

# ASHRAE Will Give You The World

**NETWORK**

**Give Back To ASHRAE**

**GROW**

**LEARN**

**TEACH**

**SHARE**



This ASHRAE Distinguished Lecturer is brought to you by the Society Chapter  
Technology Transfer Committee

# ***Volunteer!***

***Become A Future Leader in ASHRAE - Write The Next Chapter In Your Career***

ASHRAE Members who attend their monthly chapter meeting become leaders and bring information and technology back to their job.

***You are needed for:***

**Membership Promotion  
Research Promotion  
Student Activities  
Chapter Technology Transfer  
Technical Committees**



**Find Your Place in ASHRAE! Visit [ashrae.org](http://ashrae.org).**



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Green Buildings - Help or Hype?

**Hank Jackson, PE**  
**ETech Solutions**  
**October 2010**





**ASHRAE**  
*Engineering  
for  
Sustainability*

# Copyright Materials

*This presentation is protected by US and International copyright laws. Reproduction, distribution, display and / or use of the presentation without written permission of the speaker is prohibited.*

*© ETech Solutions 2010*

*All rights reserved*



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Introductions

**Who am I?**

**Who are you?**

**What do you do?**

**What do you want to learn?**



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Objectives

- Stimulate / provoke a discussion about green building practice, current issues, and likely future developments
- Examine the status of green building certification, particularly LEED
- Discuss how ASHRAE standards and design tools can support sustainable design



**ASHRAE**  
Engineering  
for  
Sustainability

# Do You Remember ....?



**“IT”**



**Digital Audio  
Tape**

**NEW!!**

**COCA COLA**

- If so, you know about hype







**ASHRAE**  
Engineering  
for  
Sustainability

# A Commentary on Ourselves

*“Overshadowing everything else is the question of conservation of natural resources. For how much longer may we waste stored heat resources to save first-cost only of buildings? Our instinct is to live as to make living for our descendants a better proposition. How are we intelligently following the instinct? We refine the artificial heating plant, spend time and dollars and skill and genius in elaborating the heat transmitting appliances and the consuming devices with no more than cursory investigation of the type of construction of the building, and with no effort to influence it so as to reduce the heat losses. Many of us, I believe, stand convicted of crime in this regard against future generations.”*

S. R. Lewis, member ASHVE Tests Committee, 1914  
(ASHRAE Insights, January 2008)





**ASHRAE**  
*Engineering  
for  
Sustainability*

# Why Green Building?

- Public pressure related to climate change / global warming
- Declining water and energy resources
- Increase in waste disposal problems
- Life cycle cost of buildings



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Why Green Building?

In the United States, all building types account for:

- 39 % of total energy use (almost evenly split between residential and commercial)
- 12 % of the total water consumption (3/4 is residential usage)
- 68 % of total electricity consumption (kWh)
- 38 % of the carbon dioxide emissions

**Source: EPA, [www.epa.gov/greenbuilding/pubs/whybuild.htm](http://www.epa.gov/greenbuilding/pubs/whybuild.htm)**



**ASHRAE**  
*Engineering  
for  
Sustainability*

# What is Sustainable Design?

- Sustainability or “green building” has no single definition, but is a philosophy that exists on a continuum
- Terms include green building, green architecture, natural building, or environmental building
- Design and construction of buildings is only one part of sustainability or green building practice
- Land use, transportation, and life style choices are integral parts of sustainable design





**ASHRAE**  
*Engineering  
for  
Sustainability*

# Common Elements of Sustainability

- Building strategies that offer low environmental impact - air, soil, water, energy
- Design for maximum overall energy efficiency - materials production, construction, and operation
- Quality and durability of construction, resulting in lower life cycle impact
- Materials compatible with reuse, recycle, and renewable sources



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Group Discussion

- What factors drive the commercial / institutional building design and construction process?
- If construction budget is diverted to non-building systems “green features, how will that affect the short term and long term functionality of a building?
- In your experience, what is the “sustainability” associated with operation and maintenance of traditional / current building systems?
- What hurdles, if any, does green building present to HVAC-R professionals?



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Who Says It's Green? Leaders in Sustainability

- U.S. Environmental Protection Agency (EPA)
- U.S. Department of Energy (DOE)
- U.S. Green Building Council (USGBC)
- American Institute of Architects (AIA)
- ASHRAE
- Other players: Green Globes, BREEAM (UK), Green Building Challenge (20 nations, including Korea, Italy, and Brazil)
- AND ...potentially lots of special interest groups, non-profits, and local government agencies!





**ASHRAE**  
*Engineering  
for  
Sustainability*

# Misperceptions About Green Building

- It costs too much (ignoring certification fees)
- Quality and function are compromised
- It's too complicated
- It requires too many compromises in life style
- Reality: since green building isn't an all-or-nothing proposition, the builder / owner can choose how far to go and how much to spend, and anything is better than nothing



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Practical Considerations of Green Building

- Green building / sustainability is not a fad, it isn't going away
- Proposition for consideration: O&M has a greater long-term impact on sustainability than initial design and construction
- Some of the attraction surrounding green buildings is hype - there are many responsible designers and buildings who are already practicing "green building"
- Green buildings do not have to be certified - it's a marketing / identity issue
- In some cases, building codes have not caught up with green building practices, and conflicts will arise



**ASHRAE**  
Engineering  
for  
Sustainability

# Leadership in Energy and Environmental Design (LEED)

- Created by USGBC; assumed by some to be the *de facto* standard for evaluating and certifying green buildings
- Several different guidelines exist - new construction and major renovation, existing buildings, schools, residential, etc.
- Majority of certification points are available through energy efficiency and indoor environmental quality – ASHRAE strongholds
- LEED is not a building code, but a rating system





**ASHRAE**  
*Engineering  
for  
Sustainability*

# LEED – con'td

- It is important to remember that the point system is somewhat arbitrary - there is no rigorous analysis associated with some point values
- The profitability of green buildings is primarily enhanced by lower operating costs – systems O&M and energy usage
- Give credit to USGBC and LEED – they pushed us out of our comfort zone!



**ASHRAE**  
Engineering  
for  
Sustainability

# LEED is a Good Start, But ....

- Consensus does not mean true – remember “The Emperor’s New Clothes” by Hans Christian Anderson?
- Some of the provisions are not supported by substantial research consistent with ASHRAE standards
- The “round trip” impact of some measures have not been completely appreciated
- Regional variations in environmental factors must be considered
- LEED V3 *“will try to move to more scientifically rigorous performance-based credits with bioregional weighting of points”* (Nigel Howard, USGBC VP, ASHRAE Journal June 2005)



**ASHRAE**  
*Engineering  
for  
Sustainability*

# ASHRAE as THE Leader in Sustainability

- We have the research
- We have the consensus standards
- We are not alone in the world – China and other nations are rapidly consuming more resources – but we have the international stature to have an impact
- We are playing a major collaborative role in defining green buildings





**ASHRAE**  
Engineering  
for  
Sustainability

# ASHRAE and Sustainability

Building Sustainability Position Statement, 2002:  
*“ASHRAE will use its position as a recognized global leader ... to develop and disseminate technical information, standards, educational programs and research on issues of social importance to promote building sustainability”*



**ASHRAE**  
Engineering  
for  
Sustainability

# ASHRAE and Sustainability

- 1975 Standard 90
- 2003 GreenGuide
- 2005 Engineering for Sustainability
- 2006 Sustainability Roadmap
- 2007 Vision 2020 NZEB
- 2008 Standard 189

*“ASHRAE will lead the advancement of sustainable design and operations”* Board of Directors, March 2006



**ASHRAE**  
*Engineering  
for  
Sustainability*

# ASHRAE Criteria for Sustainability

- Minimal energy consumption through efficiency and resource use
- Minimal negative atmospheric emissions
- Minimal discharge of liquid and solid wastes
- Minimal site impact
- Maximum indoor air quality





**ASHRAE**  
*Engineering  
for  
Sustainability*

# New ASHRAE Standards

- 90.1-2010 – Energy Efficiency - Prescriptive and Performance
- 189.1 – High Performance Green Buildings
- 189.2P – High Performance Green Healthcare Facilities
- 191P – Efficient Water Use in Building, Site, and Mechanical Systems
- Vision 2020 – a rating system and branding for new and existing buildings, including design and operation



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Advanced Energy Design Guides

- For K-12 School Buildings
- For Retail Buildings
- For Small Warehouses
- For Small Office Buildings
- Use qualifies for LEED certification points





**ASHRAE**  
Engineering  
for  
Sustainability

# Green Help - Some Examples of Haste?

- California Green Building Action Plan - Governor's Executive Order S-20-04 *"All new State buildings and major renovations of 10,000 sq. ft. and over and subject to Title 24 will be designed, constructed and certified at LEED-NC Silver or higher, (or LEED-EB as applicable.)"*
- San Francisco "Green Points" rating system, patterned after LEED – mandatory, and applies to all new and renovation projects in SF
- Who pays for this?





**ASHRAE**  
Engineering  
for  
Sustainability

# Green Hype?

- [The growth in green building concepts] “... points to a need for a database of hard information on green building performance ... a growing need exists for hard data.” (David Grumman, editor of ASHRAE’s GreenGuide, quoted in ASHRAE Journal, Sept. 2004)
- “... savings in life cycle costs may be misleading ... Misunderstanding risks of sustainable design can result in a flow of red ink on the design firm’s balance sheet” (Frank Musica, risk management attorney with Victor O. Schinnerer & Co., quoted in ASHRAE Journal Dec. 2005)
- “... mandatory use of LEED places designers at great risk.” (Musica, ASHRAE Journal Letters, Feb. 2006)
- “Sunshine Energy participant sues FPL ... an audit by Florida’s Public Service Commission found that the bulk of the \$11.4 million raised between 2004 and 2007 [by Sunshine Energy payments] was spent on ‘highly excessive’ administrative and marketing costs.” (Palm Beach Post Sept. 4, 2008)



**ASHRAE**  
Engineering  
for  
Sustainability

# Green Hype? cont'd

- “Energy Star has lost some luster ... qualifying standards are lax ... tests are out of date ... companies test their own products” (Consumer Reports Oct. 2008)
- *“Why, I must ask, does being ‘green’ mean building with glass and steel and concrete and then adding wind turbines, solar panels, water heaters, sedum roofs, glass atria – all the paraphernalia of a new ‘green building industry’ – to offset buildings that are inefficient in the first place?”* (UK Prince Charles, The Press Association, Oct. 11, 2008)
- *“Many ‘green’ buildings don’t save energy ... they rely on gimmicks and fads rather than physics”* (Joseph W. Lstiburek, PhD., ASHRAE Fellow, quoted in Building Science Nov. 2008)
- “Pickens delays his wind farm plan ... cited the fall in natural gas prices ... as a deterrent.” (Green, Inc., New York Times, Nov. 12, 2008)



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Real Green Help

- MEP input during initial design phase to influence / evaluate building orientation, daylighting, shading
- Routine energy modeling as part of the design development process
- Improved OA systems – better damper systems, demand control ventilation
- Premium efficiency motors & VSD, high SEER / EER equipment
- Innovative HVAC – geothermal HP, displacement ventilation, others?
- Incorporate life cycle cost / value engineering in every project





**ASHRAE**  
*Engineering  
for  
Sustainability*

# Design Tools

- Computer building simulation and modeling – EnergyPlus, eQuest, proprietary software (Carrier, Trane)
- ASHRAE Standard 189
- ASHRAE Green Tips
- ASHRAE Advanced Energy Design Guides
- ASHRAE Building EQ™ evaluation tool for existing buildings





**ASHRAE**  
*Engineering  
for  
Sustainability*

# Sources for More Information

- [www.eere.energy.gov/buildings/building\\_america/about.html](http://www.eere.energy.gov/buildings/building_america/about.html)
- [www.epa.gov/greenbuilding/index.htm](http://www.epa.gov/greenbuilding/index.htm)
- [www.energystar.gov/](http://www.energystar.gov/)
- [www.usgbc.org](http://www.usgbc.org)



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Sources for More Information, cont'd

- [www.ashrae.org/doclib/200621485921\\_886.pdf](http://www.ashrae.org/doclib/200621485921_886.pdf)
- [http://www.engineeringforsustainability.org/docs/greentips\\_2006.pdf](http://www.engineeringforsustainability.org/docs/greentips_2006.pdf)
- [www.aia.org/susn\\_default](http://www.aia.org/susn_default)
- [www.greenglobes.com/](http://www.greenglobes.com/)



**ASHRAE**  
*Engineering  
for  
Sustainability*

# Questions?



**ASHRAE**  
Engineering  
for  
Sustainability

# Contact for More Information

*Further questions and information may be obtained by contacting the presenter:*

Hank Jackson, PE  
ETech Solutions  
P.O. Box 2355  
Weaverville, NC 28787  
(828) 691-0785  
HZJackson@juno.com  
www.ETechSolutions.biz





**ASHRAE**  
*Engineering  
for  
Sustainability*

**THANKS!**