

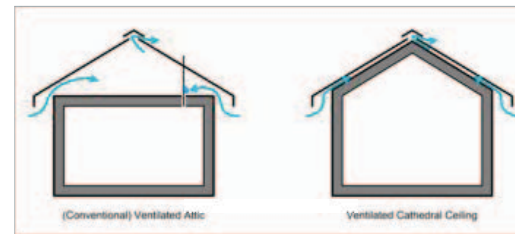
Vented and Unvented Roofs

Dr John Straube
 Building Science Corporation
 University of Waterloo



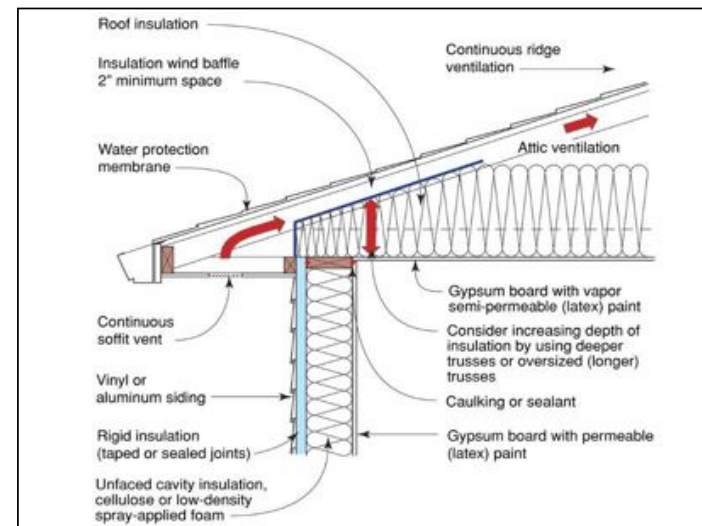
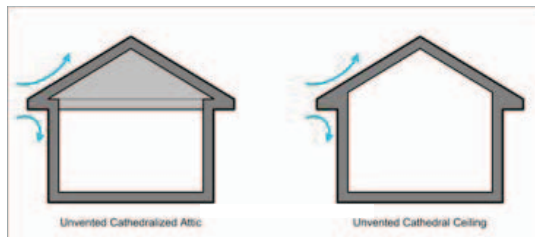
Pitched Roof Types

- Vented Attic
 - Insulation/air barrier at ceiling plane
- Cathedral Ceiling
 - Insulation/air barrier at roof plane



Pitched Roof Types

- Unvented Cathedralized Attic
 - As cathedral but no venting above insulation
- Unvented Cathedral





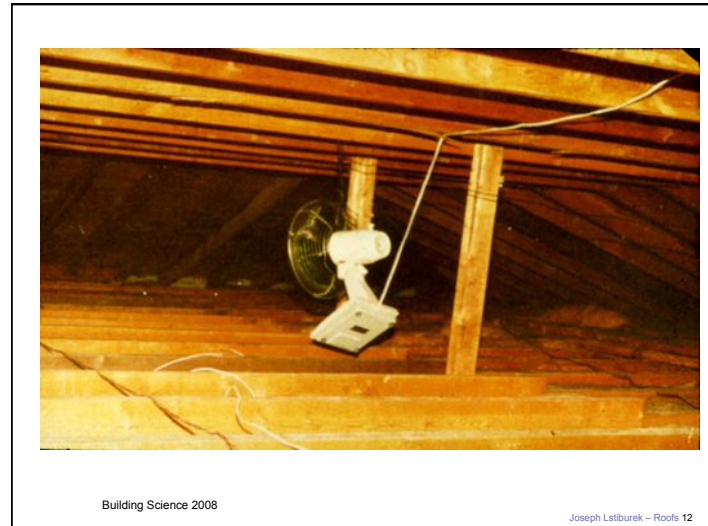
Vented Attics

- Ductwork placed in ventilated attics!
- Complex roof shapes hard to vent



Vented and Unvented Roofs

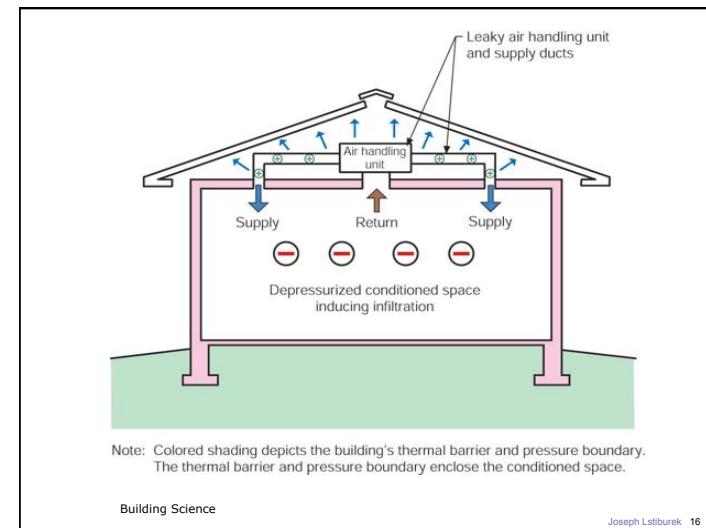
Condensation forms on nails first (coldest) then sheathing (cold) framing (warmest)

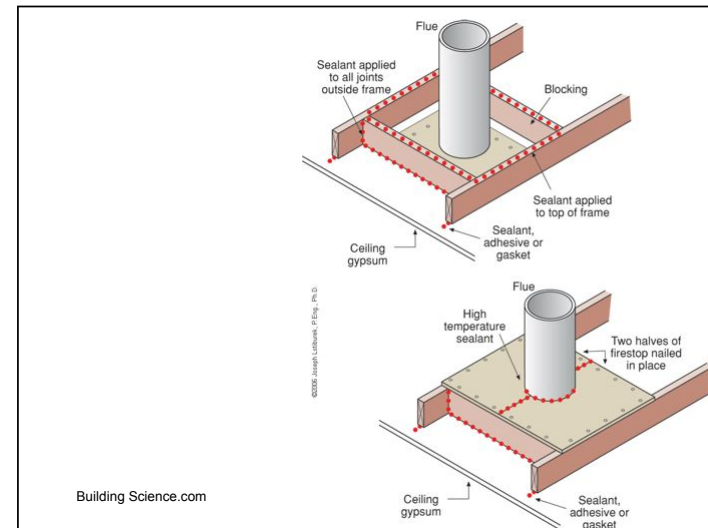
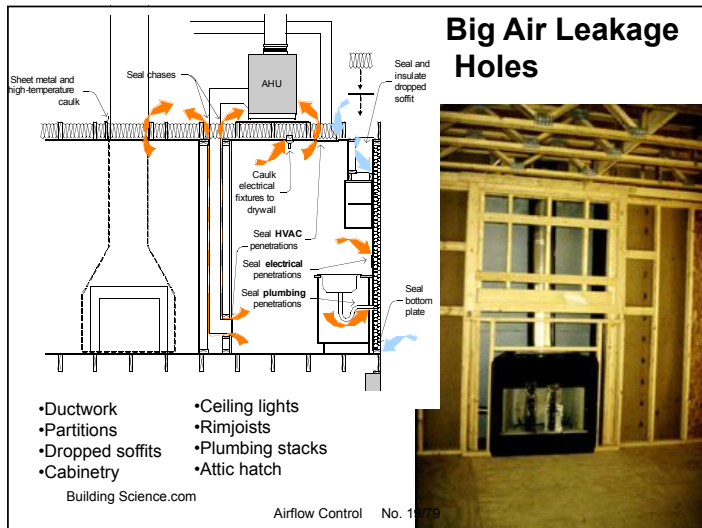
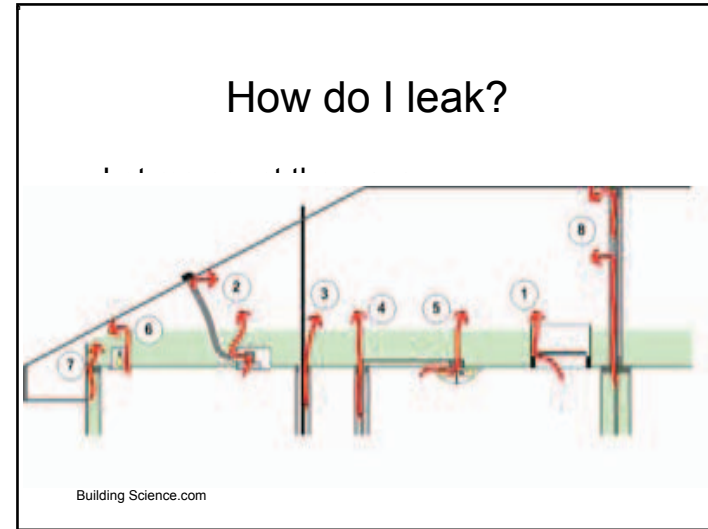
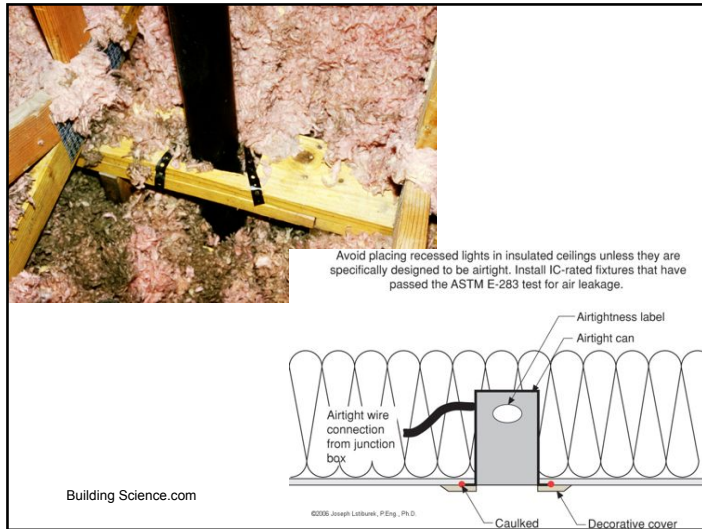


Vented Attics

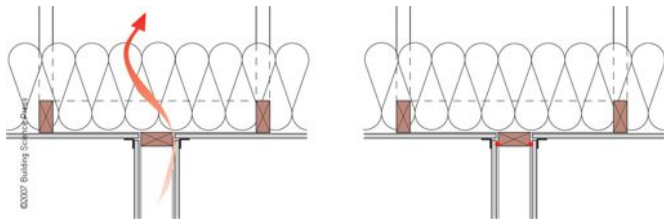
- Air leakage thru ceiling is a problem in colder weather
 - Ducts are a disaster in both
- Condensation and heat gain on ducts in warm climates
- Modern roofs often hard to vent

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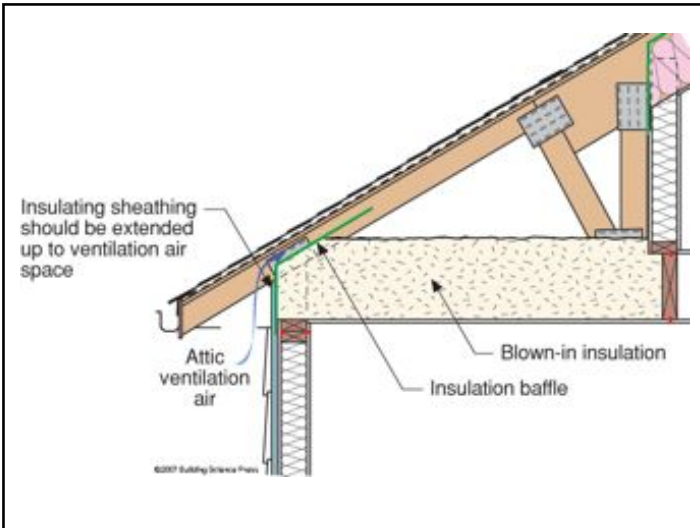




Partition leaks (1/8" x 100 ft)



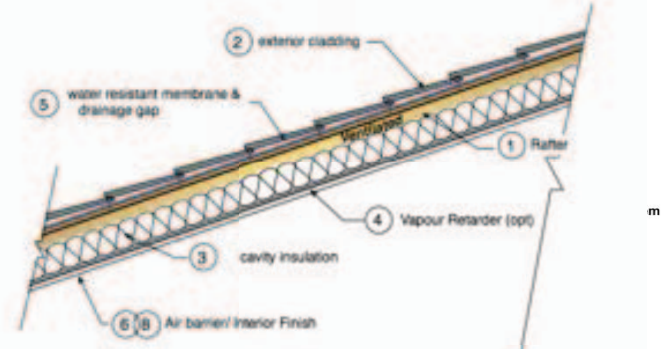
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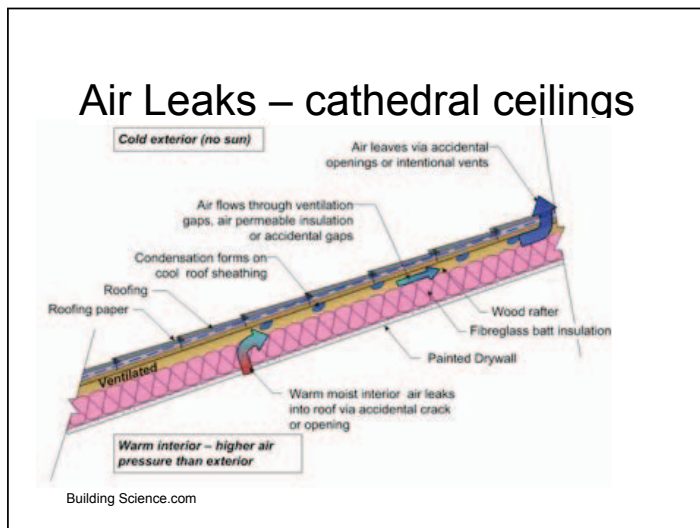
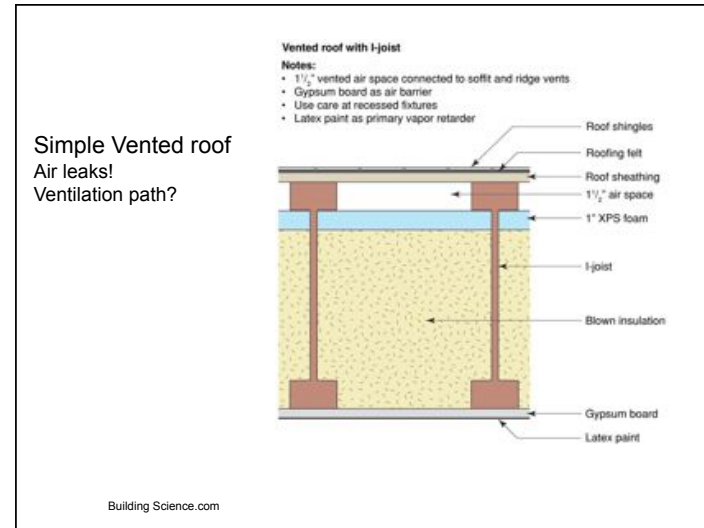
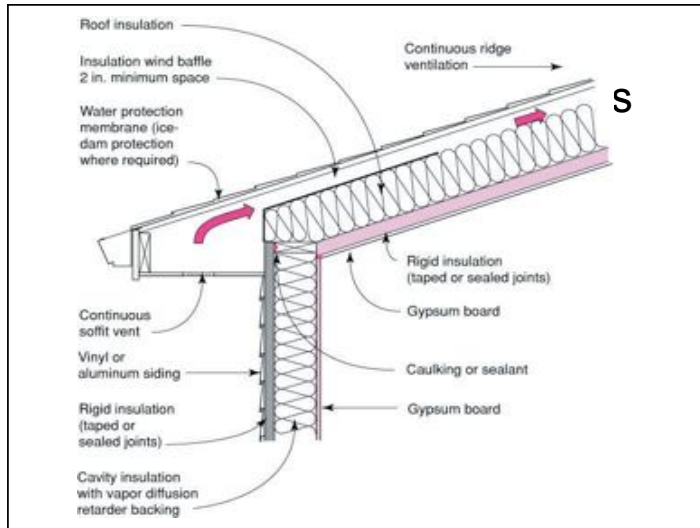
Air sealing



Ventilated Cathedral Ceiling



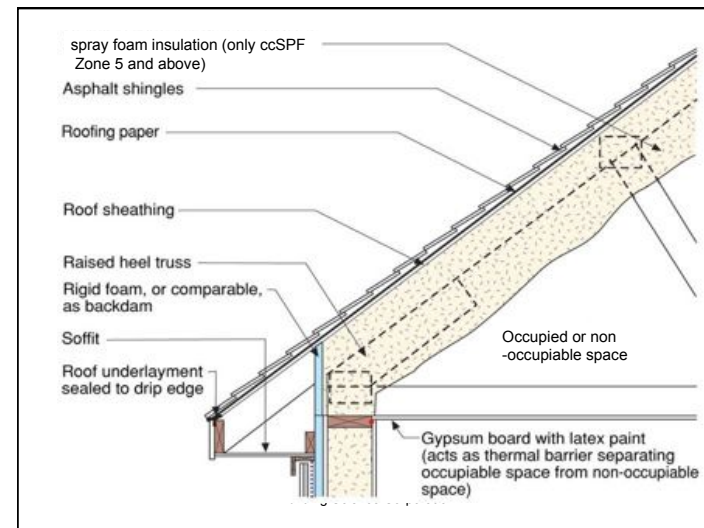
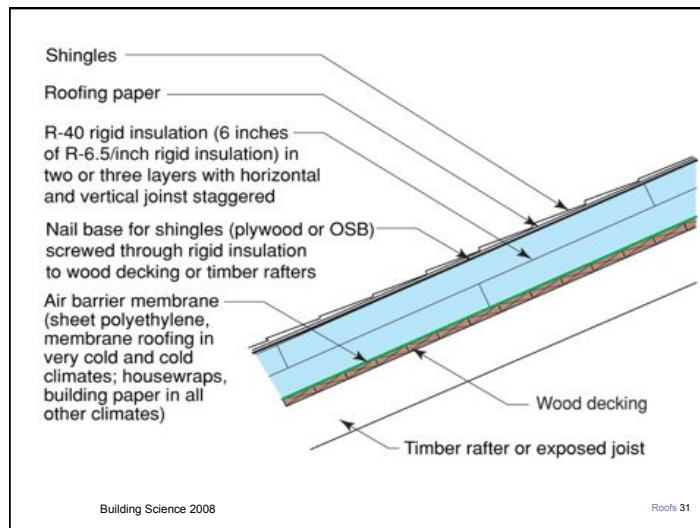
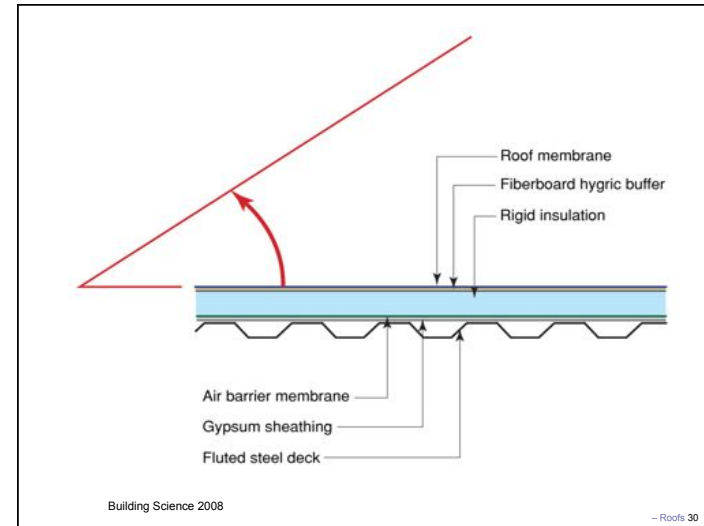
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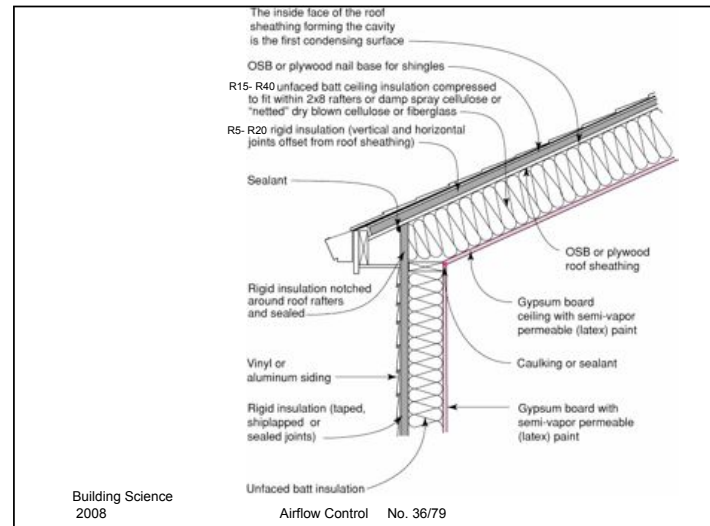
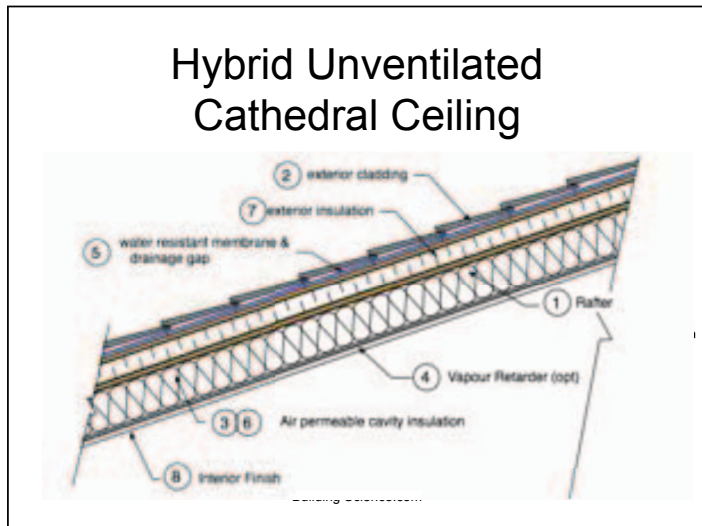
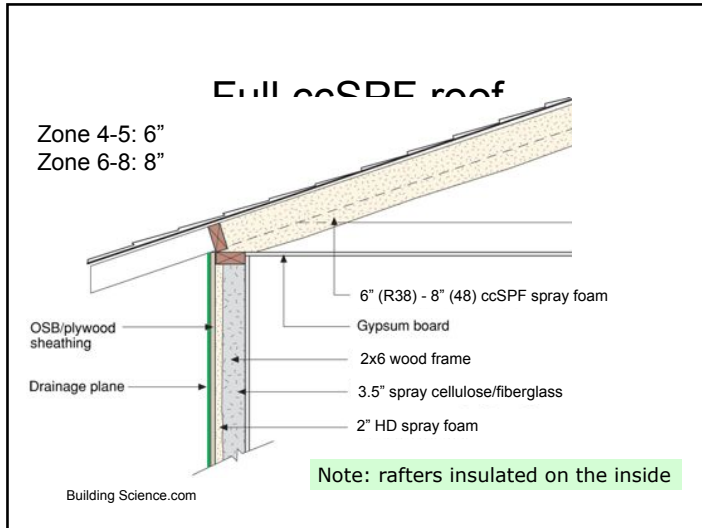


Unvented Cathedralized Attics

- Move air and insulation control from ceiling plane to roof plane
- Allows attic space to be used
- Or HVAC into conditioned space
 - Saves lots of energy, reduce problems with comfort, extends life of equipment
- Avoids wind blown rain, snow, and burning wildfire embers

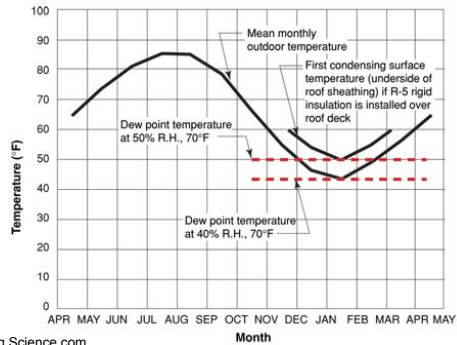
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Air Leaks: Monthly Calculation

Compare interior air dewpoint to exterior sheathing temperature



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Hybrid Roof Insulation IRC

- IRC 2009

TABLE R806.4
INSULATION FOR CONDENSATION CONTROL

CLIMATE ZONE	MINIMUM RIGID BOARD OR AIR-IMPERMEABLE INSULATION R-VALUE ^a	CCSPF
2B and 3B the roof only	0 (none required)	1*
1, 2A, 2B, 3A, 3B, 3C	R-5	2*
4C	R-10	2.5*
4A, 4B	R-15	3+*
5	R-20	4+*
6	R-25	5*
7	R-30	6*
8	R-35	

^a Contributes to but does not supersede Chapter 11 energy requirements.

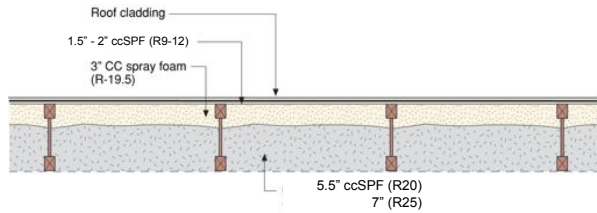
... or all air impermeable insulation

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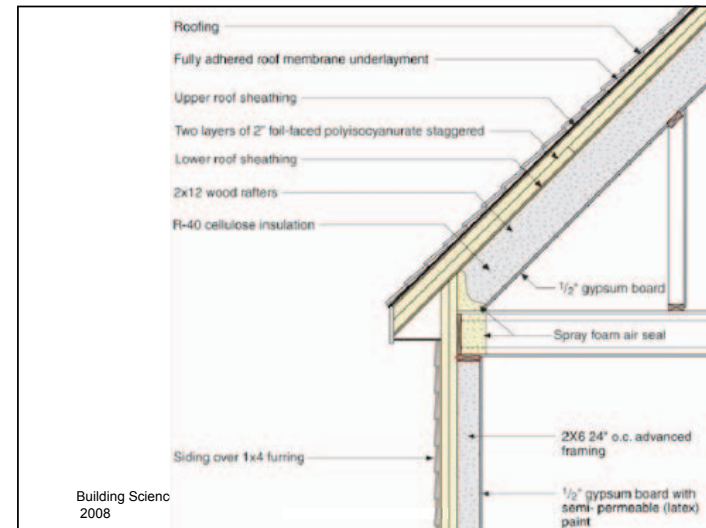
Hybrid Code R & fire protection

Cold Climate R30: Zone 3
R38: Zone 4

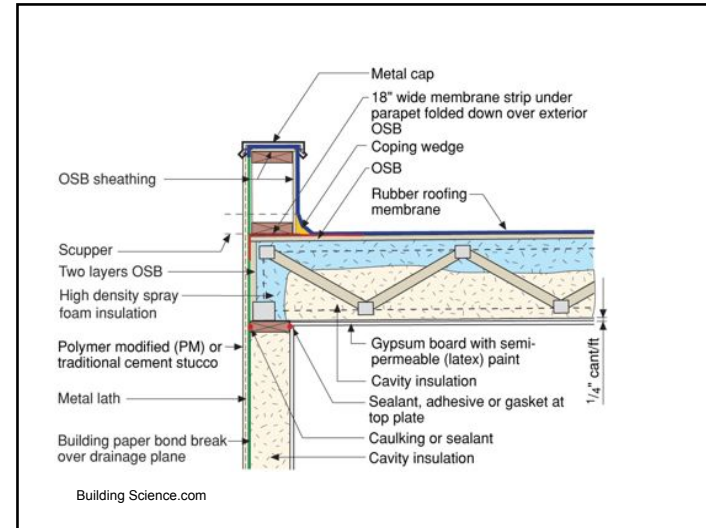
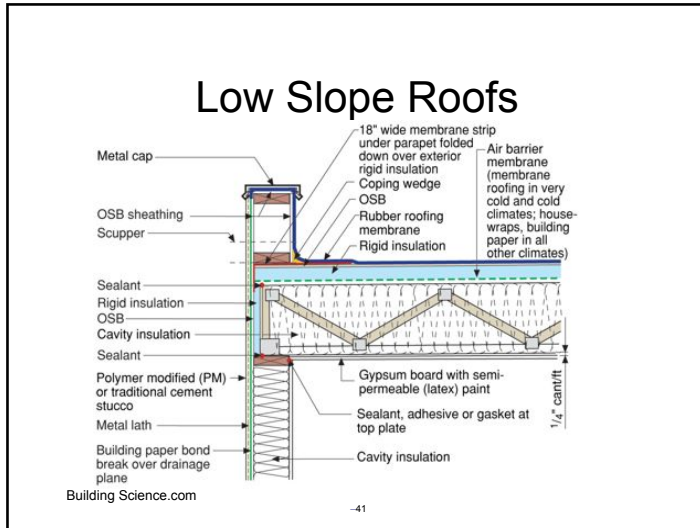


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- ### US Code: IRC R806.4
- “Cathedralized attics” explicitly allowed
 - Require air impermeable insulation in contact
 - No additional vapor control needed in Zones 1-4
 - Insulation needs to be
 - Zone 4 Marine, Zones 5 and higher need retarder
 - All of Canada

Hybrid Roof Insulation IRC

- IRC 2009

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a. Contributes to but does not supersede Chapter 11 energy requirements.

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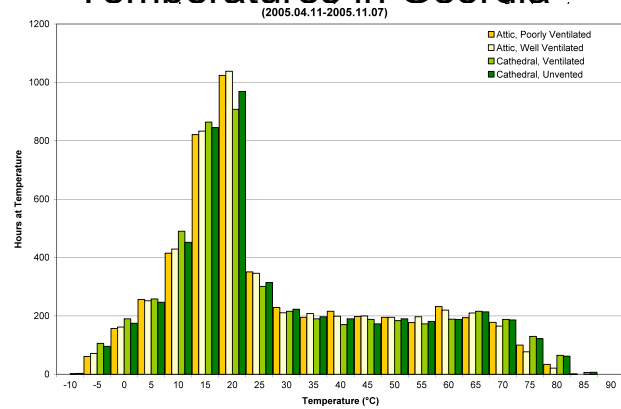
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Roof Temperatures

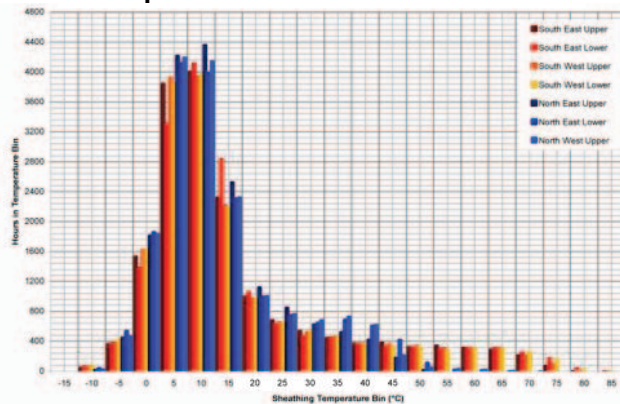
- Shingle life is affected by high temperatures
- Ventilation does little to cool shingles!
 - Extensive field research
- Roof color has big effect
- Orientation has a big effect

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Temperatures in Georgia



Temperatures in Vancouver



Large Vent Areas= Cooling



Conclusions

- Highly ventilated open attic with R50+ of low cost fibrous insulation is best
 - Requires good air sealing of ceiling
 - No duct work! (less than 5% leakage?)
- Unvented roofs provide more options
 - Airtightness is again *critical* to success
 - Hybrid foam /fibrous
- Venting does not cool shingles noticeably

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