

COOLING SYSTEM

A Factsheet from Austin Energy's Green Building Program

Many factors must be considered when correctly sizing the HVAC system. For example, sizing requirements will depend on the home's orientation, design, window area, shading, insulation, and many other factors. Proper maintenance of the HVAC system is also essential for comfort and energy efficiency.

How the system works

Your air conditioning system has two parts. The part located inside the home is called the *air handler* or *evaporating coil*, and the one outside is called the *compressor* or *condensing coil*. These two parts are connected by tubes which carry a *refrigerant*--a substance which absorbs heat in your house and releases it outside.

The air in your house moves in a continuous loop from the living space to the air handler, and back out to the living space. Every time it passes through the air handler, it loses heat to the refrigerant. The refrigerant moves in a continuous loop from the inside air handler, where it picks up heat from your home's air, to the outdoor condensing unit, where this heat is dumped to the outside air. Notice the very hot air coming out of your outdoor unit.

Run-time and comfort

Relative humidity is just as important to your comfort as temperature. Your cooling system can only respond to temperature changes; it goes on or off according to the setting on the thermostat. Luckily, while your cooling system is working to reduce the temperature, it reduces humidity at the same time.

Be aware that most systems don't start to dehumidify the air until they've been running about ten minutes. That's why it's important for the run-cycle to last long enough for both temperature and humidity reduction to occur. A unit that is too large for your house will cool it quickly and then shut off. You'll feel cool but not comfortable, because the humidity in the house will still be high and you'll feel clammy.

A correctly-sized unit is large enough to cool your house in a reasonable period of time, and small enough to run in long cycles, so it has enough time to dehumidify. When it comes time to replace your system, don't let anyone convince you that bigger is better. It requires careful calculation to determine proper system sizing.

Run-time and efficiency

By running longer cycles, the system also has time to reach the efficiency for which it was designed (it takes about ten minutes run-time to reach full efficiency). An added benefit of longer cycles is reduced wear and tear on the blower motor and the compressor (like highway versus city driving). Not only will your correctly-sized unit last longer and be quieter, your electricity bill will actually be lower, because a smaller unit costs less to run than a larger one. It also costs less to buy, maintain and replace.

Thermostat setting

Your electric bill will be lowest if you keep the temperature fairly uniform at the upper edge of the "comfort zone"--about 80-85 degrees*. It'll be much easier to adjust to a warmer temperature if you use ceiling fans to increase air movement over your skin.

The Green Building Program does not advise turning off your system in warm, humid weather. If the house gets very hot, the unit may be unable to cool it in a reasonable time when you start it up again. More importantly, indoor humidity may rise above 60 percent, promoting the growth of molds and dust mites, a serious health hazard even if you can't see them.

*Experiment with the thermostat setting to find out what works best with your house and lifestyle, to maintain both comfort and health.

Cooling System Maintenance

- With regular yearly maintenance - Your system will last longer and perform better, resulting in greater comfort and safety for less money.
- Without maintenance - The efficiency of your cooling system will drop about 5 percent per year, and its ability to dehumidify will diminish. (Gas heaters may not burn or vent properly, resulting in health problems.)

Homeowner's Job

- Know the location of your inside unit(s), their filters, and all supply and return air grills.
- Do not store anything in gas furnace closets or near gas furnaces in attics or near gas water heaters.
- Be sure there is good air flow around the compressor outside. Don't build a box around it or plant anything within three feet of it.
- Every spring, with the power turned off, clean the compressor air fins with a garden hose and a brush. Spray from the inside to the outside and let it drip-dry before turning the power back on.
- Change the filters when they are dirty.
- Filter life span varies, depending on the house, occupant lifestyle, and the type and thickness of the filter. Check after one month. A clean, high-quality filter, such as a pleated media or electronic type, protects the equipment and your indoor air quality.
- Do not block or close registers or doors of rooms you aren't using. A well-functioning system depends on air moving freely through it. Unless a room has a separate return air duct (most do not), leave the door open whenever possible.
- If you have a multi-zoned system, it is okay to close off zones that are not in use.
- If your house was not tested for leaky ducts when it was built, get it tested and have leaks repaired.
- Testing is not required by code. However, this is one of the most cost-effective energy-efficiency measures you can take. Typical leakage before testing and repair is 25 percent -that's air being wasted that you paid a lot to heat or cool. Aim to get leakage below 10 percent.

Service Contractor's Job

Annual servicing of a standard air conditioner or heat pump includes the following:

- Cleaning of the evaporator and condenser coils.
- Checking the amperage draw of the compressor.
- Oiling the fan motors and checking the adjustment of the belts.
- Checking the system operating pressures and temperatures to ensure they comply with manufacturer's specifications.

If these measures indicate problems, the service contractor should do the following:

- Check the refrigerant (coolant) charge. This cannot be done by guesswork. The air flow and superheat or subcooling must be checked. An incorrect charge (too high or too low) reduces efficiency and life span. For example, a system that is 10 percent low on refrigerant will cost about 20 percent more to operate. The service contractor must by law fix any leaks before refrigerant is added.
- Check the air flow over the indoor coil. For most brands, the flow should be 400 cubic feet per minute per ton. Low air flow results in loss of efficiency, and even freezing of the evaporator coil, causing the unit to fail. Low air flow has many possible causes; for example, poor duct design, leaky ducts, dirty coils and filters, or closed registers and doors.