






Comfort in a Bonus Room? It's in the Details



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Program Description



Rooms located above a garage, often referred to as a Bonus Rooms, have been a source for difficult air sealing and thermal control details. In this webinar we will look at some of these locations and review some details on how we can reduce the risk for poor air infiltration and thermal control details.

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Learning Objectives

- Understand the initial concerns regarding bonus rooms and their relationship to surrounding conditioned and unconditioned spaces.
- Review bonus room air sealing details that could allow for both unconditioned air along with potentially hazardous air to enter the conditioned space above.
- Discuss details and materials used in creating the assembly between bonus room and the space below. This assembly is critical as it is the control layer that can keep poor air quality from entering the conditioned space.
- Examine how the 2018 IRC requires specific materials to be used between the garage and bonus rooms above. These items are for the safety of the occupants.

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Why Are You Here?



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We Must Understand the Problem Before We Can Fix It.



- Before we can fix our thermal discomforts, we must first understand how heat moves.




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Building Science Principles



- **Heat Flow, Moisture Flow & Air Flow**
 - High pressure → low pressure
 - High concentration → low concentration



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Heat Flow



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Heat Flow


- From hot to cold (high concentration to low concentration)
- Summer - flow directed inward
- Winter - flow directed outward



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Heat Flow Mechanisms – Conduction

- **Conduction**
 - Heat flow through a substance or material by direct contact
 - Conduction takes place within a single material or between materials in direct contact
- **Where does conduction occur in a home?**



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Heat Flow Mechanisms – Convection

- Convection
- Transfer of heat through air (for building enclosures)
- Where does **convection** occur in a home?

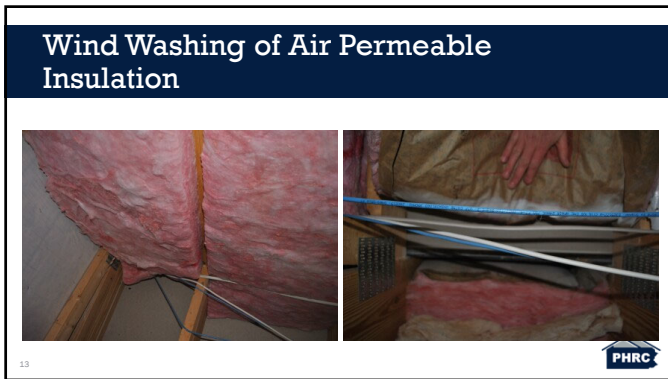
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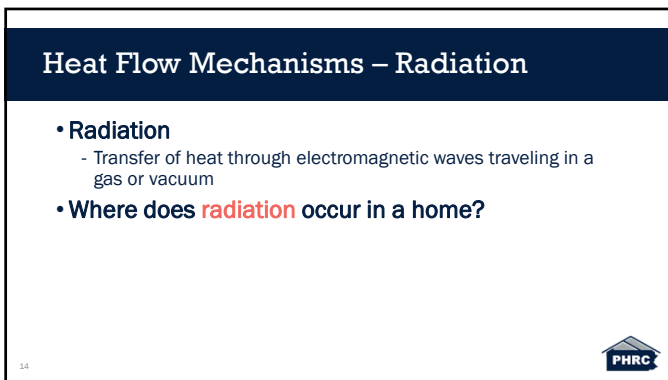
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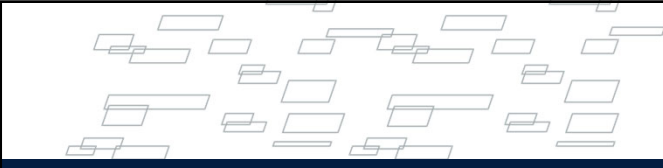
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What is a Bonus Room?



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Bonus Room Explained


- Typically a room above a garage
- Can be completely over a garage or partially over a garage
- Room often gets built inside a truss. This truss is often referred to as a “Bonus Room” truss
- Due to the nature of this area, it is often difficult to thermally isolate and air seal



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Habitable Attic – R325.6

- A habitable attic shall not be considered a story where complying with **all** of the following requirements:
 1. The occupiable floor area is not less than 70 square feet in accordance with Section R304.
 2. The occupiable floor area has a ceiling height in accordance with Section R305.
 3. The occupiable space is enclosed by the roof assembly above, knee walls (if applicable) on the sides and the floor-ceiling assembly below.
 4. The floor of the occupiable space shall not extend beyond the exterior walls of the floor below.



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Bonus Room Truss

1. > 70 sq. ft.
2. Ceiling Height
3. The occupiable space is enclosed by the roof, knee walls, and floor-ceiling assembly
4. The floor of the occupiable space shall not extend beyond the exterior walls of the floor below

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Room Over Unconditioned Space

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Concerns

- Cold floors
- Cold / hot interior space
- Air infiltration / Odor control

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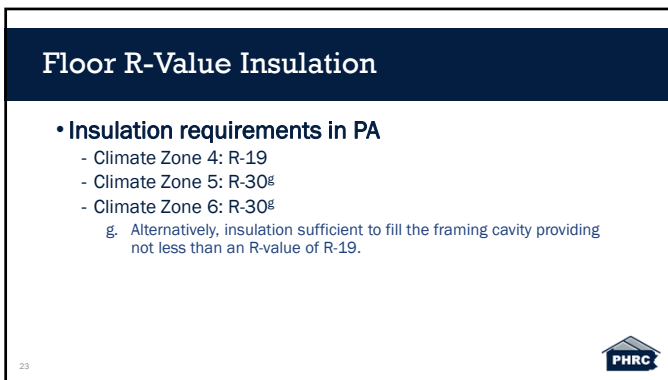
Cold Floors

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A graphic showing a floor joist with insulation underneath. The text "Cold Floors" is written in white on a dark blue background. The PHRC logo is in the bottom right corner.

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Floor R-Value Insulation

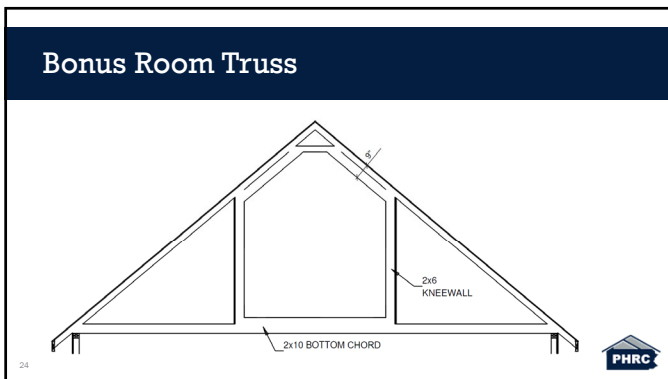
- Insulation requirements in PA
 - Climate Zone 4: R-19
 - Climate Zone 5: R-30^g
 - Climate Zone 6: R-30^g
 - g. Alternatively, insulation sufficient to fill the framing cavity providing not less than an R-value of R-19.

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A graphic with a dark blue header "Floor R-Value Insulation". Below is a list of insulation requirements for Pennsylvania in different climate zones. The PHRC logo is in the bottom right corner.

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Bonus Room Truss

2x10 BOTTOM CHORD

2x6 KNEEWALL

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A diagram of a truss structure for a bonus room. It shows a 2x10 bottom chord, 2x6 kneewalls, and a peak. The PHRC logo is in the bottom right corner.

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Compressed Insulation Values - NAIMA

- 2x10 truss bottom cord allows a space of 9 1/4"
- R-30 insulation typically has a loft of 9 1/2" - 10"

Nominal Lumber Size	Cavity Depth	R-15	R-20	R-25	R-30	R-35	R-40	R-45	R-50
1 2x4	14"	49							
1 2x6	13 7/8"	44	38						
2x12	13 1/4"	42	37	30					
1 2x8	9 1/2"	33	29						
2x10	9 1/4"	32	28	23	25				
2x8	7 1/4"		25	25	24				
2x6 (vertical)	6"				21	20	18		
2x6	5 1/2"				18	18	16		
2x4 (vertical)	4"				15	15	14		
2x4	3 1/2"				15	14		15	13
2x3	2 1/2"							11	10
2x2 (vertical)	1 3/4"								6.3
2x2	1 1/2"								6.1
Label R-value	R-49	R-38	R-30	R-25	R-20	R-18	R-15	R-13	R-11
Label Thickness	14"	12"	10"	9 1/2"	8"	5 1/2"	6 1/4"	5 1/2"	

Source: https://www.phrc.com/insulation-compressed-into-framing-cavities-2016-08-Compressed_If_Values.pdf

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Room Over Unconditioned Space

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Floor Insulation – N1102.2.8

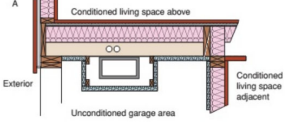
- Floor framing-cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.**
 - Exception: As an alternative, the floor framing-cavity insulation shall be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum wood frame wall R-value in Table N1102.1.2 and that extends from the bottom to the top of all perimeter floor framing members.

Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL

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Floor Insulation – N1102.2.8

- Floor framing-cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking.



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Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL.
Image Source: International Code Council, (2015), 2015 Significant Changes to the IRC, ICC, Country Club Hill, IL.




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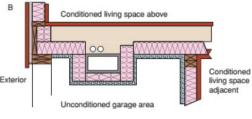
Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL.



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Alternative Floor Insulation – N1102.2.8

- As an alternative, the floor framing-cavity insulation shall be in contact with the top side of sheathing where combined with insulation that meets or exceeds the minimum wood frame wall R-value in Table N1102.1.2 and that extends from the bottom to the top of all perimeter floor framing members.



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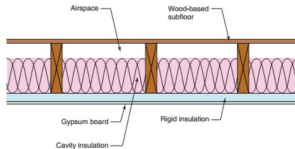
Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL.
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Alternative Floor Insulation – N1102.2.8

- As an alternative, the floor framing-cavity insulation shall be in contact with the topside of continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum wood frame wall R-value in Table N1102.1.2 and that extends from the bottom to the top of all perimeter floor framing members.

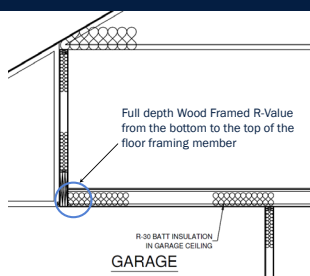


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31 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club HS, IL. Image Source: International Code Council, (2015), 2015 Significant Changes to the IRC, ICC, Country Club HS, IL.

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Room Over Unconditioned Space

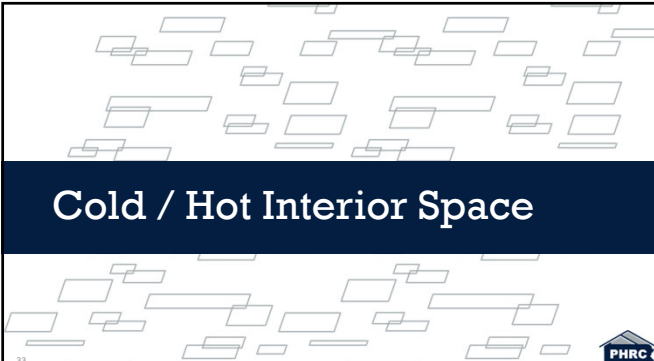


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Cold / Hot Interior Space




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Ceiling R-Value Insulation


- **Insulation requirements in PA**
 - Climate Zone 4: R-49
 - Climate Zone 5: R-49
 - Climate Zone 6: R-49

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Ceilings Without Attic Spaces

- Where Section N1102.1.2 requires insulation R-values greater than R-30 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section N1102.1.2 shall be limited to 500 square feet (46 m²) or 20 percent of the total insulated ceiling area, whichever is less.

35 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL 


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***2021 Pennsylvania Alternative Residential Energy Provisions**

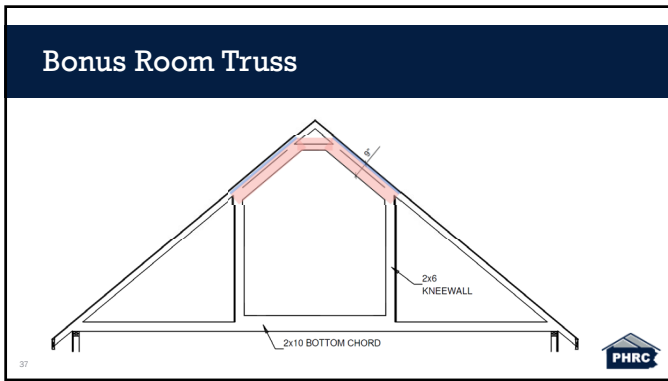
Cathedral ceilings: R-30 insulation, for up to 75% of the total living space square footage area

PA302.2 Ceilings without attic spaces. Where the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, such as cathedral ceilings, the minimum required insulation for such roof/ceiling assemblies shall be R-30, insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section PA301 shall be limited to 75% of the total living space square footage area.

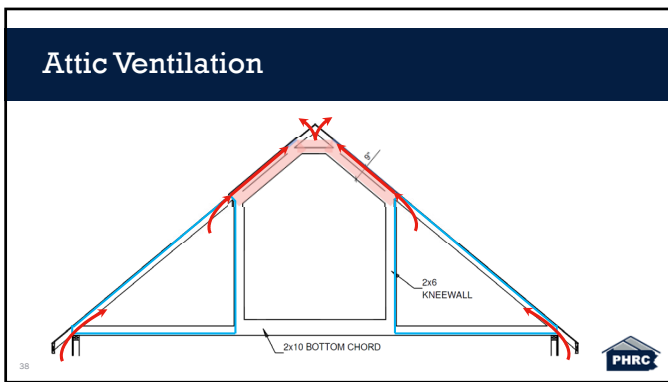
2021 PA Alternative Residential Energy Provisions
- <https://bit.ly/2021PA-Alt>

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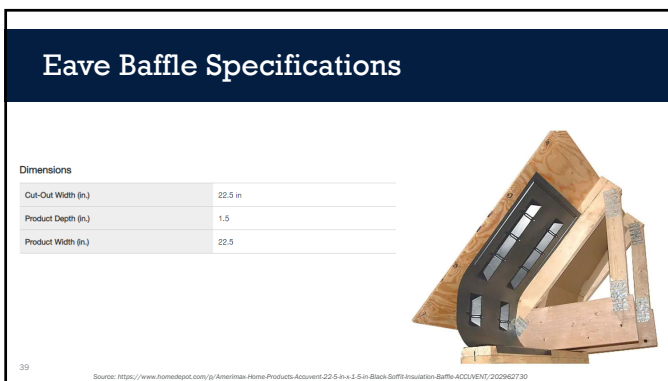
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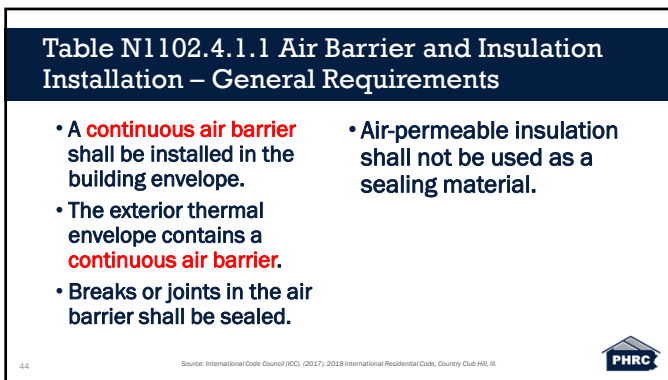
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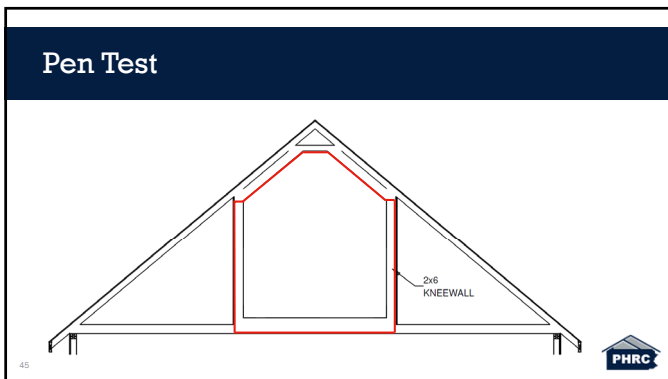
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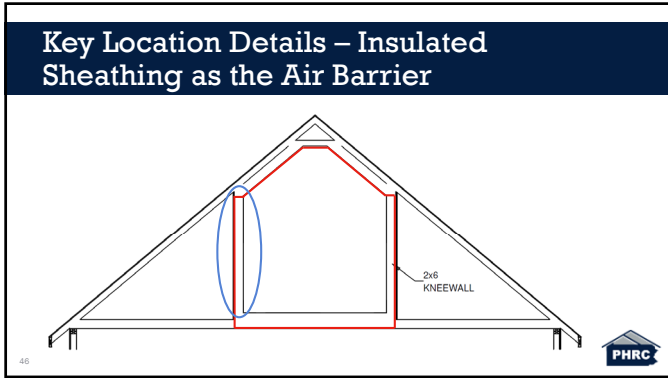
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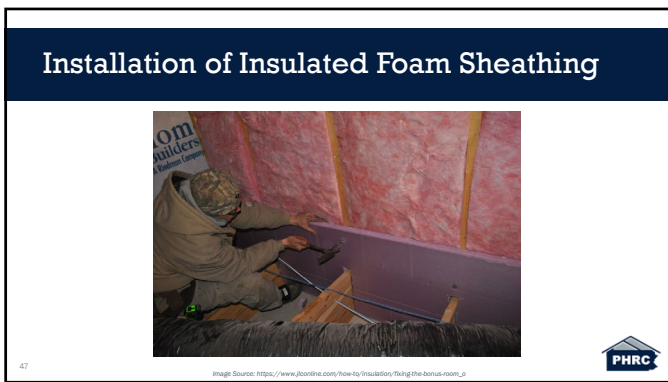
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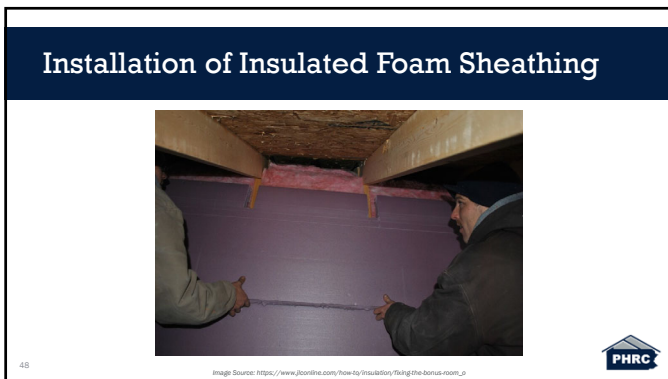
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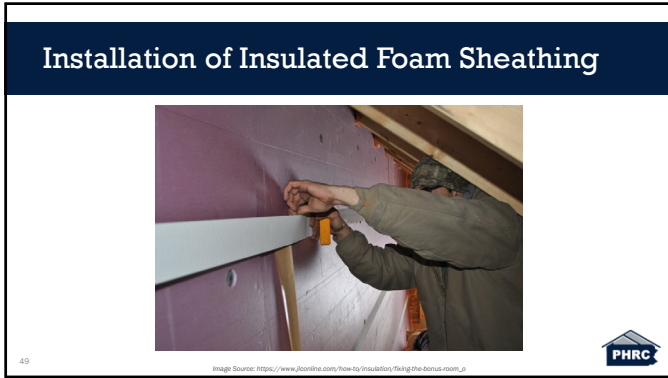
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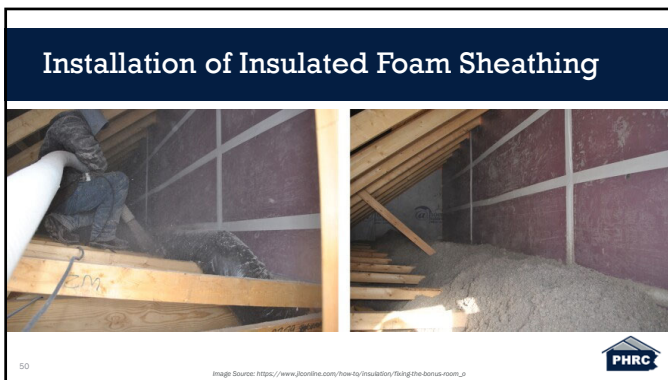
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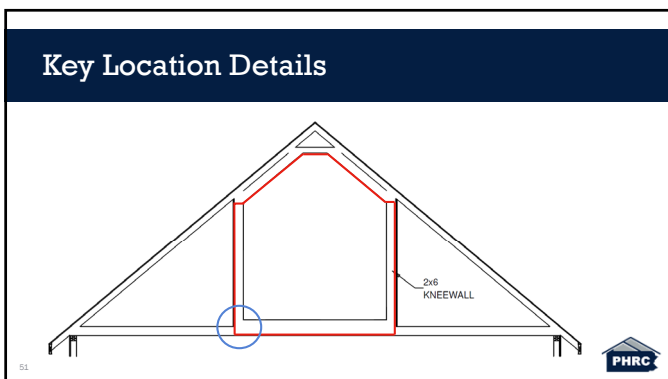
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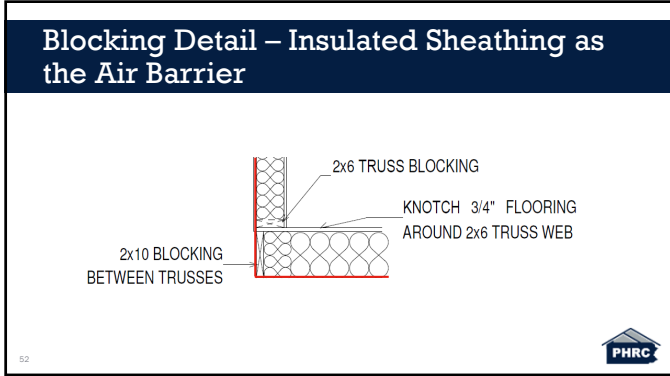
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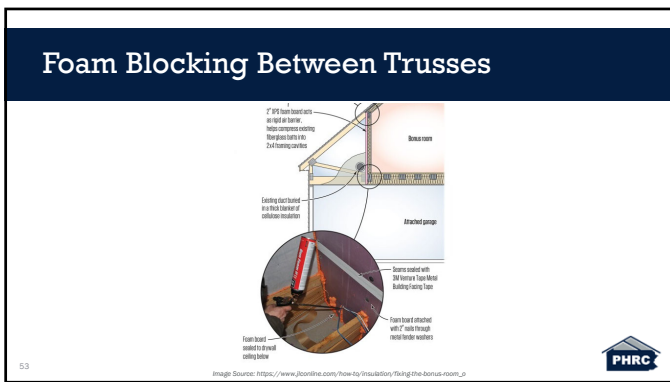
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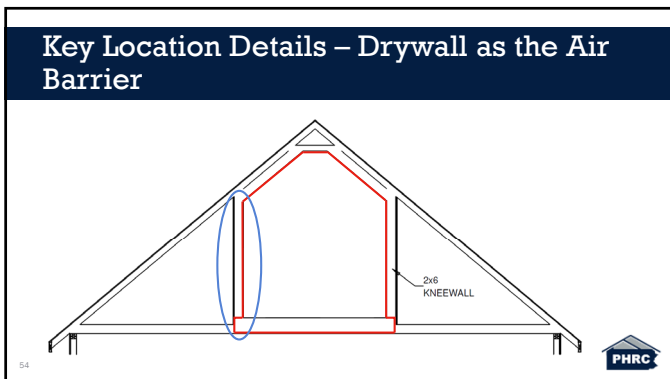
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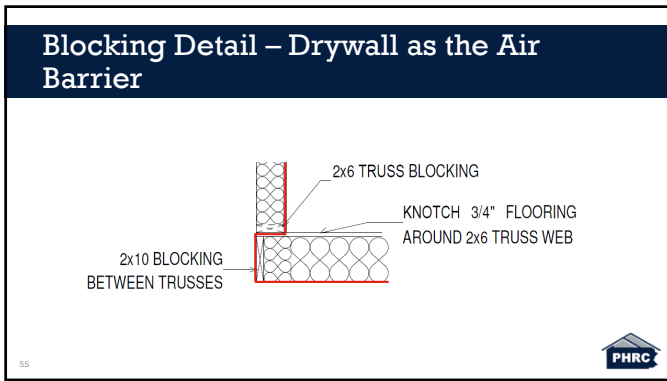
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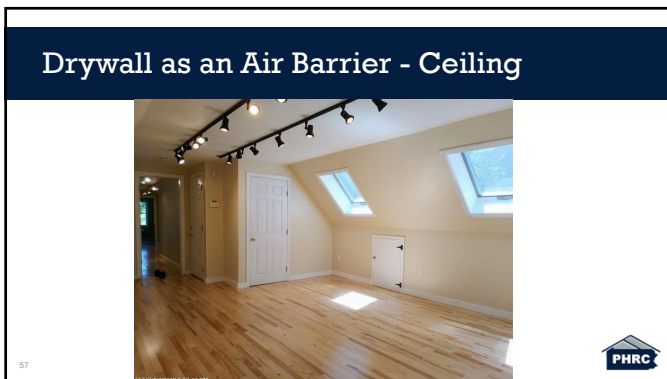
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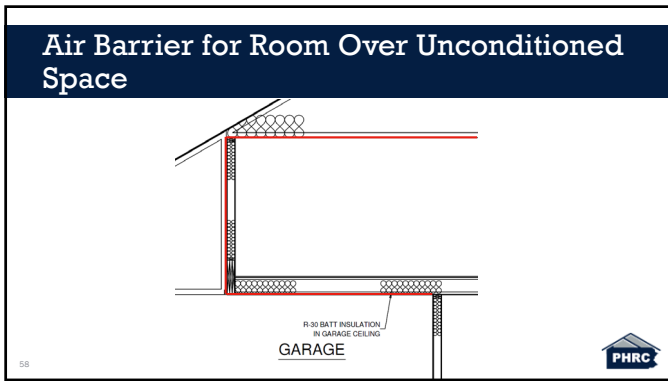
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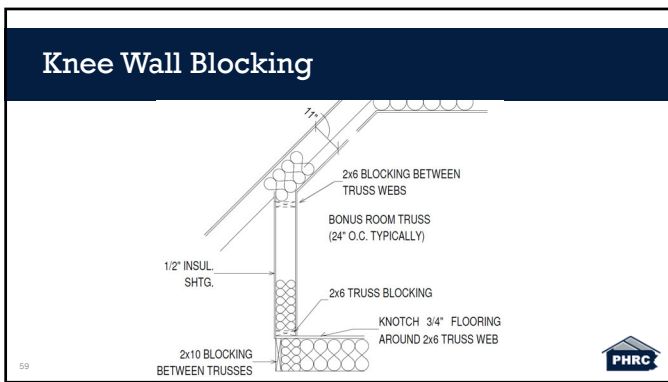
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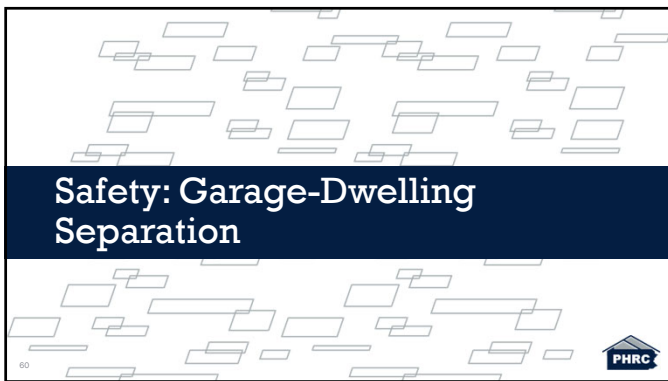
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Dwelling – Garage Opening and Penetration Protection – R302.5

- **R302.5.3 Other penetrations - Penetrations through the separation required in Section R302.6 shall be protected as required by Section R302.11, Item 4.**
- **R302.11 Fireblocking**
 4. At openings around vents, pipes, ducts, cables and wires at ceiling and floor level, with an approved material to resist the free passage of flame and products of combustion. The material filling this annular space shall not be required to meet the ASTM E136 requirements.

61 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL.

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Dwelling-Garage Fire Separation – R302.6

- **The garage shall be separated as required by Table R302.6. Openings in garage walls shall comply with Section R302.5. Attachment of gypsum board shall comply with Table R702.3.5. The wall separation provisions of Table R302.6 shall not apply to garage walls that are perpendicular to the adjacent dwelling unit wall.**

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Dwelling – Garage Separation


SEPARATION	MATERIAL
From the residence and attic	Not less than 1/2-inch gypsum board or equivalent applied to the garage side
From habitable rooms above the garage	Not less than 1/2-inch Type X gypsum board or equivalent
Structures supporting floor/ceiling assemblies used for separation required by this section	Not less than 1/2-inch gypsum board or equivalent
Garages located less than 3 feet from a dwelling unit on the same lot	Not less than 1/2-inch gypsum board or equivalent applied to the interior side of exterior walls that are within this area

63 Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Hill, IL.

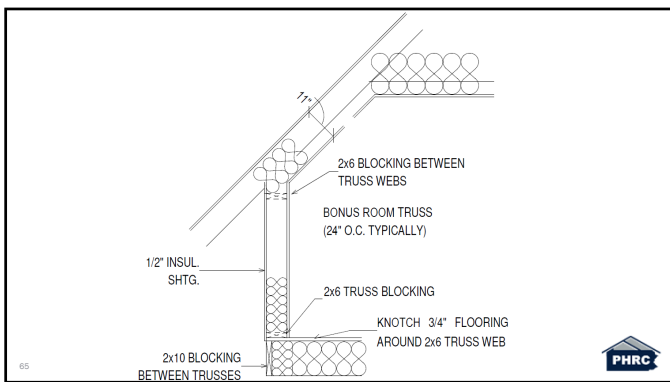
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Summary

- It's hard to fix what you can't see so understanding how heat is transferred is critical
- Design structural members for the installation of at least the minimum required insulation without compression
- Understand your air barrier and be sure it is continuous
- Encapsulate your insulation to reduce wind washing

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Questions?

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