WELCOME *to your* NEW HOME

Homeowners' Manual

ENVIRONMENTS FOR *Living*®

CONGRATULATIONS ON MOVING INTO *your* NEW HOME

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WELCOME TO YOUR NEW HOME!

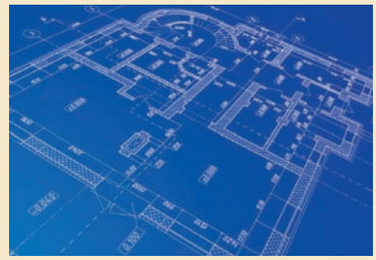
Your builder has made a special commitment to advanced building science techniques by participating in the Masco Home Services, Inc. *Environments For Living*® program. This program requires your builder to meet specific building standards that are designed to result in homes that are safer and more energy efficient, comfortable and durable than conventionally built homes. Many features of the *Environments For Living* program are not things you can see or touch. It's all about using building science to build homes. This manual explains the features of the program and how homes built to the program's specifications are different and benefit homeowners.

While your builder may have taken care to build your home, there are maintenance and operational issues that you should know about your home in order to help keep your home performing properly. This manual explains some of these issues.

HOW TO USE YOUR NEW HOME

1. The first section of this manual contains the BASICS on how homes built in compliance with the program's specifications differ from conventionally built homes and the basics of what you should know about maintaining, operating and living in your home. And you may want to review it periodically to refresh yourself on the home maintenance and operation tips included here.

2. The second section describes in more detail the SCIENCE behind the key features of homes built in compliance with the program specifications. You should read this section to learn why these features are important and why certain operation and maintenance issues help in optimizing the performance of your home. This section offers quick tips, as well as specific maintenance and operation information. And some of it may surprise you.



KEY FEATURES OF YOUR NEW HOME

The *Environments For Living*® program prescribes a set of specifications for heating, ventilation, air conditioning, ductwork and the outer shell, or "building envelope," that encases a home's living quarters. All these requirements serve to improve the efficiency and performance of the home. While some of these features have overlapping benefits, the following is a summary of the seven key areas that the *Environments For Living* program addresses and what they provide.

1 TIGHT CONSTRUCTION

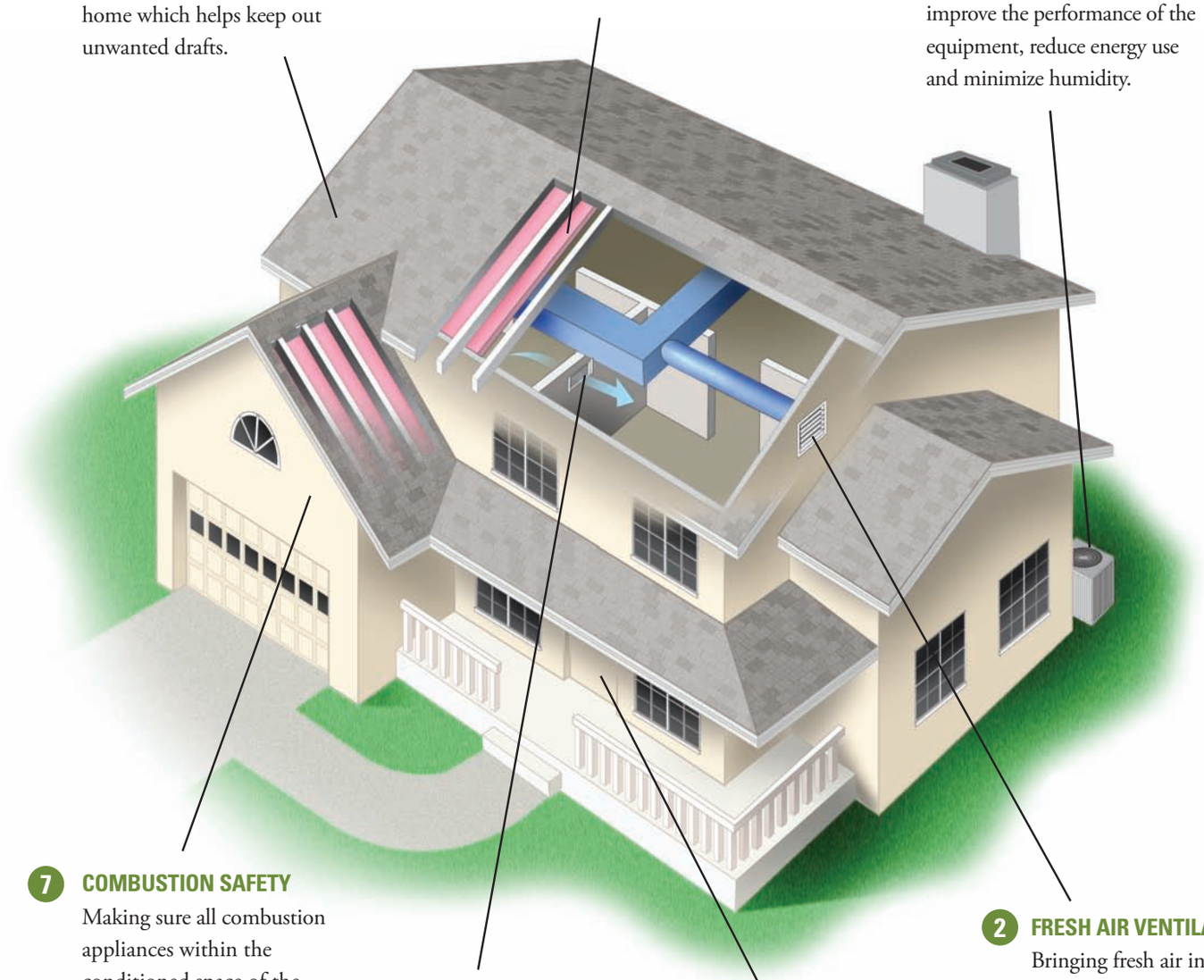
Framing techniques include a continuous air barrier enclosing the conditioned space of the home which helps keep out unwanted drafts.

3 IMPROVED THERMAL SYSTEMS

Energy performance is enhanced by paying careful attention to avoid insulation gaps, voids and compressions and by installing energy-efficient windows.

4 RIGHT-SIZED HVAC SYSTEMS

Right-sizing is the process of determining which heating, ventilation and air conditioning system should be used in any particular structure, and helps improve the performance of the equipment, reduce energy use and minimize humidity.



7 COMBUSTION SAFETY

Making sure all combustion appliances within the conditioned space of the home are sealed or power vented helps avoid back-drafting of appliances and buildup of carbon monoxide. CO detectors provide an extra measure of safety.

5 PRESSURE BALANCING

Installing returns, transfer grilles and/or jump ducts can help balance air pressure throughout the home and can result in more even temperatures and reduced potential for condensation build up.

6 INTERNAL MOISTURE MANAGEMENT

Vents, pressure balancing, fresh air ventilation and "right-sized" HVAC equipment work to reduce moisture in multiple ways.

2 FRESH AIR VENTILATION

Bringing fresh air into the home in a controlled manner helps maintain beneficial air exchange rates and dilutes indoor contaminants and everyday pollutants, dust and odors.

TIPS ON MAINTENANCE AND OPERATION

CEILING FANS (IF APPLICABLE)

- Use the ceiling fans only when rooms are occupied. Cooling associated with air movement can make occupants comfortable at air temperatures several degrees warmer than otherwise. But all that ceiling fans do when rooms are empty is unnecessarily use electricity and contribute heat from the fan motor. The same can be said for the lights built into most ceiling fans. Turn off ceiling fans and lights when you leave the room.

SPOT VENTILATION

- Use spot ventilation fans in your bathrooms and kitchen. All of these fans should be vented directly to the outside, in which case these fans will help remove air contaminants and excessive humidity associated with activities in these rooms.

SMOKE DETECTORS

- Replace backup batteries in smoke detectors and programmable thermostats as recommended by the manufacturer. Each of these devices typically operates off of house current during normal operation but relies on batteries if and when your home loses power. Each should receive fresh batteries as recommended by the manufacturer or as otherwise needed—but at least every year. When you change batteries, perform maintenance as recommended by the manufacturer, such as, for example cleaning dust from the device. Excess dust may interfere with proper operation.
- Test your home's smoke detectors. Each device comes equipped with a test button. Test each one as recommended by the manufacturer—but at least once a year.

PAINT AND OTHER FLAMMABLE ITEMS

- Store touch-up paint and other flammable items in a safe location away from the water heater, air handler, fireplace or any other combustion sources.

THERMOSTAT

- Set your thermostat no higher than 72 degrees F during the heating season and no lower than 75 degrees F during the cooling season. Your heating and cooling systems have been sized per industry standards for energy-efficiency and comfort. Be aware that setting your thermostat above the highest recommended temperature for heating and/or below the lowest recommended temperature for cooling may compromise the equipment's short-term and/or long-term performance. In addition, the *Environments For Living*® program Limited Guarantee, if one has been issued for your home, requires among other things, that you set your thermostat no higher than 72 degrees F during the heating season and no lower than 75 degrees F during the cooling season. If you received a Limited Guarantee, please refer to its terms and conditions for details or call 866-912-7233 for more details.

USE THE TABLE BELOW TO HELP MANAGE HOUSEHOLD ENERGY USE.

APPLIANCE	WATTS USED
Coffee maker	900 – 1,200
Clothes washer	350 – 500
Clothes dryer	1,800 – 5,000
Dishwasher (Using the drying feature greatly increases energy consumption)	1,200 – 2,400
Ceiling fan	65 – 75
Hair dryer	1,200 – 1,875
Clothes iron	1,000 – 1,800
Microwave oven	750 – 1,100
Personal computer:	
CPU awake/asleep	120/30 or less
Monitor awake/asleep	150/30 or less
Laptop	50

APPLIANCE	WATTS USED
Radio (stereo)	400
Refrigerator (16 cubic feet, frost free)	725
Televisions:	
27"	113
36"	133
53"-61" Projection	170
Flat screen	120
Toaster	800 – 1,400
Vacuum cleaner	1,000 – 1,400
VCR/DVD	17–21 / 20–25

A watt is the basic unit of electrical power.
Source: A Consumer's guide to Energy Efficiency and Renewable Energy, U.S. Department of Energy

FREQUENTLY ASKED QUESTIONS

Q: I HAVE NOTICED THAT A FAN COMES ON WHEN MY AIR CONDITIONER IS NOT RUNNING. IS THERE A PROBLEM?

A: *The Environments For Living*® program requires fresh air ventilation. Filtered fresh air helps reduce interior moisture, dust, odors and indoor contaminants for improved indoor air quality. Your builder may have chosen to use a system that delivers 5–10 minutes of fresh air every 20 minutes that the heating and air conditioning system is not in use.

Q: HOW MUCH ENERGY DOES THE FRESH AIR FAN USE TO OPERATE?

A: The fan uses approximately 60 kWh per month in the months that you are not using your heating or cooling system and less in other months.

Q: HOW MUCH MORE ENERGY EFFICIENT IS MY ENVIRONMENTS FOR LIVING PROGRAM HOME COMPARED TO HOMES WITHOUT THE PROGRAM FEATURES?

A: Depending on the program level your builder provides, a home built meeting the applicable program specifications may be up to 30% more efficient than conventional code-built homes. For more details on the program levels and other program features, please call our customer service hotline at 866-912-7233.

WHERE TO LEARN MORE

Following is a list of additional resources on the Internet that may be helpful:

www.environmentsforliving.com
Information about the *Environments For Living* program

www.energystar.gov
U.S. Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, D.C. 20460

CUSTOMER SERVICE CONTACT INFORMATION

Environments For Living® program
Masco Home Services, Inc.
2339 Beville Road
Daytona Beach, FL 32119
Toll Free: 866-912-7233
Email: eflcustomerservice@mascocs.com
www.environmentsforliving.com

THE SCIENCE BEHIND YOUR HOME

THE SCIENCE BEHIND BUILDING ENERGY-EFFICIENT HOMES HAS EVOLVED INTO A COMPLEX DISCIPLINE.

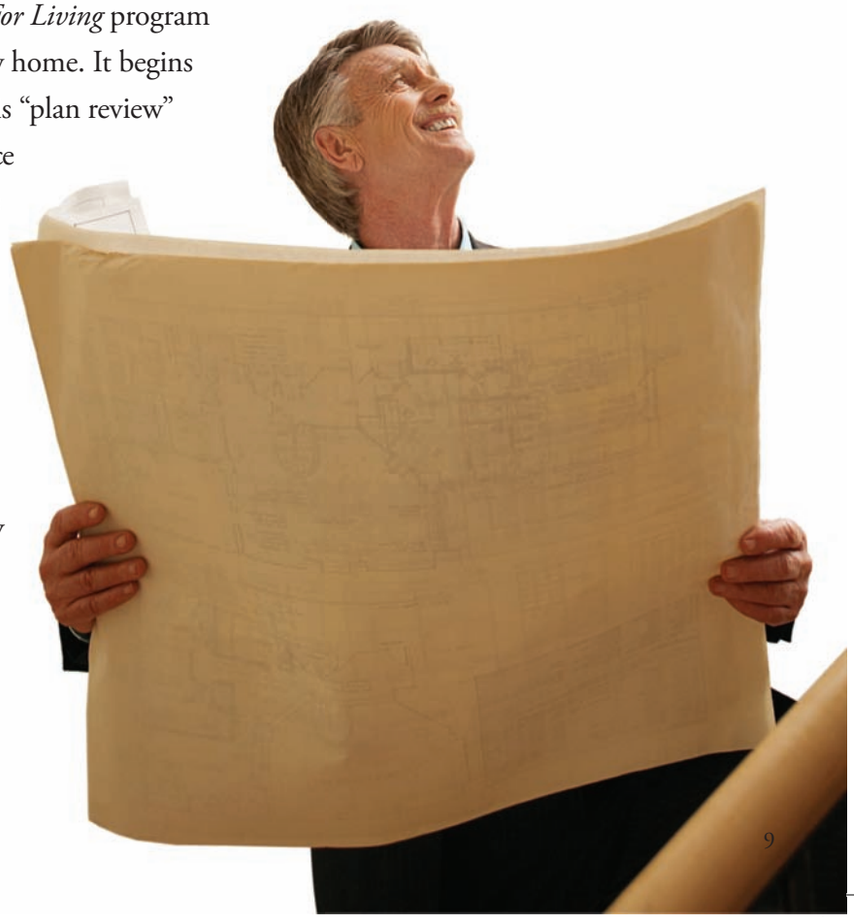
A number of things influence how energy efficient a new home will be. And it's not just about the use of certain building materials, products and mechanical equipment. It's about how all those materials, products and equipment work together as a system.

A house is an interactive system, made up of many different parts. Change any part, and you impact the whole—favorably or unfavorably. That's a key premise behind a growing discipline known as "building science." And a growing number of residential builders are looking to the answers of building science to assist them in constructing better homes.

The *Environments For Living*® program helps builders apply the principles of building science. Developed by a team of leading building science experts, the program's specifications are designed to help builders achieve homes that are more energy efficient, more comfortable, more durable and safer than homes built without the program's requirements.

Builder participation in the *Environments For Living* program starts before the ground is broken for a new home. It begins with an assessment of the home's plans. This "plan review" provides the builder with detailed performance information and recommends modifications necessary to meet the *Environments For Living* program's requirements. Using the tools of building science, it's possible to predict the impact of a particular change.

The *Environments For Living* program provides builders with the information they need to implement these requirements.



A SHORT HISTORY OF NEW HOME CONSTRUCTION

THAT WAS THEN

When energy for heating homes was inexpensive, before air conditioning became one of life's necessities, houses in America were filled with fresh air—because they were drafty. For the most part, homeowners did not mind because the drafts cooled their houses in the summer and gave them year-round fresh air. In the winter, homeowners fought the chill by burning a variety of inexpensive and plentiful fuels, such as coal, wood and oil.

Because homes were drafty and had plenty of fresh air, they were generally healthy places to live. For the most part, these homes—even in humid climates—did not have problems with moisture because of all of the air that moved through them. And the homeowners were generally comfortable, even in winter, because fuel was plentiful and inexpensive.

However, all this changed in the 1960s and 1970s, when a quiet revolution began taking place in the way houses were being built. In the South, homeowners began to add air conditioning. This made homes more comfortable. When the first oil crisis hit in the 1970s, our once inexpensive, plentiful fuel ceased to exist. Builders responded first by adding insulation, which improved comfort and affordability. Later, as energy prices continued to rise, builders began to focus on eliminating the drafts, making homes more airtight. The fresh air that once moved freely through our homes began to be eliminated. While these changes may have addressed the specific issue, they may have contributed to other, unexpected issues, such as moisture management. Terms like "indoor air quality" and "sick building syndrome" became part of our language.

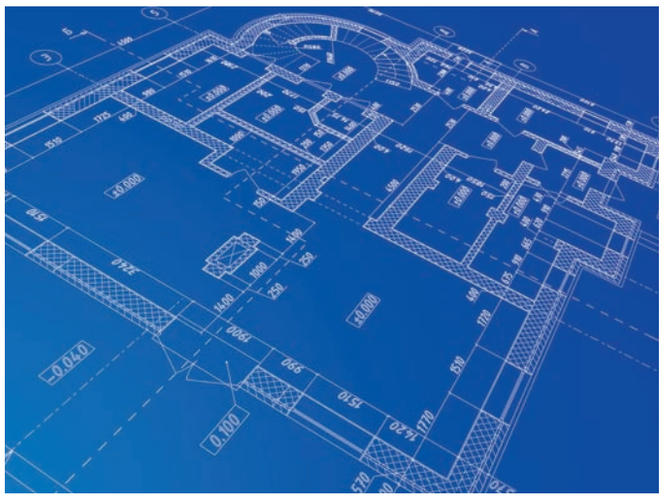
No one wanted our homes to end up with these problems. Builders have always tried to deliver the very best houses they could. Sometimes, problems happen as one "improvement" leads to another without knowing how they would interact with each other.

THIS IS NOW

Today, we understand a great deal more about how the "improvements" over the past 50 years interact with each other. Today, we at Masco Home Services, Inc. understand that the house is a system. All of the parts of the system have to work together in order to produce a quality home.

Your builder has agreed to use this understanding to build homes to the program's applicable specifications, which can result in homes that are safer, more comfortable, more durable and use less energy to heat and cool than homes of the past or present that do not have the features required under the program.

YOUR THERMAL ENVELOPE



The thermal envelope, or "shell," of your house (walls, roof, floor) is designed to keep you dry and comfortable. It protects you from rain, wind, sun, cold and heat. This shell is constructed from various products. Pieces of wood called studs and joists form the skeleton of the house, called the frame. Insulation is installed within the frame, on the exterior wall, floors and ceiling. Sometimes insulation may also be installed in interior walls for sound control. The frame is covered inside and out with different types of finishing products, such as sheetrock or paneling (inside) and siding and roofing (outside). The shell is completed by installing windows, skylights and doors.

AIR LEAKAGE

Air leaks are common in homes. These leaks bring in cold air in the winter and hot, humid air in the summer. Numerous air leaks can make the home uncomfortable and cause high energy bills. Windows and doors get most of the blame for these leaks, but in most houses they contribute only a small amount of the leakage. Most leaks are in places such as pipes and air ducts that go into the attic.

The *Environments For Living*® program requires the builder to seal those places where pipes and ducts leave the house. Most of this work is difficult, or impossible, to see. Homes built under the program's specifications are allowed only a small amount of overall air leakage—much less than the typical home.

INSULATION

Insulation helps keep heat inside in the winter and outside in the summer. Part of what makes your insulation work well is a properly installed air barrier. The *Environments For Living*® program requires builders, like yours, to use enhanced insulation techniques that help to minimize voids and gaps, which can help reduce drafts in your house. Great care has been taken by your builder to make sure that you get the maximum value from your insulation.

WINDOWS

Windows allow light and fresh air into our homes. However, older windows can let too much heat out in the winter and too much heat in during the summer. And they let in full sunlight, which over time may fade our furnishings. The windows required under the *Environments For Living* program have a special coating on them that reduces heat going through the glass. This makes it easier to keep the house warm in the winter and cool in the summer. The coating also helps address any fading effect that sunlight may have on carpets, drapes and furnishings in the house.

This type of window is called a "low-e" window. ("Low-e" stands for low emissivity, which is a measure of how much heat will move through the glass.) The low-e coating is practically invisible, so much so that you will probably never notice that it is there.

SHELL OPERATION

Routine maintenance may be needed to keep the shell of your home in good operating condition. You should immediately repair any damage to the shell—such as from storms and roof or plumbing leaks.

YOUR HOME'S HEATING AND COOLING SYSTEM

Of all the major components in a home, perhaps the most misunderstood is the heating/cooling system. Yet it is the component you are most likely to interact with. (Note: not all homes have both a heating and a cooling system, depending on your climate. Check with your builder for details about the system that is installed in your home.)

When moving into a new home, we want to be comfortable. We look to a home to be a sanctuary from nature's brutal extremes. We want to simply adjust the thermostat and forget about it. However, as with any technology, some simple routine maintenance on your part will be necessary.

First, it might be helpful to review how heating and air conditioning works, and what makes the system in an *Environments For Living*® program home different from most others.

HOW YOUR HEATING AND COOLING SYSTEM WORKS

The basic principle behind your heating and/or cooling system is this: it circulates air through a device that either heats or cools the air and returns it to the house. Heating the air is usually done with natural gas, propane or electricity. Cooling is almost always done with electricity only. When your system is cooling the air, it is also removing humidity.

The air is moved by a large fan (called an "air handler") that may be under your house, in the attic or outside. Sometimes the air handler is a separate device from the one that actually provides heating or cooling, and sometimes they are the same.

The air moves into and out of the air handler in tubes that are called ducts. The duct that takes air from your house is called a "return." It will have a large grille with the filter in it, usually in the central part of the house. There may be more than one return. The ducts that bring the heated or cooled air back into the house are called "supplies." These will have smaller grilles, and there will be one or more in every room, except for small rooms, such as closets.

You may also notice several smaller grilles in your walls that are not connected to either a return or supply duct. These allow for the free movement of air throughout your entire living space and are an innovative feature.

Finally, the temperature in your house is controlled by a thermostat, which you set. The thermostat tells the system how long to run at any given time to produce the temperate you have selected. Please review the "Thermostat" section for a discussion of appropriate temperature settings.

SIZING THE HEATING AND COOLING SYSTEM

The "size" of the heating or cooling system determines how much heating or cooling it can provide. Common sense says that the bigger the house, the more heating and cooling will be needed. And for years, most heating and cooling systems have been sized based simply on the square footage of the house.

But a home built to the program's specifications is different. It has less air leaks and drafts, and has enhanced insulation systems. For the same amount of square footage, this home will need less heating and cooling than a typical older home. The *Environments For Living®* program requires a careful calculation of the actual heating and cooling needs of the home, based not only on size, but also on the climate, the amount and type of insulation, the number of windows and window type, the airtightness of the home and other construction details your builder has provided.

It's a common misperception that when it comes to heating and cooling systems, bigger is better. It's not. Oversized systems may cost more to operate. If the system is too large, it may cycle for a shorter period of time, unless the temperature outside is really hot or really cold. This means that it starts and stops more than it should, wasting energy. This is much like the difference between driving in stop-and-go city traffic and driving on the highway. You may

notice that the system in your *Environments For Living*® program home runs more than in other homes—this is not because something is wrong with it. It's because it was "right sized", which means that your builder used a process for determining which HVAC system should be used. You should talk to your builder for details.

Oversized systems also tend to produce less comfort. Your cooling system is designed to both cool the air and to remove humidity. Humidity is just as important to comfort as temperature. And all houses have moisture from laundry, cooking and bathing that needs to be removed, even in dry climates. If the cooling system is too large, it may cool the air to the setting on the thermostat so quickly that the system does not have time to remove enough humidity. The result can be a cool, clammy home. Using a system that is "right sized" for the particular home also helps remove moisture.

Finally, whether your system is providing heating or cooling, an oversized system may produce uneven temperatures in the home. If the system does not have to operate very long to reach the setting on the thermostat, there may not be enough air flow through every room to produce the even temperatures that most people find comfortable.

DUCT DESIGN AND DUCT LEAKAGE

As noted above, people prefer even temperatures throughout their home. In addition to having a "right-sized" heating or cooling system, the ducts must be designed and installed so that the right amount of air reaches every room.

According to the U.S. Environmental Protection Agency's ENERGY STAR® website, a typical house may lose up to 20 percent of the air that moves through the duct system due to leaks, holes, and poor connections. The *Environments For Living* program requires that all duct connections are sealed with a material that helps to reduce duct air leaks. This not only helps improve comfort, but also helps reduce energy usage.

HEATING AND COOLING SYSTEM MAINTENANCE

There are certain responsibilities that you, the homeowner, have, in order to maintain your heating and air conditioning system. You should follow any maintenance operation recommendations concerning the system equipment from your builder or the equipment manufacturer.

The following are additional suggestions for system maintenance and use that you might find helpful.

- **FIRST. Arrange** with your heating and air contractor to provide you with at least an annual service checkup (sometimes called "warranty tune ups"). Some contractors provide this service biannually. Each visit gives the contractor the opportunity to check the system and provide any maintenance tune-ups in time for the upcoming seasons. They also can provide early diagnostics of potential problems before they become a problem.

- **BE SURE** you **change** the filters for your system as recommended by your builder or the manufacturer or on a monthly basis. This helps keep the system clean and helps keep the system from overworking due to clogged or blocked filters. When selecting a replacement filter, look for a filter that has a MERV (minimum efficiency reporting value) rating of between 10 and 13, but only if these filters are approved by the manufacturer for use with your equipment. These filters are available at most home improvement stores and some supermarkets. They are typically made of paper and have a "pleated" appearance.

- **RESIST** the temptation to play race car driver with your thermostat settings. Ramping your thermostat up to maximum levels will not heat the home quicker; the air coming out of the ducts will be the same temperature no matter what the setting. Large temperature swings only waste energy. This is particularly important if you have a heat pump. Heat pumps use electric resistance strips as back up heat sources for when the temperature outside gets too low. If you make too large of a change in your thermostat setting, the strip heat will come on first, rather than the far more economical heat pump itself. Moreover, the *Environments For Living*® Limited Guarantee, if you received one under the program, requires you, among other things, to use prudent energy management. If you received a Limited Guarantee, please refer to its terms and conditions for details or call 1-866-912-7233 for more details.

- **DO NOT** place a heat source such as a lamp near your thermostat, as this will "fool" it into thinking the home is actually warmer than it really is.

- **IF YOU** have a programmable thermostat that allows for temperature changes while you are away from your house, use the "8/8" rule: make sure that you have it set so that the temperature change is only around 8° F or so, and only if the house will be empty for eight hours or more. Any less than eight hours or more than an 8° temperature swing, and the amount of energy saved will be lost when it comes time to re-heat or cool the house

INDOOR AIR QUALITY AND VENTILATION

A tight house may be more comfortable and use less energy to heat and cool. But common sense tells us that a tighter house won't allow fresh air in or stale air out, and may trap dust and odors inside the house. So how do we build a house that is more comfortable, with fresh air and lower energy usage for heating and cooling?

Part of the answer is to build the house using tight construction and then use "right-sized" systems to help remove stale air from the house and to control the amount and source of incoming and outgoing air. This is accomplished with the following:

FRESH AIR VENTILATION. Your house is equipped with a system to bring a small amount of fresh air into the house periodically throughout the day. Ask your builder how your particular system works, and what, if anything, you need to do to properly operate and maintain it. There's probably a filter to change or clean periodically, and possibly an air intake grille on the outside of your house to check and brush clean when needed.

BATHROOM EXHAUST FANS. Every bathroom in your house should have an exhaust fan that moves a specified amount of air out of the bathroom directly to the outside. These only work, of course, if you use them. Bathroom fans should be run for at least 20–30 minutes after a shower. This will help remove moisture created by the shower.

KITCHEN EXHAUST FAN. Your kitchen should be equipped with a range hood or other exhaust fan that is ducted (or that exhausts) to the outside. Again, this works only if you use it. Whenever you are cooking, run the range hood to help remove moisture and odors from the air caused by cooking. If you have a gas range, it's even more important. Never run a gas range or oven without running the range hood. Burning gas produces various air pollutants, including carbon monoxide, nitrogen oxides and moisture.

COMBUSTION GASSES

Whenever fuel is burned, gasses are produced that may be harmful to human health. When wood is burned in a fireplace, for instance, it creates smoke along with other gasses. Because we can see and smell the smoke, we know that we need a chimney to get the smoke out of the house. Other fuels, such as natural gas and propane, burn much cleaner than wood. We can't see the fumes from these fuels when they are burning, and most of the time, we can't smell them either. But we still need to make sure they get out of the house.

Burning natural gas, propane or wood produces moisture and sometimes may produce other concerns, such as carbon monoxide, or CO. CO can make you sick or, in extreme cases, it can even kill. Nitrogen oxides (Nox) are also sometimes produced. Nox can cause lung irritation and can be a problem particularly for people with asthma and allergies and other respiratory conditions.

Because natural gas and propane have many advantages, many people choose to use it for heating their house, water heating, cooking and fireplaces. The *Environments For Living*® program has specific provisions to help ensure that you can enjoy your gas appliances in confidence and safety, and that along with other elements of the program, help produce homes that are more durable.

- **ALL FURNACES, WATER HEATERS AND BOILERS** within the conditioned spaces (including basements) shall be sealed combustion or power vented units. This makes it unlikely for combustion gasses from these appliances to enter the living space.

- **IF YOU HAVE A GAS LOG FIREPLACE**, it must be vented to the outside. No unvented combustion appliances of any kind are allowed.

- **IF YOU HAVE AN ATTACHED GARAGE**, or any combustion appliances, there is at least one carbon monoxide detector per floor of your home. This is an extra measure of safety.

MOISTURE

Many health authorities agree that excessive moisture is a major culprit when it comes to unhealthy indoor environments. Construction techniques can help reduce the amount of moisture getting into the house and exhaust fans in the baths and kitchen help remove excess moisture when it's created. There are two key things you can do to help maintain your home for your family: Always use the exhaust fans when you shower and when you cook, and fix any water leak, no matter how small, immediately.

By doing these two things, you are not only improving your living environment, but you are also helping to extend the life of your house.

WHAT ELSE CAN YOU DO?

There are many things you can do to improve the indoor air quality in your home. Here are a few suggestions:

- **CHANGE THE FILTERS** on your furnace/air conditioner/ventilation system on a regular basis. How often you need to change them depends on a lot of factors, such as how dusty it is outside and how many pets you have. At first, check them at least once a month. If they're fairly clean after a month, you may be able to go longer but you should follow your builder's or the manufacturer's recommendations on how often to change your filters.
- **CONSIDER UPGRADING YOUR FILTERS** to a higher level. Be sure to talk to your heating, ventilation and air conditioning (HVAC) contractor or the manufacturer, to ensure that a different filter is compatible with your system.
- **WHEN VACUUMING**, use either a central vacuum cleaner or a portable vacuum that has a high efficiency filter.
- **TRAIN YOUR FAMILY** to wipe their feet and shoes clean on a door mat if you have one or for them to take off their shoes at the door.
- **KEEP CHEMICALS** like paints, gasoline, pesticides, fertilizers, etc. in a detached garage or storage shed, if possible. If there is no detached storage space, take extra precautions to properly seal and store these items.

BALANCED AIR PRESSURE

Homes today are tighter, and it's important to control outdoor air coming in and indoor air going out. Outdoor air may be hot, cold, wet, polluted or otherwise undesirable. Controlling undesirable air helps create a comfortable, durable, efficient home. A common problem in many tight houses is unbalanced air pressure. If you've ever been in a home where a bedroom door slams shut by itself when the heating or cooling system comes on, then you've experienced one of the effects of unbalanced air pressure. It's an important issue because unbalanced air pressure can result in drawing in undesirable air from the garage or ground, fireplace problems and even damage to walls.

WHAT CAUSES UNBALANCED PRESSURES?

First, for unbalanced pressures to occur, the house must be tight. If the house is leaky, air will move freely through the walls, windows, etc., and unbalanced pressures likely will not occur. Think about a car tire with a nail puncture. If the hole is large, no matter how much air you pump into the tire, it will simply leak out as fast as you put it in. If you partially seal the hole, the tire will hold air, at least for a little while. But, if you seal the hole completely, then you do not have to put much air into the tire for it to stay fully inflated.

The second requirement for unbalanced pressures is something that moves the air into (or out of) the house. In the tire example, it is an air pump. In a house, it can be natural effects, such as wind and cold weather. But most problems happen when "fans" are turned on in the house. The heating and cooling system is the largest fan in most homes, with the clothes dryer ranking second. There are also exhaust fans in the bathroom and kitchen. All can cause problems, if the house is not designed right.

While doors closing on their own is mainly an inconvenience, unbalanced pressures can also cause more serious concerns. In addition to drawing in unwanted air, unbalanced pressure can cause:

- Smoke and other fumes from fireplaces and furnaces being pulled into the house instead of going up the chimney;
- Warm, moist air being pulled into an exterior wall where it condenses potentially affecting the home's durability; and
- Air that you paid to heat or cool being forced out of your house, wasting energy and decreasing comfort.

FREE AIR MOVEMENT

The *Environments For Living*® program, in requiring a tight and well insulated shell, and carefully sealed ducts, helps avoid two of the causes of unbalanced pressure. In addition, the program requires that air move freely from one room to another, even if the doors are closed. In some homes when the heating and cooling system is operating there is no way for the air from a supply duct to get to the return except to go through an open door. If the door is closed, the room begins to "inflate" and the heated or cooled air is forced through every crack and crevice in the walls, ceiling and floor. Some of this air leaks into the house, but some also leaks outside, causing comfort problems and higher energy bills. Instead, you want to allow air to escape the room either by installing a return in the room, or providing a "pressure relief" system that allows the air to move from the room to a central area of the house, such as a hallway. You may notice some extra grilles on your walls, usually in the bedrooms—these are part of the pressure relief system. Unbalanced pressures can cause many problems, including high energy bills, reduced comfort and moisture in walls. But perhaps the most serious concern is the possibility that fumes produced by combustion appliances could be drawn into the living space. *Environments For Living* program requirements provide an extra measure of safety in that all combustion appliances must be sealed combustion or power vented, and CO detectors must be installed on each floor if any combustion devices are present in the home.

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