

What is a Building Envelope?

Imagine a building as a big container made up of the outside walls, windows, doors, roof and basement. Inside this container or “envelope” is air that is heated or cooled, and an area protecting people from weather and noise. For us to be comfortable, the envelope must control the flow of heat, air and moisture from the



inside to the outdoors.

https://energyeducation.ca/encyclopedia/Building_envelope

Air Flow Is Important

- Controlling air flow within a building is important to distribute heat and prevent moisture build-up.
- Air flow can be created by heating equipment, fans, wind, or from temperature differences.
- Heated air can escape through recessed light fixtures, vents, chimneys, electrical outlets or under doors and windows. Humidity can also be lost to the outdoors.

Types of Air Flow

There are three types of natural airflow patterns within any home. Tight air sealing, insulation, fresh furnace filters and good home maintenance can help control these effects. (See the diagram below.)

1. Wind Effect

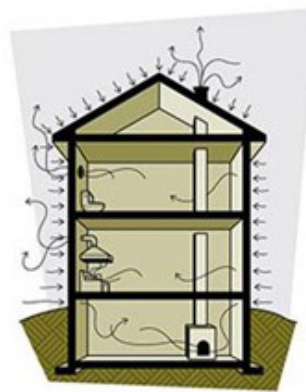
Wind blowing against a home results in air



Wind effect



Stack effect



Combustion and ventilation effect

being forced into the home and air escaping on the downwind side.

2. Stack Effect

The natural process of warm air rising to the upper floors of a home, and cool air sinking to the lower levels creates an air flow. This results in more air being lost to cracks in the roof and upper walls. This is made worse by cold air entering the home through cracks on the lower levels.

3. Combustion and Ventilation Effect

Heating equipment that burns natural gas, wood or oil will send hot air up a chimney or vent, that will draw cool air into a home through any cracks or openings.

Mechanical Control of Air Flow

Air flow that is controlled by fans, ducts, heat recovery system etc. are said to be mechanically controlled. They help keep a comfortable temperature, humidity and air quality within the home.

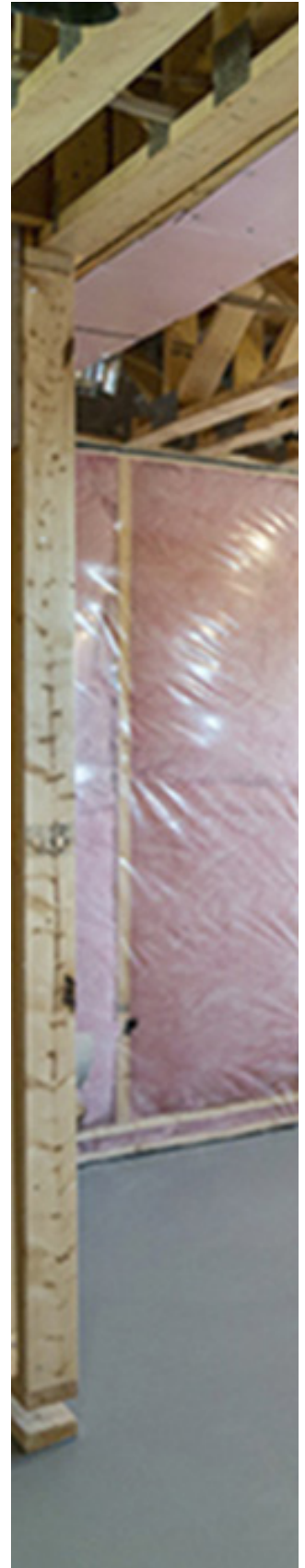
High Efficiency Furnaces

In older buildings

- They were not sealed air tight – people often imply that they “breathe”.
- Furnace intakes would simply collect air from the room they were located in.
- This caused air to be pulled in through exterior walls, windows or doors.

In new builds

- The building envelope is nearly air tight to prevent heat loss and increase air quality.
- High efficiency furnace intakes now have to collect fresh air directly from the outside of the building.



<https://www.lvairductcleaning.com/importance-efficient-airflow-work-environment/>

- This saves a great deal on energy and heat loss.

More Mechanical Control of Air Flow

Filters

Filters installed in heating equipment will remove dust and pollen in order to keep the air safe and comfortable. It is important to replace regularly to prevent damage to the furnace.

Fans

A forced air furnace system is controlled by a thermostat and will circulate warm air throughout the house. Fans in



<https://www.thurstontalk.com/2013/01/15/cold-cash-available-to-help-make-your-home-energy-efficient-putting-more-money-in-your-pocket-step-1-the-home-energy-evaluation/>

New Technology

Heat Recovery Ventilation Systems

Known as HRV's, these capture stale exhaust air from within a home and use it to preheat incoming outside air in a furnace's intake. This saves money on heating fuel by reducing the amount of work a furnace does.

Energy (or Enthalpy) Recovery Ventilation Systems

ERV's will do the same, but with the added bonus of capturing humidity in your home. In climates where dry air is the norm, some homes may have a humidifier connected to their furnace. An ERV will collect humidity within bathrooms or kitchen fans and then recirculate it so that a home's humidifier does not need to consume as much energy and water.

bathrooms and kitchens will also remove moisture.

How to Control Heat Flow

- Even an airtight home can lose heat if there isn't adequate R value insulation, or windows and doors are not installed correctly.
- Warm air can escape while cold air replaces it through cracks around doors and windows during winter.

Weatherstripping is the answer.

- Heat is also transferred by conduction through the solid parts of a building envelope (walls, windows, doors etc). This can be improved by installing new windows, spray foam, insulative blinds/curtains, and improved insulation.
- Different areas of Canada require different levels of insulation. In general, the further North in Canada the higher rated R-value insulation your home will need.

How to Control Moisture Flow

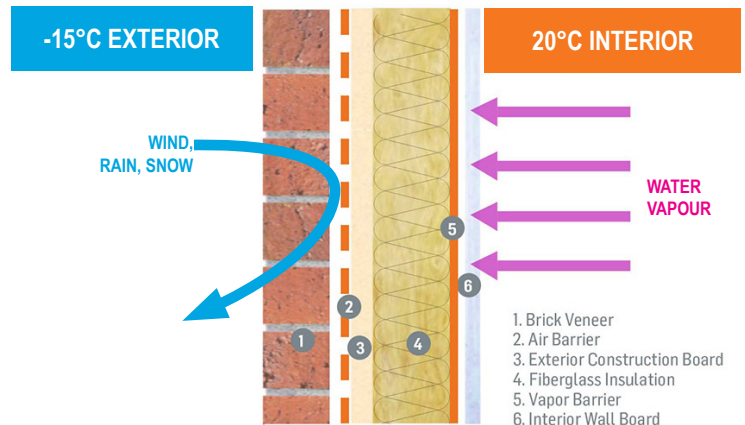
- Moisture can be destructive to homes
- Moisture encourages mould growth, rots wood, peels paint and slowly deteriorates concrete.
- Moisture can be caused by weather or appliances such as stoves, showers, humidifiers or even house plants.
- Vapour barriers are used to keep exterior moisture out.

Air Barrier

- Sometimes called a weather barrier or house wrap, an air barrier is sheeting found underneath the exterior shell of the home, such as vinyl siding, stucco or brick.
- Its purpose is to keep air, wind, rain, humidity or snow out of the building envelope.
- This protects the structure from damage, while preventing water vapour from being trapped in the wall and allowing it to evaporate to the outside. Common types include Tytar or Tyvek but there are many new products coming on the market.

Vapour Barrier

- Found on the inside of a building's frame and insulation, it blocks water vapour from the building going into the wall.
- Inside air is warm and carries moisture in the form of water vapour. If this air comes in contact with a cold wall, the vapour condenses into water droplets which can cause mould and rot.
- In order to prevent this condensation from forming, a vapor barrier should be placed on the warm side of your insulation. This way the warm, moist air never reaches



<https://continuingeducation.bnpmmedia.com/courses/soprema-inc/understanding-the-critical-elements-of-air-vapor-barriers/4/>

Useful Links

[Keeping The Heat In - Chapter 2: How your house works - Natural Resources Canada](#)



Energy Efficiency: Title

(General)

[The Difference Between Air Barriers And Vapor Barrier - EcoHome](#)

