High Performance Attics and Roofs EPIC

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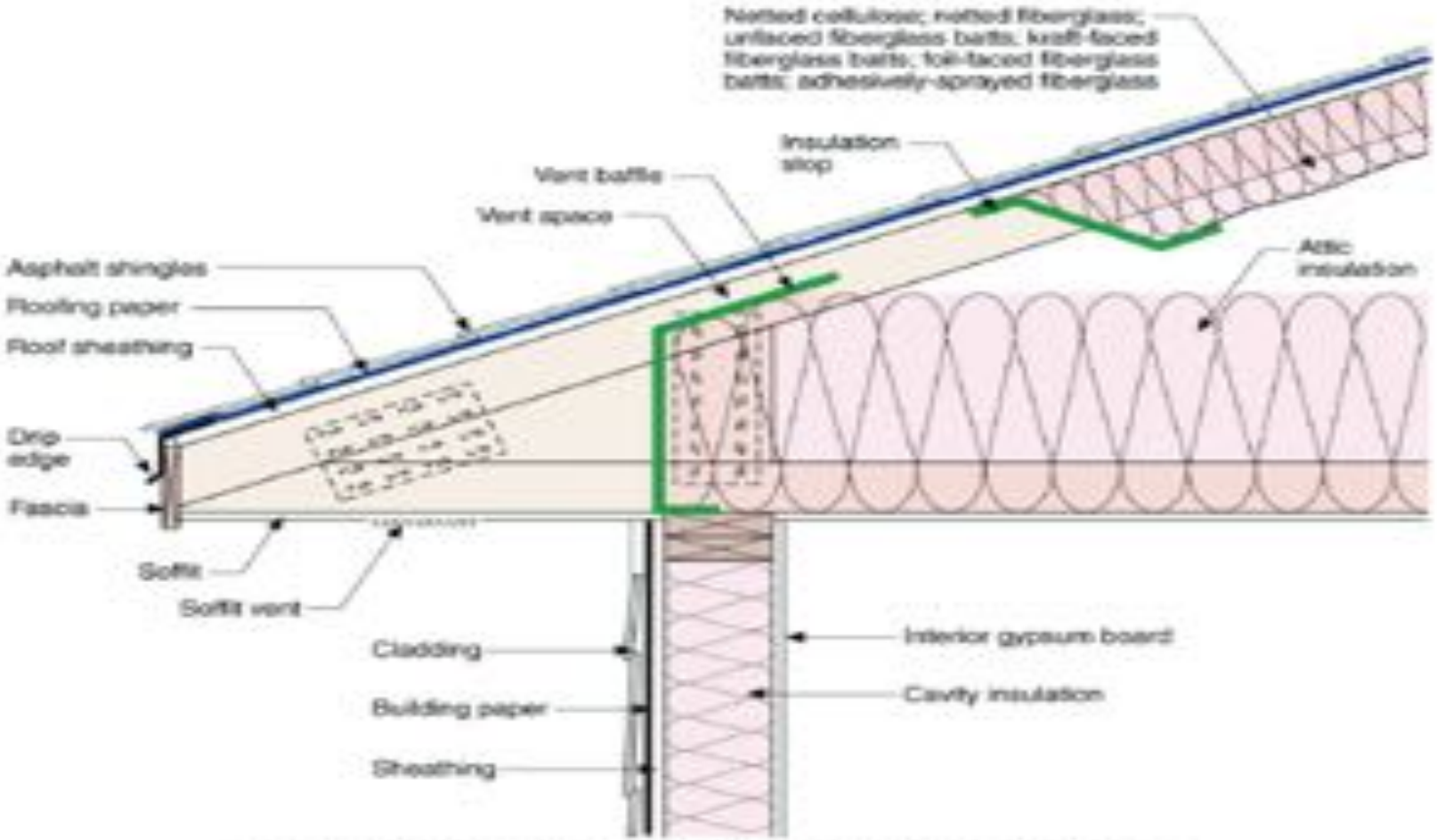
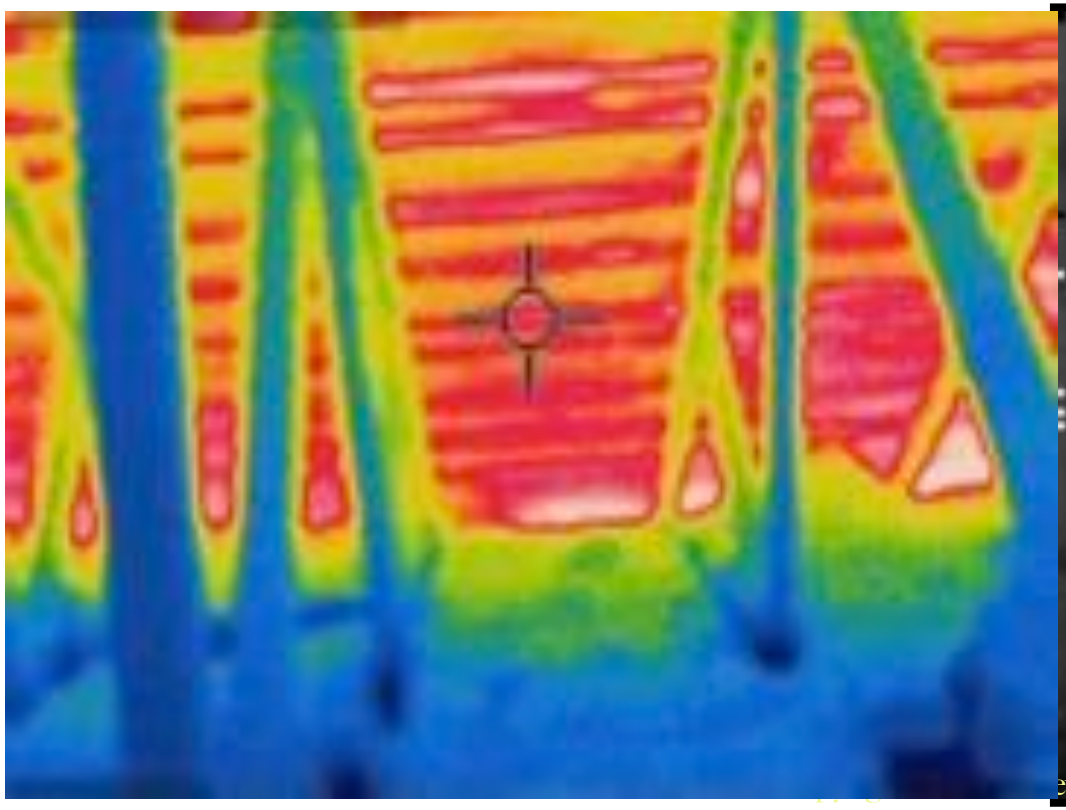


Figure 1: Venting Details for Modified Conventional Vented Attic

Duct Conduction (H/C)

- Duct conduction can be calculated with the formula

$$Q = (A^* \Delta T)/R$$



Duct Conduction (H/C)

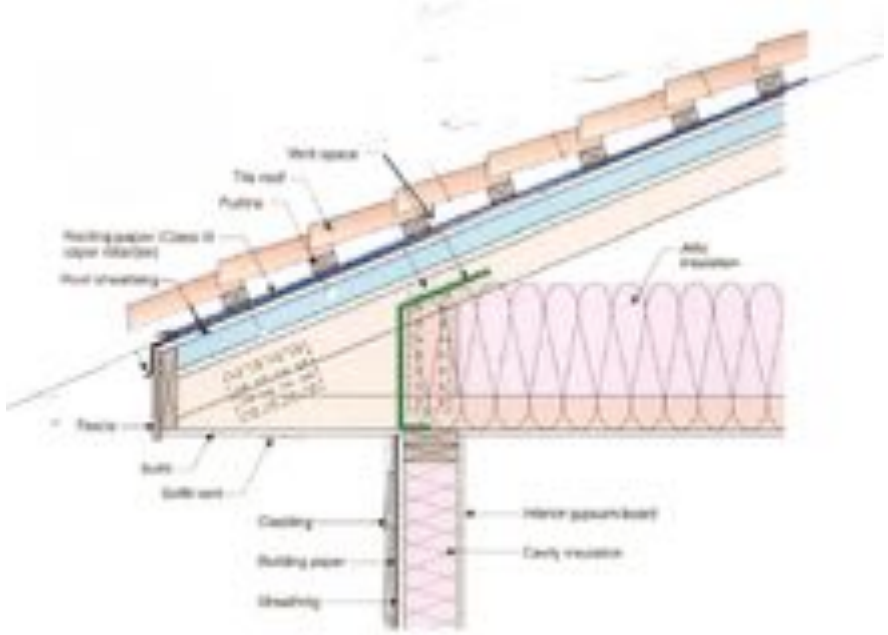
- If a 2,100 square foot house has an attic temperature of 130°F what is the duct conduction when the system is running and the duct insulation is R-6? (Duct area = 40% of floor area)

1. $Q = (A * \Delta T)/R$
2. $Q = (840 \text{ sq.ft. }) * (130^{o}F - 55^{o}F)) / R6$
3. $Q = 840 * 75^{o}F / R6$
4. $Q = 63{,}000 \text{ BtuH } /R6$
5. $Q = 10{,}500 \text{ BtuH or } + .875 \text{ ton}$

Figure 3-16: Prescriptive Requirements for Roof/Ceiling Insulation (§150.1(c).1)

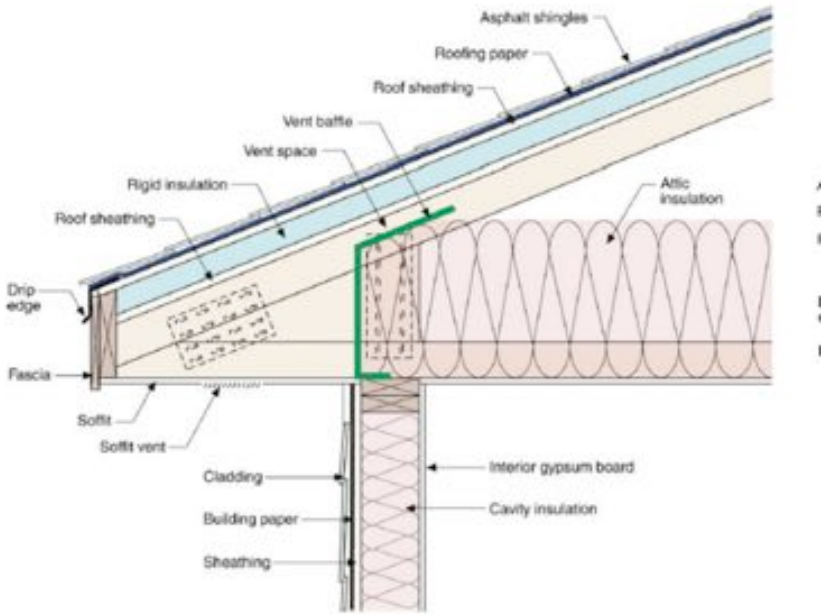
Strategy		How to Comply
High-Performance Ventilated Attics		
Option A	Vented attic with continuous insulation applied above the roof deck. (Figure 3-18). Ceiling insulation required separately above finished attic ceiling.	Table 150.1-A of the Energy Standards Roof Assembly Option A
Option B	Vented attic with batt, spray in cellulose/fiberglass secured with netting, or SPF. (Figure 3-18). Ceiling insulation required separately above finished attic ceiling.	Table 150.1-A of the Energy Standards Roof Assembly Option B
Ducts in Conditioned Space		
Option C	Vented attic with no insulation at roof deck. Ceiling insulation required separately above finished attic ceiling. Ducts and air handler equipment in conditioned space that is NOT a sealed attic.	Table 150.1-A of the Energy Standards Roof Assembly Option C Form: CF2R-MCH-20b

HPA-A: Option A *Insulation Above the Roof Deck Sheathing or Rafters With Air Space*



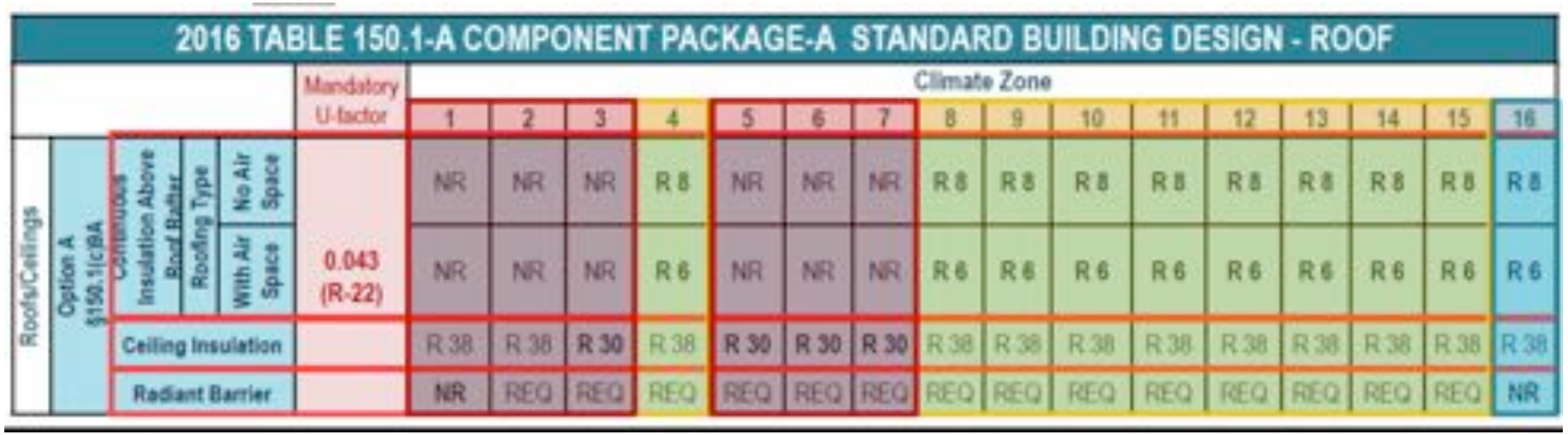
Requirements:
R-6 Rigid insulation, air gap present
Radiant Barrier
R-38 insulation above the ceiling lid
A ventilated attic

HPA-A: Option A *Insulation Above the Roof Deck Sheathing or Rafters*



Requirements:
R-8 Rigid, no air gap is present
Radiant Barrier
R-38 insulation above the ceiling lid
A ventilated attic

HPA-A: Option A *Insulation Above the Roof Deck Sheathing or Rafters*

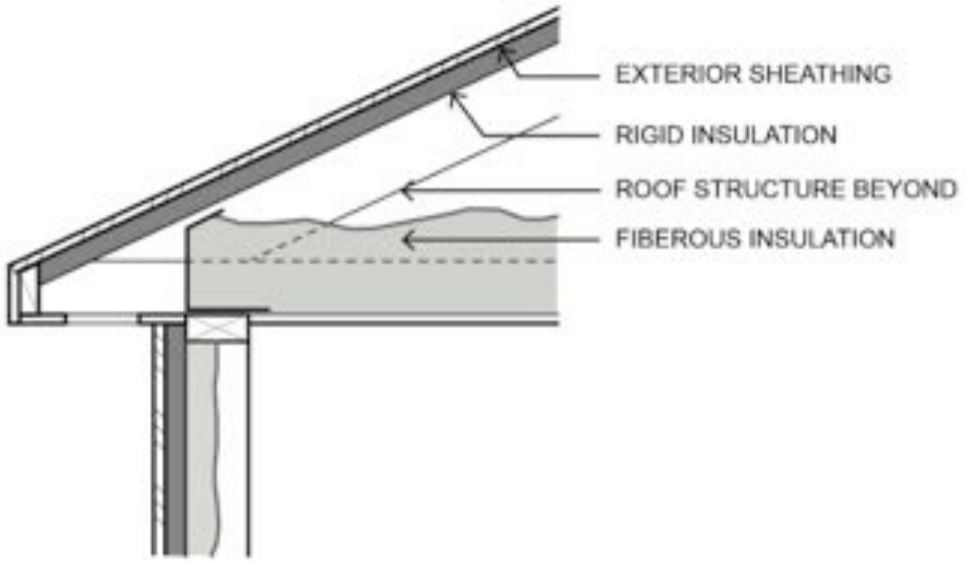


2016 TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN - ROOF

				Mandatory U-factor	Climate Zone														
					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roofs/Ceilings	Option A §150.1(c)8A	Continuous Insulation Above Roof Rafter	Roofing Type	No Air Space	0.043 (R-22)	NR	NR	NR	R 8	NR	NR	NR	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8	R 8
				With Air Space		NR	NR	NR	R 6	NR	NR	NR	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6	R 6
		Ceiling Insulation				R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
		Radiant Barrier				NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

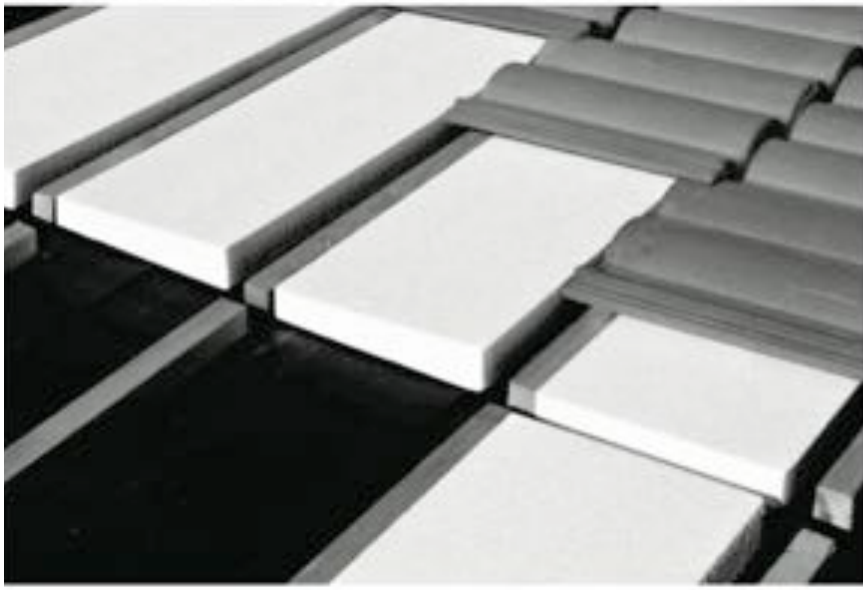
Requirements:
R-6 when an air gap is present
R-8 when no air gap is present
Radiant Barrier
R-38 insulation above the ceiling lid
A ventilated attic

HPA-A: Option A *Insulation Above the Roof Deck Sheathing or Rafters*



Requirements:
R-8 when no air gap is present
R-6 when an air gap is present
Radiant Barrier
R-38 insulation above the ceiling lid
A ventilated attic

HPA-A: Option A *Insulation Above the Roof Deck Sheathing or Rafters*



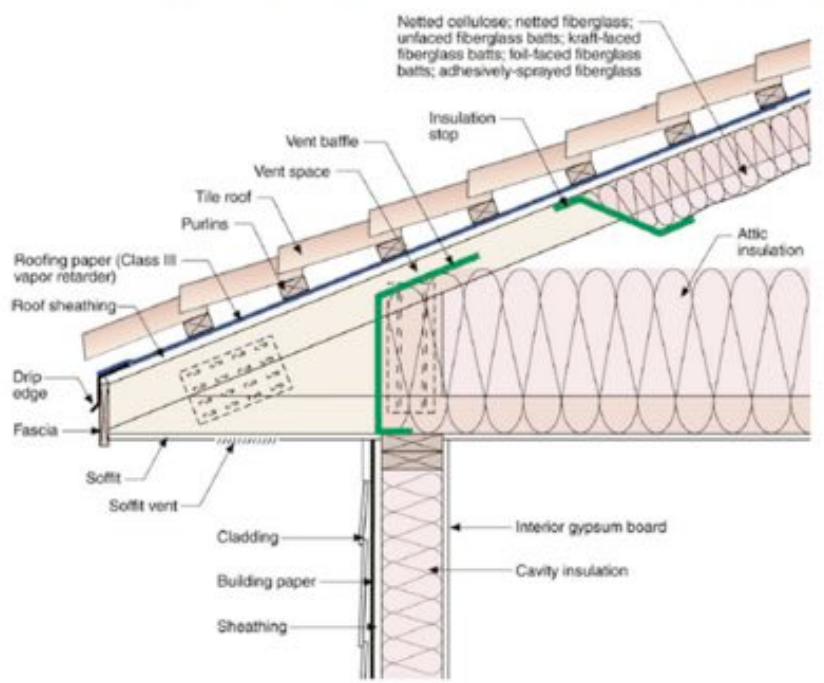
Source: Wedge-It

Requirements:
R-6 when an air gap is present
R-8 when no air gap is present
Radiant Barrier
R-38 insulation above the ceiling lid
A ventilated attic

HPA-A: Option A *Insulation Above the Roof Deck Sheathing or Rafters*

Requirements:
R-6 when an air gap is present
R-8 when no air gap is present
Radiant Barrier
R-38 insulation above the ceiling lid
A ventilated attic

HPA-B: Option B *Insulation Below the Roof Deck Sheathing Between Framing*



Requirements:

- R-13 when an air gap is present
  (R-18 when no air gap is present)
- R-38 insulation above the ceiling lid
- A ventilated attic

HPA-B: Option B *Insulation Below the Roof Deck Sheathing Between Framing*

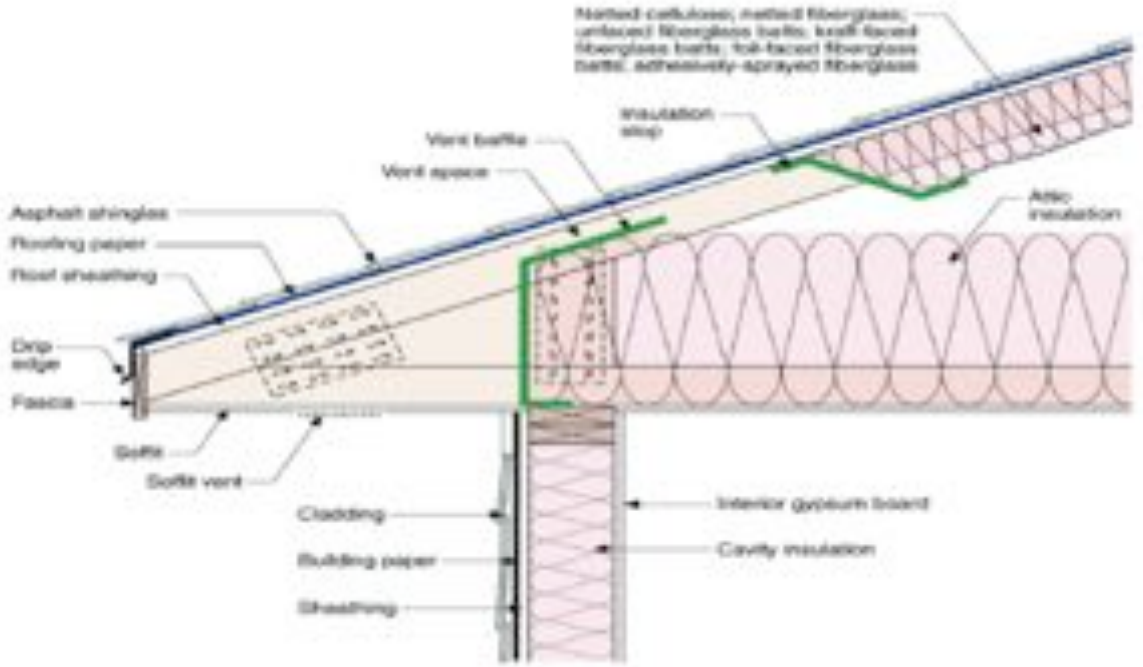


Figure 1: Venting Details for Modified Conventional Vented Attic

Requirements:

R-18 when no air gap is present
R-38 insulation above the ceiling lid
A ventilated attic

HPA-B: Option B *Insulation Below the Roof Deck Sheathing Between Framing*

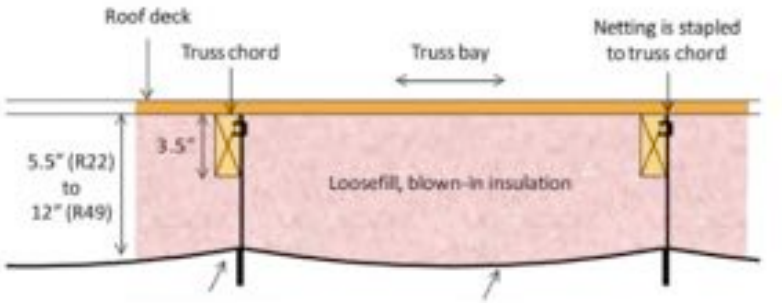
2016 TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN - ROOF

					Mandatory U-factor	Climate Zone														
						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roofs/Ceilings	Option B §150.1(c)1A	Below Roof Deck	Roofing Type	No Air Space		NR	NR	NR	R 18	NR	NR	NR	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18	R 18
				With Air Space	0.043 (R-22)	NR	NR	NR	R 13	NR	NR	NR	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13	R 13
		Ceiling Insulation				R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
		Radiant Barrier				NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR

Requirements:

R-18 when no air gap is present
R-13 when an air gap is present
R-18 when no air gap is present
R-38 insulation above the ceiling lid
A ventilated attic

Option C Ducts in Conditioned Space or High Performance Sealed Attic HPSA



HPSA Does NOT qualify for ducts in conditioned space

Option C Ducts in Conditioned Space

- Requirements:
- Air handler and ducts to be in conditioned space
- Radiant barrier to be installed (climate zone dependent)
- R-30/38 installed at ceiling (climate zone dependent)
- A ventilated attic

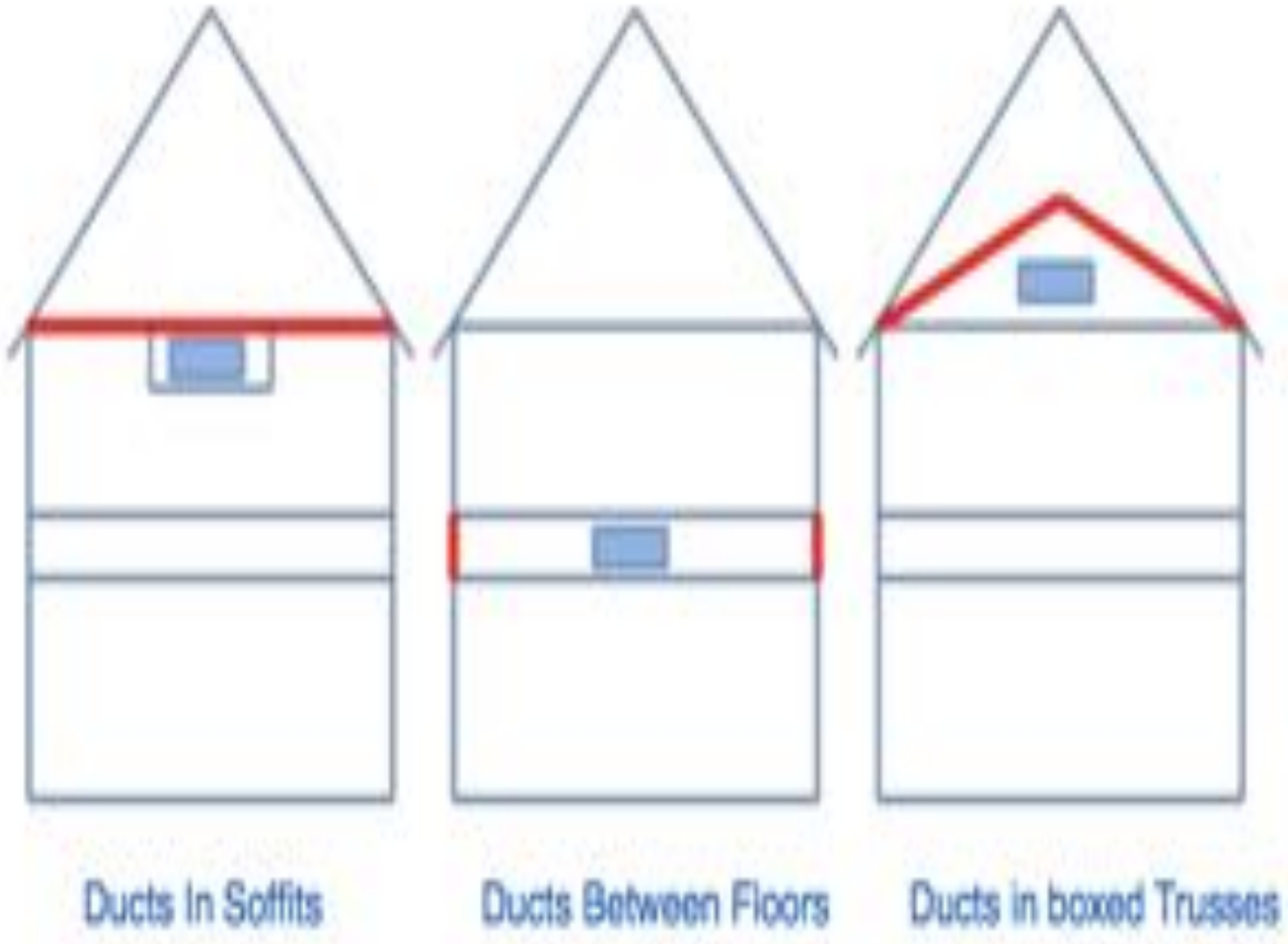
Option C Ducts in Conditioned Space

- Eliminate attic heat gain on HVAC System
- Eliminate air leakage to outside and resulting pressure imbalances
- Ability to downsize HVAC equipment
- Several Approaches

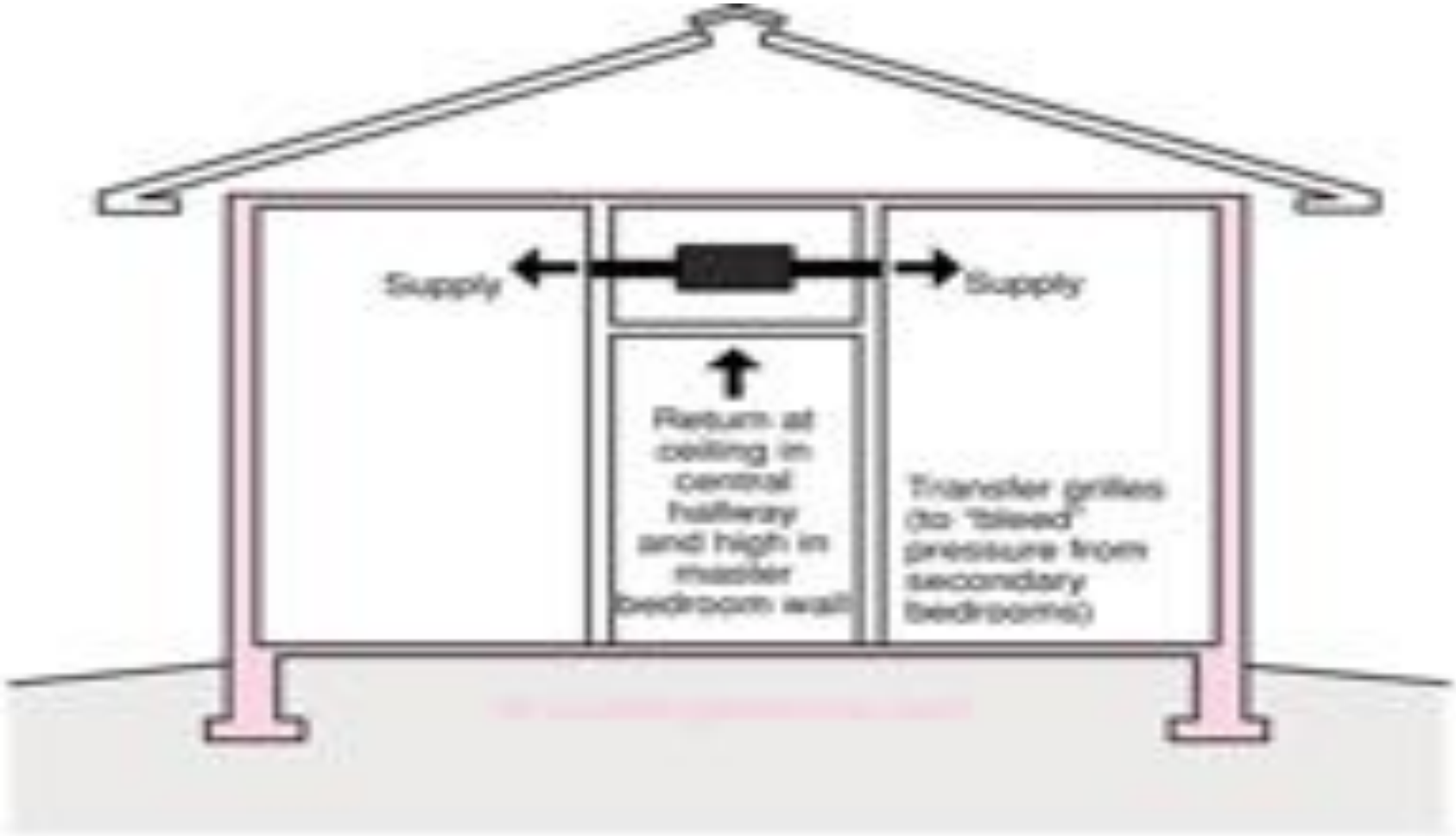
Option C Ducts in Conditioned Space

2016 TABLE 150.1-A COMPONENT PACKAGE-A STANDARD BUILDING DESIGN - ROOF

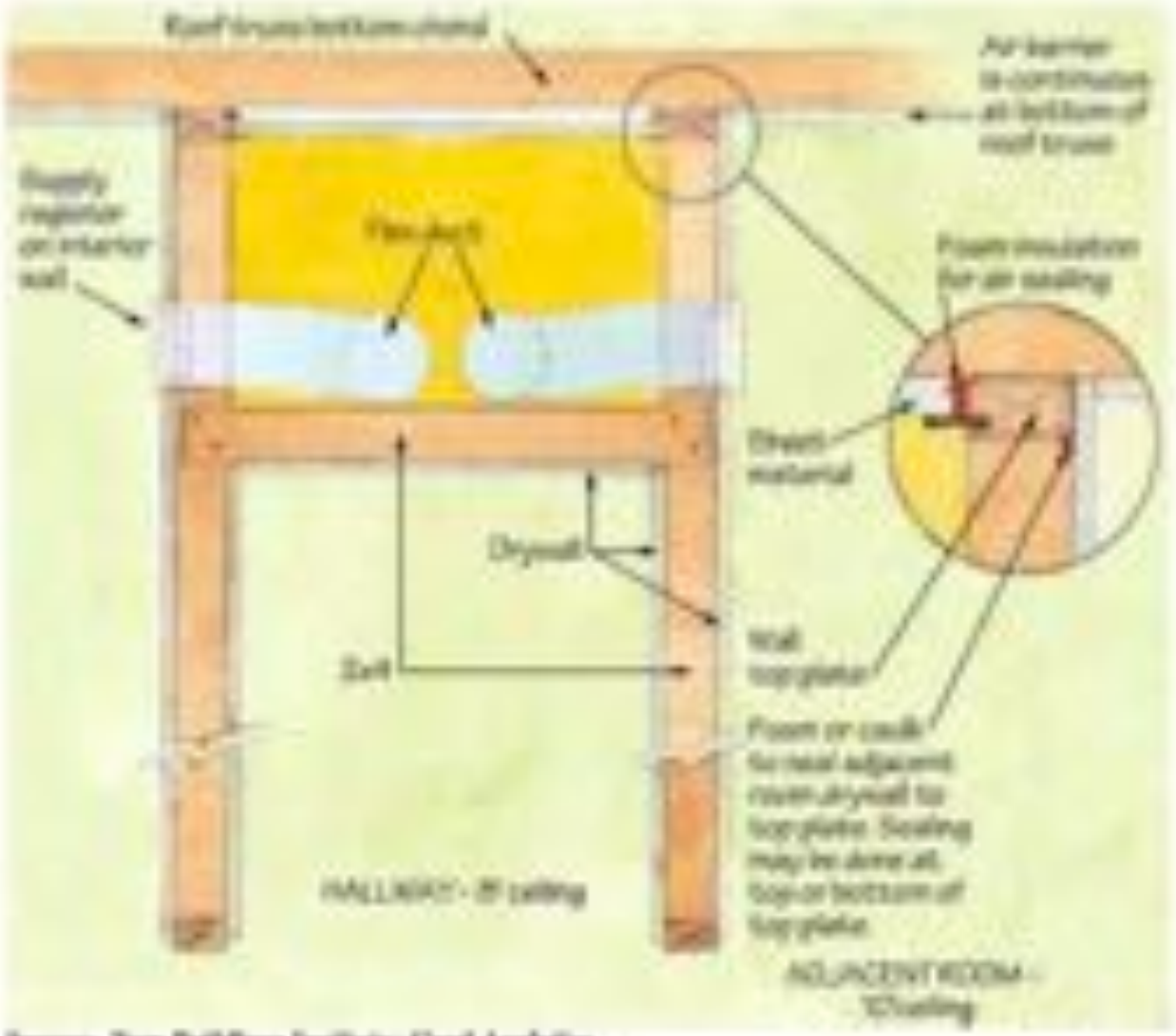
			Mandatory U-factor	Climate Zone														
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Roofs/Ceilings	Option C §150.1(c)9B	Ceiling Insulation	~~0.043~~ (R-22)	R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
		Radiant Barrier		NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR


Ducts In Soffits
Ducts Between Floors
Ducts in boxed Trusses

Ducts Inside



Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary encloses the conditioned space.



Source: New Buildings Institute; Gard Analytics

Figure 16. Illustration of dropped ceiling approach. Air sealing the duct passageway is important to avoid air flow into the attic and minimize losses

Truss Integrated "Plenum Truss"

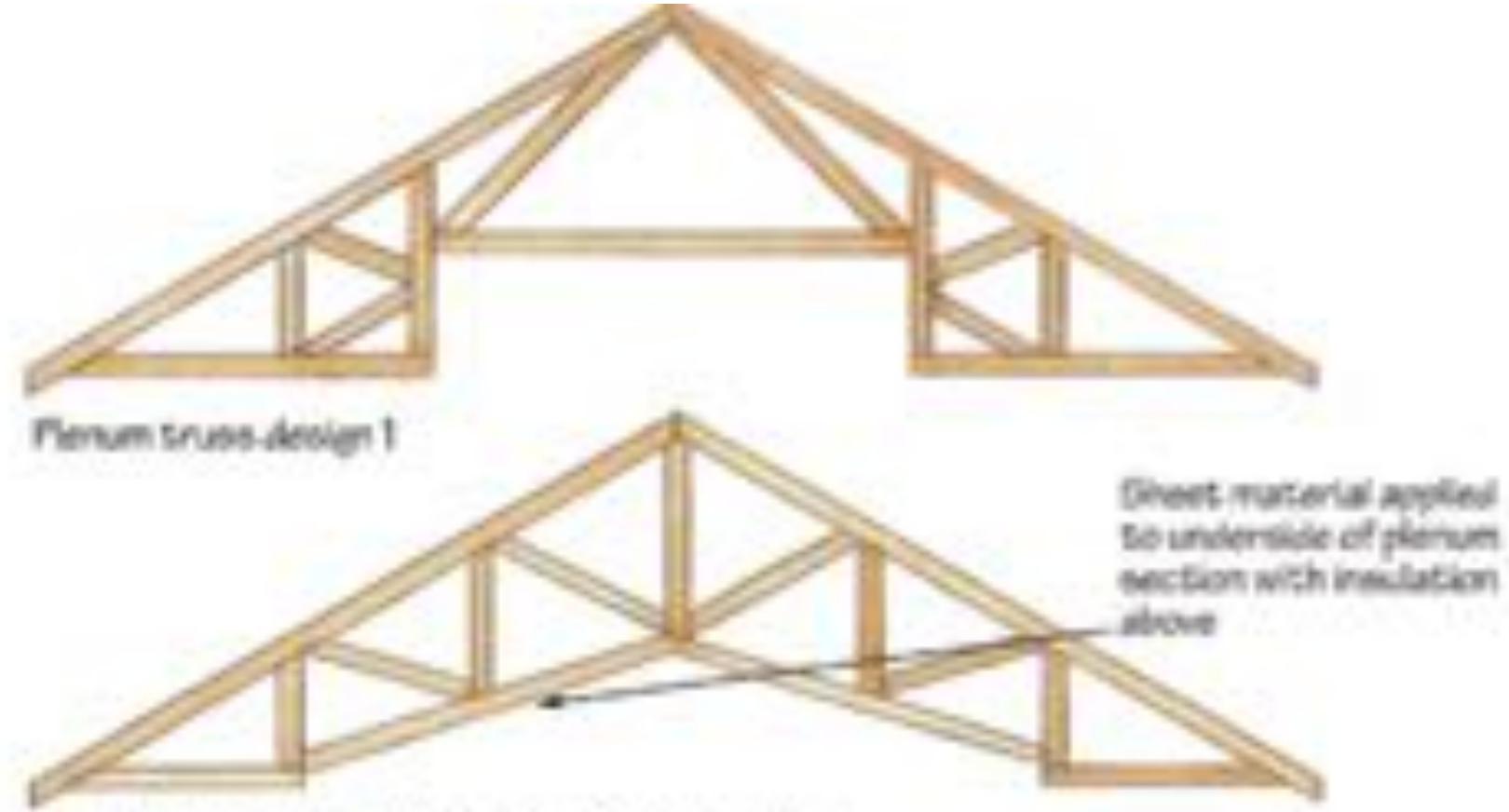


Figure 15. Two approaches to truss design to accommodate duct runs under insulation

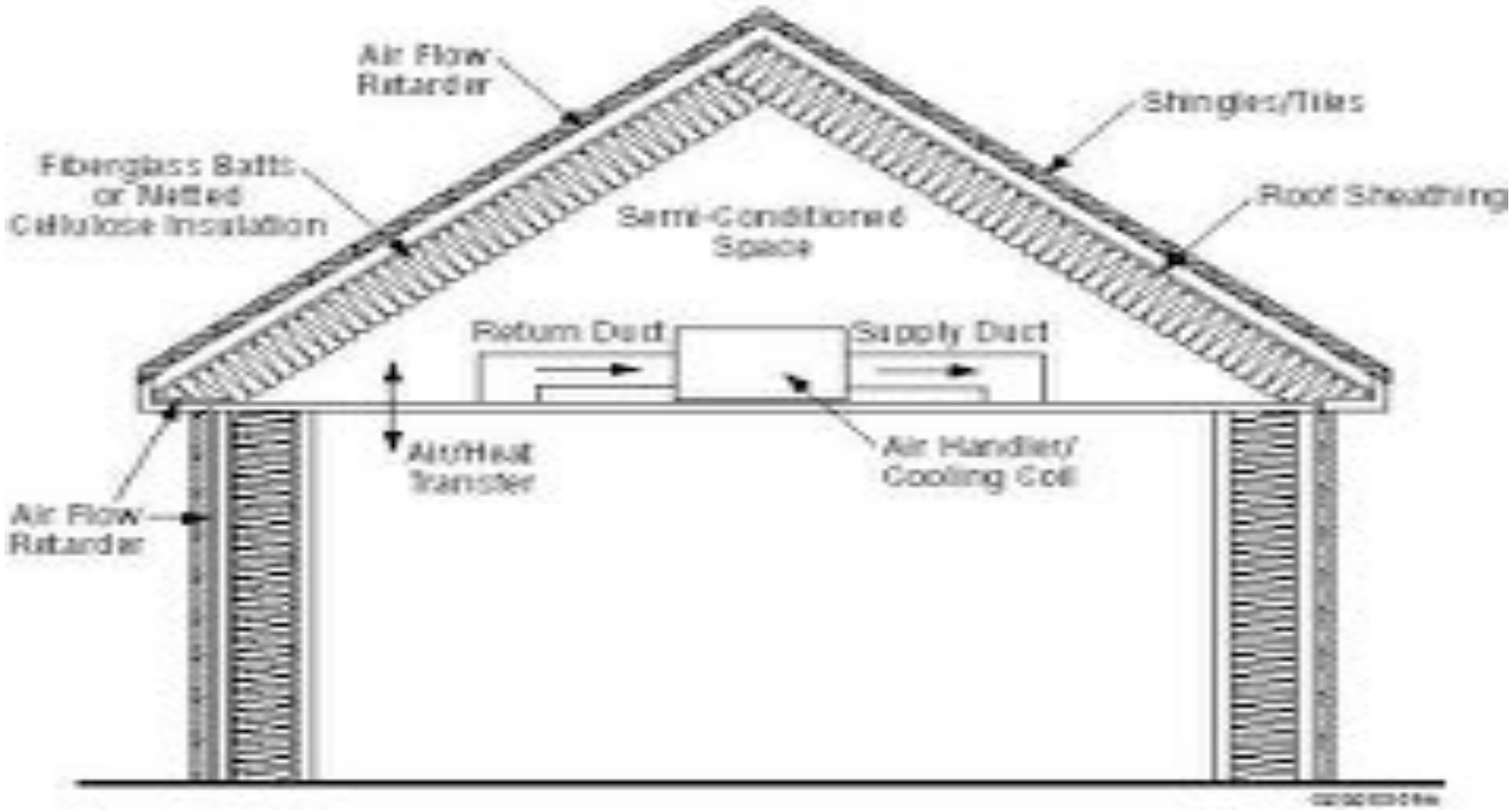
Option: Ducts in Modified Truss

- A space for ducts is created above the ceiling plane by using a modified roof truss configuration and moving the thermal boundary up into the attic.

Option: Ducts in Modified Truss

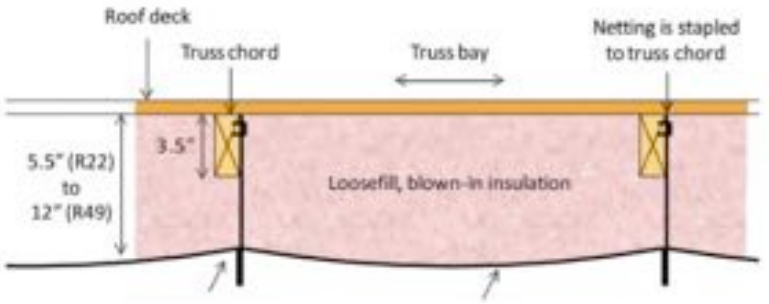
“Plenum Truss”

Option C High Performance Sealed Attic HPSA



Does NOT qualify for ducts in conditioned space

Option C High Performance Sealed Attic HPSA



Does NOT qualify for ducts in conditioned space

Requirements:

Complete air sealing between attic space and exterior

Code minimum insulation levels underside of roof deck

Could use rigid insulation above roof deck, foam board or structural insulated panels (SIPS)

Sealed combustion furnace or a heat pump

Gable end walls to be insulated

- Attic ventilation not needed or allowed
- Does not require radiant barrier
- Does not require insulation at ceiling
- Does not require venting

Option C High Performance Sealed, Un-vented, Attic HPSA

Does NOT qualify for ducts in conditioned space

Requirements:

Complete air sealing between attic space and exterior

Code minimum insulation levels underside of roof deck

Could use rigid insulation above roof deck, foam board or structural insulated panels (SIPS)

Sealed combustion furnace or a heat pump

Gable end walls to be insulated

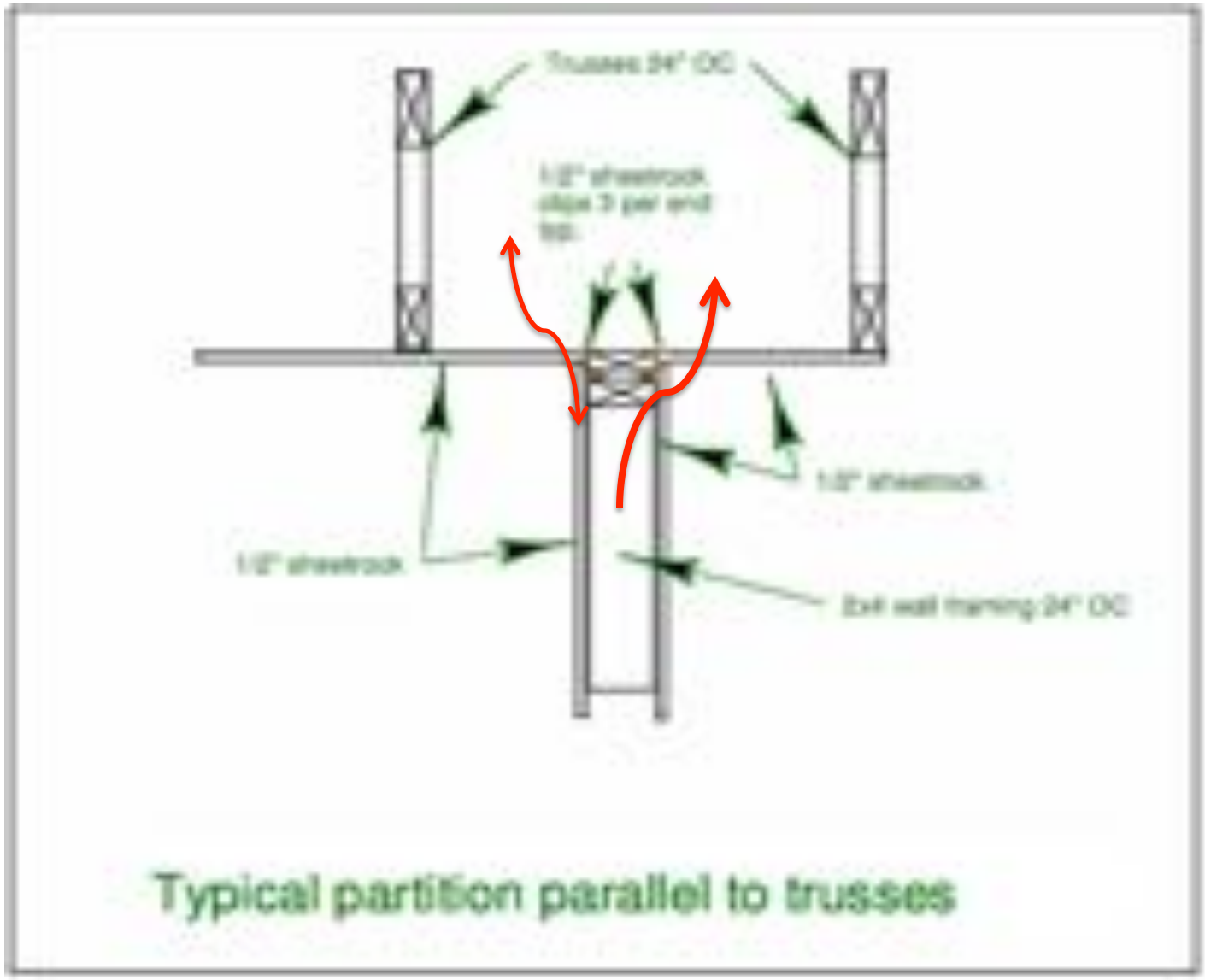
- Attic ventilation not needed or allowed
- Does not require radiant barrier
- Does not require insulation at ceiling
- Does not require venting

Yes the Light is Off…

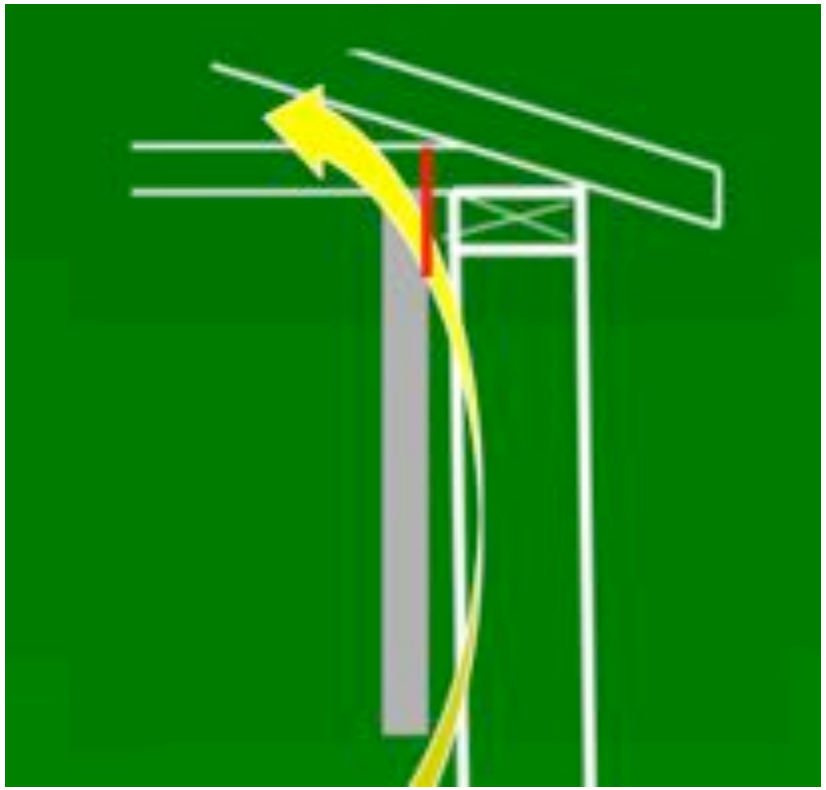
Attic Bypasses

Attic Bypasses

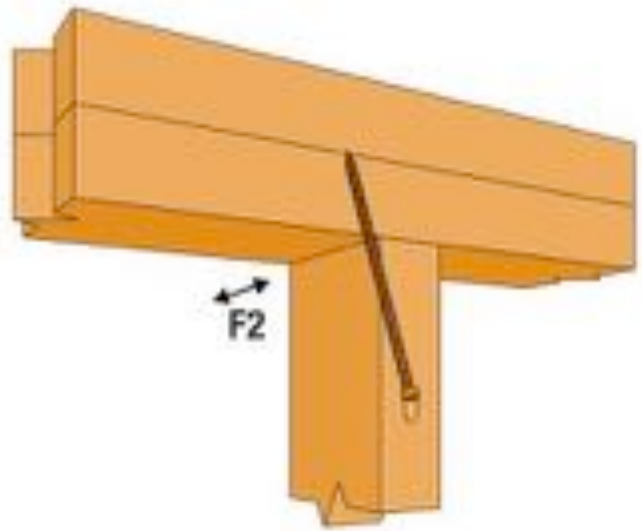

Wall Plates



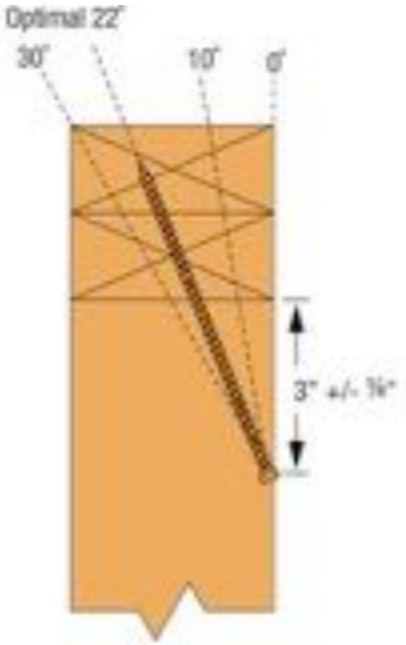
Typical partition parallel to trusses



Photo, Chitwood Energy Services



1 Narrow Face of Stud-to-Top Plate Connection
(This application requires SDWC15600)



Installation Angle Range


Traverse Unlimited
No Housing or Junction Box Required
Round or Square Designs
White, Satin Nickel or Bronze Finishes
750 Delivered Lumens at 3000K
IC & Wet Rated
ENERGY STAR & Title 24 Qualified
Installs in Under 6 Minutes

Plumbing Walls