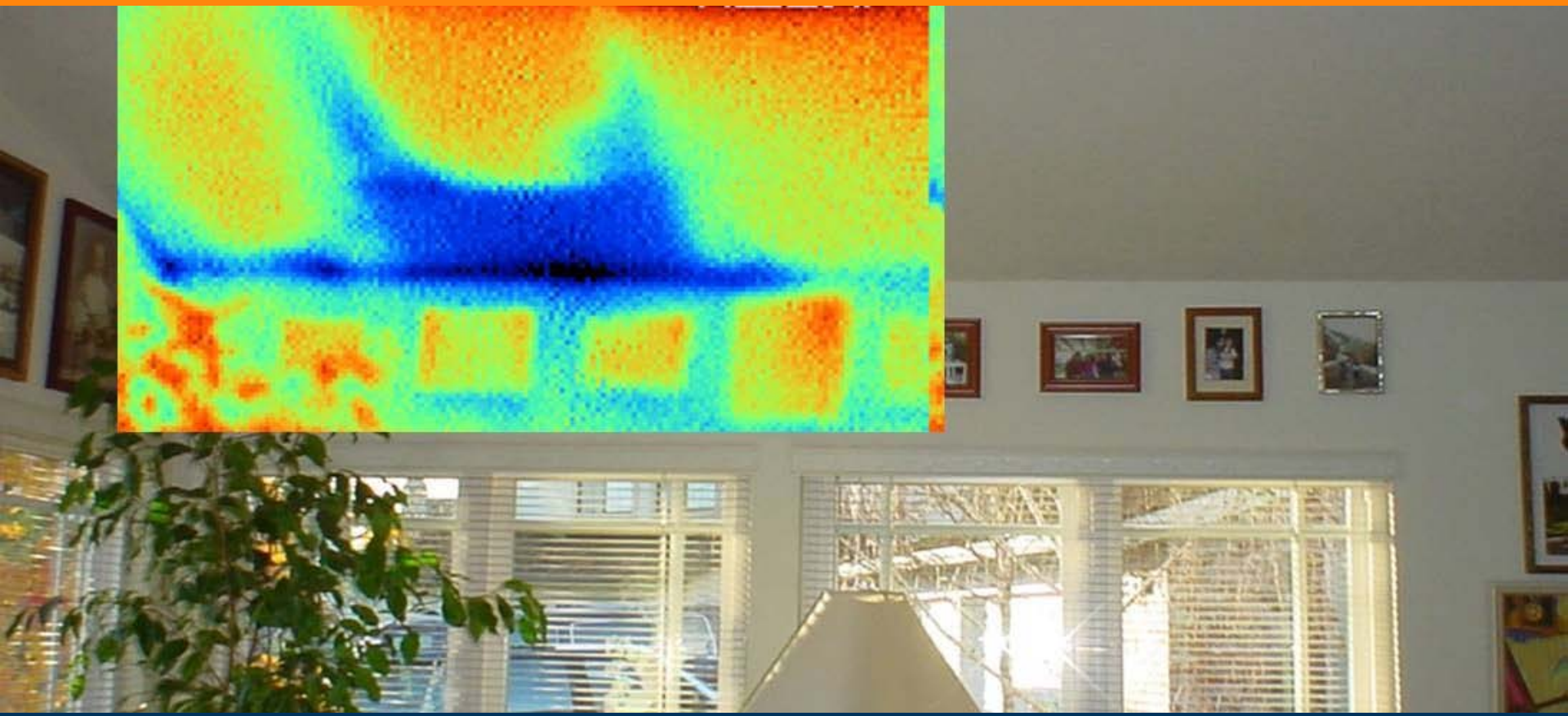
El Paso Electric

Residential Energy Efficiency



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Presenter Bio

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Jaymar Davis, PE, CEM, CLEP, CMVP, CEA

Sr. Field Engineering Manager

- 10 Years experience in energy efficiency
- Johnson Controls, Kohler Co.

- Certifications:
  - Licensed Professional Engineer (PE)
  - Certified Energy Manager (CEM)
  - Certified Lighting Efficiency Professional (CLEP)
  - Certified Energy Auditor (CEA)
  - Certified Measurement & Verification (CMVP)
- Professional Background
  - Power Factor Correction
  - Kaizen and Lean Six Sigma
  - Power Quality
  - Energy Usage and Load Analysis

Heat Loss and Heat Gain

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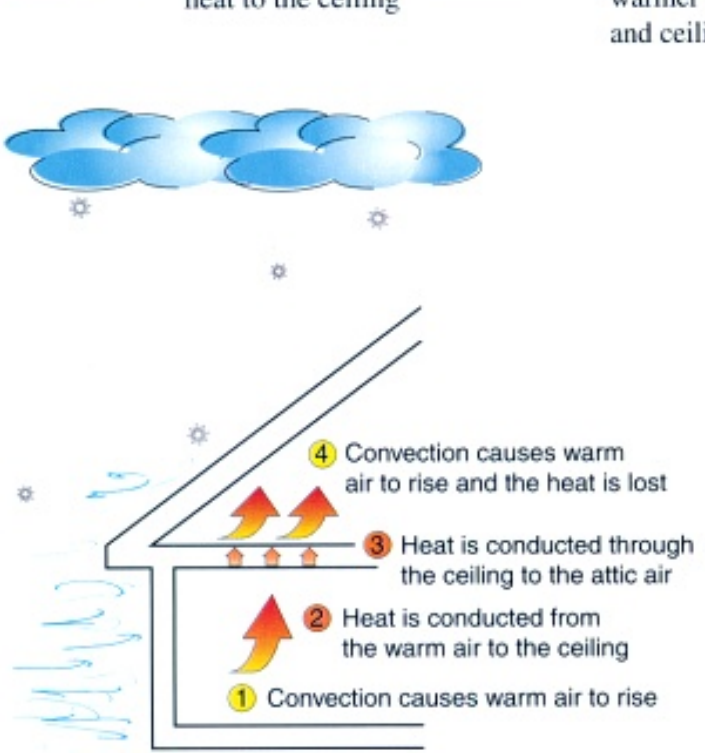
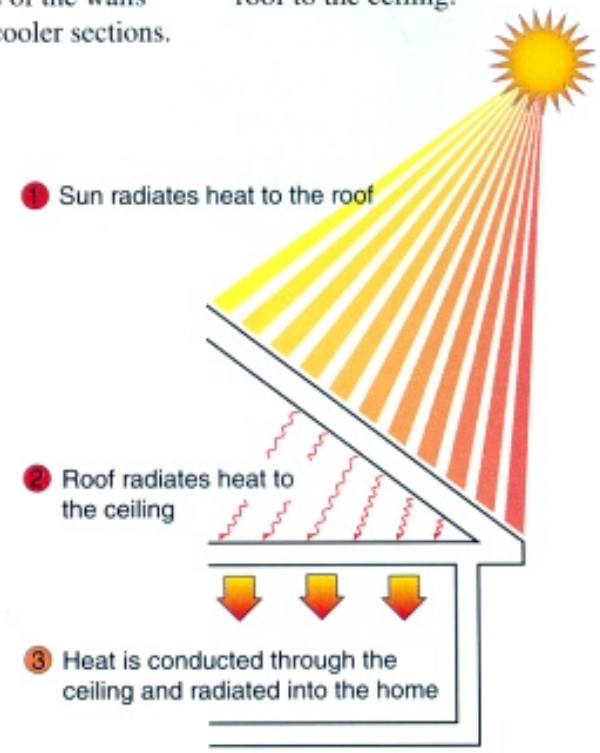
Your Home Loses and Gains Heat in 3 Ways

	Convection	Conduction	Radiation
Definition:	The transfer of heat by moving air.	The transfer of heat through a solid material.	The transfer of heat in the form of electromagnetic waves.
Example:	Warm air rises and transfers heat to the ceiling	Heat is transferred from warmer sections of the walls and ceilings to cooler sections.	Heat is transferred from the roof to the ceiling.





Types of Heat

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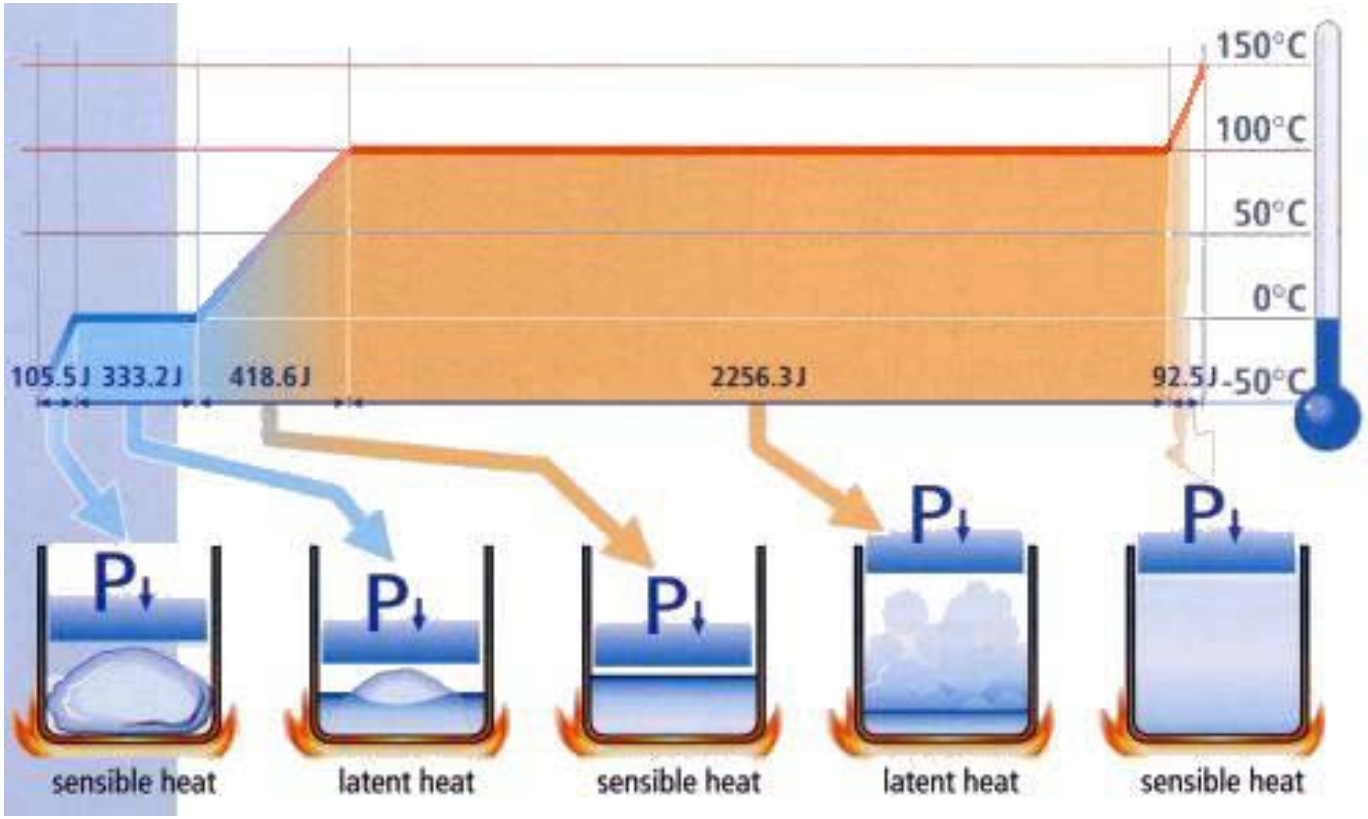
- Sensible Heat
- Latent Heat



Heat Loss Diagram

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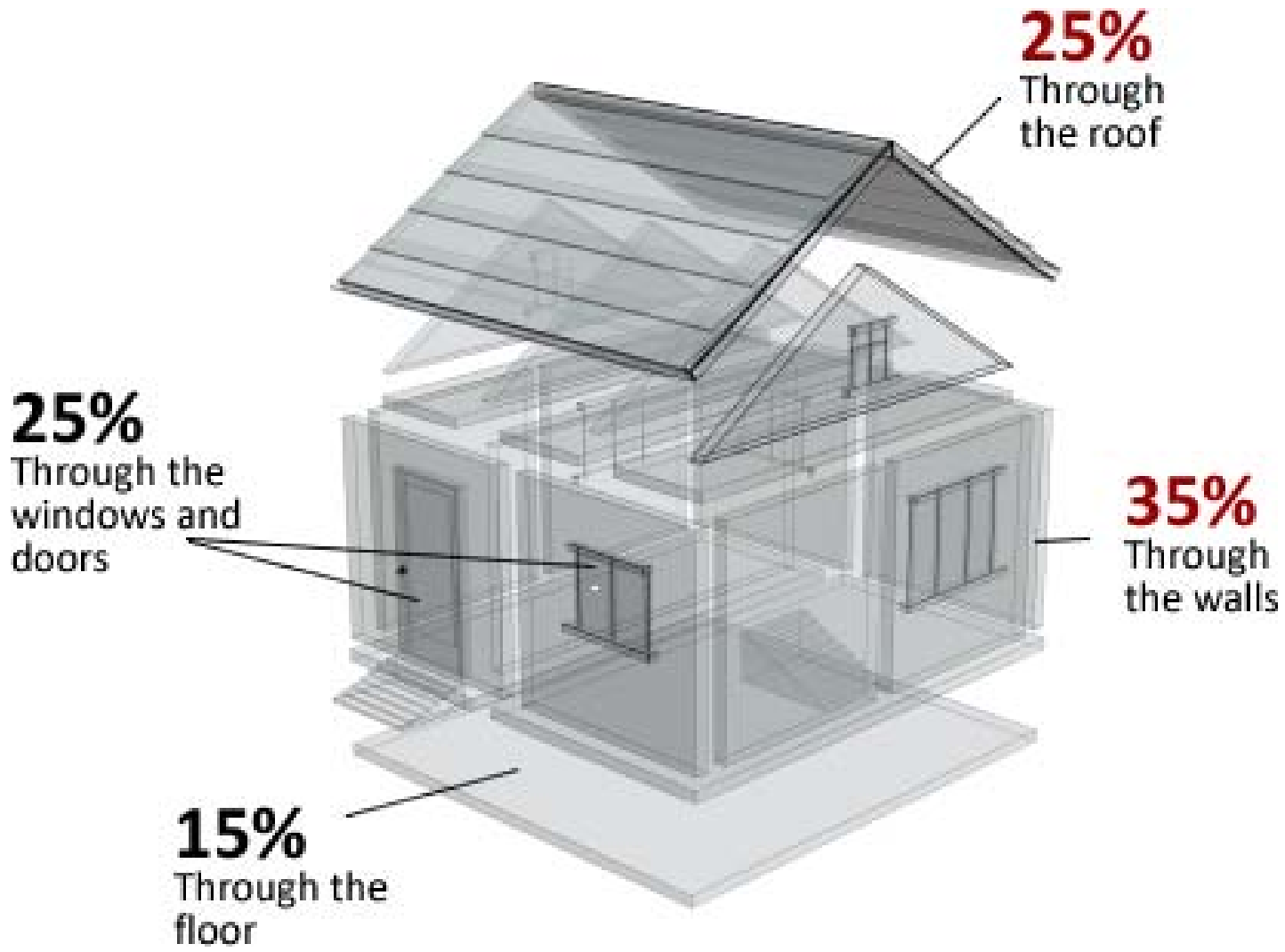

Conditioned Air Losses

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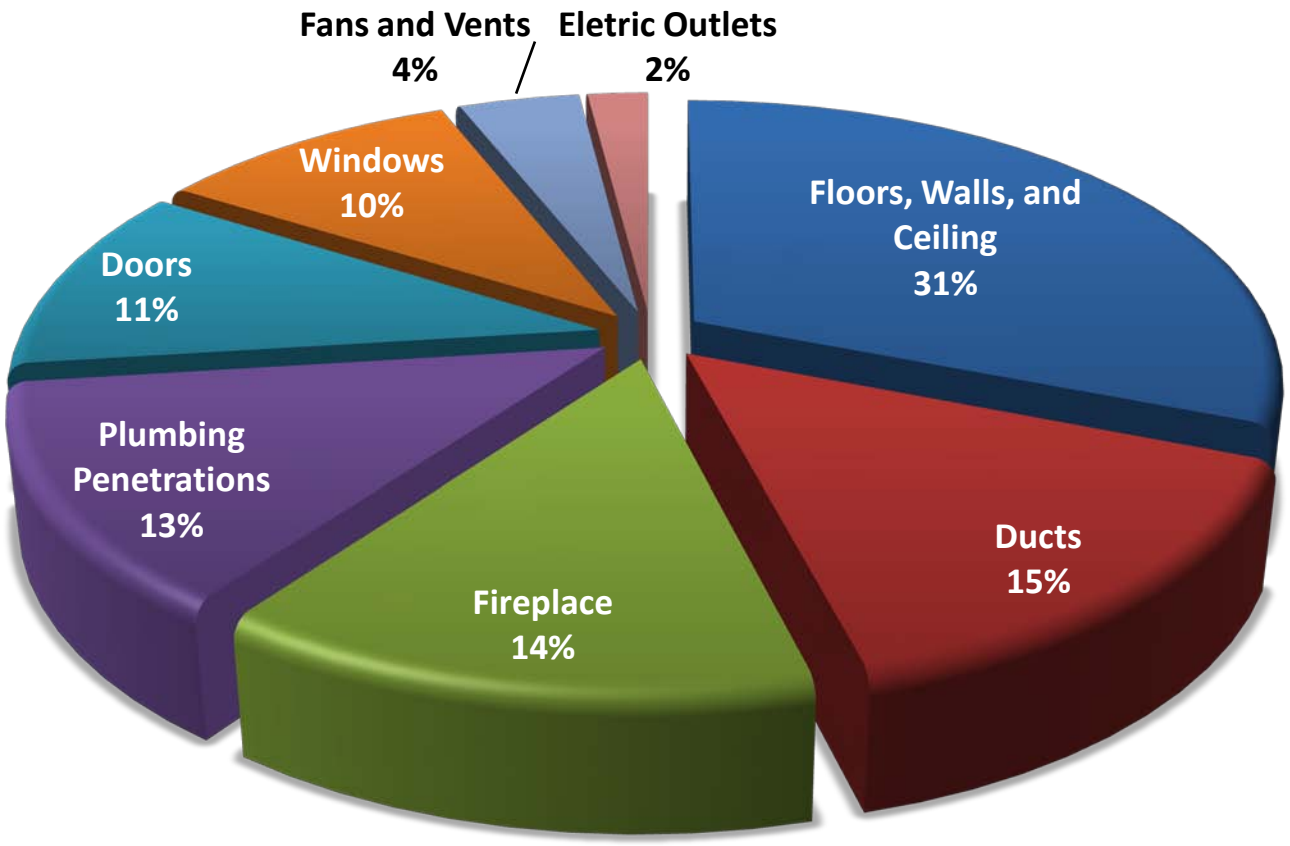

Objectives

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- Understanding Insulation
- Understanding Duct Sealing
- Understanding Air Infiltration Testing
- Understanding Window replacement
- Understanding Solar Screens

What is the Value?

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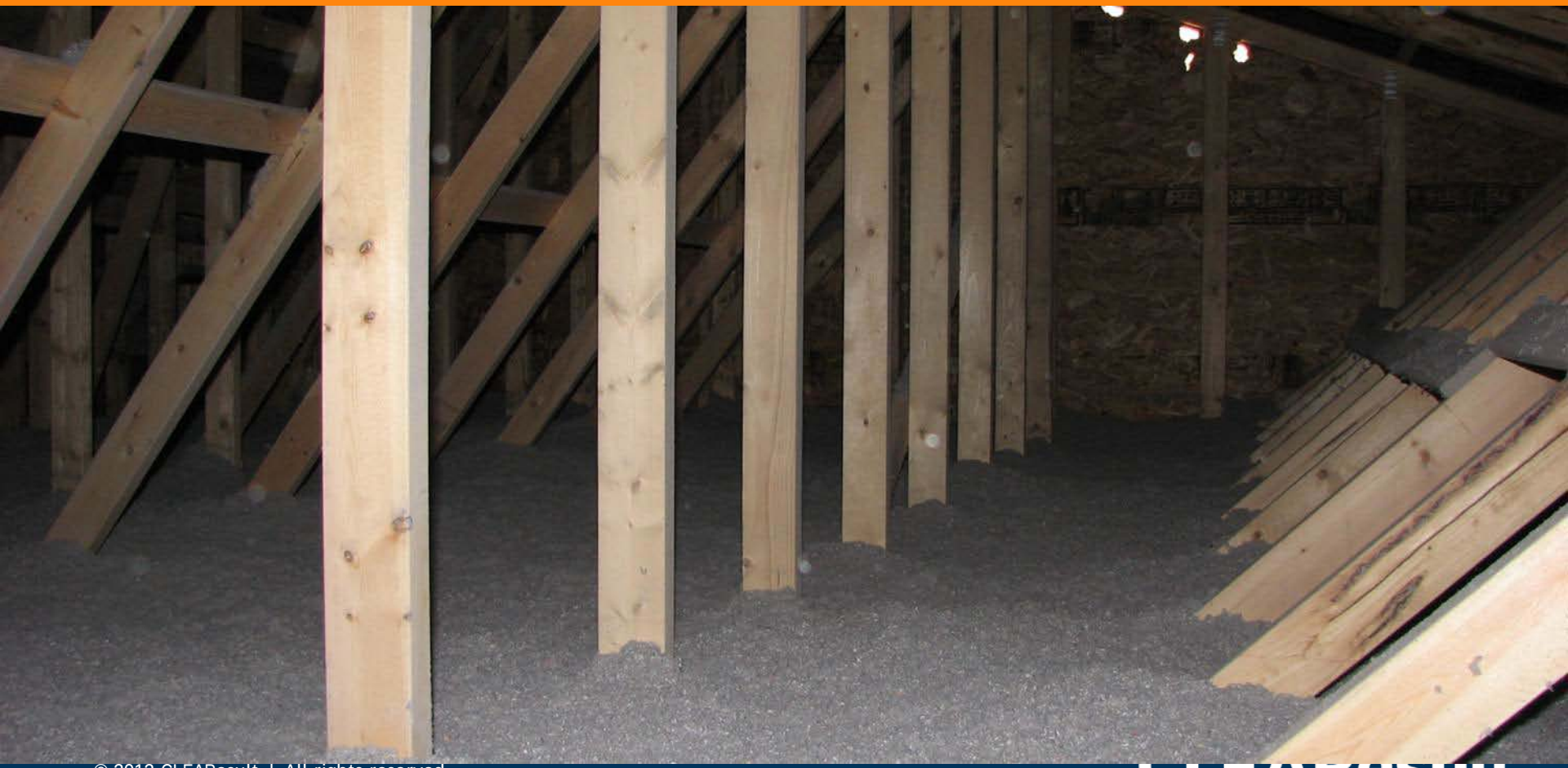
Why install these energy efficiency measures?

- Energy Savings
- Provide comfort
- Be a trusted source
- Control the home environment
- Optimize the home HVAC system
  - 3-ton Units→ 2-ton Units

Ceiling Insulation



What is R-Value?

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- A measure of resistance to heat flow through a given thickness of material
- The higher the R-value, the greater the resistance.

What is R-Value?

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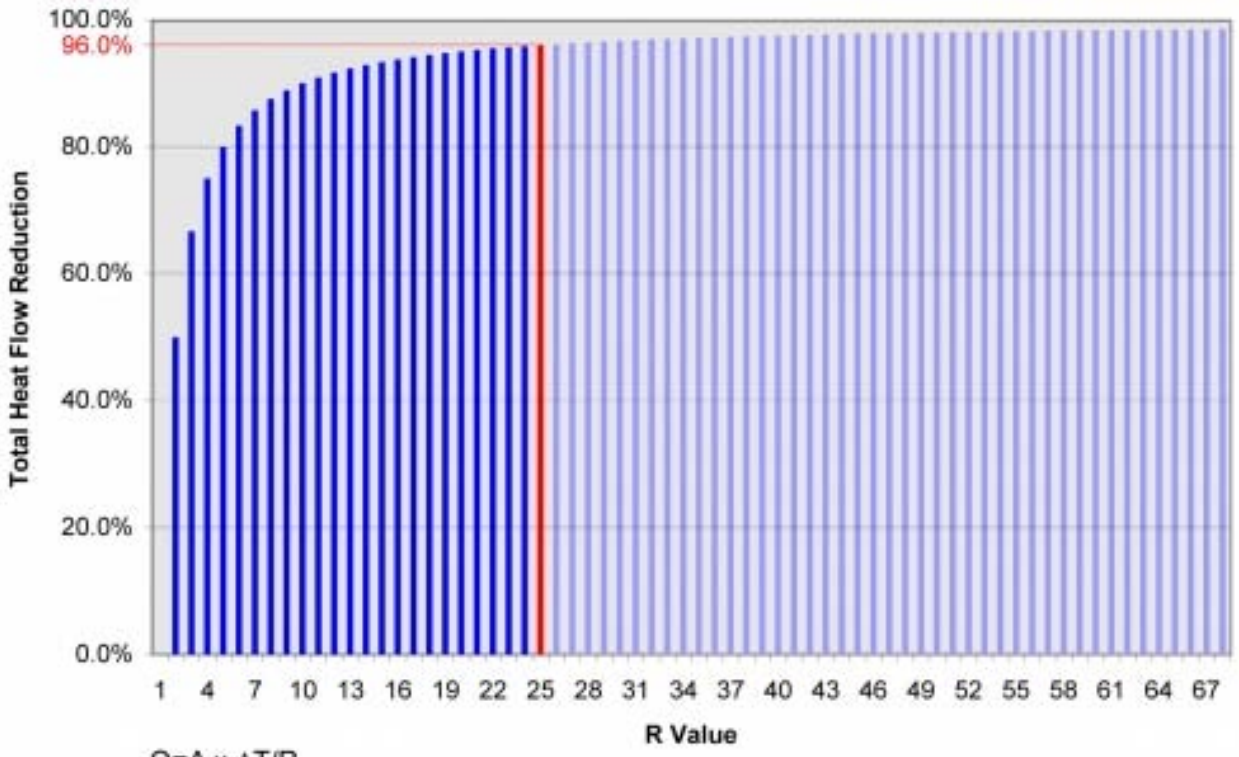

$Q=A \times \Delta T/R$

where:
Q = Rate of heat flow (Btu/hr)
A = Area (ft^2)
ΔT = Difference in Temperature (° F)
R = Resistance to conductive heat flow (hr ft^2 °F/Btu)

Total Heat Flow Reduction = $1 - (Q_R / Q_1)$

Measure

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- Ceiling insulation savings are per square foot of treated ceiling area above a conditioned space.
- Ceiling insulation must be added only to homes with electric air conditioning or evaporative cooling systems to qualify for deemed savings.

Baseline Qualifications

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- Deemed savings are based on the current level of ceiling insulation in the home from R-0 to R-22.
- The current insulation level of each home will be determined and documented by the insulation installer.
- Degradation due to age and density of the existing insulation should be taken into account.
- In the event that existing insulation is or has been removed, the existing R-value will be based upon the R-value of the existing insulation prior to removal.

Installation & Efficiency Standard | CLEAResult

- A ceiling insulation level of R-30 is recommended throughout Texas as prescribed by DOE.
- The combined R-values of the existing insulation and the insulation being added will total at least R-30.
- The R-value of the existing insulation can be no greater than R-22.

Floor Insulation

Measure

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- Floor insulation savings are per square foot of treated floor area above a non-conditioned space.
- Only for homes with electric air conditioning or evaporative cooling systems to qualify for these deemed savings values.

Baseline

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- The baseline is considered to be a house with pier and beam construction and no floor insulation against the floor of conditioned area.

Installation & Efficiency Standard

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- A floor insulation level of R-19 is recommended for site-built home**
- There must be no existing floor insulation to qualify for the incentive.
- Insulation should be attached or secured so that it remains in place for at least 10 years.
- Typical floor construction depth of manufactured homes usually does not allow R-19 batt. to be installed within the floor joists, so R-15 loose-fill insulation**

** United States Department of Energy (DOE) and Texas Department of Housing and Community Affairs (TDHCA) programs.

El Paso Electric

Wall Insulation

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Measure

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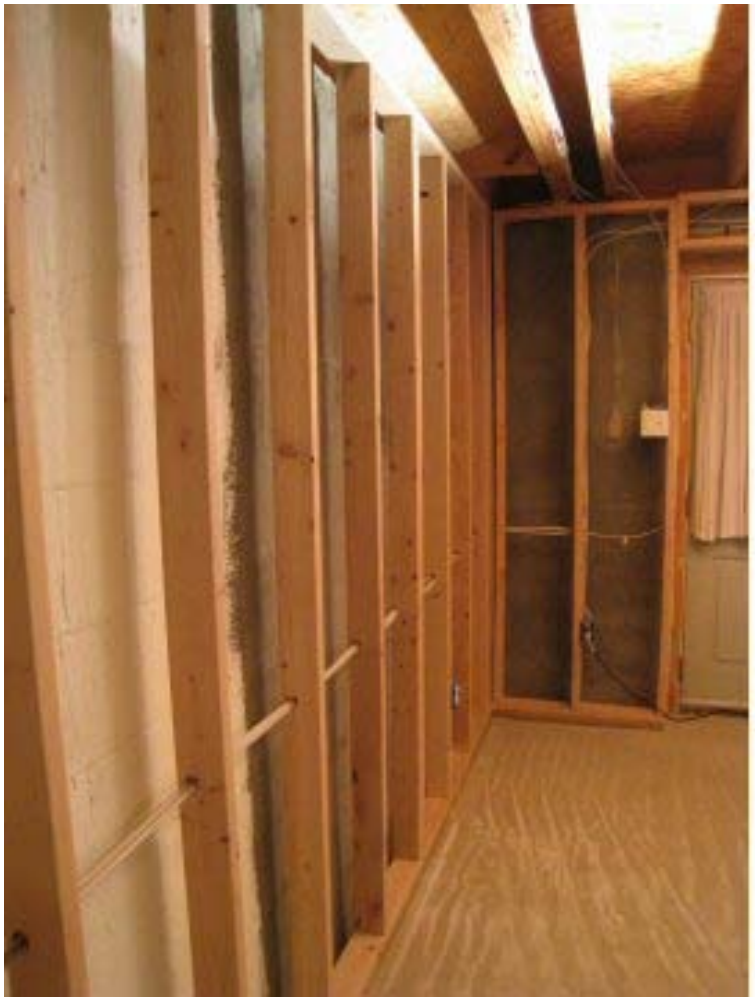
- Wall insulation savings are per square foot of treated wall area (gross wall area less window and door area), and are based on R-0 increased to R-13.
- Only for homes with electric air conditioning or evaporative cooling systems to qualify for these deemed savings values.

Baseline

- The baseline is considered to be a house with no wall insulation in the 4” wall cavity.



Installation & Efficiency Standard

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- The standard for Texas for adding wall insulation to an existing wall cavity is R-13**
- To qualify for the incentive, there must be no existing wall insulation.

** United States Department of Energy (DOE) and Texas Department of Housing and Community Affairs (TDHCA) programs.

Insulation Materials

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Common Materials

- Fiberglass
- Cellulose
- Foam

Best Practices

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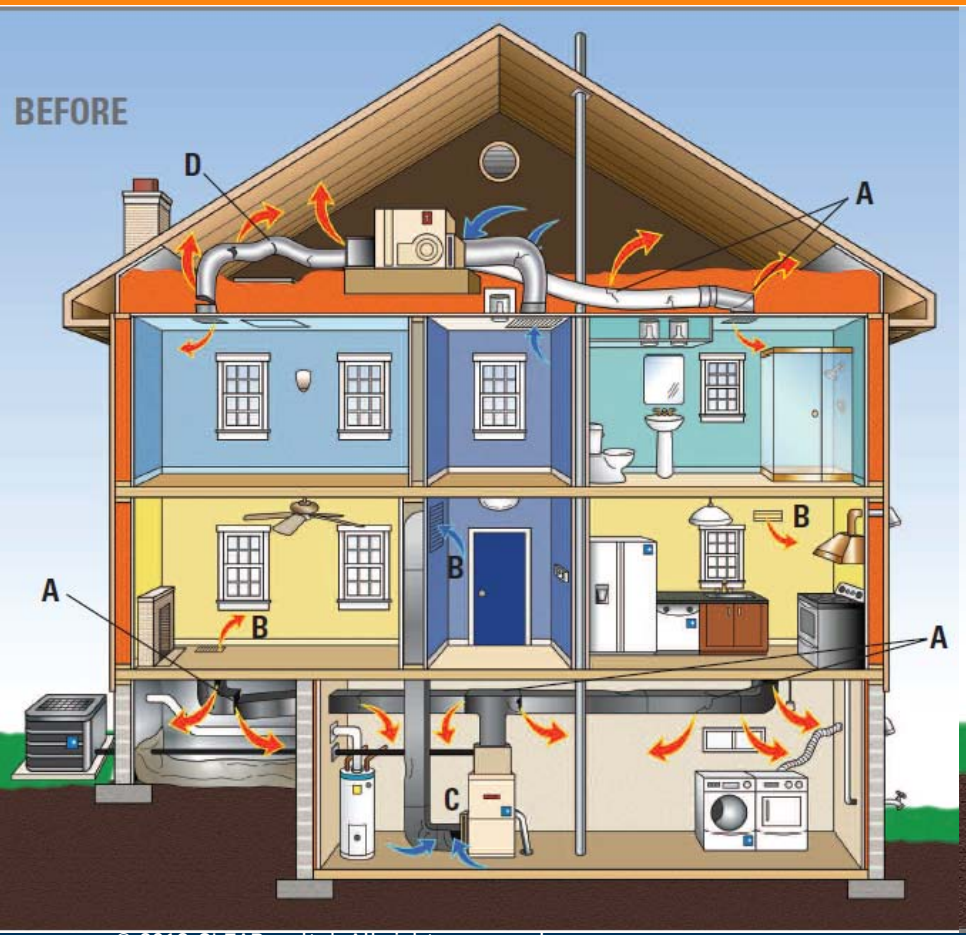
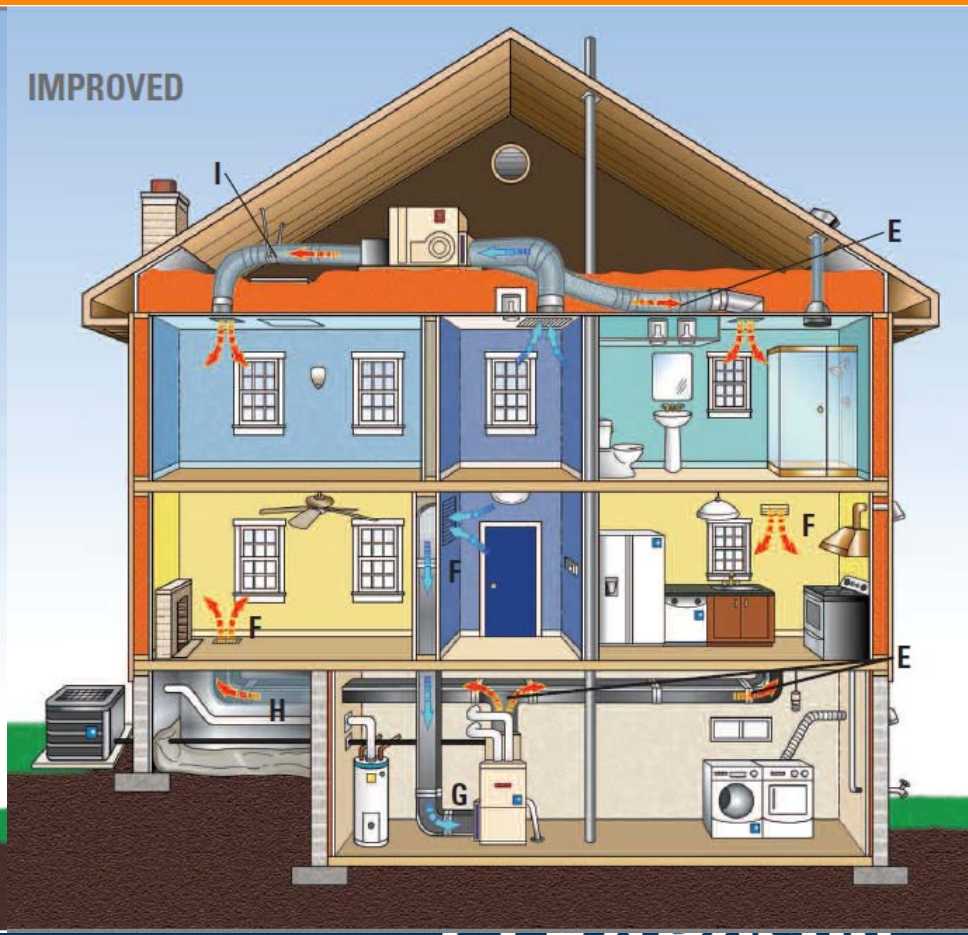
- Install evenly & seal around air penetrations when installing fiberglass batting or cellulose insulation.
- Adjust for the amount of settling that will occur over time. Cellulose loses 20% of its R-value over time.
- Thermal imaging is a way to identify missing wall insulation.

Duct Efficiency Improvements





Benefits of Duct Sealing

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- **Lowered Energy Bills**
  - Leaky ductwork decreases the efficiency of your air conditioning and heating system by 10 – 30%, on average.
- **Improved Indoor Air Quality**
  - Dust and other pollutants can easily enter your duct system through holes.
- **Safety**
  - Ductwork not only delivers conditioned air throughout your home, it also expels gases (such as carbon monoxide) from your home.

Duct Sealing

CLEAResult

- Applicable to measures which seal leaks in supply and return ducts and repair or re-insulate ducts of existing homes that have central electric air conditioning or heat pumps.
- All treated sites must have a majority of the treated ducts and returns located in an unconditioned space.

Baseline Qualifications

CLEAResult

- Existing duct system must have a leakage rate of greater than or equal to values in the table below, as measured by a pre-retrofit duct pressurization test.
- The calibrated deemed savings model uses an average duct loss factor of 30%.

Air Flow Requirements for Duct Efficiency Measure		
AC Size (tons)	Minimum Pre-Installation Leakage Rate (CFM)	Maximum Post-Installation Leakage Rate (CFM)
1.5	120	60
2.0	160	80
2.5	200	100
3.0	240	120
3.5	280	140
4.0	320	160
4.5	360	180
5.0	400	200

Installation & Efficiency Standard

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- Materials used should be long-lasting materials, (e.g., mastics, tape-applied mastics, foil tape, and/or aerosol-based sealants), to reduce total leakage rates to less than 10% of total air handler fan flow, verified by post-retrofit duct pressurization test.
- Duct efficiency improvements also reduce the ventilation rate in the home and therefore a post-installation blower door test must be conducted.
- Results must comply with the Minimum Final Ventilation Rate table found under the Air Infiltration slides.

Mastic Sealants

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Advantages

- performs well without clamping
- Faster to apply and more durable than tape

Disadvantages

- Still need sheet-metal screws, and scrap metal or fiberglass drywall mesh to seal bigger holes
- Must have clean joints before applying sealant

Metallic or Foil Tape

CLEAResult

Advantages

- Most commonly used
- Better used to seal holes in a furnace or air handler

Disadvantages

- Must have clean joints before applying tape
- Does not hold up well to dirty environments

Aerosol Based Sealants

CLEAResult

Advantages

- Permanent seal that does not degrade over time
- Seals ductwork internally, better for hard to reach places
- Does not require ductwork cleaning before sealing

Disadvantages

- Not recommended for air gaps larger than ¼-inch

Air Infiltration

Air Infiltration

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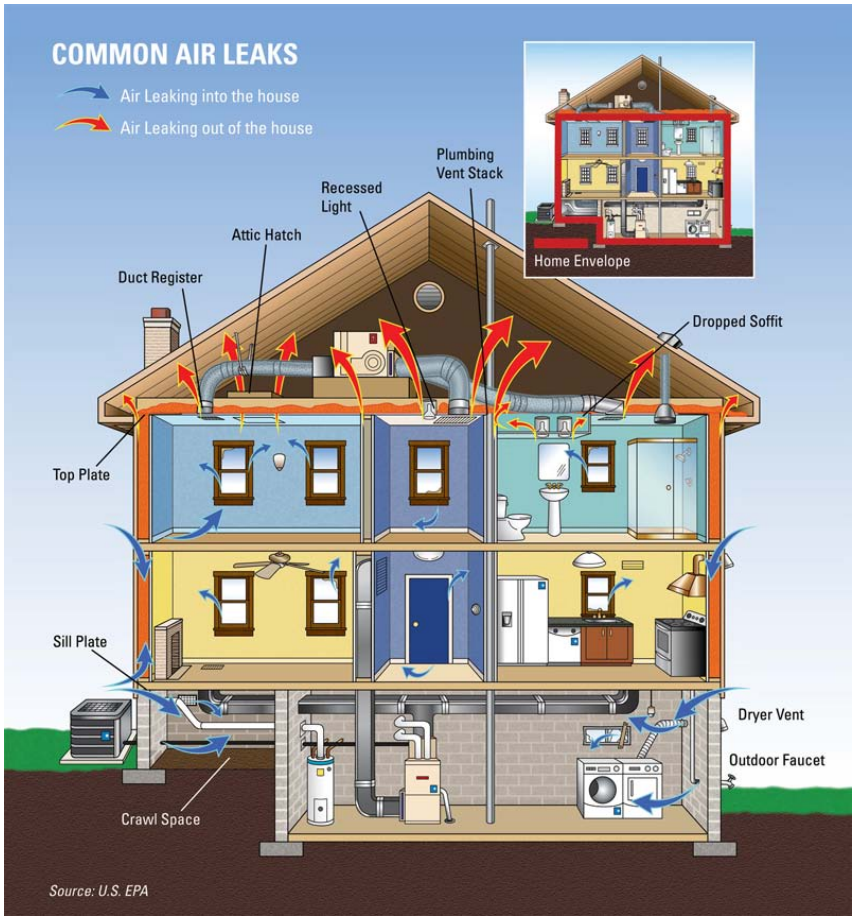
- This measure reduces air infiltration into the residence, using pre- and post-treatment blower door air pressure readings to confirm air leakage reduction.
- Homes treated for air infiltration reduction must have electric air conditioning to qualify for these deemed savings values.



Baseline Qualifications

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- For residential dwellings, the winter/summer air change per hour (ACH) differential was derived from ESPRE (EPRI Simplified Program for Residential Energy) model weather data.
- Electric air conditioning was assumed for all homes, with gas, electric or heat pump heating.

Air Infiltration Values (ACH)		
Region	**Winter ACH**	**Summer ACH**
Panhandle	1.25	0.96
North	0.94	0.49
South	0.86	0.54
Valley	0.95	0.94

Installation & Efficiency Standard

CLEAResult

- A minimum air leakage reduction of 10% of the pre-installation reading is required to qualify for an incentive.
- Testing or certification may be required for personnel who will perform the blower door tests.

ENERGY STAR® Window Replacement

How Windows Affect the Home

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Definitions

- Solar Heat Gain Coefficient (SHGC)
  - The fraction of incident solar radiation admitted through a window, both directly transmitted and absorbed and subsequently released inward
- U-Factor (inverse of R-Value)
  - The rate of heat transfer through the window (from inside to outside when it is cold, and from outside to inside when it is hot) per unit area and per unit temperature difference

Windows

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- ENERGY STAR® windows savings are per square foot of window, inclusive of frame and sash.

- Windows can be installed in homes with electric air conditioning or evaporative cooling systems to qualify.

Baseline Qualifications

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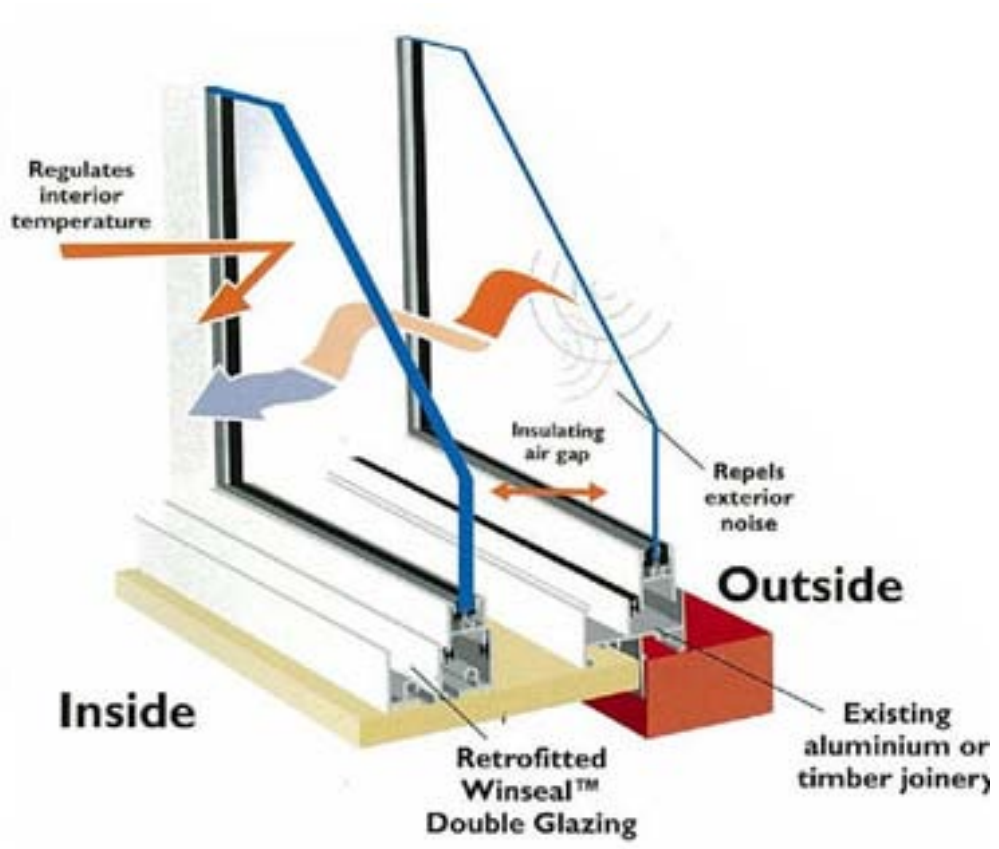
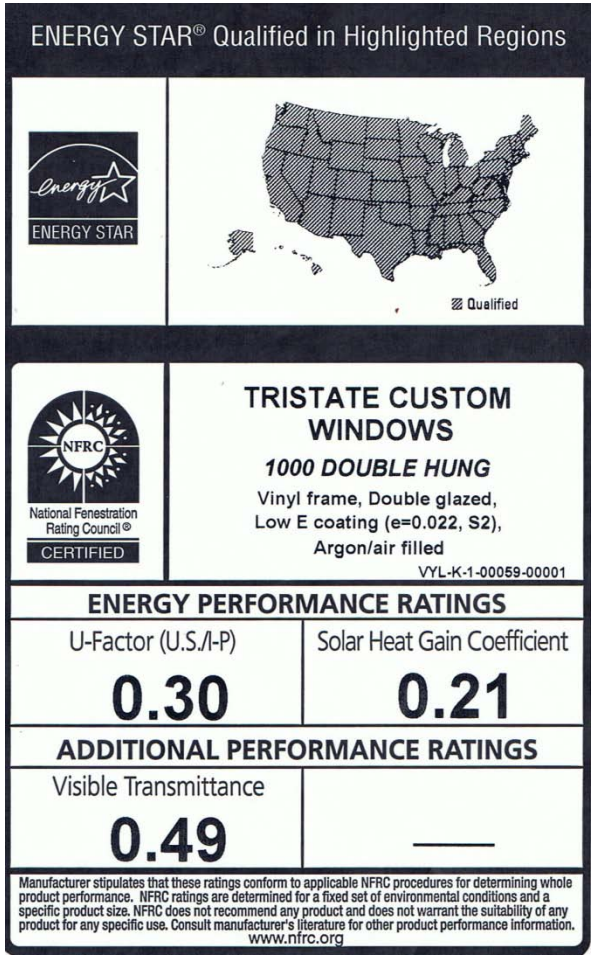
- The baseline is a double-glazed (i.e., double-pane)
- Clear window with an aluminum frame
- U-factor of 0.87
- Solar heat gain coefficient (SHGC) of 0.66
- Air infiltration of 1 cfm/ft^2



Installation & Efficiency Standard

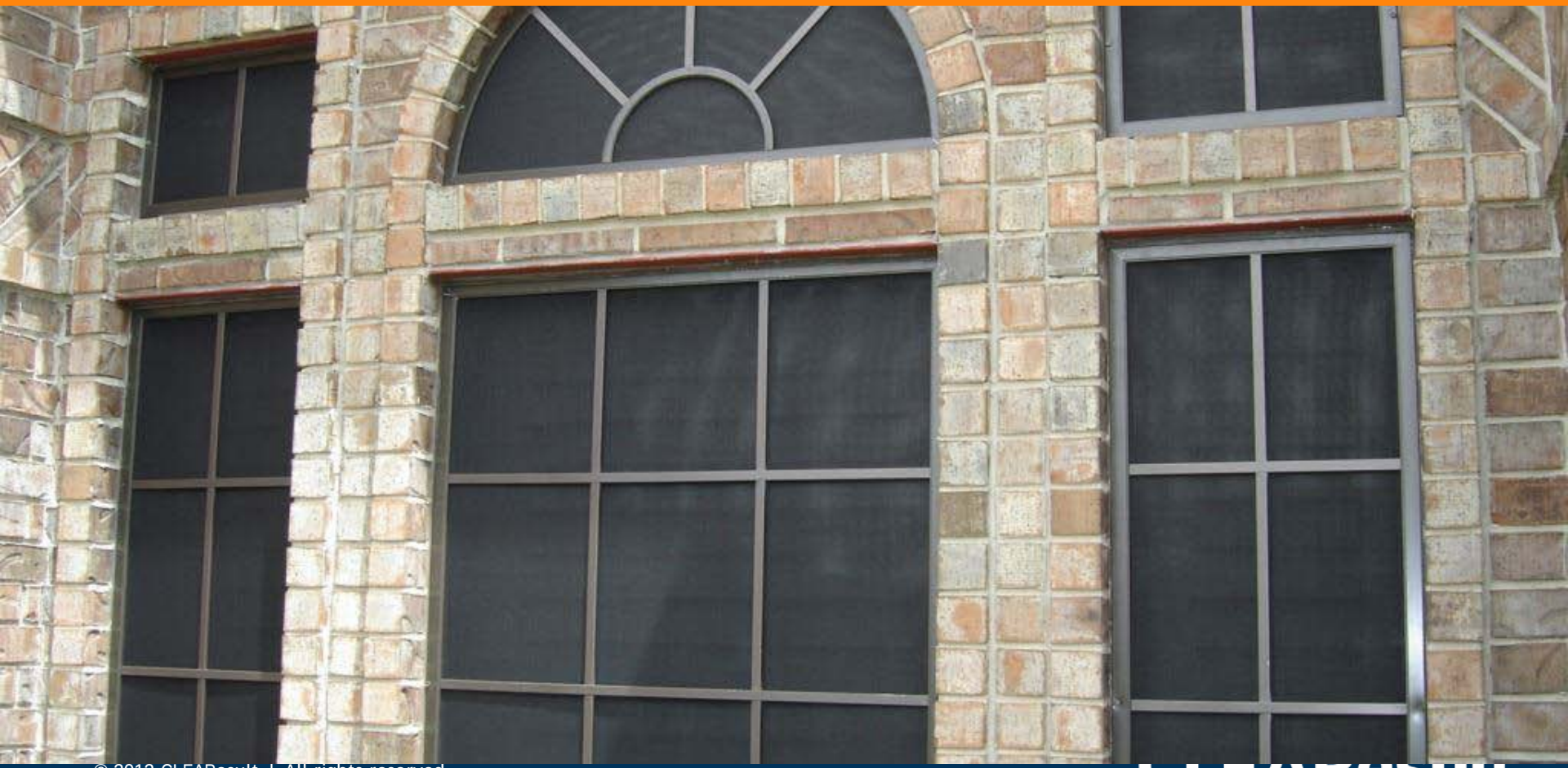
CLEAResult

- For a window to qualify for these deemed savings, it must meet ENERGY STAR® criteria
- U-factor less than or equal to 0.40
- Solar Heat Gain Coefficient (SHGC) less than or equal to 0.40



www.efficientwindows.org

Solar Screens



Advantages of Solar Screens

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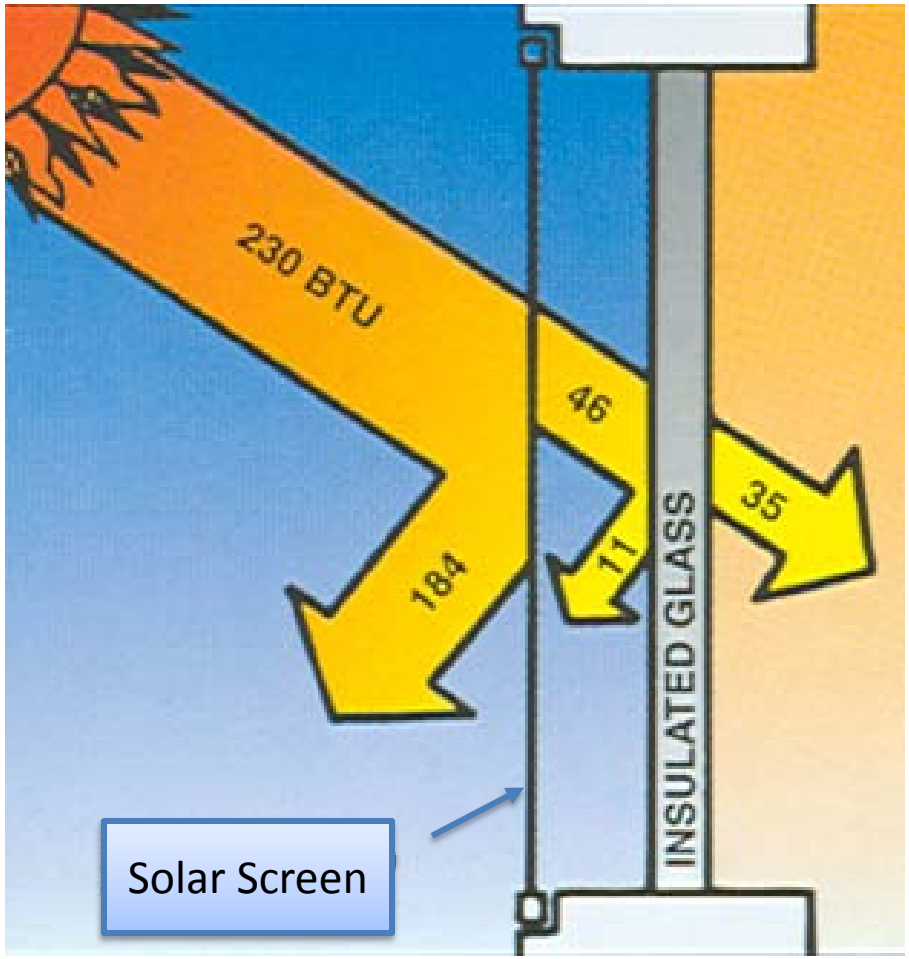
- Inexpensive energy efficiency alternative to replacing windows.
- Some of the same energy efficiency benefits as windows
  - Lower energy bill
  - Provides UV protection



Solar Screens

CLEAResult

- Solar Screens can be installed in homes with electric air conditioning or evaporative cooling systems to qualify
- Solar Screen must be installed on windows facing predominately east or west and receive significant direct sun exposure.
- Solar Screens that block at least 65% of the solar heat gain qualify for deemed savings.
- Deemed savings are per square foot of window.

Baseline Qualifications

CLEAResult

- The baseline Solar Heat Gain (SHGC) is 0.75 representing the average from RESFEN1 (0.76) and the NFRC2 900 (0.74) database for a single pane, clear glass window with an aluminum frame.

- This includes a factor to represent statistically average solar gain reduction for a generic house from overhangs, trees, obstructions, adjacent buildings, insect screen, interior shades, dirt on glass pane, etc.

Installation & Efficiency Standard

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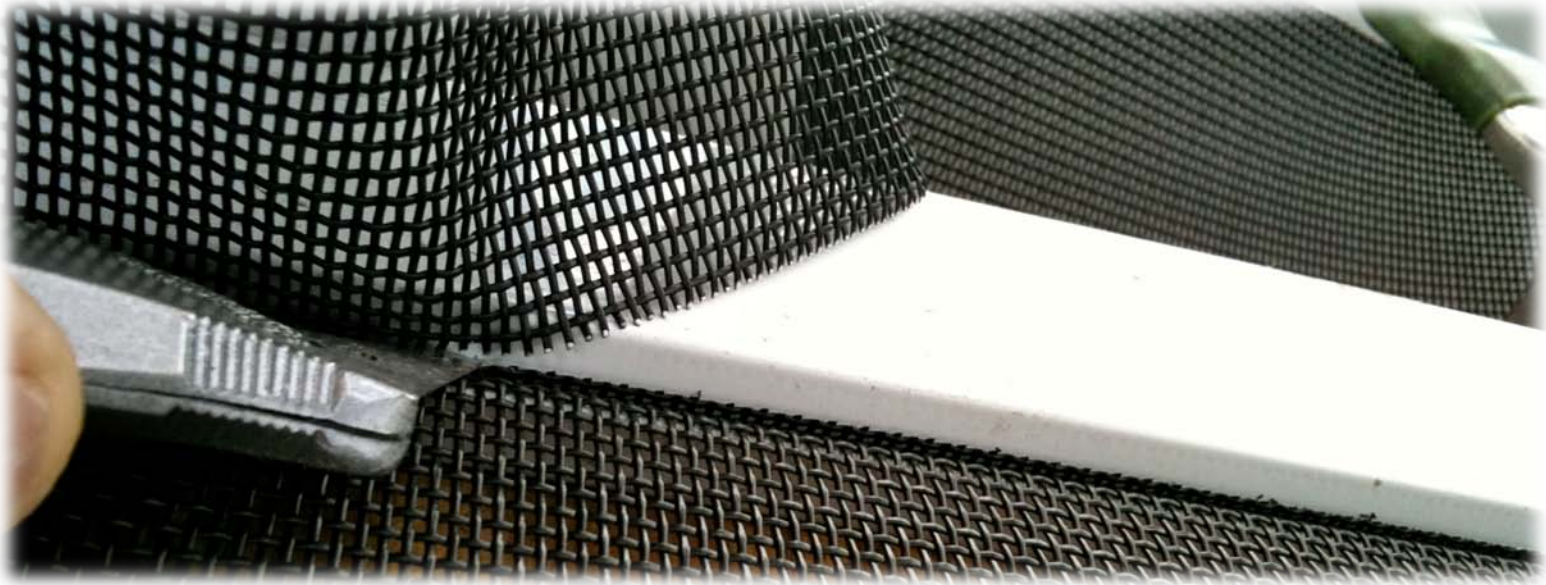
- To qualify for solar screen deemed savings, windows must be facing predominately east or west and receive significant direct sun exposure.
- Solar screen material must reduce solar heat gain by at least 65%.



Next Steps

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- Prioritization of measures
- How does your measure “measure up” to the rest of the home system
- Combining measures
  - By individual contractor
  - Strategic partnerships

Next Steps?

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- Master your measure
  - Eg. Insulation
    - Attic Insulation
    - Wall Insulation
    - Floor Insulation
- Seek Certification and Trainings
  - Eg. Building Performance Institute (BPI)
  - Eg. Home Energy Rating System (HERS)
- Marketing Materials
  - Do your materials reflect the “value” of your service
  - Utilize EPE resources

What is a Value Proposition?

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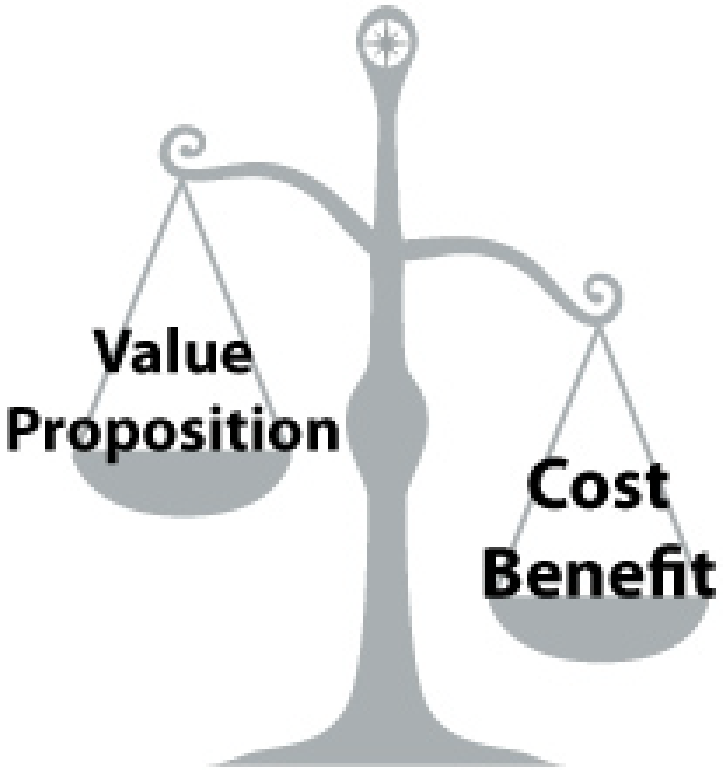
- A business or marketing statement that describes why a customer should buy a product or use a service.

- Value = Benefits - Cost



Value Proposition

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Non-Cash Motivators

- Comfort, Health, Safety
  - Room usage
  - Allergy, Indoor Air Quality
  - Carbon Monoxide
  - Negative pressured home
  - Home Resale Value
  - Going Green

Barriers

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- Up front cost
- Trusting the source of information
  - Credibility
  - Customer Satisfaction
- Understanding:
  - Why install an energy efficiency measure
  - How to install measure
- Quantifying the potential savings

Helpful Sites

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- BPI
  - www.bpi.org
- HERS
  - www.resnet.us
- The Energy Conservatory
  - www.energyconservatory.com
- Texas HERO
  - www.txhero.org

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Questions
&
Comments

Installation & Efficiency Standard

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- Blower door air pressure measurements will also be used to ensure that air infiltration in a residence shall NOT be less than the standards set forth in the following table:

Minimum Final Ventilation Rate*

	Number of Stories		
Shielding	**Single Story**	**Two Story**	**3 or More Stories**
Well shielded	1.18	0.95	0.83
Normal	0.99	0.79	0.69
Exposed	0.89	0.71	0.62

* Measured in cubic feet per minute at 50 Pascal per square foot of conditioned area.

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QUESTIONS?