

15 Questions You Can Ask to Improve Building Efficiency

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1) Are you going to incorporate daylighting into the building design?

Artificial lighting accounts for as much as 40% to 50% of the energy consumption in many commercial and institutional buildings, and 10% to 20% in industrial buildings. Reducing lighting loads can save energy and improve worker productivity and comfort. Daylighting is one alternative that can reduce lighting loads. Designing for daylighting includes clerestory windows, skylights, and interior space planning that puts activity areas close to windows at the appropriate time of day for maximum light.

For more information, see":

- "Daylighting for commercial, Institutional, and Industrial Buildings": www.eere.energy.gov/consumerinfo/factsheets/cb4.html

- "Passive Solar Heating, Cooling, and Daylighting":

http://www.eere.energy.gov/RE/solar_passive.html.

- Solar tube tubular skylights can be an excellent source of natural lighting. Some Frequently Asked Questions about this technology are answered at <http://www.skylightguys.com/faq>

- Interior louvers, exterior glass curtain-walls, and atrium skylights can direct light where you want it and control the indoor environment so that occupants enjoy the benefits of natural light. See www.es-so.com.

2) Have you planned to assure the building has energy efficient lighting?

There are energy efficient lighting options

for commercial and residential buildings including T8 lights and compact fluorescents.

T8 Lights produce an efficacy of up to 100 lumens per watt, the highest efficacy of any fluorescent light and use less of the toxic materials found in larger fluorescent lights. Note: T8 lights require a T8 compatible ballast to operate and will not operate on ballasts rated for T12 lights.

Compact Fluorescent Lights (CFLs) are designed to replace many frequently used incandescent bulbs. They can be used to reduce energy use and power demand by over 70 percent. The lights have a lifetime of at least 10,000 hours and the light produced is similar in appearance to that of an incandescent light. Note: frequent cycles of short operation hours significantly reduce light life.

For more information see:

- "Frequently Asked Questions about Lighting Commercial Facilities": <http://www.energy.state.or.us/bus/light/FAQ.htm>.

- http://www.eere.energy.gov/EE/buildings_lighting.html also provides links to building lighting information.

3) Are you planning to use Low-E windows or planning to have windows with a U factor of 0.35 or less?

Low-emittance (Low-E) coating consists of microscopically thin, virtually invisible, metal or metallic oxide layers deposited on a window or skylight glazing surface



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primarily to reduce the U-factor by suppressing radiative heat flow. A typical type of low-E coating is transparent to the solar spectrum (visible light and short-wave infrared radiation) and reflective of long-wave infrared radiation.

U-factor (U-value) is a measure of the rate of non-solar heat loss or gain through a material or assembly - the lower the U-factor, the greater a window's resistance to heat flow and the better its insulating value. It is expressed in units of Btu/hr-sq ft-°F (W/sq m-°C). Values are normally given for NFRC/ASHRAE winter conditions of 0° F (18° C) outdoor temperature, 70° F (21° C) indoor temperature, 15 mph wind, and no solar load. The U-factor may be expressed for the glass alone or the entire window, which includes the effect of the frame and the spacer materials.

For more information see:

- <http://www.efficientwindows.org/index.cfm> or http://www.energystar.gov/index.cfm?c=windows_doors.pr_windows or http://www.state.mn.us/mn/external/Docs/Windows__Doors_110802042904_Window&Doors05-03.pdf

- Minimum requirements for Energy Star windows in the Midwest can be found at: <http://www.efficientwindows.org/energystar.cfm>.

- If possible, use triple-pane high efficiency windows with condensation resistance.

- Fixed windows are most effective at maintaining energy efficiency. The alternate is casement windows. Least efficient are sliders and double-hung windows.

4) Have you planned to use passive solar heating, solar electric, solar hot water, or solar thermal technology in your building?

Solar energy offers great potential. According to the International Window Film Association, Solar control glass with transparent heat-reflective coatings can insulate against heat loss in winter and block unwanted solar heat year round. The siting and orientation of your building can affect heat loss or gain, well-planned landscaping can provide shade protection, and active solar systems can provide both heat and electricity.

For more information see:

- Center for Sustainable Building Research: <http://www.csbr.umn.edu/>

- Solar control glass with transparent heat-reflective coatings: Minnesota Energy Information Center:

www.commerce.state.mn.us;

- Solar Minnesota website:

www.solarminnesota.org

- International Window Film Association: www.iwfa.com.

- Solar wall solar air heating systems, check out www.solarwall.com.

- Midwest Renewable Energy Association, www.the-mrea.com,

5) Have you integrated occupancy sensors into your design to minimize energy use in unoccupied rooms?

Occupancy sensors can ensure that the energy usage declines when no one is in a room or building. By installing the sensors in the proper locations, you can ensure the lights automatically turn off when no one is present and back on when they return.

For more information see:

- <http://www.greenseal.org/recommendations/CGR=Sensors.pdf>

6) What heating source are you planning to use? Have you thought about ground source heat pumps? Have you planned for dual-fuel heat?

Non-electric heat is typically more efficient than electric heat, but ground source heat pumps, which do use electricity, are more efficient than gas.

Dual fuel systems may allow residential and commercial customers to benefit from cost reductions offered by utilities when the building has an alternate heat source that allows the utility to turn off the electric or gas furnace during peak periods.

For more information see:

- www.ghpc.org, http://www.nmnrenewables.org/geothermal/heat_pumps.shtml, or www.enlinkgeoenergy.com for Ground Source Heat Pumps.

- www.epa.gov/Region10/offices/air/catalyti.html for the US EPA wood

heater program. A wood or corn stove can provide back-up heat during emergencies or times that your utility turns off your gas or electric furnace during peak periods. This use of biomass helps save energy by reducing consumption of gas and electricity.

7) Have you thought about using in-floor heating (also referred to as Wirsbo for one of the popular manufacturers)?

This type of heating warms objects as opposed to raising the temperature of the air.

- For descriptions, pictures, general design, installation, and system component information see: "Hydronic Radiant Floor Heating": <http://www.cmhc-schl.gc.ca/en/burema/gesein/abhose/ce04.cfm>.

8) Are you planning to site the facility to take advantage of energy efficiencies from landscaping and control erosion?

Buildings can be oriented on a site so that they take advantage of the sun's heat and light. The building should be sited on an east-west axis within 30 degrees of south for best use of the sun in Minnesota. For landscaping, one should use plants to shade east and west facing windows, NEVER south facing windows. Trees will provide summer shade and a winter wind-break.

Other questions to consider include:

- Have you thought of adding porches, trellises, and roof overhangs to minimize solar gain in summer?
- Have you developed a plan to control erosion before, during and after construction? Will your plan protect hillsides and prevent air pollution from dust?
- Will your landscaping use native plantings that do not require irrigation after establishment, or will use captured rainwater for irrigation?

For more information see:

- The Minnesota Department of

Commerce Website:

http://www.state.mn.us/mn/externalDocs/Energy_Saving_Landscapes_110802040030_Landscaping05-03.pdf.

9) Have you planned for water recycling in the building, a green roof on the building, and pervious paving outside the building?

If your building will have a large roof area, you may want to consider capturing rain water, storing it in a cistern, and using it to flush toilets and water plants. A green roof can also prevent stormwater runoff from roof areas. Reservoirs and ponds can be incorporated in a water recycling system and water used to wash clothes and dishes can even be captured, filtered, and reused (but not for drinking unless you incorporate special measures).

When evaluating storm water drainage from parking lots, keep in mind that pervious paving allows rainwater to soak into the ground rather than run off it.

Form more information see:

- www.co.st-louis.mn.us, which describes how the City of Duluth used water conservation methods.
- www.greenroofs.com.
- www.greenbuilder.com
- www.bfrl.nist.gov/oe/software/bee_s/products.html
- www.clean-water.uwex.edu/pubs.raingarden

10) Have you specified that energy efficient appliances be installed?

- See www.energystar.gov.

11) Have you planned to use sustainable building materials and a percentage of recycled materials in the interior and exterior of the building? Will you recycle the construction and demolition debris?

Recycled paint, ceiling tiles, carpet, flooring, millwork, beams, and other components can be incorporated into a building to reduce the amount of new materials needed. When designing

buildings, select durable materials when feasible such as stone for floor, steel for roof. Try to avoid materials with CFCs, PVC and high VOCs.

Form more information see:

- <http://www.forestrycenter.org> and <http://www.fscus.org>.
- www.freecycle.org
- www.envirolink.org
- www.nrc-recycle.org

12) Are you planning on using local, sustainably-harvested wood products?

- Minnesota's own Community Forestry Resource Center can be found at <http://www.forestrycenter.org/>, and the Forestry Stewardship Council is at <http://www.fscus.org/>

13) Have you planned for plenty of fresh air to flow throughout the building, and reduce air infiltration by sealing plumbing, electrical, window, and door openings with caulk and weatherstripping materials?

Reduced air infiltration combined with proper ventilation may not only reduce your energy bills but also improve the quality of your indoor air. Outdoor air coming in makes it difficult to maintain comfort and energy efficiency. In addition, air leakage accounts for 25-40% of the energy used for heating and cooling a typical home. A key building improvement is sealing all attic bypass leaks which can reduce heat loss all over the building.

For more information see:

- The Department of Energy's Energy Efficiency & Renewable Energy site: http://www.eere.energy.gov/EE/buildings_envelope.html.
- "Considerations for Building a More Energy Efficient Home": <http://www.toolbase.org/tertiaryT.asp?TrackID=&CategoryID=16&DocumentID=4168>.

Green Roof at the Green Institute in Minneapolis



For additional information about energy efficient buildings please see:

- LEED (http://www.usgbc.org/leed/leed_main.asp). LEED stands for Leadership in Energy and Environmental Design - a green building rating system.
- B3 Project, Buildings, Benchmarks and Beyond. Here are a couple of links to that: <http://www.csbr.umn.edu/B3/index.html> and <http://www.csbr.umn.edu/b3-msbg.html>
- Minnesota Dept of Commerce Energy Information Center: energy.info@state.mn.us
- <http://www.energystar.gov/ia/business/BUM.pdf>

14) What kind of insulation were you thinking of using? What is the R rating you have planned to achieve for the building's walls, roof, and floors?

R-Factor (Thermal Resistance Factor) - the National Commercial & Industrial Insulation Standards Manual defines R-Value as a measure of the ability to retard heat flow rather than to transmit heat. The higher the "R", the higher (better) the insulating value.

Currently, commercial buildings only have to be built to R20 and residential to R30-new buildings should shoot for an R50 rating at least.

For more information:

- about R Factors: <http://www.insulation.org/techs/faq.cfm#11>
- about insulation: <http://www.insulation.org/techs/faq.cfm#11> or <http://www.b4ubuild.com/links/insulation.shtml> or http://www.ornl.gov/sci/roofs+walls/insulation/ins_16.html.

15) Will your building envelope feature energy efficient building techniques?

Some suggestions include:

- Rigid insulation sheathing placed outside 2 x 6 walls
- Staggered stud construction

- 1/2 inch rigid insulation inside framed walls
- Continuous thermal barrier to reduce thermal bridging
- Fill between wall studs with cellulose or urethane foam, not fiberglass batts)
- Exterior air barrier such as Tybex or Turbotex paper
- Correct installation of window flashing
- Foundation backfilled with gravel base and non-clay soil
- Insulation under the slab, if applicable.
- Frost protection for shallow foundations
- Sealing of attic bypass leaks

For more information see:

- www.sbicouncil.org
- www.usgbc.org
- www.buildinggreen.com
- www.buildingscience.com,
- www.sustainabledesignguide.umn.edu/default.htm
- www.builderbooks.com