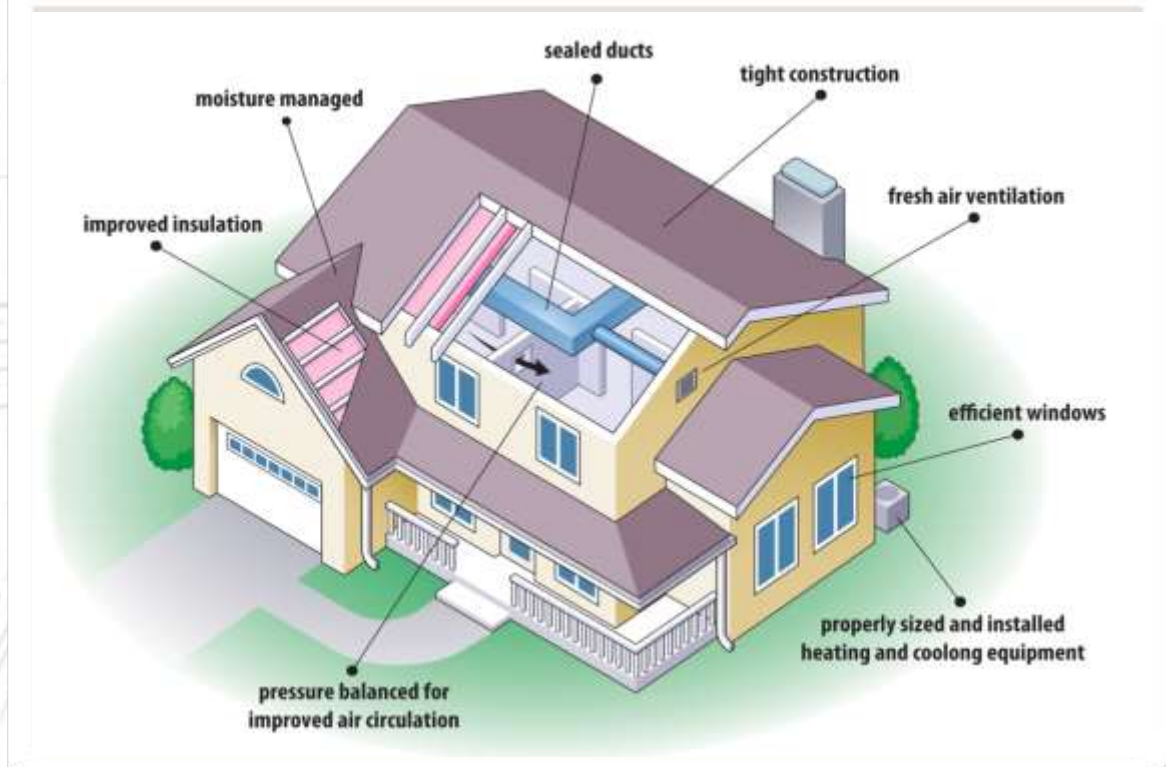




ACHIEVING HIGH PERFORMANCE HOMES AFFORDABLY

EEBA CONFERENCE
OCTOBER 6-8, 2015

Introductions

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What is the Plan?

Agenda

- **Define** energy efficiency and sustainability in relation to affordability
- **Consider** the impact of the long-term home performance, utility use and durability on the concept of simple, decent, affordable
- **Explore** simple and affordable strategies that add lasting value to homes and communities

Objectives

- **Establish** objectives for long-term home performance and affordability
- **Commit** to home performance goals based on a fundamental understanding of the building science involved in sustainable building.
- **Evaluate** practices and policies that improve opportunities for success
- **Implement** strategies for improved home performance that will ensure homes that are affordable throughout the life of the house

Our MISSION: Seeking to put God's love into action, Habitat for Humanity brings people together to build homes, communities and hope.



ENERGY STAR®



Money Isn't All You're Saving



SHELTER REPORT ²⁰/₁₅



Less is More:

*Transforming Low-Income
Communities Through Energy Efficiency*

habitat.org

Energy Efficiency

Energy efficiency has been defined by Lawrence Berkeley National Laboratory as “using less energy to provide the same or greater service.”

eetd.lbl.gov/ee/ee-1.html



“Fuel Poverty”

According to the Department of Energy, low-income households typically spend 17% of their income on residential energy compared to 4% in other households.

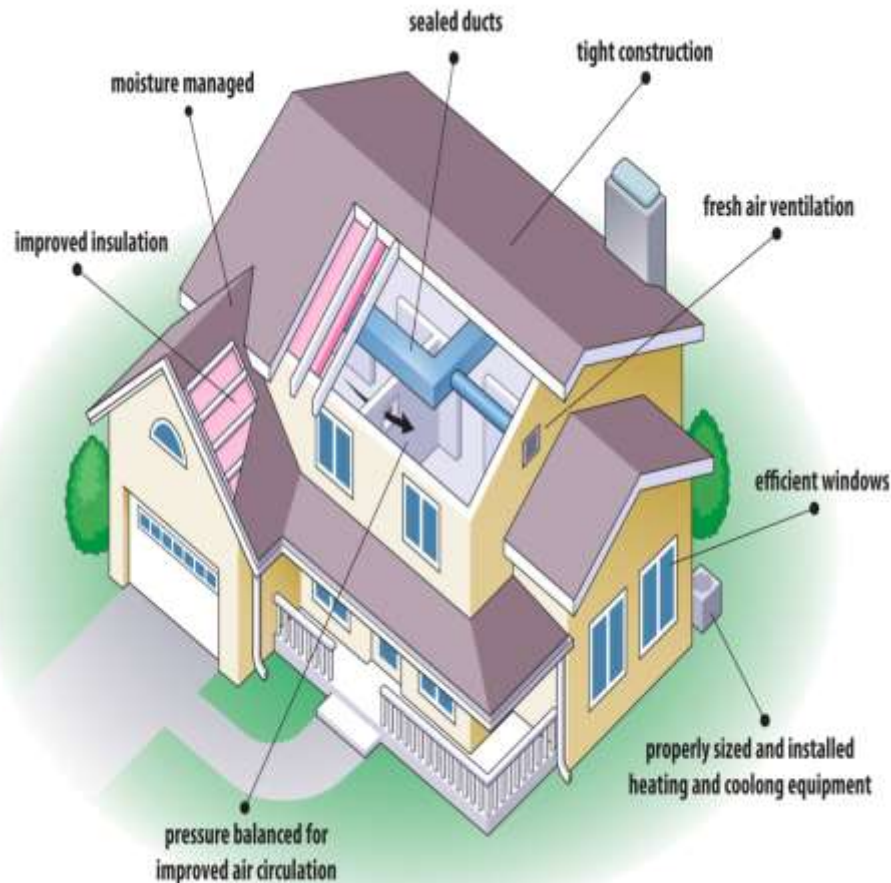
Families who pay more than 10 percent of their total incomes for energy needs may be said to be suffering from “fuel poverty.”

- Phrase coined by Brenda Boardman, professor emeritus at Oxford University



Sustainable Building for Home Performance

- Safe
- Healthy
- Durable
- Resource Efficient
- Accessible



THE BIG PICTURE GOAL



To build/repair homes
to the highest quality,
while balancing the
lowest possible cost
of construction for the
builder and with the
lowest cost of
ownership for the
homeowner?

Setting Goals

How do you define
“affordable?”

How do you define high
performance?

How do you want occupants
to experience their homes?

Are the decisions you make
in the best interest of the
homeowner?

Are you building houses that
will meet everyone’s needs
equitably?



Construction Management

Requires a written strategic plan for meeting long-term goals for construction operations and identification of the resources necessary to meet those goals

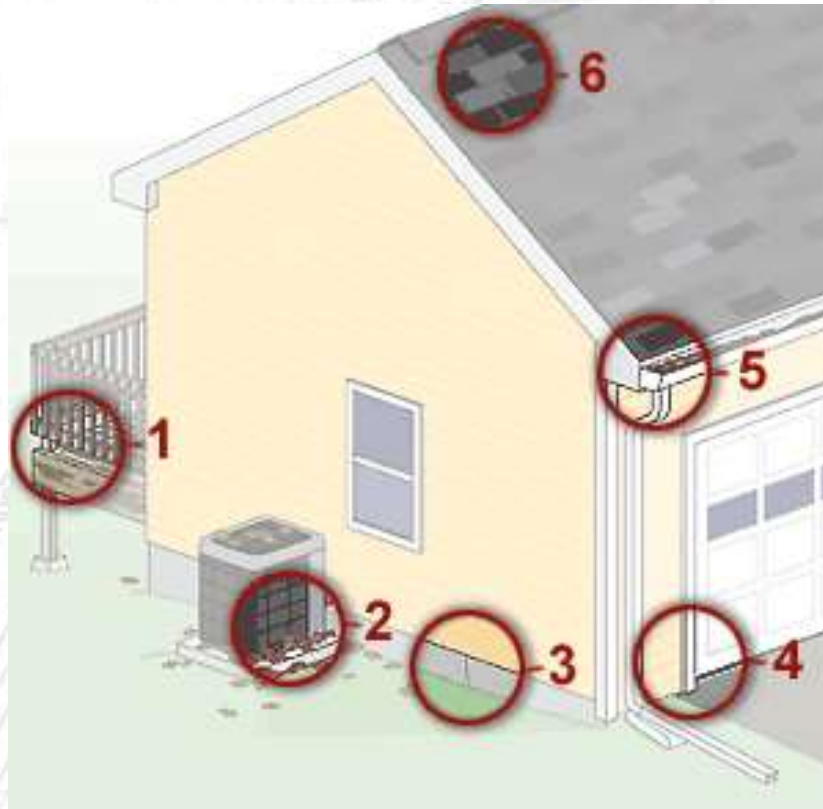


Project Management

- *Design criteria*
- *Budget and material lists*
- *Construction schedule that drives deliveries and subs*
- *Thorough and enforceable contracts*
- *Walk-through and warranty documents*
- *Homeowner education documentation*
- *Training of staff and subs*



HOMEOWNER EDUCATION



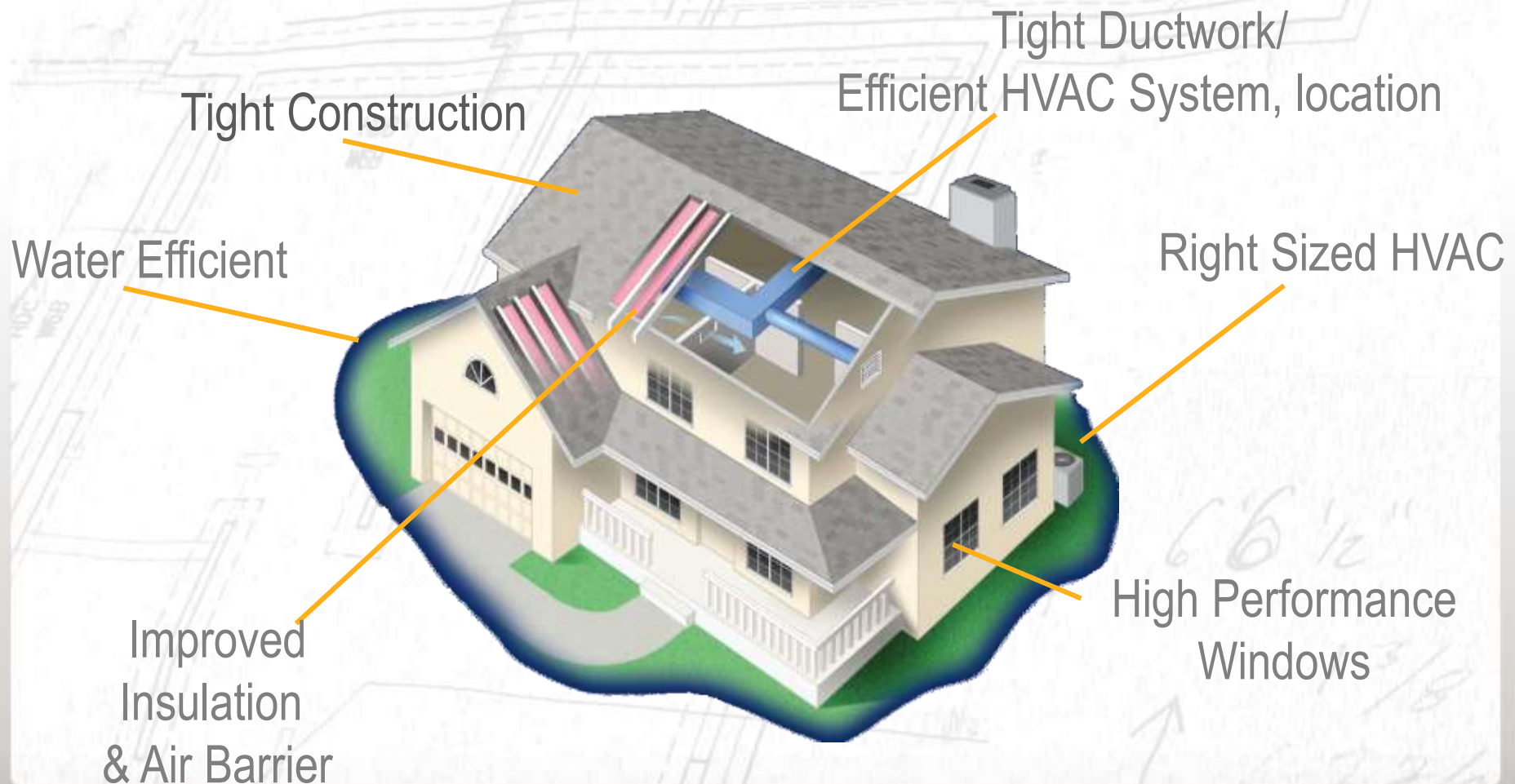
“Understanding human behavior is critical for achieving the goals of energy efficiency. Whether we are purchasing goods, using energy to service our homes and workplaces, or responding to the constraints placed upon us by technology and systems that surround us, human behavior is the key.” ~aceee.org/portal/behavior.

Integrated Design Process

- A practical planning process that considers the whole while dealing with its parts
- A deliberate collaboration that merges diverse ideas and disciplines to create a better building
- Cost savings through team commitment & accountability



SYSTEM OVERLAP



IDP Benefits & Results

Project goals

- Program participation and certification level
- Community involvement
- Low impact development

Resource efficient strategies

- High performance shell
- Air sealing and insulation
- HVAC specifications
- Water systems and fixtures
- Appliances and lighting
- Environmentally preferable material choices

Problem solving

- Code compliance
- Program compliance
- Logistics
- Neighbor relations

Management of:

- Specifications
- Costs
- Program Compliance
- Quality

Measurable Results

- Certification
- Better material sourcing
- House performance

The IDP Team

The team must be committed to environmentally responsible and healthy building principles and practices

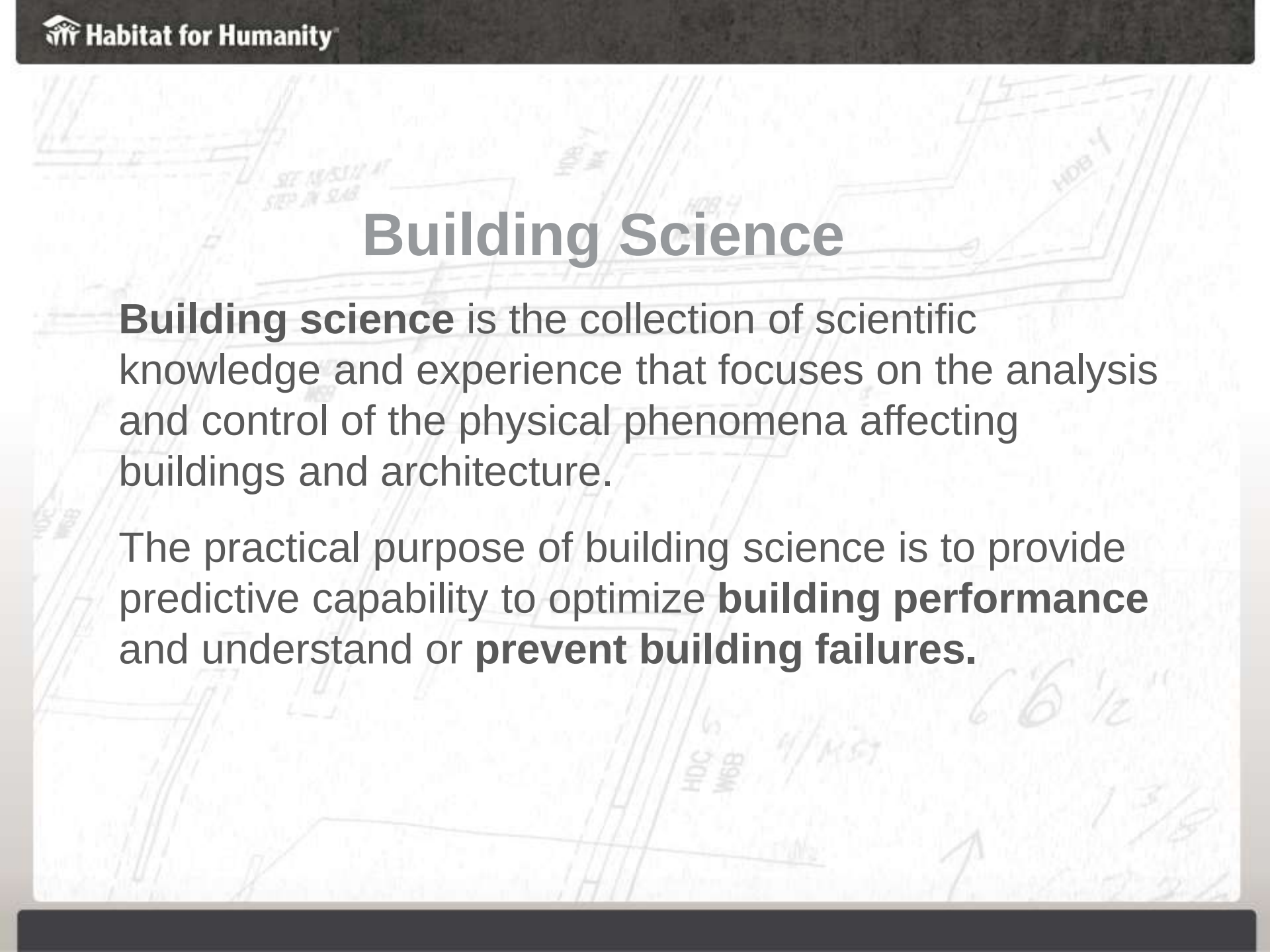
- Affiliate Staff
- Architects
- Engineers
- Landscape architects
- Experienced green building design professionals (CSBA, LEED-AP, etc.)
- Sub-contractors
- Neighbors
- City officials
- Family/occupants
- Other stakeholders

THE RATER RELATIONSHIP

Who is your rater and what do they provide?



- Diagnostics/Performance Testing
- Expertise
- Modeling
- Collaboration
- Quality Control
- Additional Incentives



Building Science

Building science is the collection of scientific knowledge and experience that focuses on the analysis and control of the physical phenomena affecting buildings and architecture.

The practical purpose of building science is to provide predictive capability to optimize **building performance** and understand or **prevent building failures**.

Framing

Optimum Value Engineering (OVE) or
Advanced Framing

- Reduce Material Cost
- Reduce Labor And Construction Time
- Save Energy
- Save Natural Resources
- Reduce Waste
- Reduce Drywall Cracking



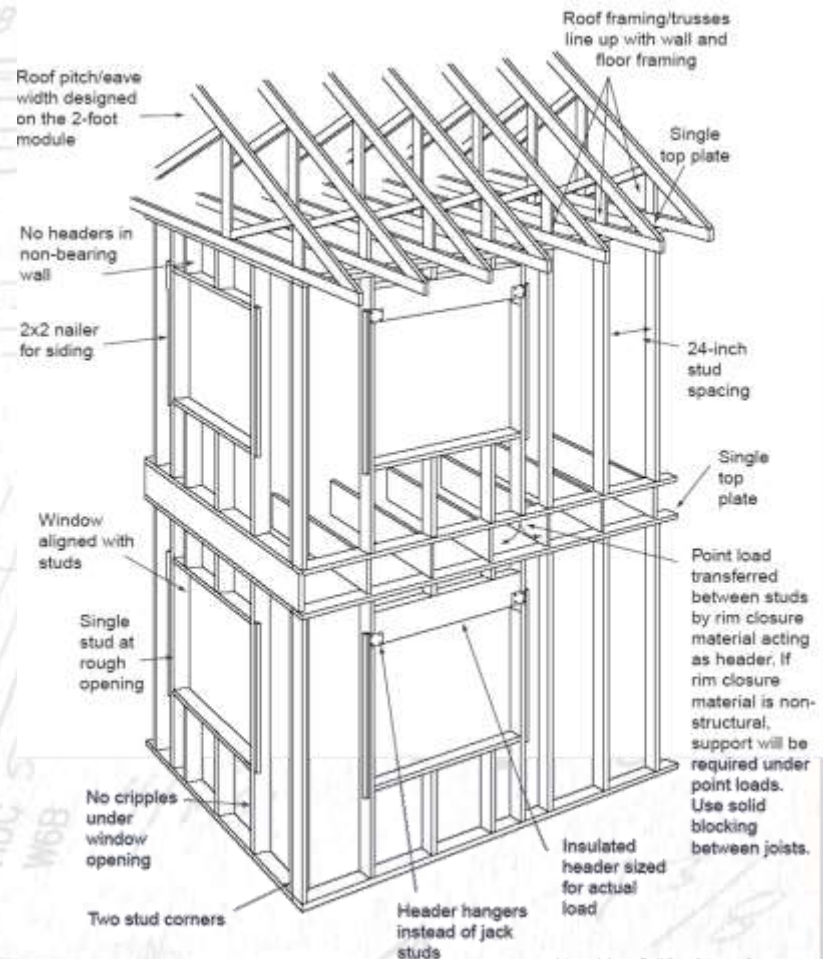
Framing Opportunities

- Raised Heel Trusses
- Windows placed within common on-center stud layout
- Overall dimensions make best use of sheathing and siding materials
- Splice scrap blocking for non-bearing interior walls
- Crown studs to one direction in the assembly
- Grade for bows and crowns
- Organize scrap pile for reuse
- Have a “return to lumber yard” pile



Advanced Framing

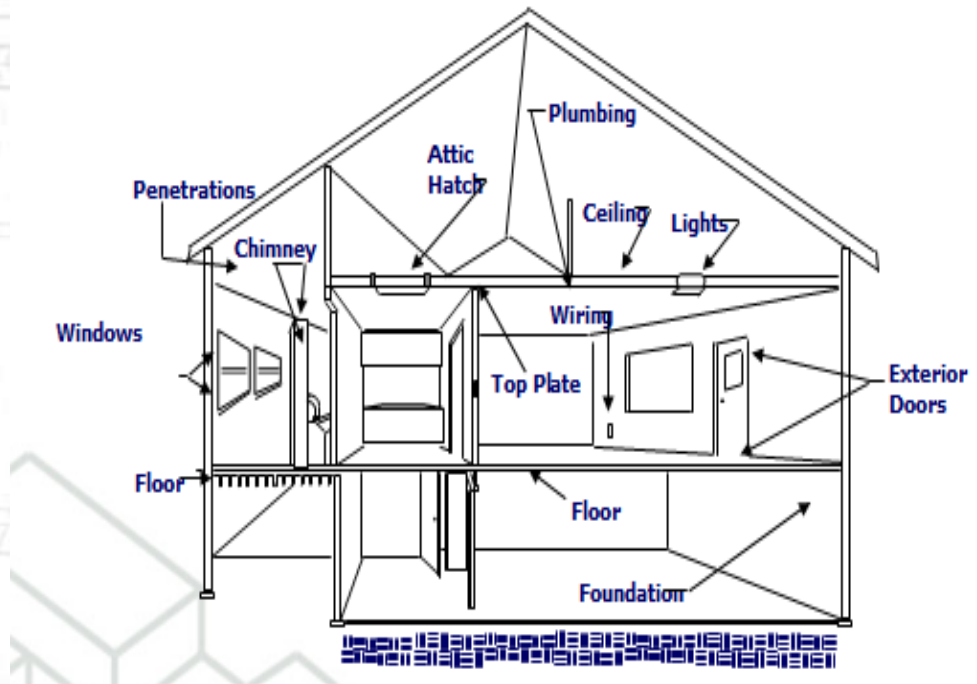
- Studs at 24" o.c. (can be a double top plate and single bottom plate)
- Two stud corners or other means to fully insulate corners (may require drywall clips)
- Bearing support aligns bottom to top
- R-10 headers and right-sized headers
- No headers at non-bearing wall
- Fully insulated interior/exterior wall intersections
- Optional single top plates and single header jacks
- Double rim in lieu of header



Adapted from Building Science Corporation

Air Sealing

On any job site:
"If you drill the
hole, you seal the
hole." Everyone
on the job should
have access to an
appropriate
sealant or spray
foam.

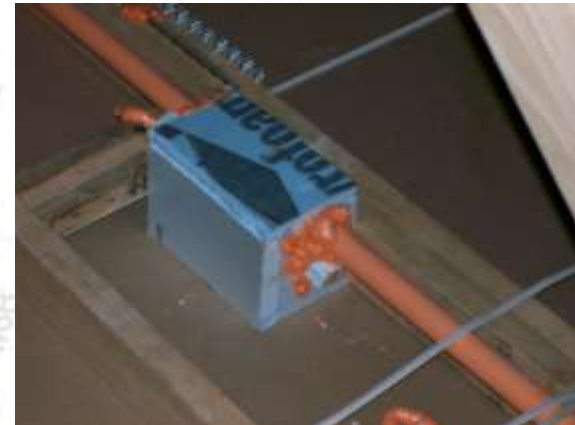


(Adapted from Energy Efficient Homes Midwest, 2005)

Air Sealing (cont.)

Other air sealing opportunities:

- Band joists
- Stud bays at exterior sheathing
- Exterior sheathing joints
- Sub-floor joints
- Above top plates at GWB seams
- Sprinkler head housings
- Air vapor electrical box housings
- Light can trim
- Duct boots to subfloor

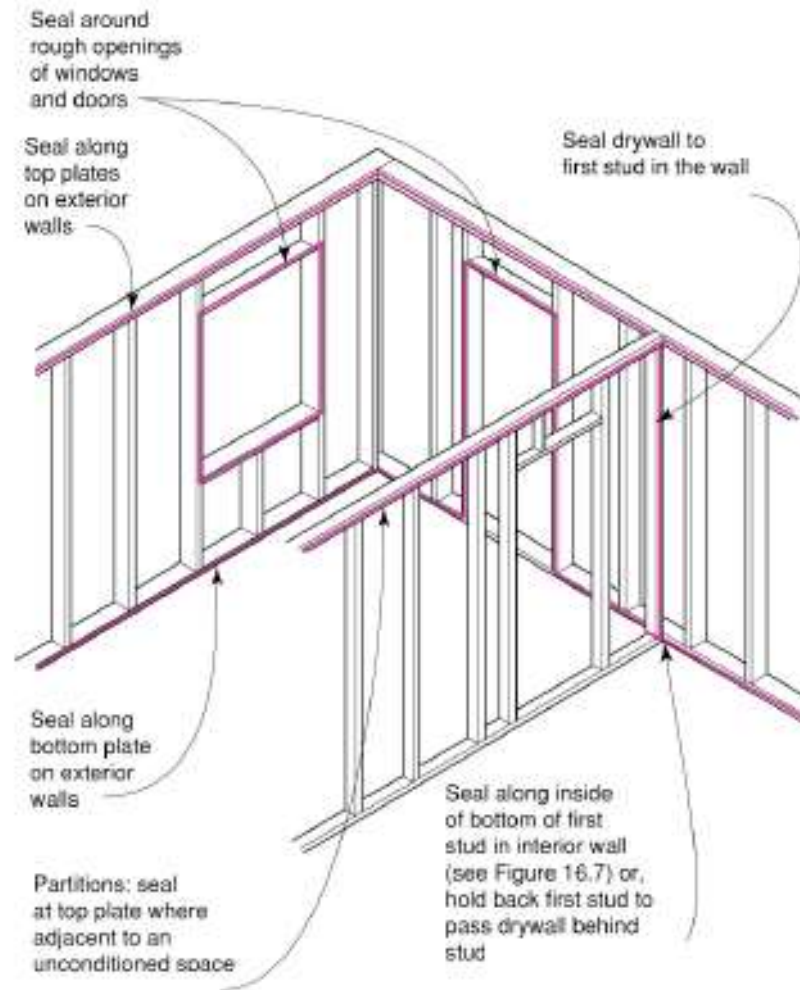


Water Management

- Leaking behind siding/flashing
- Wicking up into bottom drip edges of siding (too close to soil or concrete)
- Water vapor migrating into wall cavity from inside
- Solar driven moisture from siding into sheathing
- Wet lumber



Air-Tight Drywall



(Adapted from Building Science Corporation.)

Seal:

- all exterior wall bottom and top plates,
- all top plates at insulated ceilings,
- rough opening perimeters, and
- both sides of the first interior stud of partition walls.

Insulation: it's not the material, it's the installation!

Benefits of rigid insulation:

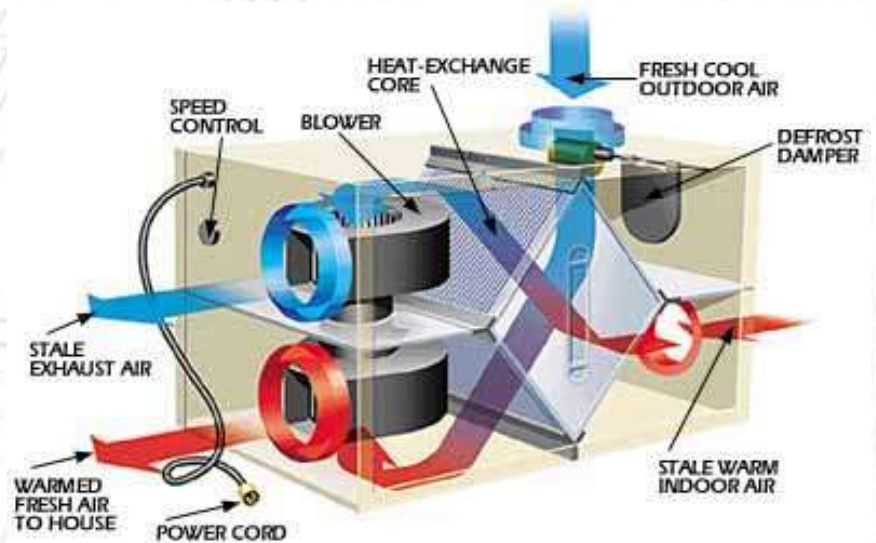
- Increased energy efficiency
- Stops thermal bridging at studs
- Moves dew point out of wall cavity



Ventilation

Three Types:

- Exhaust
- Supply
- Balanced



(adapted from WSU presentation, 2008)

Accessible Design

- Needs change
- Promotes independent living
- Improved mental health
- Promotes physical wellbeing
- Eases challenges for multi-generational families
- Home is more accessible, comfortable and attractive for all!



Goals for Home Performance

For the Homeowner

- Less ongoing maintenance
- Monthly utility savings
- Insurance savings
- Health and quality of life improvements

For the Builder

- More efficient construction practices
- Fewer warranty issues
- Lower default rate
- Increased appraisal value

HOW DO WE MEASURE SUCCESS?



- Is the home more affordable to operate and maintain?
- Is the homeowner more comfortable?
- Are the family members healthier?
- Have we contributed to the quality and resource efficiency of the community?

QUESTIONS

