



# Passing Grade.

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[www.resnet.us](http://www.resnet.us)

# What is RESNET?

- National non-profit, founded in 1995
- ANSI-accredited Standard Development Organization
  - Energy, water, carbon, inspections and testing
- Home Certification Organization
  - WaterSense Labeled Homes
  - ENERGY STAR New Homes
  - Zero Energy Ready Home
- National network of certified Home Energy Rating Professionals (~3,000)



# What is the HERS Index?

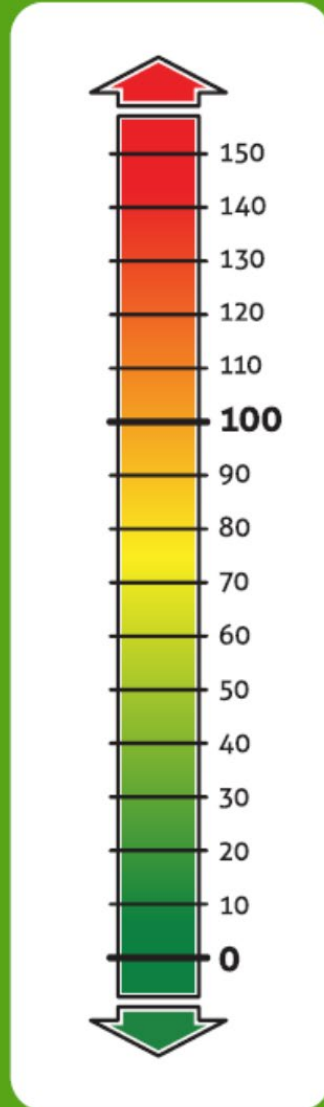
✓ The **national standard** by which a home's energy efficiency is inspected and rated.

✓ A typical home built to 2006 energy efficiency standards scores 100 on the HERS Index.

✓ A 1-Point change in the HERS Index represents a 1% change in energy use.

✓ A lower Index Score means a home uses less energy.

✓ A home with a HERS Index Score of 0 produces as much energy annually as it uses.



✓ A simple, easy to understand system for prospective homebuyers, Realtors, Appraisers and utilities to compare the energy performance of homes.



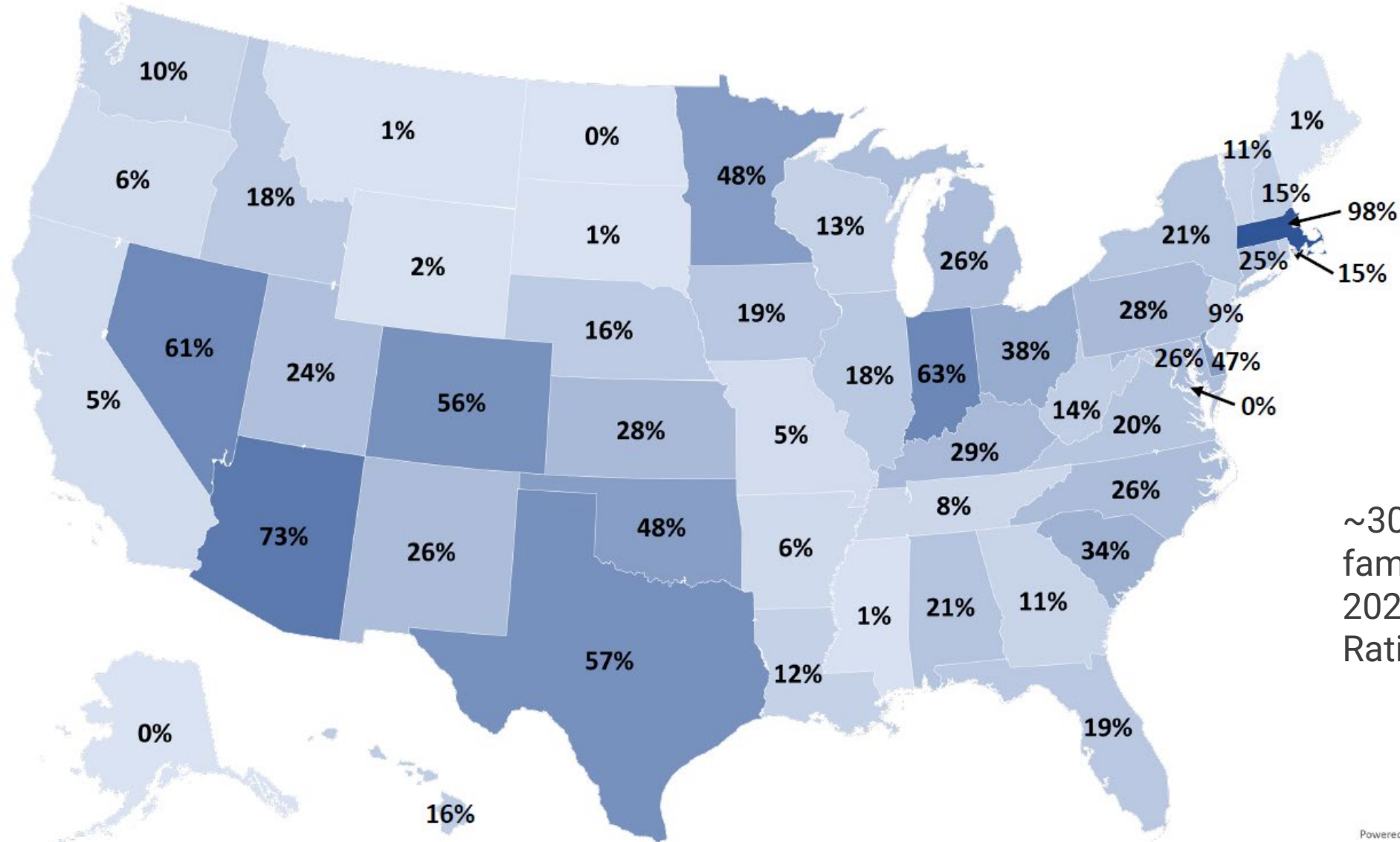
The HERS Index accounts for a home's energy consumption of heating, cooling, water heating, lighting and some appliances.



Like a miles per gallon rating on a home



# Percent New Homes HERS Rated, 2023



~30% of all new single-family homes built in 2023 received a HERS Rating.

# The HERS Rating Process



## Projected Rating

Based on Plans

Provides a HERS based on anticipated design

Should be required for issuance of a Permit



## Pre-drywall Inspection

Insulation R-values

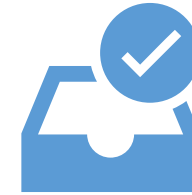
Insulation installation grading

Air sealing

Windows

HVAC Equipment

Mandatory for HERS, Energy Star and ZERH



## Final Inspection

Envelope tightness testing

Duct tightness and ventilation system testing

Mandatory for HERS, Energy Star and ZERH

# Insulation Grading: I, II, III



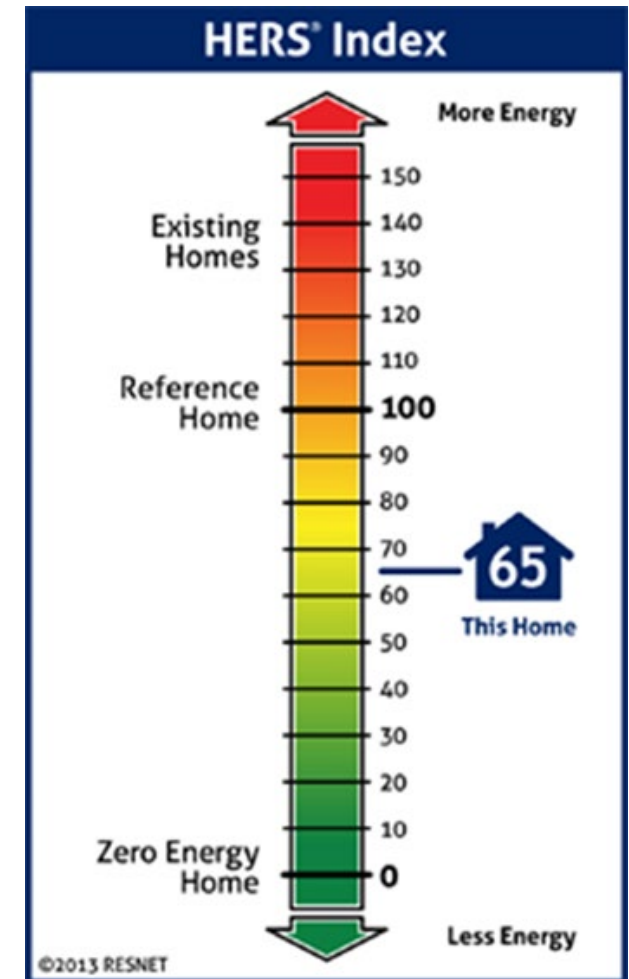
**Grade I**



**NOT Grade I**

# How HERS Ratings Work With the Energy Code and Other Programs

- Some states (TX and MA) allow HERS for code compliance
- About 35 states have the Energy Rating Index (ERI) compliance option which also allows HERS to be used
- RESNET HERS Raters and Rating Field Inspectors are involved with energy code compliance:
  - About 90% do code compliance work
  - Performance compliance modeling
  - Duct and Envelope Leakage Testing
  - Prescriptive and UA compliance
- Programs that use the HERS Index (or ERI)
  - Energy Star and Zero Energy Ready Home
  - National/Local/Regional Green Building Programs
  - Utility Incentive Programs



# Air Sealing Requirements

## IECC and State/Local Energy Codes

- Typically, between 2.5 and 7 ACH50

## HERS Ratings

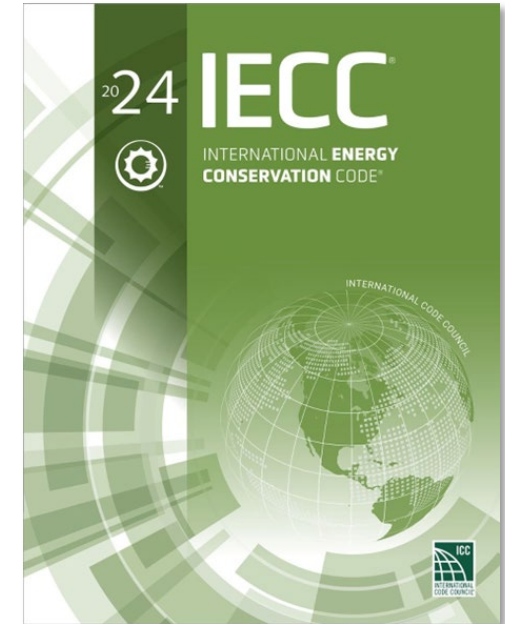
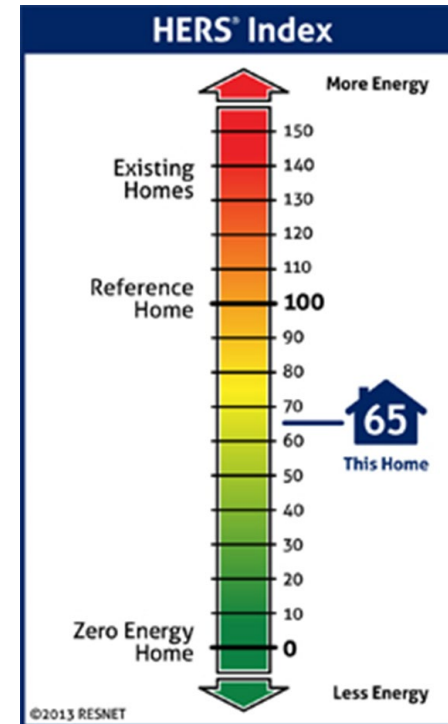
- No minimum requirement
- Higher air leakage means higher HERS scores

## Energy Star

- SFNH v3.2 = 3 ACH50 for Reference Home
- SFNH v3.1 = 4 ACH50 in CZ 1-2; 3 ACH50 everywhere else

## Zero Energy Ready Home

- Single Family V2 = 2.75 to 1.5 depending on climate zone for "Target Home"







Special Thanks to NAHB.



# Air Sealing

## Continuous air barrier required

- Exterior / Interior / Combination
- Joints / breaks / penetrations

## Third-party blower door test

- 2.5-7 ACH50 (depending on state)

## Prescriptive requirements

- Specific locations
- IECC table describes air sealing locations

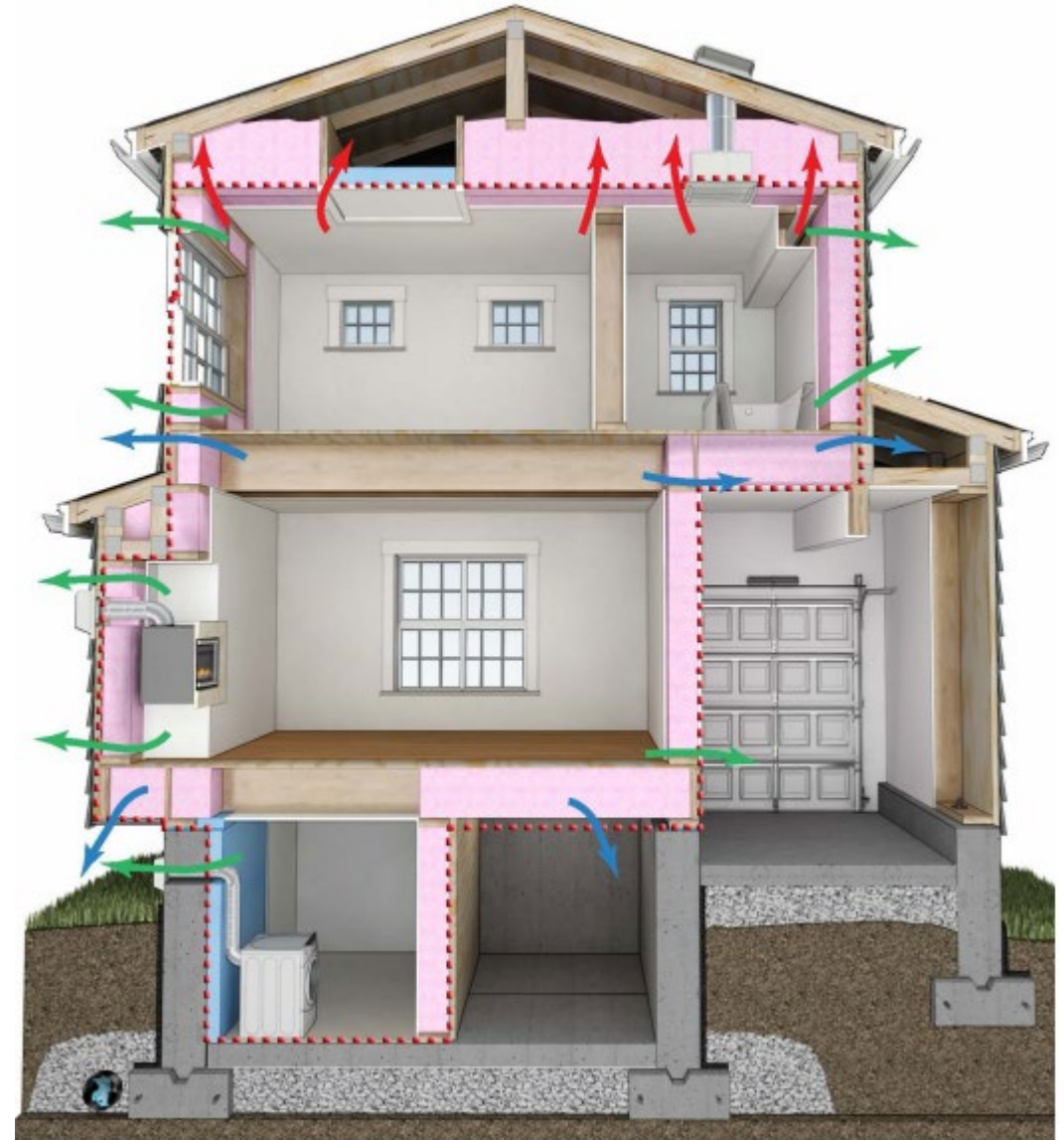


Image Credit: NAHB

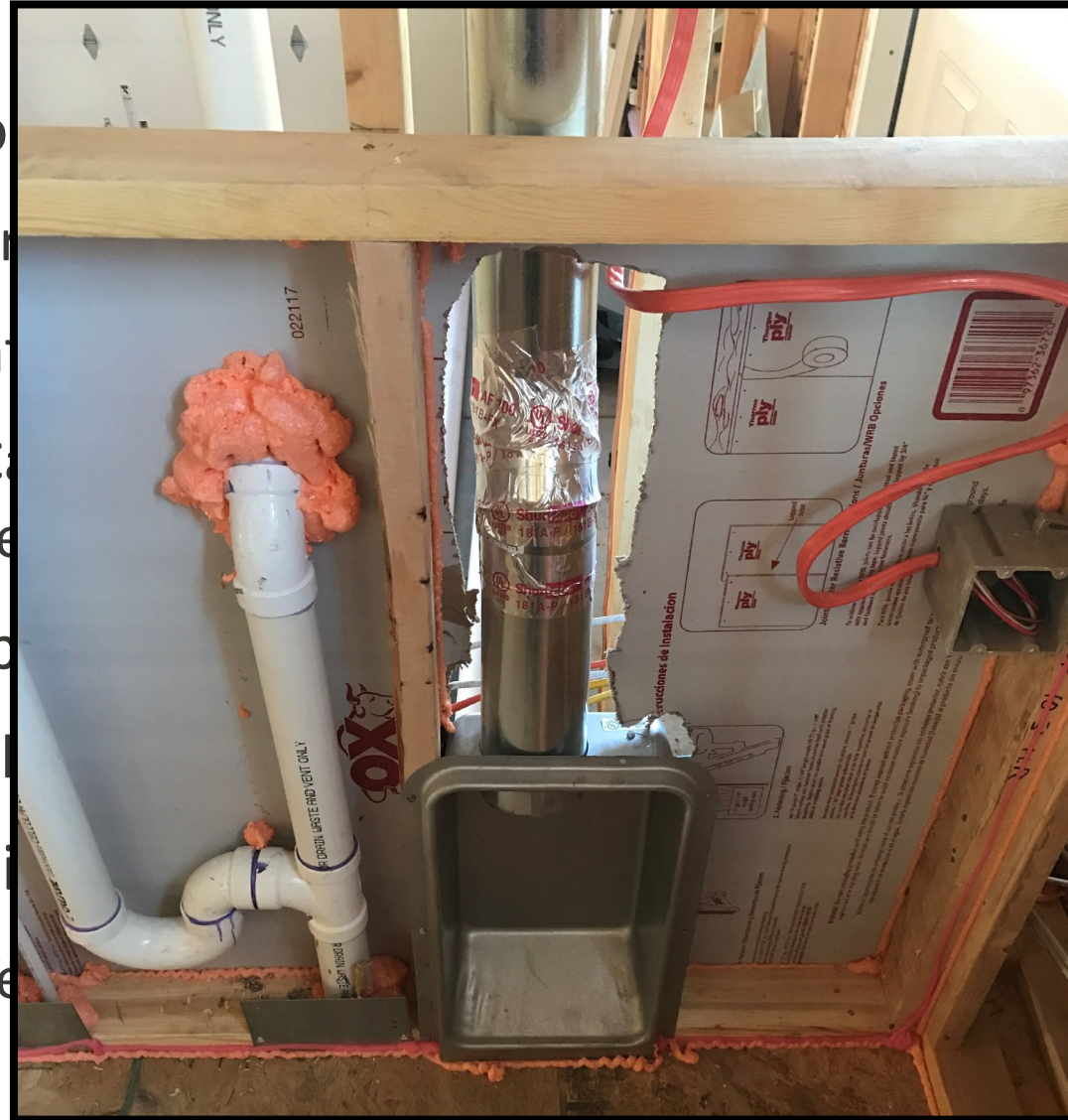


## Benefits of Air Sealing

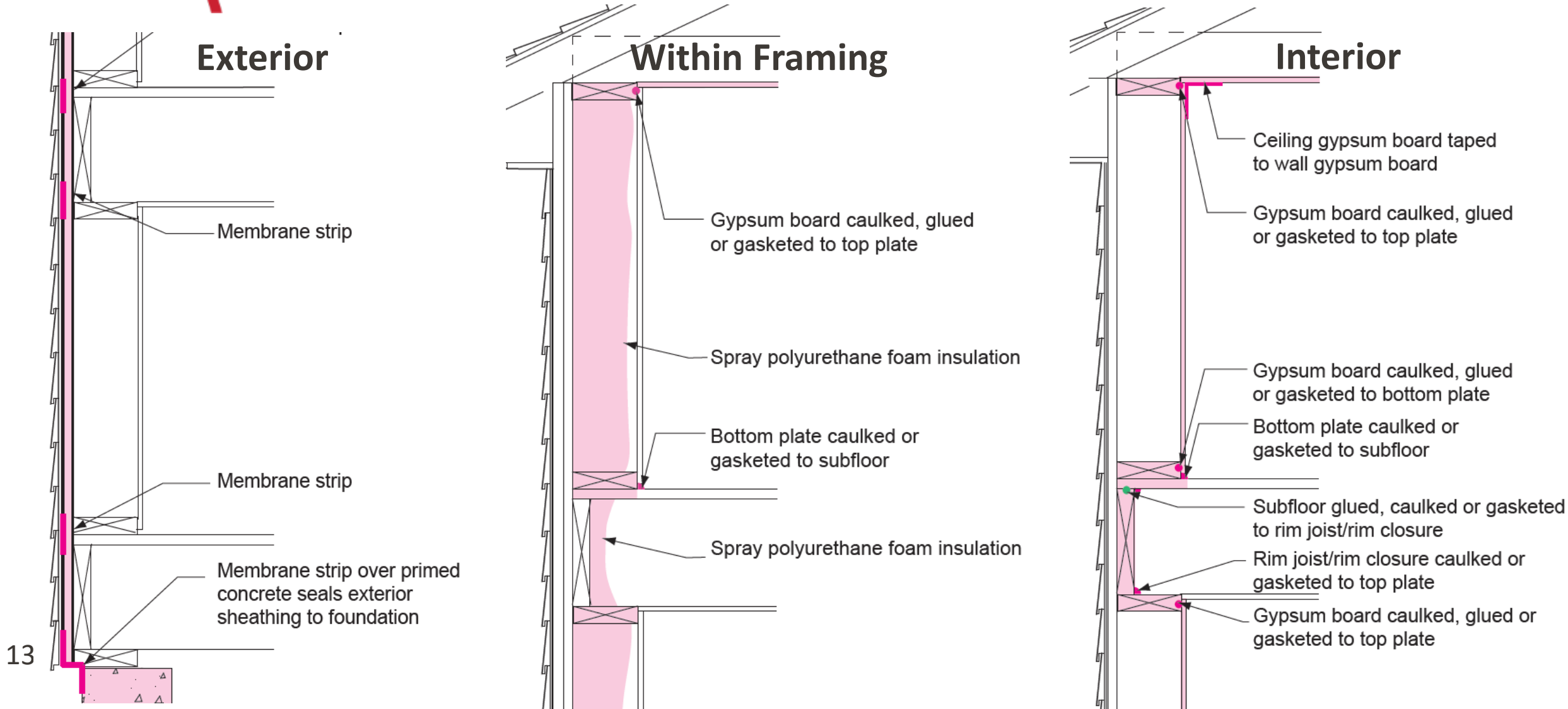
- Significant energy savings
- More comfortable home (i.e., less drafty)
- Reduced outdoor noise
- Keep moisture out of wall system
- Keep out insects and pests
- Better control of indoor air relative humidity

# Some of the Challenges

- Numerous  
◦ Friction, designer
- Different  
◦ Combination air
- Proper p  
◦ T
- Getting i  
◦ Te

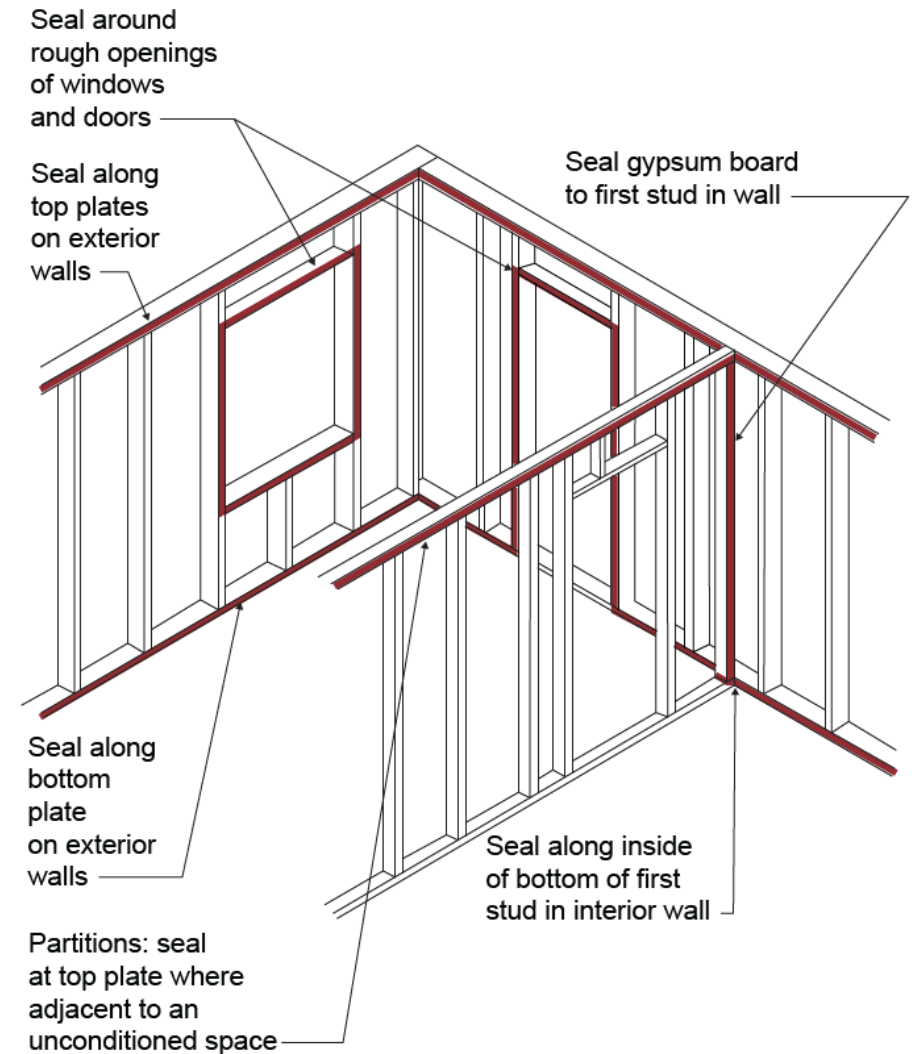


# Main Air Barrier Strategies



# Interior Air Barrier Strategy

- Often referred to as air-tight drywall method
- Seals drywall to framing at key joints:
  - Top Plate
  - Sill Plate
  - Openings



# Air Sealing Methods – Taping



OSB



Integrated WRB



Foam Insulation

# Air Sealing Methods – House Wraps



Mechanically Attached



Fully Adhered



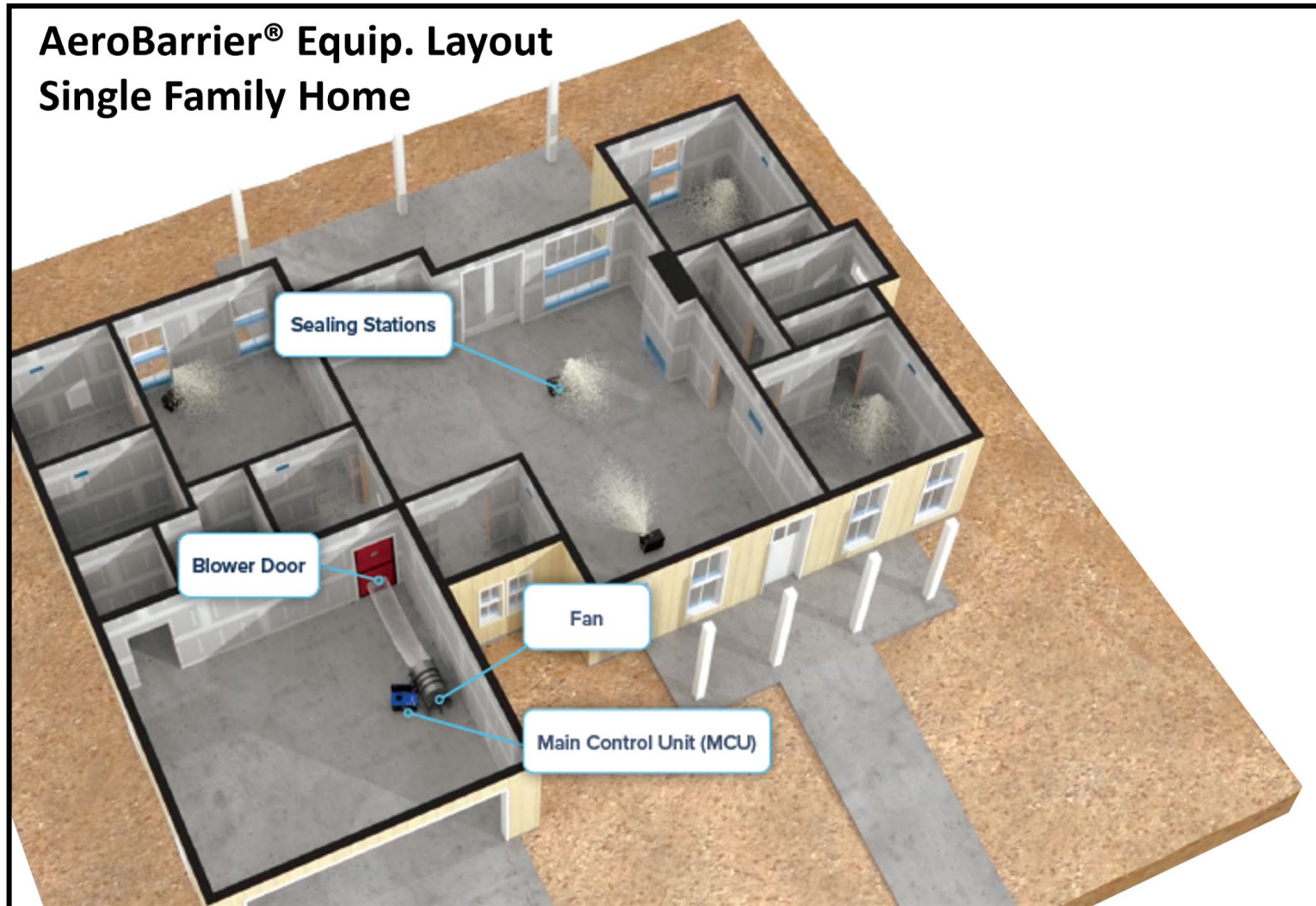
# Air Sealing Methods – Caulking & Sealants



# Air Sealing Methods – Spray Foam



# Air Sealing Methods – Aerosol





# Key Air Sealing Areas (Table R402.5.1.1) (2024 IECC section)

- Provides prescriptive air sealing requirements
- Sealing these areas can make or break the blower door test results
- Key Areas:
  - Ceilings
  - Walls
  - Windows, skylights and doors
  - Rim joists
  - Floors
  - Shafts
  - Showers and tubs
  - Electrical and communication boxes
  - HVAC boots
  - Common walls
  - Garage
  - Recessed lighting

# Drop Ceilings & Soffits

An air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space



Full Coverage & Well Sealed



Holes in Materials & No Sealant

# Ceilings for Vented Attics

Ensure air barrier is installed between drop ceiling and attic



Air barrier seams and penetrations properly sealed

# Wall to Foundation

Junction of the foundation and sill plate must be sealed



# Top of Walls

Penetrations through the top plate on exterior walls and into unconditioned attic



Electrical Penetrations Sealed



Large Hole Can't Be Sealed



# Wall to Roof

The junction between top plate and drywall needs to be sealed to prevent air leakage into the attic



with Sill Seal



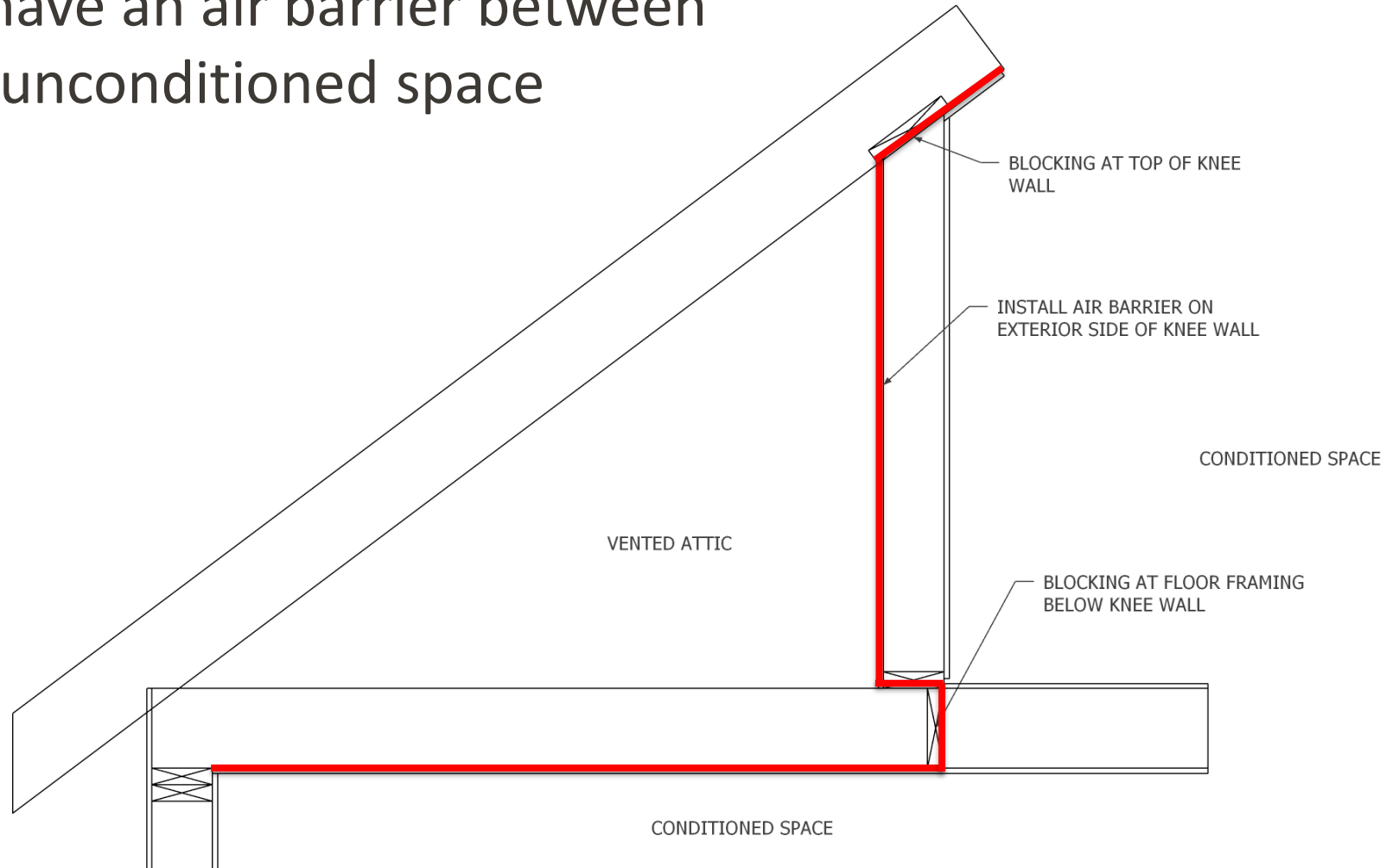
with Sealant/Caulk



with Spray Foam

# Attic Knee Walls

Knee walls shall have an air barrier between conditioned and unconditioned space



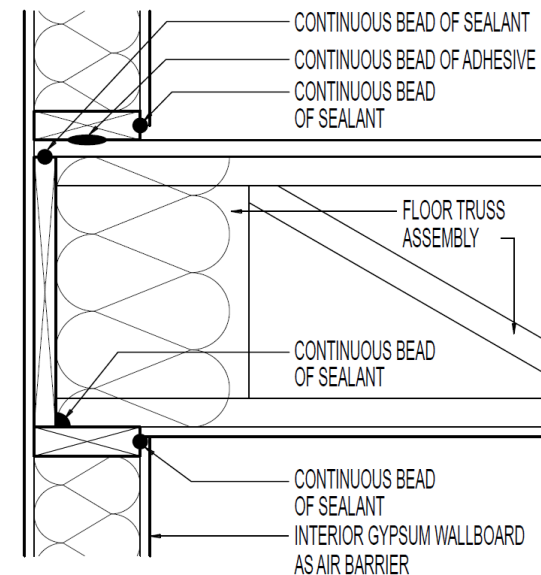
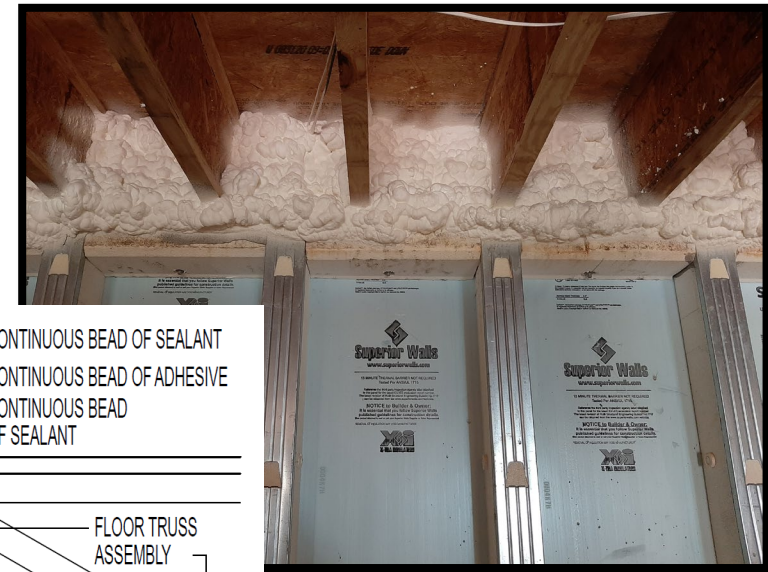
# Windows | Skylights | Doors

The rough opening gap between framing and the frames of skylights, windows, and doors, shall be sealed in accordance with fenestration manufacturer's instructions



# Rim Joists

- The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed
- Sealing methods:
  - Spray foam (as shown)
  - Canned foam or caulk (as shown)
  - Foam insulation and sealant (not shown)
  - Taping from the exterior (not shown)
  - Continuous exterior air barrier over rim (not shown)



# Cantilevered Floors



No air barrier between cantilever and conditioned space

Cantilever properly blocked and sealed

# Shafts

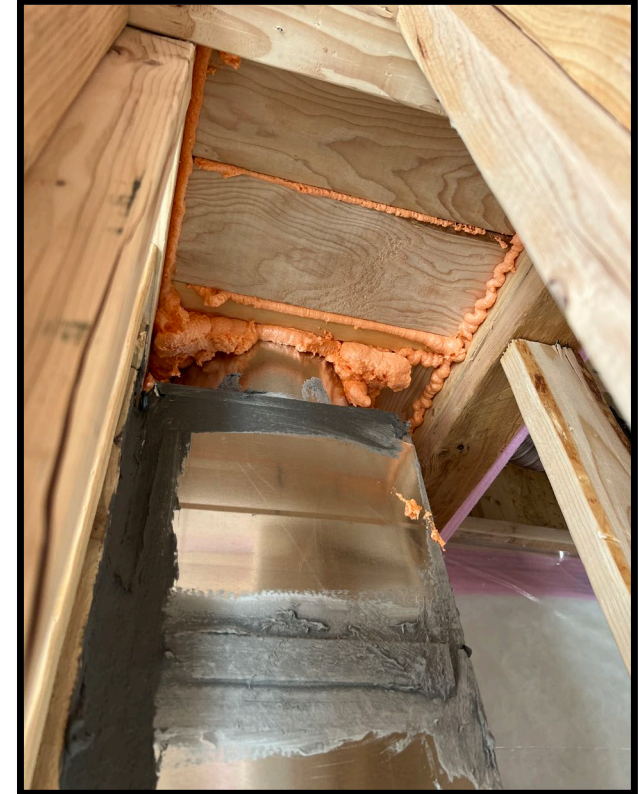
Duct and flue shafts to exterior or unconditioned space shall be sealed



Utility Chase at Exterior Wall



Air Barrier Separating HVAC Chase from Exterior Wall



Air Barrier Separating HVAC Chase from Attic

# Attached Garages

Walls between conditioned and unconditioned space must be sealed

Seams, joints, penetrations in ceiling must be sealed if there is conditioned space above

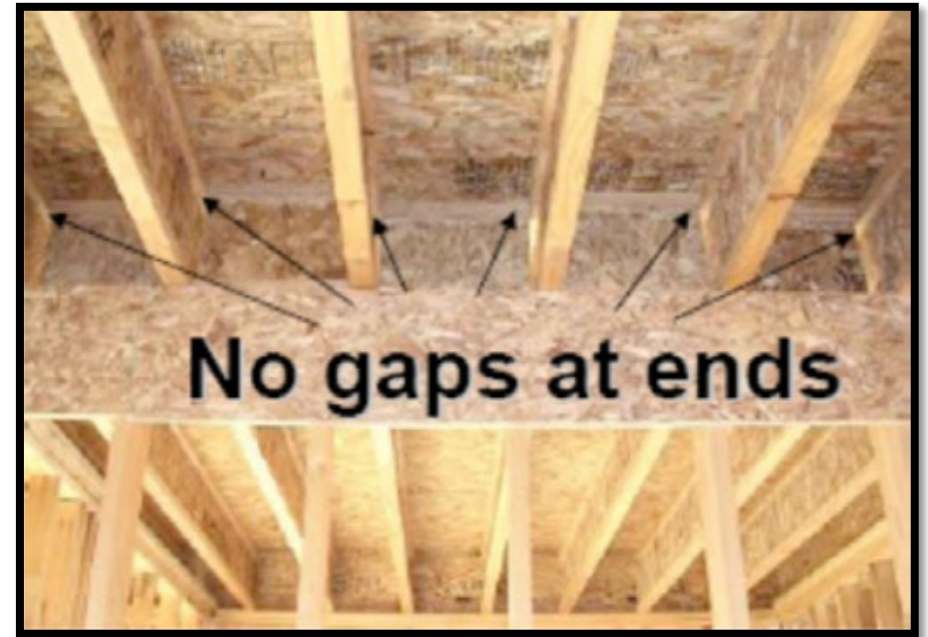


# Attached Garages

*Continued*



Air barrier between garage and floor system (Be sure to seal bottom plate to subfloor!)



Gaps at ends, where light is coming through should be sealed (foam works!)



# Attached Garages – Penetrations

- Garages frequently have penetrations for MEP and structural members. Good rules to follow:
  - Minimize multiple items through a single hole
  - Keep the hole close in size to the item going through



# Bathtubs



Insulation installed behind tub enclosure needs an air barrier prior to tub install



Air barrier in place prior to tub install

# Blower Door Testing

- Typically tested when home is near completion
- Tested per ANSI/RESNET/ICC Standard 380
- Blower door tests for CFM50 and that value is converted to an air leakage rate (ACH50)



# Why is it important to work with a HERS Rater?

1. They conduct the insulation installation grading inspection (pre-drywall insp)
  - a. Energy Star and ZERH use Grade I for the reference home.
2. They conduct the envelope leakage testing for HERS, Energy Star, ZERH and Energy Codes
3. They determine compliance with Energy Star, ZERH, HERS and Energy Codes
4. They can assist with achieving energy code compliance using performance (energy) modeling
5. A great resource for new and existing homes



# New 45L Tax Credit



Home Type	ENERGY STAR (Prevailing Wage)	ZERH (Prevailing Wage)
Single Family	\$2,500	\$5,000
Manufactured	\$2,500	\$5,000
Multifamily	\$500 (\$2,500)	\$1,000 (\$5,000)

Credits can't be stacked.

# Energy Star—the basics, v3.1



## 2024 Acquisition Dates

### Minimum ENERGY STAR Program Versions Eligible for the § 45L Credit

State/Territory	Single-Family	Manufactured	Multifamily
AL, AK, AR, AZ, CO, CT, DC, DE, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, UT, VA, VT, WI, WV, WY	SFNH National v3.1	MH v2	MFNC National v1.1
CA	SFNH California v3.3	MH v2	MFNC California v1.3
FL	SFNH Florida v.3.1; or SFNH National v3.1	MH v2	MFNC National v1.1
HI	SFNH Pacific v3	MH v2	MFNC National v1.1
OR, WA	SFNH Oregon and Washington v3.2; or SFNH National v3.2	MH v2	MFNC Oregon and Washington v1.2; or MFNC National v1.2

Requires 2009 IECC insulation levels.  
ERI Target scores typically upper 50's to mid-60's.

# Energy Star—the basics, v3.2



## 2025 Acquisition Dates

### Minimum ENERGY STAR Program Versions Eligible for the § 45L Credit

State/Territory	Single-Family	Manufactured	Multifamily
AL, AK, AR, AZ, CO, CT, DC, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, PA, RI, SC, SD, TN, TX, UT, VA, VT, WI, WV, WY	SFNH National v3.2	MH v2	MFNC National v1.1
CA	SFNH California v3.3	MH v2	MFNC California v1.3
HI	SFNH Pacific v3	MH v2	MFNC National v1.1
OR, WA	SFNH National v3.2	MH v2	MFNC Oregon and Washington v1.2; or MFNC National v1.2

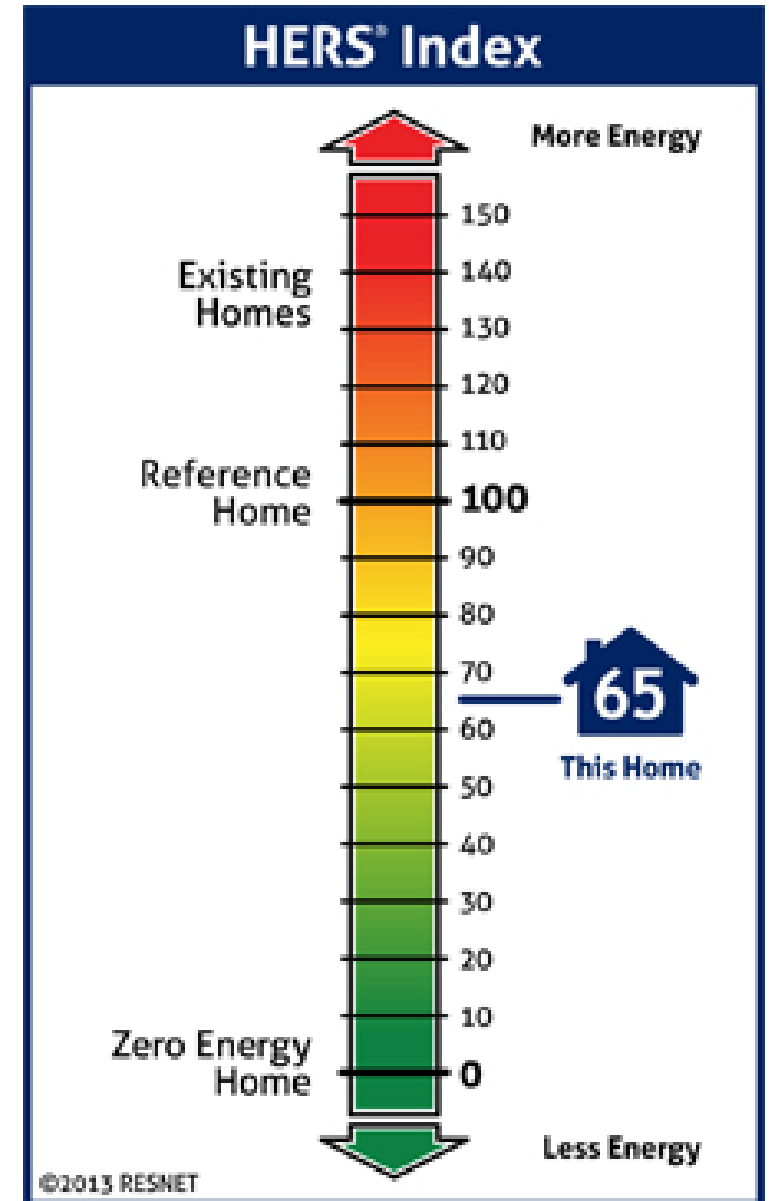
Requires 2021 IECC insulation levels.

\*Homes being started in 2024, but not “acquired” until 2025 will need to meet v3.2 for the tax credit.

# Energy Star v3.2 Highlights



- **The Reference Home has ducts in conditioned space**
- Energy Rating Index (ERI) target scores—are likely to be about 10 points lower, on average.
- The mandatory building envelope insulation levels are now based on the 2021 International Energy Conservation Code (IECC), rather than the 2009 IECC.
- The allowance for sampled ratings (single family) will end when v3.2 takes effect. This means builders must have a pre-drywall and final inspection on every home certified for Energy Star.





# ZERH—the basics, v2



## DOE ZERH Program Version Effective Dates

National (except California)

Program Version and Revision Number	Required for Use, if Home's Permit Date is on/after this Date	Project Type
Version 1, Rev. 7	6/1/2019	Single family, multifamily up to 5 stories
Version 1, Rev. 8	1/1/2023	
Version 1, Rev. 9 <sup>a</sup>	1/1/2024	Multifamily, any height
Single Family Version 2, Rev. 1	1/1/2024	Single Family
Multifamily Version 2	1/1/2025	Multifamily, any height

<sup>a</sup> Multifamily buildings of any height certified under Version 1, Rev. 9 are deemed to meet the certification requirements for Version 1, Rev. 8 where that revision is required.

- ZERH v2 took effect for single family homes on Jan. 1, 2024.
  - (Permit Date)
- ENERGY STAR is a prerequisite
- ZERH v2 requires ENERGY STAR v3.2
- Target Home ducts and equipment are all in conditioned space

# 2009 vs. 2021 IECC Envelope Requirements

2009 vs 2021 IECC Prescriptive Insulation Requirements														
Climate Zone	Ceiling R-Value		Wood Frame Wall R-Value		Mass Wall R-Value		Floor R-Value		Basement Wall R-Value		Slab R-Value & Depth		Crawl Space Wall R-Value	
	2009	2021	2009	2021	2009	2021	2009	2021	2009	2021	2009	2021	2009	2021
1	30	30	13	13 or 0+10ci	3ci or 4	3ci or 4	13	13	0	0	0	0	0	0
2	30	49	13	13 or 0+10ci	4ci or 6	4ci or 6	13	13	0	0	0	0	0	0
3	30	49	13	20 or 13+5ci or 0+15	5ci or 10	8ci or 13	19	19	5ci or 13	5ci or 13	0	10ci, 2ft	5ci or 13	5ci or 13
4 except Marine	38	60	13	30 or 20+5ci or 13+10ci or 0+20ci	5ci or 10	8ci or 13	19	19	10ci or 13	10ci or 13	10, 2 ft	10ci, 4ft	10ci or 13	10ci or 13
5 and Marine 4	38	60	20 or 13+5h	30 or 20+5ci or 13+10ci or 0+20ci	13ci or 17	13ci or 17	30	30	10ci or 13	15ci or 19 or 13+5ci	10, 2 ft	10ci, 4ft	10ci or 13	15ci or 19 or 13+5ci
6	49	60	20 or 13+5h	30 or 20+5ci or 13+10ci or 0+20ci	15ci or 19	15ci or 20	30	30	15ci or 19	15ci or 19 or 13+5ci	10, 4 ft	10ci, 4ft	10ci or 13	15ci or 19 or 13+5ci
7 and 8	49	60	21	30 or 20+5ci or 13+10ci or 0+20ci	19ci or 21	19ci or 21	38	38	15ci or 19	15ci or 19 or 13+5ci	10, 4 ft	10ci, 4ft	10ci or 13	15ci or 19 or 13+5ci

Ci = continuous insulation.

The 2024 IECC reduces the ceiling insulation levels back to 2018 IECC.

# Ducts in Conditioned Space

## Common Strategies:

- Dropped soffit/ceiling/chase (air sealed and insulated between conditioned and unconditioned space)
- Insulate and air seal the roofline and gable ends (bring attic into conditioned space)
- Insulate and air seal crawlspace, if HVAC equipment is in crawlspace



# HERS Affiliate Training

Available at: <https://portal.resnet.us/>

Free for the next 30 days!

Everything you need to know about the basics of HERS Ratings in 2 hours.



## HERS AFFILIATE TRAINING

EVERYTHING YOU NEED TO KNOW TO HELP YOUR CUSTOMERS ACHIEVE LOWER HERS SCORES

- ▶ Module 1: RESNET and the HERS Index
- ▶ Module 2: HERS Raters and RFIs
- ▶ Module 3: Why Builders Should Get Their Homes Rated
- ▶ Module 4: HERS Rater Training and Quality Assurance
- ▶ Module 5: Conducting a Home Energy Rating
- ▶ Module 6: Basics of Building Science
- ▶ Module 7: Building Components
- ▶ Module 8: HERS and Energy Codes
- ▶ Module 9: HERS in Green Building Programs

# Thank you!

Ryan Meres, RESNET Program Director  
Email: [ryan@resnet.us](mailto:ryan@resnet.us)

Resources:

RESNET:

<https://www.resnet.us/about/us/resnet-home-certification-and-incentive-programs/>

ENERGY STAR:

<https://www.energystar.gov/about/federal-tax-credits/ss-45l-tax-credits-home-builders>

ZERH:

<https://www.energy.gov/eere/buildings/section-45l-tax-credits-zero-energy-ready-homes>

Find a HERS Rater

## Get a Home Energy Rating

A comprehensive HERS® home energy rating, conducted by a certified RESNET Home Energy Rater is an in-depth energy performance assessment of a home.

State	Area	Company	Name
<p>This directory is not a listing of all certified HERS® Raters but rather the Home Energy Rating companies that are members of RESNET. To determine if a HERS® Rater or a Rating Field Inspector (RFI) is certified go to <a href="#">Verify Whether a HERS® Rater or Rating Field Inspector is in good standing with RESNET.</a></p>			
<input type="text" value="Select a State"/>			
<a href="#">Find a HERS® Rating Company Member</a>			

<https://www.hersindex.com/find-a-hers-rater/>