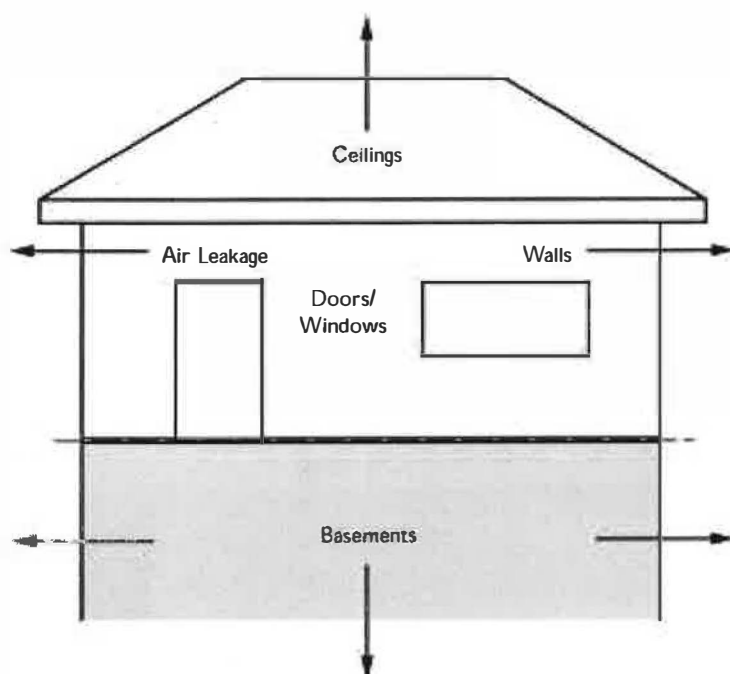


ABOUT YOUR HOUSE

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BEFORE YOU START AN ENERGY EFFICIENT RETROFIT—THE BUILDING ENVELOPE



Heat loss is dependent on existing insulation levels and air tightness

The building envelope is the outer layer of the building that separates the living space from the outdoor environment, both above and below grade. Many older homes have high heating requirements because of high rates of air leakage and building envelope areas that are not well insulated.

Like any renovation, retrofitting the building envelope requires careful planning. Before you decide to go ahead with the project, it is important to clearly identify the areas that you want to improve. Just as important is a thorough inspection of the existing structure so that any current problems can be corrected.



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Common Situations

All equipment has an optimal life span. Older furnaces and boilers may need replacing simply because they have outlived their useful life, or because they may not have been regularly serviced.

If you have noticed a sudden change in fuel bills, it may be because you have started using the house differently—perhaps the temperature settings have been increased because a new child has entered your life or an elderly person has moved in.

Older homes often have areas that are cold because of poorly laid out heating and mechanical systems.

Perhaps you are undertaking other renovation work that requires some adjustments to your present mechanical systems. In this case, you can also consider upgrading your mechanical equipment to take advantage of new, more efficient products. This may also be an opportunity to install a proper ventilation system where one does not exist.

It is important to note that mechanical systems must not change the balance between the air pressure inside and outside the house—since high pressure differences can lead to combustion spillage problems from furnaces, hot water heaters or fireplaces. If there are no fuel burning appliances of any kind in the house, then this is not a significant issue.

Healthy Housing™

Renovating is an ideal time to make your house healthier for you, the community and the environment. When upgrading your mechanical systems to increase their efficiency, be sure to consider:

- **Occupant health**—venting strategy for combustion appliances, adequate ventilation for occupants, addition of air filtration.
- **Energy efficiency**—energy efficient appliances, high efficiency motors for fans and furnaces.
- **Resource efficiency**—upgraded insulation and draftproofing to reduce heating needs and allow installation of a smaller heating system.
- **Environmental responsibility**—energy efficient appliances to reduce the home's environmental impact.
- **Affordability**—energy efficient fixtures to reduce ongoing operating costs.

House as a System

A house is much more than just four walls and a roof—it's an interactive system made up of many components including the basic structure, heating, ventilating and air conditioning (HVAC) equipment, the external environment and the occupants. Each component influences the performance of the entire system. A renovation provides an opportunity to improve how your house performs.

Energy efficient mechanical systems such as gas furnaces, usually have a sealed combustion chamber that isolates the flue gases from the house. Direct vent gas fireplaces can be a decorative heat source too, while not compromising the indoor air quality. New appliances may require special provisions for make-up air if the combustion appliances are not the “sealed combustion” or “induced draft” type.

Avoid Surprises

Knowing the properties and operating characteristics of your heating system will help you to determine the changes you may want to consider. You will want to

hire a professional heating contractor to make changes in the mechanical systems. Thinking about what changes you'd like to make or anticipating problems ahead

of time will help the heating contractor address the shortcomings of your home's system. Here are some of the likely situations that people encounter.

Ask yourself...

- How old is the furnace or boiler? Is it more than 15 years old?
- When was the last maintenance service done?

Consider your options...

- Replace the furnace, depending on its age and condition. Furnaces typically last 15 to 20 years, while boilers may last up to 40 years if maintained correctly.
- Older furnaces have very inefficient motors and the heat exchangers are not as efficient at extracting heat compared with newer furnaces. Hot water based heating systems may have inefficient boilers and pumps. New equipment is much more energy efficient than the older equipment likely to be in your home.
- Have your heating system maintained regularly to keep it operating safely and efficiently. Filters must be cleaned or replaced regularly. Combustion system components must be maintained as outlined in user manuals.
- Choose more energy efficient appliances that may make it possible to eliminate existing chimneys. This is worth considering if the chimney is located on an exterior wall or mostly outside. These types of chimneys can contribute to backdrafting of combustion gases.

...and if you don't

- Inadequate maintenance will mean a shorter life span for the equipment and can lead to premature failure, incomplete combustion of fuels and backdrafting of combustion gasses. Clogged filters and flues are a fire hazard. Cracked heat exchangers allow combustion gases into the home's air.
- Newer, combustion-fuelled, energy efficient equipment requires venting and combustion air supply directly to the unit. This may also have an impact on the overall environment within the house.
- Many new furnaces, because they are significantly more efficient, may require some modifications to the original heating ducts.
- If only one appliance is upgraded and removed from a flue, then there may have to be modifications made to the chimney so that the remaining appliance is vented correctly.

- Is the house warm enough?
- Is it easy to keep the house at a uniform temperature?

- Replace old thermostats with programmable models. New thermostats that can automatically setback temperature settings can result in energy savings.
- Improve cold air returns to increase the capacity of the system to deliver adequate airflows.
- Consider draftproofing and insulation upgrades to reduce the heating load.
- Choose a new, more efficient heater that will likely be much smaller.

- The furnace may operate inefficiently. Furnaces that frequently turn on and off (excessive cycling) can deteriorate prematurely, along with the flue. This may happen if your furnace is oversized.

Ask yourself...

Consider your options...

...and if you don't

- Are there areas that are difficult to keep warm?

- Check to make sure that dampers and valves are open and registers and cold air returns are not blocked by furniture. It may be necessary to install balancing dampers to divert heat away from areas that receive too much heat to rooms that are too cool.
- Upgrade or replace circulation pumps in hydronic heating systems with individual zones.
- Install pumps or fans in older gravity systems.

- Prolonged periods of low temperatures will create uncomfortable conditions. There will also be increased relative humidity in those areas, so that condensation may take place on cold surfaces. Wet surfaces are ideal for mold and fungus growth, compromising indoor air quality.
- Warm air ducts that run through unheated spaces need to be sealed with duct sealers and insulated; hot water pipes need to be insulated.

- Is there enough fresh air in the house?
- Do smells linger? If you burn breakfast toast, can you still smell it at lunch time?

- Install a proper mechanical ventilation system to provide adequate air exchange. The system must have a fan capable of operation for long periods. This may mean a fan that runs continuously or at least for many hours per day. Opening windows does not provide adequate air exchange, even if weather conditions are satisfactory.
- Choose a heat recovery ventilator to provide controlled, fresh air, while conserving heat in the winter for optimum energy efficiency.

- Poor indoor air quality can compromise health. If those smells are a result of combustion, such as lingering smells from a fireplace, wood or oil stove, then it may mean that the appliances are not operating properly and may be a health and safety risk.

- Would it make sense to switch to natural gas?
- How hard will it be to install the new fuel service?

- Consider whether you will really save money by switching fuels. Your heater must convert the fuel energy efficiently to save you money.
- Consider maintenance costs.
- Factor in the cost and inconvenience of switching fuel. If you switch from electricity or oil to natural gas, you will need to install a natural gas feed from the service to the house. This will mean digging a trench. If there are extensive rock outcroppings or large hard surfaces in the yard, it may add to the cost of installation.

- In most cases, there will be a limited range of upgrading options and you will likely remain with the fuel you are now using. Fuel choice should be made on the basis of availability, fuel and installation cost and availability of service tradespeople to install and maintain the equipment.
- If fuel switching is not possible or appropriate, using more efficient equipment or tuning the existing system can still improve energy efficiency.

Rewards

- A comfortable, warm interior environment will be pleasant for your family.

- An even indoor climate is the result of a properly functioning, energy efficient mechanical system that is

well matched to the design of the house. It will offer superior indoor air quality and be easier on your budget.

Ask yourself...

Consider your options...

...and if you don't

- Will the planned renovation affect the mechanical systems?

- Consult a professional heating contractor or consultant. If you are doing extensive remodeling, it is usually an opportunity to address any shortcomings that may exist in your present system. Elements of the mechanical system may also be more accessible during the renovation.

- If air sealing, window replacement and insulation upgrades are part of the work, combustion appliances in the house may need make-up air to minimize pressure imbalances.
- Central vacuums exhausting to the outside, as well as dryers and range hoods, depressurize the house and must be considered in the overall pressure balance of the house.

- Is there a constant shortage of hot water?

- Have the hot water system checked by a professional plumbing contractor. Hot water shortages may occur from a change in lifestyle, number of persons in the house, low temperature setting or problems with the heating elements.
- Upgrade the hot water system to meet increased needs. Insulate any hot water pipes that run through an uninsulated or poorly insulated part of the house.
- Relocate the water heater if it is a long distance from most of the bathrooms and kitchen.

- If temperature settings are too low, conditions are appropriate for bacterial growth that could compromise health.
- Lack of adequate hot water is unpleasant.

- Is it time to consider an air conditioner?

- Upgrade insulation, air sealing and exterior shading devices to reduce overheating. Renovations are a great opportunity to install these effective passive cooling elements.
- Consider upgrading or installing an air conditioning system, especially as part of another planned renovation.

- High temperatures and humidity are not only uncomfortable, but also unhealthy.

Skills to Do the Job

A homeowner is usually able to assess the condition and install the replacement filters, following the manufacturer's instructions. However, the nature of possible changes to the entire mechanical system may be much more difficult. Because of the consequences of any

changes, most work must be done by qualified tradespeople. Your local utility will be able to provide advice or refer you to competent technicians who can assess your home and the mechanical systems.

Heating contractors that install and

service a variety of heating system types should also be able to give you advice. However, if they specialize in only one type of system, they may not be able to provide impartial advice on possible alternatives.

Use the Mechanical Systems Assessment Worksheet to record the present condition, any problems with your mechanical system and preliminary costing.

Mechanical Systems Assessment Worksheet			
Type of heating system			
Year installed			
Last time service performed (There should be a service technician's sticker on the unit.)			
Maintenance service costs			
Heating cost and amount of fuel used (This would be listed in energy units on your fuel bill. Your utility can often provide this information.)			
	Present condition/problems	Proposed upgrades	Cost
Performance Issues:			
• Noise			
• Dust			
• Uneven Heat Distribution (cold spots in the house)			
• Effectiveness of Thermostat			
• High Fuel Bills			
• Lingering Smells			
• Fuel Smells			
Other			

Costing Your Project

Cost of mechanical system upgrades will depend on the work that needs to be done. When reviewing bids from contractors, make sure that the quotes

you are comparing are for the same work, including the same or truly equivalent equipment.

Other useful information from Canada Mortgage and Housing Corporation

A Guide to Mechanical Equipment for Healthy Indoor Environments
PE0372 \$12.95
Healthy Housing Renovation Planner
2172E \$34.95
Homeowner's Inspection Checklist
2444E \$19.95
Renovator's Technical Guide
6993E \$34.95

About Your House fact sheets, Free
Measuring Humidity in Your Home, CE 1
Combustion Gases in Your Home, CE 2
Your Furnace Filter, CE 22
How to Hire a Contractor, CE 26
Assessing the Comfort and Safety of Your Home's Mechanical Systems, CE 28k

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