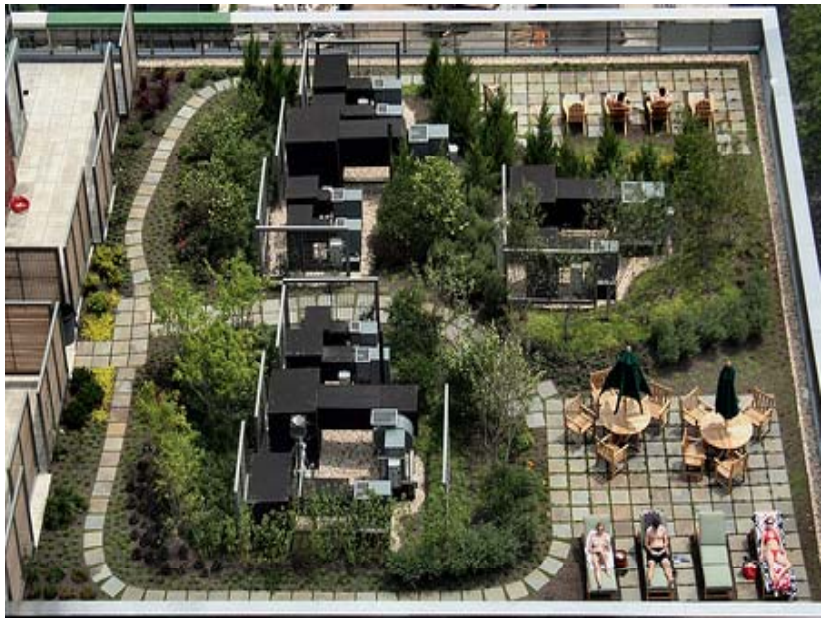
Sustainable Roof System Design Drivers and Considerations

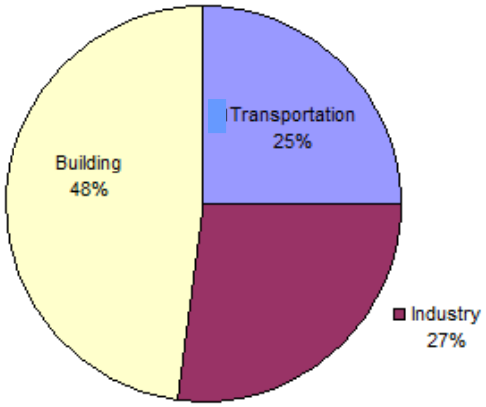


Environment friendly e-library

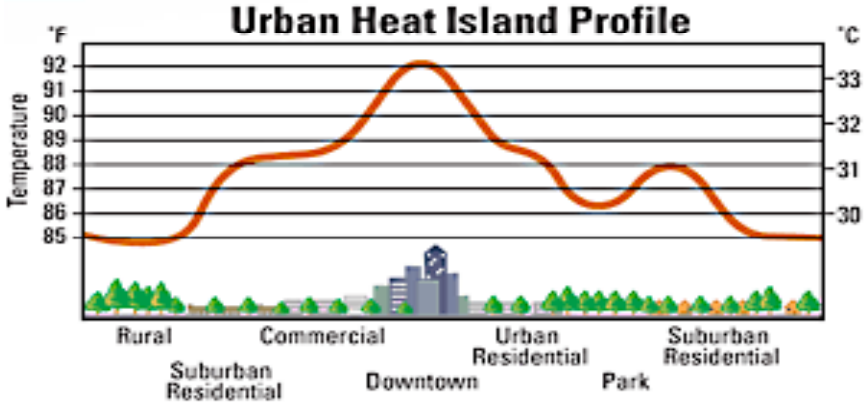
Sustainable Roof System Design Drivers

•Buildings use about 50% of all energy and consume about two thirds of all electricity.

•48.4% of the nation's electric power is coal driven.



•In some cities the "heat island" effect can increase the local temperature by as much as 12%.



Sustainable Roof System Design Drivers

•Electric prices have been averaging 5% per year increases since 2006.

•The EPA has issued a final finding, upheld in federal court, that greenhouse gases pose a danger to human health.

•**Clean Energy Act,** passed by Congress in 2009, establishes carbon reduction goals; and creates federal building codes based on LEED & ASHRAE 189.1

•**American Power Act,** currently under debate in the Senate, establishes carbon reduction goals; leaves methods of achievement to administrators.

Sustainable Roof System Design Drivers

•Clearly improvements in building efficiency could have a significant impact on energy usage and the environment.

•One of the most significant opportunities to increase building energy efficiency lies within the commercial roofing sector, where over 50 billion square feet of roofs are currently available for retrofit.

•If the insulation levels in commercial roofs are upgraded from their current R-value to the high performance levels embodied in High R Roofs, annual energy savings would exceed $2 billion

Sustainable Roof System Design Drivers

•Reflective roofs can directly save up to 40% in heating and cooling energy costs, as reported by the Oak Ridge National Laboratory

•Scientist Hashem Akbari states that converting 100sft of black roof to white roof offsets 1 ton of carbon dioxide

Sustainable Roof System Design Drivers

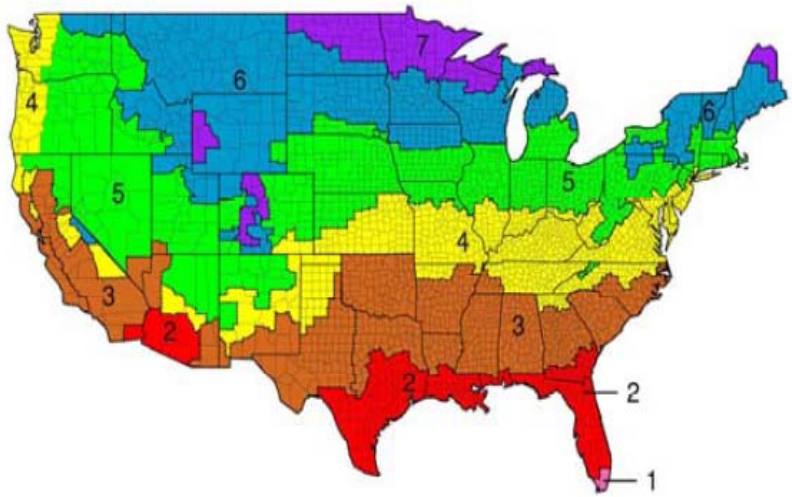
•The Center for Environmental Innovation in Roofing with input from representatives of important non-profit stakeholder groups representing roofing contractors, roof consultants, roofing material manufacturers and roofing research organizations has developed RoofPoint. The RoofPoint guideline is intended to serve as a cornerstone for the design and selection of environmentally innovative roofing systems. This presentation is not intended to represent the Roof Point guide.

If you are planning the purchase of a roof, consider these recommendations:

Sustainable Roof System Design Considerations

•Use recommended insulation R values to reduce environmental and economic impacts associated with excessive energy.

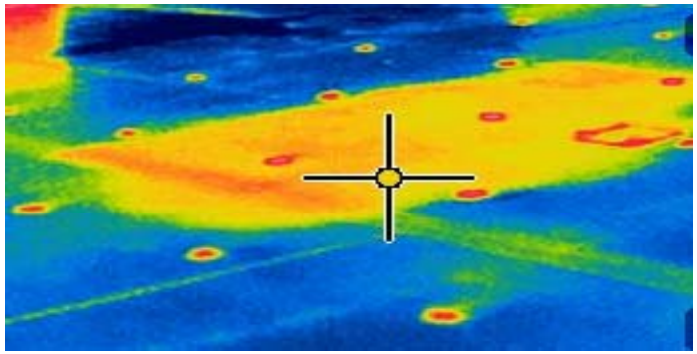
ASHRAE Climate Zone	Minimum Roof R-Value[1]
1	20
2-5	25
6	30
7-8	35



Sustainable Roof System Design Considerations

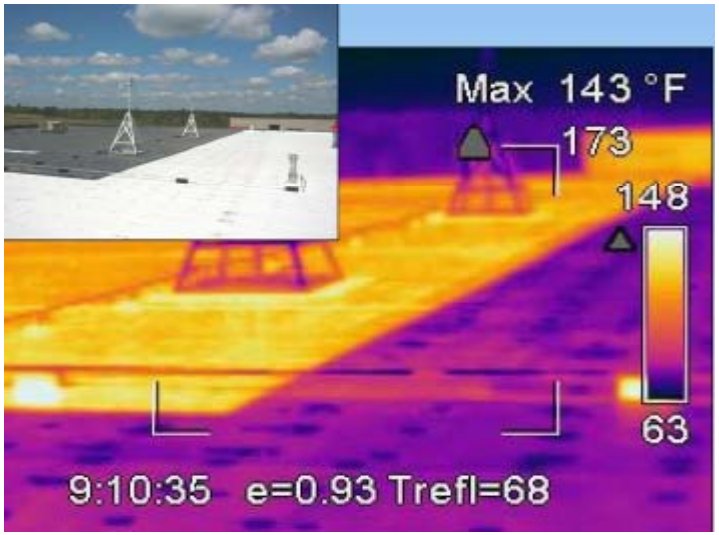
Insulation, to be effective, must be installed properly

- Always use at least two layers. The bottom layer can be mechanically attached while the top layer should be adhered with adhesive.
- Joints between layers should be staggered and taped.
- Using this installation method eliminates thermal bridging a condition where heat or cold escape the insulation. Thermal bridging can reduce the efficiency of insulation by up to 5%.
- A cover board should be installed over the thermal insulation to reduce traffic damage.



Sustainable Roof System Design Considerations

- White roofs generally have better performance in all climate zones as studies indicate that HVAC units operate more efficiently due to lower air temperatures.



- White roofs also reduce thermal shock a condition that occurs when cool rain hits a hot surface. Thermal shock can reduce the life span of the roof.

Sustainable Roof System Design Considerations

•Use an air / moisture barrier to maximize the thermal contribution of the roofing system by restricting air movement and related thermal transfer through the roofing system.

- Oak Ridge has an on-line moisture calculator:

http://www.ornl.gov/sci/roofs+walls/calculators/wetroof/

Sustainable Roof System Design Considerations

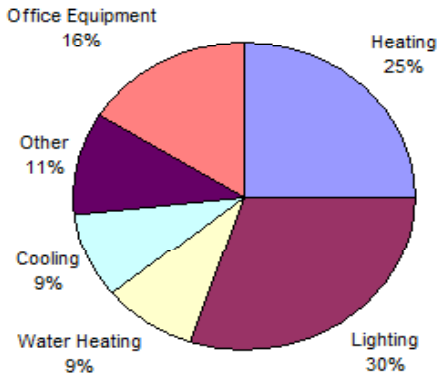
•Consider the use of rooftop renewable energy.

- •Photovoltaic
- •Solar thermal heating
- •Wind

Sustainable Roof System Design Considerations

•Consider the use of rooftop daylighting to supply a portion of building lighting requirements.

•Lighting accounts for 30% of building electric cost. Up to 70% of lighting cost can be saved with effective daylighting.



Sustainable Roof System Design Considerations

•The NRCA estimates that 5% of all landfill waste is roof related. Check with your contractor to determine if existing insulation can be re-used, if they recycle roof membrane or use products that have a recycled content.

Sustainable Roof System Design Considerations

•Consider roof water runoff. Green roofs can be a good choice if your community has high water runoff standards. Alternatively some roof system manufacturers use other methods to retain water runoff.

•Structural weight can be an issue.

Sustainable Roof System Design Considerations

•Minimize the potential for moisture intrusion into the roofing system and the underlying building by assuring storm water is effectively drained away from the roof surface.

- •Proper number and location of drains.
- •Tapered insulation system where required.

Sustainable Roof System Design Considerations

•Use walkway pads to minimize the potential for damage to the roofing system and the underlying building. Walkway pads assure that the roof surface is protected from service traffic and that service traffic is limited to designated areas of the roof.

Sustainable Roof System Design Considerations

•The roof system should be designed and installed to withstand wind speeds 10 mph higher than the 100 year average.

•Verify by manufacturer specification

Sustainable Roof System Design Considerations

•Minimize moisture during installation. All materials should be stored properly; tarps used to cover materials until installation.

Sustainable Roof System Design Considerations

•Implement a roof maintenance program to extend the life of the roof.

- •Life cycle management programs can extend the life of the roof well past the design life saving building owners substantial money while reducing consequential damage to the building.

Sustainable Roof System Design Considerations

•Quality control; document that the roofing project has been installed as part of an ongoing quality management program established by the roofing contractor, roof system manufacturer, roof consultant or similar roofing professional.

•Document and verify approval of all specification changes.

Sustainable Roof System Design Considerations

Warranty

•Contractors should always use manufacture approved products for a full system warranty.

•Manufacturers will perform inspections during the installation process if asked.

•If the project is large enough have the manufacture inspect completed sections.

•All manufacture warranties require an annual roof maintenance program.