

Flat roofs

Reflective roofs

Reflective roof tops save on air conditioning costs and prolong the life of a roof by reflecting the solar radiation and lowering the temperature of the roofing materials. During a typical winter, flat roofs will be white due to snow making a dark roof not as much of an asset for heating months as a light roof will be for summer cooling in Minnesota's climate. The link below is connected to a calculator which can estimate the savings of adding insulation as well as installing a reflective roof

http://www.energystar.gov/index.cfm?c=roof_prods.pr_roof_emissivity

http://www.energystar.gov/index.cfm?fuseaction=find_a_product.showProductGroup&pgw_code=RO

Additional insulation

Built up roofs on older buildings typically had very little insulation on the roof and the roof structure may not have been exposed to heavy snow loads due to heat loss causing snow to melt. It is advisable to have an engineering study done to evaluate the structures ability to handle the additional load of both the added insulation and a potentially larger snow load before installing additional insulation.

Roofs with an attic crawl space are less complicated to add insulation. Insulation can be installed in the attic crawl space similarly to how it is done in a residential property by using batts, sprayed or blown-in insulation. It's always best to complete all conservation work before updating energy (heating, water heating) equipment so the equipment is properly sized to operate at maximum efficiency. See 'wall insulation' below for more on types of insulation.

Green garden roofs

Roof top rainfall can be absorbed by having a roof top garden. Any actions you make to lower storm water run-off on your property may help you receive a storm water run-off discount on your city utility bill. Go to <http://www.ci.minneapolis.mn.us/stormwater/fee/index.asp> for more information on fee reductions.

Roof top greenery can also help lower air conditioning bills in the summer. The plants absorb sunlight and the transpiration process of plants (a part of photosynthesis) lowers ambient air temperatures in the immediate vicinity by 2 to 3 degrees. Hence, turning roofs into green space also helps diminish the heat island effect found in cities. A green roof also protects the roofing by lowering the roof temperature. A water proof membrane to protect the roof and a light weight growing medium are important parts of a green roof. Before installing a roof-top garden you may need to add structural support to carry the additional weight. Consult an architect or engineer to determine your building's weight bearing capacity.

http://www.mngreenroofs.org/?page_id=18

Windows

Window shading treatment

While we value windows for day lighting and summer ventilation, preventing summer heat gain is important in lowering air conditioning costs. Screens, films, shades, blinds, awnings and trees all help block out unwanted heat gain from the sun. It is good practice in new construction to build a ledge or overhang over each window to let in sun in the winter and to shade the window in the summer while still allowing natural light without the heat gain. In existing buildings, that approach is not practical unless you are doing substantial exterior remodeling. An alternate could be retractable or permanent awnings designed to block summer sun while allowing it in during the winter. If using shades or blinds inside the window to block sunlight, it is helpful if the side facing the sun is reflective. If there is internal heat gain (e.g.: from machinery) you may want to block external heat gain all year long.

For a high tech approach you can use automated controls.

<http://content.usatoday.com/communities/greenhouse/post/2011/02/nasa-research-center-goes-ultra-green/1>

For a low tech approach you may want to use plants.

http://en.wikipedia.org/wiki/Green_wall

Replacement windows

Window replacement is an expensive option and generally has a long payback period to recoup your investment based solely on energy savings. But you may have multiple reasons that make window replacement a sensible option for your building. The lower the 'u value' of a window, the better insulator it is, giving you lower heating and air conditioning costs. Low E coatings or films applied to windows or internal films within glass cavities increase the thermal performance of windows while blocking harmful infrared and ultraviolet rays and allowing light to pass through.

<http://www.facilitiesnet.com/windowsexteriorwalls/article/Weighing-the-Costs-and-Benefits-of-Window-Replacement--2636>

Walls

Wall insulation

Poorly insulated buildings waste energy while well insulated buildings save energy and keep inhabitants comfortable. The many types of insulation perform differently and some are more appropriate for existing buildings than others. Where and how insulation is added will determine the options available as well as desired characteristics. Some of the questions to consider;

- the desired thermal performance or R value
- is an integral vapor barrier required
- is the material sustainable or made from recycled material
- is it made locally from local materials are by-products during manufacture and after installation such as off-gassing detrimental
- is it flammable
- does it handle humidity well
- will this be applied on the exterior or interior of walls
- how will it fit the original design of the wall

There are several types of insulation to choose from;

- fiberglass and mineral wool made from glass or slag are available in a loose blow-in form or batts or semi-rigid boards with or without vapor barriers
- recycled cotton from fabric or cellulose from newspaper treated with boric acid as a flame retardant foams of different materials come in either sprayed on or rigid board installation
- forms and in either closed cell or open cell composition. These often have fire code requirements involving mandatory fire-rated coverings.

In general it is good to remember that the more insulation the better. For more on insulation types and R values:

[http://en.wikipedia.org/wiki/R-value_\(insulation\)](http://en.wikipedia.org/wiki/R-value_(insulation))

Wall shading

Vertical green walls could be vines growing from the ground on their own or other live plants installed on a wall system. They can be used to add shading and help lower cooling costs. They also can clean the air as well as help to purify storm water runoff. They are a good option where you don't have space for adding trees.



http://en.wikipedia.org/wiki/Green_wall

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Questions? Contact Vicki.Carey@ci.Minneapolis.mn.us or visit the website at <http://www.ci.minneapolis.mn.us/ccs/greenbuilding.asp>

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