GREEN STAR TIP SHEET #6

Energy Efficiency -- Building Envelope

This tip sheet corresponds with Green Star Award Standard # 4 – Reduce Energy and Water Consumption. Another useful tool is Chapter 6 in "Becoming a Green Star: A Waste Prevention Guide for Anchorage Businesses."

You can find the guide online in pdf and html format at www.greenstarinc.org/guideindex.php or request a hard copy from Green Star.

What Is the Building Envelope?

The building envelope includes everything that separates the interior of a building from the outdoor environment, including the foundation, basement slab, walls, ceiling, roof, windows, and insulation. In a climate like Alaska's, it is important that all of these systems work well together to keep out cold and moisture.

Windows

Windows are a major factor in whether your business is wasting energy or not. About a decade ago, the energy it took to offset the heat lost and gained through windows cost this country $20 billion -- that's 25% of all the energy used to heat or cool homes and businesses in the U.S.

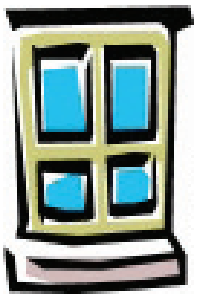
The big issues with windows are heat loss and solar gain. Yes, even in Alaska, solar gain can be a problem if you have a large bank of south-facing windows.

Energy efficiency ratings for windows are represented by an R value rating. R value measures the window's resistance to heat flow. The higher the R value, the greater the insulating ability.

A high-performance northern climate window should have a minumum value of R4 for a working window (one that opens) and R5 for a picture window.

Here are four good ways to ensure you are minimizing heat loss through your windows.

1) Increase air space between panes of glass to at least 1/2 inch. The R value increases by R1 for every 1/2 inch of air space.



2) Increase the number of panes to increase still air space. Increase double and triple pane windows to quadruple glazings. If you still have single pane windows, you are probably paying the price with high heating bills, uncomfortable work spaces, condensation, fogging, and ice buildup.

3) Reflect radiant heat back into the building using low-emissivity (low-e) coatings. Low-e coatings are heat reflective sheets placed on one pane of a multiple paned window. A low-e coating can raise the R value of a window as if you added another pane. The coating reflects 40 - 70% of heat that is normally transmitted through a clear-glass paned window. Low-e coatings can increase efficiency by more than 40% for an additional capital cost of only 10-15%, making them a smart purchase.

4) Use windows with gas fill between panes of glass. Gases are better insulators than plain air.

R Values of Gases in Windows

Air space	AIR	ARGON	KRYPTON
1/4"	2.21	2.50	3.68
1/2"	2.90	3.59	3.72
3/4"	2.90	3.40	3.61
1"	2.90	3.31	3.42

Don't forget that the window frame also is important. Window frames are responsible for an additional 10% loss of heated or cooled air. Non-metal frames (e.g., wood, fiberglass, or vinyl) are best to reduce heat conduction. Having air spaces built in also reduces the transfer of heat.

If you can't change your windows, installing blinds, curtains, or other window coverings can improve window efficiency by about 10%.

Insulation - Walls, Ceilings & Roofs

Insulation also uses R value as a measurement of effectiveness. The state standard insulation value for walls is R26. The insulation value for an energy efficient, northern climate attic is R48 to R60. This equates to about 12 to 18 inches of blown or batt insulation.

There's more out there than just the pink fiberglass insulation. Different types are suited for different areas of a building and various applications.

Fiberglass rolls are good for roof, attic, and wall spaces between framing. Loose cellulose insulation is available locally, made from recovered newspaper. It has the highest R-value per inch of all loose-fill materials. And it can be blown through smaller holes than fiberglass. It is more impervious to air infiltration than fiberglass or rock wool. The material available in Anchorage is treated with fire retardant chemicals. The University of Alaska Fairbanks Cooperative Extension offers a fact sheet comparing all types of insulation.

Insulation can only work if kept dry. Be sure the vapor barrier is on the "warm side," which, in Alaska, is on the inside. If the insulation or vapor barrier has been disturbed by pipes, wires, or other interruptions, its effectiveness is compromised. Be sure there are no gaps where air or moisture can penetrate.

Foundations & Basement Slabs

Foundations in Alaska must take into account earthquakes, freeze/thaw and, in many areas, permafrost. Anyone considering building in Alaska should consult professionals who are experienced with Arctic building problems.

Where To Turn

Consider contacting an architectural or engineering firm that has LEED-accredited professionals on staff. LEED (Leadership in Energy and Environemental Design) is a program of the U.S. Green Building Council. The LEED Green Building Rating System is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings.

If You Don't Own Your Building

If you can't make big changes, there are small but substantial improvements you can make.

- Simply shutting doors and windows when it's cold can greatly improve the efficiency of your workplace.
- Check for air leaks and gaps, and add caulking and weather stripping around doors, windows, outlets, vents, and other gaps that break the barrier between inside and outside.
- Consider installing vinyl curtains or strips in doorways that are open a lot. Vinyl strips or roll-up curtains can reduce energy losses by up to 75%. On cold winter days, vinyl strip doors can really make a big different in reducing heat loss and increasing employee comfort. They can pay for themselves in just one heating season on a loading dock.
- Installing blinds or curtains can keep out cold air if windows are not ideal, and can block heat absorption if a window is experiencing direct sunlight.

Resources

Alaska Building Science Network
www.absn.com

Alaska Building Science News
University of Alaska Fairbanks Cooperative Extension
www.uaf.edu/ces/faculty/seifert/absntoc.html

Alaska Housing Finance Corporation
www.ahfc.state.ak.us/energy/energy.cfm

Cold Climate Housing Research Center
http://www.cchrc.org

Efficient Windows Collaborative
www.efficientwindows.org

ENERGY STAR
www.energystar.gov

U.S. Green Building Council Cascadia Chapter
http://cascadiagbc.org

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