

# **SUMMER COOLING WITHOUT A/C**

***Most folks use window fans the wrong way...making the room warmer. Learn how to get the most out of low/cost and natural methods for cooling a home.***

**by Bob Alf Construction**

The cooling technology that has brought us air conditioning (AC) has arguably brought much needed comfort to the sick and elderly of our society. But has the near universal use of AC left us with a void in knowledge for how to cool our homes with low-cost fans ... even when night time temperatures drop low enough?

## **Good Intentions ...**

I have a friend and neighbor who was asking about how to add AC to their 100 year old house that does not have duct work. They are minimalists and eco-conscious but could no longer take the sweltering temps in their house when they returned from a long day at work. For years they have done without AC and just used window fans at bedtime and often leave windows open while at work.

### *Daytime- Why let in 100+ degree heat?*

After review of their house and their habits, it was clear that their habits often made the house warmer than it needed to be. By leaving the 2nd floor window open on the south side while at work, they allowed 100+ degree heat into the house by late afternoon. This came from the heated stucco siding and a lower level asphalt roof that became heat sinks in the daytime sun. This heat then radiated up into the open window. This is much worse than keeping the windows shut so that the cooler morning temps inside the house are not lost so quickly.

### *Nighttime- Wrong Use of Fans-*

By using a fan to bring air into the south-facing master bedroom starting at bedtime, they were actually pulling in hotter air than was already in the house. Bedroom temps were a sweltery 86 degrees at times, but the air temp outside the south facing window was often still in the upper 80's at bedtime. Again, that heat stored in the stucco was still releasing and would continue to do so thru the night.

## **So What is a non-AC Person to Do?**

Some basic tricks/tips were able to bring the interior house temp down about 5-8 degrees thus reducing the need for AC. First, closing windows during the day just before leaving for work. This kept the early morning cooler temps within the house (mid 70 degree range). Second, install a

window fan in the East window instead of the south window. This air was generally 10+ degrees cooler than air at the South window. To maximize the benefit, the bedroom door was closed and the upper sash on the south window left open. This brought in air that was COOLER and helped to push out the warmer air thru the upper sash. Another option would be to install the fan in the upper south window sash and exhaust it to the outside. Then open a window on first floor on the north side which would then allow the coolest possible air to travel thru the house and into the bedroom while exhausting the hottest air.

This would all vary depending on the specifics of your house and the exterior conditions of your landscape and home surfaces.

### **Strategy for Bedrooms on 2nd Floor**

The basic strategy for cooling a 2-story home with bedrooms on 2nd floor is as follows:

1. Close windows during daytime before leaving for work
  - keeping warmer air out & conserving cooler interior air
  - most glass also helps to block some UV rays that can also contribute to heating the house
2. Close curtains or shades to significantly reduce radiant heating; update to more reflective window treatments
3. Install window fans in the upper sash of each bedroom window
  - if upper sash is stuck, install in lower sash
  - fan set to exhaust to outside (many fans allow either in or out)
  - does not work easily with casement or awning type windows
4. At bedtime (or soon as exterior temp < interior temps), open windows on **1st floor**: north side and east side only
5. Turn on fans and leave bedroom doors open

This allows the coolest possible air to travel thru first floor cooling surfaces like plaster, floors, cabinets, etc. This cooler air is then drawn upstairs and creates air movement in the bedroom (feels good on the skin) and the warmer bedroom air is then exhausted. No more fighting the laws of physics by pulling warmer air into the bedroom which is already warm and that warm air can't go anywhere except into the 2nd floor hallway. Since warm air rises, our drawing air in from 1st floor and exiting on 2nd matches the laws of physics...we just give it a turbo-boost from the window fan unit. Also, since we cooled most of the surfaces all the way from 1st thru 2nd floor, these items become a source for keeping the home relatively cool inside while the house is closed up during the day and the outside temps are soaring.

## **Factors of Cooling**

To customize this low-tech approach to your own specific house and conditions, it is first helpful to understand a bit more about the science of heating and cooling. Most of us have had no or few courses in physics, yet we quickly understand many basic principles simply because we learn from experiences. Here are some of the Variables that affect heating/cooling of our homes in the Summer time:

*Air Movement* - this is a big one. Air moving into the house can bring in warmer air when we don't want it. So keep doors and windows closed if the outside temp is > inside temp. And this varies by direction as the north side of the house often has air temps 10+ degrees cooler than the south and west sides on sunny days. Moving air can also cool the skin thus bringing comfort but you are going backwards if you are pulling warmer air in a window to make this happen.

*Radiation* - light waves (sun rays) carry energy which can heat objects. Block the sun by closing windows and shades during daytime hours. Light color and/or reflective coated shades/drapes can block a significant amount of energy and related heat. Roofing materials and exterior siding can stay cooler if reflective colors/coatings are selected. Recent studies show a significant benefit from these reflective options. Shade trees especially at the South and West side of a home can provide huge relief from radiant heat. Plus shade trees are actually a bit like primitive AC units as they also "transpire" meaning that moisture is released from the leaves which evaporates thus cooling the leaf surface and therefore the air around the tree. Some trees grow as fast as 6'-8' per years so plant them NOW.

*Mass materials on outside* - generally heavier and denser materials can store more heat which is then released as the air temperature becomes cooler than the material. If for example, you have a driveway or sidewalk near the south or west side of the house, this will absorb a LOT of heat during the day and will reach temps that far exceed the air temp. So when night comes and the air cools a bit ... say into the 70's, then the concrete is releasing it's heat for hours into the night and potentially until you wake up. Windows located above these mass materials often draw in air that is much warmer than other windows around the house. Darker color mass materials are even worse, such as asphalt drives/walks or maybe a lower level porch roof with asphalt shingles. Other heavier mass items can include stucco/brick wall claddings, concrete foundations, vehicles, landscaping stones, etc.. Do what you can to shade these items from the sun or to make them more reflective.

*Humidity* - humidity is the amount of water vapor in the air and the more there is, the more uncomfortable it feels to us. It slows the rate of perspiration and natural cooling of your skin. If the non-AC methods of cooling still leave you feeling miserable, it's likely due to humidity and there is not much else you can do other than sparingly use your AC. A de-humidifier will likely not help much as it gives off heat while removing moisture from the air and that is why they are generally located in basements. Minimal use of AC can be accomplished by running it only sparingly just after work and while sleeping. Then keep it turned off and the house closed during the day. Note that oversized central AC units are often installed and have a very hard time removing humidity thus are ineffective and even more inefficient than correctly sized units. Never allow an install to "round up" when installing central AC.

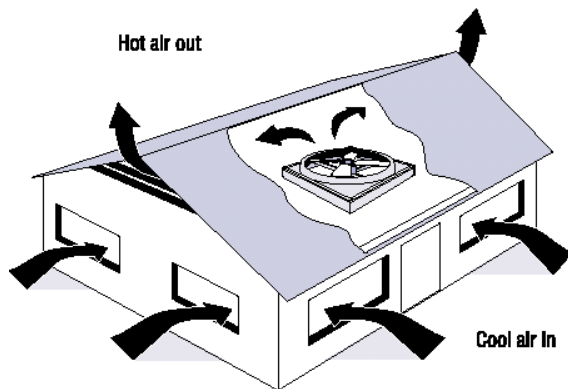
*Living Habits* - cooking can be a big contributor to heating a home. On hot days, switch to foods that do not need cooking...like a big salad (add refrigerated meat if you need that). Cook on the grill if you need to but keep in mind the negative eco-impacts of burning charcoal. Always use a kitchen exhaust fan for any indoor cooking ... even if just running the toaster. And run that fan for 30-60 minutes after cooking as most ovens, stoves and toasters keep giving off heat well after they are turned off. When showering, run the exhaust fan for at least 60 minutes else humidity and heat will be added.

*Attic Temp* - the sun will heat your attic significantly which then heats the upper level ceilings of your home. Insulation helps but proper attic ventilation should be added. Some building scientists have found that the reflectivity of your roof is an even bigger factor in reducing the temps in your attic so consider that the next time you replace your roof. Some folks advocate installing attic fans that run on a thermostat. However, there are some risks with these fans. They are located on top of your roof and of course add another place where water leaks can happen. And in winter, a malfunctioning thermostat could make the fan run even though it's cold and this will pull a lot of heat from your home plus potentially put you at risk for carbon monoxide poisoning. Another solution is to consider the "Advanced Approach" described below.

### **Advanced Approach - the Whole House Cooling Fan (WHCF)**

The WHCF is an advanced method of using a low energy consumption fan to cool a home ... often more effectively than with window fans. Like the window fan method, cool air is brought in from lower level windows at night which then travels upstairs. But instead of exhausting out of a bedroom

window, the air is exhausted thru the upper floor ceiling and into the attic. This then forces hot air out of the attic vents (see picture below). A double benefit... cooling the homes' interior plus cooling the attic. Generally it's best to locate the fan in the south and/or west portion of the home to help exhaust the excess heat and bring in cool air. But if that is a bedroom, there will be fan noise that maybe be louder than a window fan since these WHCF's are generally more powerful. It is *CRUCIAL* to get a fan that is insulated and air sealed so that in the winter it does not allow lots of heat/moisture into the attic. Else you will have a big energy penalty plus may have moisture damage in the attic. Finally, these fans should NEVER be operated with doors/windows closed due to the risk of basement appliance backdrafting thus causing carbon monoxide poisoning.



### **In Conclusion**

AC itself is not an evil culprit as it can bring comfort to elderly, sick and others who need it. But most of us can significantly reduce our use of AC. All that is needed is to refresh our knowledge of how to work with the laws of physics and maybe a few extra glasses of cool drinking water.

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