



**Cool, Clean
Air all
Round You**

**Air
Conditioning &
Heat Pump
Services**

White Paper

Cool, Clean Air all Round You Air Condition Services

About Air Conditioners

Indoor air conditioning is a key concept when constructing any modern household. Air conditioning systems will keep you cool during the hot summer months, and make staying in a pleasant, relaxing experience not to be missed.

Depending on your living situation, you can purchase various types of air conditioners. For college dorms and smaller apartments that lack air conditioning systems, it is very easy to go out and purchase a smaller window unit to help with air circulation. Houses and larger commercial building will use carefully place condensing units or even cooling towers to power indoor air conditioning.

An air conditioner is basically a refrigerator without the insulated box. It uses the evaporation of a refrigerant, like Freon, to provide cooling. The mechanics of the Freon evaporation cycle are the same in a refrigerator as in an air conditioner.

The most common refrigeration cycle uses an electric motor to drive a compressor. Since evaporation occurs when heat is absorbed, and condensation occurs when heat is released, air conditioners are designed to use a compressor to cause pressure changes between two compartments, and actively pump a refrigerant around. A refrigerant is pumped into the cooled compartment (the evaporator coil), where the low pressure and load temperature cause the refrigerant to evaporate into a vapour, taking heat with it. In the other compartment (the condenser), the refrigerant vapour is compressed and forced through another heat exchange coil, condensing into a liquid, rejecting the heat previously absorbed from the cooled space.

Insulation reduces the required power of the air conditioning system. Thick walls, reflective roofing material, curtains and trees next to building also cut down on system and energy requirements.

Refrigeration air conditioning equipment usually reduces the **humidity** of the air processed by the system. The relatively cold (below the dewpoint) evaporator coil condenses water vapor from the processed air, (much like an ice cold drink will condense water on the outside of a glass), sending the water to a drain and removing water vapor from the cooled space and lowering the relative humidity. Since humans perspire to provide natural cooling by the evaporation of perspiration from the skin, drier air (up to a point) improves the comfort provided. The comfort air conditioner is designed to create a 40% to 60% relative humidity in the occupied space. In food retailing establishments large open chiller cabinets act as highly effective air dehumidifying units.

How the Evaporation Cycle Works

1. The compressor compresses **cool Freon gas**, causing it to become **hot, high-pressure Freon gas**.
2. This hot gas runs through a set of coils so it can dissipate its heat, and it condenses into a **liquid**.
3. The Freon liquid runs through an expansion valve, and in the process it evaporates to become **cold, low-pressure Freon gas**.

4. This cold gas runs through a set of coils that allow the gas to absorb heat and cool down the air inside the building.

Mixed in with the Freon is a small amount of lightweight oil. This oil lubricates the compressor.

Window Air Conditioners

A window unit implements a complete air conditioner in a small space. The units are made small enough to fit into a standard window frame. You close the window down on the unit, plug the unit in and turn it on to get cool air. If you take the cover off of an unplugged window unit, you will find that it contains:

- A **compressor**
- An **expansion valve**
- A **hot coil** (on the outside)
- A **chilled coil** (on the inside)
- **Two fans**
- A **control unit**

The fans blow air over the coils to improve their ability to dissipate heat (to the outside air) and cold (to the room being cooled).

Maintenance

Neglecting necessary maintenance ensures a steady decline in air conditioning performance while energy use steadily increases.

Keeping your system properly maintained will lower energy and repair costs, prevent breakdowns and prolong the life of your equipment. **Some maintenance jobs should be left to the professionals**, but there is much that you, as a homeowner, can do to prolong the life of your equipment, keeping it running at peak efficiency.

Air Conditioner Filters

The most important maintenance task that will ensure the efficiency of your air conditioner is to **routinely replace or clean its filters**. Clogged, dirty filters block normal airflow and reduce a system's efficiency significantly. With normal airflow obstructed, air that bypasses the filter may carry dirt directly into the evaporator coil and impair the coil's heat-absorbing capacity. Filters are located somewhere along the return duct's length. Common filter locations are in walls, ceilings, furnaces, or in the air conditioner itself.

Some types of filters are reusable; others must be replaced. They are available in a variety of types and efficiencies. Clean or replace your air conditioning system's filter or filters **every month or two during the cooling season**. Filters may need more frequent attention if the air conditioner is in constant use, is subjected to dusty conditions, or you have fur-bearing pets in the house. If you use a disposable type filter, it's always wise to keep several spares inside the house.

Sealing and Insulating Air Ducts

An enormous waste of energy occurs when cooled air escapes from supply ducts or when hot attic air leaks into return ducts.

Recent studies indicate that 10% to 30% of the conditioned air in an average central air conditioning system escapes from the ducts.

For central air conditioning to be efficient, ducts must be airtight. Hiring a competent professional service technician to detect and correct duct leaks is a good investment, since leaky ducts may be difficult to find without experience and test equipment. Ducts must be sealed with duct "mastic." The old standby of duct tape is ineffective for sealing ducts.

Obstructions can impair the efficiency of a duct system almost as much as leaks. You should be careful not to obstruct the flow of air from supply or return registers with furniture, drapes, or tightly fitted interior doors. Dirty filters and clogged evaporator coils can also be major obstructions to air flow.

The large temperature difference between attics and ducts makes heat conduction through ducts almost as big a problem as air leakage and obstructions. Ducts in attics should be insulated heavily in addition to being made airtight.

Outside Units

Dirt, leaves, grass and other debris clog the condenser coils, straining the system.

Once a month, inspect the outdoor unit to insure that nothing is obstructing the airflow across the coil. Remember, before you do any work on your condenser unit turn off the power at the disconnect switch mounted on the wall near the unit. If you don't have a disconnect switch, turn off the breaker. If you find that your unit is becoming dirty, you can follow the procedures below.

Performing Outside Maintenance

1. After disconnecting the power, if leaves or other debris have collected inside the condensing unit, open the unit by undoing the screws on the top panel and tipping it up. Remove any debris from the enclosure. Then, reverse the procedure insuring the screws are replaced before restoring power. Do not open the electrical panel cover. This is best left to a certified technician.
2. Check to be sure your compressor unit is level. An unlevelled unit will be noisier, less efficient, and cause excessive wear. Check the level in both directions, making adjustments if necessary. Be careful how much you move the unit. It has rigid connections to the electrical and refrigerant lines. Too much (and it doesn't take much) movement could cause a refrigerant leak to occur.
3. Finally, check the condensate line for a bacterial slime that tends to grow in condensed water. The condensate line is the drain that removes water that has condensed from your indoor coil. Pour a 1:9 bleach-and-water solution through the line. Find the fitting for the hose, pull it out, and flush the line all the way to the floor drain. If the drain is difficult to reach, you may be wiser to call your HVAC (Heat, Ventilation and Air Conditioning) contractor to do the job.

Always be careful when using lawn mowers and trimmers around your condensing unit. Flying debris can damage the coil and fins.

A Word about Heat Pumps

Imagine that you took an air conditioner and flipped it around so that the hot coils were on the inside and the cold coils were on the outside. Then you would have a heater. It turns out that this heater works extremely well. Rather than burning a fuel, what it is doing is "moving heat."

A heat pump is an air conditioner that contains a valve that lets it switch between "air conditioner" and "heater." When the valve is switched one way, the heat pump acts like an air

conditioner, and when it is switched the other way it reverses the flow of Freon and acts like a heater.

Heat pumps can be extremely efficient in their use of energy. But one problem with most heat pumps is that the coils in the outside air collect ice. The heat pump has to melt this ice periodically, so it switches itself back to air conditioner mode to heat up the coils. To avoid pumping cold air into the house in air conditioner mode, the heat pump also lights up burners or electric strip heaters to heat the cold air that the air conditioner is pumping out. Once the ice is melted, the heat pump switches back to heating mode and turns off the burners. Maintenance is similar to straight air conditioners and usually serviced by the same contractors.

Heat, Ventilation and Air Conditioning (HVAC) Contractor

Your contractor may be required to have a license, depending on your province/state or local requirements. They should be well trained, and experienced to provide quality installation and repair. Don't be afraid to ask you contractor about his or her training, experience, and membership in associations.

Contractors are required to be certified to handle refrigerant in cooling systems. They are also required to own and use refrigerant recovery equipment. Ask for proof that your contractor is certified. Check the contractor's record and their performance. Get a list of their past projects and take a look at their work. Call the Better Business Bureau to find out if there have been any complaints against them and get a list of references from the contractor.

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