# *Green Building: Public Regulation or Private Certification?*

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*Environmental Politics and Law*
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Buildings consume 76% of the United State's electricity, and emit almost half of the nation's greenhouse gases.

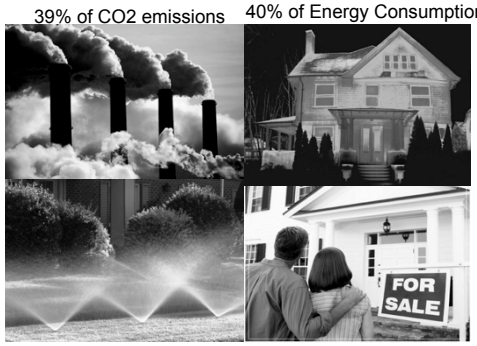
## U.S. Contribution

- The United States consumes *more energy than any other country* in the world
- The U.S. consumes nearly 25% of the worlds energy and only accounts for 5% of the world population.
- Our energy is increasing nearly 2% each year.

U.S. buildings are responsible for…

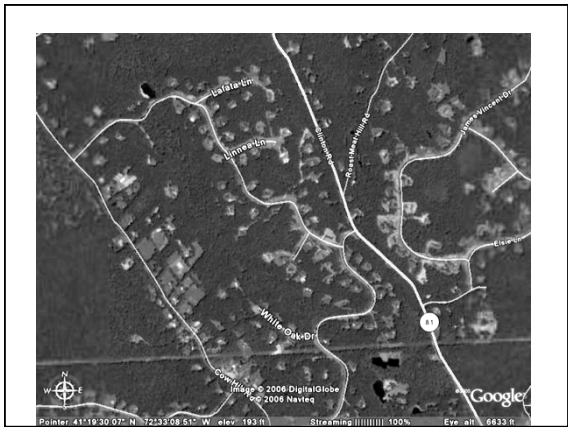
39% of $CO_2$ emissions

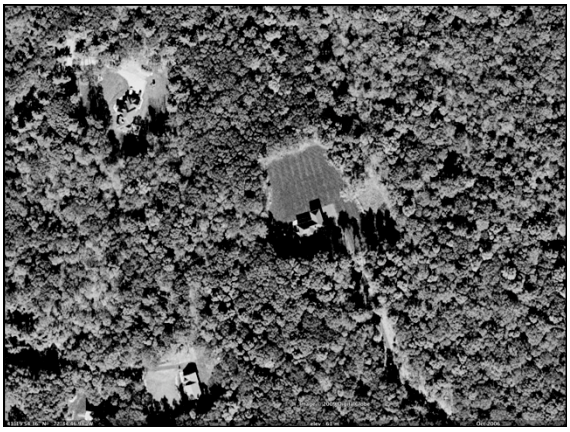
40% of Energy Consumption




13% of water consumption

15% of GDP per year

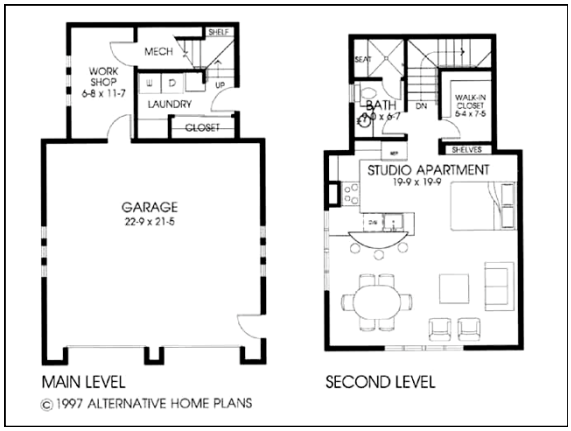



Average Home Size

2009: 2,500 sf

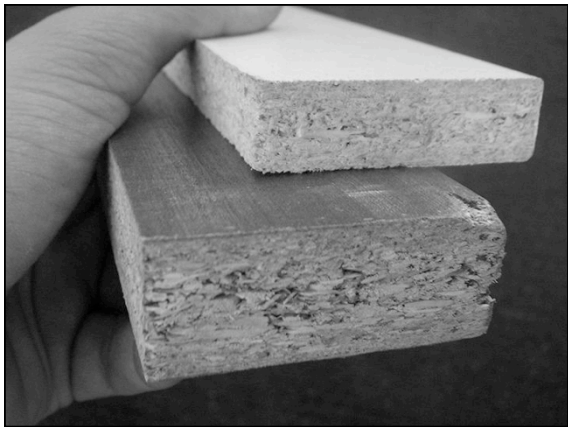
1970: 1,500 sf

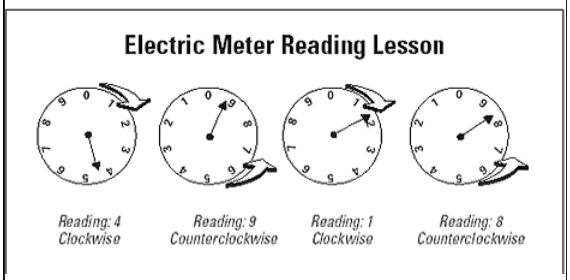
1950: 800 sf





Number of Cubic Feet to Heat/Cool Per Person?





Smart Metering Alternatives

## International Building Codes

- Materials
- Electrical
- Energy
- Fire Prevention
- Mechanical: HVAC, Plumbing
- Historical
- Earthquake Stability

## Major Green Building Certification Programs

- LEED (U.S.)
- BREEAM (U.K.)
  - BRE's Environmental Assessment Method
- Green Star (Australia)

## Great Britain: BREEAM

- BRE Environmental Assessment Method
- Leading and most widely used environmental assessment method for buildings.
- Sets the standard for best practice in sustainable design and has become the de facto measure used to describe a building's environmental performance.

## Australia: Green Star

- Green Star is a national, voluntary environmental rating system that evaluates the environmental design and construction of buildings and, with 11 per cent of Australia's commercial office buildings Green Star certified, building green is now a business imperative.

## Green Star Purpose:

- Establish a common language
- Set a measurement standards
- Promote integrated, whole-building design
- Identify building life-cycle impacts

## Differences in Programs?

- LEED, BREEAM, & Green Star similarly focus on energy conservation, but pay little attention to chemical lifecycles and human health.

## "US Green Building Council"

- USGBC organized in 1993 as a voluntary, non-profit, with no government affiliation.

## USGBC Benefits Claims:

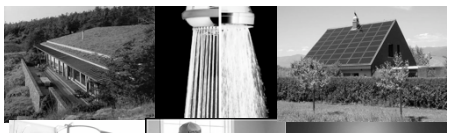
ENVIRONMENTAL

ECONOMIC

HEALTH AND COMMUNITY

## Rating Systems and Categories

**Sustainable sites** **Water Efficiency** **Energy & Atmosphere**



**Materials & Resources**

**Indoor Environmental Quality**

**Innovation In Design**

## U.S. Green Building Council's
"Leadership in Energy and Environmental Design"

- LEED is a rating system designed by USGBC to "evaluate the environmental performance of the design, construction, and operation of green buildings." - USGBC

## Certification: Scoring Performance

- 100 base points possible + 10 bonus
  - Certified 40-49 points
  - Silver 50-59 points
  - Gold 60-79 points
  - Platinum 80-110 points

## Development of LEED

- The LEED board consists of architects, real estate agents, engineering firm executives, building materials executives, and chemical company representatives.
- In 1997, the U.S. DOE agreed to fund the LEED pilot program, which was launched in August of 1998.

## Purpose of LEED

- According to USGBC, LEED was developed to
  - Protect the environment, *occupant health*, and become economically beneficial
  - Provide a standard of "GREEN"
  - Prevent inaccurate claims of being "green"
  - Promote an integrated design process

## LEED's Rating Systems

- New Construction & Renovation
- Schools
- Core & Shell
- Neighborhood Development
- Retail Facilities
- Healthcare Facilities
- Commercial Interior Projects
- Homes

## USGBC's

Benefits of Green Building

Environmental benefits:
- Enhance and protect ecosystems and biodiversity
- Improve air and water quality
- Reduce solid waste
- Conserve natural resources

Economic benefits:
- Reduce operating costs
- Enhance asset value and profits
- Improve employee productivity and satisfaction
- Optimize life-cycle economic performance

Health and community benefits:
- Improve air, thermal, and acoustic environments
- Enhance occupant comfort and health
- Minimize strain on local infrastructure
- Contribute to overall quality of life

## Categories

- Sustainable Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation of Design

## Certification

- 100 base points possible + 10 bonus
  - Certified 40-49 points
  - Silver 50-59 points
  - Gold 60-79 points
  - Platinum 80-110 points

## Certification

- In order to become certified, buildings must first meet several basic mandatory requirements. Examples include that the building must be a permanent structure, or the site/building must comply with environmental laws.
- Then, buildings can earn points for meeting a variety of "credits" in each section.
- In most categories, there are additional prerequisites that must be met in order to become certified.

## Sustainable Sites

26 possible points
24% of total

- Credits buildings for being built on previously developed land
- Promotes a minimal impact on ecosystems and waterways
- Promotes landscaping that is regionally appropriate
- Encourages public transportation
- Controls stormwater runoff, erosion, light pollution, heat island effects, and pollution from the construction process

Hazardous Site Cleanup Standards? Pierson Sage Power Plant→Kroon Hall Yale.

| Sustainable Sites (23.6%) | Possible Points 26 |
|---|---|
| ☐ Prerequisite 1 Construction Activity Pollution Prevention Required | |
| ☐ Credit 1 Site Selection | 1 |
| ☐ Credit 2 Development Density and Community Connectivity | 5 |
| ☐ Credit 3 Brownfield Redevelopment 1 | |
| ☐ Credit 4.1 Alternative Transportation—Public Transportation Access | 6 |
| ☐ Credit 4.2 Alternative Transportation—Bicycle Storage and Changing Rooms | 1 |
| ☐ Credit 4.3 Alternative Transportation—Low-Emitting, Fuel-Efficient Vehicles | 3 |
| ☐ Credit 4.4 Alternative Transportation—Parking Capacity | 2 |
| ☐ Credit 5.1 Site Development—Protect or Restore Habitat | 1 |
| ☐ Credit 5.2 Site Development—Maximize Open Space | 1 |
| ☐ Credit 6.1 Stormwater Design—Quantity Control | 1 |
| ☐ Credit 6.2 Stormwater Design—Quality Control | 1 |
| ☐ Credit 7.1 Heat Island Effect—Nonroof | 1 |
| ☐ Credit 7.2 Heat Island Effect—Roof | 1 |
| ☐ Credit 8 Light Pollution Reduction | 1 |

# Water Efficiency

10 points
9% of total

- Encourages efficient appliances, fixtures, and fittings
- Promotes “water-wise landscaping” to help reduce water use and improve conservation

| Water Efficiency (9.1%) | Possible Points 10 |
|---|---|
| ☐ Prerequisite 1 Water Use Reduction Required | |
| ☐ Credit 1 Water Efficient Landscaping | 2-4 |
| ☐ Credit 2 Innovative Wastewater Technologies | 2 |
| ☐ Credit 3 Water Use Reduction | 2-4 |

# Energy and Atmosphere

35 points
32% of total

- Credits involve
  - Energy consumption monitoring
  - Efficient design and construction
  - Efficient appliances, systems, and lights
  - Use of renewable and clean sources of energy
  - Other strategies involving energy efficiency

| Energy and Atmosphere (31.8%) | Possible Points 35 |
|---|---|
| ☐ Prerequisite 1 Fundamental Commissioning of Building Energy Systems Required | |
| ☐ Prerequisite 2 Minimum Energy Performance Required | |
| ☐ Prerequisite 3 Fundamental Refrigerant Management Required | |
| ☐ Credit 1 Optimize Energy Performance | 1–19 |
| ☐ Credit 2 On-site Renewable Energy | 1–7 |
| ☐ Credit 3 Enhanced Commissioning | 2 |
| ☐ Credit 4 Enhanced Refrigerant Management | 2 |
| ☐ Credit 5 Measurement and Verification | 3 |
| ☐ Credit 6 Green Power 2 | |

## Materials and Resources

14 points
13% of total

- Promotes recycling
- Rewards waste reduction
- Encourages use of sustainably grown, harvested, produced and transported materials

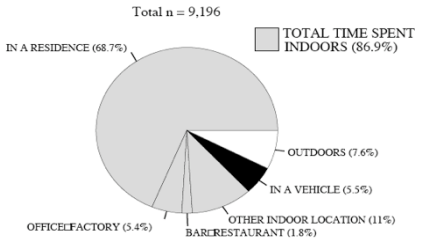
| **Materials and Resources (12.7%)** | **Possible Points 14** |
|---|---|
| □ Prerequisite 1 Storage and Collection of Recyclables Required | |
| □ Credit 1.1 Building Reuse—Maintain Existing Walls, Floors and Roof | 1-3 |
| □ Credit 1.2 Building Reuse—Maintain Existing Interior Nonstructural Elements | 1 |
| □ Credit 2 Construction Waste Management | 1-2 |
| □ Credit 3 Materials Reuse | 1-2 |
| □ Credit 4 Recycled Content | 1-2 |
| □ Credit 5 Regional Materials | 1-2 |
| □ Credit 6 Rapidly Renewable Materials | 1 |
| □ Credit 7 Certified Wood | 1 |

## Indoor Environmental Quality

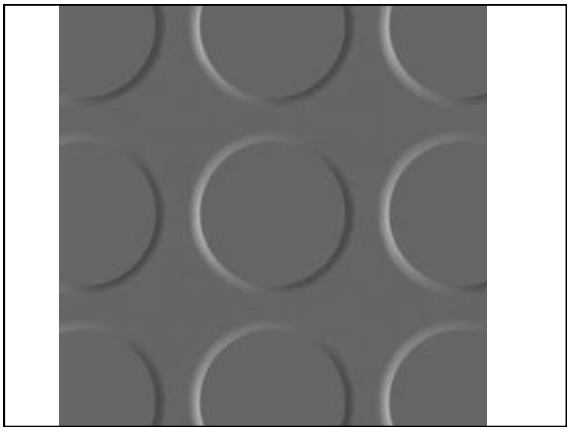
15 points
14% of total

- Developed to improved indoor air quality
- Promotes natural daylight and views
- Rewards improved acoustics

On average, Americans spend nearly 90% of the time indoors or within vehicles




| **Indoor Environmental Quality (13.6%)** | **Possible Points 15** |
|---|---|
| □ Prerequisite 1 Minimum Indoor Air Quality Performance Required | |
| □ Prerequisite 2 Environmental Tobacco Smoke (ETS) Control Required | |
| □ Credit 1 Outdoor Air Delivery Monitoring | 1 |
| □ Credit 2 Increased Ventilation | 1 |
| □ Credit 3.1 Construction IQ Management Plan—During Construction | 1 |
| □ Credit 3.2 Construction IAQ Management Plan—Before Occupancy | 1 |
| □ Credit 4.1 Low-Emitting Materials—Adhesives and Sealants | 1 |
| □ Credit 4.2 Low-Emitting Materials—Paints and Coatings | 1 |
| □ Credit 4.3 Low-Emitting Materials—Flooring Systems | 1 |
| □ Credit 4.4 Low-Emitting Materials—Composite Wood and Agrifiber Products | 1 |
| □ Credit 5 Indoor Chemical and Pollutant Source Control | 1 |
| □ Credit 6.1 Controllability of Systems—Lighting | 1 |
| □ Credit 6.2 Controllability of Systems—Thermal Comfort | 1 |
| □ Credit 7.1 Thermal Comfort—Design | 1 |
| □ Credit 7.2 Thermal Comfort—Verification | 1 |
| □ Credit 8.1 Daylight and Views—Daylight | 1 |
| □ Credit 8.2 Daylight and Views—Views | 1 |

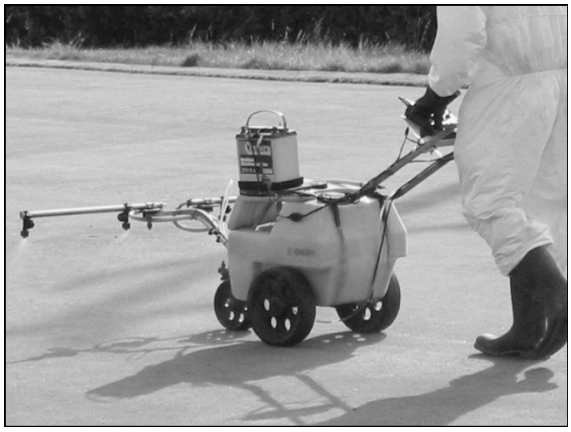



## Building materials posing possible health hazards

- Paint, stain
- Sealants, caulking
- Appliances
- Lighting
- Fans
- Electronics
- Fireplaces
- HVACs
- Insulation
- Concrete
- EMFs
- Drywall
- Roofing
- Siding
- Rugs
- Wood
- Plastics
- Air ducts
- Air purifiers

## Air Exchange: HVAC Systems

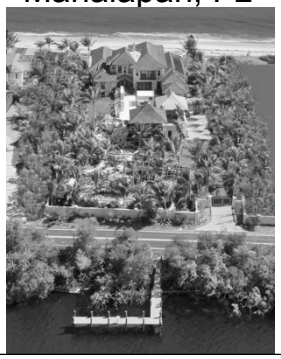
**Tighter, more energy efficient structures often have one-tenth the air exchange rates of older structures with windows, doors and walls that are less well-insulated and sealed.**



## Nestle Bottling Plant

http://www.maconcountytn.com/NW9822.JPG

## Acqua Liana, Manalapan, FL



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