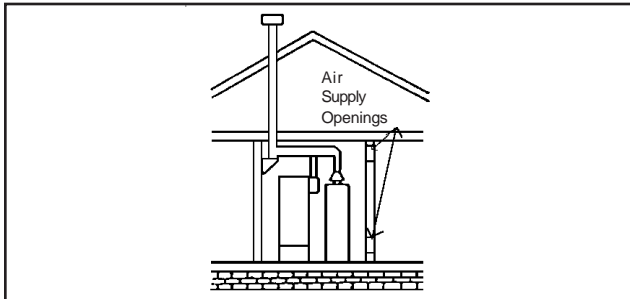


VENTING CLEARANCES

The vents should not be obstructed and all joints properly fitted. Floors, ceilings and walls must be cut or framed to provide necessary clearance to vents. Metal strippings and metal thimbles are used to maintain proper clearances.

ADEQUATE AIR

If a heater is being installed in a relatively small room which does not appear to be adequately ventilated, provisions must be made for adequate air supply. Louvers on interconnecting doors or air ducts may be needed. Two openings should be provided, one opening high on a door or wall and one near the floor. Each opening should be sized according to the input rating of the appliances. Special provisions also need to be made if an exhaust fan or fireplace are present as they too remove air from the available space.



NO VENTS INSIDE OF HEATING OR COOLING DUCTS

No vents may be installed in heating or cooling ducts. If a leak were to develop, the combustion products would contaminate the circulating air.

When placing the installed appliance into operation, check the following:

1. On installations vented through the roof, check for leaks. Suitable flashing must be applied and the roof sealed. Run water on the roof above the vent for a few minutes and check inside for leaks.

2. The overall appearance of an installation can be indicative of its condition. A properly installed system should be neat. Check the draft hood to be sure the vent or vent connector is securely attached. Determine that correct clearances are maintained by spacers and supports.

If the vent connector enters a masonry chimney, be sure there is a chimney liner, if the vent connector pierces the liner, be sure it is sealed where it enters and does not extend into the chimney so far that venting will be restricted by the opposite wall of the liner. An approved vent cap on top of the vent keeps out birds, helps eliminate the effects of wind and, prevents objects from falling into the vent.

Appliances that are designed to be vented need both the supply of combustion air and the removal of the products of combustion to work safely. When improper combustion takes place because of a poor gas/air mixture, carbon monoxide may be produced. This combustion by-product can be deadly when released into the living areas of a home, camper or any confined area. Carbon monoxide can cause death by asphyxiation. Serious and costly accidents have resulted from heaters designed to be vented and are not, or incorrectly vented gas appliances.

When customers ask a professional dealer to install appliances, they expect that every precaution will be taken to be sure the job is done correctly. Their lives are literally in your hands. Do every task or assignment you receive as if you were working for your own family. This will help you develop a safety conscious attitude toward your work.

This bulletin is limited to appliances using gravity type or atmospheric venting and does not cover power vented appliances. Also, it is not intended to cover all methods of venting but offers ways in which some common installations can be installed according to the provisions of NFPA # 54 "NATIONAL FUEL GAS CODE". You should check your local codes and regulations to be sure you have complied with their provisions. Also, consult NFPA 54 and your manufacturer's instructions for detailed requirements for all appliance installations.

There are two reasons for venting gas appliances. First, venting provides a means to safely remove the by-products of combustion to the outside atmosphere.

Venting also works to create air movement through the appliance which helps draw in for proper combustion of

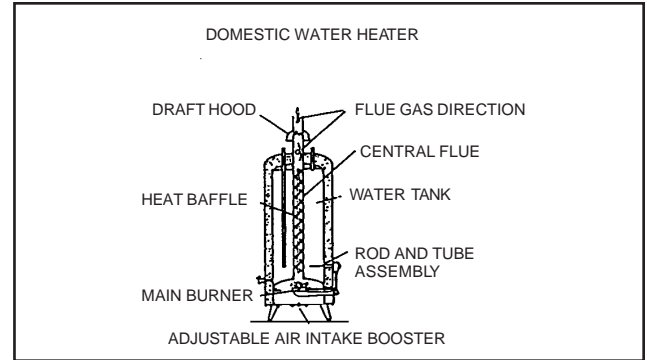
the gas.

When LP-gas is mixed with air and burned, heat is produced. This heat is the power that moves the products of combustion through the gas vent or chimney. Combustion gases rise in a chimney or vent because they are hotter, therefore lighter, than the surrounding air. For a 1,000,000 BTU gas appliance, 240 lbs. of gases are vented each hour.

The hotter the gases, the more swiftly and powerfully they rise in the vent. Conversely, the cooler they are, the more sluggish their movement. If cooled enough, the upward motion stops and combustion gases, if the appliance is operating, spill out of the appliance. Obviously, the vent should be kept sufficiently hot to ensure a strong positive draft. This is the principle behind the "gravity vents" covered in this bulletin.

Gravity type appliances can be vented by virtue of chimneys or gas vents. Chimneys may be masonry or metallic and can be factory built or assembled at the building site. Chimneys are often designed to remove gases from high temperature fuels such as wood or coal (600° to 1000°F.). Gas burning appliances operate at much cooler temperatures and the gases may condense into a sulfuric acid mixture that could deteriorate the chimney mortar. For this reason, most masonry chimneys are adequate for venting gas appliances unless lined.

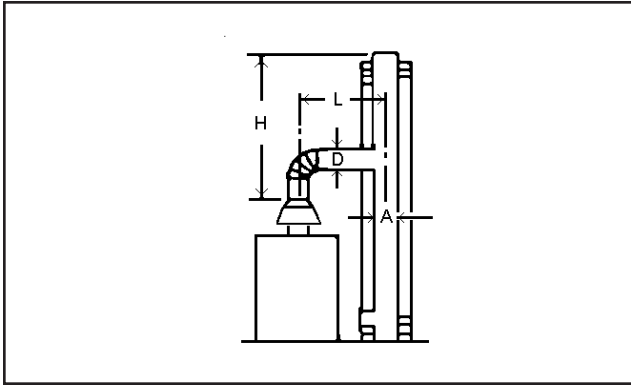
Each appliance has a flue gas passageway within the appliance. In the case shown below, the main and pilot burners are in the bottom of the water heater and the flue gases, which initiate near the bottom of the water heater, are carried by a central flue way that rises through the middle of the water tank. The central flue is an internal sleeve that contains a heat baffle to slow down the passage of the flue gases and allow the heat to transfer and maintain water temperature. A draft hood at the top of the central flue provides for dilution air to reduce the temperature of the flue gases before they enter the vent. The draft hood also prevents back draft from entering the appliance and neutralizes the effect of stack action from the chimney or gas vent on the operation of the appliance burners.



Installation of the venting system from the draft hood to the termination of the vent above the roof should be a continuous passageway of companion parts, caps, flashing and accessories.

A vent having a diameter equal to the draft hood outlet of the appliance is sufficient for that single appliance, provided the vent outlet is at least five (5) feet above the draft hood relief opening. You may be venting a single appliance such as a water heater, or multiple appliances. In the case of multiple appliances, however the size of the vent will be determined by the total BTU capacity of the appliance. Tables are available which will help you determine the size and height of venting systems. **(Please refer to the Common Vent Table at the end of this bulletin)**

When venting a single appliance such as a water heater, you must: (1) Determine total height (H) and total lateral length (L) of the vent; (2) Check the BTU (per hour) input of the appliance; (3) Using a table provided by the manufacturer or "Gas Vent Capacity Tables" provided by the Gas Vent Institute, Bulletin #15, or in tables in the National Fuel Gas Code, select the proper vent system.



Joint connections must be secured to maintain the integrity of the venting system. Single wall pipe, which cannot be used in concealed spaces and must have a minimum clearance from combustible materials (6" for listed appliances), should be fastened together with sheet metal screws.

Double wall (Type B) should be connected according to the vent manufacturers instructions using compatible components.

ROOM HEATERS have become increasingly popular because they are economical to buy and offer savings on fuel because they provide warmth to specific living areas, allowing unused areas to be kept at lower temperatures. However, safe installation means following exact instructions of the manufacturer and meeting all local codes and requirements.

Heaters listed as vented heaters, and all heaters over 40,000 BTU per hour require a vent. Also, wall heaters over 25,000 BTU/Hr must be vented.

All gravity vented room heaters, except those with direct vent systems, have a draft hood, (or draft diverter, to isolate the heater from the effects of backdraft or stoppage in the vent) similar to the draft hood of the water heater described before. A sealed combustion or direct vent system, which is on some room heaters and newer boilers, uses air directly from the outdoors and exhausts all combustion products directly outdoors without the use of traditional venting. No combustion air from indoors is used with this type of heater.

If the vent pipe were connected directly to the flue outlet of a gravity type appliance without using a draft hood, the amount of air drawn through the combustion chamber would vary with the height of the vent pipe - not allowing the proper air flow rate through the heater. The draft hood neutralizes the stack action of the vent.

More important, outdoor conditions of wind and weather can impose pressures at the outlet end of the vent and disturb the natural flow of vent gases. If wind creates a positive pressure, as it could if the vent terminal did not extend sufficiently above

the roof, it would tend to reverse the flow and create a downdraft. A draft hood minimizes the effects of such down-drafts on a room heater's operation.

Room heaters can be either vented through an exterior wall or through the roof. The vent piping should extend at least two (2) feet above the roof regardless of whether the vent exit is through the roof or through an exterior wall. Some codes require that a vent pipe extend two (2) feet above any part of the building within ten (10) feet of the vent.

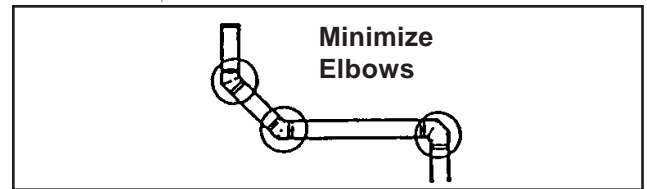
SUPPORT

When pipes must run laterally they must be supported. If the vent extends more than five (5) feet above the roof level, it must be securely braced. Where vents pass through a floor, ceiling or roof, be sure to check codes for properly securing and fire stopping the vent system. Codes require that all portions of the gas vent are adequately supported for the design and weight of the materials.

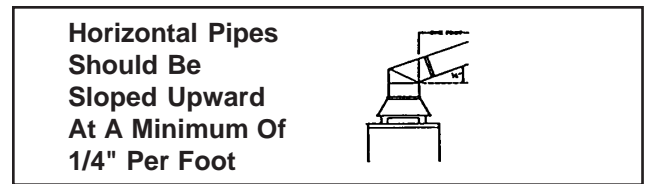
MINIMIZE HORIZONTAL RUNS

Whenever possible, an appliance should be connected directly to a vertical vent. This is not always possible because of desired locations. If a horizontal vent is needed, be sure to

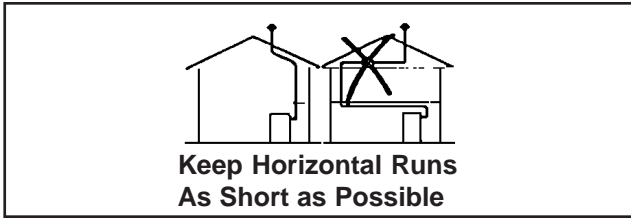
- (1) Minimize elbows which will restrict the flow of products of combustion.



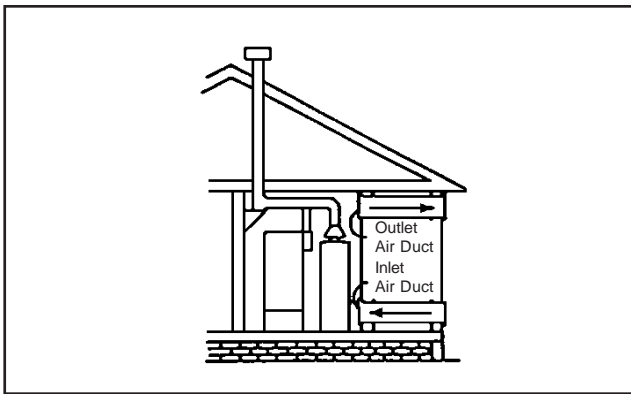
- (2) Slant upward at least 1/4" per foot from the heater for the horizontal portion of the vent.



(3) Keep Horizontal runs as short as possible not exceeding the limits given in the National Fuel Gas Code.



Checking air supply is extremely important. Combustion and ventilation air ducts must be permanently open to the outside. Screens used to trap dirt and lint should not have openings of less than 1/4 inch as they could become clogged, stopping the air flow.



POSSIBLE MALFUNCTIONS

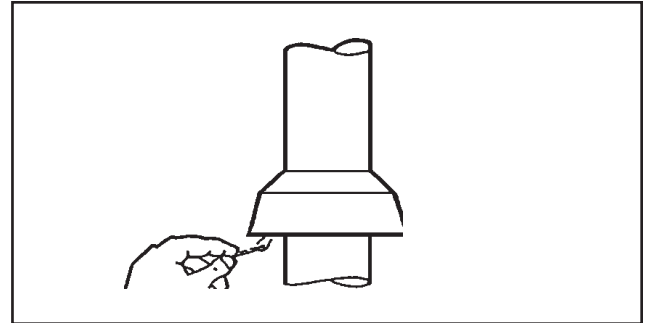
In a venting system, flue gases will not leave the building if the vent system above an appliance is blocked or damaged. With several appliances on the same vent, spillage could be a serious health hazard.

TROUBLE SHOOTING

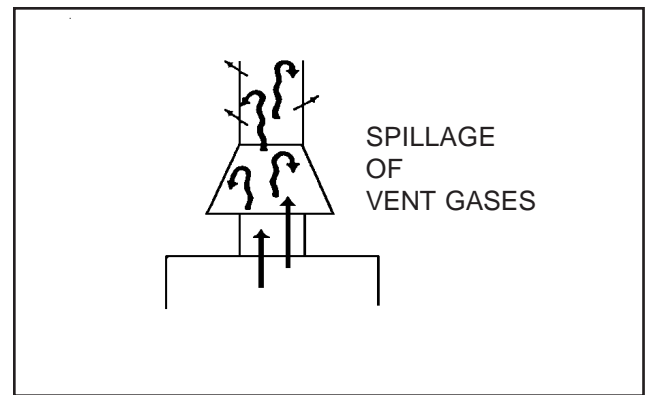
When trouble shooting a venting system it is necessary to determine two things:

1. Does a spillage situation exist?
2. Is there a leak in the system?

Operate the appliance burners for several minutes and check to see that combustion products are going up the chimney or gas vent. Pass a recently extinguished match around the edge of the relief of the draft hood. (A draft gauge, smoke from a cigarette, cigar, pipe or candle can also be used.)



If the smoke or flame is not drawn up into the draft hood, a proper draft has not been established. This may be due either to blockage of the vent or to poor placement, improper combustion or damage of the vent termination.



CHECK

- RISE
- PROPER CAPACITY
- BLOCKAGE

Check for proper vent connector rise, proper vent capacity using appropriate tables, or blockage of the vent or damage.

Check for leaks in all flues, vents and connectors. Replace any damaged gas vent, flue or connector.

Be sure that proper combustion is taking place (blue flame). Carbon monoxide, the result of improper combustion, can be measured by a device called a flue gas analyzer. Burner flames can be adjusted in most cases using the air shutters to obtain a proper (non-yellow) flame.

If condensation appears on water pipes or windows indoors, check the appliance venting system. Such condensation could indicate improper venting.

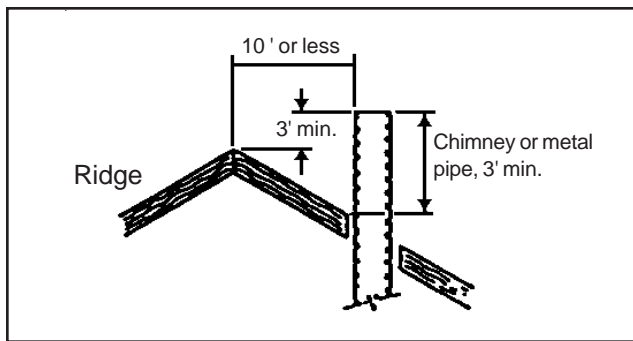
The most important point to remember when installing or inspecting LP gas appliances is that the products of combustion must

be vented safely to the outside. This is done safely when you have installed the system according to the manufacturer's instructions, followed local codes and NFPA 54 and checked the system for proper operation, leaks and blockage.

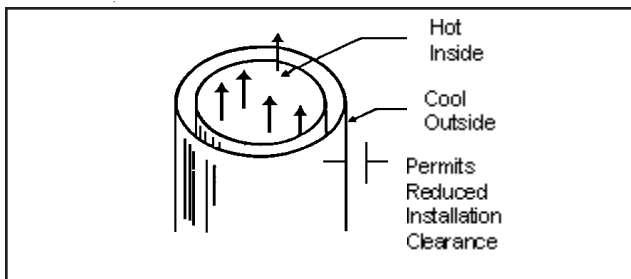
Advise the customer that after an installation has been in operation for some time, periodic inspections for bird nests, leaves or other litter which can accumulate will help ensure continued safe operation; also that rusty or corroded vent pipe must be replaced.

To avoid deterioration and impede venting, chimneys can be designed with two or three flues, one for say, a wood burning appliance and others for gas appliances.

A chimney or vent must extend at least three (3) feet above the highest point where it passes through a roof and at least two (2) feet higher than any portion of a building within a horizontal distance of ten (10) feet.



"Type B" gas vents are specifically designed for low temperature vent gases (Refer to NFPA 54). They are listed, corrosion resistant, generally made of aluminum or steel and employ double wall construction for ventilation by virtue of the insulating air space.



This vent is designed to avoid excessive temperature on surrounding combustible materials and must be installed with the specific clearances marked on the components. This type of vent is suitable for equipment with draft hoods.

Type B-W gas vents are designed for use only on wall heaters and are manufactured in various lengths of oval or rectangular double wall metal duct. These are primarily used for installation between wall studs.

Single wall vents are used only in the space in which the appliance is connected. In some areas, such a vent is not allowed by local codes.

One of the most common gas appliances is the gas water heater. There are limitations in the National Fuel Gas Code which state where the installation of water heaters is prohibited. These are:

- Bedrooms
- Bathrooms
- Occupied rooms kept closed
- Kitchens, in some instances

CONCLUSION

Although this bulletin covers only information on water and room heating installations, installation and service personnel may find a variety of conditions at user homes where basic knowledge of good venting practices will help in determining if an unsafe condition exists. Installation technicians will be well advised to be alert to these conditions, which may have been the results of "do it yourself type" installations, and advise users to have the condition corrected immediately.

Also, be sure that your installations are done to exacting standards and when you leave the customer's premises you are confident that the system is operating properly. You can avoid costly customer recalls and potentially hazardous conditions by following the few simple guidelines mentioned in this bulletin and carefully reading:

- MANUFACTURER'S LITERATURE AND INSTALLATION INSTRUCTIONS
- NATIONAL FUEL GAS CODE, NFPA 54 (ANSI Z223.1)
- LOCAL CODES AND REGULATIONS

VENT HEIGHTS

MINIMUM PAST ROOF AT VARIOUS PITCHES

Pitch	Height*
Flat	3 feet, 0 inches
1 : 12	3 feet, 0 inches
2 : 12	3 feet, 8 inches
3 : 12	4 feet, 6 inches
4 : 12	5 feet, 4 inches
5 : 12	6 feet, 2 inches
6 : 12	7 feet, 0 inches
7 : 12	7 feet, 10 inches
8 : 12	8 feet, 8 inches
9 : 12	9 feet, 6 inches
10 : 12	10 feet, 4 inches
11 : 12	11 feet, 2 inches
12 : 12	12 feet, 0 inches
13 : 12	12 feet, 10 inches
14 : 12	13 feet, 8 inches
15 : 12	14 feet, 6 inches
16 : 12	15 feet, 4 inches
17 : 12	16 feet, 2 inches
18 : 12	17 feet, 2 inches
19 : 12	17 feet, 0 inches
20 : 12	18 feet, 8 inches

* Or at least 3 feet AND
at least 2 feet above peak