



Energy & Dollar Saving Cooling Strategies

A good subject for this week's issue of Going Green occurred to me as I was walking into my 68 degree home from outside, where it was 92 degrees and climbing! Whether you have air conditioning or not, this week's issue should bring you comfort, literally and figuratively! So to start, let's look at techniques to cool down your home or commercial property by preventing as much "summer heat gain" as possible. These techniques will reduce your bill if you have air conditioning and, if you don't, keep you cooler – naturally!

Most of the summertime heat enters your building from three places – windows, roof and air leakage. Most of the attempts I see to limit heat gain from windows fall far short of what seems to be popular belief. Interior window treatments such as drapes or Venetian blinds block less than half of the solar energy hitting the glass. They also block a substantial amount of light, meaning that lights need to be on in many cases, which just adds more heat to your indoor air. A far better solution is a solar screen, also called a "sun screen" or "solar shade cloth", mounted over the window on the outside of the building. These screens block almost twice as much solar energy while allowing more natural light than most interior treatments. I've made them myself, for as little as \$0.50/sf from materials I bought locally at Hills Flat Lumber, and I've had automatic, motor-powered shades (for large, unreachable 2nd story picture windows) made starting at about \$700 and up (depending on size).

Awnings are another option, but keep in mind they'll work best on south-facing windows when they're sized to block all the direct sun. But just like an overhang designed to block 100% of the "direct" sun, they can still allow 40% to 60% of the total solar heat to enter, depending on the reflectivity of the surface in front of the window (reflected - or "indirect" solar energy, along with diffuse solar energy, makes up 40% to 60% of the total). The reason they don't work as well on east and west windows is because the summer sun angle is very low in the early morning eastern sky and late afternoon western sky; around the spring and fall equinox the sun can be shining directly – dead on - into east and west windows!

Your roof is another culprit. It gets baked by the summer sun and, in turn, lets some of the energy it absorbs sneak into your building. And that will make inside temperatures much hotter or, in the case of air-conditioning, make your electricity bill a lot less affordable! The most cost-effective way to minimize this problem in a home with an attic is to bring your attic insulation up to an "R-value" – or insulating value – of R-38. I strongly discourage, and the California Energy Code gives no credit to, the use of radiant barriers laid out over the floor of an attic; scientific studies have shown they lose their effectiveness over time, and it's especially true in this area due to airborne dust and pollen. Vaulted roofs are much more expensive to insulate, so they're most cost-effectively insulated when the roofing needs to be torn off and replaced. For flat or "low-sloped" roofs I strongly recommend a "cool roof" or new "cool roof coating". Also contrary to popular belief – and even the advice of some Utility companies – DO NOT install an attic fan. Scientific studies have shown them to be so marginally effective as to be not worth the money to purchase or operate. In writing these facts about radiant

barriers and attic fans in the past I've received a number of phone calls wherein people question this advice and want to know the reasoning behind it. While I can explain why, based on the fundamentals of heat transfer theory and my own practical experience/measurements, I prefer not to receive phone calls at home or in the middle of a busy day at the office over such things – please email me if you like, and I'll send you references. Lastly, before adding insulation to your attic, always (always!) be sure the attic floor is thoroughly sealed against air leakage (topic coming up next) and that any wiring or plumbing work is done first.

While auditing a beautiful, high-end, not-so-old home up off Banner Lava Cap last fall I saw a 14" diameter flexible return-air duct in the attic, slit open longitudinally for about 10 feet. It looked sort of like a gutted fish laying on its' back. Can you imagine how much money those homeowners were wasting on air conditioning?!?! And heating too! While this may sound extreme it's not much different than the disconnected or partially disconnected ducts I see in about every 2 to 3 homes I audit. Duct tape should be renamed "temporary tape" because it doesn't provide a good, permanent, air-tight seal. There are lots of other places – like sheet metal plenums and connections – where ducts leak air and waste energy, in heating as well as cooling. It's really unpleasant work to fix these problems, which is why I pay my guys an extra \$5/hour on top of their regular rate for this sort of work. And you don't want to be in a hurry because, if you think about it, that's how most of these problems were created in the first place! And buildings themselves leak air too – a lot of it. Here's a good source for information on how to seal leaks in your building and heating/cooling duct system – http://www.energystar.gov/index.cfm?c=home_sealing.hm_improvement_sealing. If you don't want to do the work yourself, or you'd like an experienced professional to help you "elbow-to-elbow", call us or another local Building Performance Contractor.

Once you've greatly limited summertime heat from sneaking in during the daytime hours, you can dramatically reduce – in some cases completely eliminate – any need for any air conditioning. Think of it this way: you need your building to capture - and hold - the cool night climate we're blessed with here in Nevada County (the vast majority of the time, anyway - there are rare times when it just doesn't cool off at night)! Many folks will use a Whole House Ventilation fan (not to be confused with the "Attic Fan" mentioned earlier), which works best if you have a single story home, very little in the way of nighttime prevailing breeze, windows that don't allow "cross-flow" ventilation through rooms, or some combination of the above. People with two story homes, ample operable window area, and a willingness to open and close windows twice a day, can benefit from "natural night ventilation" and don't need to use a fan.

Evaporative cooling is something that I personally – and many of our customers – have found to be much less costly than air conditioning, and it can provide night ventilation too. The lowest cost approach is to buy a window style unit off the shelf at a local hardware store and install it yourself; it's pretty easy. We install mostly "whole house evaporative cooling systems"; these systems use insulated air ducting to get the air distributed throughout the home, an automatic thermostat to control the fan & water (rather than a manual hi/lo switch), and automatic dampers to exhaust the air into the attic or the outdoors so windows don't need to be opened and closed twice a day (a privacy and security concern for some). Unlike window units they're also very quiet, but installed costs range from \$4,500 to \$9,500 or more (for the really advanced, two-stage evaporative cooler that qualifies for the 30% Federal Tax Credit that applies to air conditioners).

More often than not, air conditioning systems, which typically share the same duct system as the heating systems here in Nevada County, suffer from a wide range of problems above and beyond leaky or poorly insulated ducts. The flexible air duct commonly used is not typically large enough or fully

extended, which lowers air flow, increases run-time, and increases operating costs. They rarely have the proper refrigerant charge (a system one of our guys recently checked had just been serviced but was 1.5 pounds low in refrigerant!).

While this was a brief review of how to stay cool and save money at the same time, hopefully it was comprehensive enough to get you headed in the right direction. Always, dear friends and readers, keep in mind that you can email me at the address below if you have any questions!

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