The Roof – Unheralded Hero of the Zero Energy Building

Jared Blum, President
Polyisocyanurate Insulation Manufacturers Association
Spray Polyurethane Foam Alliance
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Trying to cut energy costs?

Your mom was right about wearing a hat to keep warm. But there's a better way to keep your energy costs from going through the roof. Polyiso Insulation. It's quite simply the most cost-effective choice for the R-value you need. And it offers the best energy efficiency on the market. That's why Polyiso is the most trusted and specified roof insulation. To learn more about why your building should be wearing Polyiso, please visit www.polyiso.org.
The Ethics of Energy Conservation

“Concern for man himself and his fate must always form the chief interest of all technical endeavors, in order that the creations of our mind shall be a blessing and not a curse to mankind. Never forget this in the midst of your diagrams and equations.”

Albert Einstein, 1931

“Insulation is sexy”

President Barack Obama, 2009
Commercial Energy Consumption

(index, 1980 = 1)

History

Projections

Electricity

Natural gas

Petroleum

Source: EIA 2005
Why Roofs Matter

• Not your grandparents’ roof anymore
• Roofs now responsible for more than keeping building comfortable and dry
• Local and global issues—Storm water runoff, Urban Heat Island, Peak Electricity Loading, Energy Security and Production, Climate Perturbations all impact roofs
High Performance Roofs

• High thermal
• Design and installation practices
• Cool roofs
• Photovoltaic
• Roof day lighting
• Commissioning and maintenance
1980’s, 1990’s ...

... “KEEP IT OFF THE ROOF!”
Keep it Off the Roof

• Keep the roof free of
  – Mechanical equipment
  – IT Cables
  – Satellite dishes
  – Antennae
  – Conduit
  – Gas pipes
  – Unnecessary foot traffic
  – PENETRATIONS!
Why?

• “First means of extending the roof’s potential service life”
The Exception to the Rule

• Roofs designed for foot traffic and use

Lakeshore Athletic Club, Chicago, IL
Proactive maintenance emphasized a methodology for obtaining long-term service life.
Roof’s Goals

• Keep interior dry
• Allow interior functions to occur
• Provide a level of thermal protection
• Provide a level of security
2013
New Influences Affecting Roof System Design

• Sustainability-USGBC-LEED/AIA have Zero Energy Building Goals
• Climate Concerns/International Energy costs and security concerns
• U.S. Energy Star Roof Program (Environmental Protection Agency)
• State and local Energy Codes
• Tax and rebate policies now include roofs
2013

• Now the roof must:
  – Keep interior dry
  – Provide level of thermal protection

• But also must be:
  – Work surface for other building components
  – Support for roof top energy production
  – Longevity for sustainable design-30-40 year roofs
2010

“Keep it off the roof”
Has now in effect become
“How can the roof surface be used most effectively for other non-roof related activities?”
2013

“The roof has become too valuable of an asset to be left underutilized”
2013 - Supporting Solar Arrays
2013 – Solar Energy Producing Surface

Source: Phil Dregger, Technical Roof Consultant
2010 – Support Wind Turbines
Photovoltaic System
Solar Panels
Vegetative Roof
Why is ASHRAE 90.1 Important?

• The National standard referenced in law

• The “Model” against which all state codes must be compared
  – DOE must certify state code compliance as being at least as efficient as 90.1

• The “Standard of Care” for design professionals
What about white roofs?

• Effective in reducing cooling load
• Studies show northern tier states where heating load greater not as effective/
• ASHRAE Regions 1-3 Required w/no insulation trade off-Cal, Chicago, etc.
• ASHRAE 189.1 Committee considers expansion to region 4
• Reflectivity can be affected by aging, discoloration, exposure to air pollution
Tight Roofs = Less Consumption

- Zero energy buildings require high envelope performance
- In U.S. 85% of Nation’s Commercial buildings 3 stories or less
- Median size is 28,000 square feet
- Majority are flat, low slope-perfect fit for high performance continuous insulation
- 50 billion square feet of existing commercial roofs provide huge opportunity
- In US High thermal roof retrofits can save $2 billion annually-retail, office and school buildings study (Center for Environmental Innovation in Roofing)
Age Distribution: Existing Commercial Floor Space

Most Buildings constructed before 1989: Likely under-insulated

Reroofing

- Re-roof focus is a great opportunity for being a valued partner with up-to-date information
- Many older codes weak on requiring energy efficient measures during re-roofing
- Exceeding the energy code where it does regulate reroofing
- Recent (January 2013) 90.1 approval clarifies need to meet energy code when reroof
- Primary way to move building stock to zero energy is to add insulation, roof, and solar
Experts on Zero Energy Agree

• “The goal of zero energy buildings can only be achieved with high performance roofs, limiting heat loss or gain through high levels of thermal insulation”

Thomas Hutchinson,
AIA, CSI, FRCI, RRC
Past President, Roof Consultants Institute
Experts Agree-the Roof is key

“After working on over 350 zero energy buildings I believe the key components to success are both the durability of the roofing system and its high level of thermal performance.”

Scott Sklar
Distributed Energy Consultant
Challenges to Adding Solar and Wind Power to Roofing System

- Matching Life Cycle of Roofing System to Wind or Solar Assembly (reroofing critical point)
- Achieving High Quality Field Installation with Minimum Risk
- Achieving Effective Inspection Maintenance and Repair Services over Service life of Integrated Roof Assembly
- Warranties?
Be not afraid of going slowly; be afraid only of standing still.

~ Chinese Proverb