Residential Energy Efficiency:

Opportunities for Consumers, Businesses, and the Nation

COMMONWEALTH SUSTAINABILITY WORKS

GREEN BUILDING + SUSTAINABLE COMMUNITIES + STRATEGIC PLANNING

www.commonwealthsustainability.com

Green Building

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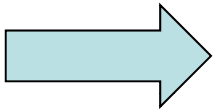
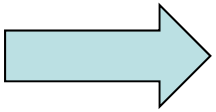
What makes it Greener?

- Better for the Environment
- Better for Human Health



- Reduces energy use
- Saves natural resources (land, fuel, fiber)
- Better employs human resources
- Improves community life



- Makes occupants and owners happier, healthier, smarter, richer, more neighborly, better looking, etc.

Principles of Green Building

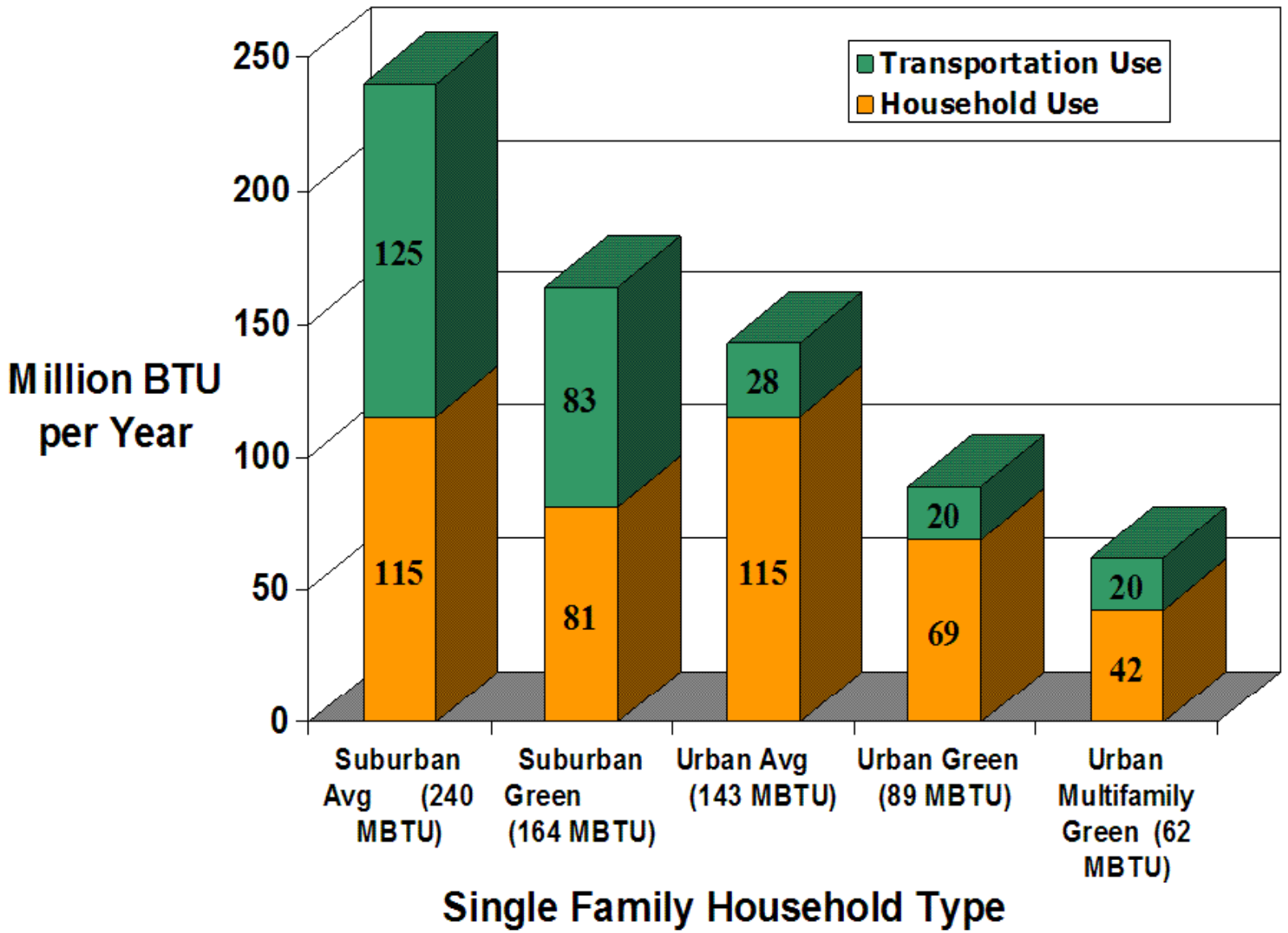
1. The Site
2. Energy
3. Water
4. Materials
5. Healthfulness

Categories developed for the US Green Building Council's LEED rating system.
www.usgbc.org

Principles of Green Building: The Site

- Walkable, Mixed-use neighborhoods
- Viable alternative transportation
- Agricultural and rural land protected
- Re-use of existing infrastructure

Principles of Green Building: The Site



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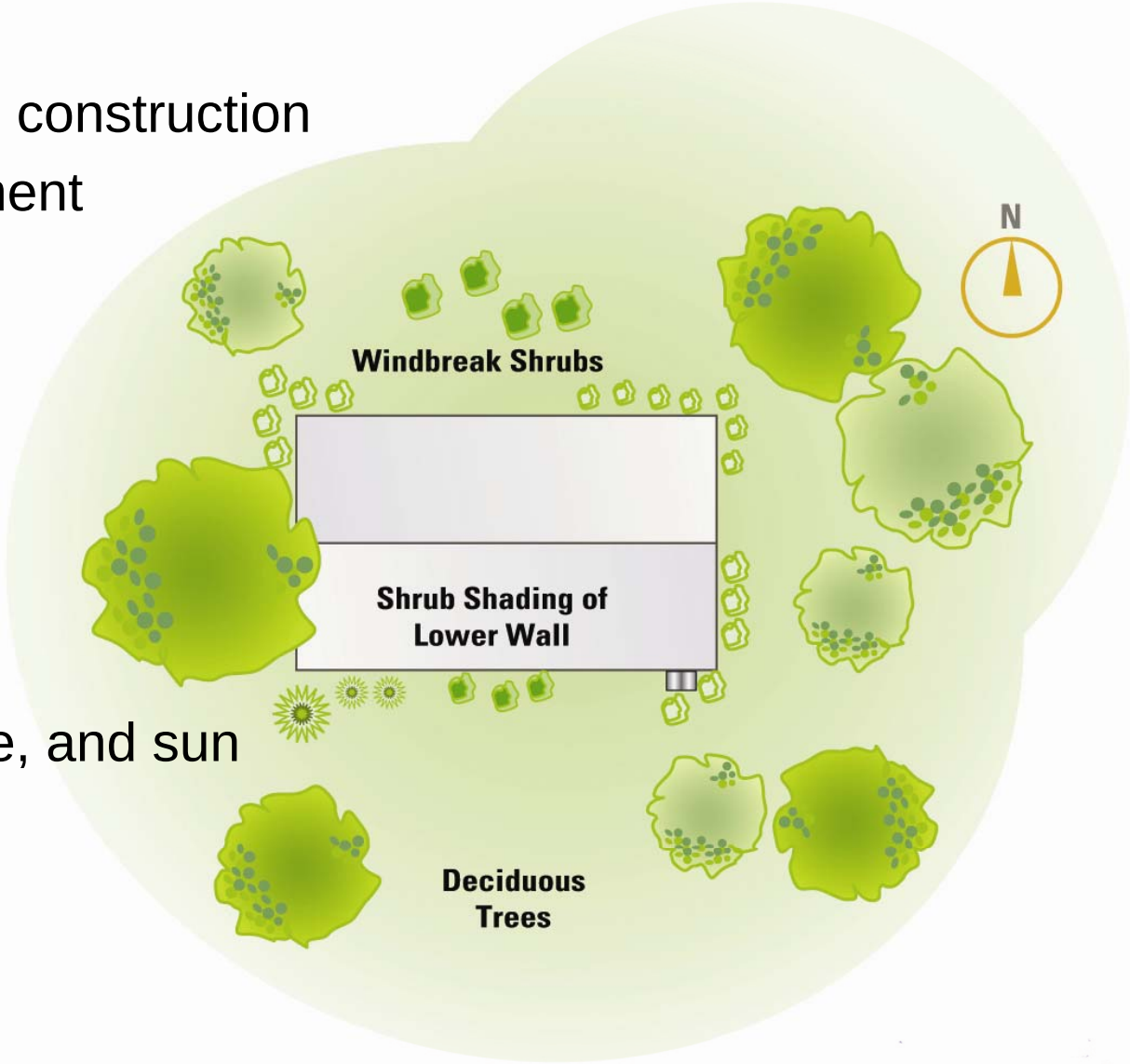
Compact development reduces tax burden

- Roads in planned development are 25 percent cheaper, schools 5 percent cheaper, utilities are 15 percent cheaper, and the other infrastructure costs are the same.
- Planned development reduces housing costs 6 percent.
- Planned development consumes 40 percent as much land overall and 60 percent as much farmland and 17 percent as much fragile lands.
- Planned development is less costly on an annual basis to both municipality and school district by about 2 percent and requires 3 percent less capital expenditure for school districts.

Robert Burchell, Rutgers Univ.

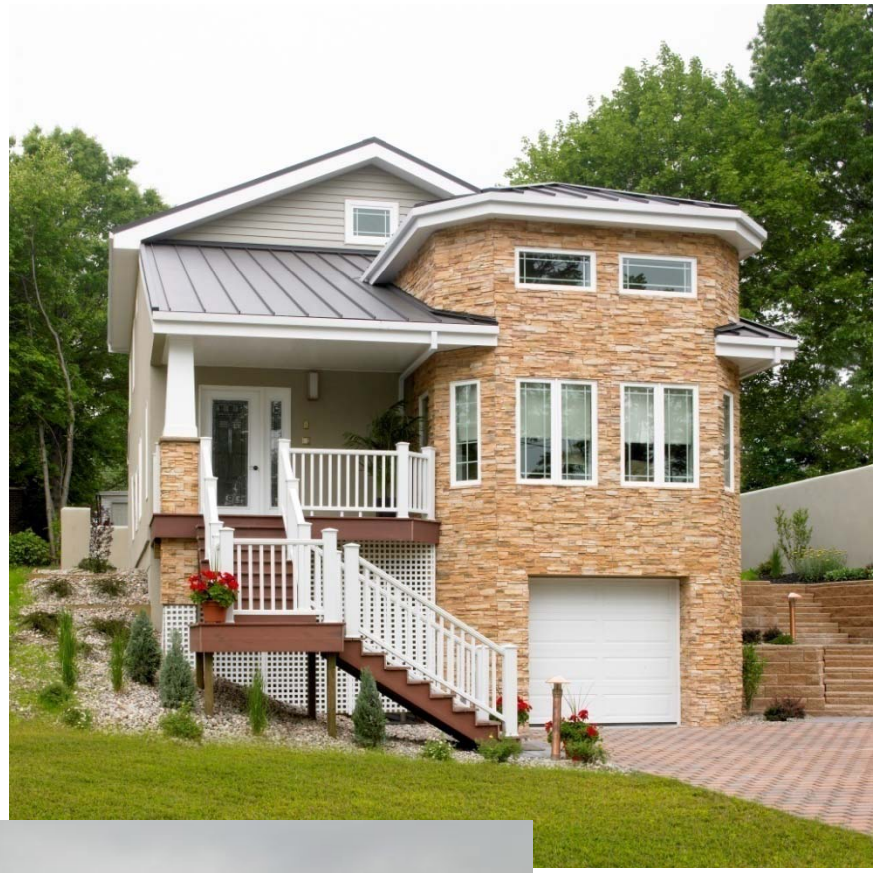
Principles of Green Building: The Site

- Erosion control during construction
- Stormwater management
- Permeable pavement
- Shade hardscapes
- Smart landscaping
  - Natives
  - Limit turf
  - Edibles
  - Windbreaks, shade, and sun

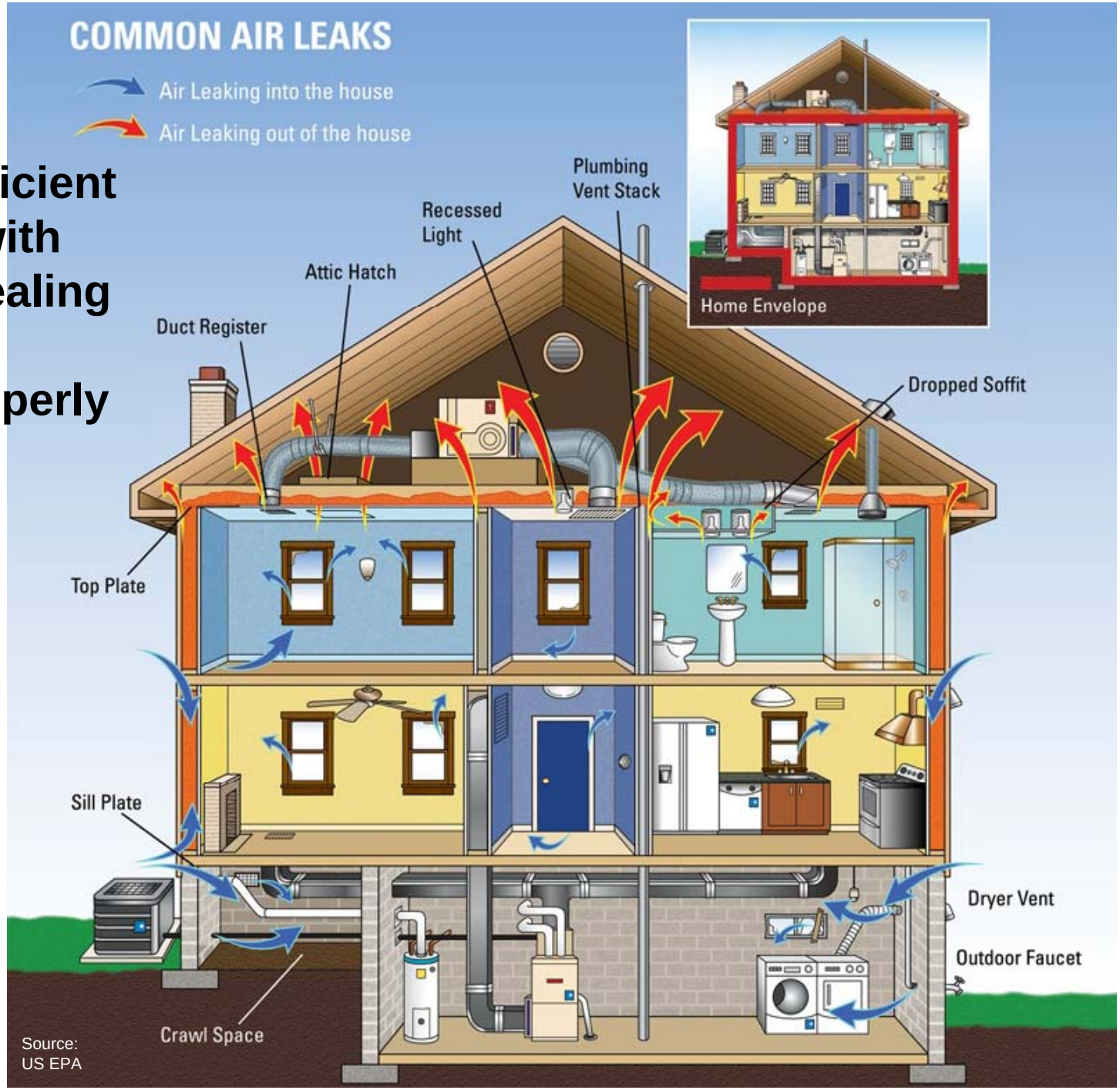


Principles of Green Building: Energy

- Tight envelopes
- Superior insulation
- High-performance equipment
- Efficient appliances
- Smart operations
- Home-based Renewable Energy

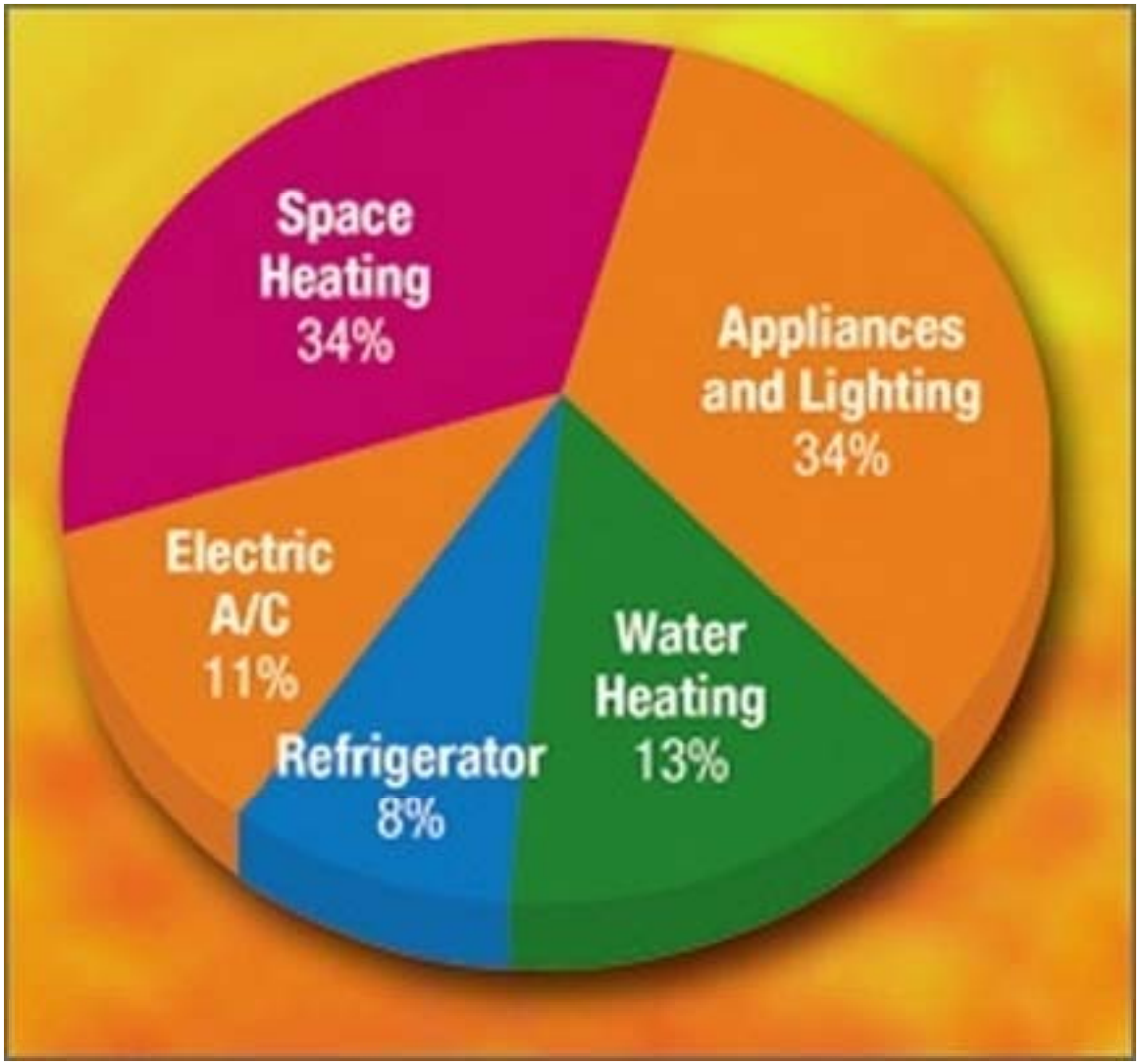


The energy efficient house starts with rigorous air-sealing and abundant insulation, properly installed.



Principles of Green Building: Energy

Home Energy Use: Average $1900/yr for US Homes



Source: 2005 Building Energy Data Book

Principles of Green Building: Energy

Renewable Energy for Homes: Wind

Principles of Green Building: Energy

Renewable Energy for Homes: Solar

Principles of Green Building: Water

- Efficient Fixtures
- Rainwater Harvesting
- Appropriate Landscaping
- Wastewater Management

Principles of Green Building: Materials

- Materials:
  - Recycled
  - Locally - sourced
  - Renewable
  - Non-toxic
  - Durable
- Business Practices:
  - Jobsite recycling
  - Waste reduction

Principles of Green Building: Materials

Embodied Energy of Common Building Materials (in MJ/kg)

baled straw = 0.2
soil-cement = 0.4
stone (local) = 0.8
brick = 2.5
kiln-dried hardwood = 2.5
cellulose insulation = 3.3
gypsum wallboard = 6.1
cement = 7.8
particle board 8.0
asphalt shingles = 9.0
plywood = 10.4

float glass = 15.9
fiberglass = 30.3
virgin steel = 32.0
recycled steel = 10.1
brass = 62.0
PVC = 70.0
copper = 70.6
styrofoam (EPS) = 117.0
carpet (synthetic) = 148.0
virgin aluminum = 209.0
recycled aluminum = 8.1

Embodied energy is an accounting methodology which aims to find the sum total of the energy necessary for an entire product lifecycle. This lifecycle includes raw material extraction, transport, manufacture, assembly, installation, disassembly, deconstruction and/or decomposition.

Wikipedia

Principles of Green Building: Healthfulness

Green Carpet?

Carpet and Rug Institute Green Label

Sets maximum amounts for 13 chemicals.

- Acetaldehyde
- Benzene
- Caprolactam
- 2-Ethylhexanoic Acid
- Formaldehyde
- 1-Methyl-2-Pyrrolidinone
- Naphthalene
- Nonanal
- Octanal
- 4-Phenylcyclohexene
- Styrene
- Toluene
- Vinyl Acetate

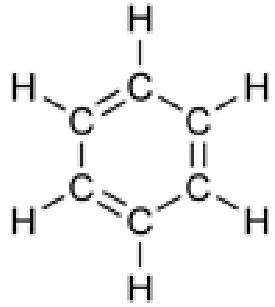
Principles of Green Building: Healthfulness

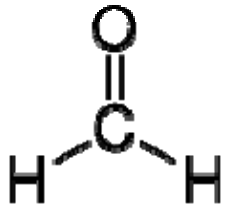
- Humans have introduced more than 80,000 synthetic chemicals into the environment.
- Of 287 industrial chemicals detected in umbilical cord blood, 180 cause cancer, 217 are toxic to the brain and nervous system, and 208 cause birth defects or abnormal development.
- Worldwide, some 300-500 million tons of hazardous wastes are generated each year.

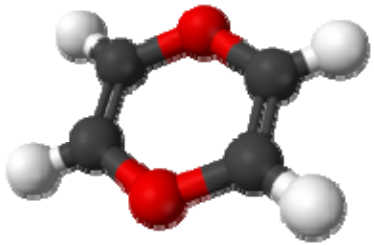
Environmental Working Group (EWG). 2006. Body Burden: The Pollution in Newborns.
http://www.ewg.org/reports/bodyburden2
http://www.worldwatch.org/node/3623

Principles of Green Building: Healthfulness

- Reduce use of toxic materials
- HVAC design and installation to keep indoor air cleaner
- Natural lighting
- Design strategies for moisture management







Principles of Greener Building

1. Smarter Location & Gentler on the Site
2. Less Energy
3. Less Water
4. Smarter, Low-Impact Materials
5. Greater Healthfulness

THE GOVERNOR'S CONFERENCE ON ENERGY

RICHMOND, VIRGINIA • OCTOBER 12-14, 2010

Residential Energy Auditing

Curious about the science and the business of this fast-growing industry? Do you need to understand the tools and techniques, the training opportunities, and any rebates or incentives? There are at least 100 million homes in this country that need energy upgrades. It's the most economical and accessible solution to our energy challenges – and it's an incredible business opportunity.

Whether you are a job-seeker looking to enter this fast-growing industry, a homeowner curious about this service, or a workforce development professional who needs to understand the training involved, you'll benefit from this introduction to home energy audits.

Instructor: Andrew Grigsby, LEED AP, HERS, BPI

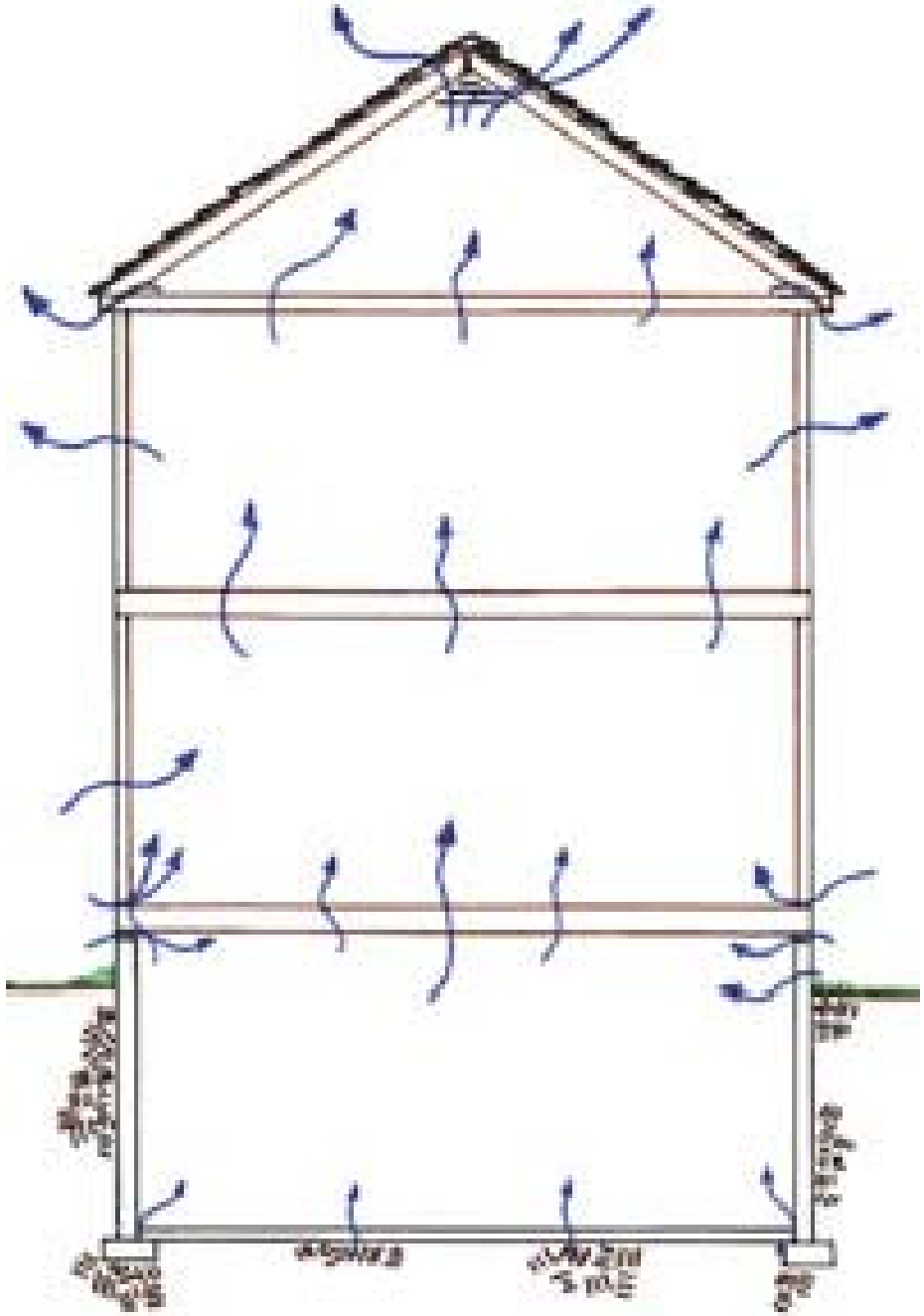
Everyone knows you should have good insulation in your attic

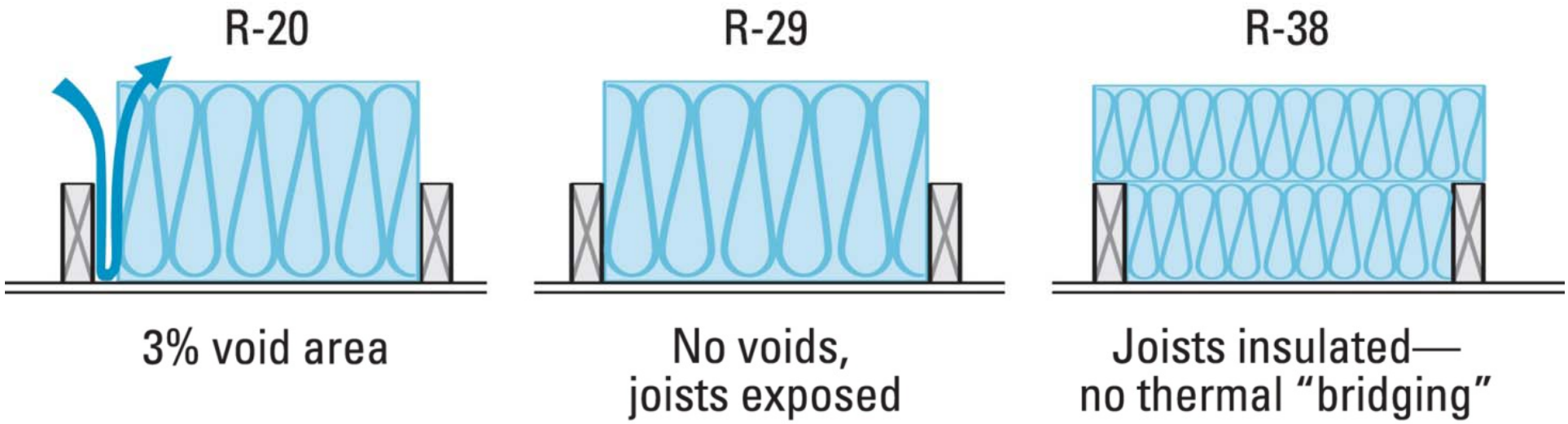

CHARLOTTE PIPE

Warm air rises!

Everyone knows this.

So why are all of our attics under-insulated?





The batt says R-38.

But a 3% void reduces effective performance by nearly 50%.

Of the 130 million homes in the USA, at least 90% are candidates for modest to substantial energy retrofits.