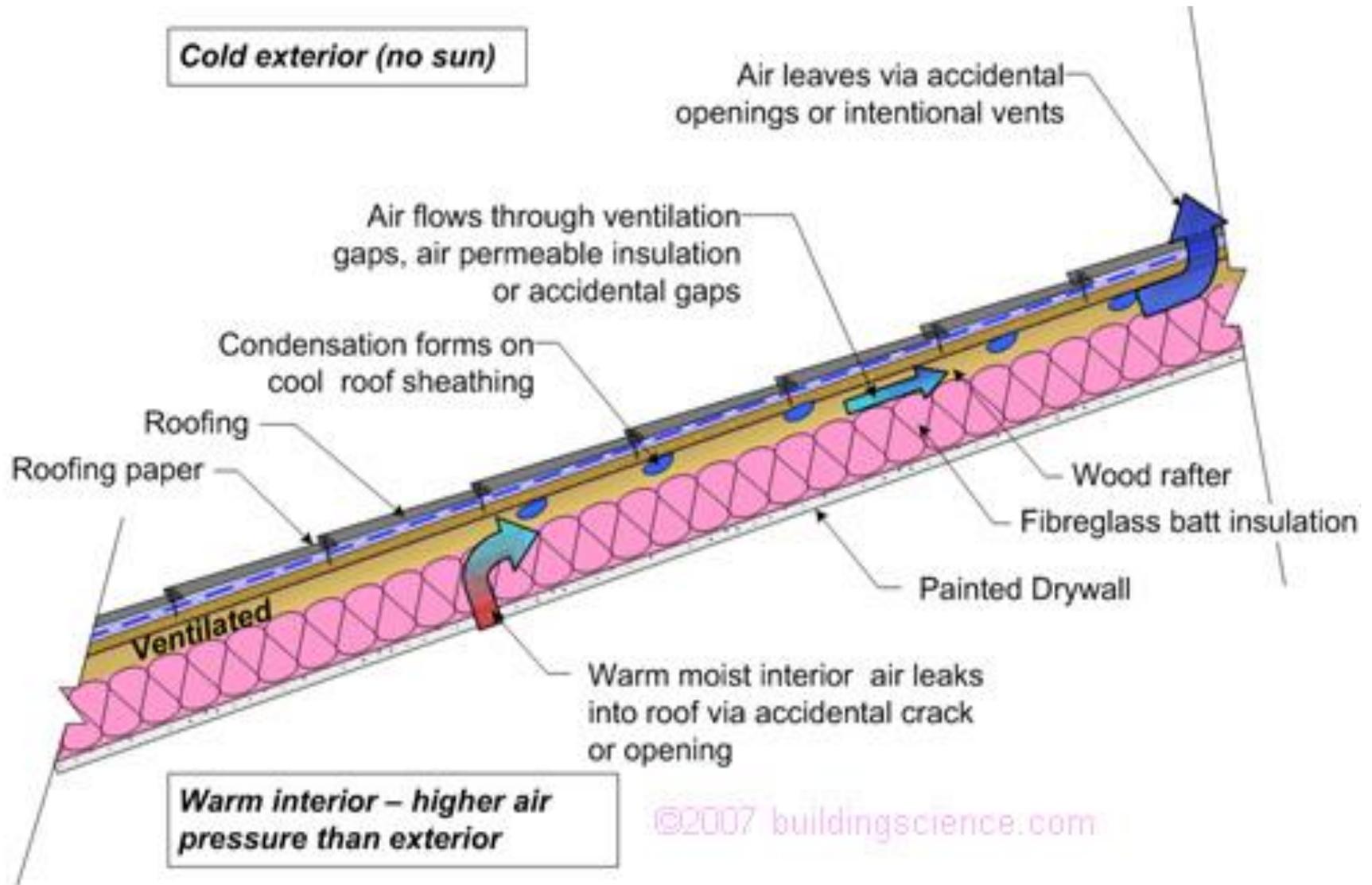
Serious ice dams

Mark Kessler: “My house in Vermont has cathedral ceilings with a 1/12 pitch and asphalt shingle roofing. The roof has **serious ice dams.**”

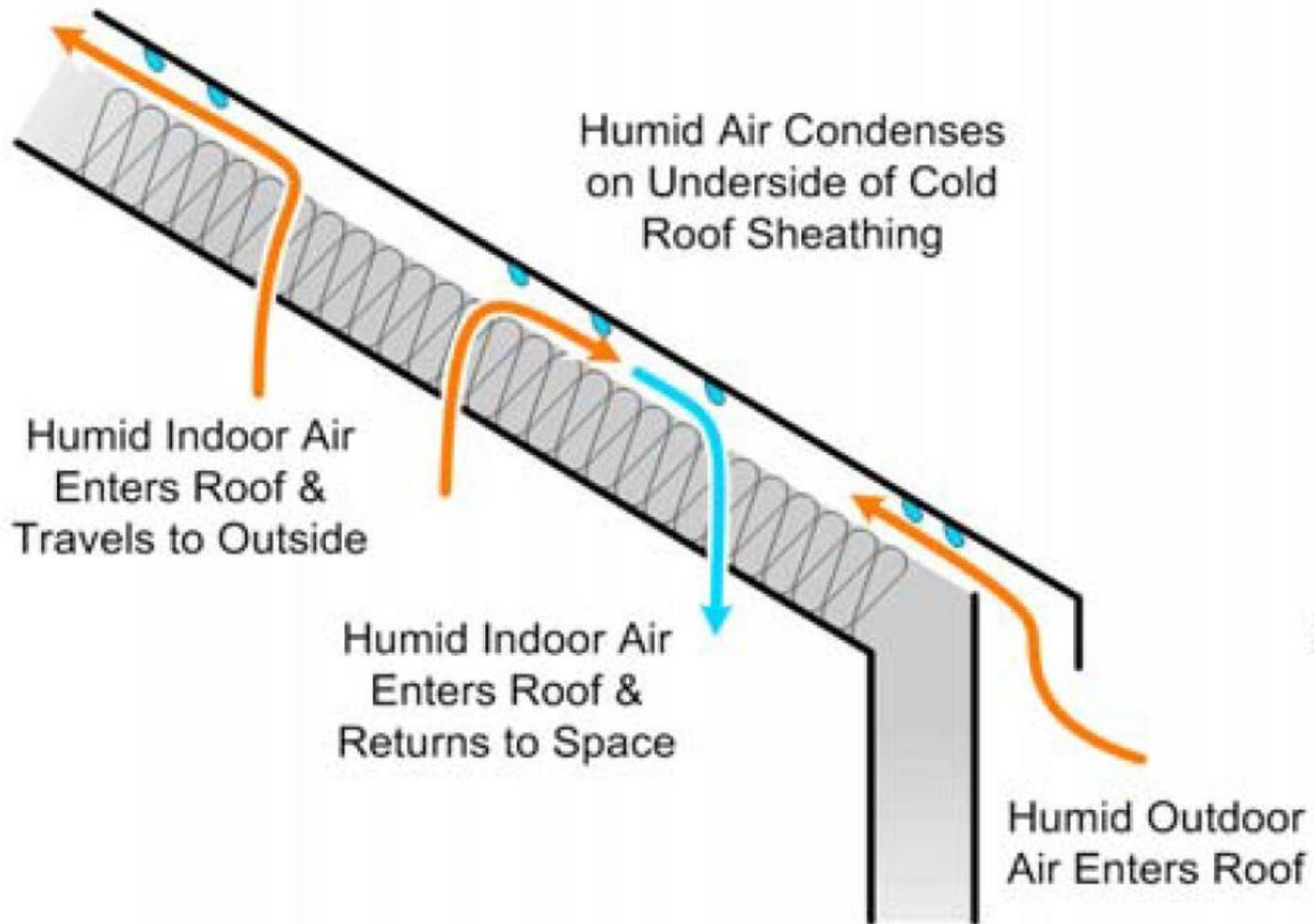
Insufficient insulation

Ian Osborn: “I have a room with a cathedral ceiling (4/12 pitch) at my house in Michigan (Zone 5). There are exposed tongue-and-groove boards over the rafters, with R-20 rigid foam above the boards. I have 2 problems: bad ice dams, and the room with the cathedral ceiling is noticeably **hotter in summer and colder in winter** than the adjacent room.”

Air leaks lead to condensation



Moisture in the air condenses on cold surfaces



T&G ceiling and recessed lights



T&G ceiling and recessed lights



A YouTube video shows you what to do



Another YouTube video



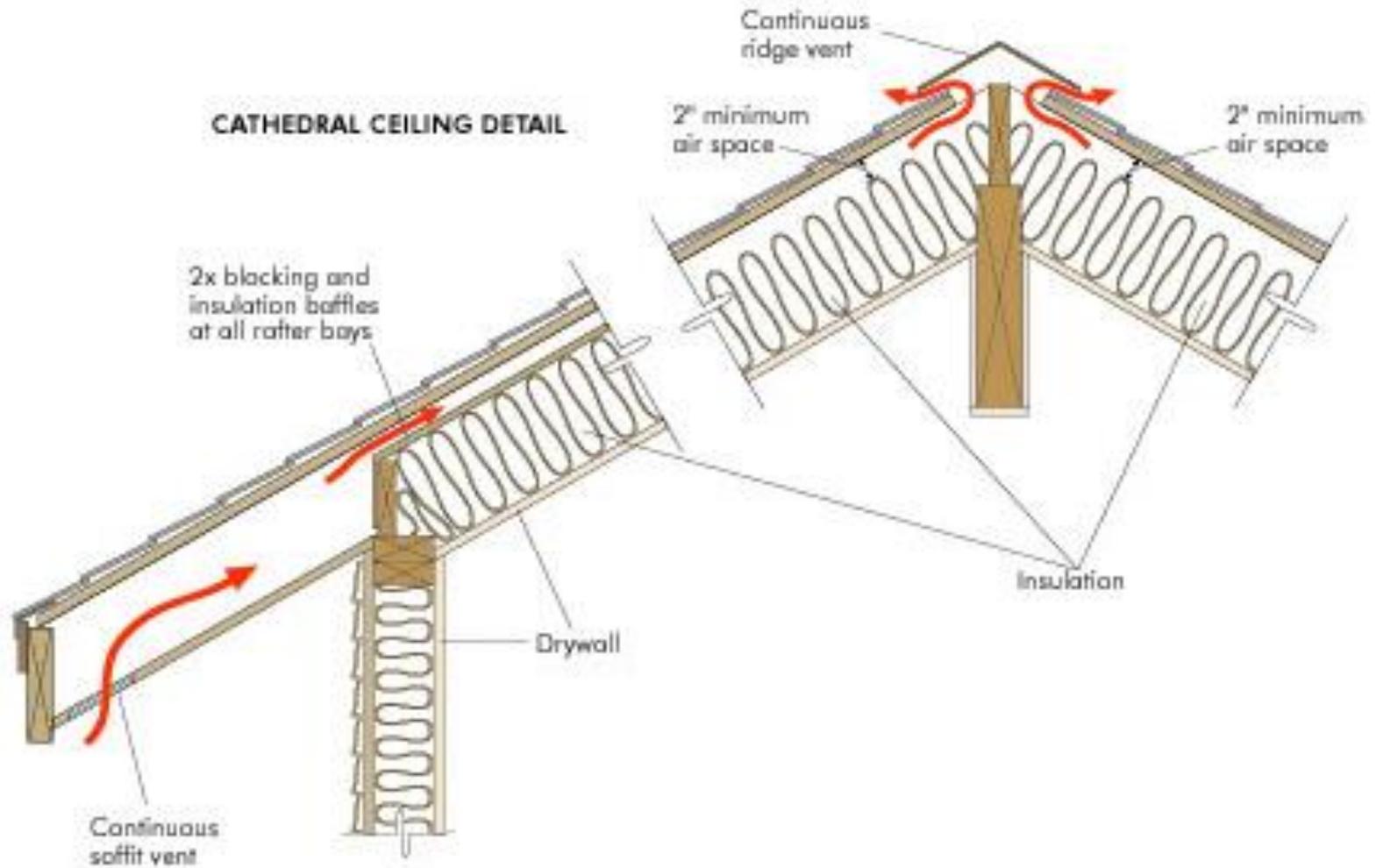
YouTube video – ugly!



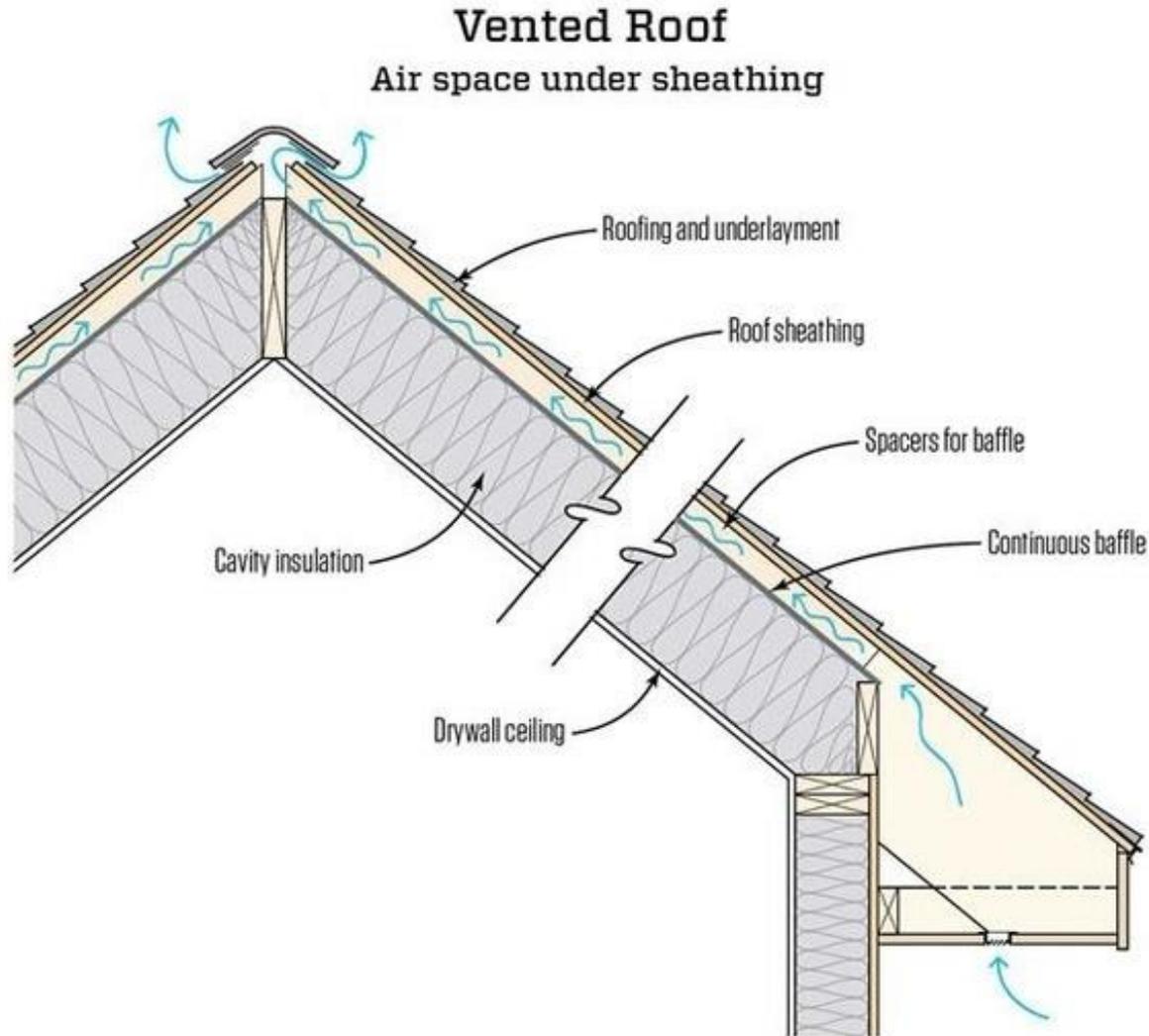
Proud homeowner shares a photo



This is the idea...
but you need air barriers



It can work if everything is perfect



No dormers!

**Vented approaches don't work
if you have:**

- Dormers
- Skylights
- Hips
- Valleys
- Big chimneys

When the envelope is convoluted...

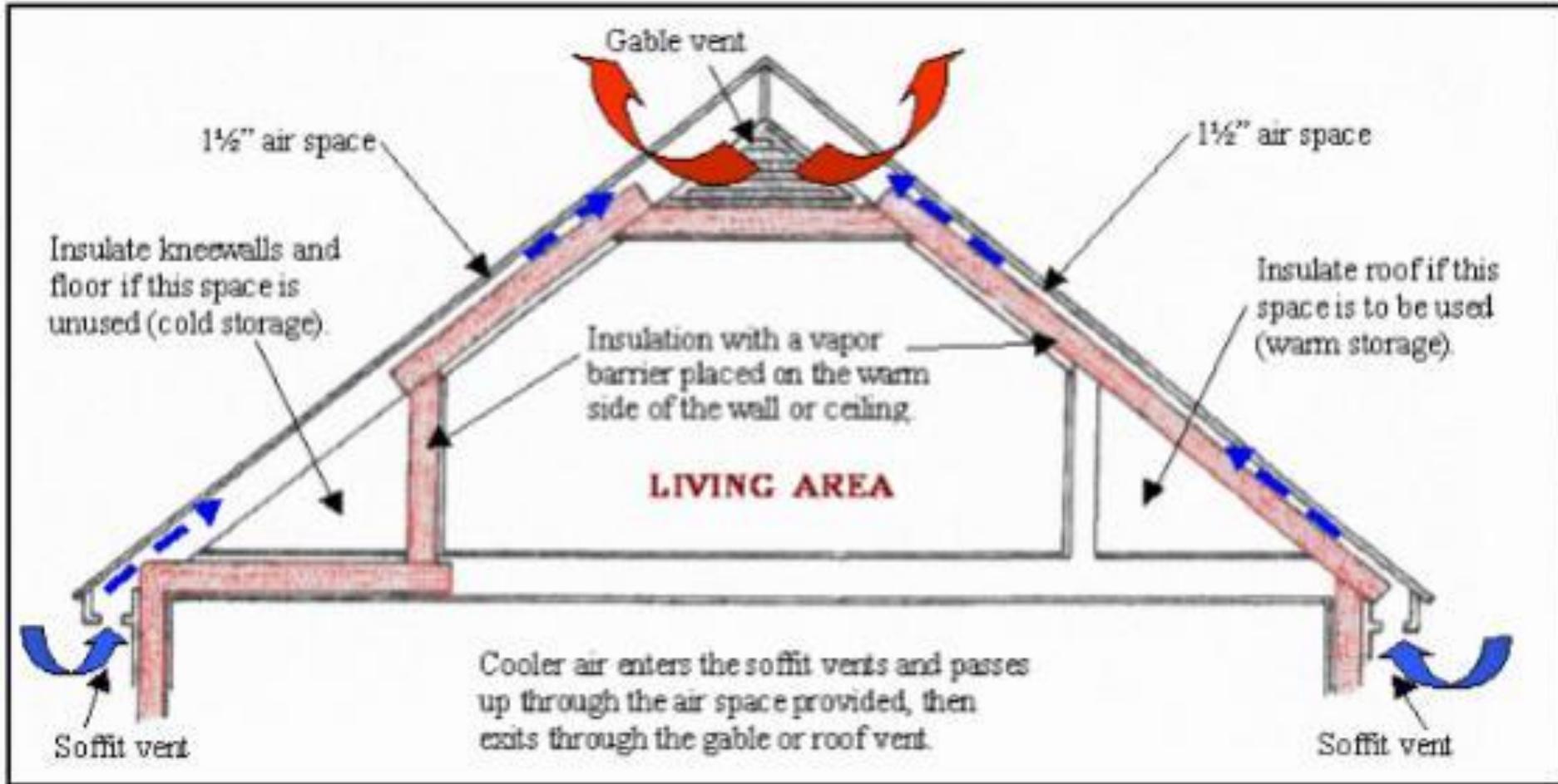


Figure 1 - Proper method of insulating and ventilating a typical 1/2 story

The reality



The 3 big problems

- **Air leaks** leading to condensation, moisture accumulation, or ice dams
- **Insufficient R-value** leading to high energy bills, comfort complaints, and ice dams
- **Recessed can lights** that contribute to air leakage and insufficient R-value

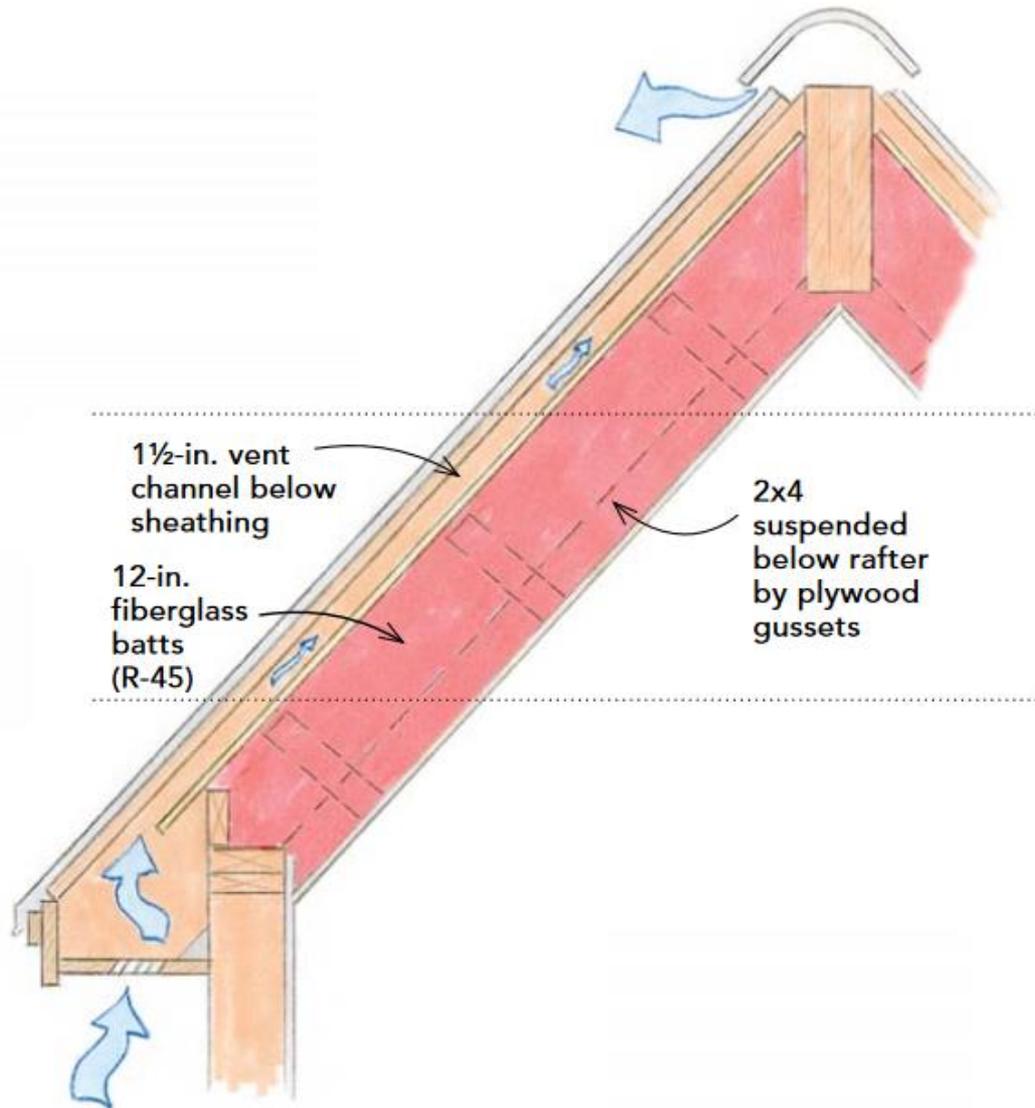
Doing it right

- Insulated sloped roof assemblies need **an airtight ceiling**.
- Insulated sloped roof assemblies **should never include recessed can lights**.
- Insulated sloped roof assemblies need **enough R-value** to meet minimum code requirements (R-38 in Zones 2 and 3, R-49 in colder zones).
- Insulated sloped roof assemblies benefit may need a **ventilation channel** between the insulation and the roof sheathing.

Vented cathedral ceiling – Option 1

- This option only works if your roof has **simple geometry** (no valleys, hips, dormers, or skylights).
- Option 1: Install **ventilation baffles** in rafter bays, followed by fluffy insulation below. This requires deep rafter bays. (R-38 requires about 11 inches of insulation; R-49 requires about 14 inches of insulation.)

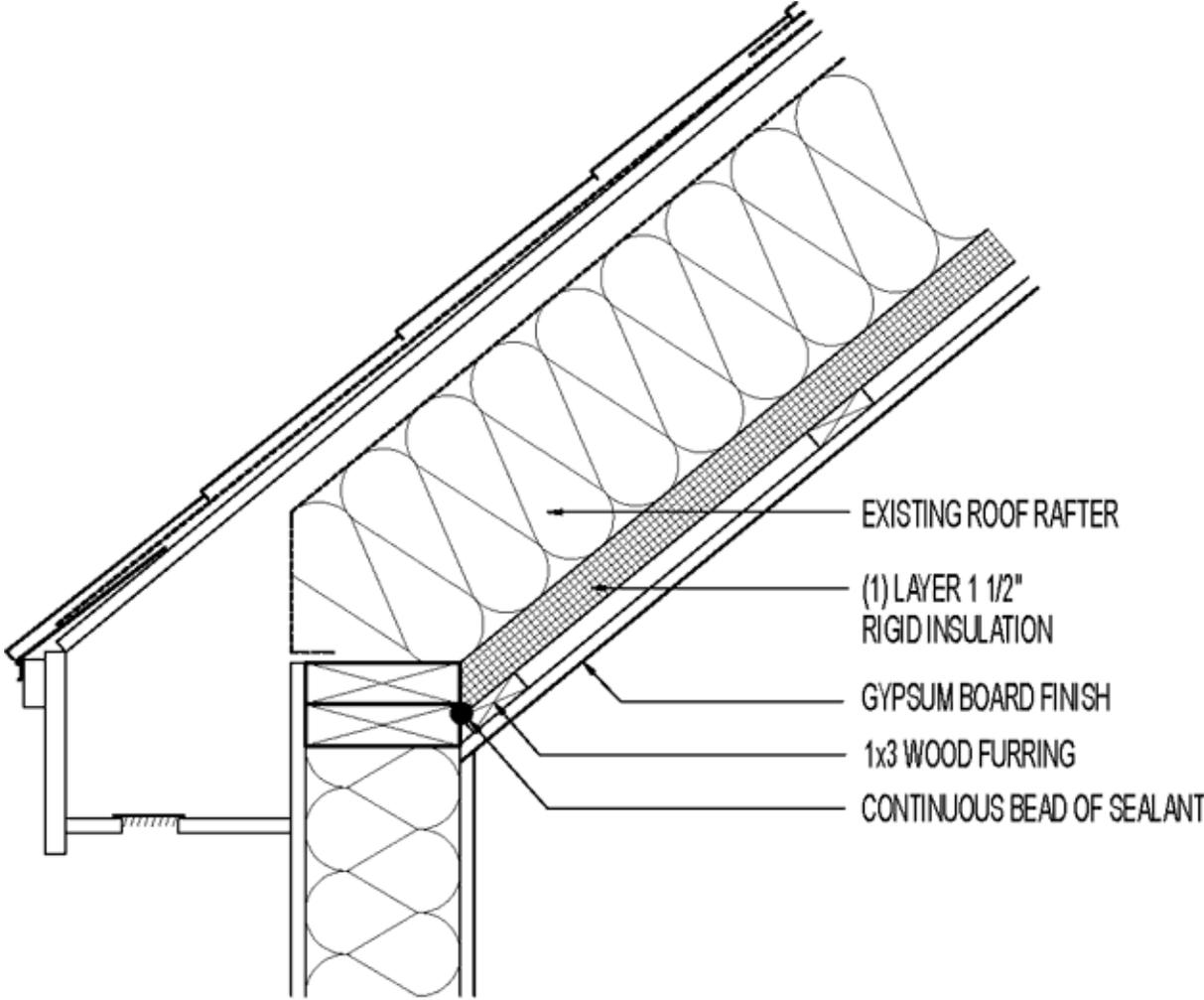
Vented cathedral ceiling



Vented cathedral ceiling – Option 2

- Install **ventilation baffles** in rafter bays, followed by fluffy insulation below – **supplemented by a continuous layer of rigid foam fastened to the underside of the rafters.**
- The advantage of this approach is that the rigid foam addressed thermal bridging through the rafters.

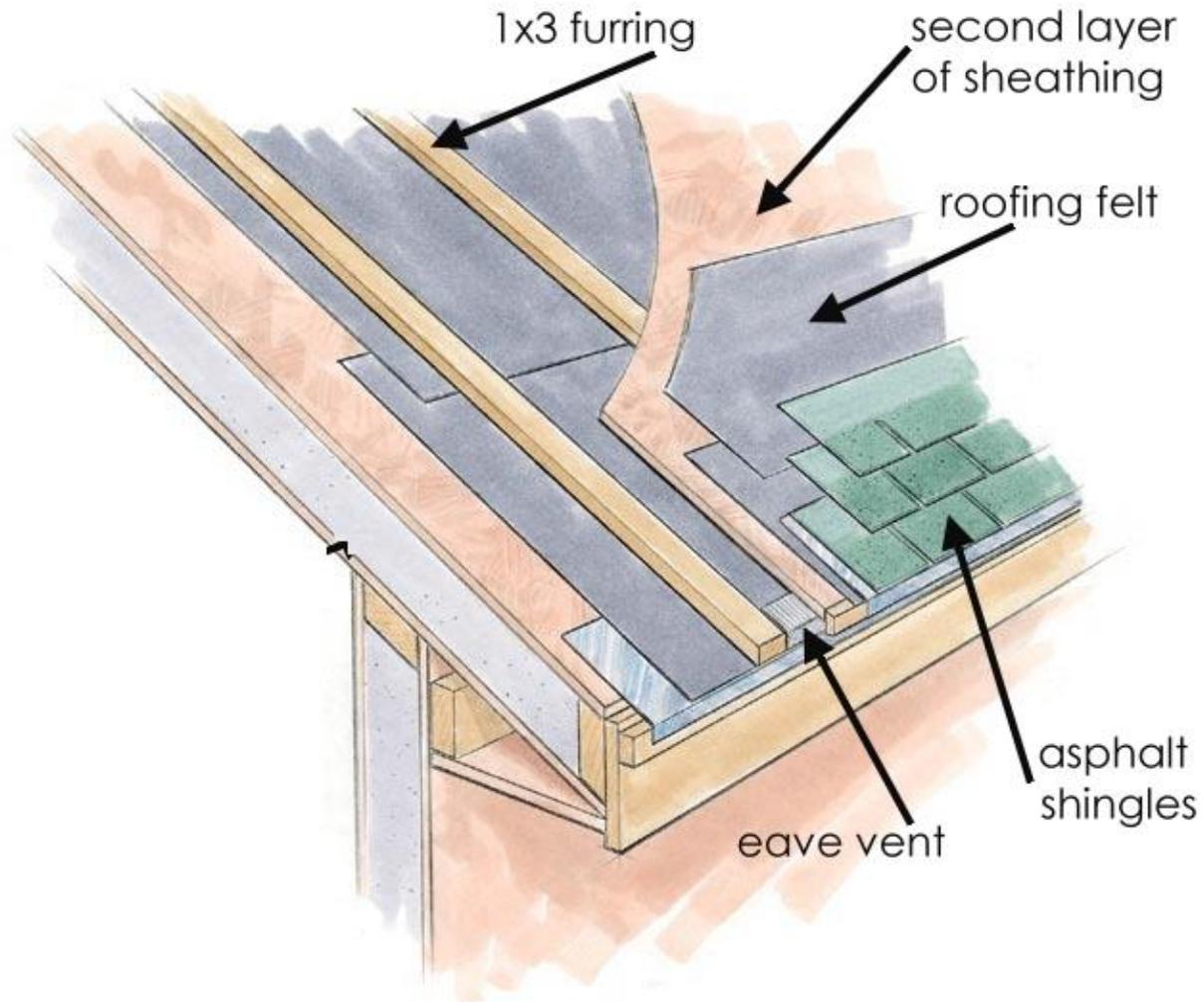
Vented cathedral ceiling – Option 2



Vented cathedral ceiling – Option 3

- Create vent channels above the roof sheathing.
- This approach only works if you remember to install a vapor-permeable roofing underlayment.
- Some code officials may not accept this approach.

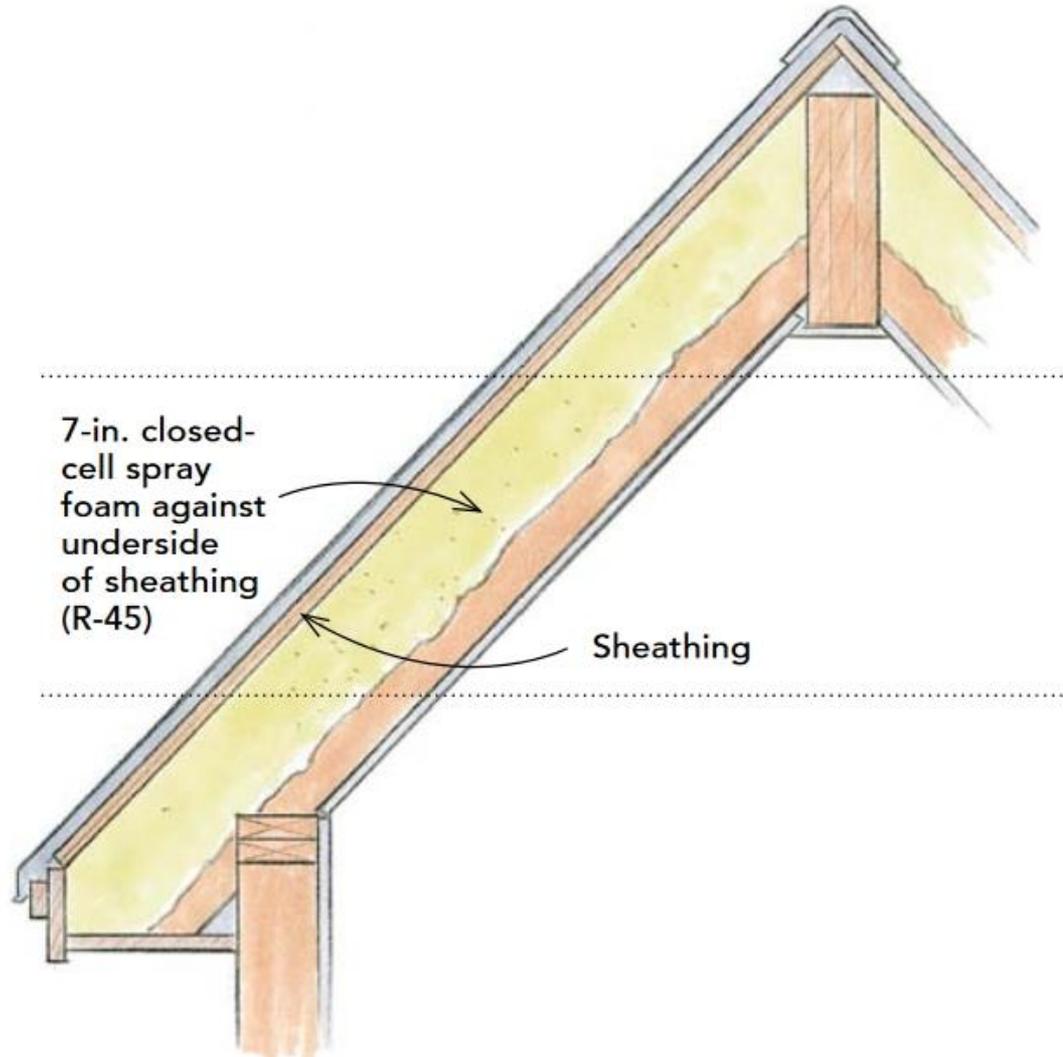
Vented cathedral ceiling – Option 3



Unvented cathedral ceiling – Option 1

- **Install closed-cell spray foam on the underside of the roof sheathing.** You'll need 6 inches of closed-cell spray foam to get R-38, or 8 inches to get R-49.
- Open-cell spray foam is also possible here, but open-cell spray foam is associated with more moisture problems than closed-cell spray foam.

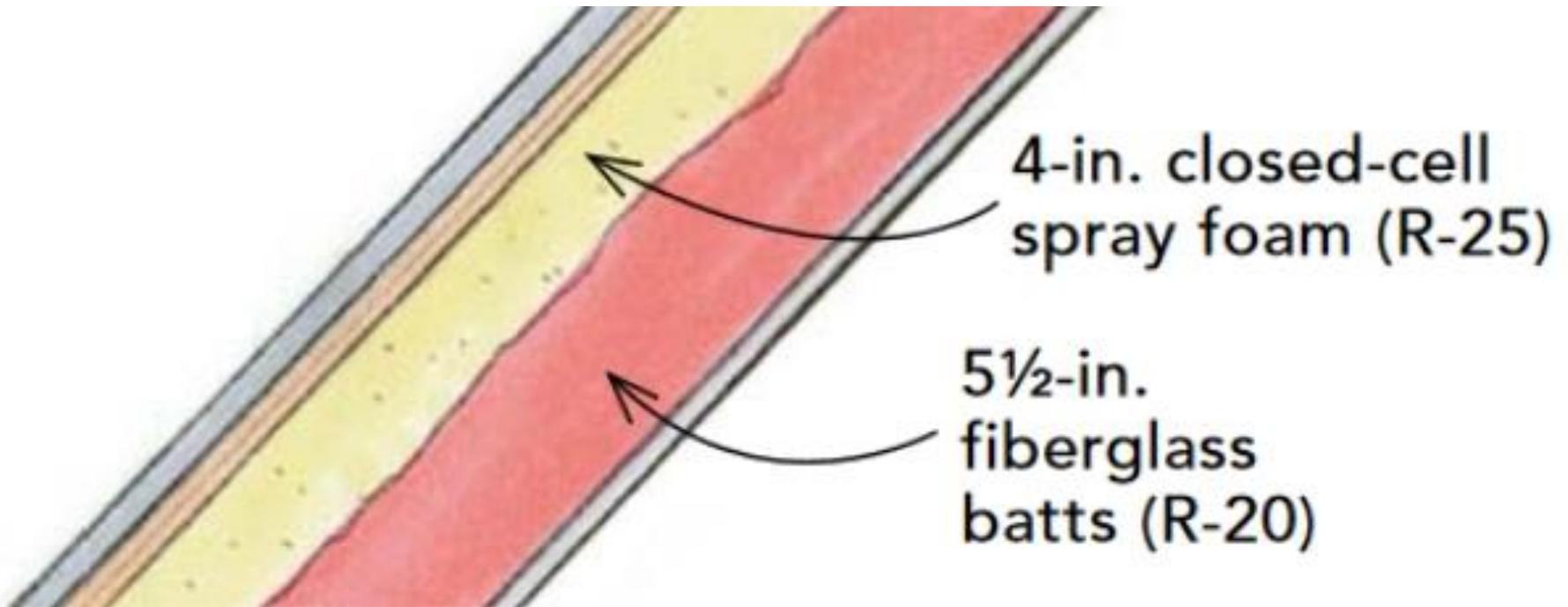
Unvented cathedral ceiling – Option 1



Unvented cathedral ceiling – Option 2

- **Flash-and-batt approach:** Install closed-cell spray foam on the underside of the roof sheathing, with fiberglass batts under the spray foam.
- In Zones 1, 2, or 3, you'll need at least R-5 of closed-cell foam to make this approach work.
- In Zone 4, you'll need at least R-15 of closed-cell spray foam to make this approach work.
- In Zone 5, you'll need at least R-20 of closed-cell spray foam to make this approach work.

Unvented cathedral ceiling – Option 2

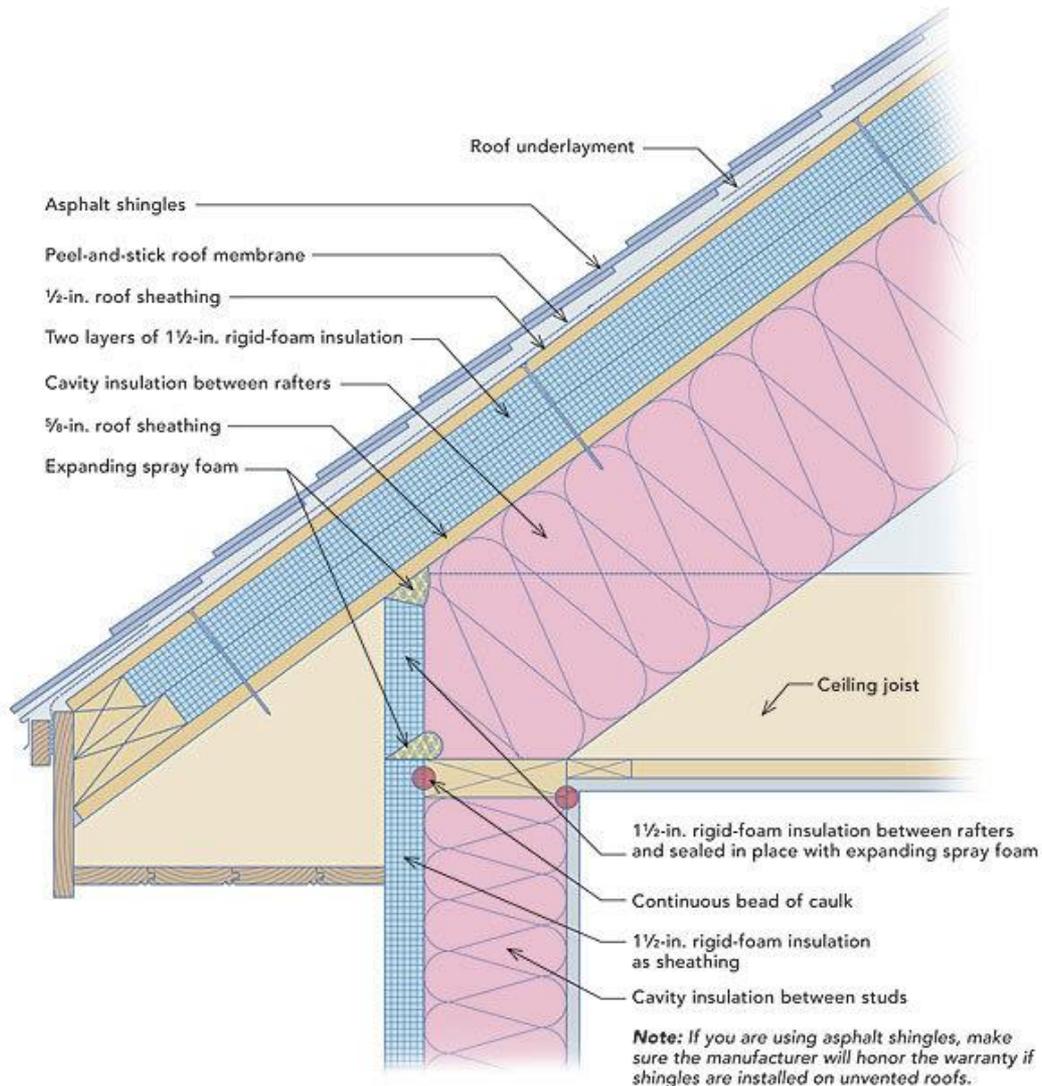


Flash and batt approach

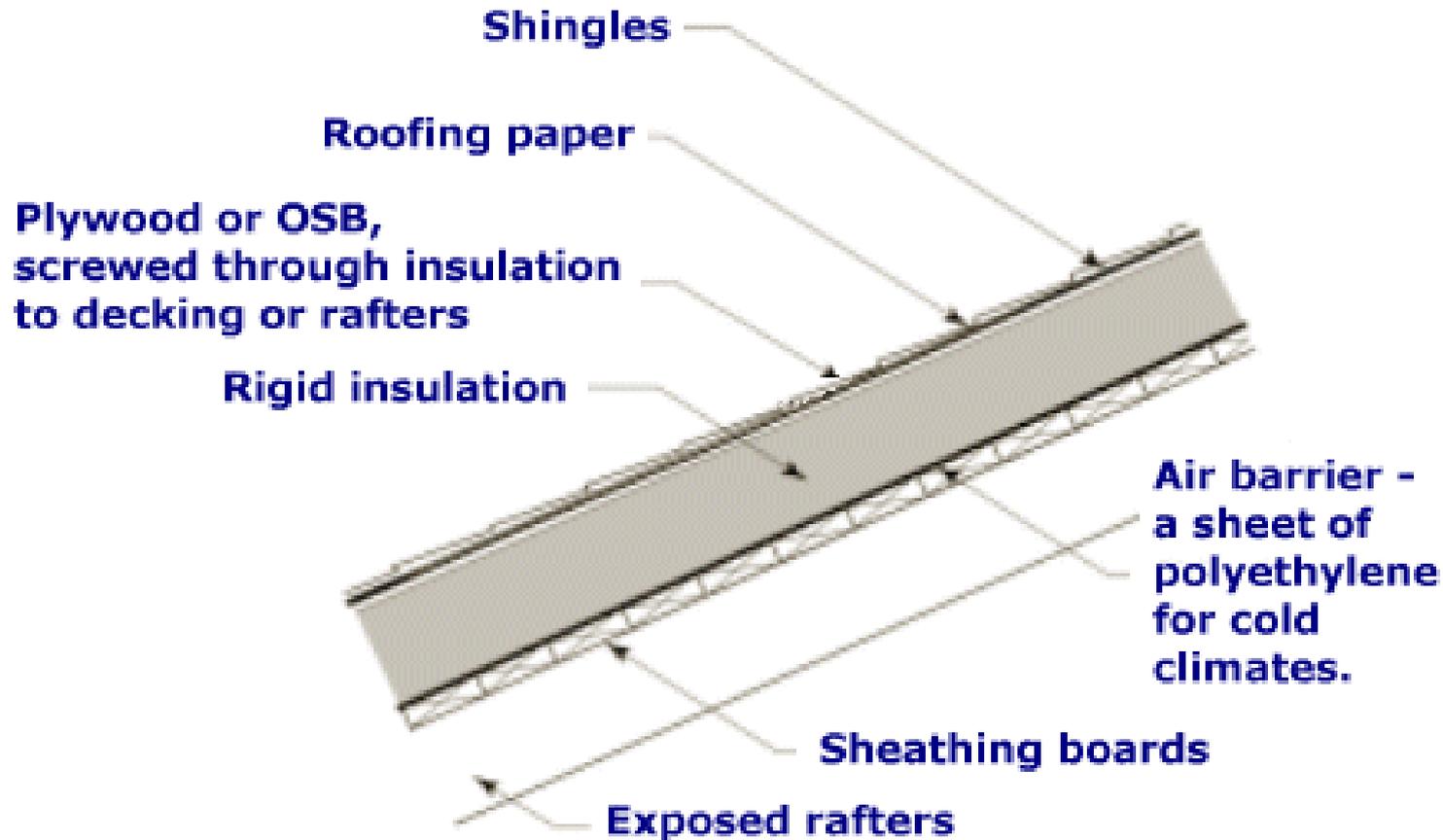
Unvented cathedral ceiling – Option 3

- Install an adequate thickness of continuous rigid foam above the roof sheathing, along with fluffy insulation between the rafters.
- In Zones 1, 2, or 3, you'll need at least R-5 of rigid foam to make this approach work.
- In Zone 4, you'll need at least R-15 of rigid foam to make this approach work.
- In Zone 5, you'll need at least R-20 of rigid foam to make this approach work.

Unvented cathedral ceiling – Option 3



Unvented cathedral ceiling – Option 4



All insulation is above the roof sheathing

Interior vapor retarders?

Unvented insulated roof assemblies are designed to dry to the interior, so these assemblies should never include interior polyethylene.

Dense-packed cellulose

Q. Can I install dense-packed cellulose in the rafter bays to create an unvented roof assembly?

A. No – not unless you also install an adequately thick layer of continuous rigid foam above the roof sheathing.

No recessed cans



What about unvented conditioned attics?

How are conditioned attics different from cathedral ceilings?

The main way they're different: there's no drywall.



Another difference: these attics usually don't have forced-air registers.

Conditioned attics can get humid

If open-cell spray foam is installed on the underside of the roof sheathing, attics can be quite humid – especially if there is no forced air register up there.



Thanks!

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