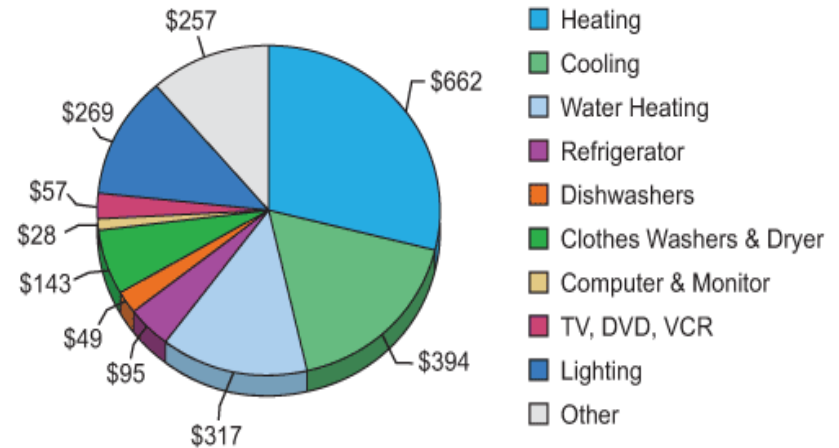


Energy Efficiency – Examples and Practices

- 114 million households¹
 - 69% built before 1980¹
 - 68% or 76 million owner occupied¹
 - 59% single-family owner occupied¹
- Average energy cost \$2200/year

Typical House's Annual Utility Bill



Retro Fit Loading Order

Fundamentals

- *Insulation*
- *Air Sealing*
- *Duct Sealing*
- *Lighting*
- *Appliances*
- *Water Conservation*
- *Plug Loads*
- *Behavior*

Major Systems

- *Heating*
- *Air Conditioning*
- *Ventilation*
- *Water Heating*

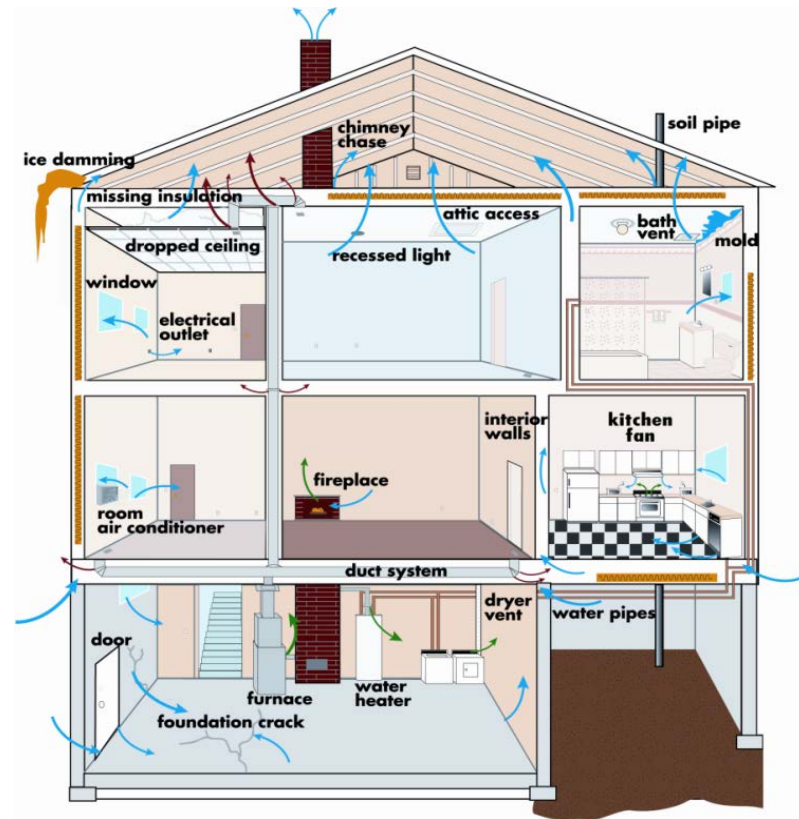
Renewables

- *Solar PV*
- *Solar Thermal*
- *Wind*
- *Water Catchment*

Typical home...full of systems...

Drainage system

- Foundation system
- Flooring system
- Wall system
- Ceiling system
- Roof system
- Heating system
- Air conditioning system
- Ventilation & IAQ systems
- Moisture control systems
- Distribution system
- Exhaust systems
- Plumbing systems in/out
- Electric, Appliance
& Lighting systems
- Energy management system



New Direction Needed!

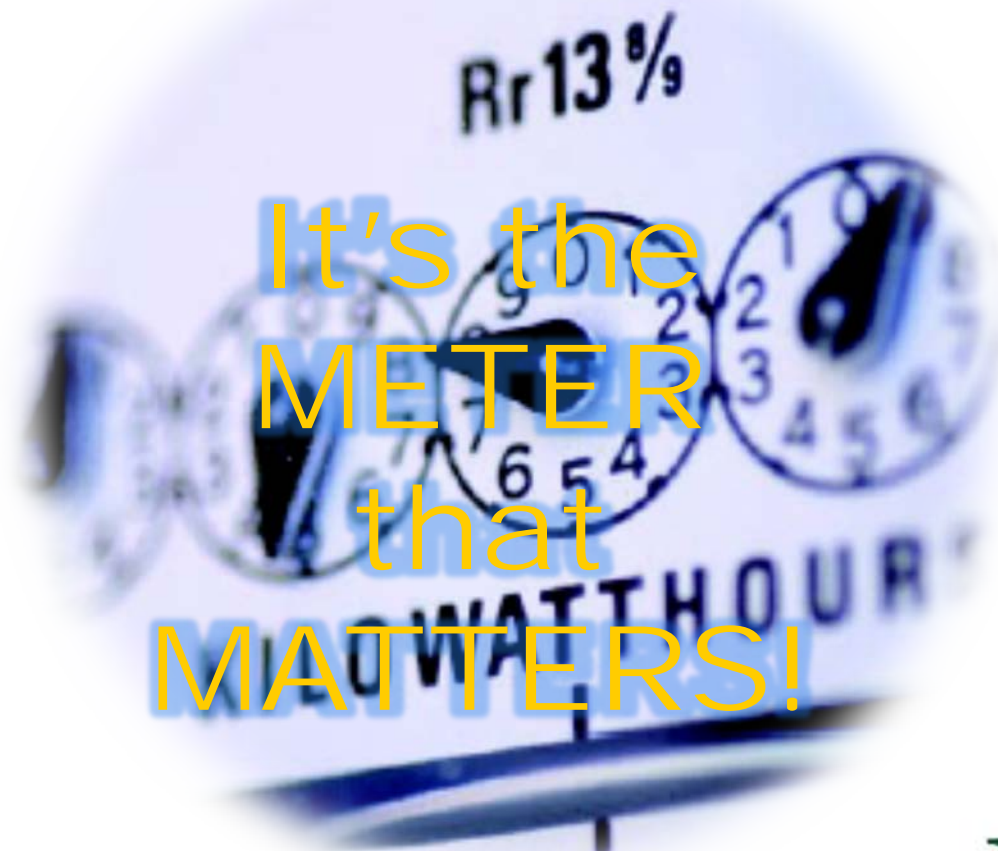
- Start with a whole-house assessment, that includes diagnostic tests, by a qualified contractor who can make comprehensive improvements or refer you to someone who can.
- **Chandler von Schrader**
– **U.S. EPA**
- **Evaluating** a home's performance
- **Recommending** home improvements
 - Quality assurance to ensure unbiased recommendations
- **Completing** energy saving improvements
 - Quality assurance to ensure installation best practices
 - Facilitate installation of recommended measures via incentives and mentoring
- **Testing out** to demonstrate performance improvements and energy savings

Home Performance Assessment

- Whole-house energy inspection
 - Energy specialist trained in building science
- Diagnose why performance is poor
 - Completed before work
- Summary report
 - Findings
 - Recommendations
 - Estimated costs and savings



How do we measure savings?



Health and Safety



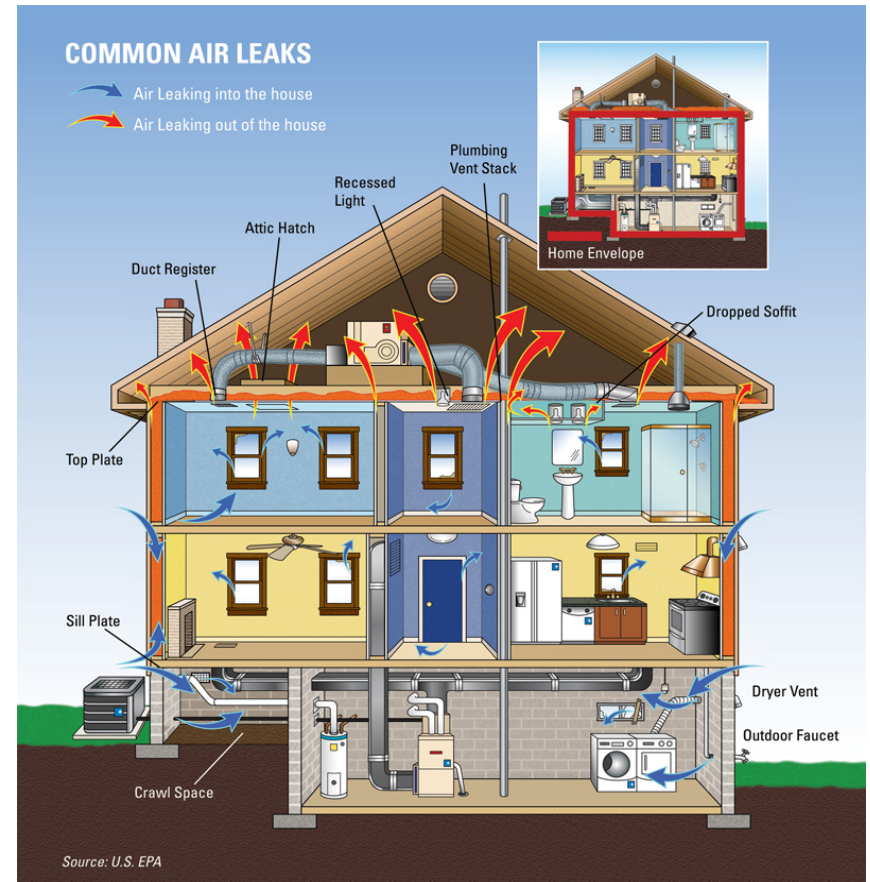
- Do No Harm...to yourself, the occupants, the workers, or the house



**#1 Priority
in Building
Performance
Contracting**

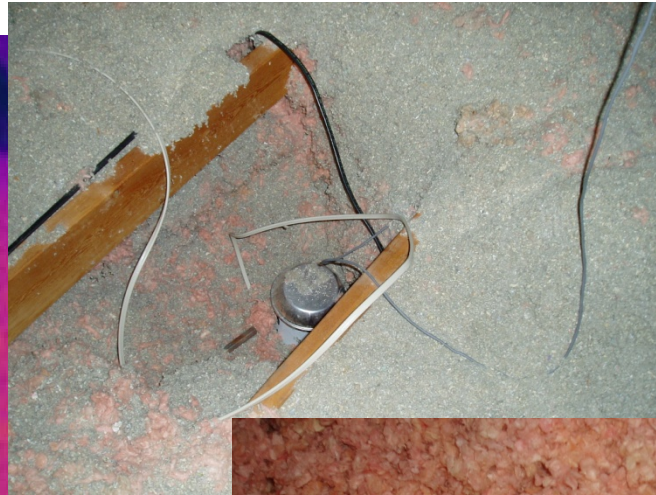
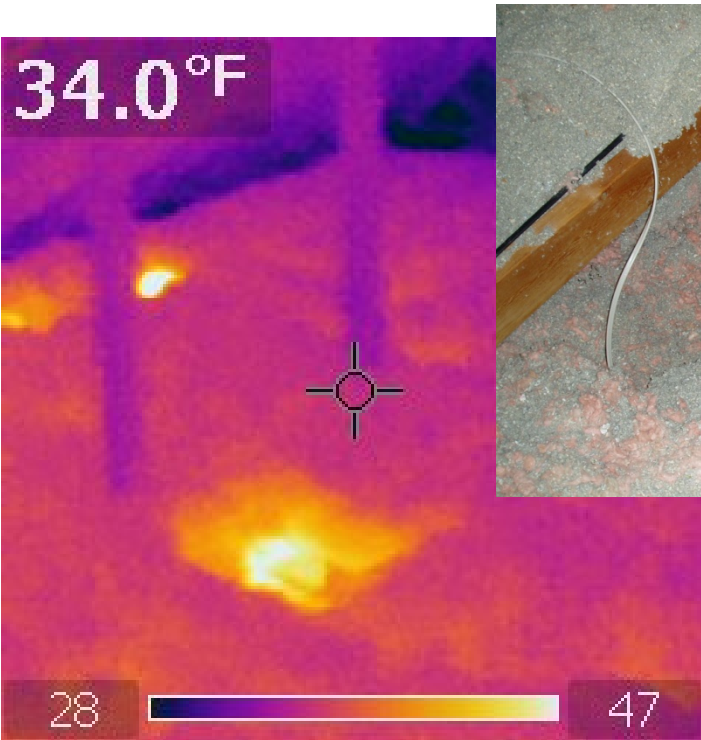
Air Sealing

- Any part of the building shell that offers resistance to air leakage. The air barrier is effective if it stops most air leakage. The primary air barrier is the most effective of a series of air barriers. Also called air boundary or pressure boundary.

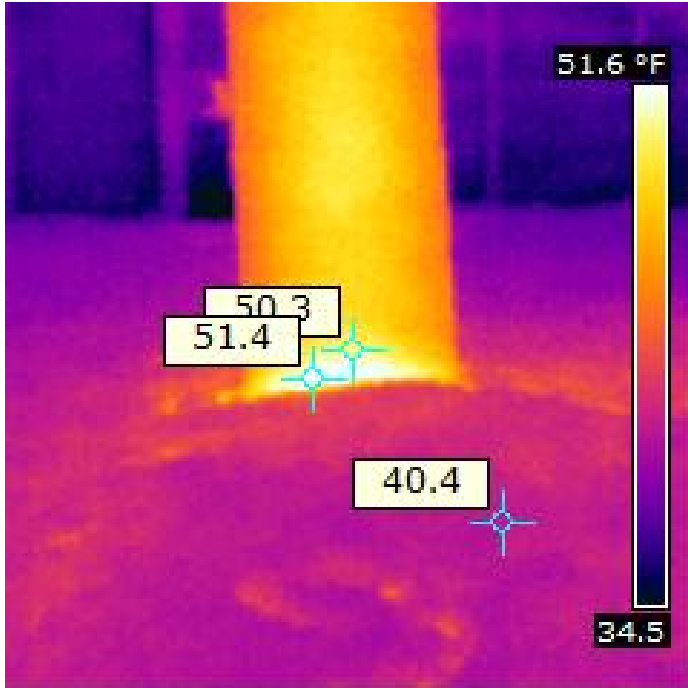


Recessed Lights (Can lights)

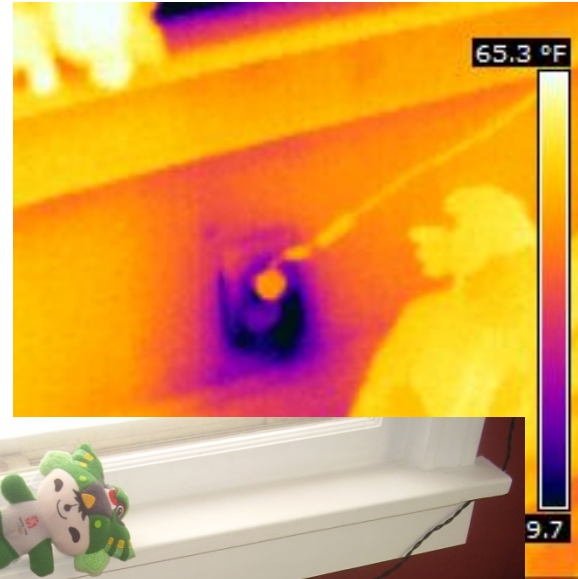
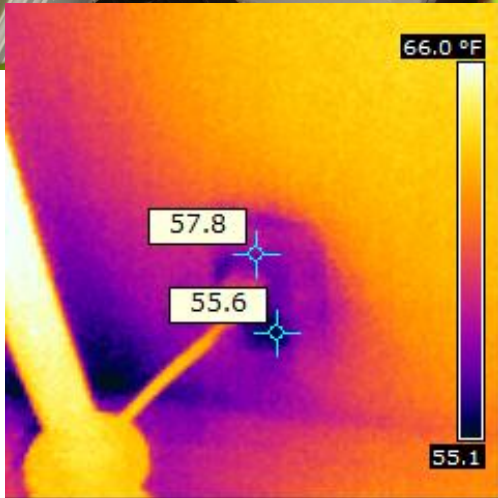
www.sealalight.com



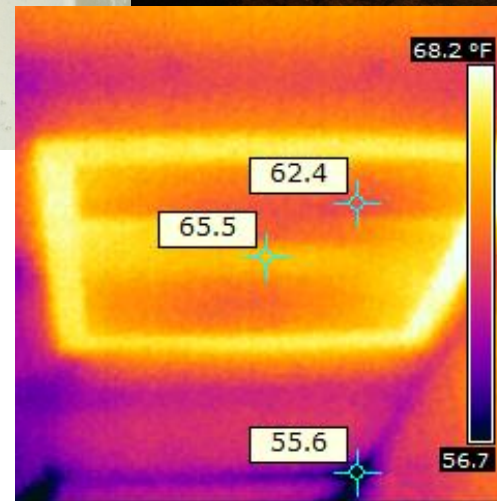
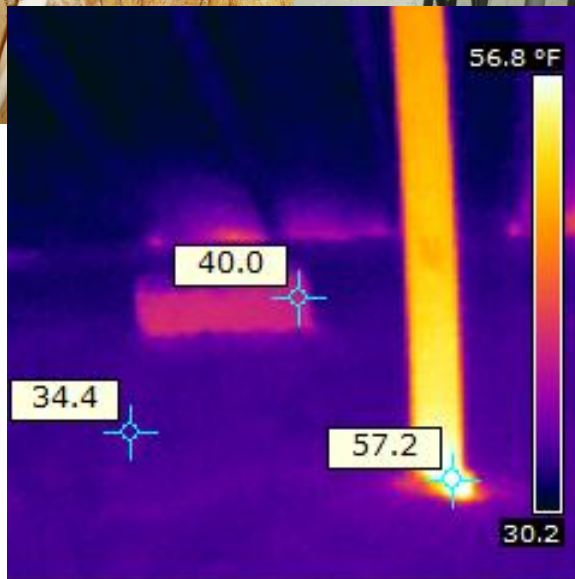
Chimney's



Outlets and switches



Other air sealing opportunities



A Blower Door Test is the Key!



- A Blower door is the only sure way to identify air bypasses.
- The best test the rest guess !!!!!!!
- Reduction of the CFM is the only way to verify quality of air sealing.

Insulation Types

- Cellulose
- Fiberglass
- Closed Cell Foam
- Open Cell Foam
- Enclosed cavity Foam
- Reflective Insulation and Barriers
- Hybrid insulation (Blue jeans ,Straw, Soy based)
- Others ????????????

Cellulose Applications

Bad

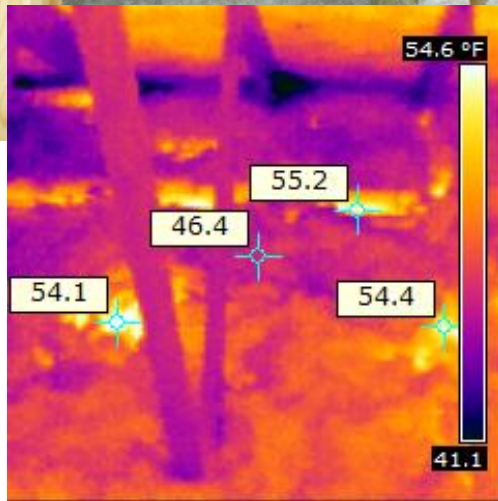
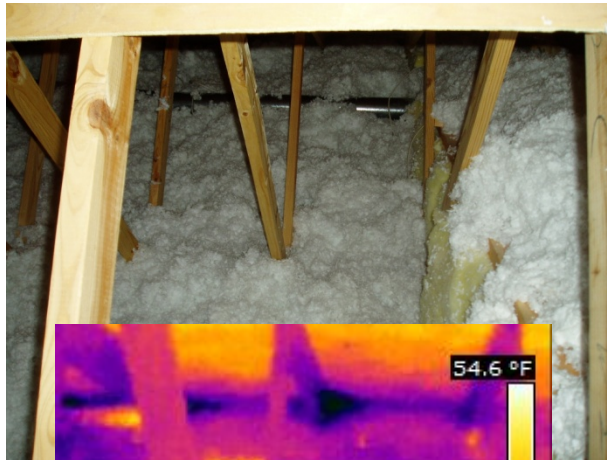


Good



Fiberglass Applications

Bad



Good



Closed Cell Foam

Challenges

- Installation is not simple
- Winter temperatures affects the mixture
 - Installer training is Key
 - Smell during installation
 - Extensive job prep
 - High Cost

Effectiveness

- Air seals and insulates R-6 per inch
 - Adds structural strength
- Good for below grade moisture control
 - Great for crawl space walls



Open Cell Foam

Challenges

- Installation is not simple
- Winter temperatures affects the mixture
 - Installer training is Key
 - Smell during installation
 - Extensive job prep
 - Cost

Effectiveness

- Air seals and insulates R-3.5 per inch
 - Expands fast
- Good for above grade installations
- Great for Rim Joist and hard to reach places.



Enclosed Cavity Foam

- High R-Value
- Can be installed in existing cavities with current insulation
- Excellent sound deadening properties
- Good air sealing and insulation combination
- Reduces air infiltration



Reflective Insulation & Radiant Barriers



Attic Ventilation



Lack of Attic ventilation = Mold



Duct Work Sealing & Insulation

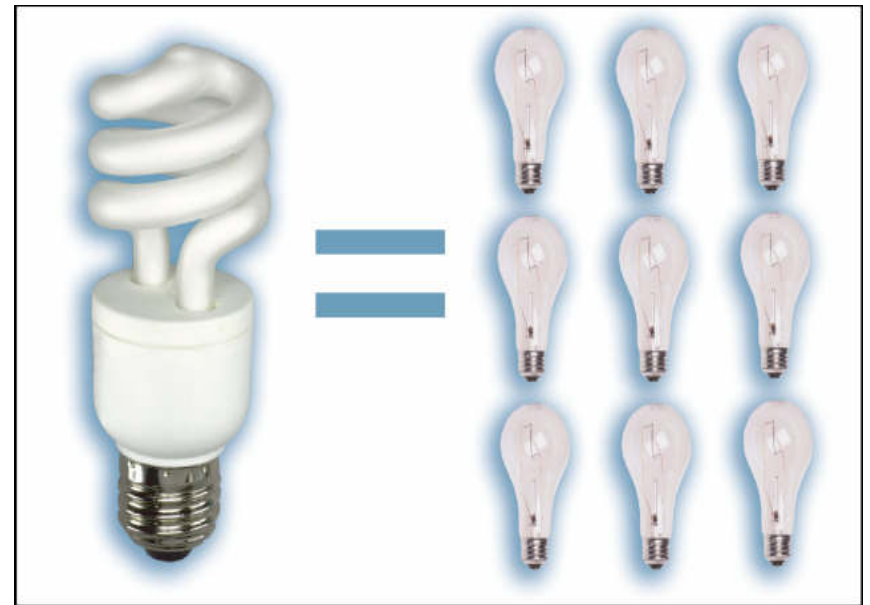


Duct Work Sealing & Insulation

In a typical house about **20 percent** of the air that moves through the duct system is lost due to leaks, holes, and poorly connected ducts. The result is higher utility bills and difficulty keeping the house comfortable, no matter how the thermostat is set.

Lighting

- CFL Light bulb
- An ENERGY STAR qualified compact fluorescent light bulb (CFL) will save about \$30 over its lifetime and pay for itself in about 6 months. It uses 75 percent less energy and lasts about 10 times longer than an incandescent bulb.



Heating & Cooling

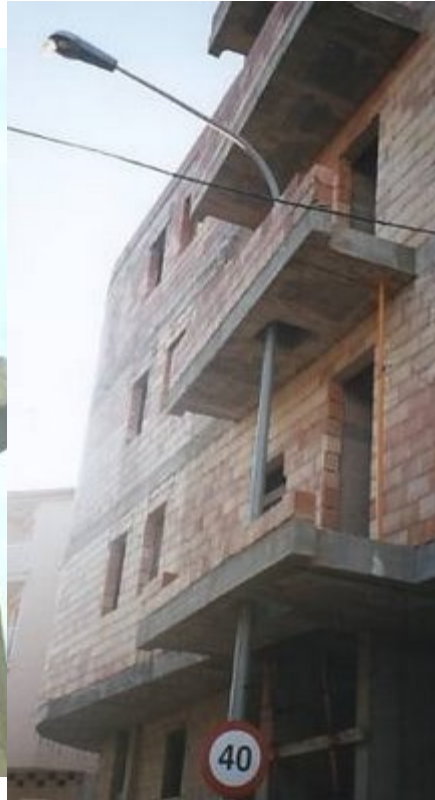
- Choose right contractor
- Have furnace sized correctly
- Have system serviced regularly
- Just replacing furnace without dealing with the envelope of your home may not get the results you are seeking.



Health and Safety Must Do's Follow BPI Standards

- Gas leak checks in home
- Carbon Monoxide tests
- CAZ Zone depressurization test
- Hazard material checks
- Post installation testing
- Every year in the United States, **hundreds of people die of carbon monoxide poisoning** and thousands more are hospitalized. Carbon monoxide is a gas produced when fossil fuels such as coal, natural gas and oil are burned.

You must have a plan!



Do it right!

1. Whole house assessment (Audit) BPI Standards. BPI.org
2. Prioritized work scope to proper Loading order.
3. Choose BPI Certified contractors.
4. Post installation assessment
5. Quality Assurance program

Question & Answers

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