

# Putting Home Comfort in Your Hands



**A Guide to Your  
Heating & Cooling System**

# HVAC Systems: SET IT...FORGET IT



As homeowners, we assume our heating and air conditioning (HVAC) system will work to heat and cool our homes and it isn't until something goes wrong that we suddenly become aware of our HVAC system.

This guide "Putting Home Comfort In Your Hands" has been designed to be a "go-to" reference to help you:



- *Schedule regular maintenance*
- *Understand the basics of how the HVAC system works so you'll know when it isn't*
- *Organize the information about your system*
- *Learn how to maximize the efficiency of your system*
- *Perform a periodic inventory of your system to ensure its long life*

Why is this important? An HVAC system that is regularly maintained provides the best heating and cooling with the lowest financial investment on your part.

Additionally, there are proposals in Congress and with utility companies where new efficiency goals are being established, new rate structures for energy are being discussed and the overall improvement of energy usage in our world is debated continuously as a part of the changing response we have to global climate challenges.

**Consumers are going to be asked, incentivized and in some cases *mandated* to upgrade HVAC equipment.**

By reading, understanding and completing this booklet you will be prepared for any future government requirements as well as meeting today's demands for Indoor Air Quality, efficient operation, quiet operation and lifestyle adaptability.

It all starts with you developing a Comfort Plan for your conditioned air.

What does "comfortable conditioned air" mean for you and your family?



## "Putting Home Comfort in Your Hands - A Guide to Your Heating and Cooling System"

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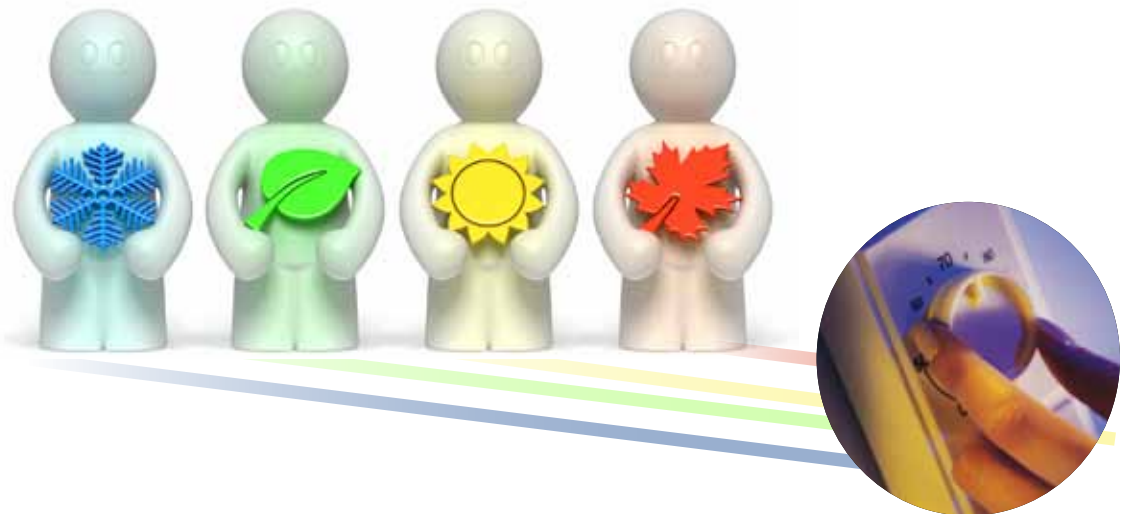
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# THINK ABOUT COMFORT



Every season, sometimes multiple times during a season, we are faced with changes in our home comfort situations.

What is the first thing you do when you are too cold or too warm in your home?

**Adjust the thermostat!**

While the thermostat does control your heating and cooling system, your overall comfort settings go beyond the little box on the wall. In fact, there are many internal and external influences which impact the comfort you experience in your home.

Our goal with this section is to point out some of the most common influences to your home comfort and suggest ways to address these issues. If you have questions on these topics, your heating and cooling contractor will be able to discuss them with you and provide additional options for your personal comfort situation.

Record your heating and cooling specialist’s contact information for easy reference:

Company Name:	
Contact Person:	
Phone Number:	



# GETTING TO KNOW YOUR COMFORT SYSTEMS

This next section focuses on your heating and cooling systems, along with other components which impact your home comfort. These pages are meant to be a quick reference guide to review with your heating and air conditioning contractor during service calls. Be sure to complete the information to the best of your ability and for those items you cannot complete on your own, ask your contractor for assistance.

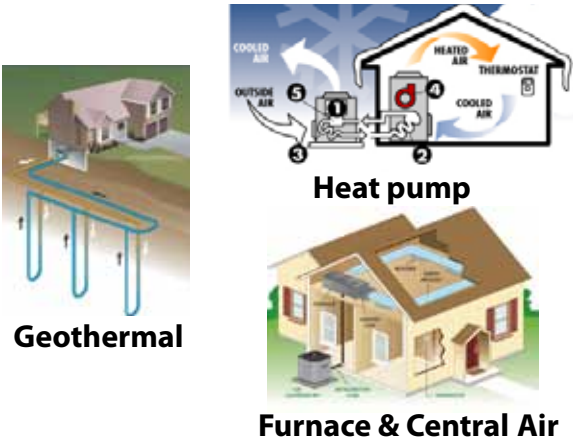
## General Equipment: Heating

### Where do I typically find my heating equipment?

Your heating equipment, such as a furnace or boiler is typically found in the basement or in utility spaces such as a laundry or storage area. Heat pumps are located outside and can heat and cool your home depending on the time of year.

### What type(s) of equipment heat your home?

- Furnace-natural gas, fuel oil, coal, electric or wood
- Heat pump-electric, fuel
- Geothermal



### What is the model number of your heating equipment?

- For furnaces,** remove the front door and look at the upper-left side of the unit. You can find the model number listed on a “rating plate” sticker located on the inside of the unit.
- For heat pumps,** you can find the model number listed on a “rating plate” sticker affixed to the unit above the back-seated service valve connections.
- For geothermal units,** the tag is usually found on the front of the device

### When was your heating equipment installed?

Most contractors will place a sticker with the date of installation on your equipment. This sticker is typically located near the model and serial number or on the outside of the unit.

### When was the last time a professional cleaned and checked your heating equipment?

Usually a label with the date of the last clean and check is located near the installation information.

## Your Heating System Checklist

### What type(s) of equipment heat your home?

- ☐ Furnace: Type\_\_\_\_\_
- ☐ Heatpump: Type\_\_\_\_\_
- ☐ Geothermal

### What brand is your heating equipment?

Amana	Lennox
American Standard	Rheem
Bryant	Ruud
Carrier	Trane
Goodman	York

### What is the model number of your heating equipment?

### When was your heating equipment installed?

Date:\_\_\_\_\_

Company:\_\_\_\_\_

### When was the last time a professional cleaned and checked your heating equipment?

Date:\_\_\_\_\_

Company:\_\_\_\_\_

Any issues or concerns?\_\_\_\_\_

### Schedule of On-going Heating Equipment Cleaning- record the dates in this chart

1/1/11											

General Equipment: Cooling

Where do I typically find my air conditioning equipment?

Your air conditioning system can be located in two places depending on the system. You can have a split system, with the condenser and compressor located in an outdoor unit and the evaporator is mounted in the air handler unit. If you have a package unit for your A/C, all components are located in a single outdoor unit that may be located on the ground or roof.

What type(s) of equipment do you cool your home with?

- Central air-electric
- Heat pump-electric, fuel
- Geothermal



Central Air

What model is your cooling equipment?

For air conditioning units and heat pumps, you can find the model number listed on a “rating plate” sticker affixed to the unit above the back-seated service valve connections.

When was your cooling equipment installed?

Most contractors will place a sticker with the date of installation on your equipment. This sticker is typically located near the model and serial number.

When was the last time a professional cleaned and checked your air conditioning equipment?

Usually a label with the date of the last clean and check is located near the installation information.

Your Cooling System Checklist

What type(s) of equipment cools your home?

- ☐ Central air
- ☐ Heatpump: Type\_\_\_\_\_
- ☐ Geothermal

What brand is your cooling equipment?

Amana	Lennox
American Standard	Rheem
Bryant	Ruud
Carrier	Trane
Goodman	York

What is the model number of your cooling equipment?

\_\_\_\_\_

When was your cooling equipment installed?

Date:\_\_\_\_\_

Company:\_\_\_\_\_

When was the last time a professional cleaned and checked on your cooling equipment?

Date:\_\_\_\_\_

Company:\_\_\_\_\_

Any issues or concerns?\_\_\_\_\_

Schedule of On-going Cooling Equipment Cleaning- record the dates in this chart

1/1/11											

# General System: Filters

## What types of filters can I use for my system?

**Fiberglass filter:** This throw-away air filter is the most common type. Layered fibers are laid over each other to form the filter media and typically are reinforced with a metal grating that supports the fiberglass to prevent failure and collapse.

**Polyester and pleated filters:** These filters are similar to fiberglass filters but typically have a higher resistance to airflow and a superior dust-stopping ability.

**High Efficiency Particulate Arrestance (HEPA) filters:** These units filter the air passing through them at a very fine scale. The U.S. Department of Energy (DOE) and its contractors use HEPA filters that meet DOE standards to filter 99.97 percent of all particles 0.3 microns or larger. These filters trap smoke, molds, bacteria, dust mites, pollen and other particles.

**Washable air filters:** These products are not as common and rely on the build-up of dust along the cloth to improve the efficiency of the filter.



## How often do I change the filters?

Fiberglass filters should be changed monthly.

**Polyester or pleated filters** should be changed anywhere from every month to every other month, depending on how often the fan runs or the condition of air quality and the environment. If you like to keep the windows open in the house, or have pets, it will shorten the life of any filter.

**HEPA filters or other allergen filters** should be changed every three months.

## What type of filter do I have installed?

- ☐ Fiberglass
- ☐ Polyester/Pleated
- ☐ HEPA
- ☐ Washable



**Schedule of Filter Replacement-** record the dates in this chart

1/1/11											
--------	--	--	--	--	--	--	--	--	--	--	--

# General System: Dampers, Ductwork & Thermostats

## Does your system have any manual dampers? Yes\_\_\_\_\_ No\_\_\_\_\_

Manual dampers are turned by a handle located on the outside of a duct. They are typically used to cut off central airflow to an unused room, or to regulate it for room-by-room temperature and climate control.

## Where are they located?\_\_\_\_\_

## What is duct work and where do I find it in my home?

Duct work is the system through which air flow travels through your home. Duct work can be constructed out of a few different materials depending on the region you live in and the set-up of your home's system.

**Rectangular duct** is made of galvanized metal which is commonly used to run ductwork between rafters or floor joists.

**Sheet Metal ductwork** can also be round and is used most often as a branching addition off larger rectangular ductwork.

**Flexible duct** is a flexible round duct material, made so that sections will bend or angle in almost any direction. It consists of an accordion-type plastic liner that is surrounded by insulation. It is the most common type of ductwork for use in existing buildings because of its versatility.

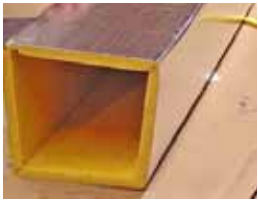
**Duct board** is compressed fiberglass board that is popular for creating rectangular shaped ductwork. Common uses are applications between rafters and floor joists or along an existing ceiling.

## What type of duct work do you have?

- ☐ Sheet metal
- ☐ Flexible
- ☐ Duct Board



Sheet Metal



Duct Board



Flex Duct

**How many duct runs do you have?** Count the number of supply registers (not the return registers) to determine the total number.

Duct runs:\_\_\_\_\_

## Where are the thermostats located?

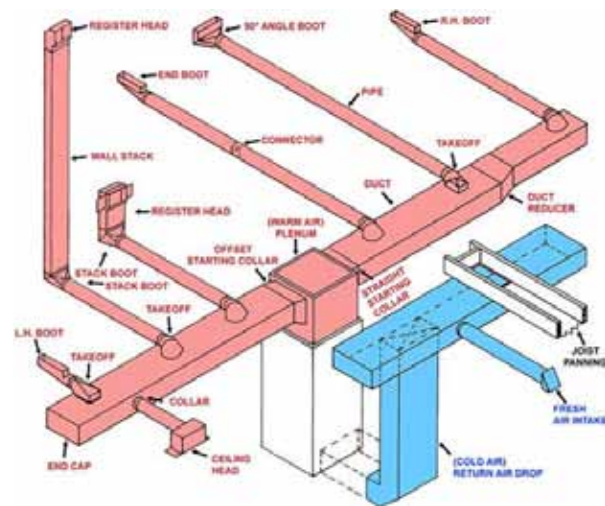
- |                |              |
|----------------|--------------|
| Living Room    | Foyer        |
| Master Bedroom | Basement     |
| Home Office    | Second Floor |
| Hallway        | Bonus Room   |
| Other          |              |



# Inside Your Home: Influences on Your Comfort

## Ductwork – What is it and How Does It Work?

Ductwork is responsible for distributing the airflow produced by your heating or air conditioning, to all the areas in your house. The process for heating or cooling involves unconditioned air coming into the system that is running and then delivering the newly conditioned air to your home.



Airflow is delivered by a “trunk line” or series of rectangular ducts that act as a main supply channel throughout the house. Branch ducts “branch out” from the trunk lines, which are usually round and extend to the registers strategically placed throughout your home.

A properly sized heating and air conditioning system has ductwork that is sized to handle the airflow needed to pass through it. The trunk line is designed to evenly distribute the appropriate amounts of air to every register.

### How do you know if your ductwork is adequate for your size home?

A Manual J load calculation should always be done by your contractor when installing a new system to ensure you are receiving maximum efficiency from your system and ductwork.

## Common Ductwork Problems

Your home’s ductwork system is just as important as your heating and cooling equipment. An improperly designed ductwork systems can cost money through inefficiencies, and in some cases, cause premature failure of heating and cooling equipment.

Here are a few features to look for in your ductwork system:

- Has your house changed design since it was originally built?
- Was the ductwork poorly installed causing air leakage?
- Do you have return air ducts in every room?
- Has your heating bill greatly increase in recent years?
- Is one room colder/hotter than the rest of the house?



## A CLOSER LOOK



### Supply Registers & Return Vents

*The supply registers deliver conditioned air throughout your home through the “branches” that come off your main trunk line of duct work. The air is pushed out of individual room registers commonly found on the ceiling, floor or wall.*

*To complete the cycle, your system picks up inside air and delivers it to the air handler of your central system. Return vents gather this air and feed it back through return ducts to your system. Here heat and moisture are either removed or added and then delivered back to the supply side.*

*When looking at your duct work, supply registers are usually located on outside walls and return registers are located on inside walls.*

**Poor Installation:** Many complaints about high energy bills and discomfort are due to poor ductwork installation. Air leakage is typically due to poorly installed ductwork and result from not properly sealing the leaks. The more air that leaks out of your ductwork, the more energy it takes to heat and cool your home. Again, air leakage causes your equipment to run more often and harder to maintain your desired comfort set points.

**Unbalanced Ductwork:** Unbalanced or improperly adjusted ductwork is another problem typically experienced by homeowners. When you have an unbalanced system, the right amount of air is not going to each room and it takes more energy to keep you comfortable. A heating and cooling contractor can modify or adjust your ducts to evenly heat and cool every room in your home.

**Central Air Return Ducts:** A common design in many homes is a centrally located air return. When you close doors to rooms or certain areas of the home, you can cut off the supply of air to the return and create a pressure imbalance. Your contractor can correct this problem by installing a return duct in every room that has a supply duct.

A heating and cooling contractor that specializes in duct repairs can recommend solutions to solve many of these common duct problems. The contractor will use special diagnostic equipment to determine duct pressures, air flow and any leakages to help improve and maximize the efficiency of your duct system.



# Home Design

The layout of your home can greatly effect the comfort you experience from your heating and cooling system. Certain home design features can cause irregular heating and cooling or make it difficult to properly condition areas.

## Common Home Design Challenges

- Rooms with high or vaulted ceilings
- Rooms with a lot of windows
- Finished basements
- Bonus rooms or sun rooms
- Multi-leveled homes

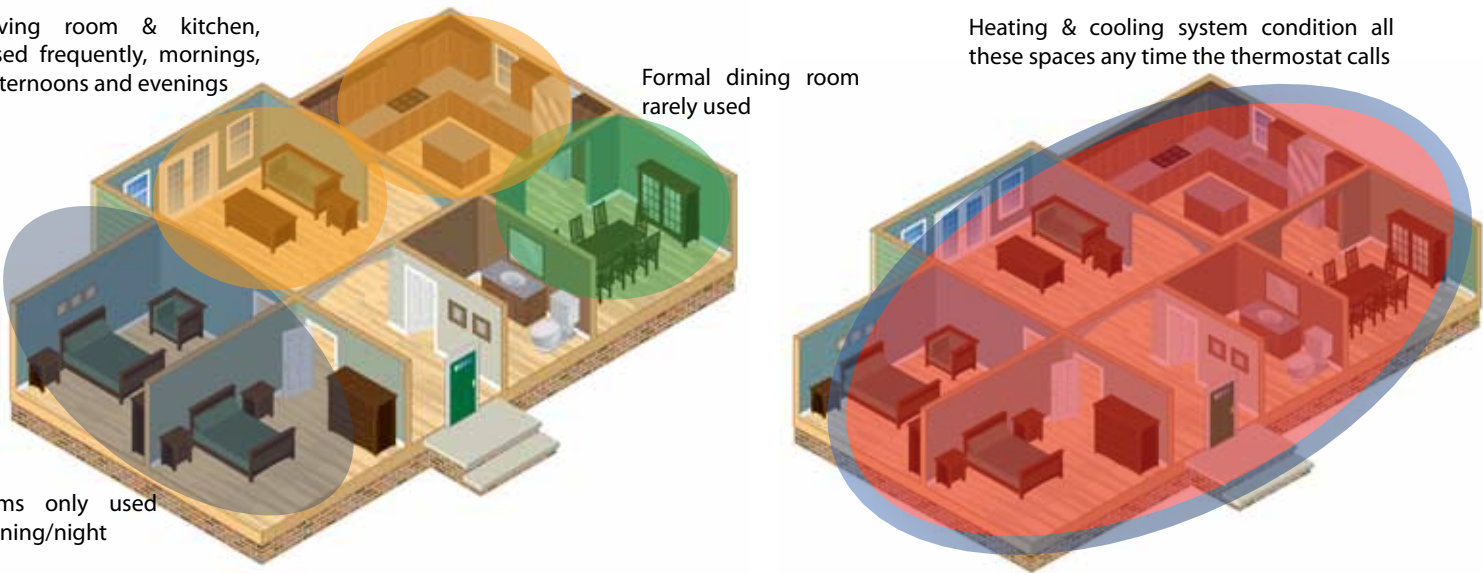
Heat rises which can be troublesome with high ceiling rooms or multi-leveled homes as your system tries to regulate two or more different temperature demands simultaneously.

Rooms with lots of windows or bonus rooms can be challenging to heat and cool due to exposure and insulation. Bonus rooms are usually above an empty space, like a garage, which has little or no insulation. They also may have been built with incorrect ducting, making it difficult to allow for conditioned airflow.

Living room & kitchen, used frequently, mornings, afternoons and evenings

Formal dining room rarely used

Heating & cooling system condition all these spaces any time the thermostat calls



Bedrooms only used late evening/night

## HOME DESIGN SOLUTION

To correct the challenges posed by home design, your contractor can install a zoning system which allows multi-point control over your heating and air conditioning system. By using multiple thermostats in various areas of your home, you can direct heating or cooling to areas where it's needed, only when it's needed. Zoning minimizes the energy being wasted trying to cool upstairs areas as it shuts off areas not needing conditioning using a damper system. The dampers open and close to let air flow get to where its needed in areas that are "calling" for heating or cooling and shut off other areas that do not need conditioning.

# Home Orientation

Depending on your home's design, your heating and cooling requirements can be significantly impacted by the movement and overall exposure to the sun. As the sun moves throughout the day, it heats up certain areas of your home, while leaving others cooler. If your thermostat is in one of the sunny areas, the room temperature will be drastically different than in the unexposed rooms.

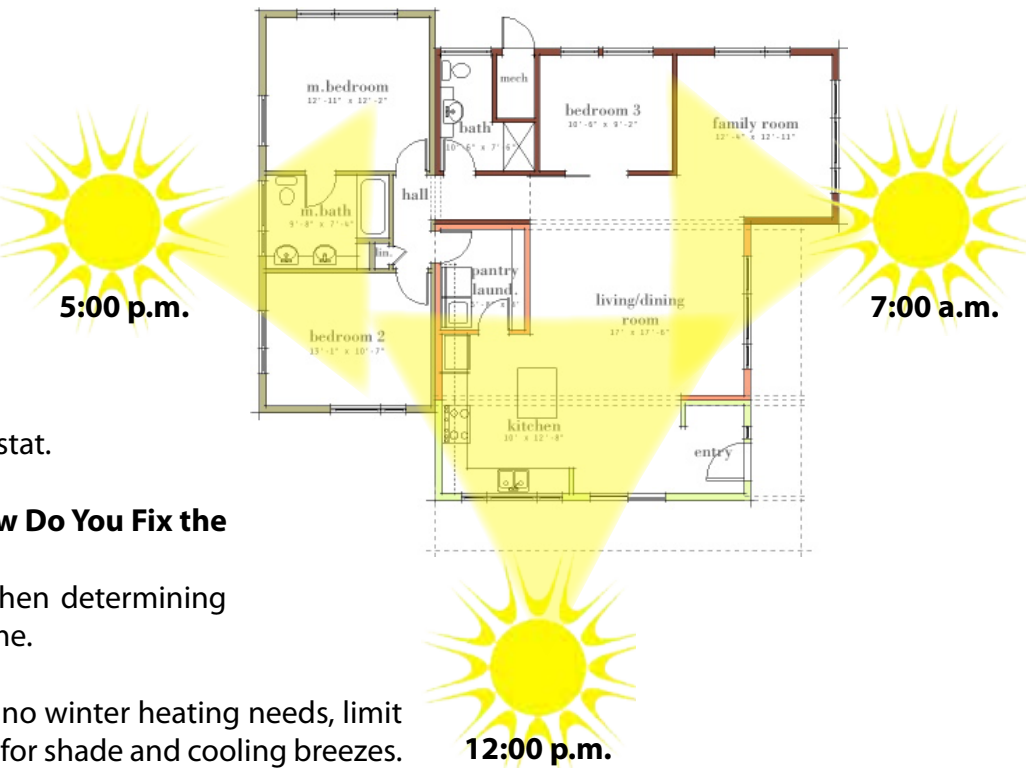
The placement and size of your windows can effect the temperature throughout your home. Rooms with many windows can quickly cool off once the sun has moved for the day, forcing your system to work harder to satisfy the difference. Beyond comfort issues, poorly oriented homes or windows can drastically raise your energy usage as you try to combat these influences with frequent adjustments to your thermostat.

## You Can't Move Your Home – So How Do You Fix the Problem?

There are a few points to look for when determining your living pattern for an existing home.

**Warm Climates:** In hot climates with no winter heating needs, limit the amount of sun exposure and look for shade and cooling breezes. Landscape features such as trees or hills can impact your home's energy needs. In the summer, when the sun is higher in the sky, trees with adequate tree-tops can help to shade the building and keep it cooler.

**Colder Climates:** Southern exposure is crucial to get maximum solar benefits. The most used areas of the house should be located on the winter side of the building, where sunlight can enter through windows or skylights. Other rarely occupied rooms like garages, storage rooms and laundry rooms should be located on the home's east/west and shorter sides, where they can act as an extra thermal buffer. Avoid glass in the east and west sides of the house, since it is a common cause of unwanted energy losses and glare.





# Choosing Your Contractor

Your heating and air conditioning should be designed to suit your needs and it's the responsibility of the contractor to make sure your system works at its top efficiency levels and meets your comfort expectations. Selecting a contractor means finding one who understands your comfort needs and provides the right solutions to meet them. Most of the following information was taken from the Air Conditioning Contractors of America (ACCA) website, [www.acca.org](http://www.acca.org).



## A Quality contractor...

- Complies with state and local codes and regulations and carries the proper business and workers compensation insurance.
- Is prompt, courteous and provides fast, reliable service while attempting to perform service at your convenience.
- Has the skill and knowledge to not only service your equipment, but if necessary, to design and install the right system for you.
- Is up to date on the newest developments in equipment, technology and design procedures in order to choose and install a system which will be the most efficient and most reliable for you.
- Takes the time to listen to your problem, cares about your comfort and notes the rooms which are too drafty or dry during the winter, or too hot or damp in the summer.
- Has been in business for several years. An established record provides two benefits: the likelihood the contractor has made his clients happy more often than not and if the contractor has established a track record, they should have not problem providing you with references who can back up their record.
- Will show you how to care for your system on a day to day basis. For example, how to change the filter and how to operate the thermostat. He or she will advise you about symptoms which could signal that there might be a problem with the equipment. After servicing your equipment, he or she will let you know when it should be serviced again.
- Performs a Manual J load calculation to ensure your new system, is properly sized for your home or building. They should inspect your existing furnace, and collect a wide range of information about your home: how many windows it has, which direction they face, how thorough is its insulation, etc. The contractor uses all of this information to calculate the load or the correct capacity for the furnace they would install.
- Offers preventative maintenance services to maximize the life of your equipment.
- Honors the terms of the warranty on the equipment throughout the warranty period.
- Will follow up with you to make certain that you are satisfied with the service and/or your new system.



## When dealing with a new contractor..

Ask the contractor for references. Find out if other customers were satisfied. Ask these questions:

1. Can they confirm that they hired the contractor in question?
2. Were they happy with the contractor's work?
3. Did the contractor finish the project on time and on budget?
4. Would they have any hesitation recommending this contractor to someone else?

- Ask the contractor about his or her license. If a license is required in your area, ask for the license number.
- Ask the contractor if he or she is a member of any industry associations.
- Contact your local Better Business Bureau and ask them if anyone has filed a complaint about this contractor.
- If their estimate is vastly different from others you have received, don't be afraid to ask why. It is highly possible they may have noticed something that other contractors missed.
- Make sure you understand all the services a contractor offers. Is scheduled maintenance included? What about repairs? Is the contractor available 24 hours a day?
- Visit their website, if they have one, to find any offers or specials of services and products.
- Ask if the contractor/technicians are NATE (North American Technician Excellence) certified or certified by any other organization such as HVAC Excellence, RSES (Refrigeration Service Engineers Society) or UA Star.
- Professional associations are another good way to screen for high quality local heating and A/C service companies. These organizations include: ACCA (Air Conditioning Contractors of America), ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) and RSES (Refrigeration Service Engineers Society).
- You should select a contractor that has the kind of employees you will feel comfortable having in your home as ideally, they will install, maintain and repair your heating and air conditioning system for years to come.

Source for the above information: [www.acca.org](http://www.acca.org)



# PLANNING FOR IMPROVEMENT

After considering all the internal and external factors that impact your home comfort, you may be considering changes or improvements to your heating and cooling system. Before investing in new equipment or other upgrades to your comfort systems, there are a few factors to consider about your existing system, lifestyle patterns and selecting the correct contractor for your needs.

## Lifestyle Pattern

One of the most important influences on your comfort is how your family uses your home. In the tables on the following pages, fill in how your family typically utilizes your home during a week day and weekend day in each season.

## Analyzing Your Lifestyle Pattern

From this exercise, you should see a pattern in how you use your home, what we call a Lifestyle Pattern. For instance, you may use the upstairs only during sleeping hours while the kitchen and living room are most frequently occupied in the evenings and weekends. The whole home may be completely unoccupied during workday hours. By plotting your lifestyle pattern, you can see where you are wasting energy in your home. Additionally, you are able to see where and when you need conditioning in certain areas throughout the day.

While you only use some areas of your home, your heating and air conditioning work to heat and cool your entire house, not just the occupied rooms. The result is costly, wasted energy as your system works longer to condition spaces that do not need it.



During the weekday, our home is virtually empty (except for pets): ex. 8am – 3pm

From \_\_\_\_\_ To \_\_\_\_\_

Our household is usually asleep: ex. 11pm – 6am

From \_\_\_\_\_ To \_\_\_\_\_

Determining the rooms you spend the most AWAKE hours in will help when creating a plan for conditioning your air in the most effective and efficient manner.

## Rate the usage of the living space in your home:

- 1: Never use – except for rare occasions
- 2: Rarely use – just a few hours each week
- 3: Spend about 50% of our time in this room
- 4: Frequently use
- 5: Except for when we are at work – there is always someone in this room

### SPRING

	Weekday	Weekend		Weekday	Weekend
Living Room			Bedrooms		
Kitchen			Home Office		
Family Room			Basement		
Dining Room			Bonus room		
Master Bedroom			Other:		

### SUMMER

	Weekday	Weekend		Weekday	Weekend
Living Room			Bedrooms		
Kitchen			Home Office		
Family Room			Basement		
Dining Room			Bonus room		
Master Bedroom			Other:		



Rate the usage of the living space in your home:

- 1: Never use – except for rare occasions
- 2: Rarely use – just a few hours each week
- 3: Spend about 50% of our time in this room
- 4: Frequently use
- 5: Except for when we are at work – there is always someone in this room

FALL

	Weekday	Weekend		Weekday	Weekend
Living Room			Bedrooms		
Kitchen			Home Office		
Family Room			Basement		
Dining Room			Bonus room		
Master Bedroom			Other:		

WINTER

	Weekday	Weekend		Weekday	Weekend
Living Room			Bedrooms		
Kitchen			Home Office		
Family Room			Basement		
Dining Room			Bonus room		
Master Bedroom			Other:		

What can you do to improve this situation?



ZONING SYSTEMS

To combat wasted energy by your heating and cooling system, your heating and air conditioning contractor can install a zoning system. Zoning solves the issues associated with a single thermostat by putting the control where it’s needed, when it’s wanted. It provides the comfort and control you expect in your home, while using less energy to operate your heating and cooling equipment.

As energy costs rise homeowners are challenged to develop ways to cut expenses. With a zoning system, you are no longer forced to choose between your comfort and energy savings. By dividing your home into distinct comfort zones and giving each its own thermostat, you can regulate the temperature and timing of heating/cooling by room. Areas that aren’t being used are simply shut off from receiving conditioned air which reduces the amount of energy your home needs.

BUT FIRST...

Before you meet with your contractor to discuss zoning your home, determine which rooms require customer control. Group rooms together with similar usage patterns or areas that may be troublesome to condition. When you are laying out your zones, or distinct areas, there are a few things to keep in mind.

- South facing rooms can be combined
- Rooms that are shaded or face the north can become another zone
- Rooms on the same level when the home has multiple stories can be combined
- Rooms with common usage patterns such as combining bedrooms together (provided they are on the same level)
- Consider creating equally sized zone areas

When considering which zoning system to install, ask about the Arzel Zoning System. It features retrofit dampers which control the flow of air and can be installed in most existing applications without any need to reconfigure your ductwork.

For more information on the features and benefits of Arzel Zoning, visit [www.arzel.com](http://www.arzel.com)

COMFORT & ENERGY EFFICIENCY



Save up to \$300 annually on your energy costs!

Heating and cooling your home accounts for 50% of your overall energy consumption.

Using a zoning system can drastically reduce a lot of wasted energy by putting air where you want it, when you want it. However, if you have older, outdated equipment, your home energy consumption can still be high when operating your heating and cooling systems.

Now, you can replace your existing heating and cooling system’s PSC motor with an Evergreen motor. It’s like giving your car a new, more fuel-efficient transmission. Its energy-saving technology will instantly upgrade the efficiency of your heating and cooling system, using 30-50% less electricity and saving you approximately \$125 each year on your electric bill.

# YOUR HOME & INDOOR AIR QUALITY



According to the Environmental Protection Agency, you spend the majority of your time indoors and may not realize the air you breathe inside can be just as polluted (if not more) than the air outdoors! Luckily, this is one source of pollution you can control using indoor air quality (IAQ) technology in your homes, offices, schools and other buildings.

Some of the pollutants found indoors can cause health problems such as sore eyes, burning in the nose and throat, headaches, or fatigue. Other pollutants can be more serious in their effects, causing worsening allergies, respiratory illnesses (asthma), heart disease, cancer and other serious long-term conditions. In some cases, certain concentrations of a pollutant, such as carbon monoxide can be fatal.

## Pollutants in Your Home

Better understanding and controlling the common pollutants found in your home can help improve your indoor air quality and reduce your family's risk of health problems. The following are what the EPA reports as the most common indoor air pollutants and the health effects they hold for you and your family.

**Radon** is a radioactive gas that is formed in the soil. It can enter indoors through cracks and openings in floors and walls that are in contact with the ground. Radon is the leading cause of lung cancer among nonsmokers, and the second leading cause of lung cancer overall.

**Secondhand smoke** comes from burning tobacco products. It can cause cancer and serious respiratory illnesses. Children are especially vulnerable to secondhand smoke. It can cause or worsen asthma symptoms and is linked to increased risks of ear infections and Sudden Infant Death Syndrome (SIDS).

**Combustion Pollutants** are gases or particles that come from burning materials. In homes, the major source of combustion pollutants are improperly vented or unvented fuel-burning appliances such as space heaters, woodstoves, gas stoves, water heaters, dryers, and fireplaces. The types and amounts of pollutants produced depend on the type of appliance, how well the appliance is installed, maintained, and vented, and the kind of fuel it uses.

*\*All Information from the Environmental Protection Agency website at [www.epa.gov/iaq](http://www.epa.gov/iaq)*



Common combustion pollutants include:

**Carbon monoxide (CO)** is a colorless, odorless gas that interferes with the delivery of oxygen throughout the body. Carbon monoxide causes headaches, dizziness, weakness, nausea, and even death.

**Nitrogen dioxide (NO<sub>2</sub>)** is a colorless, odorless gas that causes eye, nose and throat irritation, shortness of breath, and an increased risk of respiratory infection.

Volatile organic compounds (VOCs) are chemicals found in paints and lacquers, paint strippers, cleaning supplies, varnishes and waxes, pesticides, building materials and furnishings, office equipment, moth repellents, air fresheners, and dry-cleaned clothing. VOCs evaporate into the air when these products are used or sometimes even when they are stored.

Volatile organic compounds irritate the eyes, nose and throat, and cause headaches, nausea, and damage to the liver, kidneys, and central nervous system. Some of them can cause cancer.

**Asthma** triggers include mold, dust mites, secondhand smoke, and pet dander. A home may have mold growing on a shower curtain, dust mites in pillows, blankets or stuffed animals, secondhand smoke in the air, and cat and dog hairs on the carpet or floors. Other common asthma triggers include some foods and pollutants in the air.

Asthma triggers cause symptoms including coughing, chest tightness, wheezing, and breathing problems. An asthma attack occurs when symptoms keep getting worse or are suddenly very severe.

**Molds** produce spores that float in the air, land on damp surfaces, and grow. Inhaling or touching molds can cause hay fever-type symptoms such as sneezing, runny nose, red eyes, and skin rashes. Molds can also trigger asthma attacks.

*\*All Information from the Environmental Protection Agency website at [www.epa.gov/iaq](http://www.epa.gov/iaq)*



## Steps to Improve Indoor Air Quality

- Test for radon and fix if there is a problem.
- Reduce asthma triggers such as mold and dust mites.
- Do not let people smoke indoors.
- Keep all areas clean and dry.
- Clean up any mold and get rid of excess water or moisture.
- Always ventilate when using products that can release pollutants into the air; if products must be stored following use, make sure to close tightly.
- Inspect fuel-burning appliances regularly for leaks, and make repairs when necessary.
- Consider installing a carbon monoxide alarm.

### Carbon Monoxide

Fireplaces and leaking chimneys are common sources of carbon monoxide. Be sure to ventilate rooms that have fireplaces, make certain the flue damper is operational and fully open when in use, and ensure the chimney is properly sealed. To help prevent carbon monoxide exposure, make sure appliances such as gas stoves vent to the outside whenever possible and that all appliances are properly installed, used and maintained.

### Secondhand Smoke

Secondhand smoke from cigarettes, cigars, and other tobacco products can trigger asthma and other respiratory illnesses especially in children. To help protect children from secondhand smoke, do not smoke or allow others to smoke inside your home or car.

### Mold

Bathrooms are a common source of mold. Humidity from showers can cause moisture problems, which will lead to mold growth. Mold can cause allergic reactions, asthma and other respiratory ailments. Installing and using a ventilation fan will help to control moisture and inhibit mold growth.

### Dust

Dust mites can trigger allergy and asthma attacks. Dust mites are everywhere especially on pillows, blankets, carpets, upholstered furniture and stuffed toys. Dust and vacuum your home regularly, wash bedding, and use allergen-proof mattress and pillow covers



### Volatile Organic Compounds

Common household cleaners, often placed under the kitchen sink release VOCs when used and stored. Store household products that contain chemicals according to manufacturers' instructions and keep all products away from children. Paints, resins, paint thinners, and chemicals and other products will still release VOCs even while stored properly. Make sure there is plenty of ventilation when painting, remodeling or using other products that may release VOCs. Consider purchasing low and no VOC products.

### Pesticides

When used to rid homes of rodents, termites, insects and other pests, pesticides can irritate the eyes, nose, and throat; damage the central nervous system and kidneys; and increase the risk of cancer. Don't leave food out, and if you must use pesticides, ventilate during and after use and follow directions to limit exposure. Use non-chemical methods of pest control when possible.

### Pet Dander and Hair

Pets can trigger allergy and asthma attacks due to dander and hair. Keep them out of the sleeping areas and away from upholstered furniture, carpets, and stuffed toys. Vacuum and clean carpets, rugs, and furniture often.



## Improving Your Home and IAQ

While remodeling or improving the energy efficiency of your home, steps should be taken to minimize pollution from sources inside the home, either from new materials or from disturbing materials already in the home. In addition, residents should be alert to signs of inadequate ventilation, such as stuffy air, moisture condensation on cold surfaces, or mold and mildew growth.

When building new homes, homebuyers today are increasingly concerned about the IAQ of their homes. Pollutants like mold, radon, carbon monoxide, and toxic chemicals have received greater attention than ever as poor IAQ has been linked to a host of health problems. To address these concerns, builders can employ a variety of construction practices and technologies to decrease the risk of poor IAQ in their new homes using the criteria from EPA's Indoor airPLUS as a guide.

To help ensure that you will have good IAQ in your new or remodeled home:

- Ask about including radon-reducing features.
- Provide proper drainage and seal foundations in new construction.
- Consider installing a mechanical ventilation system. Mechanical ventilation systems introduce fresh air using ducts and fans, instead of relying on holes or cracks in the walls and windows.
- When installing new appliances, like furnaces, make sure they are installed properly with a good vent or flue.



*\*All Information from the Environmental Protection Agency website at [www.epa.gov/iaq](http://www.epa.gov/iaq)*

# CARING FOR YOUR SYSTEM



Throughout the year, there are several maintenance tasks you can perform yourself on your heating and air conditioning equipment. The following are general tips to help you care for your system in between service calls and check-ups. If at any time you are unsure of how to proceed or feel your equipment has a problem, contact your heating and air conditioning contractor immediately. Do not try to troubleshoot problems on your own. Doing so can lead to more costly damage and potential danger to yourself and home.

Many contractors offer service agreement contractors which can offer peace-of-mind for unforeseen equipment issues throughout the year. Ask your contractor if their company offer these agreements for service, maintenance and preventative care of your system.

All maintenance care should be done only when you have a general understanding of your system. If you are unsure on how to safely conduct the suggested tips, please contact your HVAC contractor. Improper maintenance can cause a system to operate incorrectly or cause injury.

## General System Maintenance

1. Check your thermostat before each season to ensure the batteries are charged and the settings match your comfort needs. Consider installing a programmable thermostat to control your day-to-day comfort needs such as setting the temperature back when you are at work or sleeping.
2. Lubricate all moving parts. Parts that lack lubrication cause friction in motors and increase the amount of electricity you use.
3. Check and inspect the condensation drain in your central air conditioner, furnace and/or heat pump (when in cooling mode). A plugged drain can cause water damage in the house and affect indoor humidity levels.
4. Check controls of the system to ensure proper and safe operation. Check the starting cycle of the equipment to assure the system starts, operates and shuts off properly.

## Air Conditioning Maintenance

1. Clean evaporator and condenser air conditioning coils. Dirty coils reduce the system's ability to cool your home and cause the system to run longer.
2. Clean and adjust blower components to provide proper system airflow for greater comfort levels.
3. Check the aluminum fins on the rear of the unit – they can get bent and crushed when objects touch them, reducing the efficiency of the unit.



## Heating System Maintenance

Before the first frost, test your heating system to see if it runs. If there is no heat, you can try:

1. Check for blown fuses or a tripped circuit breaker
2. Contact a professional if you don't feel any warm air coming from the vents
3. Check the pilot light if you have a natural gas system. The flame should always be clear blue. A yellow or orange flame could be a sign of a problem.
4. Always change your furnace filters each year.
5. Make sure there are no drapes, furniture or plants blocking the vents. Proper flow of air from the vents will ensure that the heat coming from the system will get out into all the spaces that need it.
6. Have your equipment cleaned annually by a licensed HVAC contractor.



# ENERGY SAVINGS FOR YOUR SYSTEM

According to Energy Star, the annual average energy bill for a single family home is \$2,200.

The Energy Star program is a joint effort of the U.S. Environmental Protection Agency and the U.S. Department of Energy to help consumers save money while protecting the environment through energy efficient products and practices. Energy efficient choices can save about a third on your energy bill with similar savings of greenhouse gas emissions, without sacrificing features, style or comfort. Visit the Energy Star website for a list of approved products: [www.energystar.gov](http://www.energystar.gov).

While many products can be implemented into your home to reduce energy costs, there are other, simple energy-saving measures you can take without making additional purchases. The following are easy steps you can do yourself to help save energy throughout the year.



## General Energy Saving Tips

1. Have your system maintained annually by a qualified technician.
2. Inspect, clean or replace your filters monthly.
3. Don't block your registers or vents.
4. Install a programmable thermostat that should be located on an inside wall away from drafts and heat sources.
5. Duct work should be sealed and insulated.
6. When buying a new system make sure it is Energy Star rated and is sized to meet the requirements of your home.

## Cooling Season Energy Tips

1. Keep lights off when rooms are not in use. Lights generate heat, making your air conditioner run more.
2. Try to wash and dry clothes, iron and cook in the morning or later in the evening. Use microwave ovens, which produce much less heat than stoves for cooking.
3. Use curtains or blinds to keep out direct sunlight, to keep your rooms cooler during the day.
4. Refrain from activities in the afternoon that involve continuous in and out through the doors of your home. Constant travel between inside and outside allows cool air to escape and hot air to enter the home.
5. Setting the temperature a little higher can help save 6 to 8 percent of your cooling costs for each degree above 78 and most people will be comfortable.
6. A fan can make the temperature feel three to four degrees cooler and only costs a half-cent per hour to operate. This allows you to set your thermostat a few degrees higher and save on cooling costs. Only run fans in occupied areas to avoid wasting energy. Make sure the fan is running in the clockwise direction in the summer so the air is pushed down to create a wind chill.
7. Be sure your air conditioner is not blocked. A free flowing air conditioner operates most efficiently.
8. When air conditioning is running, close doors and windows. Be sure to turn off kitchen or bathroom exhaust fans when your air conditioning is operating.
9. Caulk and weather-strip leaky windows and doors to prevent air from escaping.
10. If you suspect your air conditioning system is not cooling properly, have it checked promptly. A unit that is having operational problems can cause extremely high bills.

## Heating Season Energy Tips

1. During the heating season, keep the shades open on any south-facing windows during the day to allow the sunlight to enter your home and closed at night to reduce the chill you may feel from cold windows.
2. Use storm or thermal windows in colder areas. The layer of air between the windows acts as insulation and helps keep the heat inside.
3. You may be able to cut heat loss in half by weather-stripping doors and windows. Be sure to place weather-stripping on attic and basement doors to prevent heat from escaping.
4. Move furniture away from any exterior walls to put space between you and the cold walls. This allows air to move around, making the house feel warmer.
5. Dust acts as a great insulator and builds up on radiators and baseboard heat vents. It keeps the heat from getting into the rooms where you need it. Be sure to dust or vacuum all radiator surfaces frequently.

# Frequently Asked Questions

## ***How do I know if I have an existing warranty on my furnace, air conditioner or HVAC system?***

Look at the label on the equipment for a manufactured date. If the equipment is less than five years old, it may still be covered under warranty. Warranty terms and conditions vary widely by manufacturer and the installing company.

## ***What's causing my ductwork to pop when the furnace starts or stops?***

Since most heating ducts are made of metal, they conduct noise easily from the unit handling the air all the way down the run. If a popping sound comes from the ducts, it may be due to thermal expansion. It can also be caused by a loose piece of metal being caught by the air passing through it. The ducts and pipes will actually expand as they are heated by warm air blowing through. This is a normal occurrence, but fixable. If the noise is too annoying, call your heating and cooling contractor so they can diagnose the cause of the noise as determine the appropriate solution.

## ***Why is a SEER rating important?***

SEER stands for Seasonal Energy Efficiency Ratio. It's a number that describes how well air-conditioning equipment works. A higher SEER means better efficiency and the potential for lower energy bills when used correctly. Typically, manufacturers which have higher SEER ratings on their products use newer or better technology, meaning the higher the SEER rating the more the equipment will usually cost.

## ***How can I know what size system I need for my home?***

There are many things which will determine the size, or the capacity, of the system your home requires. Some of these are: square feet to be cooled/heated, climate, humidity, number of windows, insulation factors, which direction your home faces, heat producing appliances, and even the number of people who will be in the home. Your HVAC professional should complete a Manual J load calculation to determine the appropriate size of equipment needed to properly heat or cool your home.

## ***Should I cover my outdoor unit in the winter?***

Covering your unit is not necessary. Air conditioners are manufactured to withstand all possible climate changes. In fact, rain helps keep your unit clean. Heat pumps run all year long so it is important that they never be covered.

## ***How will the EPA's new regulations regarding R-410a refrigerant affect me?***

Due to growing environmental concerns, in 2003 the Environmental Protection Agency passed the Montreal Protocol Act. This piece of legislation has already had a significant impact on the heating and air conditioning industry and will continue to impact it in the coming years. This legislation began the process of phasing out R-22, an ozone-depleting HCFC refrigerant used in most HVAC systems around the world. In 2010, heating, ventilation and air-conditioning system manufacturers were no longer able to produce new air conditioners and heat pumps containing R-22.

The refrigerant that has been designed to take its place is R-410a which is better for the environment and it allows new equipment to run quieter and be more efficient. Your contractor will still be able to replace existing R-22 systems with remaining reserves of R-22, however, over the next few decades that supply will eventually run out. Therefore, when you are purchasing a new system, you can also speed the transition away from ozone-depleting R-22 by choosing a system that uses ozone-friendly refrigerants.

## ***How can I control the humidity in my house?***

Removing unwanted moisture in your home is one of the primary functions of your home's air conditioning system, however to do this the equipment and ductwork must be sized and installed correctly. Appropriately sized systems have sufficient capacity, run times that are long enough and ample airflow to pull excess humidity out your home. Precisely designing a system for your home keeps you more comfortable. It can also save you money in the process.

Winter may pose the opposite problem for you as your home's humidity level may become too low. This often causes skin irritations, dried out sinuses, damage to hardwood floors and furniture, and general discomfort. Regardless of whether you have a heat pump or a gas, oil, or electric furnace a whole-house humidification system to meet your needs can be designed.

## ***Are there any advantages to using the fan's "On" setting versus the "Auto" setting on my thermostat?***

Switching your fan into the "on" position provides continuous filtration of the air in your home. As the air circulates through your system, it is constantly being passed through your filters. As a result, the quality of the air in your home improves.

## ***How close to the outdoor unit should I plant shrubs or flowers?***

Manufacturers generally agree that plants or other obstructions should be no closer than eighteen inches to your heat pump or air conditioning unit. Any closer and they may restrict the intake and exhaust of air necessary for your system to operate properly.

## ***How much will a new heating and air conditioning system cost?***

Purchasing a new heating and air conditioning system is one of the largest and most important investments that can be made for your home. A variety of factors will impact the cost of your new system. Your contractor should perform a load calculation survey on your home to ensure your new system matches the capacity and demand of your home.

Your ductwork should be inspected to see if any repairs or alterations should be made. There are many system manufacturers to choose from, work with your contractor to select the best make and model that fits your home's needs. Now is the time to consider the efficiency rating of the new system, as higher efficiency can save more energy.





# Glossary of Common Terms

**Air Conditioner-** Device used to control temperature, humidity, cleanliness and movement of air in a confined space.

**Air Conditioning-** Control of the temperature, humidity, air movement and cleaning of air in a confined space.

**Air Flow-** The distribution or movement of air.

**Air Handler-** Fan-blower, filter and housing parts of a system.

**Balancing-**Process of adjusting the flow of air in duct systems or water flow in hot-water heating systems.

**BTU-** (British Thermal Unit) Quantity of heat required to raise the temperature of one pound of water one degree Fahrenheit.

**Condenser Coil-**Part of the outdoor portion of a split-system air conditioner or heat pump. By converting refrigerant that is in a gas form back to a liquid, the coil transfers heat carried by the refrigerant to the outside.

**Compressor-**Pump of a refrigerating mechanism that draws a low pressure on cooling side of refrigerant cycle and squeezes or compresses the gas into the high pressure or condensing side of the cycle.

**CFM-**(Cubic Feet per Minute) A standard measurement of airflow that indicates how many cubic feet of air passes by a stationary point in one minute. The higher the number, the more air is being forced through the system. A typical system produces 400 CFM per ton of air conditioning.

**Damper-**A device that is located in ductwork to adjust air flow.

**Dehumidification-**The reduction of water vapor in air by cooling the air below the dew point; removal of water vapor from air by chemical means, refrigeration, etc.

**Duct-**A pipe or closed conduit made of sheet metal, fiberglass board, or other suitable material used for conducting air to and from an air handling unit.

**EER** (Energy Efficiency Rating)-The Air-Conditioning and Refrigeration Institute standardized this rating, which reports central air conditioning efficiency at 80°F indoors and 95°F outdoors. This rating measures steady-state efficiency. Steady-State efficiency is the efficiency of the air conditioner once it is up and running. To reduce energy bills associated with cooling your home, look for a high EER rating and EnergyStar compliance when purchasing a new air conditioner.

**Filter-**A device for removing dust particles from air or unwanted elements from liquids.

**Forced Air-**This describes a type of heating system that uses a blower motor to move air through the furnace and into the ductwork.

**Furnace-**A self-contained heating unit that is designed to deliver heated air to a home.

**Geothermal Equipment-**Heat pumps that uses the ground to transfer heat to and from the refrigerant in the unit. The unit circulates water through a heat exchanger to a closed loop buried in the ground or by pumping water from a well through the unit.

**Heat Exchanger-**This is a device that enables furnaces to transfer heat from combustion safely into breathable air. The primary heat exchanger transfers heat from combustion gases to the air blowing through the ductwork.

**Heat Pump-**Compression cycle system used to supply heat to a temperature controlled space. Same system can also remove heat from the same space.

**Humidifier-** A device that adds moisture to warm air being circulated or directed into a space.

**Humidistat-**A device designed to regulate humidity input by reacting to changes in the moisture content of the air.

**HVAC-**Abbreviation for Heating, Ventilation and Air Conditioning.

**IAQ-**Indoor air quality.

**Load Calculation-**A mathematical determination of how much cooling and heating (BTUs) an HVAC system must deliver for occupant safety and comfort. It is based on a variety of factors: square footage, building orientation, number of occupants, size and placement of rooms, number and size of windows and doors, amount of insulation, number of floors, and climate.

**Manual J-** An ACCA procedure covering the method for calculating heating and cooling requirements (load calculation) for single-family detached homes and mobile homes.

**Refrigerant-**A fluid that absorbs heat at low temperatures and rejects heat at higher temperatures.

**R-22** (Freon)-A refrigerant containing chlorine used in air conditioning systems. The EPA has mandated that R-22 cannot be manufactured after 2010 because it has been linked to the depletion of the ozone layer and global warming. Most commonly referred to by its trademarked name, Freon.

**R-410A-**The refrigerant that replaces R-22. It does not contain chlorine and is not hazardous to the environment.

**Return Air-**The path the air takes to get to an air-handling unit or furnace so it can be cooled or heated.

**SEER Rating:** (Seasonal Energy Efficiency Ratio)- The total cooling of a central unitary air conditioner or unitary heat pump in BTU's during its normal annual usage period for cooling divided by the total electric energy input in watt-hours during the same period.

**Split System-**A two-component heating and cooling system. The condensing unit is installed outside; the air handling unit is installed inside. Refrigerant lines and wiring connect them together.

**Supply Air-**The part of an HVAC system that supplies the conditioned air from the air-handling unit or furnace to your home.

**Thermostat-** A temperature sensitive switch for controlling the operation of a heater or furnace.

**Ton-** A unit of measure for cooling capacity. One ton equals 12,000 BTUs per hour.

**Zoning-** Single HVAC system that can meet different heating and cooling needs in different areas (zones) of the home. Each zone of a home has its own thermostat with which it regulates the temperature and humidity in its area.

Arzel Zoning Technology, Inc. is the industry leading innovator of comfort and efficiency enhancement systems for retrofit as well as new construction HVAC projects. Arzel solutions are available throughout North America via a growing network of contractors and wholesale distributors. The patented solutions offered by Arzel lead the zoning industry in installation flexibility, reliability and warranty.

For more information on Arzel products please visit [www.arzel.com](http://www.arzel.com) or ask you heating and cooling contractor.

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