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Everblue HERS Rater Training

HERS Course Description

Everblue Home Energy Rating System (HERS) Rater Certification Training is designed to prepare individuals to become HERS raters for the Residential Energy Services Network (RESNET). RESNET's energy rating standards provide a mechanism to quantify a home's energy consumption using energy modeling software. Students will learn the fundamentals of energy efficiency, conduct blower door and duct pressurization testing, and complete two models prior to taking the 50 question HERS certification exam.

HERS Course Objectives

- Understand the fundamentals of building science
- Know how to perform a residential energy model
- Identify the features and benefits of Energy Efficient and Energy Improvement Mortgages
- Explain the HERS rating system

HERS Exam Format

- 50 multiple choice questions
- 2 hour exam taken online
- 80% score required to pass (40 out of 50)
- Open book test
  - OK: Internet, Printouts, Calculator
  - Not OK: Emailing, Texting, Talking, etc.

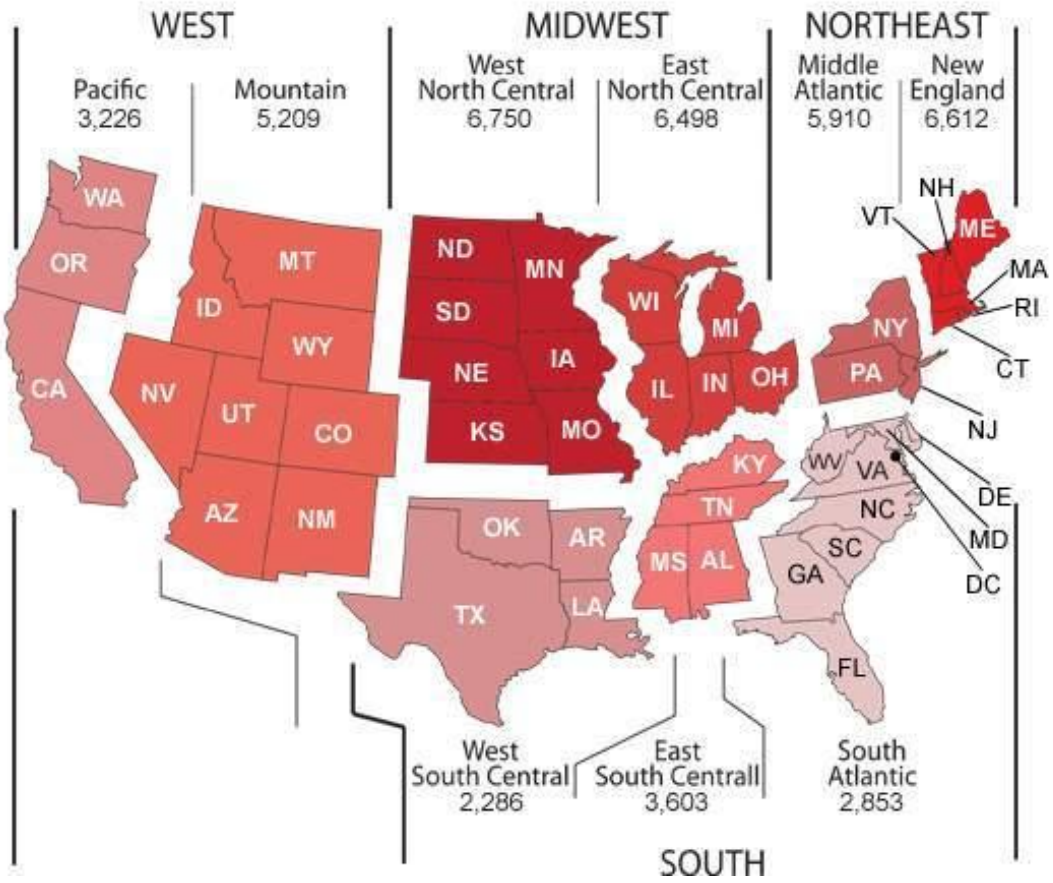
Heating Degree Days (HDD)

- Heating Degree Day (HDD) = Heating Degrees per Day = The number of degrees that a day's average temperature is below 65° F, the temperature below which buildings need to be heated.
- Example:
  1. Today's High & Low = 30° & 20°
  2. Average Temperature = (30° + 20°) /2 = 25°
  3. HDD = ΔT = 65° - 25° = **40 HDD for one single day**
- Calculating HDD:
  1. Calculate a day's average temp
  2. If average > 65° then HDD = 0
  3. If average < 65° then HDD = ΔT = 65° – Average Temp

HDD = °F x days

Annual Heating Degree Days

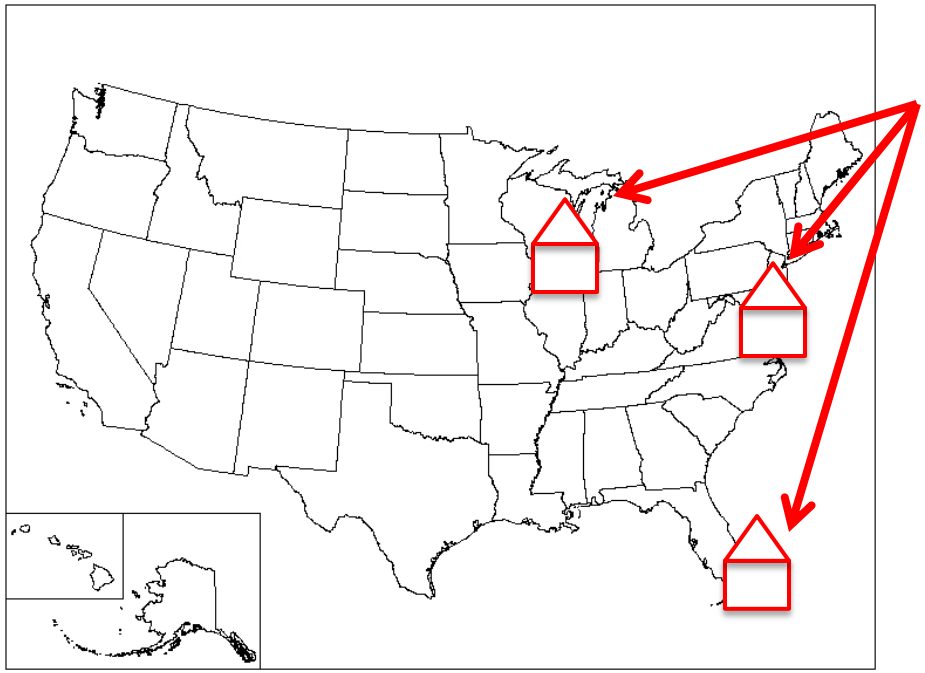
- Sum of all HDD for 1-year for a city/region



Day	Average Temp	HDD
Monday	38°	27
Tuesday	45°	20
Wednesday	51°	14
Thursday	56°	9
Friday	60°	5
Saturday	65°	0
Sunday	69°	0
TOTAL		75

Uses for CDD and HDD

- HDD and CDD can be used to calculate the heating and cooling load of a house in a particular geographic area over an entire heating or cooling season.



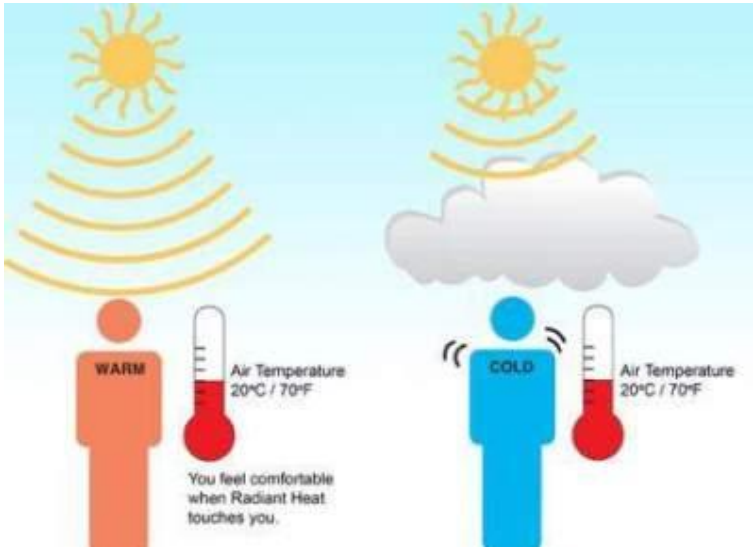
The same house in 3 different locations will have 3 different HDD and heating bills

HDD & Heating Costs by Location		
Location	HDD	Cost
Miami, FL	392	$100
Washington, DC	4537	$1150
Chicago, IL	5927	$1500

Heat Transfer: Radiation

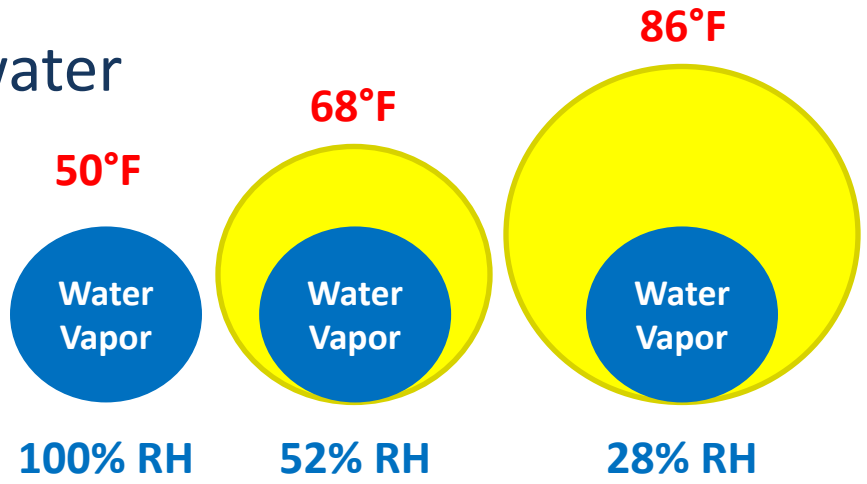
- The transfer of heat through empty space by line of sight
  - No medium is necessary for radiation to occur, for it is transferred by electromagnetic waves.
  - The energy from the Sun travels through the vacuum of space before warming the earth.
  - Examples:

Frost is caused by radiation

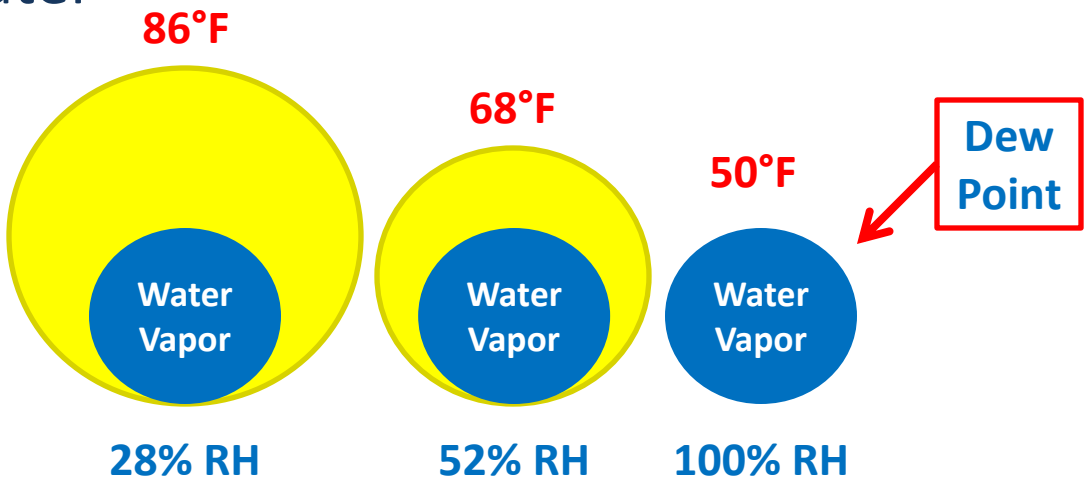


Relative Humidity

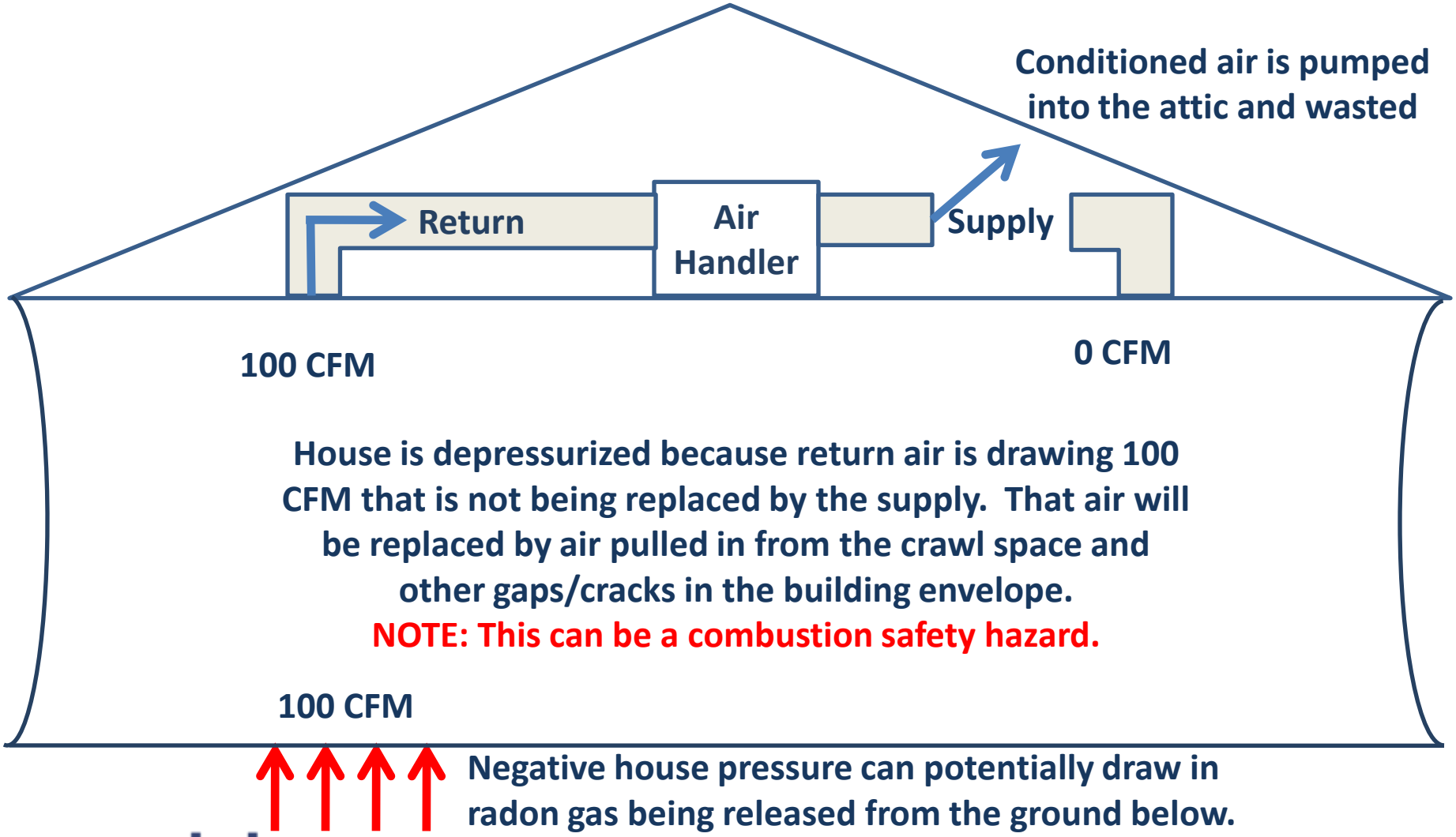
- Warm air holds more water



- Cool air holds less water
  - Dew Point = Saturation



Bad House - Depressurized



Efficiency Rating Example

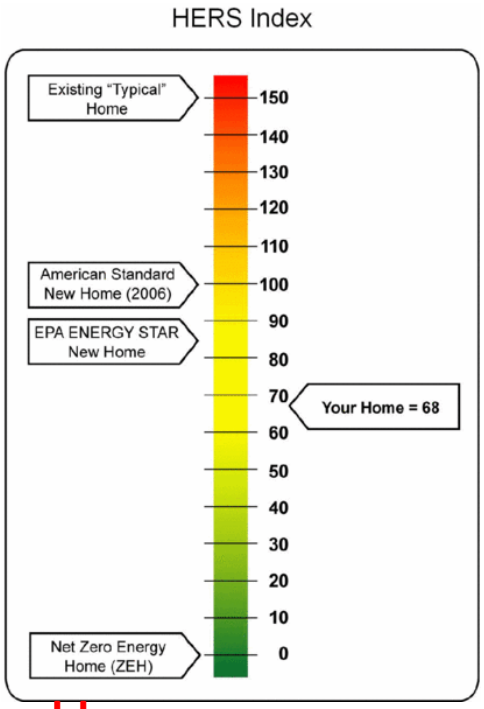
- Electric Resistance Heat vs. Heat Pump
  - 1 kWh = 3,412 Btus
  - Electric resistance heat using 1 kWh provides 3412 Btus of heat for a home

  - A heat pump with a COP of 3 that uses 1 kWh moves 3 x 3,412 = 10,236 Btus of heat into a home

HERS

- Home Energy Rating System
- HERS Index: A relative energy use numerical index
  - 150 = Typical existing home
  - 100 = HERS Reference Home (i.e. home built to code)
  - 0 = Net Zero Purchased Energy Home

HERS Index	Energy Use Compared to Reference Home
50	50% as much energy
85	85% as much energy
100	Same amount
150	150% as much energy
200	200% as much energy



Rated Home vs. Reference Home

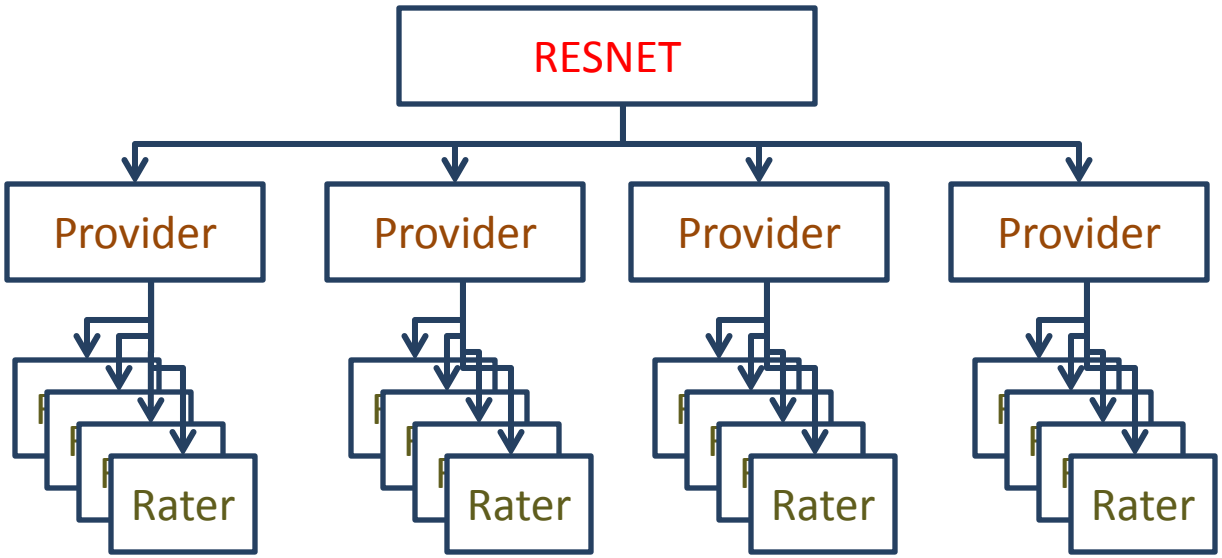
- Rated Home: The new or existing home being rated on the HERS Index
- Reference Home: The geometric twin of the rated home
  - Contains different energy efficiency measures
  - Used as point of comparison for HERS Index
  - Reference home HERS Index = 100
- Allows for apples to apples comparison

Raters & Providers

RESNET sets standards

Providers maintain standards

Raters implement standards

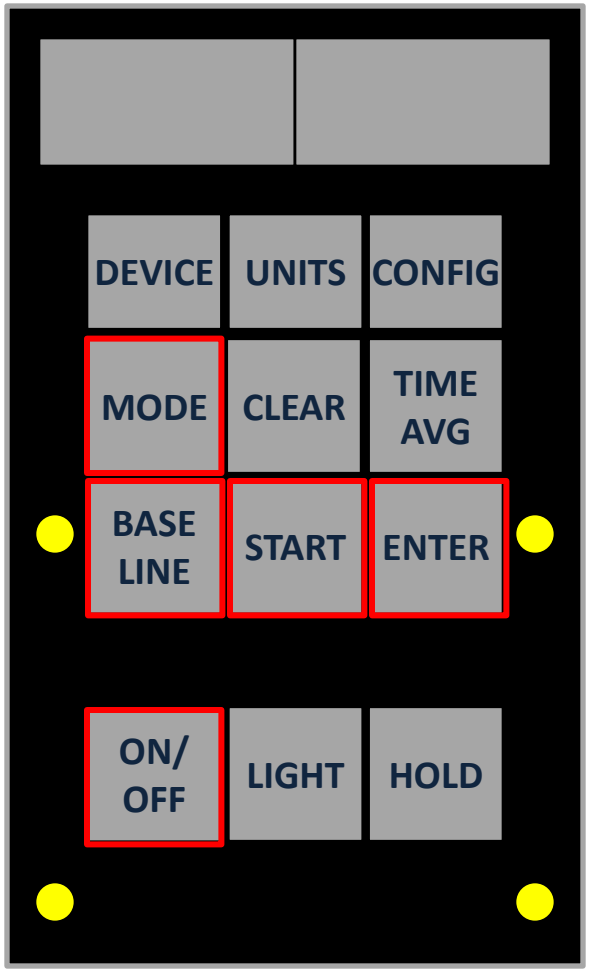


- Provider: An organization that develops, manages, and operates a home energy rating system
- Every rater must contract with a rating provider

Baselining the DG-700 Manometer

DG-700 Set-Up:

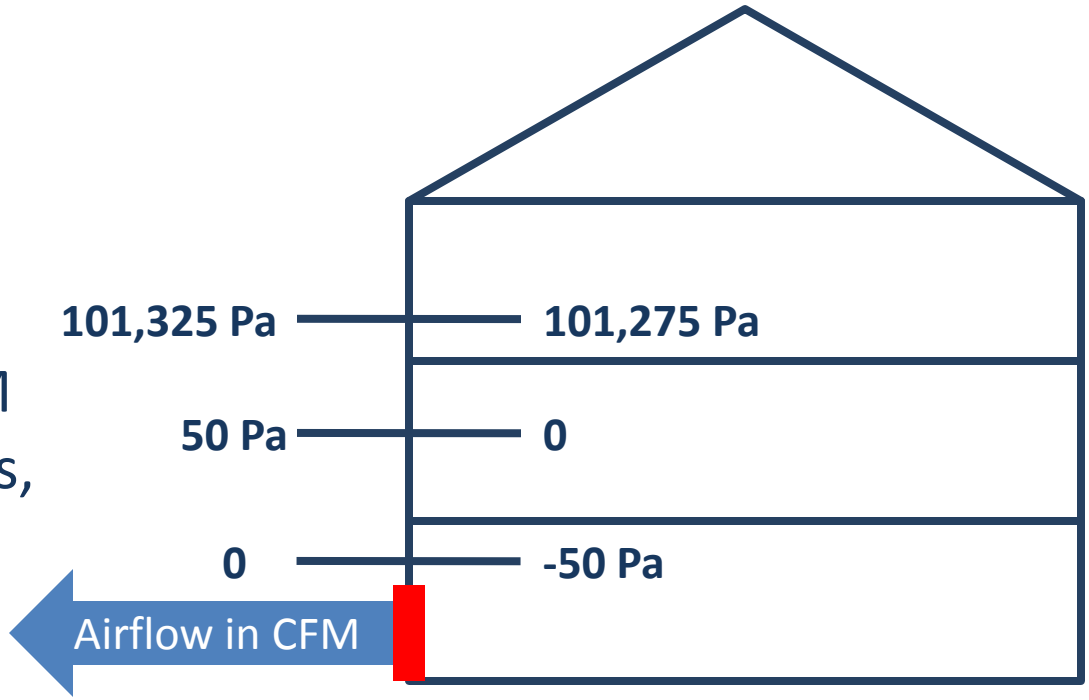
1. Hit “ON/OFF”
2. Hit “MODE” until CFM@50 is displayed
3. Hit “BASE LINE”
4. Hit “START” and wait 10 seconds
5. Hit “ENTER”



Pressure and Airflow

- There is a 50 Pa pressure difference between inside and outside. How you record that difference does not really matter:

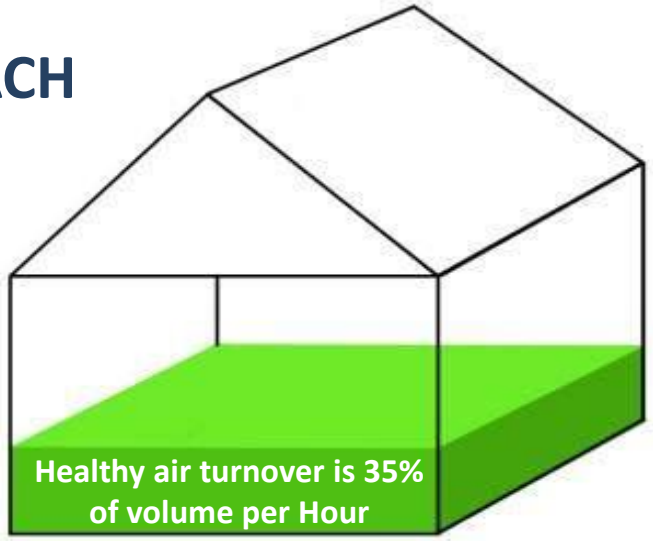
- Airflow in CFM at -50Pa can be converted to CFM under Natural Conditions, and vice versa, using the "N factor" calculation*



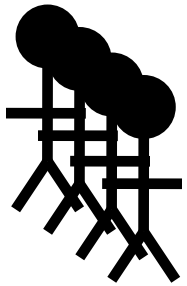
*N factor developed by Lawrence Berkeley Laboratories from thousands of test cases

HERS Airflow Standard

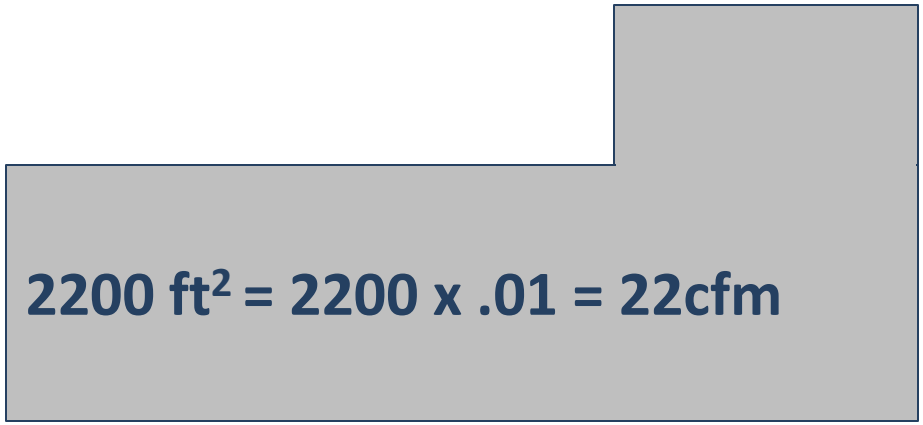
Natural Ventilation Requirement = .35 ACH



Mechanical Ventilation Requirement = $Airflow_{People}$ + $Airflow_{Building}$



= 4 x 7.5 = 30 CFM +



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Equipment

- Manometer + Duct Blaster

Retrotec

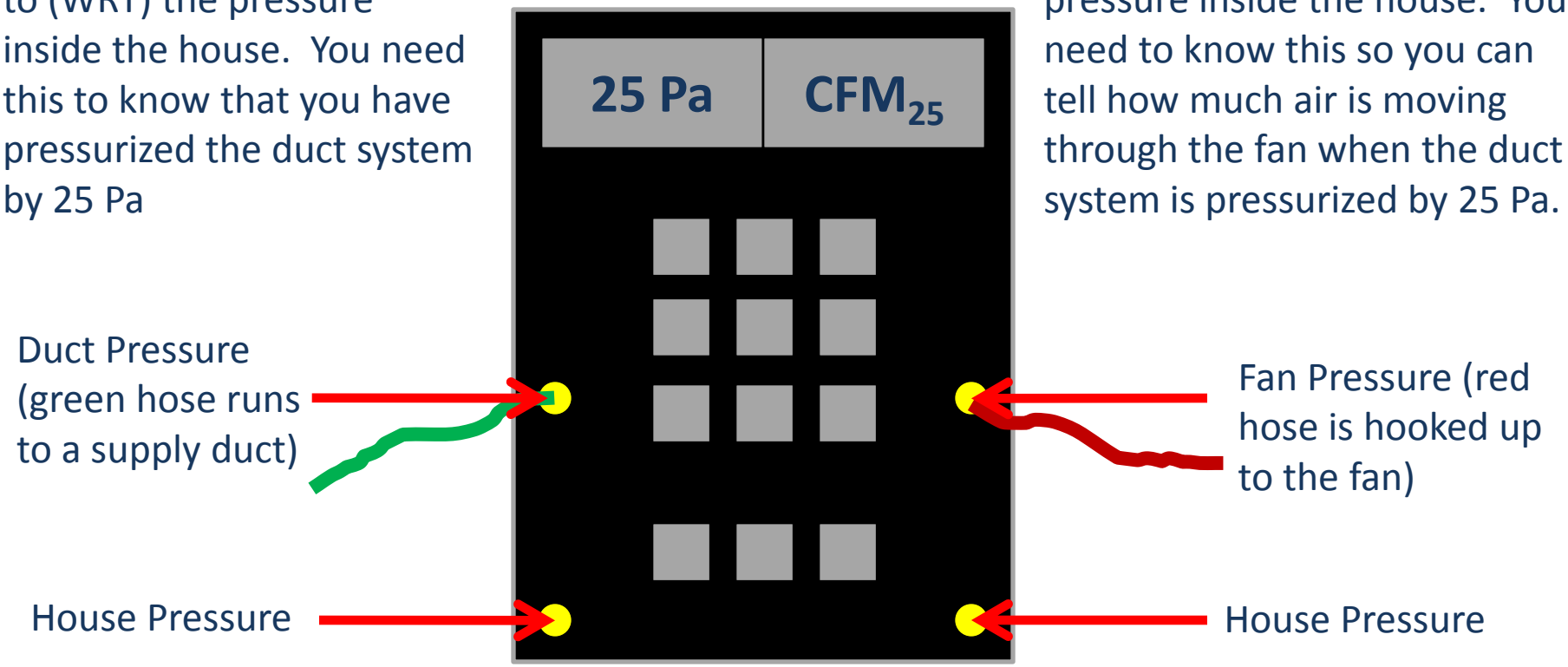
Minneapolis Blower Door

Duct Pressurization Testing

Setup

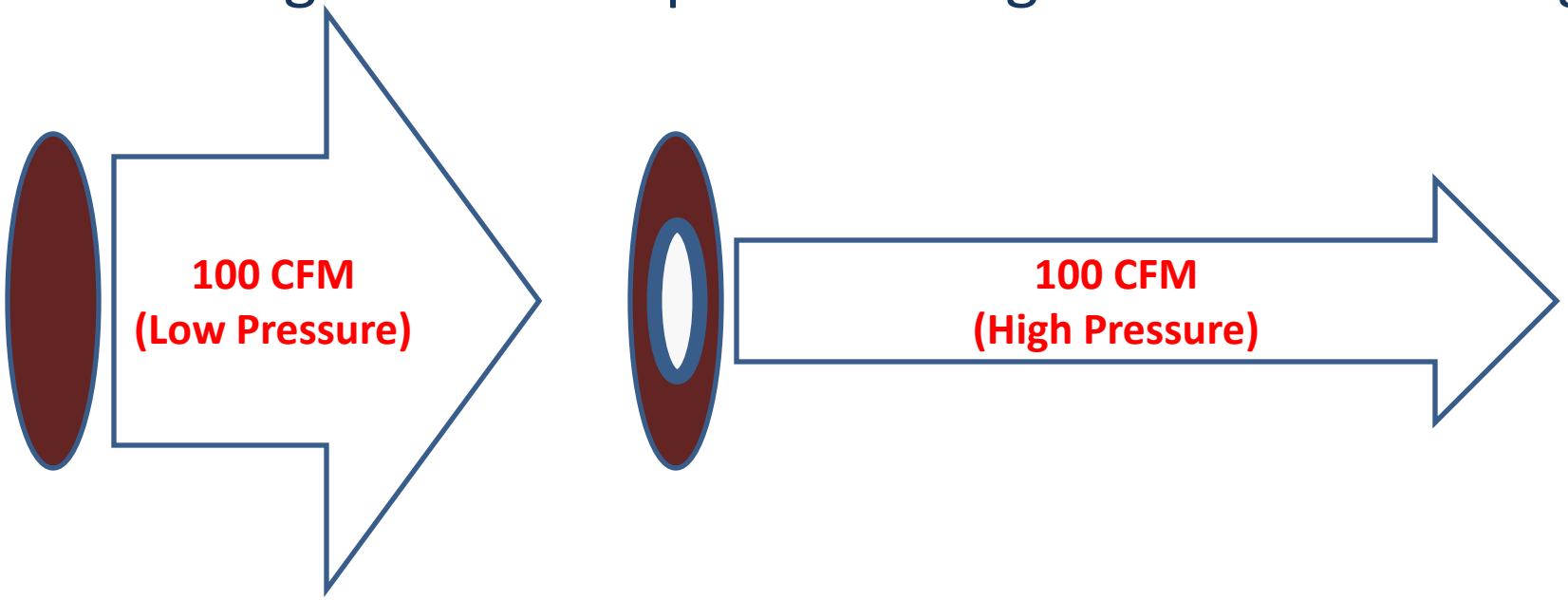
The reading on the left tells you the pressure inside the duct system with reference to (WRT) the pressure inside the house. You need this to know that you have pressurized the duct system by 25 Pa

The reading on the right tells you the pressure inside the fan with reference to (WRT) the pressure inside the house. You need to know this so you can tell how much air is moving through the fan when the duct system is pressurized by 25 Pa.



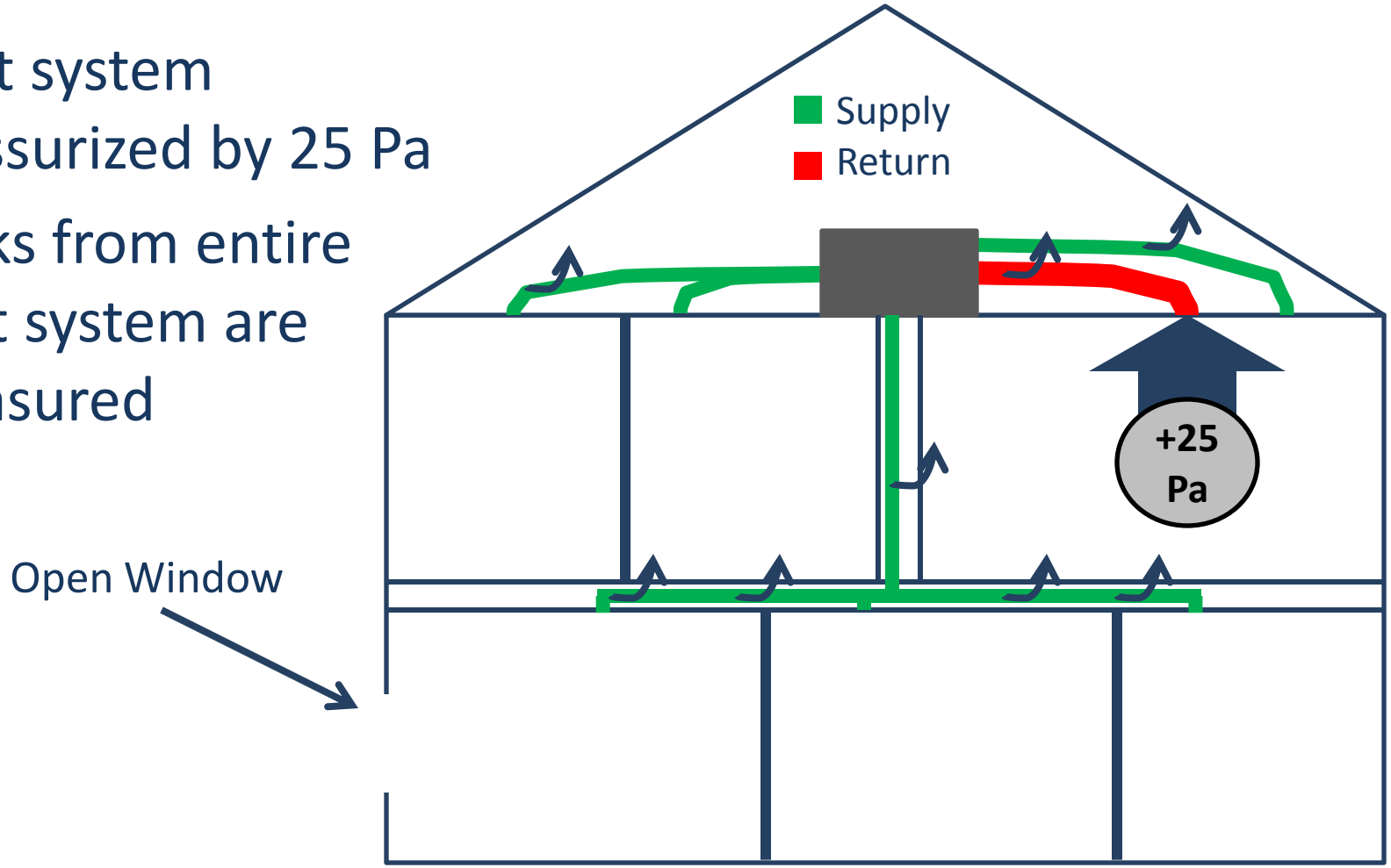
Troubleshooting

- Unable to reach 25 Pa: Ducts are too leaky. Remove rings until 25 Pa can be established.
- Low Flow: Fan pressure is not high enough. Insert smaller ring to increase pressure to get accurate reading.



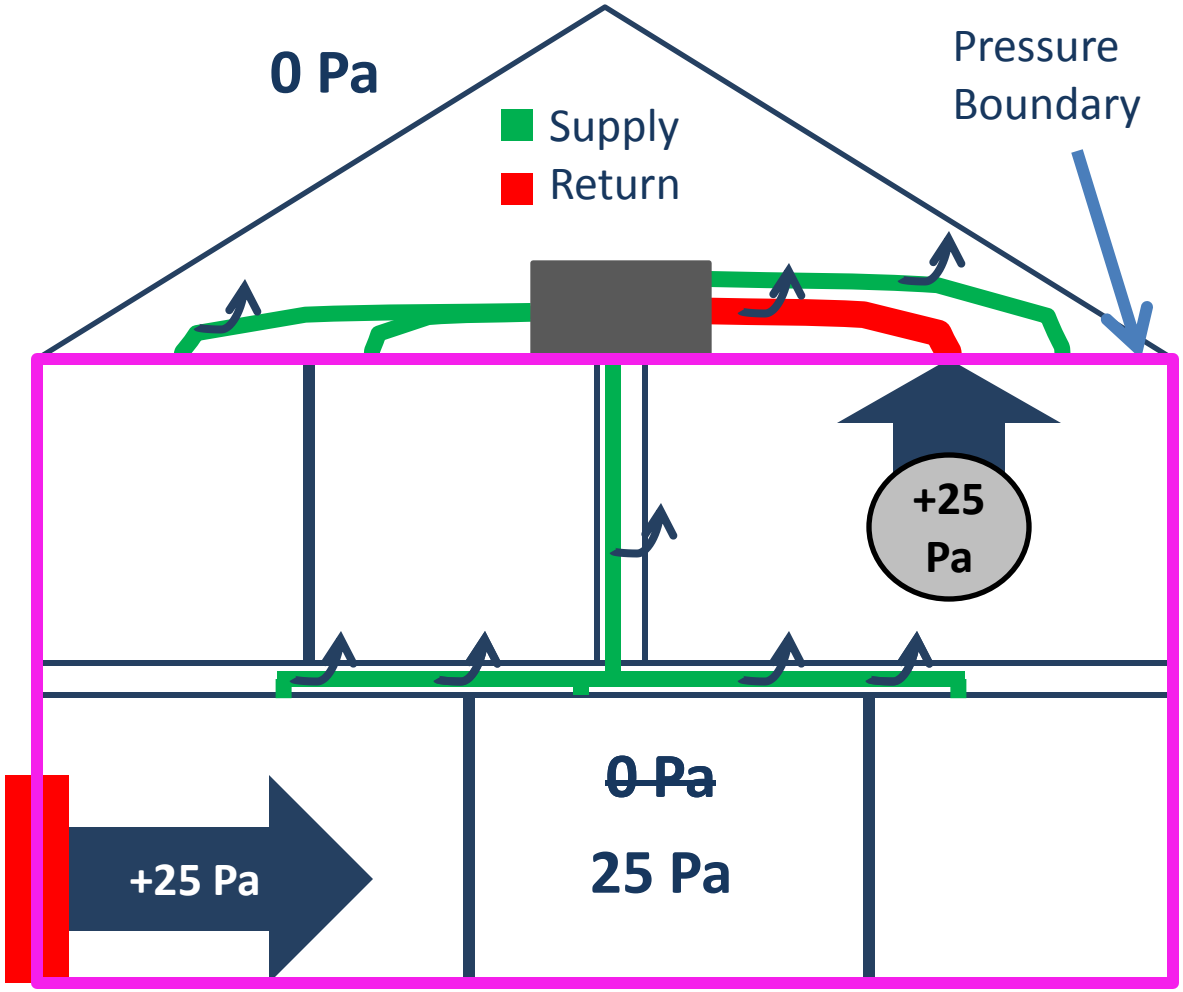
Total Duct Leakage

1. Duct system pressurized by 25 Pa
2. Leaks from entire duct system are measured



Duct Leakage to the Outside

1. Duct system pressurized by 25 Pa
2. Leaks from entire duct system are measured
3. Blower door pressurizes house by 25 Pa
4. Interior ductwork and house have same pressure = no leaks = exterior leaks only

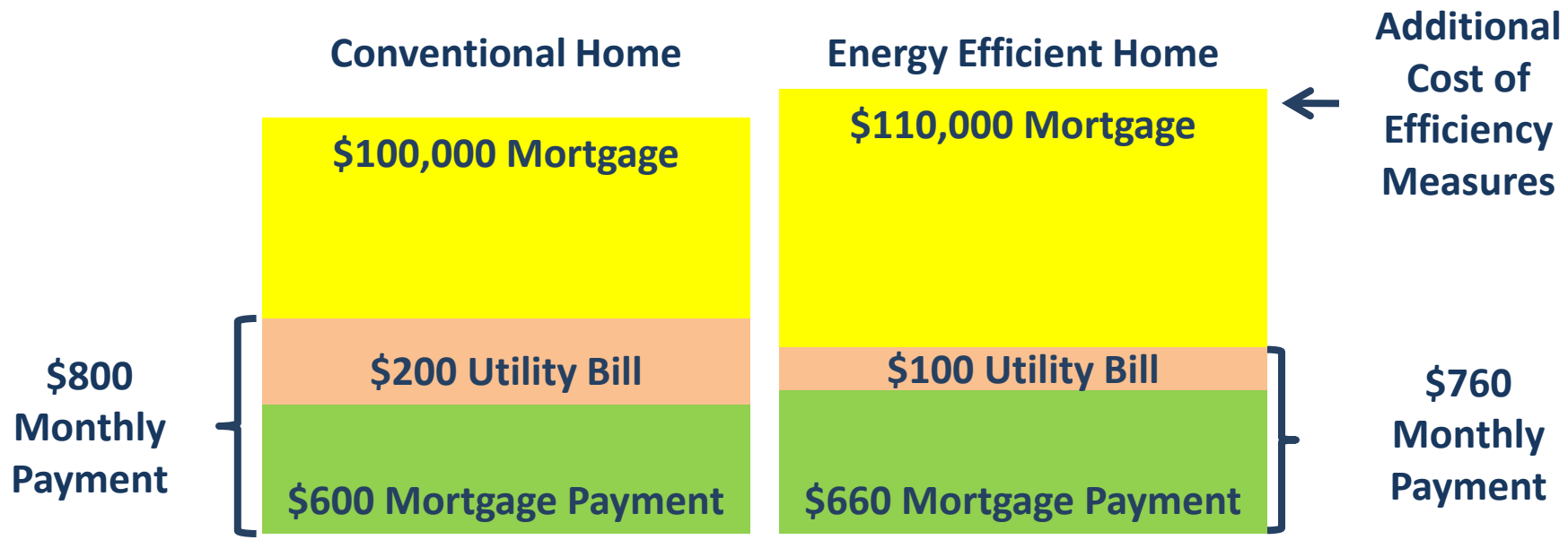


Shower/Tub Exterior Wall

- Walls behind bathtubs and shower inserts often have no insulation.
- This allows heat and air to easily escape a home in those locations.

Energy Efficient Mortgages (EEMs)

- Factors in a home's energy efficiency in mortgage
- Typically used to purchase a new home



Thermal Bypass Checklist

Home Address:_____ City:_____ State:_____

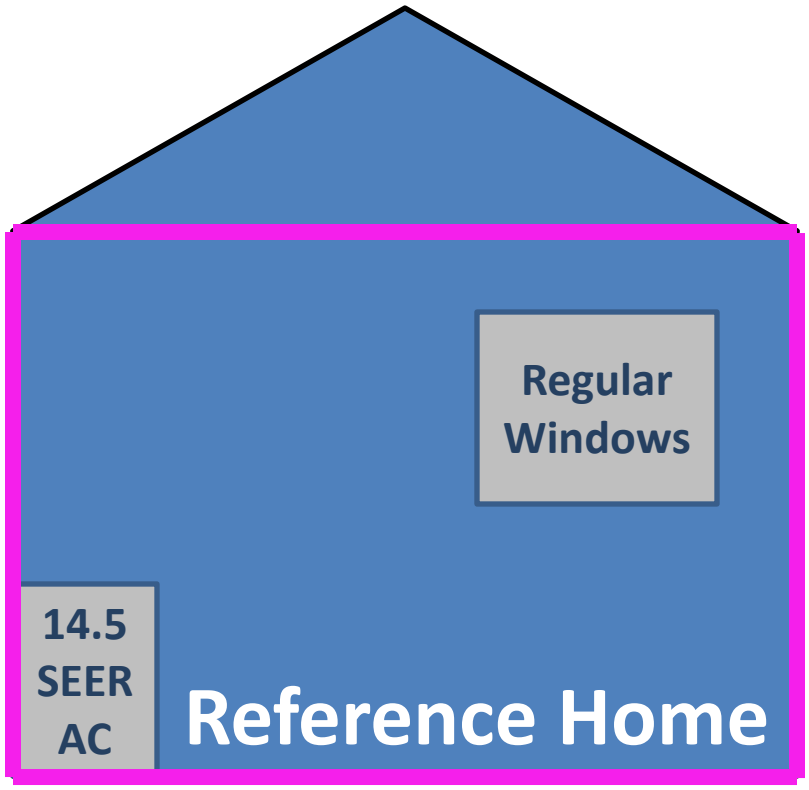
Thermal Bypass	Inspection Guidelines	Corrections Needed	Builder Verified	Rater Verified	N/A
1. Overall Air Barrier and Thermal Barrier Alignment	**Requirements:** Insulation shall be installed in full contact with sealed interior and exterior air barrier except for alternate to interior air barrier under item no. 2 *(Walls Adjoining Exterior Walls or Unconditioned Spaces)*				
	All Climate Zones:				
	1.1 Overall Alignment Throughout Home	☐	☐	☐	☐
	1.2 Garage Band Joist Air Barrier (at bays adjoining conditioned space)	☐	☐	☐	☐
	1.3 Attic Eave Baffles Where Vents/Leakage Exist	☐	☐	☐	☐
	Only at Climate Zones 4 and Higher:				
	1.4 Slab-edge Insulation (A maximum of 25% of the slab edge may be uninsulated in Climate Zones 4 and 5.)	☐	☐	☐	☐
	Best Practices Encouraged, Not Req'd.:				
	1.5 Air Barrier At All Band Joists (Climate Zones 4 and higher)	☐	☐	☐	☐
	1.6 Minimize Thermal Bridging (e.g., OVE framing, SIPs, ICFs)	☐	☐	☐	☐
2. Walls Adjoining Exterior Walls or Unconditioned Spaces	**Requirements:** • Fully insulated wall aligned with air barrier at both interior and exterior, **OR** • Alternate for **Climate Zones 1 thru 3**, sealed exterior air barrier aligned with RESNET Grade 1 insulation fully supported • Continuous top and bottom plates or sealed blocking				
	2.1 Wall Behind Shower/Tub	☐	☐	☐	☐
	2.2 Wall Behind Fireplace	☐	☐	☐	☐
	2.3 Insulated Attic Slopes/Walls	☐	☐	☐	☐
	2.4 Attic Knee Walls	☐	☐	☐	☐
	2.5 Skylight Shaft Walls	☐	☐	☐	☐
	2.6 Wall Adjoining Porch Roof	☐	☐	☐	☐
	2.7 Staircase Walls	☐	☐	☐	☐
	2.8 Double Walls	☐	☐	☐	☐

Thermal Bypass Checklist

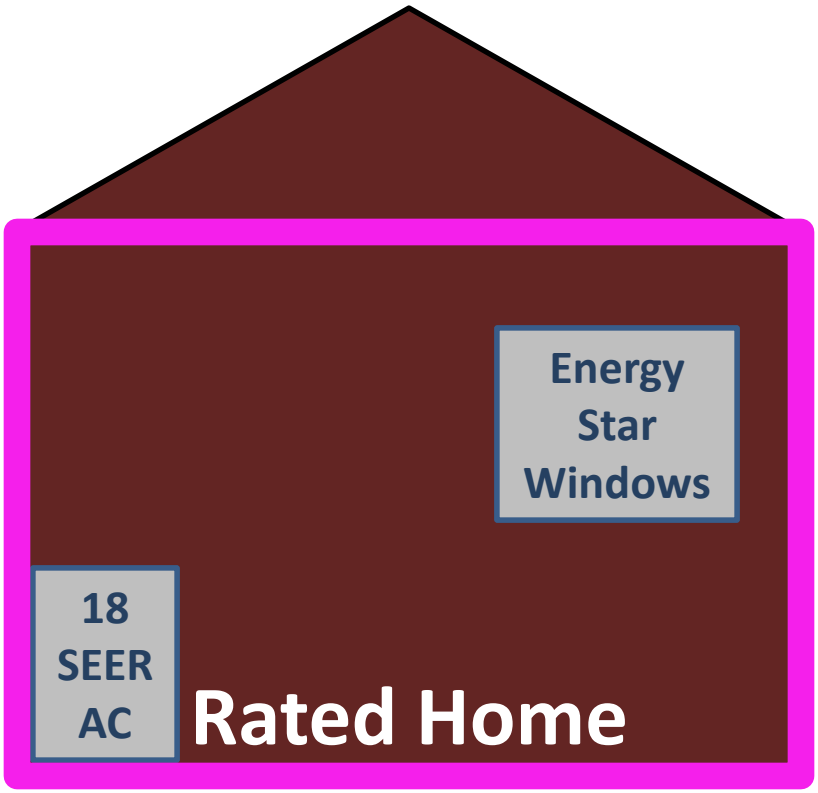
3. Floors between Conditioned and Exterior Spaces	**Requirements:** • Air barrier is installed at any exposed fibrous insulation edges • Insulation is installed to maintain permanent contact with sub-floor above including necessary supports (e.g., staves for blankets, netting for blown-in) • Blanket insulation is verified to have no gaps, voids or compression. • Blown-in insulation is verified to have proper density with firm packing				
	3.1 Insulated Floor Above Garage	☐	☐	☐	☐
	3.2 Cantilevered Floor	☐	☐	☐	☐
4. Shafts	**Requirements:** Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam (provide fire-rated collars and caulking where required)				
	4.1 Duct Shaft	☐	☐	☐	☐
	4.2 Piping Shaft/Penetrations	☐	☐	☐	☐
	4.3 Flue Shaft	☐	☐	☐	☐
5. Attic/ Ceiling Interface	**Requirements:** • All attic penetrations and dropped ceilings include a full interior air barrier aligned with insulation with any gaps fully sealed with caulk, foam or tape • Movable insulation fits snugly in opening and air barrier is fully gasketed				
	5.1 Attic Access Panel (fully gasketed and insulated)	☐	☐	☐	☐
	5.2 Attic Drop-down Stair (fully gasketed and insulated)	☐	☐	☐	☐
	5.3 Dropped Ceiling/Soffit (full air barrier aligned with insulation)	☐	☐	☐	☐
	5.4 Recessed Lighting Fixtures (ICAT labeled and sealed to drywall)	☐	☐	☐	☐
	5.5 Whole-house Fan (insulated cover gasketed to the opening)	☐	☐	☐	☐
6. Common Walls Between Dwelling Units	**Requirements:** Gap between drywall shaft wall (i.e., common wall) and the structural framing between units is fully sealed at all exterior boundary conditions				
	6.1 Common Wall Between Dwelling Units	☐	☐	☐	☐

Energy Modeling 101

HERS Index: 100



HERS Index: 80



Thank You!

- We wish you the best of luck
- We are always available to answer questions
- We appreciate referrals
- Class locations for LEED, BPI, HERS, Solar, and other Everblue training:

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CA - Irvine	FL - Jacksonville	MD - Baltimore	NV - Las Vegas	TN - Nashville
CA - Los Angeles	FL - Miami	MI - Detroit	NY - New York City	TX - Austin
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