1. Venting

Overview

Purpose

Venting is the removal of combustion gases and excess air from an appliance to the outdoors and the supply of fresh air to the burner to replace the exhausted air. The vented products vary from innocuous gases that result from complete combustion to toxic gases that result from incomplete combustion. The most important use for venting is to exhaust the combustion products safely to the outside atmosphere without spillage and without water vapour condensing in the appliance or vent unless they are designed for condensing. The use of natural draft, mechanical draft, or a combination of both may help achieve venting.

Objectives

At the end of this Chapter, you will be able to:

- explain the purpose of a venting system;
- explain natural draft venting systems;
- explain mechanical draft venting systems; and
- describe types of gas vents.

Terminology

Term	Abbreviation (symbol)	Definition
Flue gas		Products of combustion
Natural draft		Pressure difference between the hot air and gases in a chimney or vent and the cooler, heavier air outside the chimney or vent, causing the hot gases to rise
Mechanical draft		Draft that a mechanical device such as a fan or blower produces
Thermal draft		See Natural draft.

Purpose of a venting system

Early peoples built fires at the centre of their dwellings and ventilated smoke through a hole in the roof. Ventilation air entered and exited through doors, windows, and other unsealed openings.

CSA GROUP

CSA Group Gas Trade Training Materials – Red Seal Alignment

Red Seal		CSA Gas Trade Unit	1	2	3	4	4A	5	6	7	8	9
2014 Red Seal Block	2014 Red Seal Task	Title	Safety	Fasteners, Tools and Testing Instruments	Properties, Characteristics, and Safe Handling of Fuel Gases	Utilization Codes, Acts and Regulations	Utilization Codes, Acts, and Regulations – Ontario Supplement	Introduction to Electricity	Technical Manuals, Specifications, Drawings and Graphs	Customer Relations	Introduction to Piping and Tubing Systems	Introduction to Gas Appliances
A - Common Occupational Skills	Task 1	Performs safety-related functions.	✓									
	Task 2	Maintains and uses tools and equipment.	✓	✓	✓							
	Task 3	Plans and prepares for installation, service and maintenance.	✓			✓	✓	✓	✓			
B - Gas Piping Preparation and Assembly	Task 4	Fits tube and tubing for gas piping systems.									✓	
	Task 5	Fits plastic pipe for gas piping systems.									✓	
	Task 6	Fits steel pipe for gas piping systems.									✓	
C - Venting and Air Supply Systems	Task 7	Installs venting.									✓	✓
	Task 8	Installs air supply system.										
	Task 9	Installs draft control systems.										
D - Controls and Electrical Systems	Task 10	Selects and installs electronic components.						✓				
	Task 11	Selects and installs electrical components.										
	Task 12	Installs automation and instrumentation control systems.										
E - Installation of Systems and Equipment	Task 13	Installs gas-fired system piping and equipment.									✓	✓
	Task 14	Installs gas-fired system components.										
	Task 15	Installs propane storage and handling systems.										
F - Testing & Commissioning of Gas-fired Systems	Task 16	Tests gas-fired systems.										
	Task 17	Commissions gas-fired systems.	✓	✓	✓	✓	✓	✓			✓	✓
G - Servicing Gas-fired Systems	Task 18	Maintains gas-fired systems.										
	Task 19	Repairs gas-fired systems.										✓
	Task 20	Decommissions gas-fired systems.	✓	✓	✓	✓	✓	✓			✓	✓

Today, people spend more time indoors in virtually airtight buildings. Heating systems and cooking facilities are, therefore, more sophisticated, as are the venting systems.

Function of any venting system

A venting system provides for the:

- removal of flue gas to the outside atmosphere;
- prevention of damage from condensation;
- protection of the building structure from fire hazard; and
- supply of fresh air to the burner.

Removal of flue gas

You must remove the following products of combustion, commonly called flue gas, to the outside atmosphere:

Flue gas	Description
Carbon dioxide (CO_2)	This does not support combustion, but when it dissolves in water vapour, it forms carbonic acid, which corrodes steel venting pipes.
Water vapour (H_2O)	A 100 000 Btu/h furnace produces approximately 200 ft^3/h of water vapour.
Nitrogen (N_2)	This is a colourless, odourless gas that constitutes 78% of the atmosphere. It is not harmful nor is it used for heating purposes.
Carbon monoxide (CO)	This is a product of incomplete combustion. As such, it remains combustible. When produced, it must be vented from the building because it is deadly.

Prevention of damage from condensation

When flue gas temperature is low, the water vapour (in the flue products) condenses. Condensation can cause corrosion inside the heat exchanger, flue passages, and vent pipes, unless the appliance and its venting system are designed and properly installed for the collection and removal of this condensation.

Protection from fire hazard

The flue gas temperature in the vent can range from 100°F (40 °C) for properly setup high efficiency appliances (condensing appliances) to 500°F (260 °C) for low efficiency or improperly setup appliances. The vent material, installation method, and clearance to combustibles must meet the requirements of CSA B149.1 and the manufacturer's certified instructions to prevent a fire due to venting.

Supply of air to the burner

As flue gases leave the appliance via the venting system, the pressure at the inlet to the burner is drops. The negative pressure draws fresh outside air to the burner through dedicated ducts (in the case of direct vent appliances) or generally through openings in the building envelope (in the case of appliances that consume indoor air). This air supply is essential for proper combustion and venting.

Problems associated with venting systems

A failure of the venting system can result in a wide variety of serious problems including:

- spillage of CO_2 inside the building, resulting in potentially serious health effects for the occupants due to reduced levels of oxygen;
- spillage of water vapour inside the building, resulting in damage to the building structure;
- spillage of CO, if incomplete combustion is occurring in the appliance, resulting in CO poisoning of the occupants;
- combustion problems that result from the failure to remove the products of combustion from around the flame, which allows fresh combustion air to enter the combustion chamber and results in incomplete combustion, production of carbon monoxide, soot, and potentially, extinguishing of the flame;
- condensation of acidic water vapour inside the appliance and/or vent, resulting in damage to the equipment if the appliance and vent are not designed for this condensation;
- reduced efficiency of the heat transfer, if removal of the products of combustion occurs at a faster rate of flow than originally designed, resulting in longer cycles and higher heating costs;
- fire hazards that result from flame roll-out from the combustion chamber due to the failure to provide the proper flow rate of air and flue gases out of the appliance from startup to shutdown of the burner operation; and
- fire hazards that result from the vent material raising the temperature of combustible material to the point of ignition or drying out the combustible material to the point that it easily ignites.

The level and type of risk posed varies depending largely on the type of venting system. Natural draft venting systems are more susceptible to all the previously mentioned problems compared to mechanical draft systems due to their principles of operation and the need to rely on the installer to make decisions.

Mechanical draft systems can also fail. Their advantages, however, are that they usually have more safety devices monitoring venting action, and more explicit installation instructions are available to the installer.

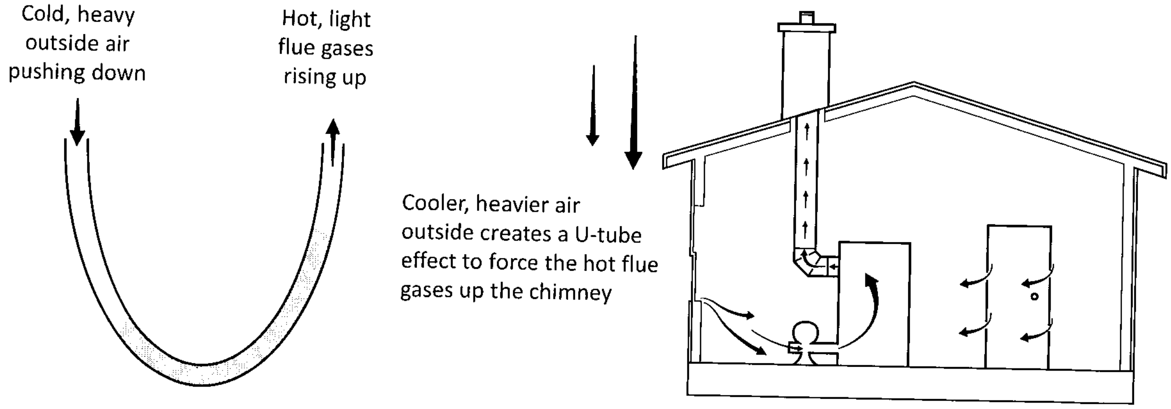
The role of a Gas Technician 3 is, primarily, to identify venting problems and notify or assist more qualified technicians/fitters to correct those problems or prevent them from occurring in the first place by properly installing venting systems.

To complete that role, a gas technician/fitter must understand the basic principles of the natural draft and mechanical draft venting systems and the components employed in those systems.

Natural draft venting system

Natural draft primarily occurs due to the pressure difference between the hot air and gases in a chimney or vent and the cooler, heavier air outside the chimney or vent. The difference in pressure causes the hot gases to rise, thus producing a suction effect in the heat exchanger. This is sometimes what you call ***thermal draft***.

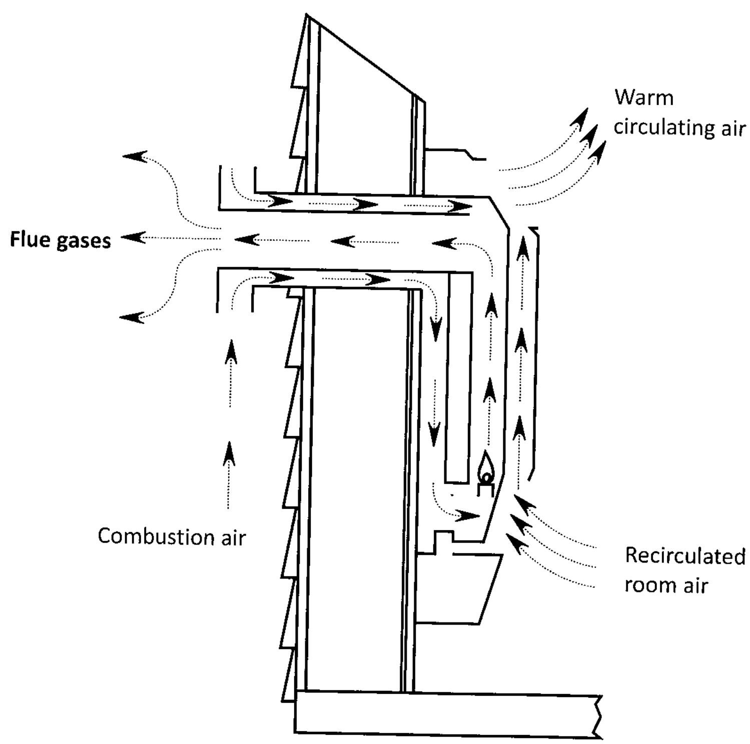
Figure 1-1
Conventional natural draft venting principles



Category 1 appliances that have a negative vent pressure and are less than 83% efficient most commonly use natural draft venting. These appliances are vented into properly lined chimneys or factory-built vents (see Figure 1-1). This is what you often call a ***conventional natural draft venting system***.

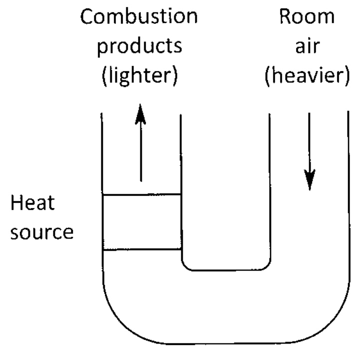
Balanced flue, direct vent appliances vented into ***special venting systems*** that are designed and approved for use with the specific appliance also employ natural draft venting. Although the vent pressure may be slightly positive, the flue gas temperature is well above the dew point temperature (approximately 127–130°F) that would otherwise cause the water vapour to condense. See Figure 1-2.

Figure 1-2
Balanced flue, natural draft appliance



In both the conventional and balanced flue types of natural draft venting systems, the use of a mechanical device is not necessary to remove flue gases from the appliance to the outdoors. Although you may use a mechanical device to deliver air to the burner and/or move the flue gases through the appliance, the pressure difference of hot, light flue gases rising and cooler, denser air outside the appliance pushing the flue gases upward in a "U-tube" effect creates the venting action in a natural draft venting system.

Figure 1-3
Movement of light and heavy air, creating natural draft



This pressure difference is usually quite small—measured in the 1/100ths of an inch of water column pressure. You can reverse it by pressures as low as 0.02 in w.c. (5 Pa). As such, it is important to understand the factors that affect natural draft venting systems.

Factors affecting natural draft venting systems

The quantity of theoretical draft in a stack, measured in inches of water column or in pascals, is directly proportional to the absolute temperature difference between the stack gas and its surroundings, and to the height of the stack. Note that draft does not directly depend on the diameter of the stack.

The draft will be greatest when:
- the average stack temperature is highest;
- the outdoor air temperature is least; and
- the stack height is greatest.

A number of factors—many of which are under the control of the gas technician/fitter—help determine the stack temperature. These factors include the following:
- The heat transfer efficiency of the appliance as designed by the manufacturer but affected by factors under the technician/fitter's control, such as:
  - The amount of excess air that enters the combustion chamber. The lower the amount of excess air, the higher the flame temperature and combustion chamber temperature and the lower the flow rate of flue gases through the heat exchanger—both of which improve heat transfer efficiency.
  - The temperature of the heated medium (water or air) entering the heat transfer system. The hotter the heated medium, the higher the stack temperature since the difference in

temperature between inside and outside the heat exchanger affects heat transfer. Too cool of a heated medium can rob the flue gases of the heat required for effective venting.
  - The flow rate of the heated medium (water or air) across the outside of the heat exchanger. The heat rise across the heat exchanger must be within the range specified by the appliance manufacturer. Generally speaking, the faster the flow rates of the heated medium, the more effective the heat transfer.
  - The cleanliness of the heat exchanger. Effective heat transfer depends on a clean heat exchanger—inside and outside. A dirty heat exchanger reduces heat transfer, resulting in elevated stack temperatures.

- The vent material, diameter, configuration, and location also affect stack temperature. Since the technician/fitter has significant control over these factors that affect stack temperature and, therefore, venting, it is worth discussing each factor.
  - The higher the insulating value of the vent material, the higher you can maintain the stack temperature throughout its travel to the outdoors. A proper vent cap holds the heat in the vent and prevent cold air from entering the vent.
  - The closer the vent diameter is to that required for the effective removal of the volume of flue gases, the higher the flue gas temperature. A too small vent diameter restricts the flue gases, while a too large vent diameter reduces the stack temperature and inhibit venting action.
  - The configuration of the venting must minimize resistance to flow by reducing lateral vent lengths, changes in direction, and restrictive fittings. A tall vertical vent with no elbows maximizes stack temperature and venting action.
  - The location of the vent must minimize heat transfer through the vent material. Vents located outdoors or in contact with outside temperatures reduce stack temperature and venting action.

The outdoor air temperature as well as, to a lesser extent, barometric pressure, humidity, and wind also affect natural draft venting systems.

Obviously, these factors are outside of the control of a gas technician/fitter. However, the draft control devices that the gas technician/fitter installed and maintained can help minimize their effects.

Draft control equipment

For proper venting and combustion efficiency, you must control the amount, and force, of the draft. A draft that is too strong pulls in too much combustion air, thus reducing efficiency. A draft that is too weak smothers the flame and reduces the combustion efficiency. Draft control equipment is therefore an essential part of a natural draft venting system.

Draft hood or draft diverter

Many domestic gas burners are of the atmospheric type and require a *neutral over fire draft* in the combustion chamber. The draft hood maintains this neutral pressure over the fire. By allowing dilution air into the venting system, the draft hood prevents an excessive negative pressure in the combustion chamber. In effect, the draft hood decouples the venting system from the appliance (see Figures 1-4 and 1-5).

When there is no draft, a back draft, or a blockage beyond the draft hood, the flue gases exits out of the draft hood instead of entering the appliance. This is what you call spillage. When there is an updraft in the venting system, the draft hood permits dilution air to enter the draft hood. Again, the draft hood serves to decouple the appliance from the venting system.

A hood is either built into the gas appliance or is part of the vent connector. You should never alter or modify one. Installing a different draft hood or altering the skirt length changes the burner neutral pressure point, possibly resulting in incomplete combustion and the production of carbon monoxide.

Figure 1-4
Operation of a vertical draft hood

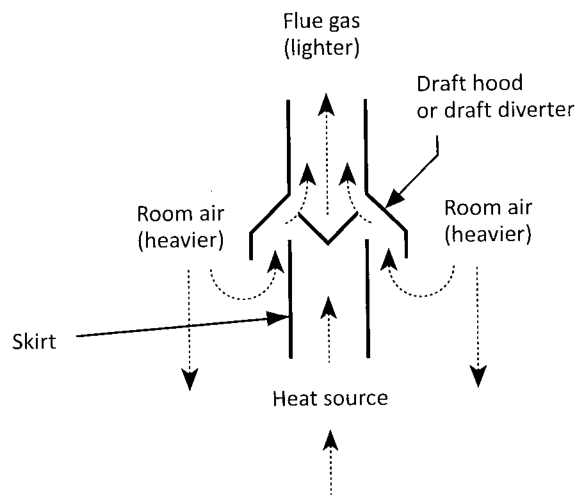
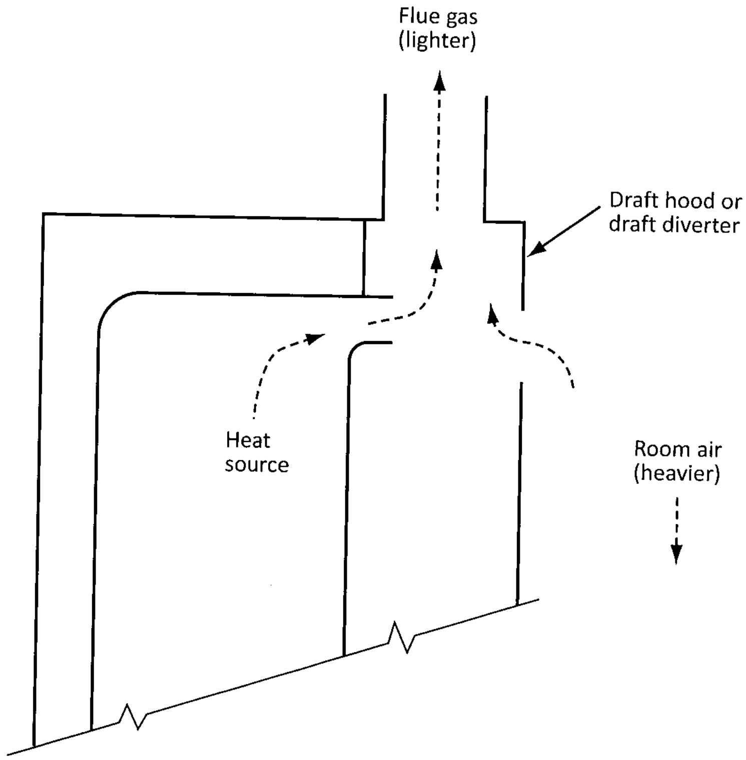


Figure 1-5
Operation of a horizontal draft hood



Barometric dampers

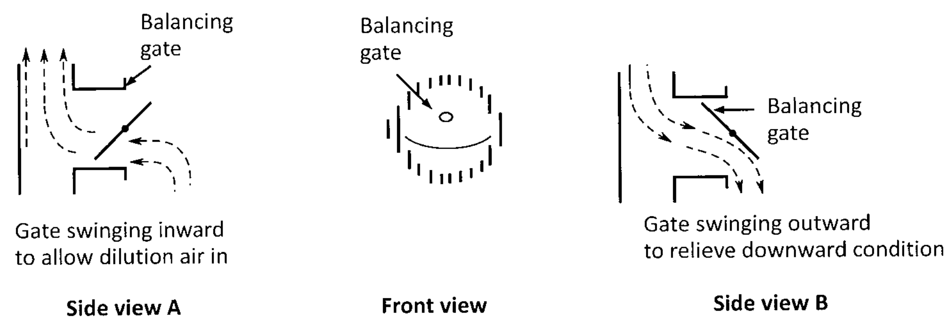
Barometric draft controls are what you use on gas appliances that operate with a *controlled* negative over fire draft in the combustion chamber. In other words, you use this type of draft control when the venting system provides a negative pull on the combustion chamber to remove flue gases. Appliances that require barometric draft controls are usually converted boilers or furnaces fired by a fan assist or power conversion burner.

A single-acting barometric damper has a gate that only swings in to regulate the stack draft and closes shut when a down-draft is present to prevent soot or ashes from entering the room. You do not use it is on gas equipment, except in some jurisdictions on gas-fired incinerators.

The strong feature of a double acting barometric damper is its ability to open both inward and outward. It opens inward to regulate the dilution air and opens outward to relieve down-draft and spillage. See Figure 1-6.

Double acting barometric damper regulates...	Feature
Dilution air	When the vent draw increases, the atmospheric pressure on the outside of the damper pushes against the gate, allowing extra dilution air in to reduce the draft draw. See Figure 1-6A.
Down-draft	If the pressure increases inside the venting system, the gate swings out to relieve a down-draft. See Figure 1-6B.
Spillage	In the event of a blockage in the venting system, the gate swings out to allow spillage. You should adjust barometric dampers according to the manufacturer's instructions. Adjustments depend on the type of burner, combustion chamber, and available draft.

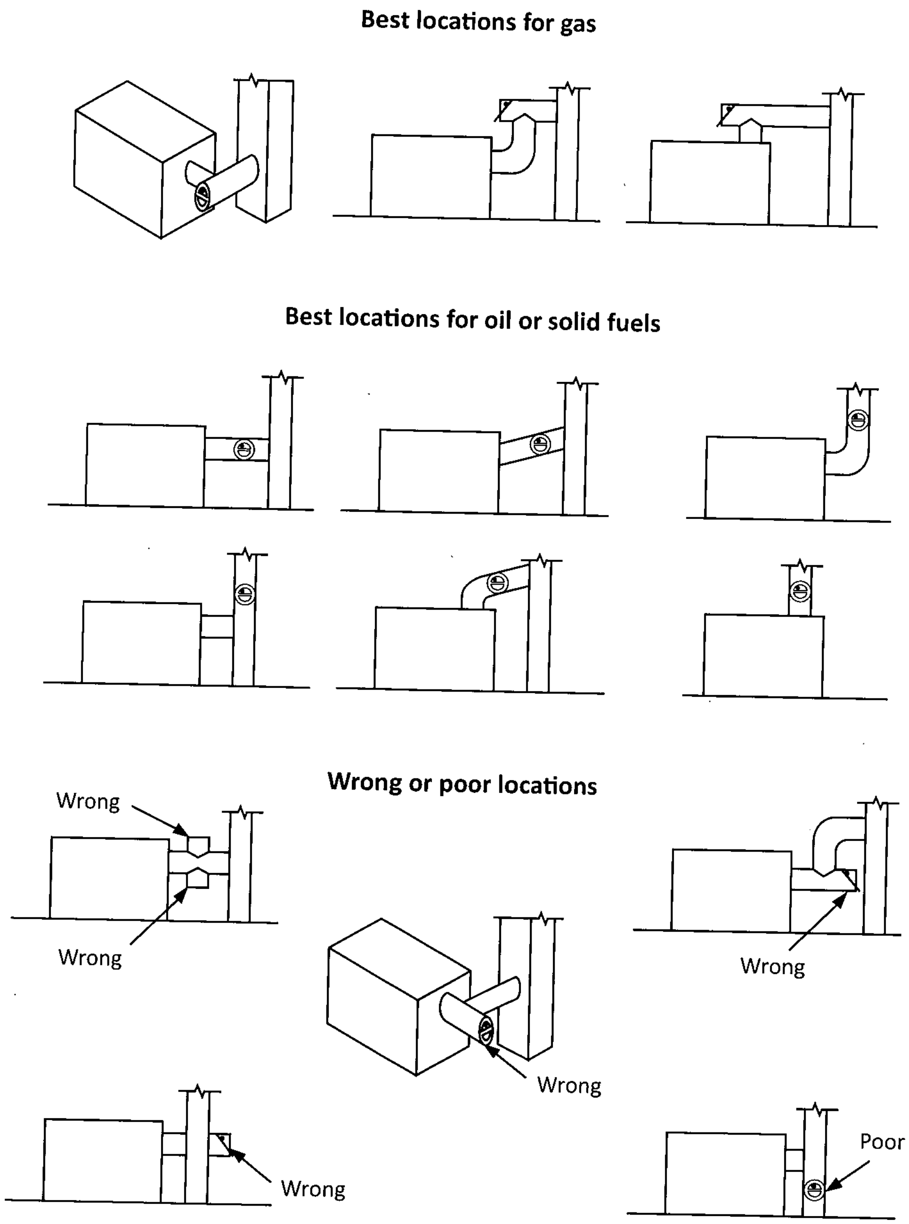
Figure 1-6
Operation of a double-acting barometric damper



Location of barometric dampers

In a correct installation, the flue gases are not directed toward the gate during normal up draft conditions, but they are so directed during a down draft condition. See Figure 1-7.

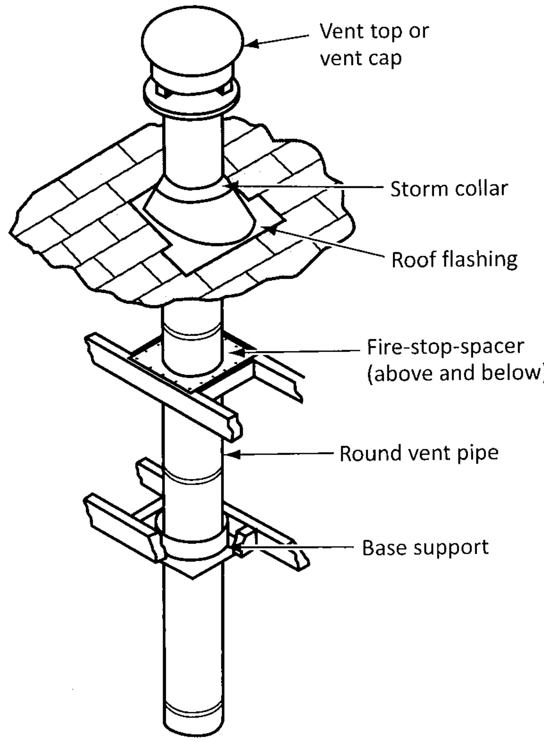
Figure 1-7
Locating the barometric draft control



Components of a natural draft venting system

Although there are many different types and configurations of natural draft venting systems, the basic system components are similar. See Figure 1-8.

Figure 1-8
Components of a typical venting system



Component	Description
Vent pipe support	Venting materials must have adequate support to maintain proper clearances. The vent supports must be separate from the appliance since the appliance cannot support the length and weight of its vents.
Fire stop spacer	The fire stop spacer blocks the stack effect during a fire. This helps to contain the fire and prevent it from spreading.
Roof flashing	Roof flashings are fitted around the gas vent to prevent rain and snow from entering the vent where it joins the roof.
Storm collar	The storm collar is an addition to the roof flashing. It prevents water from following the vent pipe down the roof flashing to seep into the dwelling area.
Vent cap or vent top	The vent cap or vent top prevents weather elements and foreign objects from entering the vent at its external opening. An approved cap or top is also designed to reduce down draft due to wind.

The *Types of gas vents* section discusses the various types of gas vents.

Unit 22 *Venting practices* provides a more in-depth analysis of natural draft venting systems. At the Gas Trade 3 level, the type of work conducted requires only a general understanding of venting systems and components.

Mechanical draft venting systems

A mechanical draft is a draft that a fan, blower, or other mechanical device produces. A mechanical draft is either a forced draft or an induced draft. A forced draft is a mechanical draft that results from the use of a device located **upstream** of the combustion zone of the appliance (see Figure 1-9). An induced draft is a mechanical draft that a device located **downstream** of the combustion zone of the appliance produces (see Figure 1-10).

Figure 1-9
Forced draft

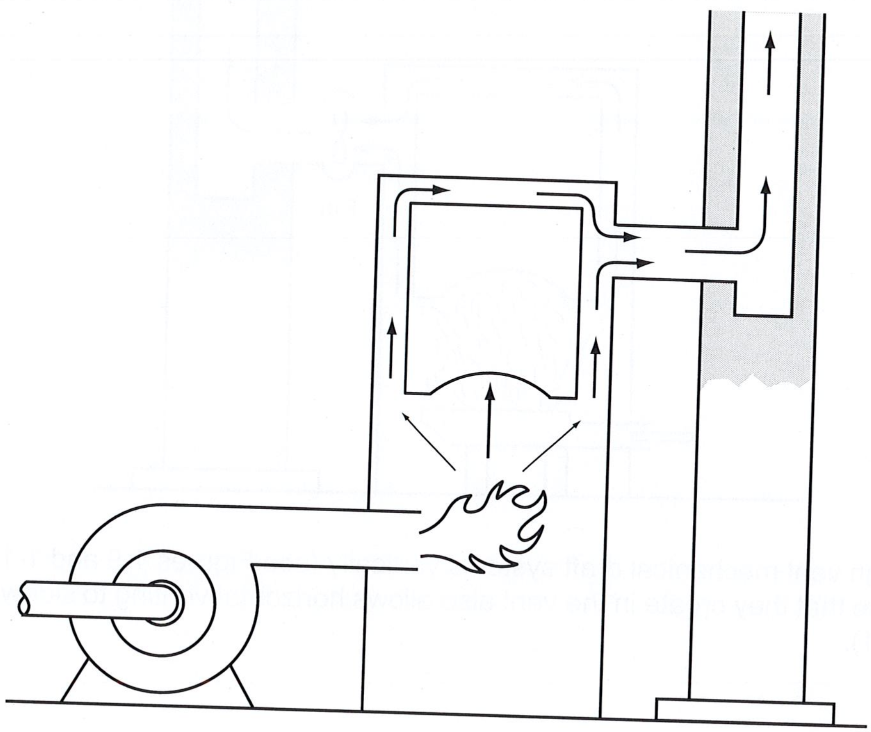
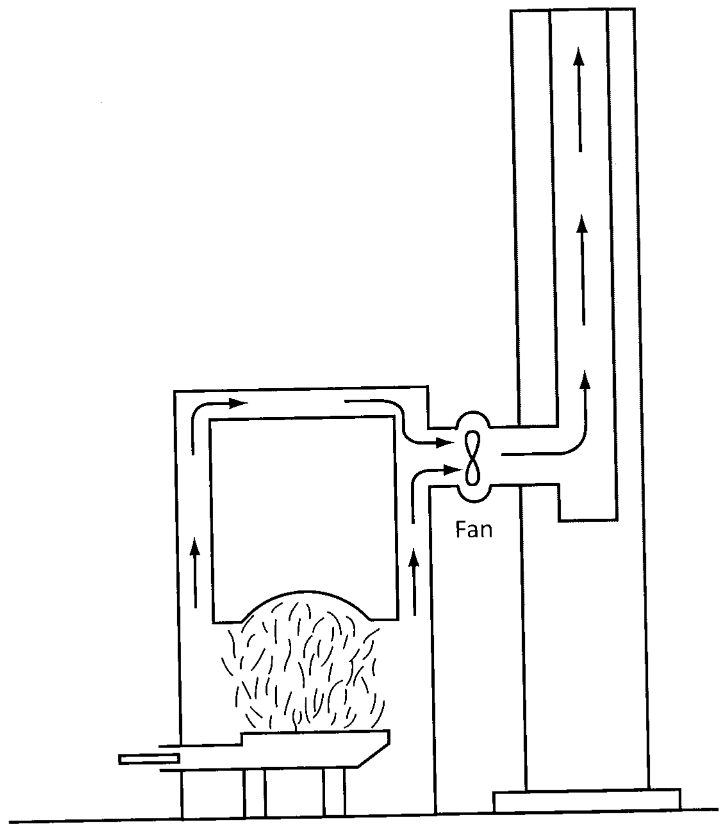
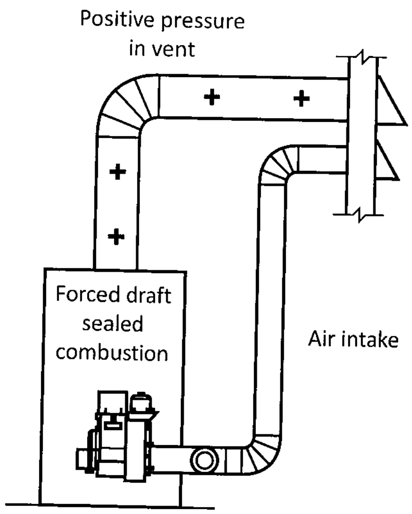


Figure 1-10
Induced draft

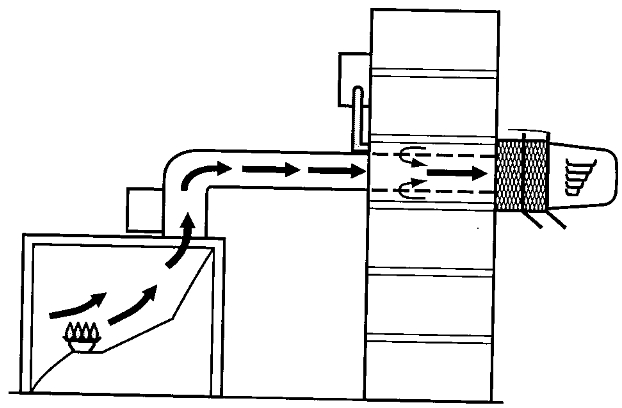


Although you can vent mechanical draft systems vertically (see Figures 1-9 and 1-10), the positive pressure that they create in the vent also allows horizontal venting to sidewall locations (see Figure 1-11).

Figure 1-11
Sidewall vented mechanical draft systems



(a) Forced draft



(b) Induced draft

Mechanical draft systems employ a mechanical device to remove the flue gases from the appliance. It is important not to confuse mechanical venting systems with mechanical burner systems—which you may know as forced draft burners or fan-assist burners.

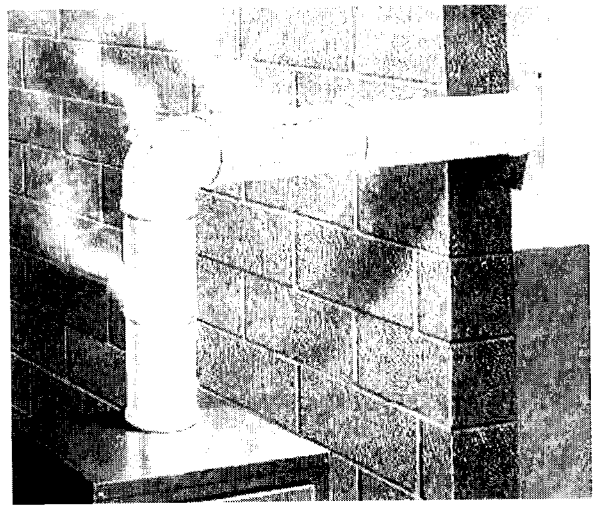
You may use a mechanical device to introduce air into the burner and/or cause the flue gases to pass through the appliance, but this device might not participate in venting. In these cases, the forced draft burner or fan-assist burner depends on a natural draft venting system to move the products of combustion to the outdoors.

It is important to focus on why the flue gases travel through the venting system. If a mechanical device causes venting, it is a mechanical draft venting system. If venting is dependent on hot flue gases rising naturally in a vent or chimney, it is a natural draft venting system.

Forced draft

Forced draft venting systems must be completely sealed because the vent pressure is positive from the inlet to the vent termination outside. Any leak or crack in the venting system causes flue gas spillage indoors (see Figure 1-12).

Figure 1-12
Spillage of flue gases from a positive pressure forced draft venting system



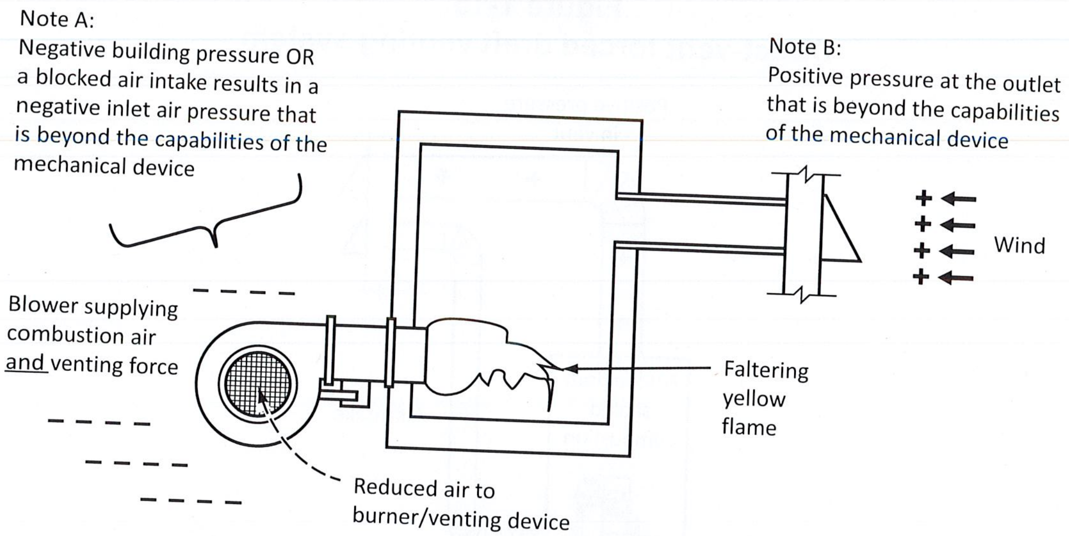
All forced draft systems are special venting systems that are designed and approved with the specific appliance. The appliance manufacturer specifies the type of vent material and the method of installation in its certified installation instructions.

It is critical that the technician/fitter who is installing or maintaining a forced draft venting system read and comply with the manufacturer's instructions as well as applicable code requirements.

The pressures at the inlet to the appliance and at the outlet of the vent also affect the performance of the mechanical device that supplies the force to push the flue gases through the vent.

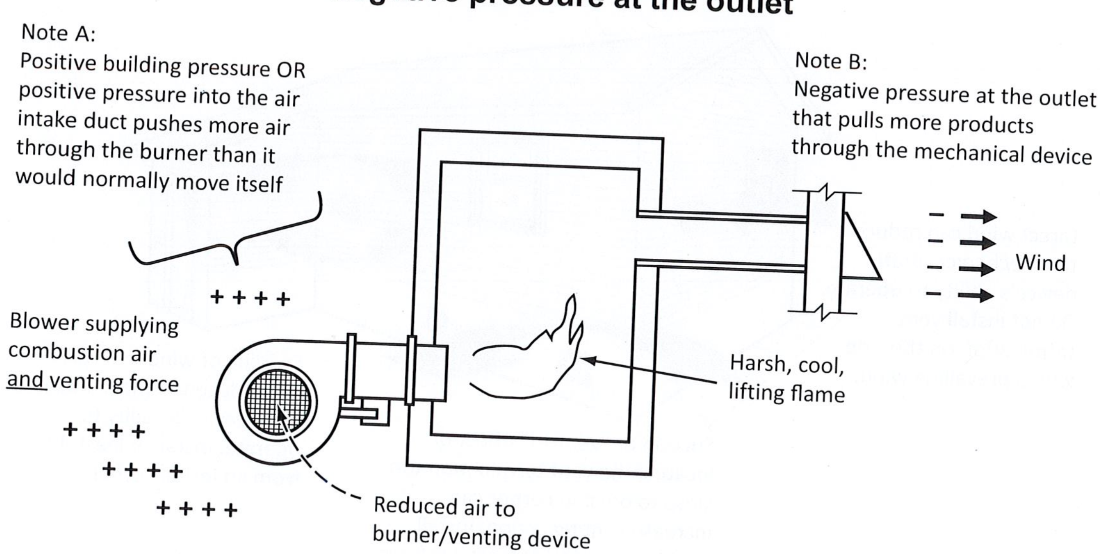
If there is insufficient air (caused by a negative building pressure or restriction of the air intake duct or filter to the mechanical device) that exceeds the suction ability of the mechanical venting device, you can reduce, stop, or reverse venting action (see Figure 1-13, Note A). The same problem can occur as a result of positive pressure (caused by wind) at the vent termination (see Figure 1-13, Note B).

Figure 1-13
Reduced forced draft venting action due to negative pressure at the inlet or positive pressure at the outlet



On the other hand, if the inlet pressure is positive (caused by a positive building pressure or suction on the air intake duct) and exceeds the static pressure ability of the mechanical venting device, you can increase venting action (see Figure 1-14, Note A). The same problem can occur as a result of negative pressure (caused by wind) at the vent termination (see Figure 1-14, Note B).

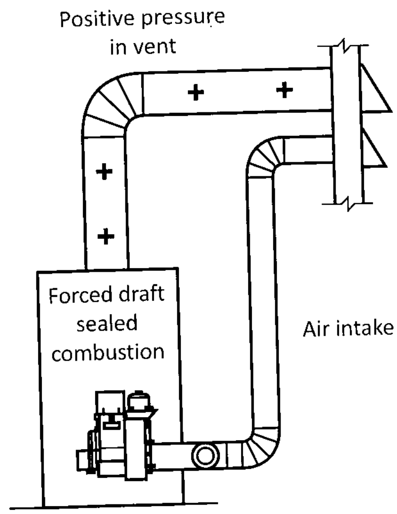
Figure 1-14
Increased forced draft venting action due to positive pressure at the inlet or negative pressure at the outlet



You can minimize the adverse effects of positive or negative pressures at the burner inlet by employing a direct vent air supply duct if the appliance manufacturer offers this option (see

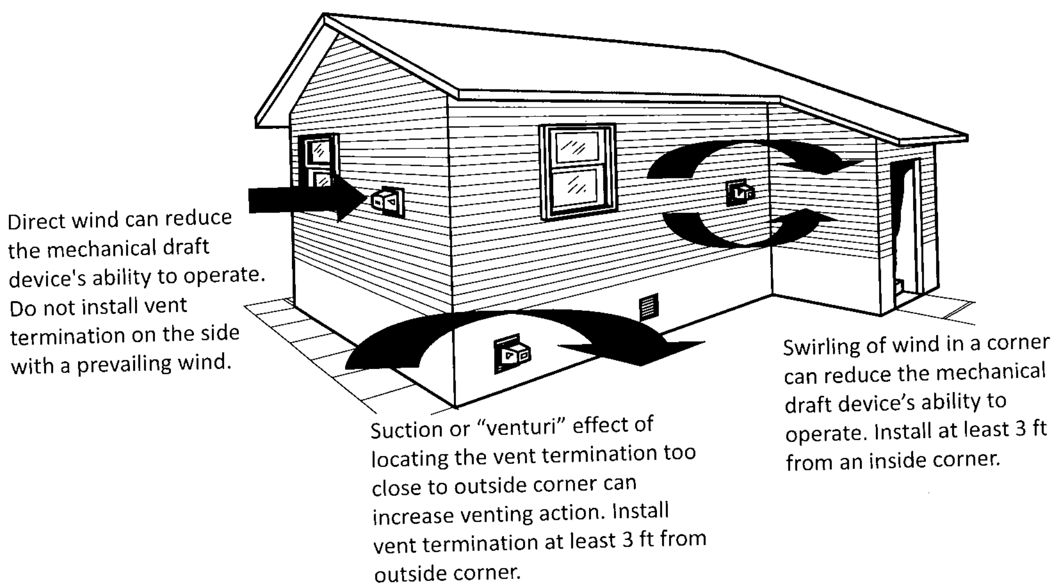
Figure 1-15). Indoor air pressures that are susceptible to change do not affect a direct-vent forced draft system.

Figure 1-15
Direct-vent forced draft venting system



You can minimize the adverse effects of a positive or negative pressure at the vent termination by following the manufacturer's instructions and code requirements regarding the location of the vent termination and the proper vent termination cap. See Figure 1-16.

Figure 1-16
Position sidewall vent termination in accordance with manufacturer's instructions and code requirements

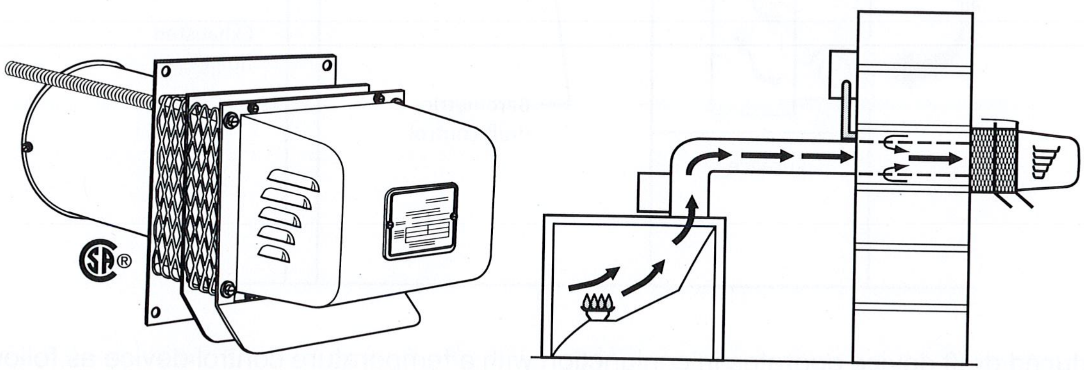


Induced draft

An induced mechanical draft device pulls the products of combustion through the vent. The vent upstream of the device is under negative pressure and, if a vent is installed downstream of the device, it is under positive pressure.

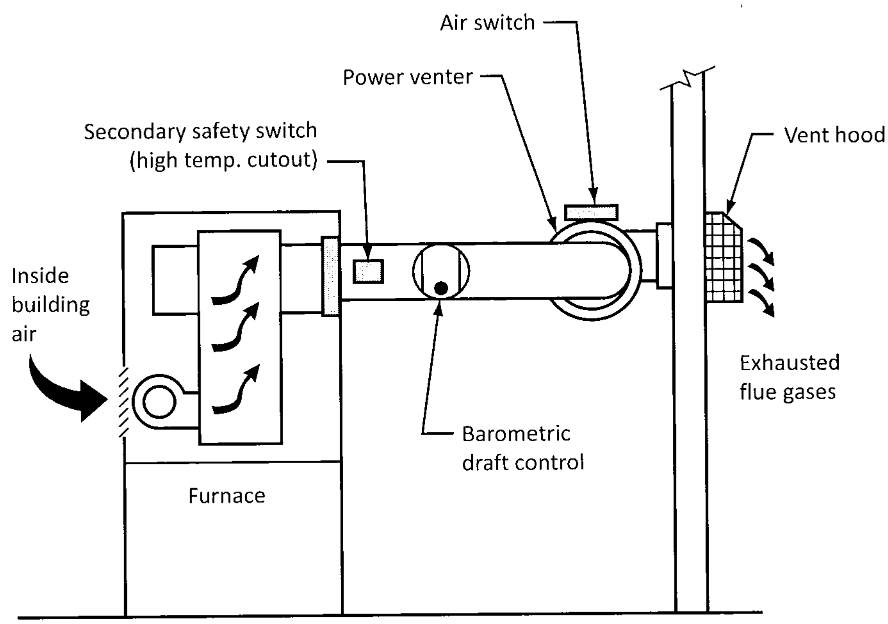
If the mechanical device is at the vent termination, the entire vent is under negative pressure. The appliance may have a draft hood or the vent may need to have a barometric damper. This type of induced draft system is what you often call a ***power venter***. See Figure 1-17.

Figure 1-17
Power venter induced draft venting system



If the mechanical device is mounted indoors (see Figure 1-18), the pressure upstream (i.e., on the appliance side) is negative and the downstream side (i.e., toward the sidewall) is under positive pressure. You must seal the positive pressure side of the vent system to prevent flue gas leakage indoors.

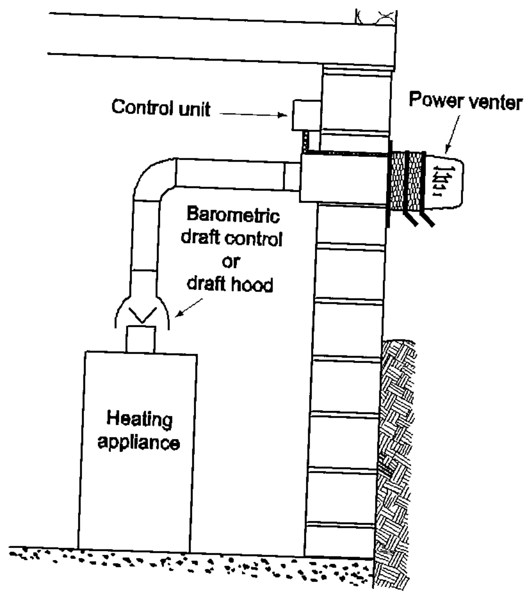
Figure 1-18
Indoor-mounted induced draft venting device



The induced draft device operates in conjunction with a temperature control device as follows:

1) The temperature control device, such as a thermostat or aquastat, calls for heat.
2) The demand activates a relay that triggers the power venter.
3) After the power venter has brought the system to a negative pressure, or to the required draft level, the pressure sensing contacts close. This allows the burner to light.
4) Following the satisfaction of the appliance demand, the contacts open and stop the power venter.

Figure 1-19
Power venter located at the vent outlet



The *Types of gas vents* section discusses the various types of gas vents used with mechanical draft venting systems.

Unit 22 *Venting practices* provides a more in-depth analysis of mechanical draft venting systems. At the Gas Trade 3 level, the type of work conducted requires only a general understanding of venting systems and components.

Types of gas vents

Since there are so many gas fired appliances available, one general type of gas vent is insufficient for all appliance types. CSA B149.1, engineering practices, and manufacturer's specifications indicate the type of vent required, along with installation procedures for appliances.

A thorough knowledge of the following vent types ensures the proper and safe venting of a gas appliance:

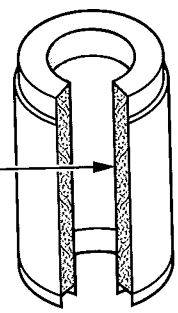
- chimneys (also known as Type A vents);
- Type B vents (including BW and L vents);
- single-wall vent connectors (also known as Type C vents); and
- Type BH vents (special metallic or plastic pipe vents).

The first three vent types are what you primarily use for natural draft venting systems, although some induced mechanical draft venting systems employ B vents or C vents. The primary use of the BH vent is for mechanical draft venting, although balanced-flue natural draft appliances may employ special venting systems as well.

Chimney

Chimneys help vent oil or solid fuel appliances or gas appliances that have flue temperatures that exceed 470°F (243 °C). Because of the high temperatures, these vents are made of such heat-resistant materials as masonry (brick or concrete). Manufacturers make them as insulated metal chimneys. See Figure 1-20.

Figure 1-20
Manufactured insulated metal chimney



Chimney liners

When solid-fuel or oil appliances are converted to gas-fired appliances that do not produce high flue temperatures, you may have to modify the chimney.

Solid-fuel or oil appliances produce high temperature flue gases and a strong draft. The cold brick walls offer little resistance to this type of high-temperature draft. However, the flue gas temperature that gas-fired appliances produce is not as hot and the draft is drastically reduced. In some cases, these flue gases may stop and collect in the chimney flue, even to the point where a back-draft is produced.

An additional problem with converting appliances is the risk of condensation and the vent corrosion it causes. Large, cold chimneys require large amounts of heat to warm them enough to stop condensation. Gas-fired appliances may not provide enough heat to restrict condensation.

Corrosion occurs when the condensed water vapour mixes with carbon dioxide and forms carbonic acid. The carbonic acid attacks the brick, chimney liner, and concrete and accelerates their deterioration.

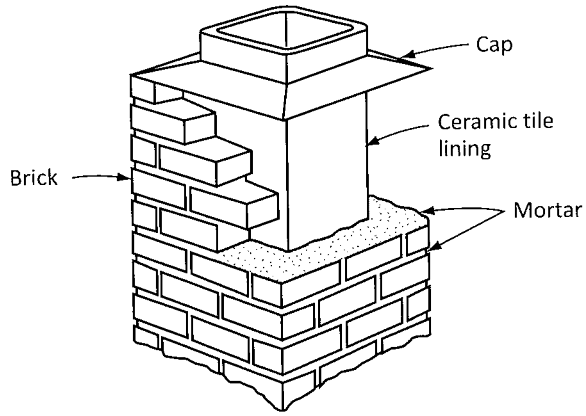
For such reasons, you may have to modify unlined chimneys (as per CSA B149.1, all chimneys must be lined for use with gas fired appliances) and chimneys with clay tile liners with a liner that both reduces the inside diameter and restricts condensation. Liners are made either of rigid material such as clay or ceramic tile (see Figure 1-21a), rigid metal (see Figure 1-21b), or flexible metal (see Figure 1-21c).

Type B vent

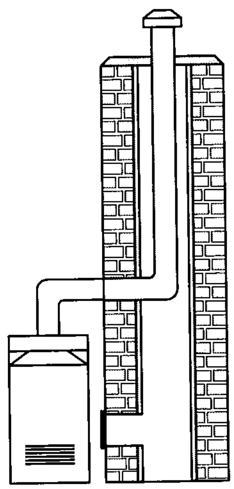
Type B vents are only approved for handling low temperature gases from gas appliances. They are of a double wall construction that encloses an insulating (dead air) space (see Figure 1-22). The outer wall is galvanized metal and the inner wall is aluminum.

Since the insulating quality of Type B vent is less than that of Type A vent, you must place it inside an insulated structure up to the roof line to avoid low outdoor temperatures that can reduce the temperature of the flue gases and reduce venting action. You must also place Type B vent at least 1 in (2.5 mm) away from combustible material in accordance with the manufacturer's instructions and the Gas Code.

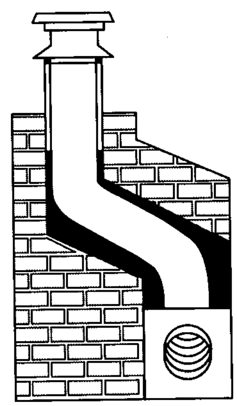
Figure 1-21
Various liners used to modify chimneys



(a) Ceramic liner

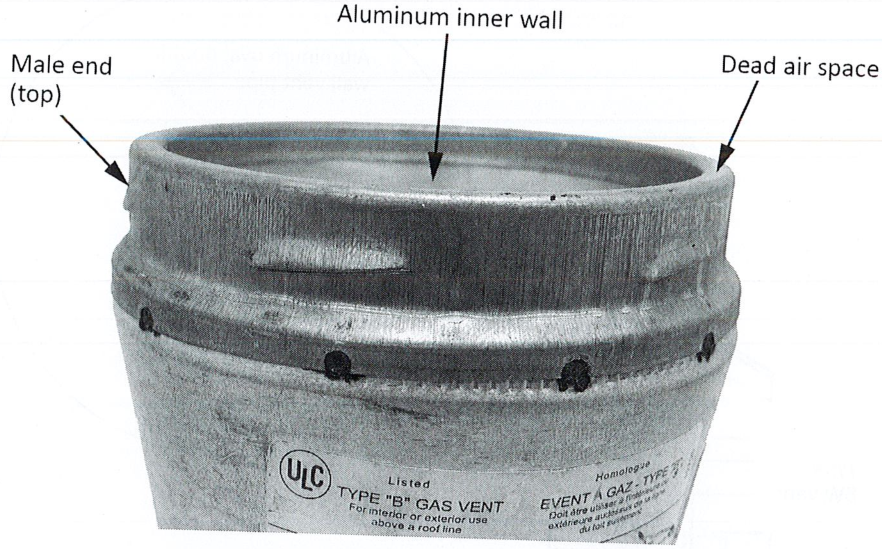


(b) Rigid metal liner



(c) Flexible metal liner

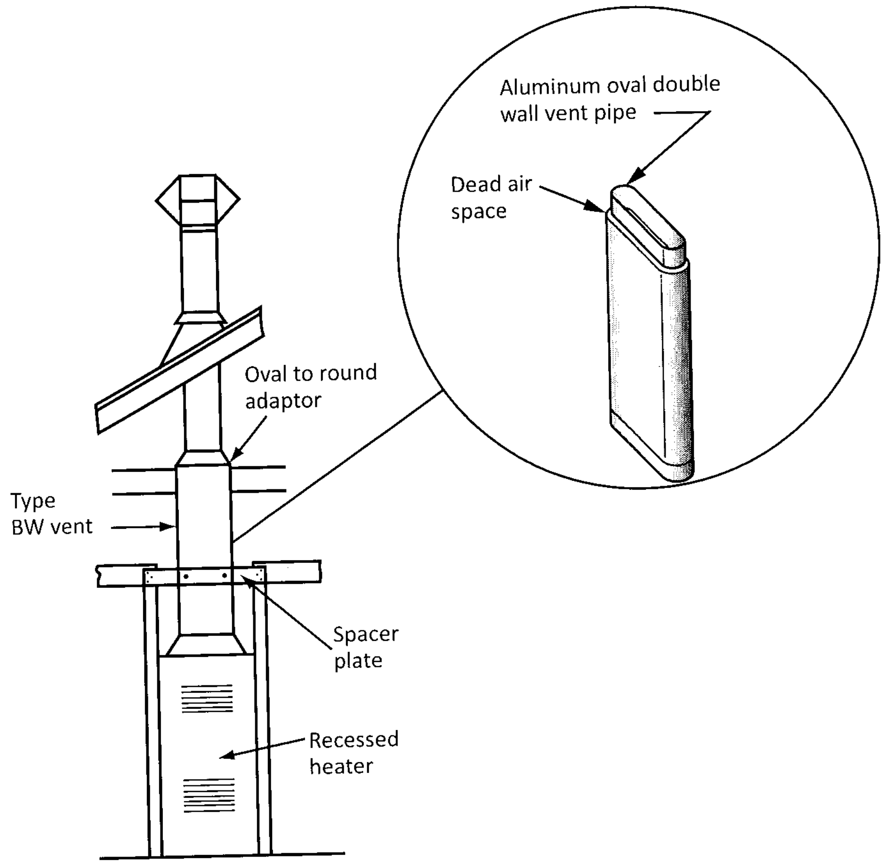
Figure 1-22
Type B vent for gas-fired appliances
Image courtesy of Terry Bell



Type BW vent

Type BW vent is similar in construction to Type B vent, except that it is oval instead of round (see Figure 1-23). BW vent is approved for recessed wall furnaces where you can install the oval shape inside a 2 × 4 stud wall.

Figure 1-23
Type BW oval vent for recessed wall furnaces

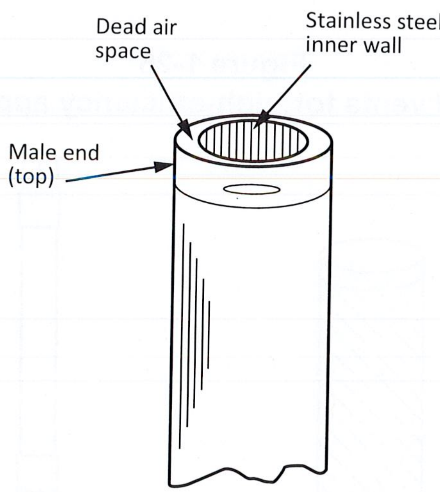


Type L vent

Type L vent is also very similar to Type B vent, except that the inner wall is stainless steel (see Figure 1-24). This makes the vent more heat and corrosion resistant.

You may use Type L vent instead of Type B vent; however, they are more expensive. Therefore, they are usually only installed where the manufacturer specifies (e.g., in a combination gas/oil appliance where heat and/or corrosion may be a specific problem.)

Figure 1-24
Type L vent for combination gas–oil appliances

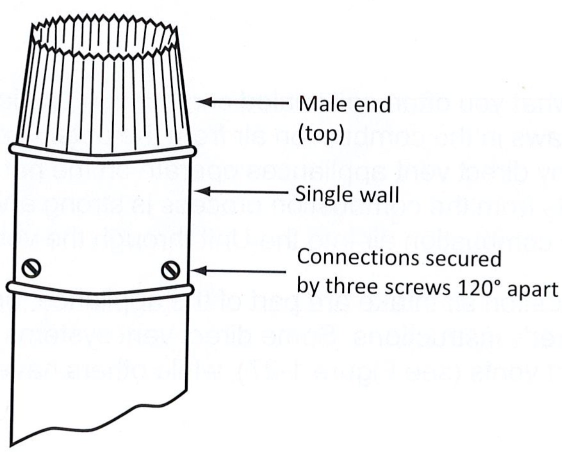


Single-wall vent

Single-wall vents are made of a single wall of galvanized steel. You must secure sections by three screws at each joint. The screws are positioned 120° apart (see Figure 1-25).

Not being insulated, single-wall vents must not penetrate any floors, ceilings, or concealed areas of the building structure. CSA B149.1 designates the minimum clearances from combustibles.

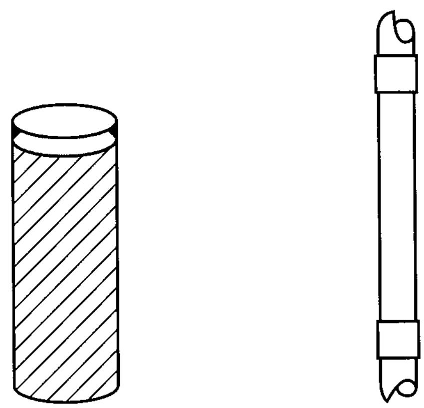
Figure 1-25
Single-wall vents



Type BH vent

Gas technicians/fitters use Type BH vents with high efficiency appliances that produce low flue temperatures and positive vent pressures or with other appliances that have approval for use with "BH only" venting. The low flue temperatures create abundant water vapour, and for this reason, the venting system must be made of corrosion resistant and leak-proof material. A thin wall of flexible stainless steel pipe (see Figure 1-26a) or plastic piping certified to ULC Standard S636 (see Figure 1-26b) is capable of withstanding the condensation of the water vapour and a positive vent pressure.

Figure 1-26
Type BH vents for high-efficiency appliances



(a) Flexible stainless steel vent

(b) PVC vent pipe

Before the regulatory acceptance of ULC S636, *Standard for Type BH Gas Venting* Systems, in 2007, plastic materials used for venting included ABS as well as "ordinary" PVC/CPVC that was not tested and certified to any Standard. Although existing installations of this non-certified plastic venting may still be in use, any new installations of plastic piping must employ certified S636 venting systems.

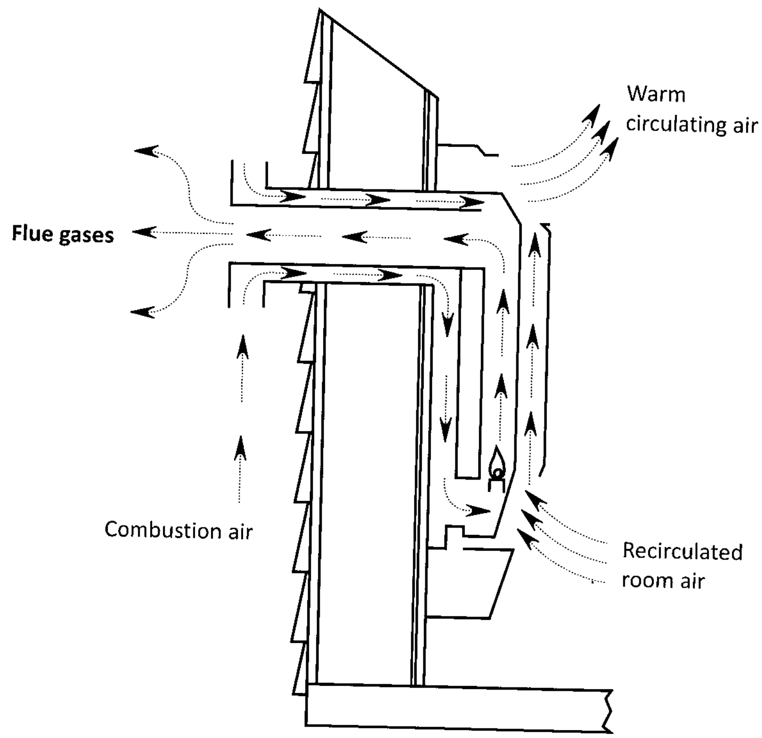
Direct vent

Direct vent appliances are what you often call sealed combustion appliances (see Figure 1-27). This venting system both draws in the combustion air from the outside and vents all flue gas directly to the outdoors. Many direct vent appliances operate on the natural draft principle, whereby the draft that results from the combustion process is strong enough to vent the products of combustion and draw the combustion air into the Unit through the vent/air intake system.

Both the vent and the combustion air intake are part of the appliance, and you must install them according to the manufacturer's instructions. Some direct vent systems are configured with concentric air intake/exhaust vents (see Figure 1-27), while others have separate air intake and exhaust pipes.

It may be beneficial to use a direct vent appliance when the building could experience a negative pressure, when a hazardous atmosphere exists within the building, or for other situations when it is not favourable to use a natural draft vent.

Figure 1-27
Direct vent draws in combustion air and emits flue gas from the same vent/air intake system



Assignment Questions – Chapter 1

1) Match the appropriate word(s) to best complete the following statements:

a) A venting system provides for the removal of __________ to the outside atmosphere:	Fresh air
b) A venting system provides for the prevention of damage from ______________:	Fire
c) A venting system provides for the protection of the building structure from __________ hazard:	Condensation
d) A venting system provides for the supply of _______________ to the burner:	Flue gas

2) What two products are produced by the complete combustion of natural gas or propane?
   a) Carbon dioxide, water vapour
   b) Carbon monoxide, oxygen
   c) Carbon dioxide, oxygen
   d) Carbon monoxide, water vapour

3) What are the conditions that provide a natural draft venting system with the greatest amount of draft?
   a) Low stack temperature, high outdoor temperature, high stack height
   b) High stack temperature, high outdoor temperature, high stack height
   c) High stack temperature, low outdoor temperature, high stack height
   d) Low stack temperature, low outdoor temperature, high stack height

4) What device allows dilution air to enter the venting system of an atmospherically fired appliance?
   a) Combustion air opening
   b) Burner air shutter
   c) Draft hood

5) Which type of vent is required when flue gas temperatures exceed 470°F (243 °C)?
   a) B vent
   b) BW vent
   c) Chimney
   d) L vent

6) Which type of vent has a double-wall construction with a dead air space between the walls?
   a) BW vent
   b) L vent
   c) B vent

7) Which type of vent draws in combustion air and emits flue gases from the same vent?
   a) Power vent
   b) BH vent
   c) Direct vent
   d) Single-wall vent

8) How does increasing vent temperature or height affect the draft of a natural draft (buoyancy vented) venting system?
   a) It decreases the draft
   b) It does not affect the draft
   c) It increases the draft

9) To what ULC Standard must all plastic material used in type "BH" venting systems be approved?
   a) ULC Standard CAN4-S605
   b) ULC Standard S636
   c) ULC Standard S609