

Skylights vs. comfort, energy efficiency

Bringing daylight indoors could also include air gaps

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Quality light from the sun is prized in modern home design. Well-placed windows and skylights bring healthy day lighting to interior spaces. Properly located glazing insures we can work, study and play – taking full advantage of every room. Without careful planning, quality day lighting often comes at a significant cost to the comfort and efficiency of a home.

The problems

Skylights are the most common device used to get light where we need it in our homes after traditional window units. The configuration and installation of skylights satisfy light requirements as intended, but can cause big problems for home comfort and energy efficiency.

The dual plastic lens, metal-framed skylight is the most common installation used in our area for through-the-roof day lighting. Most newer homes have insulation installed at the ceiling with a thermal resistance value of at least R-30. Heat energy moves from areas of higher concentration to areas of lower concentration. Insulation works as a barrier between areas of heat and cold. The average insulating value of a plastic skylight is between R-0.5 and 1.5, which is one-thirtieth the thermal protection of the surrounding insulated ceiling area!

Open attic space between the roof deck and the ceiling of our rooms must be spanned to get the desired sunlight to our living space. This requires construction of a wood framed, sheetrocked skylight well. The short wall sections of this well area have the conditioned space of the home on one side and the harsh air temperatures of the attic space on the other.



Clerestory windows are ideal for rooms with high ceilings.

In most skylight installations, these wall sections are either poorly insulated or do not get insulated at all. Heat rises into these wells and finds a large surface area in addition to the skylight where thermal resistance is minimal. For the most part, we do a great job of insulating the ceiling of a home, then cut gaping holes in that highly insulated structure (even small skylights are typically 4 square feet and include 20 or more square feet of poorly insulated well wall).

The ceiling plane is the most critical component in the thermal envelope of any home. Heat rises against the ceiling in winter. With a poor thermal barrier at skylight assemblies, heat energy is radiated to the cold space outside.

In the summer, radiant heat energy blasts into the conditioned space through these areas, hardly deterred by the meager insulating value afforded by most skylight and well wall installations. Air infiltration compounds the efficiency and comfort problems.

In the winter, if warm air can move through the ceiling plane, it is replaced by cold air pulled in at other infiltration points lower in the conditioned envelope of the home. As you may have guessed, skylight installations are not generally airtight. In fact, blower door infiltration testing I have conducted on new and existing homes shows that a large percent of air movement in and out of homes comes through skylight assemblies. This is not to blame on the skylight unit itself, but on the method of installation.

Typical skylights attach to a wood frame curve at the top of a well wall adjacent to the roof deck. Most have gaps large enough to stick a finger through leading either to the attic space or the outside at the connection to the roof and well walls. Think of having a window cracked open a half an inch or so and think how much air would move through that space. Now consider how many skylights are installed in most homes!

The solutions

Careful consideration should be given to where and how often skylights are installed at the ceiling plane. Overuse will exacerbate the problems described above.

When skylights are installed they should be the best quality that the project budget will allow. Better quality skylights (look for Energy Star-rated) will have higher thermal resistance and will come with gaskets and instructions to provide a tight air barrier.

The framed skylight wall well area should be insulated as well as or better than the regular walls of the home. Insulation at the framed wall wells should include a solid air barrier surface on the attic side of the insulation to prevent air movement through porous fiberglass or cellulose or be lined with rigid board or spray foam insulation.

In rooms with high ceilings, consider clerestory windows installed at north or south facing walls. Windows tend to have better thermal properties than skylights, are easier to air seal and do not penetrate the important ceiling plane of the home envelope.

Solar tubes offer a design option that limits the heat transfer and air infiltration problems inherent to standard skylight installations. Solar tubes are round, sealed, highly reflective tubes that bring light from a roof-mounted collector through the attic space and into interior rooms. The smaller footprint of the collector and surface area of the light tube



Select Energy Star-rated skylights to save in the long run.

make it easier to insulate and limit radiant heat transfer. These units are available with an integral electric fixture that allows the solar tube to double as a light source after the sun has set.

Be sure to consider your comfort and future utility bills when considering your skylight options. Good planning will allow you to have good interior day lighting and energy efficiency.

For more information on green and efficient homes, visit www.icenergyrate.com

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Solar tubes can also be used to limit heat transfer and air infiltration problems common with skylights.