



The Heritage Canada Foundation's Annual
Conference
The Heritage Imperative:
Old Buildings in an Age of Environmental Crisis
Friday, September 25th, 2009

Maturing the 'Greenest Building' Paradigm:
The Need to Transform Preservation

Carl Elefante, FAIA, LEED AP

Principal

Director of Sustainable Design

QUINN EVANS | ARCHITECTS





Sustainable Stewardship =
Preservation +
Sustainable Design =
Renewal +
Transformation





What is truly
SUSTAINABLE?

What is effective
STEWARDSHIP?





We are one with the Earth



David Suzuki

Life's Elements

Water

Air

Earth

Energy





Being Less Bad is NOT Being Good



William McDonough

Why can't buildings *purify* water?

Why can't buildings *sequester* greenhouse gases?

Why can't buildings *increase diversity* and *intensify vitality*?

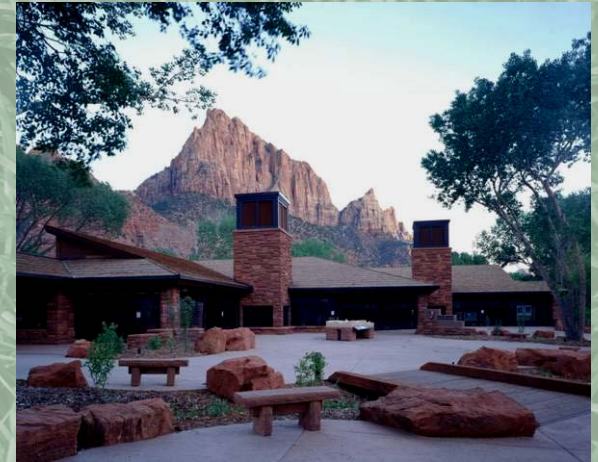
Why can't buildings *produce* energy?

Waste = Food



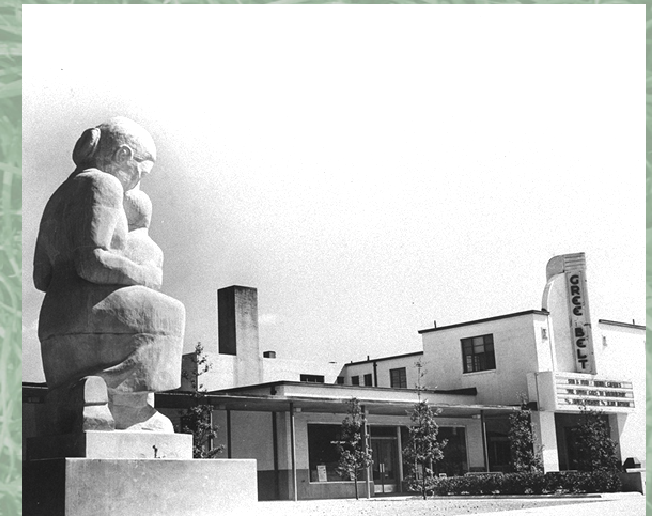
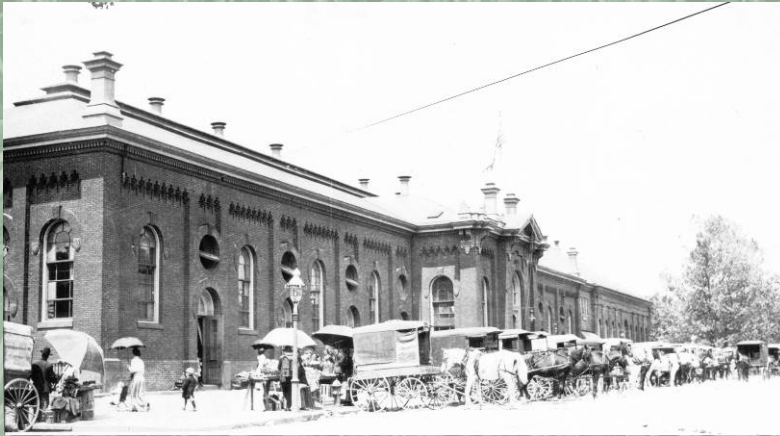


The *Greenest* Building is ...



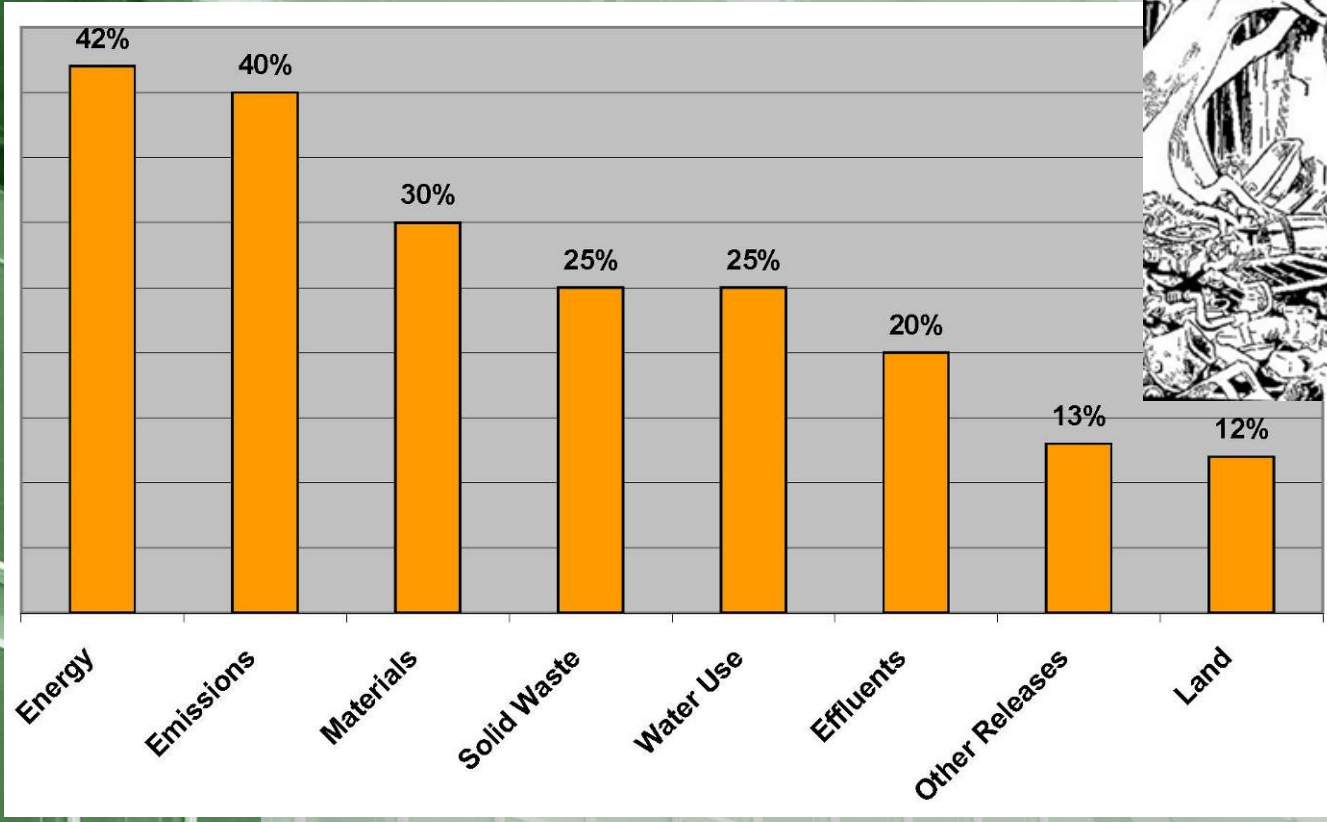


... One That is *Already* Built.





Building Industry Impacts



Pogo
Earth Day 1971
Walt Kelly

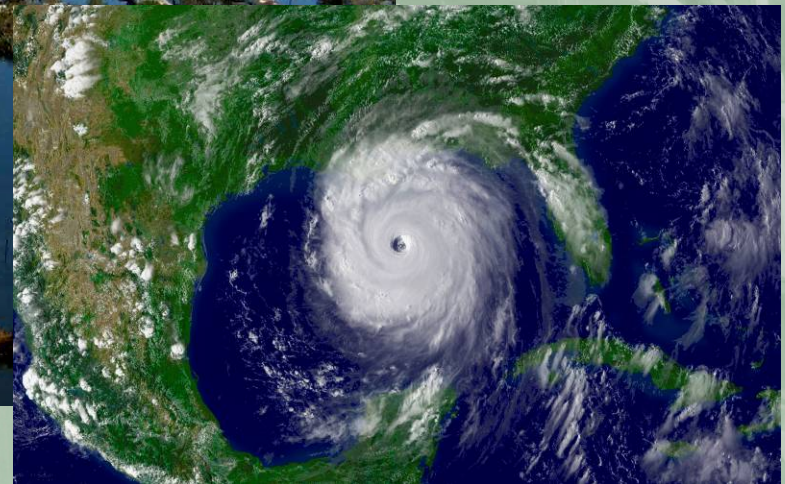




Building Industry Impacts

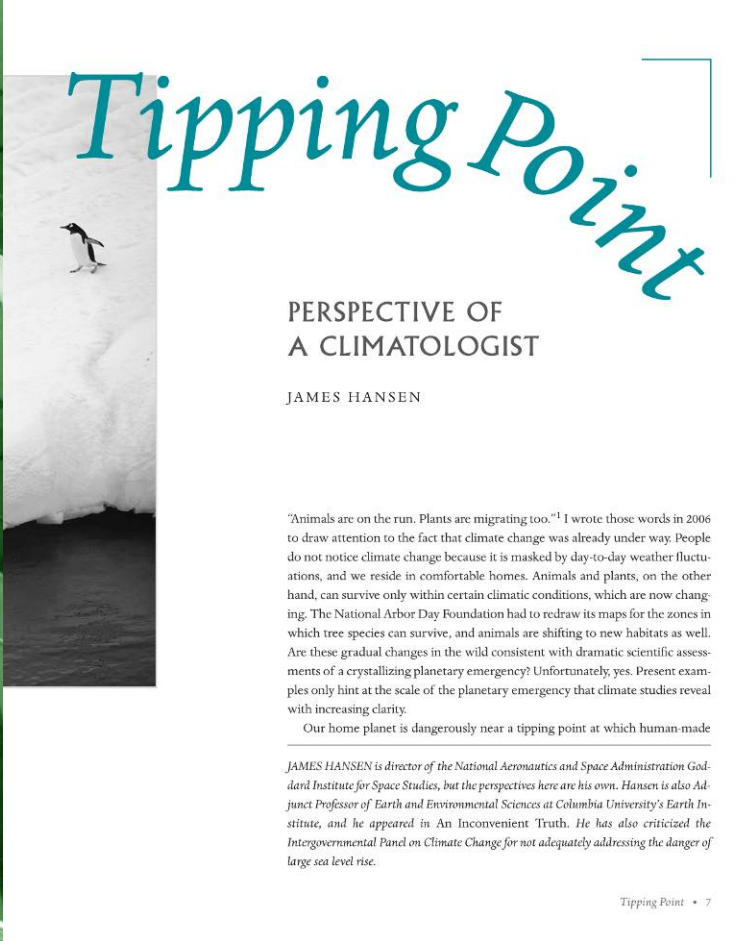


Hurricane Katrina





Building Industry Impacts



“Our home planet is dangerously near a tipping point at which human-made greenhouse gases reach a level where major climate changes can proceed mostly under their own momentum.”

Tipping Point - Perspective of a Climatologist
James Hansen





The Tipping Point CO₂ Levels

Pre-industrial level 280 ppm

2007 measured level 383 ppm

Tipping point 450 ppm

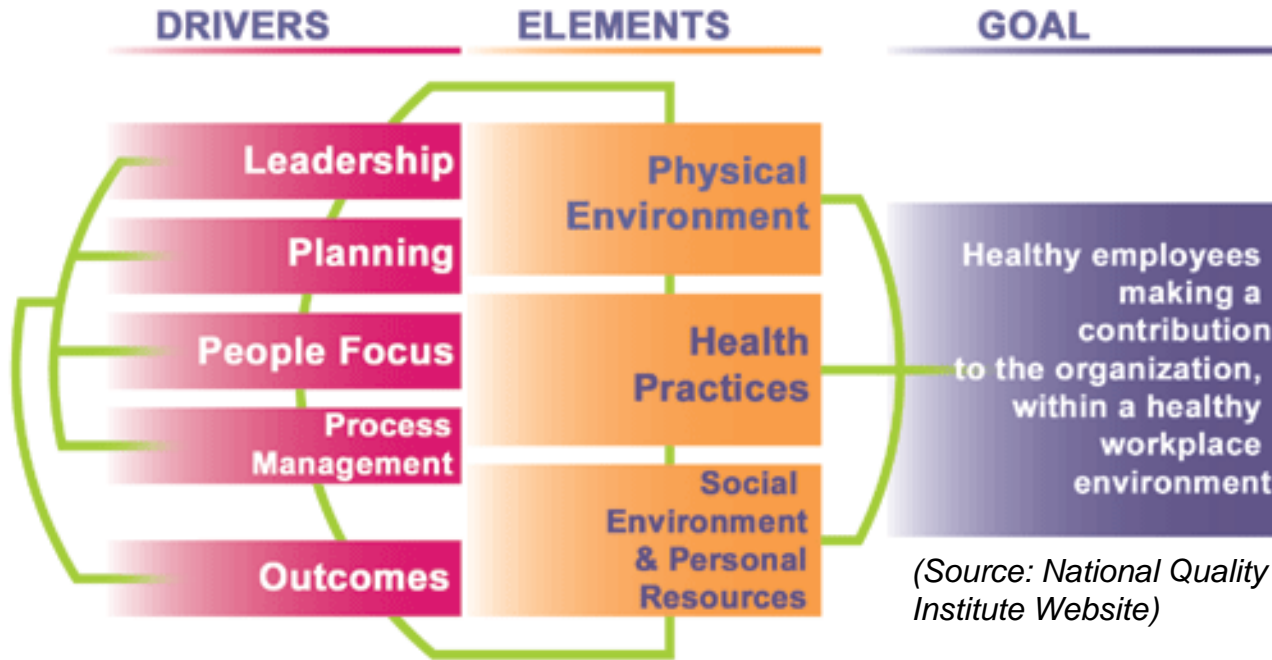
Delta 067 ppm

Current annual increase 002 ppm

Years to tipping point $67/2 = 34$



Canadian Healthy Workplace Criteria



- Developed by National Quality Institute in partnership with Health Canada
- A roadmap for organizations in any sector who wish to encourage, support and offer exemplary health-related programs in the workplace
- Management of a healthy workplace is an integral part of the management of people, and the universal principles that drive successful quality practices

Effects of Biophilic Design

- **Biophilia** – “the innately emotional affiliation human beings to other living organisms”

– Edward O. Wilson, *“Biophilia and the Conservation Ethic”*, 1984



- Biophilic design emphasizes connection to the natural environment:
 - The ancestral environment
 - Natural systems as the cyclical dynamics of daylight, weather, and temperature, and the annual changes of seasons and the movement of the sun.
 - The more traditional definition of nature: ecosystems, trees, flowers, flora and fauna of all types, either inside or out.
- Benefits of a connection to the natural environment:
 - Increased productivity of building occupants.
 - Reduced stress, faster recovery time, and decreased use of strong painkillers.

(Source: Rocky Mountain Institute: “Introduction to Biophilia and the Built Environment”)

Clothing & Insulation Value

1 CLO = 0.88 (hr-ft²-°F/Btu), typical 3-piece suit



0.2 clo

0.8 clo

1.0 clo

3.0 clo

Activity & Metabolic Heat Production

1 MET = 18.4 Btu/ft²-hr, sedentary activity



1,0 met

1,4 met

3,0 met

4,0 met

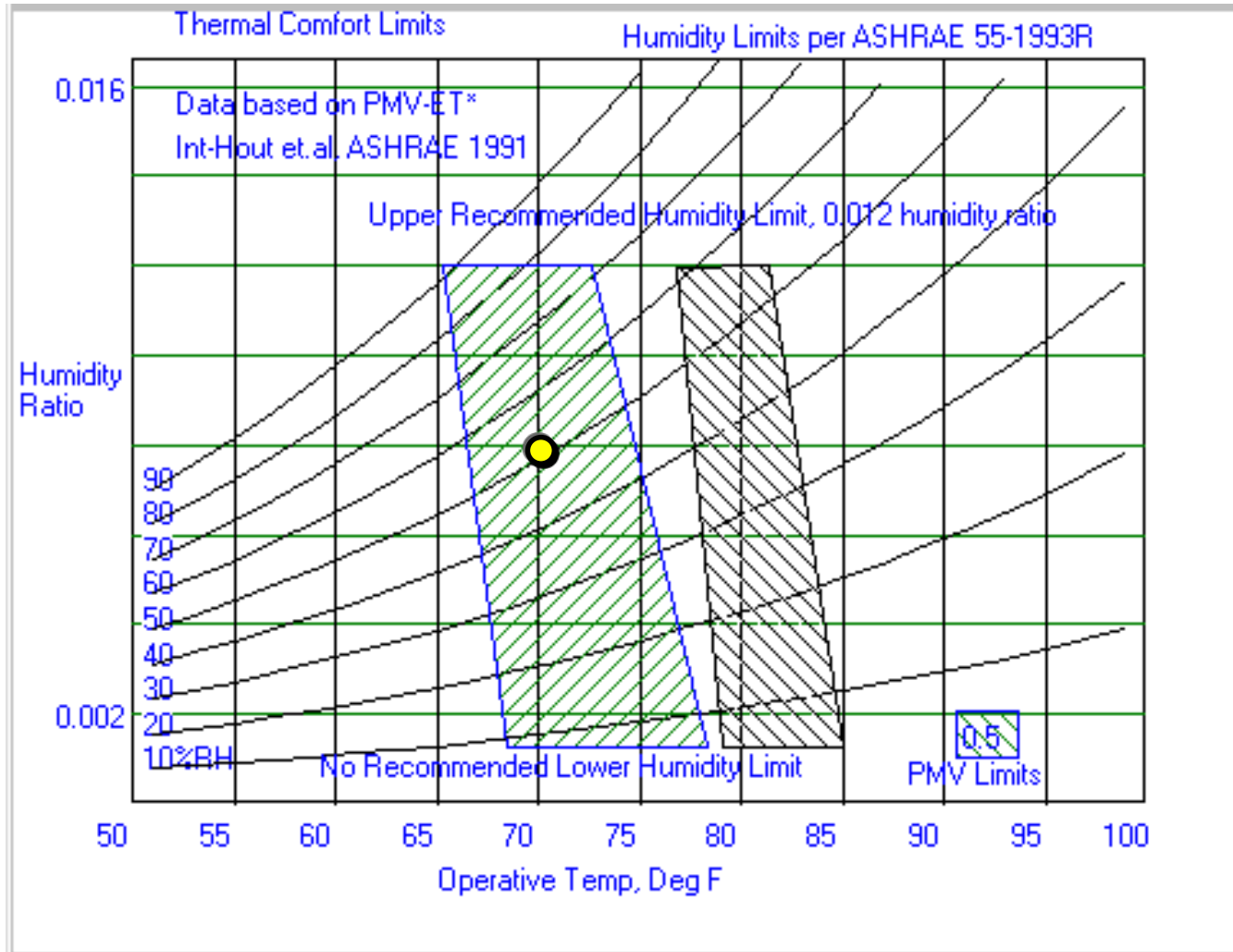
1 met

1.4 met

3.0 met

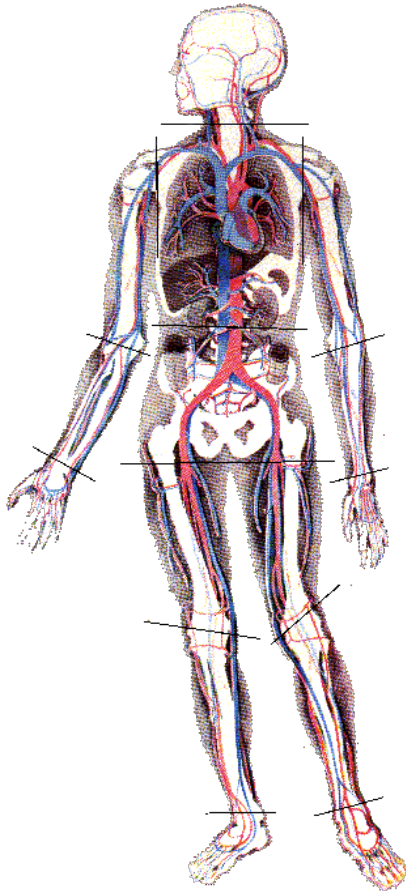
4.0 met

Plotting Both:



Advanced Comfort Modeling

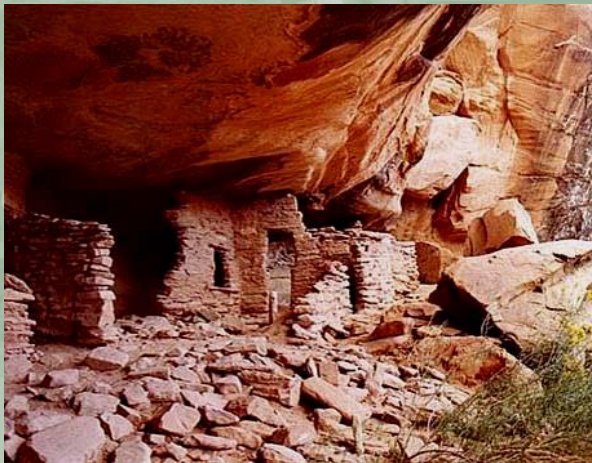
The UCB/CBE Comfort Model is a more sophisticated model that considers non-uniform thermal environments.



- **16 body segments, 4 layers (core, muscle, fat, and skin)**
- **Transient**
- **Blood flow model**
- **Heat loss by evaporation (sweat), convection, radiation, and conduction**
- **Clothing model (including heat and moisture transfer)**
- **Physiology model & comfort model**



Building of Nature





Building of Nature



Climate Integration



“Systems” Integration



Building - Site Integration





Building of Nature

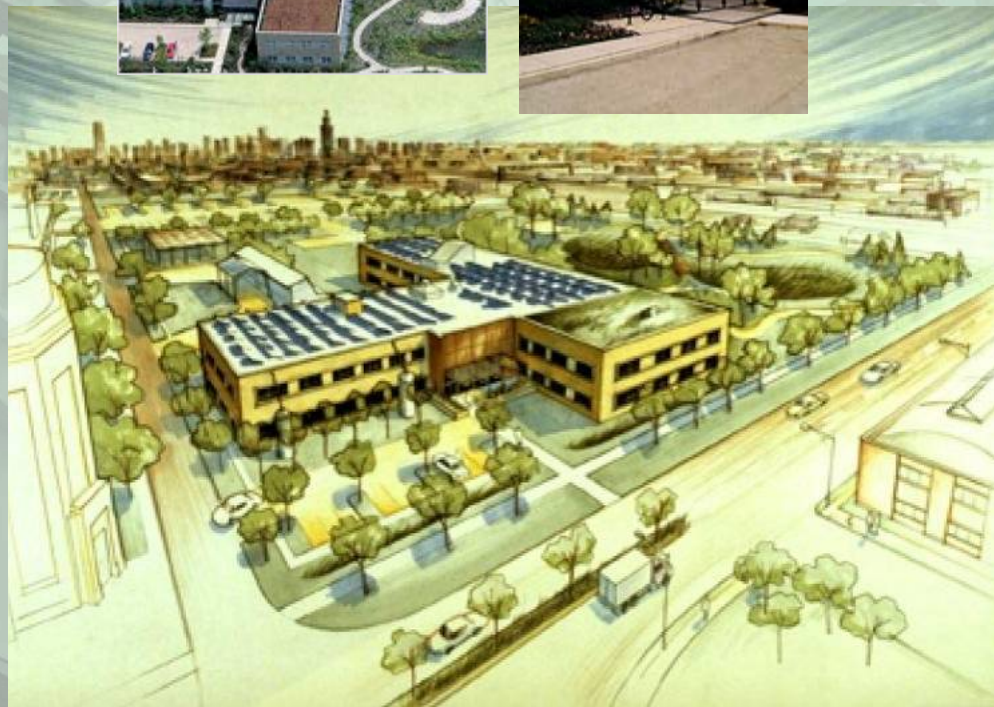


Draper Hall
Berea College, Kentucky
Van Der Ryn with Steed | Hammond | Paul



Green Rehabilitation

Chicago Center for Green Technology



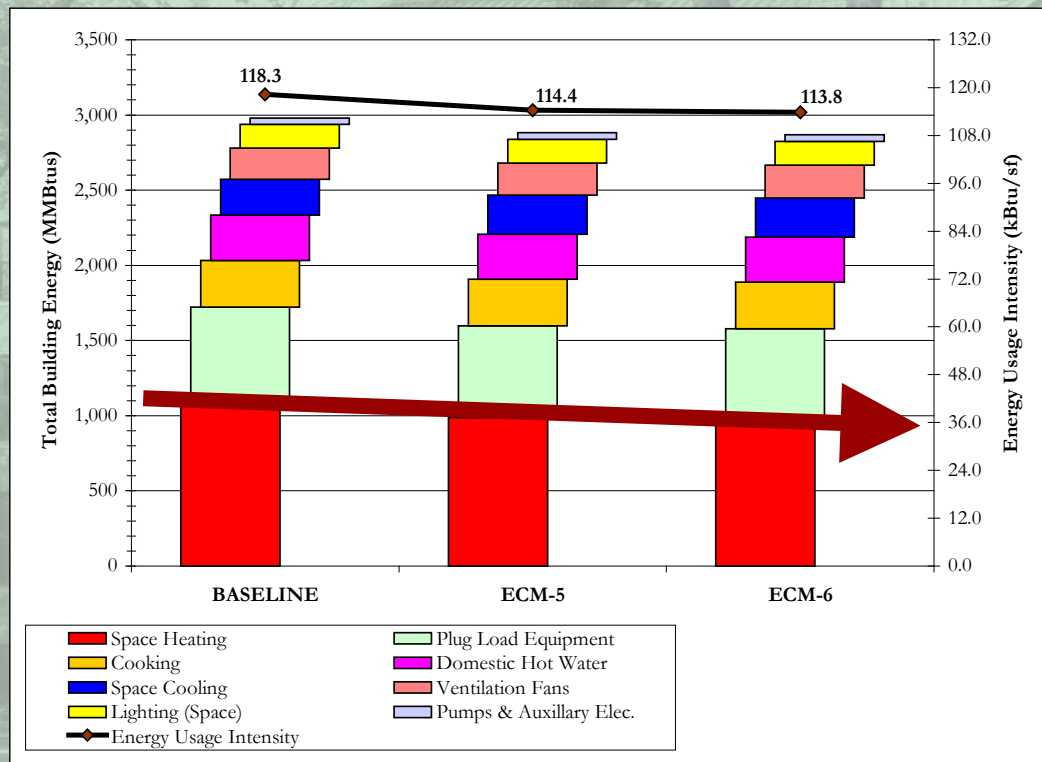
Farr Associates





Envelope Performance

ANALYSIS TOOLS



Windows

from:
118.3 Btu/sf
to:
113.8 Btu/sf
net:
- 4.5 Btu/sf

- 3.8 %

Maximum
Improvement

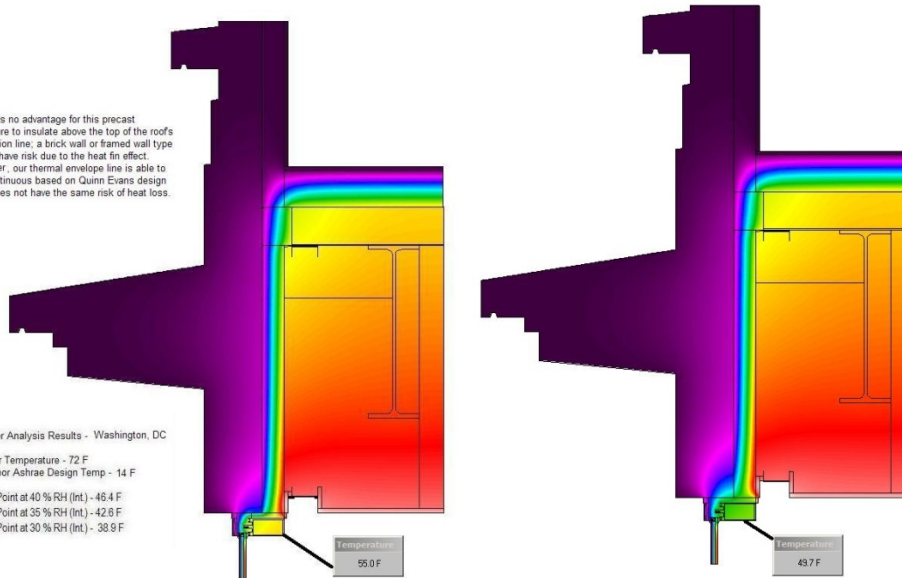
BASELINE: Assumed single pane glazing
ECM-5: Single pane low-e coated glazing
ECM-6: Double-pane glazing





Envelope Performance ANALYSIS TOOLS

There is no advantage for this precast structure to insulate above the top of the roof's insulation line; a brick wall or framed wall type would have risk due to the heat fin effect. However, our thermal envelope line is able to be continuous based on Quinn Evans design and does not have the same risk of heat loss.



Winter Analysis Results - Washington, DC
Indoor Temperature - 72 F
Outdoor Ashrae Design Temp - 14 F
Dew Point at 40 % RH (Int.) - 46.4 F
Dew Point at 35 % RH (Int.) - 42.8 F
Dew Point at 30 % RH (Int.) - 38.9 F

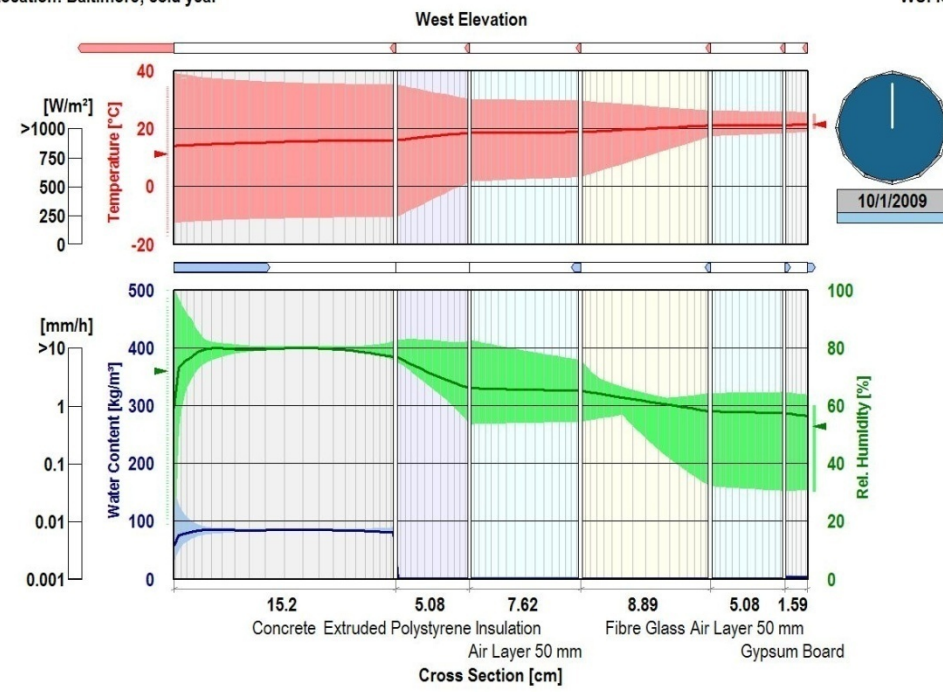
Expanding Foam (Spray Polyurethane, Low expansion rate) added near Window Head

No expanding foam at window head

“WUFI”

Location: Baltimore; cold year

WUFI®



“THERM”





Durability & Maintainability



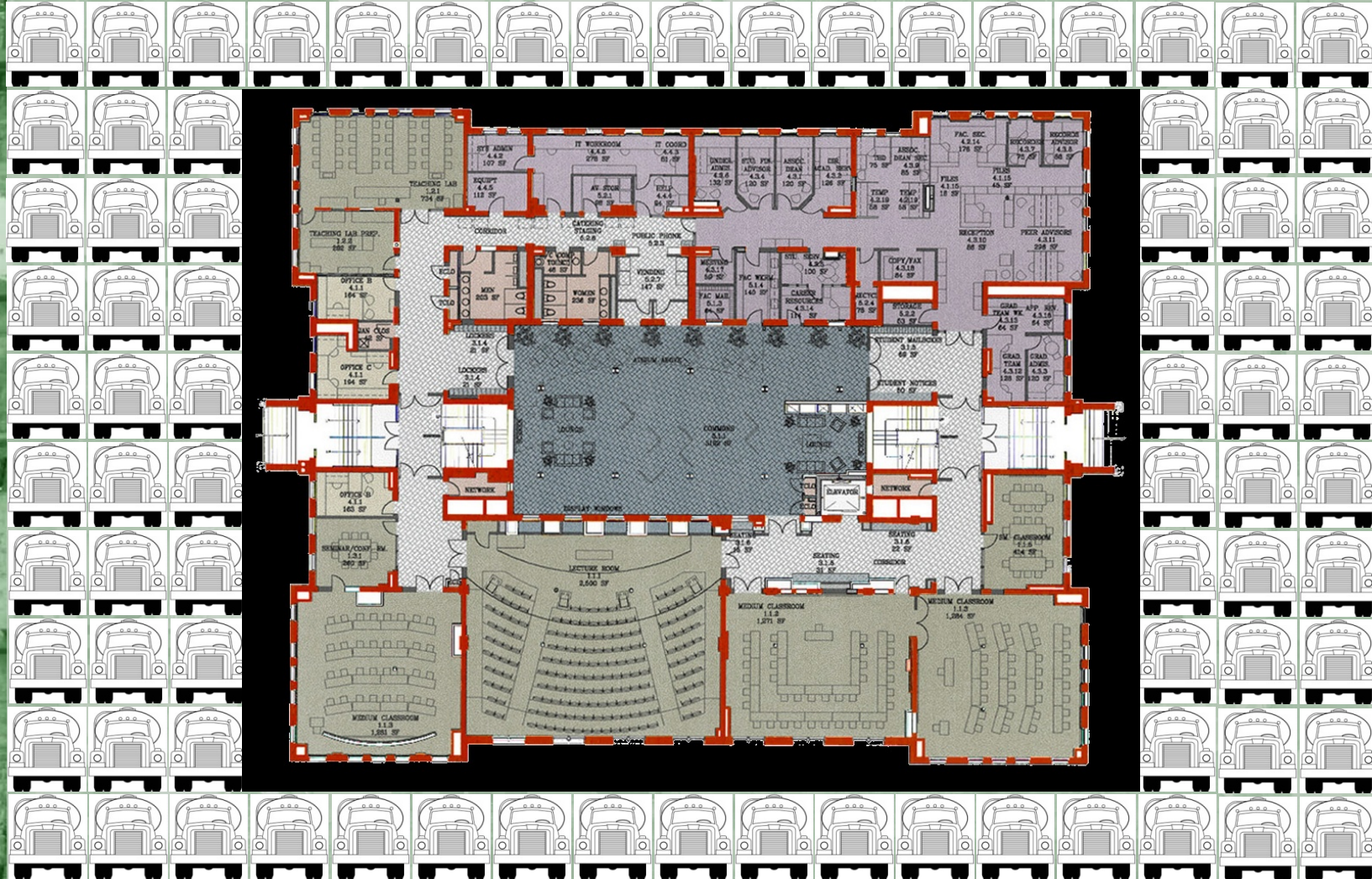


Adaptability



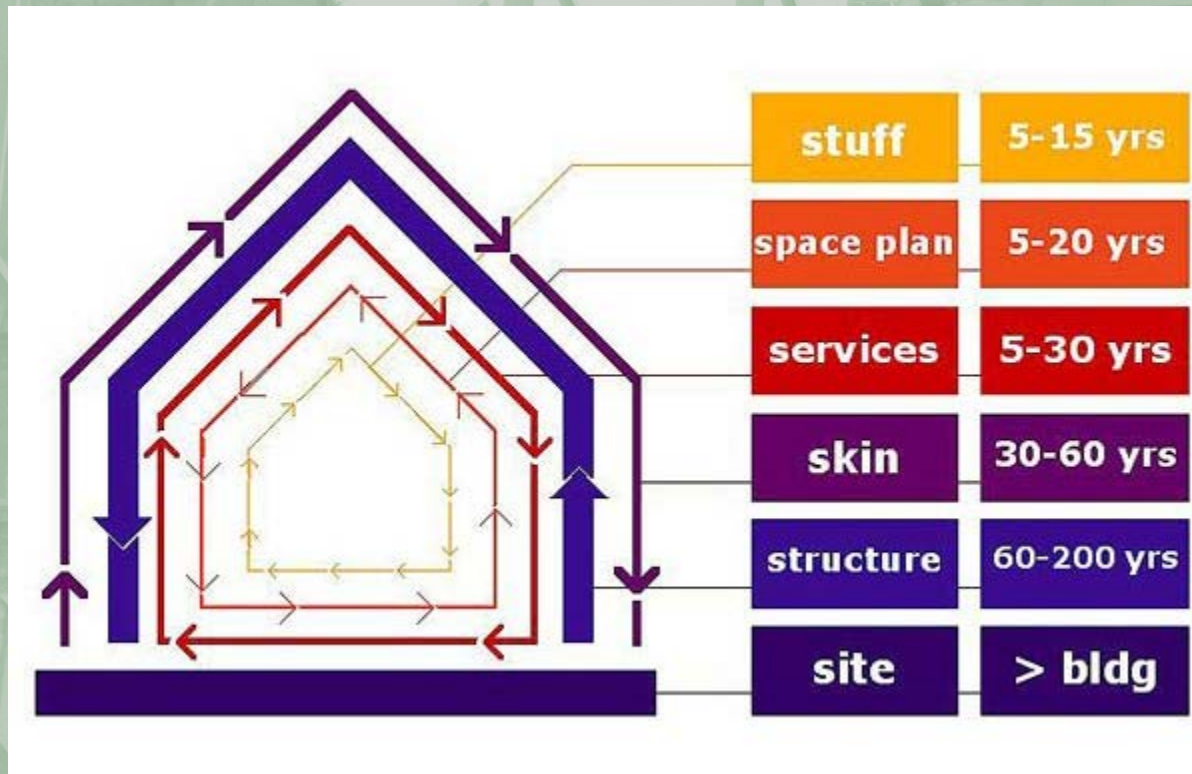


Embodied Energy





Building Life-Cycles

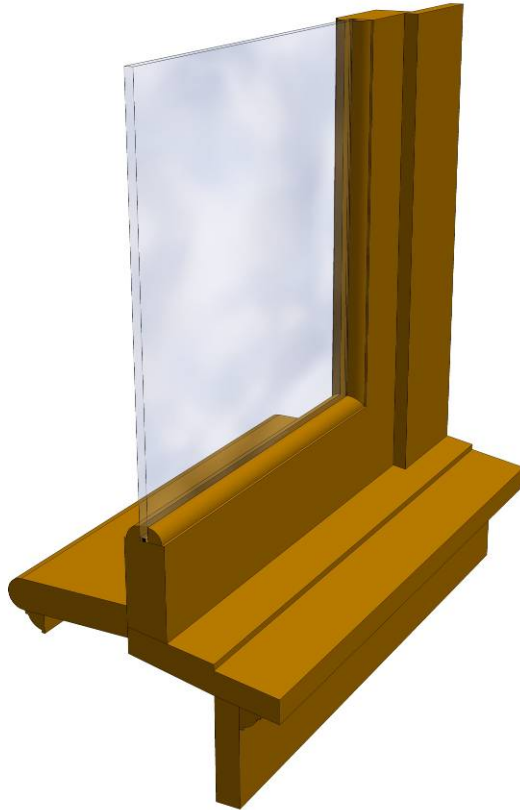


How Buildings Learn
What Happens After Their Built
Stewart Brand





Building Life-Cycles



Traditional Wood Window

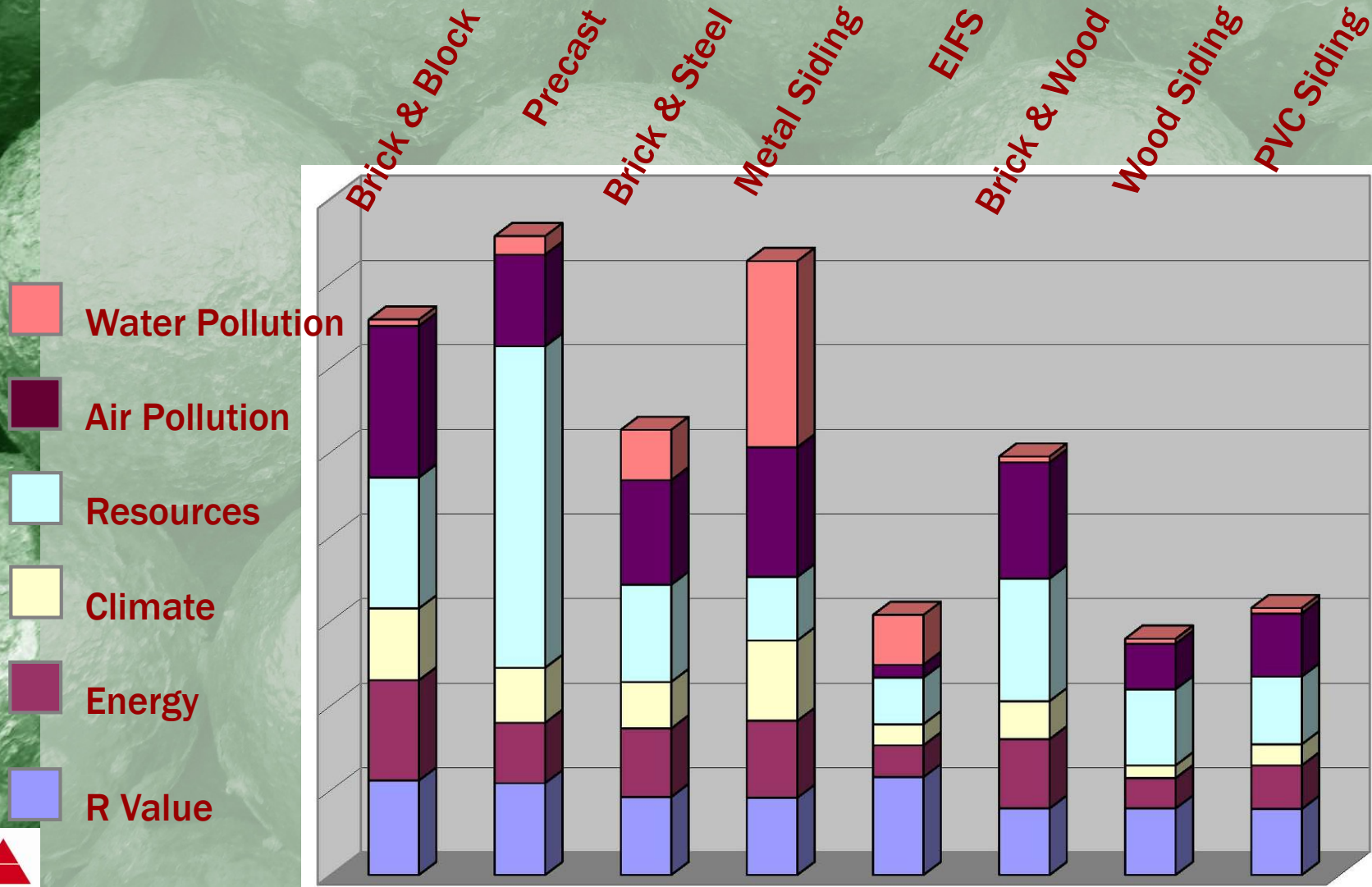


Modern Aluminum Window



Life-Cycle Analysis

Environmental Impacts of Wall Assemblies

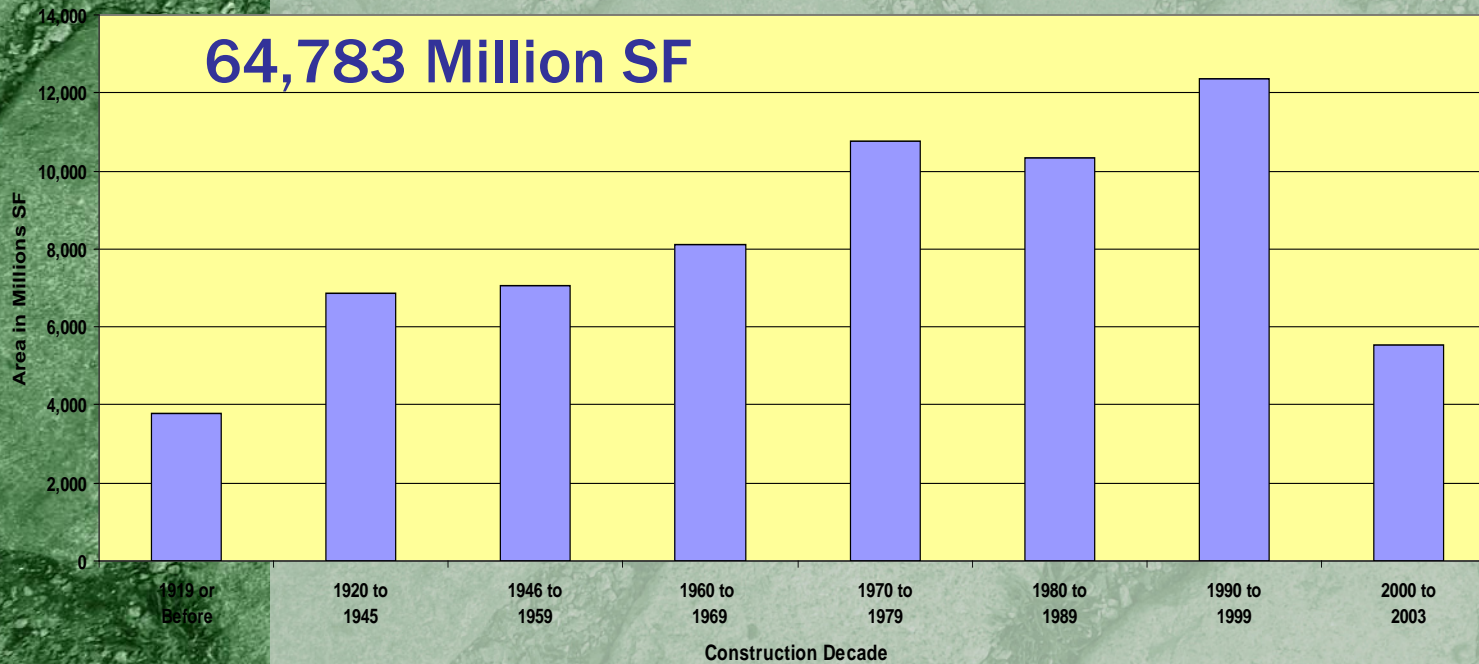




Building Stock Statistics

Existing Stock by Decade Constructed

AREA: Non-Residential Buildings



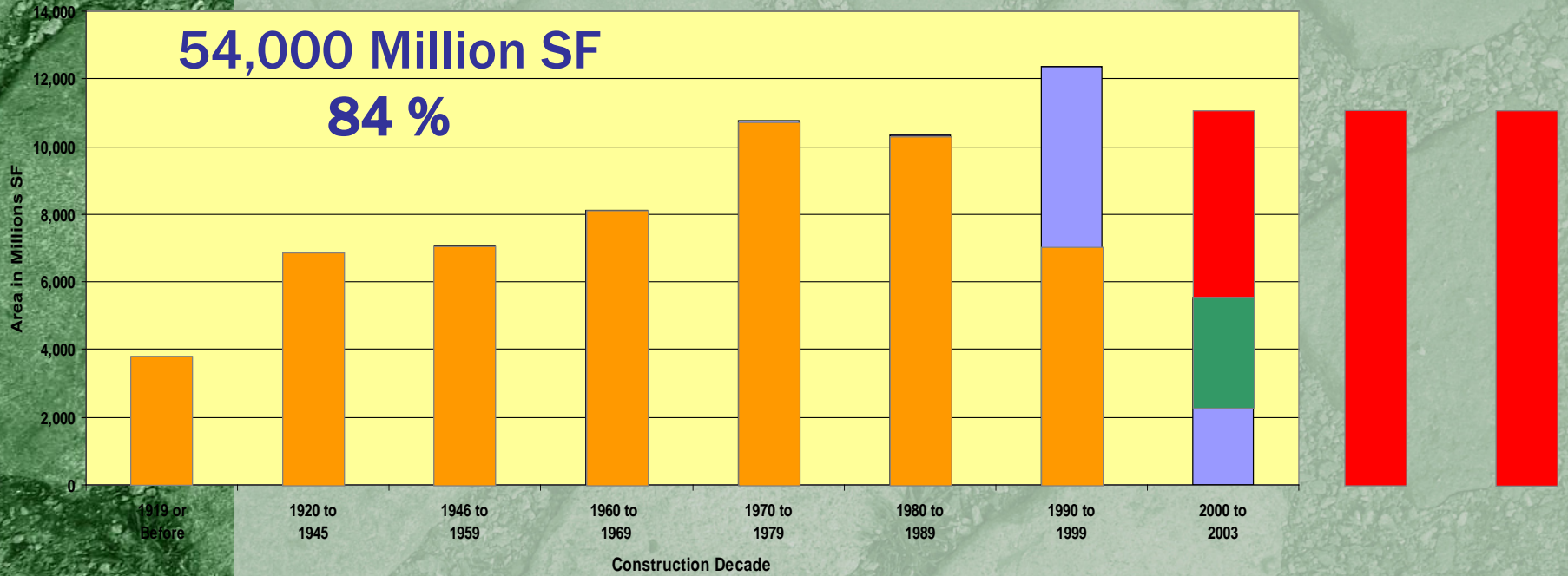
2003 Commercial Building Energy Consumption Survey
U.S. Department of Energy





Projected Growth to 2030 Renovation

AREA: Non-Residential Buildings



The Boom To Come – America Circa 2030
Architect Magazine, October 2006





Valuing Existing Buildings



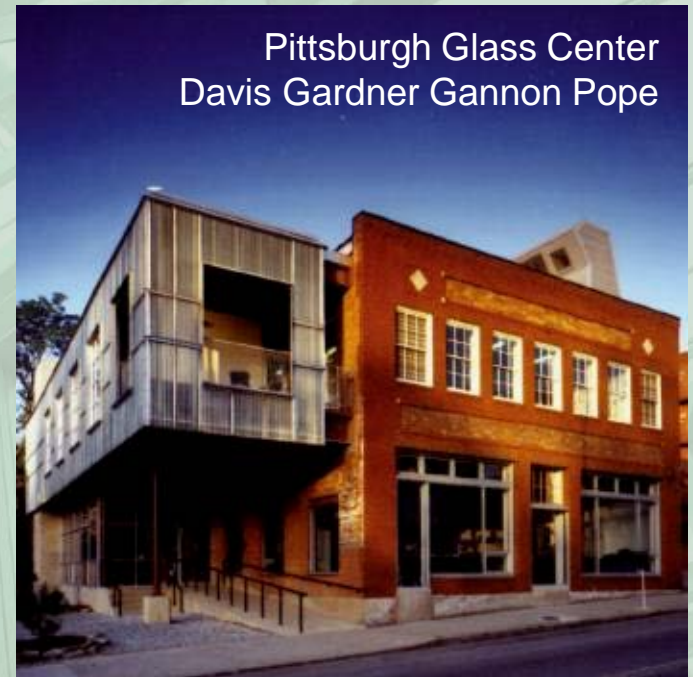


Green Rehabilitation

AIA Top 10 Green



Barn at Fallingwater
Bohlin Cywinski Jackson



Pittsburgh Glass Center
Davis Gardner Gannon Pope



California College of Arts & Crafts
Leddy Maytum Stacy



Denver Dry Building
DURA / AHDC



Challenges of the Modern-era



Washington DC from 6,000 ft.



Tysons Corner VA from 6,000 ft.

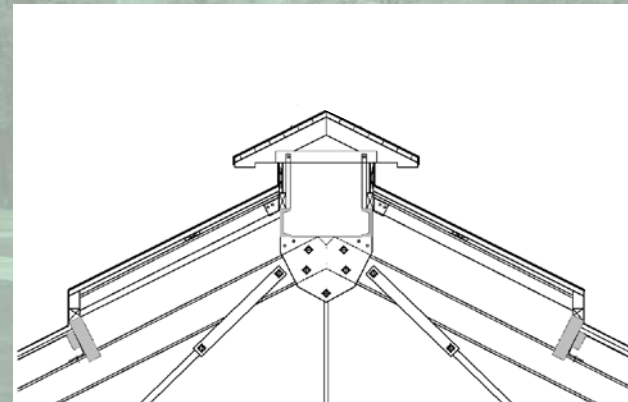
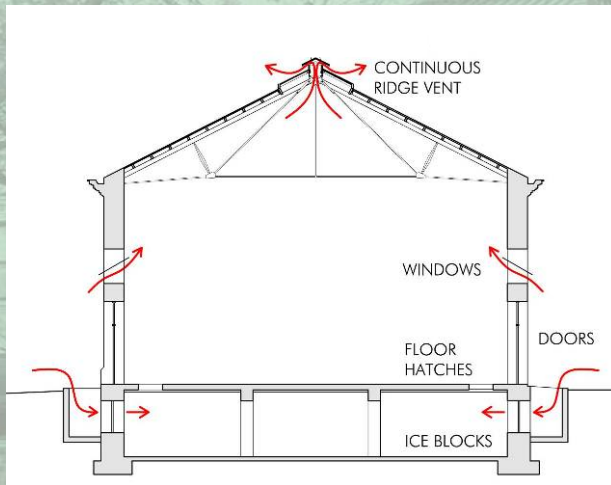




Sustainable Stewardship

EASTERN MARKET

Ventilation & Daylighting

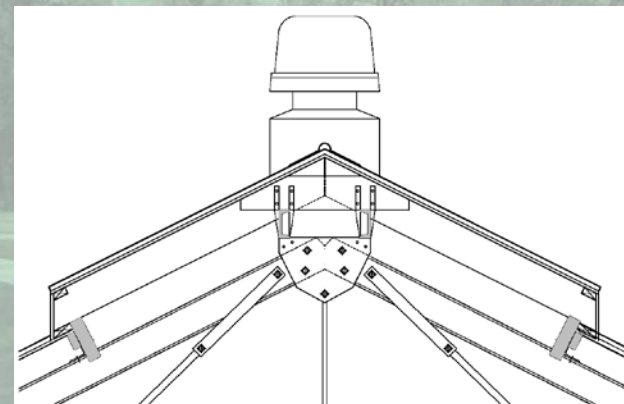
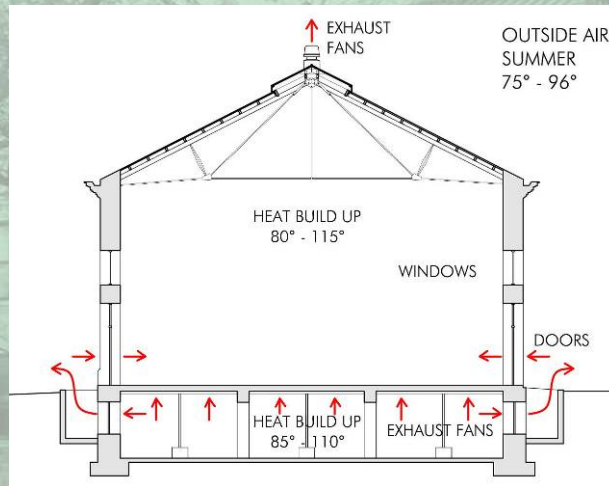




Sustainable Stewardship

EASTERN MARKET

1973 "Improvements"





Sustainable Stewardship

EASTERN MARKET

Roof with Restored Skylight

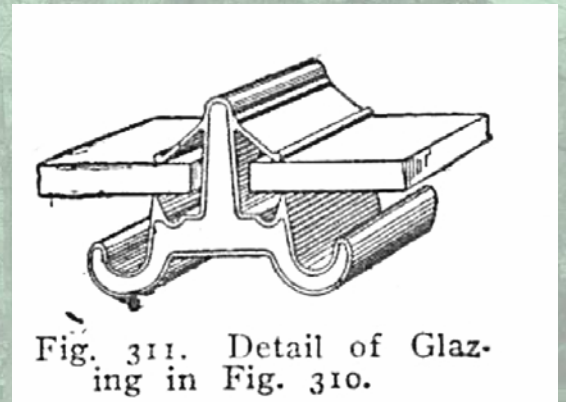




Sustainable Stewardship

EASTERN MARKET

Fire Damage



Skylight Detail





Pocantico Proclamation

The Climate Change Imperative

Human activity has increased and accelerated global warming putting the environment at risk. It is imperative that we immediately and significantly reduced greenhouse gas emissions to begin reversing extreme climate change patterns within a generation.

The Economic Imperative

Our current economy is based upon unsustainable consumption and an overreliance on finite resources. A new green economy must rest upon a conservation-based foundation to manage natural and cultural resources in a sustainable and economically beneficial manner.

The Equity Imperative

In recent years, economic inequalities between rich and poor have grown in the United States and abroad. The disproportionate levels of resource consumption and global pollution are unsustainable. Our consumption patterns must be altered to foster social equity, cultural diversity, and survival of all species.





Pocantico Proclamation

Foster a Culture of Reuse

Maximizing the life cycle of all resources through conservation is a fundamental condition of sustainability. The most sustainable building, community or landscape is often the one that already exists. Lessons learned from historic preservation are transferable to the entire existing built and landscaped environment.

Reinvest at a Community Scale

It is not sufficient to address sustainability on a piecemeal basis through individual building projects. We must consider the larger context of the built environment: our communities. Reinvestment in existing, more sustainable neighborhoods – especially our older and historic ones – saves resources and promotes socially, culturally, and economically rich communities.

Value Heritage

The design of older buildings, landscapes, and communities should inform future building practices. While new green building technology offers promise for reducing the environmental harms caused by new construction, traditional building practices offer a wealth of sustainable design solutions that are premised on sensitivity to local conditions, careful siting and planning, and long-term durability, all of which provide essential models for the future.





Pocantico Proclamation

Capitalize on the Potential of the Green Economy

Preservation economics provide a powerful model for shifting away from a consumption-based and energy-inefficient economy. Reinvestment in our existing built environment must become an indispensable part of America's new green economy. Per dollar spent rehabilitation activities create more new jobs than new construction.

Realign Historic Preservation Policies with Sustainability

Today's challenges require that historic preservation move beyond maintaining or recovering a frozen view of the past. Historic preservation must contribute to the transformation of communities and the establishment of a sustainable, equitable, and verdant world by re-evaluating historic preservation practices and policies, and making changes where appropriate.





Valuing Existing Buildings

