# Building Science Consortium

## Building America

## Energy Retrofits of

## Existing Housing

# Building America for New Homes Succeeding because

- The incremental cost of the improvements did not exceed $500
- Improvements in the building enclosure reduced the builder's warranty costs and liability exposure

# Strategies

- **Use quickly measurable performance metrics that allow the prediction and quantification of building performance**

- **Use construction techniques, equipment and systems that allow production home builders to meet the performance metrics with little or no incremental cost**

- **HERS 86 plus controlled ventilation plus sealed combustion**

# Strategy for New Houses

**Use Systems Engineering to Develop Cost Trade-Offs (save 30 percent energy on space conditioning/DHW)**

- **Improve Building Envelope (+)**
- **Downsize Mechanical Equipment (-)**

**Total Cost**

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**Remains the Same or Costs Less**

# Numbers

## Totals

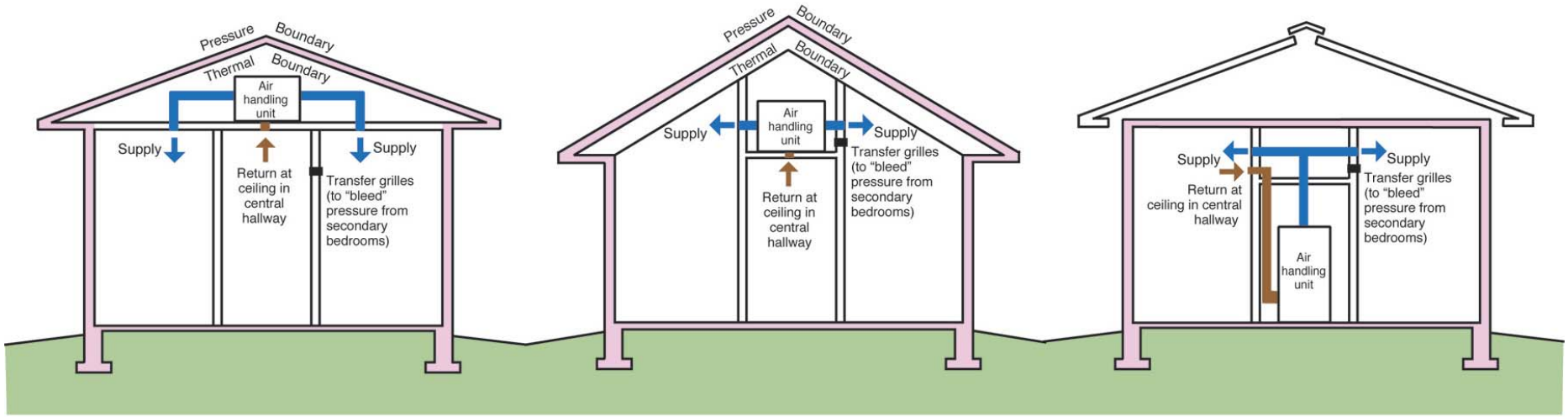
Building Science Consortium

150 Developments in 20 states

| | | | |
|---|---|---|---|
| **Homes Completed** | **8,500** | **Energy Saved** | **2,399,367 Mbtu** |
| **Homes Tested** | **2,500** | **C emissions saved** | **9,352,437 lbs** |
| **Energy Star Certificates** | **8,500** | **$SO_2$ emissions saved** | **89,135 lbs** |
| **Total Build-Out** | **15,000** | **$NO_x$ emissions saved** | **252,494 lbs** |

# Strategies

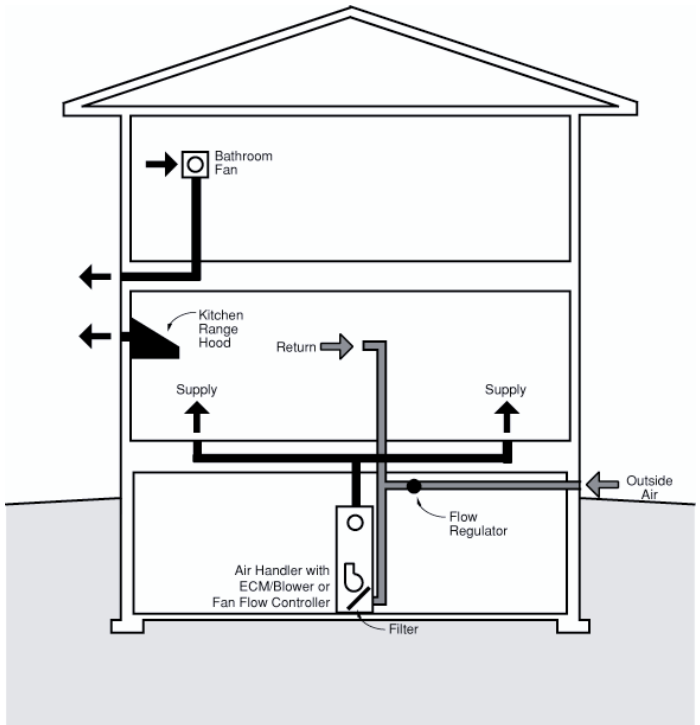
- **Use innovative air distribution systems that have been developed to address the problems of interstitial pressurization/depressurization and intra-zone air pressure imbalances**
- **These innovative air distribution systems work better and cost less than typical conventional standard practice**




Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

# Strategies

- **Use Climate specific controlled ventilation strategies that have been developed to address the problems associated with humidity control in the humid south and pressurization in the north**
- **These strategies are a model/blueprint for implementing ASHRAE Standard 62.2 —Ventilation for Indoor Air Quality in Residential Buildings**



# Existing Houses Market

- Energy retrofits done only to save energy often are not cost effective.
- Ability to predict the effects of the retrofit is less accurate
- The industry is more decentralized

# Energy Retrofits of Existing Buildings Make Sense When

- High energy costs per square foot of house
- Existing equipment is replaced
- Comfort or indoor air quality concerns justify expenses
- Major renovation occurs

# Renovations and Energy Retrofits

- Choosing the right materials and equipment often have more impact than the quality of the work
- Building science or moisture physics need to understood or disaster may follow.

# Stand Alone Energy Retrofits

- Honesty about the payback period
- Honesty about the “benefits”
- Do no harm to the occupants
- Do no harm to the building – understanding building science or moisture physics

# Financing Energy Retrofits

| Interest Rate | Annual Payment |
|---|---|
| 3.0 | $67 |
| 4.0 | $73 |
| 5.0 | $79 |
| 6.0 | $86 |
| 7.0 | $93 |
| Annual payments per $1,000 – 20 year | |

# The Hazards of Energy Retrofits

- What once was warm, now is cold
- What once could dry out, now remains wet
- What once was leaky, now is tight

# Energy Retrofits - Opportunities

- Replacing equipment and materials
- Selective improvements to the building enclosure
- Whole house retrofits

# Opportunities - Equipment

- If we can mandate low flow toilets, why not mandate high efficiency appliances
- Or provide provide incentives for high efficiency appliances

# Opportunities - Enclosure

- Focus on houses with high energy costs per square foot of conditioned space
- Condition crawl spaces
- Eliminating the big holes at the top

# Opportunities - Renovations

- Builder's Guide for renovations
- Energy Retrofits plus building science
- Stand alone documents – e.g. decision tree for evaluating existing walls for acceptability of adding insulation