

GENERAL VENTING REQUIREMENTS AND GUIDELINES

VENTING & COMBUSTION AIR REQUIREMENTS

WARNING

READ AND FOLLOW ALL INSTRUCTIONS IN THIS SECTION. FAILURE TO PROPERLY VENT THIS FURNACE CAN CAUSE CARBON MONOXIDE POISONING, OR AN EXPLOSION OR FIRE, RESULTING IN PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

WARNING

THIS FURNACE AND ANY OTHER FUEL-BURNING APPLIANCE MUST BE PROVIDED WITH ENOUGH FRESH AIR FOR PROPER COMBUSTION AND VENTILATION OF THE FLUE GASES. MOST BUILDINGS WILL REQUIRE THAT OUTSIDE AIR BE SUPPLIED INTO THE FURNACE AREA. FAILURE TO DO SO CAN CAUSE PERSONAL INJURY OR DEATH FROM CARBON MONOXIDE POISONING. REFER TO SECTION TITLED “NON-DIRECT VENTING” TO DETERMINE IF THE FURNACE MUST USE OUTSIDE AIR FOR COMBUSTION.

This furnace removes both sensible and latent heat from the combustion gases. Removal of latent heat results in the condensation of flue gas water vapor. This condensed water vapor drains from the secondary heat exchanger and out of the unit into the drain trap.

When installed as a non-direct vent furnace, only exhaust piping is required and inside combustion air may be used. Refer to the section on “NON-DIRECT VENTING.”

Direct vent installations require a dedicated combustion air and venting system. All air for combustion is taken from the outside atmosphere and all combustion products are discharged to the outdoors.

Adequate facilities for providing air for combustion and ventilation must be provided in accordance with Section 5.3, “Air for Combustion and Ventilation” of the National Fuel Gas Code, ANSI Z223.1 (latest edition), in Canada CSA B149.1; Canadian Natural Gas and Propane Installation Code and The National Fire Code of Canada, or applicable provisions for the local building codes, and not obstructed so as to prevent the flow of air to the furnace.

IMPORTANT: Air for combustion and ventilation must not come from a corrosive atmosphere. Any failure due to corrosive elements in the atmosphere is excluded from the warranty coverage.

Combustion air must be free of acid-forming chemicals such as sulfur, fluorine and chlorine. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, air fresheners, paint and varnish removers, refrigerants and many other commercial and household products. When burned in a gas flame, vapors from these products form acid compounds. The acid compounds increase the dew point temperature of the flue products and are highly corrosive after they condense.

The following types of installations (but not limited to the following) may require outdoor air for combustion (direct-vent) due to chemical exposures:

- Commercial buildings
- Buildings with indoor pools
- Furnaces installed in laundry rooms
- Furnaces in hobby or craft rooms
- Furnaces installed near chemical storage areas

If combustion air is exposed to the following substances (but not limited to the following), it should not be used and the furnace may require outdoor air for combustion (direct-vent).

- Permanent wave solutions
- Chlorinated waxes and cleaners
- Chlorine-based swimming pool chemicals
- Water softening chemicals
- De-icing salts or chemicals
- Carbon tetrachloride
- Halogen type refrigerants
- Printing inks, paint removers, varnishes etc.
- Cleaning solvents (such as perchloroethylene)
- Hydrochloric acid
- Cements and glues
- Antistatic fabric softeners for clothes dryers
- Masonry curing and acid washing materials

WARNING

ALL FURNACE INSTALLATIONS MUST COMPLY WITH THE NATIONAL FUEL GAS CODE, IN CANADA CSA B149.1; CANADIAN NATURAL GAS AND PROPANE INSTALLATION CODE AND THE NATIONAL FIRE CODE OF CANADA, NFPA 54, AND LOCAL CODES TO PROVIDE ADEQUATE COMBUSTION AND VENTILATION AIR FOR THE FURNACE. FAILURE TO DO SO CAN RESULT IN EXPLOSION, FIRE, PROPERTY DAMAGE, CARBON MONOXIDE POISONING, PERSONAL INJURY OR DEATH.

Combustion air requirements are determined by whether the furnace is in an open (unconfined) area or in a confined space such as a closet or small room.

When the furnace is installed in the same space with other gas appliances, such as a water heater, be sure there is an adequate supply of combustion and ventilation air for the furnace and the other appliances. Do not delete or reduce the combustion air supply required by the other gas appliances in this space. See Z223.1, National Fuel Gas Code (NFPA 54). In Canada, CSA B149.1; Canadian Natural Gas and Propane Installation Code and The National Fire Code of Canada for determining the combustion air requirements for gas appliances. An unconfined space must have at least 50 cubic feet (volume) for each 1,000 BTUH of the total input of all appliances in the space. If the open space containing the appliances is in a building with tight construction (contemporary construction), outside air may still be required for the appliances to burn and vent properly. Outside air openings should be sized the same as for a confined space.

GENERAL VENTING REQUIREMENTS AND GUIDELINES

VENTING & COMBUSTION AIR REQUIREMENTS (cont.)

IMPORTANT: ONLY THE CURRENT VENT INSTRUCTIONS APPLY. All 90 Plus Gas Furnaces cannot be common-vented.

OVERTEMPERATURE SAFETY SWITCHES

Furnaces are equipped with safety switches in the burner compartment to protect against over-temperature conditions caused by inadequate combustion air supply. The switches are located in the burner compartment. If a switch is tripped it must be manually reset after clearing the fault condition which caused it to open.

WARNING

DO NOT BYPASS, JUMPER, OR REMOVE ANY SAFETY SWITCH FROM THE FURNACE CONTROL CIRCUIT. IF A SAFETY SWITCH CAUSES THE FURNACE TO SHUT DOWN OR OPERATE INTERMITTENTLY, IT IS AN INDICATION OF A POTENTIAL SAFETY HAZARD THAT MUST BE ADDRESSED BY A QUALIFIED TECHNICIAN, SERVICE AGENCY OR THE GAS SUPPLIER. DO NOT RESET SAFETY CONTROLS WITHOUT CORRECTIVE ACTION AND/OR VERIFICATION OF PROPER SAFE OPERATION BY A QUALIFIED INSTALLER, SERVICE AGENCY OR THE GAS SUPPLIER.

REPLACE ANY SAFETY CONTROL COMPONENT ONLY WITH IDENTICAL OEM REPLACEMENT PARTS

MATERIAL REQUIREMENTS

PIPING REQUIREMENTS

The combustion air and vent pipe fittings must conform to American National Standards Institute (ANSI) and American Society for Testing Materials (ASTM) standards D1785 (Schedule 40 PVC), D2665 (PVC-DWV), D2241 (SDR-21 & SDR26-26 PVC), D2661 (ABS-DWV) or F628 (Schedule 40 ABS-DWV). For Canada PVC, CPVC and polypropylene venting can be used and must conform with ULCS-636C requirements.

IMPORTANT: The plastic combustion air and venting components are of Schedule 40 PVC. If using ABS piping, ensure that the solvent cement is compatible for joining PVC to ABS components or use a mechanical connection that can withstand the vent temperatures and is corrosion resistant.

NOTE: Schedule 40 ABS-DWV pipe and fittings may be used as an alternate to PVC pipe for the combustion air inlet and vent pipes.

NOTE: Cellular core PVC is also approved for use. It must be Schedule 40PVC-DWV cellular pipe for non-pressure applications and manufactured under ASTM-F-891.

All exhaust piping must be installed in compliance with the chapter titled; **“Venting of Appliances”** in the latest edition of the National Fuel Gas Code, NFPA-54/ANSI

Z223.1, CSA B149.1; Canadian Natural Gas and Propane Installation Code and The National Fire Code (Canada), local codes or ordinances and these instructions.

WARNING

IN CANADA, PRODUCTS CERTIFIED FOR INSTALLATION AND INTENDED TO BE VENTED WITH PLASTIC VENT SYSTEMS (PVC, CPVC & POLYPROPYLENE) MUST USE VENT SYSTEMS THAT ARE CERTIFIED TO THE STANDARD FOR TYPE BH GAS VENTING SYSTEMS, ULC S636.

THE COMPONENTS OF THE CERTIFIED MATERIAL MUST NOT BE INTERCHANGED WITH OTHER VENT SYSTEMS OR UNLISTED PIPE/FITTINGS.

PLASTIC COMPONENTS AND SPECIFIED PRIMERS AND GLUES OF THE CERTIFIED SYSTEM MUST BE FROM A SINGLE SYSTEM MANUFACTURER AND NOT INTERMIXED WITH OTHER SYSTEM MANUFACTURER'S PARTS.

VENT TERMINATIONS ARE NOT REQUIRED TO BE FROM THE SAME MANUFACTURER AS THE REST OF THE VENTING BUT VENT TERMINATIONS MUST BE ULC S636 APPROVED.

NOTE: WITH THE EXCEPTION OF THE TERMINATION INLET AIR PIPING IS NOT CONSIDERED TO BE A PART OF THE “VENTING SYSTEM”. THE REQUIREMENT THAT VENT MATERIAL BE CERTIFIED TO ULC S636 DOES NOT APPLY TO INLET AIR PIPING.

REGARDLESS, ALL TERMINATIONS ON BOTH INLET AND OUTLET PIPES MUST BE CONSTRUCTED FROM COMPONENTS BUILT TO ULC-S636 REQUIREMENTS.

1. All horizontal piping must slope upward from the furnace with a minimum slope of ¼ inch per foot of horizontal vent so that condensate drains back toward the furnace.
2. All horizontal runs must be supported at least every 4 feet. No sags or dips are permitted.
3. **IMPORTANT:** Do not common vent with any other appliance. Do not install in the same chase or chimney with a metal or high temperature plastic pipe from another gas or fuel-burning appliance unless the required minimum clearances to combustibles are maintained between the plastic pipe and other pipes. For Canada PVC, CPVC and polypropylene can be used as long as they conform with ULCS-636C requirements.
4. All vent installed through unconditioned spaces where below-freezing temperatures are expected must be insulated with with an approved insulating material. Materials such as Armaflex or Rubatex insulation may also be used as long as there is no heat tape applied to the vent pipe. For horizontal runs where water may collect, wrap the vent pipe with self-regulating 3 watt or 6 watt heat tape. The heat tape must be U.L. listed and installed per the manufacturer's instructions. **NOTE:** Never cover heat tape with insulation.

GENERAL VENTING REQUIREMENTS AND GUIDELINES

VENTING & COMBUSTION AIR REQUIREMENTS (cont.)

5. The minimum vent pipe length is 5 feet [1.5m].
6. **IMPORTANT:** No part of the combustion air and/or vent pipes may be installed underground.
7. Piping at a roof, wall or other penetration must be immobilized to prevent pipes from disconnecting. Disconnected pipes may allow flue products to be released inside the structure.
8. For Direct Vent systems, all pipe penetrations through roof or sidewall must be installed so that the vent and combustion air intake pipes terminate in the same atmospheric pressure zone.
9. Vent terminations must be installed with the minimum clearances specified in the TERMINATION REQUIREMENTS sections of this manual and **Figure 21** (for Non-Direct Vent) and **Figure 32** (for direct Vent installations).
10. Piping external to the structure (excluding approved venting terminations) and vent passing through unheated crawl-spaces, attics, verandas, patios or decks must be insulated with approved insulating material to prevent freezing as required for local climate.

JOINING PIPE AND FITTINGS

WARNING

PVC/CPVC SOLVENT CEMENTS AND PRIMERS ARE HIGHLY FLAMMABLE. PROVIDE ADEQUATE VENTILATION AND DO NOT ASSEMBLE NEAR A HEAT SOURCE OR AN OPEN FLAME. DO NOT SMOKE. AVOID SKIN OR EYE CONTACT. OBSERVE ALL CAUTIONS AND WARNINGS PRINTED ON MATERIAL CONTAINERS. FAILURE TO FOLLOW THESE GUIDELINES MAY RESULT IN FIRE, EXPLOSION OR ASPHYXIATION CAUSING PERSONAL INJURY OR DEATH.

TABLE 2: APPLICABLE ASTM STANDARDS FOR VENT MATERIALS (U.S. Only)

Materials	Sch. 40 Pipe	SDR Pipe	Cell Core Pipe	Fittings	Primer	Solv. Cement
ABS	D1527	-	F628	D2468 & D2661	-	D2235
PVC	D1785	D2241	F891	D2466 & D2665	F656	D2564
CPVC	F441	F442	-	F348	-	F493
ABS to PVC	-	-	-	-	-	D3138

For Canadian installations all exhaust venting materials must be certified to ULCS-636C.

All pipe, fittings, solvent cement, primers and procedures must be installed following the vent manufacturer's installation instructions and must conform to American National Standards Institute and American Society for Testing Materials (ANSI/ASTM) standards as shown in the **Table 2** below:

CEMENTING JOINTS

Properly seal all joints in the PVC vent using the following materials and procedures.

PVC CLEANER-PRIMER AND PVC MEDIUM-BODY SOLVENT CEMENT

IMPORTANT: After cutting pipe, remove all ragged edges and burrs. This is important to prevent reduction in pressure drop throughout the system.

1. Cut pipe end square. Chamfer edge of pipe. Clean fitting socket and pipe joint area of all dirt, grease and moisture.
 2. After checking pipe and socket for proper fit, wipe socket and pipe with cleaner-primer. Apply a liberal coat of primer to inside surface of socket and outside of pipe. Read instructions included with the primer for proper application.
 3. Apply a thin coat of cement evenly within the socket. Quickly apply a heavy coat of cement to the pipe end and insert pipe into the fitting with a slight twisting movement until it bottoms out.
- NOTE:** Cement must be fluid. If not, re-coat.
4. Hold the pipe in the fitting for 30 seconds to prevent the tapered socket from pushing the pipe out of the fitting.
 5. Wipe all excess cement from the joint with a rag. Allow 15 minutes before handling. Cure time varies according to fit, temperature and humidity.

NOTE: Stir the solvent cement frequently while using. Use a natural bristle brush or the dauber supplied with the can. The proper brush size is one inch.

IMPORTANT: For proper installation:

DO NOT use solvent cement that has become curdled, lumpy or thickened.

DO NOT thin. Observe shelf precautions printed on containers. For applications below 32°F, use only low-temperature type solvent cement.

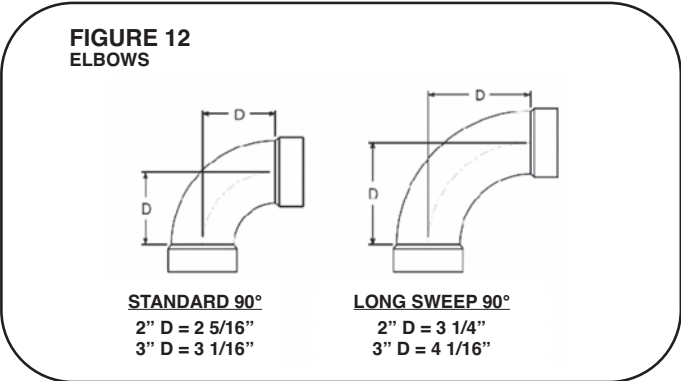
GENERAL VENTING REQUIREMENTS AND GUIDELINES

VENT PIPE SIZING AND MAXIMUM VENT LENGTHS

EQUIVALENT VENT LENGTHS

The concept of equivalent vent lengths is frequently used in piping systems to account for pressure drop of fittings, such as elbows. The equivalent length of a fitting is the length of a straight section of pipe that has an equivalent pressure drop in the application as the fitting used. With the equivalent length vent concept, a vent system can use up to the maximum number of elbows and vent length of straight pipe as long as the maximum equivalent vent length is not exceeded.

There are several different types of elbows that can be used when constructing a vent system. **Figure 12** shows the standard dimensions for standard and long-sweep 90° (1/4 turn) elbows as specified by ASTM 3311, Standard Specification for Drain, Waste and Vent (DWV) Plastic Fittings Patterns.



A long-sweep (AKA Long-Radius) 90° (1/4 turn) elbow has an equivalent vent length of 5 feet of straight pipe for either 2 inch or 3 inch plastic pipe. A standard 90° elbow has an equivalent vent length of 10 feet of straight pipe. This equivalent length can be used in circumstances where it might be necessary to lengthen the vent at the outside of the structure, such as in areas with large accumulations of snow in winter. **Table 3** shows the equivalent lengths of different types of elbows.

TABLE 3: EQUIVALENT VENT LENGTH OF COMMON VENT ELBOWS	
Fitting Type	Equivalent Length
90° Standard Elbow	10 Feet of Pipe
45° Long-Sweep Elbow	2-1/2 Feet of Pipe
90° Long-Sweep Elbow	5 Feet of Pipe

Table 4 specifies the equivalent maximum vent lengths specified by the manufacturer for each furnace. Listed table maximums have been qualified by the manufacturer. Dependant on individual installation specifics, installations beyond the table recommendations may cause erratic pressure switch operation.

Examples:

1. A 40KBTU direct-vent installation needs a 31 foot long vent run with qty=5, 90° long-sweep elbows and 2 inch pipe.
- | | |
|----------------------------------|--------------------|
| 31 feet of 2 inch pipe = | 31 equivalent feet |
| Qty = 5, 90° long-sweep elbows = | 25 equivalent feet |
| ----- | |
| Total = | 56 equivalent feet |

Since the maximum equivalent vent length specified for a 40KBTU furnace is 65 feet, this installation is acceptable.

2. If the installation from Example 1 were installed with standard elbows instead of long-sweep elbows, the calculation would be as follows:
- | | |
|--------------------------------|--------------------|
| 31 feet of 2 inch pipe = | 31 equivalent feet |
| Qty = 5, 90° standard elbows = | 50 equivalent feet |
| ----- | |
| Total = | 81 equivalent feet |

This installation is NOT acceptable as it exceeds the 65 foot maximum specified for this model.

GENERAL VENTING REQUIREMENTS AND GUIDELINES

VENT PIPE SIZING AND MAXIMUM VENT LENGTHS (cont.)

**TABLE 4: MAXIMUM EQUIVALENT VENTY LENGTH
(TABLE IS FOR BOTH DIRECT & NON-DIRECT VENTING)**

Input (BTU/H)	Pipe Size	Maximum Equivalent Length (Feet)	Recommended Maximum Number of Elbows
42,000	2 inchØ	65	6
	3 inchØ	100	6
56,000	2 inchØ	65	6
	3 inchØ	100	6
70,000	2 inchØ	65	6
	3 inchØ	100	6
84,000	2 inchØ	30	2
	3 inchØ	100	6
98,000	2 inchØ	20	2**
	3 inchØ	100	6
112,000	2 inchØ	20	2**
	3 inchØ	85	6

NOTE: The elbows needed for the vent termination are not counted in these lengths except at altitudes above 6,000 feet. Above 6,000 feet alternate horizontal vent termination elbows are to be included in the equivalent vent length.

* This is the recommended maximum number of long sweep elbows for either 2 or 3 inch pipe. Combinations of long sweep 90s, standard 90s, or 45s may be used, but the manufacturer recommends the use of long sweep 90s whenever possible because the use of the maximum number of standard 90 and 45 elbows only may result in nuisance furnace outages due to individual installation specifics.

Exceeding the recommended maximum number of elbows may cause nuisance operation of the pressure switch.

** Not applicable for alternate terminations.

GENERAL VENTING REQUIREMENTS AND GUIDELINES

VENT PIPE SIZING AND MAXIMUM VENT LENGTHS (cont.)

POLYPROPYLENE VENT PRODUCTS

Centrotherm brand *Innoflue* and Duravent *Polypro* Single-wall and flex venting products are approved for use on this furnace product only in single appliance applications. Do not exceed maximum venting lengths, diameters or elbows listed in these instructions (***Vent Pipe Sizing and Maximum Vent Lengths*** section [Table 4]). Application of these products is limited to the terminations listed in Tables 5

and 6 below. These manufacturers have provisions for B-vent liners and chimney liners which can be used with this furnace with non-direct venting applications only. Refer to the manufacturer's installation instructions for proper installation. Contact manufacturer for all installation and application information.

NOTE: These venting products are listed for use in Canada under ULC-S636.

TABLE 5: DURAVENT BRAND POLYPRO & POLYPRO FLEX TERMINATION COMPONENTS

2" VENT	3"VENT	Description
2PPS-HTP	3PPS-HTP	Horizontal Direct-Vent Termination
2PPS-HST	3PPS-HST	Horizontal Non-Direct Termination
2PPS-VK, 2PPS-VK-TC	3PPS-VK, 3PPS-VK-TC	Vertical Concentric Kits
2PPS-HK	3PPS-HK	Horizontal Concentric Kits
2PPS-FK	3PPS-FK	Flex Chimney Lining Kit
2PPS-VFT	3PPS-VFT	Vertical Flex Termination Cap
2PPS-BV4, 2PPS-BV5, 2PPS-BV6	3PPS-BV5, 3PPS-BV6	B-VENT Adapter

TABLE 6: CENTROTHERM BRAND ECO SYSTEMS TERMINATION COMPONENTS

2" VENT	3"VENT	Description	Notes
ISCP02	ISCP03	Chimney Cover	For Use on Non-Direct Vent only. <u>DO NOT</u> use with a Direct-Vent Installation.
NA	ISCM03	Stainless Steel Chimney Cover	For Use on Non-Direct Vent only. <u>DO NOT</u> use with a Direct-Vent Installation.
IABC0204 thru IABC0207	IABC0304 thru IABC0307	B-Vent Rain Collar	For Use on on Non-Direct Vent only. <u>DO NOT</u> use with a Direct-Vent Installation.
ISLPT0202	ISLPT0303	Low-Profile Wall Termination	
ISTT0220	ISTT0320	Termination Tee	
ISEP02 & ISEP0239	ISEP03 & ISEP0339	End Pipe	
IFEP02	NA	2" Flex End Pipe	
NA	ICWT352	Plastic Concentric Wall Termination	Approved for Direct-Vent
ICW2413	ICW3513	Stainless Steel Concentric Wall Termination	Approved for Direct-Vent
ICRT2439	ICRT3539	Concentric Roof (Vertical) Termination	Approved for Direct-Vent

GENERAL VENTING REQUIREMENTS AND GUIDELINES

TERMINATION REQUIREMENTS

CAUTION

THE COMBUSTION PRODUCTS AND MOISTURE IN THE FLUE GASES WILL CONDENSE AS THEY LEAVE THE TERMINATION. THE CONDENSATE CAN FREEZE ON THE EXTERIOR WALL, UNDER THE EAVES AND ON SURROUNDING OBJECTS. SOME DISCOLORATION TO THE EXTERIOR OF THE BUILDING IS TO BE EXPECTED. HOWEVER, IMPROPER LOCATION OR INSTALLATION CAN RESULT IN FINISH DAMAGE TO THE BUILDING AND MAY RE-CIRCULATE THE PRODUCTS OF COMBUSTION INTO THE COMBUSTION AIR TERMINAL AND FREEZE.

Vent terminations for both Non-Direct and Direct-Vent installations must adhere to guidelines specified by the latest edition of ANSI Z21.47 **Gas-Fired Central Furnaces**. These are clearly detailed in **Figure 21** for Non-Direct-Vent installations and **Figure 32** for Direct-Vent installations. In addition to these requirements, the installation and venting must also comply with the National Fuel Gas Code (U.S.) and CSA-B149.1; Canadian Natural Gas and Propane Installation Code (Canada) and the following requirements must also be met:

NOTE: Screens of any kind on the inlet or exhaust pipes are not permitted and will void the manufacturer's warranty.

In addition to the requirements shown in **Figure 21** for Non-Direct venting and **Figure 32** for Direct-Venting, the vent must be installed with the following minimum clearances:

1. The vent terminal shall have a specified minimum horizontal clearance from electric meters, gas meters, regulators and relief equipment. See the National Fuel Gas Code for specific distances or CSA B149.1 in Canada as these distances may vary by location.
 2. Locate the furnace combustion air inlet away from the vent of any other gas or fuel-burning appliance or clothes dryer to prevent recirculation of the flue gases into the furnace combustion air inlet. For exact distances based on BTU of appliances refer to National Fuel Gas Code or CSA B149.1 in Canada. The only exception to this requirement is the case of multiventing two or more furnaces, which is covered in the section on multiventing of these instructions.
- In addition to the minimum clearances listed above and in **Figure 21** (Non-Direct Vent) and **Figure 32** (Direct-Vent), the vent location should also be governed by the following guidelines.
1. Avoid terminating under any kind of patio or deck. However, if necessary, vent piping may be installed under a deck as long as the termination(s) is (are) not under the deck.
 2. If installing the vent under a deck, insulate it to insure that no condensate freezes and blocks the pipes.
 3. Do not terminate in any area or behind any obstruction that may allow the flue products to become stagnant and/or re-circulate.
 4. Do not locate on the side of a building with prevailing winter winds. This will help prevent moisture from freezing on the walls and overhangs (under eaves).
 5. If extending vent through a brick or masonry surface, a sleeve between the wall and venting is suggested to protect against damage from thermal expansion and contraction.
 6. A corrosion-resistant sheet metal or plastic backing plate on the wall behind the vent is suggested to prevent exhaust gases and condensate from contacting the wall.
 7. Avoid locating too close to shrubs as condensate may stunt growth or kill them.

GENERAL VENTING REQUIREMENTS AND GUIDELINES

NON-DIRECT VENT

WARNING

ALL FURNACE INSTALLATIONS MUST COMPLY WITH THE NATIONAL FUEL GAS CODE, NFPA 54, AND IN CANADA CSA B149.1; CANADIAN NATURAL GAS AND PROPANE INSTALLATION CODE, THE NATIONAL FIRE CODE OF CANADA, AND LOCAL CODES TO PROVIDE ADEQUATE COMBUSTION AND VENTILATION AIR FOR THE FURNACE. FAILURE TO DO SO CAN RESULT IN EXPLOSION, FIRE, PROPERTY DAMAGE, CARBON MONOXIDE POISONING, PERSONAL INJURY OR DEATH.

For improved indoor air quality, added safety and product performance we recommend direct vent type installations. If non-direct vent system is used, the requirements for combustion air must be provided as identified in the National Fuel Gas Code and, in Canada, CSA B149.1; Canadian Natural Gas and Propane Installation Code.

Combustion air requirements are determined by whether the furnace is in an open (unconfined) area or in a confined space such as a closet or small room.

WARNING

READ AND FOLLOW THE GENERAL VENTING REQUIREMENTS AND GUIDELINES OF THIS MANUAL FOR ADDITIONAL VENTING REQUIREMENTS PERTAINING TO ALL FURNACE INSTALLATIONS (INCLUDING DIRECT AND NON-DIRECT VENTING). FAILURE TO FOLLOW ALL INSTRUCTIONS IN THIS MANUAL CAN RESULT IN EQUIPMENT FAILURE, EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

CONFINED AND UNCONFINED SPACES

The below instructions are for U.S. installations only. The terms **Confined Space** and **Unconfined Space** refer to U.S. installations only. In Canada the proper term to use is **Enclosure** when specifying that a furnace is installed in a partially enclosed or fully enclosed room or space. For Canadian installations, to determine combustion air requirements for non-direct vent installations, the installer must follow CSA B149.1; Canadian Natural Gas and Propane Installation Code and NOT the below instructions.

FURNACE LOCATED IN AN UNCONFINED SPACE (U.S. INSTALLATIONS) USING INDOOR AIR FOR COMBUSTION:

An unconfined space must have at least 50 cubic feet for each 1,000 BTUH of total input for all appliances in the space. **Table 7** below specifies minimum space requirements and a few examples of the room sizes required for different inputs. The sizes are based on 8-foot ceilings.

If the open space containing the furnace is in a building with tight construction, outside air may still be required for the furnace to operate and vent properly. Outside air openings should be sized the same as for a confined space.

TABLE 7: MINIMUM SPACE REQUIREMENTS FOR UNCONFINED SPACE, NON-DIRECT VENT

Input (BTUH)	Minimum Space (Cubic Ft)	Minimum Area with 8ft Ceilings (sq ft)	Typical Room Size w/ 8' Ceilings (ft x ft)
42,000	2,100	263	14 x 20
56,000	2,800	350	18 x 20
70,000	3,500	438	22 x 20
84,000	4,200	525	25 x 20
98,000	4,900	613	20 x 30
112,000	5,600	700	25 x 30

FURNACE LOCATED IN A CONFINED SPACE (U.S. INSTALLATIONS)

A confined space is defined as any space for a given furnace input rating which is smaller than that which is specified in **Table 7** as minimum for an "unconfined" space. If the space is less than that specified in this table, the space is defined as "confined".

If the space is small enough to be designated as "confined", it must have openings into the space which are located in accordance with the requirements set forth in the following subsections A and B. Size connected to the heated area or to the outside, and by the input of **ALL** appliances in the space.

If the confined space is within a building with tight construction, combustion air must be taken from outdoors or from an area freely communicating with the outdoors.

A. USING INDOOR AIR FOR COMBUSTION:

IMPORTANT: Air should not be taken from a heated space with a fireplace, exhaust fan or other device that may produce negative pressure.

If combustion air is taken from the heated area, the openings must each have at least 100 square inches of free area. Each opening must have at least one square inch of free area for each 1,000 BTUH of total input in the space. **Table 8** shows some typical examples of openings required for combustion air openings required for a confined space.

TABLE 8: MINIMUM FREE AREA OPENING REQUIRED FOR A FURNACE LOCATED IN A CONFINED SPACE USING INDOOR AIR FOR COMBUSTION.

Input (BTUH)	Free Area for Each Opening (sq inches)
42,000	100
56,000	100
70,000	100
84,000	100
98,000	100
112,000	120

GENERAL VENTING REQUIREMENTS AND GUIDELINES

NON-DIRECT VENT (cont.)

B. USING OUTDOOR AIR FOR COMBUSTION:

IMPORTANT: Do not take air from an attic space that is equipped with power ventilation.

The confined space must communicate with the outdoors in accordance with Methods 1 or 2 below. The minimum dimension of air openings shall not be less than 3 inches. Where ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect.

METHOD 1:

Two permanent openings, one located within 12 inches of the top and one located within 12 inches of the bottom of the enclosure, shall be provided. The openings shall communicate

TABLE 9: MINIMUM FREE AREA REQUIRED FOR EACH OPENING (WHEN TWO OPENINGS ARE USED) WITH A FURNACE:
1. LOCATED IN A CONFINED SPACE
2. USING OUTDOOR AIR FOR COMBUSTION
3. COMMUNICATING DIRECTLY TO THE OUTSIDE THROUGH AN OPENING OR THROUGH A VERTICAL DUCT.

Total Input for ALL Gas Appliances (BTUH)	Free Area for Each Opening when 2 Separate Openings are used (sq inches)	Round Pipe Duct Diameter (Vertical Duct Only) (inches)
42,000	10	4
56,000	15	5
70,000	20	5
84,000	25	5
98,000	25	5
112,000	30	6

TABLE 10: MINIMUM FREE AREA REQUIRED FOR EACH OPENING (WHEN TWO OPENINGS ARE USED) WITH A FURNACE:
1. LOCATED IN A CONFINED SPACE
2. USING OUTDOOR AIR FOR COMBUSTION
3. COMMUNICATING DIRECTLY TO THE OUTSIDE THROUGH A HORIZONTAL DUCT.

Total Input for ALL Gas Appliances (BTUH)	Free Area for Each Opening when 2 Separate Openings are used (sq inches)	Round Pipe Duct Diameter (Horizontal Duct Only) (inches)
42,000	21	6
56,000	28	6
70,000	35	7
84,000	42	8
98,000	49	8
112,000	56	9

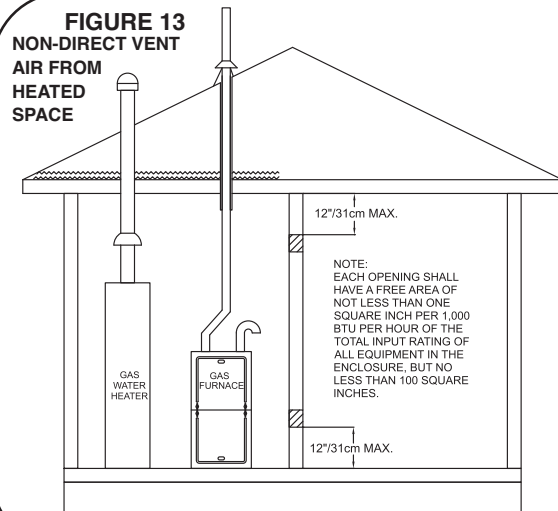
directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

A. Where directly communicating with the outdoors through an opening or where communicating to the outdoors through vertical ducts as shown in **Figure 14**, each opening shall have a minimum free area of 1 square inch for each 4,000 BTUH of total appliance input rating of all equipment in the enclosure. **Table 9** below specifies the minimum area for each of the 2 combustion air openings and minimum round duct diameter for direct openings and vertical ducting only.

B. Where communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch for each 2,000 BTUH of total appliance input rating of all equipment in the enclosure (see **Figure 15**). **Table 10** specifies the minimum area for each of the 2 combustion

TABLE 11: MINIMUM FREE AREA REQUIRED FOR AN OPENING (WHEN ONE OPENING IS USED) WITH A FURNACE:
1. LOCATED IN A CONFINED SPACE
2. USING OUTDOOR AIR FOR COMBUSTION
3. COMMUNICATING DIRECTLY TO THE OUTSIDE.

Total Input for ALL Gas Appliances (BTUH)	Free Area for an Opening when 1 Opening is used (sq inches)	Round Pipe Duct Diameter (inches)
42,000	21	6
56,000	28	6
70,000	35	7
84,000	42	8
98,000	49	8
112,000	56	9



GENERAL VENTING REQUIREMENTS AND GUIDELINES

NON-DIRECT VENT (cont.)

FIGURE 14

**NON-DIRECT VENT
AIR FROM ATTIC OR CRAWL
SPACE**

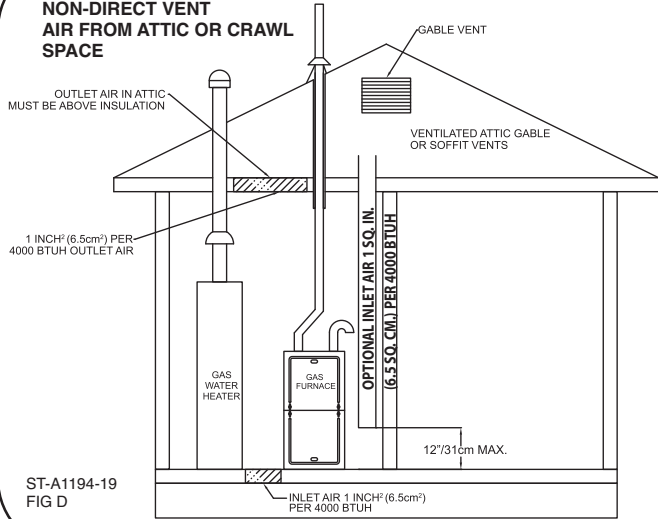
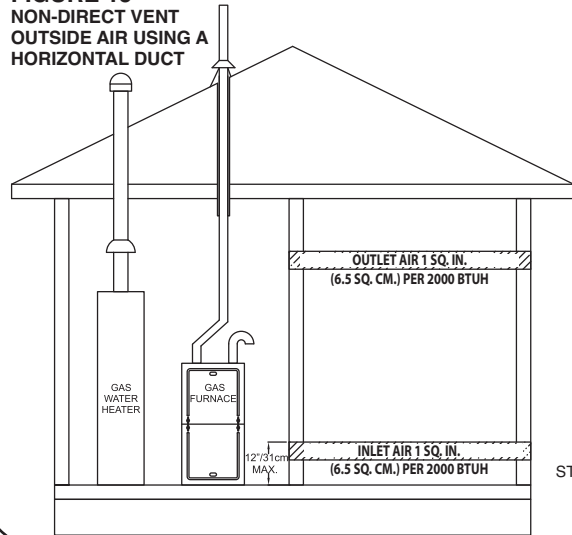


FIGURE 15

**NON-DIRECT VENT
OUTSIDE AIR USING A
HORIZONTAL DUCT**



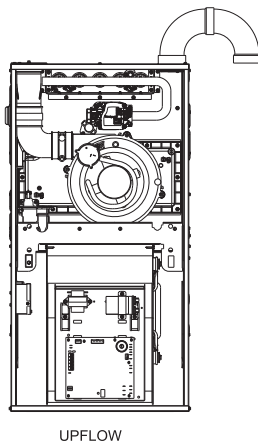
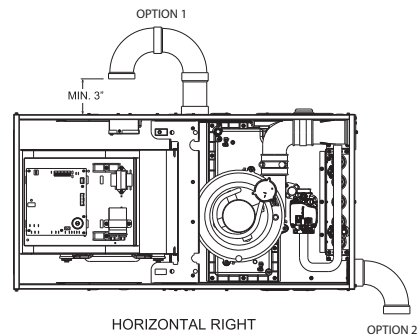
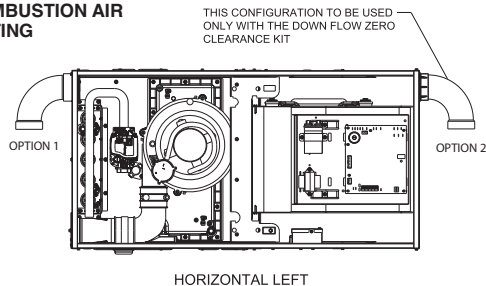
air openings and minimum round duct diameter for horizontal ducting only.

METHOD 2:

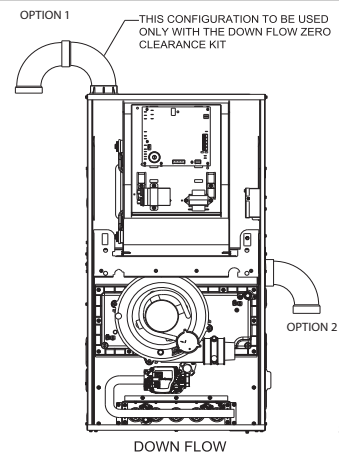
One permanent opening located within 12 inches of the top

of the enclosure, shall be permitted where the equipment has clearances of at least 1 inch from the sides and back and 6 inches from the front of the appliance. The opening shall directly communicate with the outdoors or communicate through a vertical or horizontal duct to the outdoors or spaces

FIGURE 16
**COMBUSTION AIR
FITTING**



NOTE:
COMBUSTION AIR INLETS MAY BE ROTATED IN
DIRECTIONS OTHER THAN SHOWN PROVIDING
THERE ARE NO INTERFERENCES OR
OBSTRUCTIONS



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GENERAL VENTING REQUIREMENTS AND GUIDELINES

NON-DIRECT VENT (cont.)

(crawl or attic) that freely communicate with the outdoors, and shall have a minimum of:

- A. 1 Square inch for each 3,000 BTUH of the total input rating of all equipment located in the enclosure and
- B. Not less than the sum of the areas of all vent connectors in the confined space.

If the unit is installed where there is an exhaust fan, sufficient ventilation must be provided to prevent the exhaust fan from creating negative pressure.

Combustion air openings must not be restricted in any manner.

Figure 16 shows allowable inlet air configurations for furnaces installed with non-direct vent.

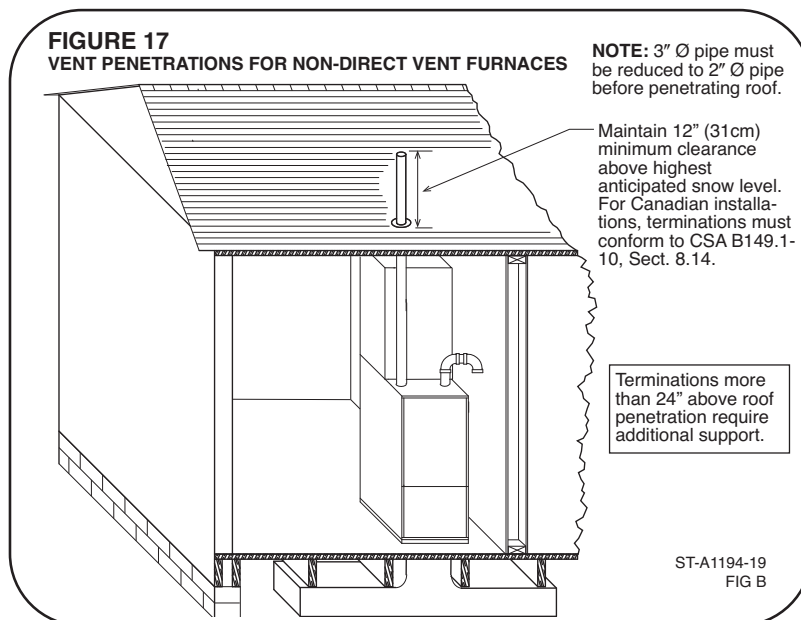
IMPORTANT: When indoor combustion air is used, the inlet air opening at the furnace must be protected from accidental blockage (see **Figure 16**).

⚠ WARNING

DO NOT USE VENT TERMINATIONS WHICH ARE NOT SPECIFIED IN THESE INSTRUCTIONS. USING VENT TERMINATIONS OTHER THAN THOSE SPECIFIED HERE CAN RESULT IN ERRATIC OPERATION, EQUIPMENT FAILURE OR PERSONAL INJURY OR DEATH FROM CARBON MONOXIDE POISONING.

NON-DIRECT VENTING TERMINATIONS

These furnaces are design-certified to use a single vent pipe where all combustion air is taken from indoors and can be vented either vertically or horizontally.



⚠ CAUTION

ALL VENT INSTALLED THROUGH UNCONDITIONED SPACE WHERE BELOW-FREEZING TEMPERATURES ARE EXPECTED SHOULD BE INSULATED WITH APPROVED INSULATION MATERIAL. MATERIAL SUCH AS ARMAFLEX OR RUBATEX INSULATION MAY ALSO BE USED AS LONG AS THERE IS NO HEAT TAPE APPLIED TO THE VENT PIPE. FAILURE TO INSULATE THE PIPE COULD RESULT IN FREEZING OF WATER IN THE PIPE THEREBY BLOCKING THE PIPE AND PREVENTING FURNACE OPERATION.

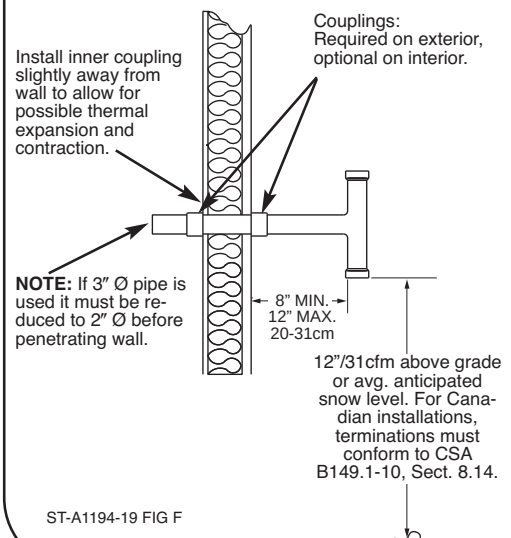
OPTION 1: VERTICAL TERMINATION

Figure 17 shows a standard non-direct vertical vent termination with clearances.

OPTION 2: STANDARD HORIZONTAL TERMINATION

Figure 18 shows the standard non-direct vent horizontal termination with minimum clearances.

FIGURE 18
VENT PENETRATIONS FOR NON-DIRECT VENT FURNACES
WALL PENETRATIONS

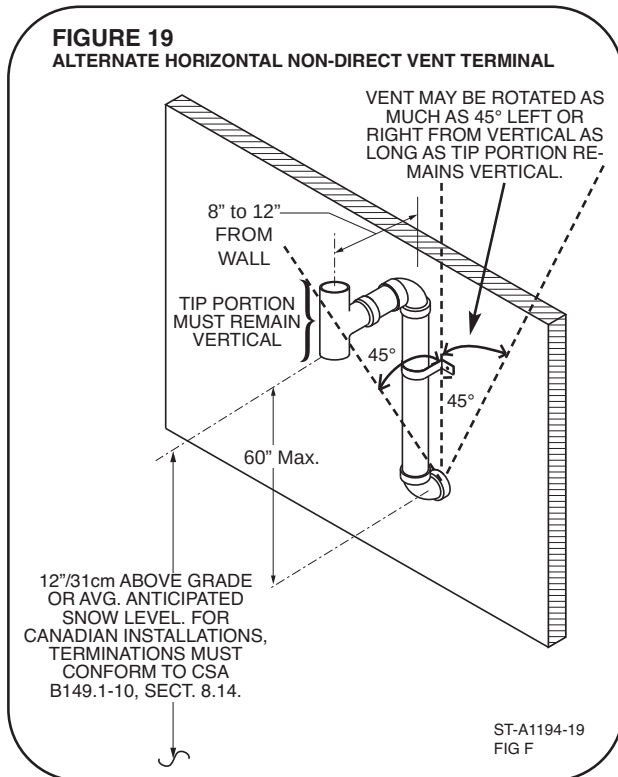


GENERAL VENTING REQUIREMENTS AND GUIDELINES

NON-DIRECT VENT (cont.)

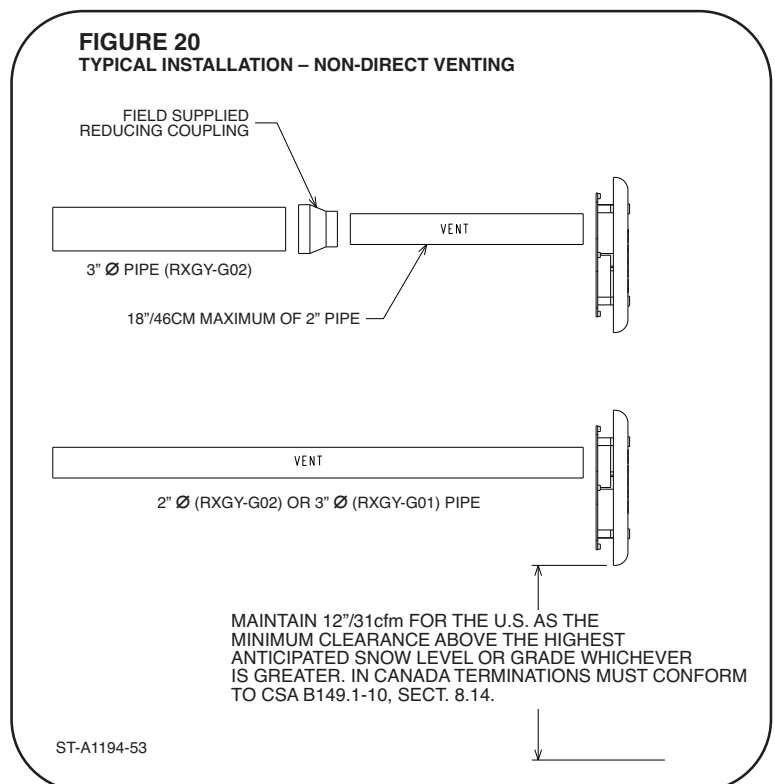
OPTION 3: ALTERNATE HORIZONTAL TERMINATION

Figure 19 shows the alternate non-direct vent horizontal termination with minimum clearances.



OPTION 4: RXGY-G02 SIDE WALL VENT TERMINATION

See **Figure 20** and refer to the **DIRECT VENT** Section, **OPTION 8: SIDEWALL VENT KIT** of this manual for information and directions on the side wall vent kit. The sidewall vent kit (RXGY-G02) can be used for both direct-vent and non-direct vent installations.

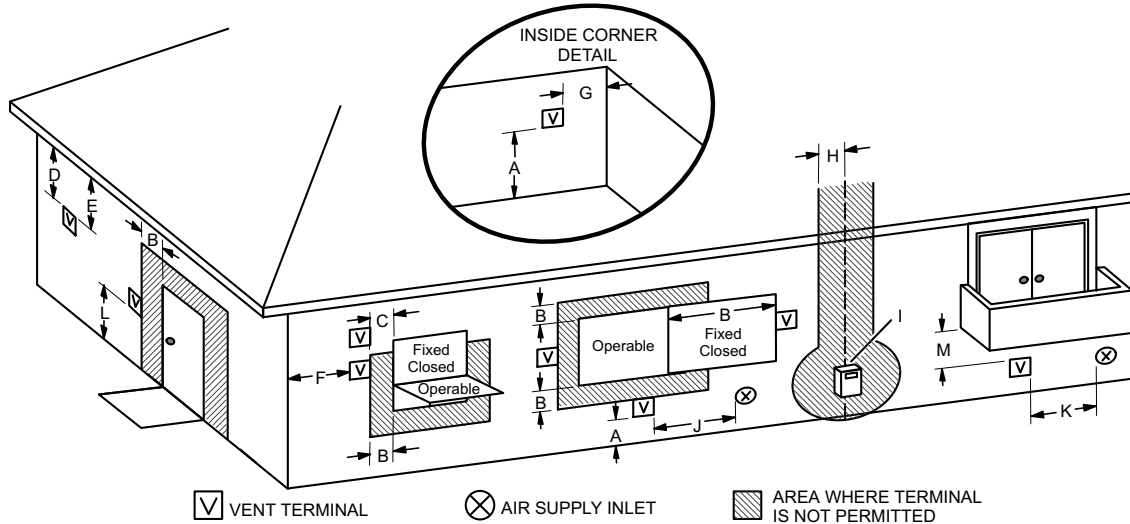


GENERAL VENTING REQUIREMENTS AND GUIDELINES

NON-DIRECT VENT TERMINATION CLEARANCES

Figure 21 shows minimum clearances that must be used for non-direct venting terminations.

FIGURE 21
VENT TERMINATION CLEARANCES FOR NON-DIRECT VENT INSTALLATIONS



	US Installations ¹	Canadian Installations ²
A = Clearance above grade, veranda, porch, deck or balcony	12 inches (305mm) or 12 in. 305mm) above average snow accumulation.	must conform to CSA B149.1-10, Sect. 8.14.
B = Clearance to window or door that may be opened	4 feet (1.2m) below or to side of opening; 1 foot (30cm) above opening	6 inches (15cm) for appliances <10,000 Btuh (3kw), 12 inches (30cm) for appliances >10,000 Btuh (3kw), and <100,000 Btuh (30kw), 36 inches (.9m) for appliances > 100,000 Btuh (30kw)
C = Clearance to permanently closed window	* 12" (30cm)	* 12" (30cm)
D = Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (0.6m) from the center line of the terminal	* Equal to or greater than soffit depth	* 3" (0.9m)
E = Clearance to unventilated soffit	* Equal to or greater than soffit depth	* 2" (0.6m)
F = Clearance to outside corner	* No minimum to outside corner	* No minimum to outside corner
G = Clearance to inside corner	* 3 ft. (.9m), 10 ft. (3.05 m) preferred	* 3 ft. (.9m), 10 ft. (3.05 m) preferred
H = Clearance to each side of center line extended above meter / regulator assembly	3 feet (.9m) within a height 15 feet (4.5m) above the meter / regulator assembly	3 feet (.9m) within a height 15 feet (4.5m) above the meter / regulator assembly
I = Clearance to service regulator vent outlet	3 feet (.9m)*	*3 feet (.9m)
J = Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4 feet (1.2m) below or to side of opening; 1 foot (30cm) above opening	6 inches (15cm) for appliances <10,000Btuh (3kw), 12 inches (30cm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36 inches (.9m)for appliances > 100,000 Btuh (30kw)
K = Clearance to mechanical air supply inlet	3 feet (.9m) above if within 10 feet (3m) horizontally	6 feet (1.8m)
L = Clearance above paved sidewalk or paved driveway located on public property	* 7 feet (2.1m)	7 feet (2.1m)†
M = Clearance under veranda, porch, deck or balcony	*12 inches (305mm)‡	12 inches (30cm) ‡

¹ In accordance with the current ANSI Z223.1/NFPA 54 Natural Fuel Gas Code

² In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

† A vent shall not terminate less than 7 ft. (2.1m) above a paved sidewalk or paved driveway that is located on public property.

‡ Permitted only if veranda, porch, deck or balcony is full open on a minimum of two sides beneath the floor. We recommend avoiding this location if possible.

For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.

GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT

⚠ WARNING

ALL FURNACE INSTALLATIONS MUST COMPLY WITH THE NATIONAL FUEL GAS CODE OR, IN CANADA, CSA B149.1; NATURAL GAS AND PROPANE INSTALLATION CODE AND LOCAL CODES TO PROVIDE ADEQUATE COMBUSTION AND VENTILATION AIR FOR THE FURNACE. FAILURE TO DO SO CAN RESULT IN EXPLOSION, FIRE, PROPERTY DAMAGE, CARBON MONOXIDE POISONING, PERSONAL INJURY OR DEATH.

⚠ WARNING

READ AND FOLLOW THE *GENERAL VENTING REQUIREMENTS AND GUIDELINES* OF THIS MANUAL FOR ADDITIONAL VENTING REQUIREMENTS PERTAINING TO ALL FURNACE INSTALLATIONS (INCLUDING DIRECT AND NON-DIRECT VENTING). FAILURE TO FOLLOW ALL INSTRUCTIONS IN THIS MANUAL CAN RESULT IN EQUIPMENT FAILURE, EQUIPMENT DAMAGE, PROPERTY DAMAGE, PERSONAL INJURY OR DEATH.

DIRECT-VENT (2-PIPE) INSTALLATIONS

The field-supplied vent system used for direct-vent installations uses 2 pipes; one inlet pipe for supplying the combustion air to the furnace, and an exhaust (or flue) pipe for transferring the flue products to the outside. The flue pipe is elevated at least 12 inches above the air intake pipe for all vertical installations to prevent flue gas recirculation during operation.

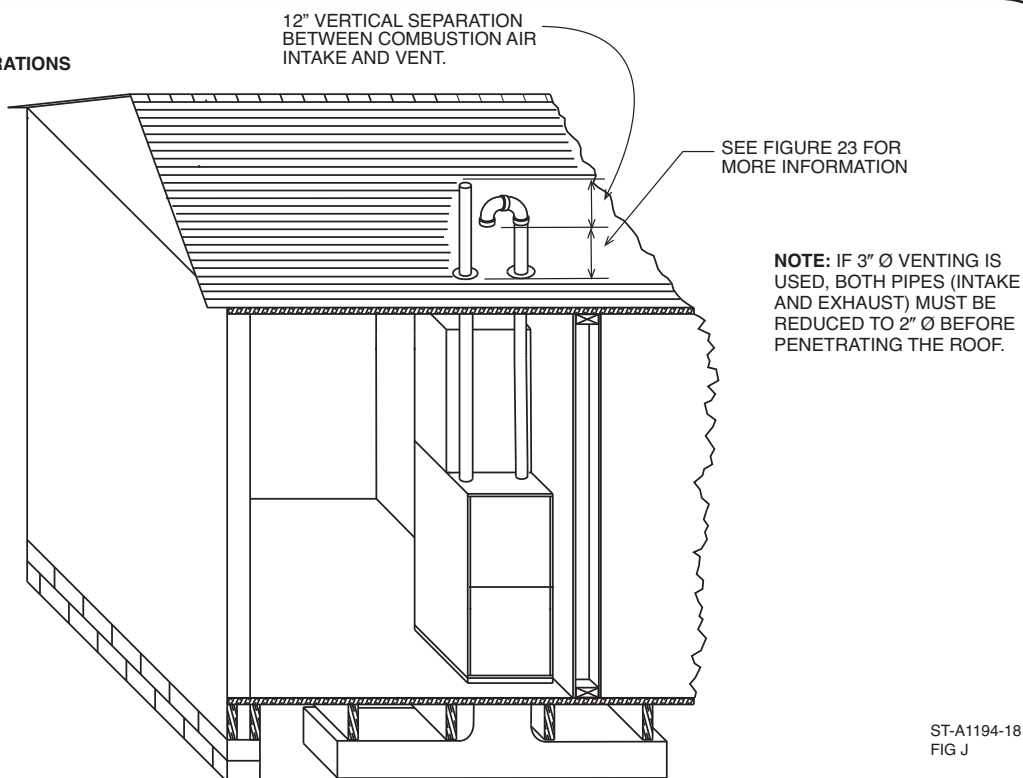
The furnace combustion air inlet must be located a minimum safe distance from the vent of any other gas or fuel-burning appliance or clothes dryer to prevent recirculation of the flue gases into the furnace combustion air inlet. Reference National Fuel Gas Code current edition and in Canada CSA 149.1 current edition for minimum distances. The only exception to this requirement is the case of multiventing two or more furnaces, which is covered in the section on multiventing of these instructions.

Direct-Vent systems must be installed so that the vent and combustion air intake pipes terminate in the same atmospheric pressure zone.

OPTION 1: STANDARD VERTICAL DIRECT-VENT TERMINATION

Figure 22 below shows a standard vertical termination for direct venting installations. Maintain the dimensions specified in this drawing for vertical venting of direct-vent furnace installations. Specific details of the roof penetration can be found in **Figure 23**.

FIGURE 22
DIRECT VENT FURNACE PENETRATIONS
ROOF INTAKE/VENT

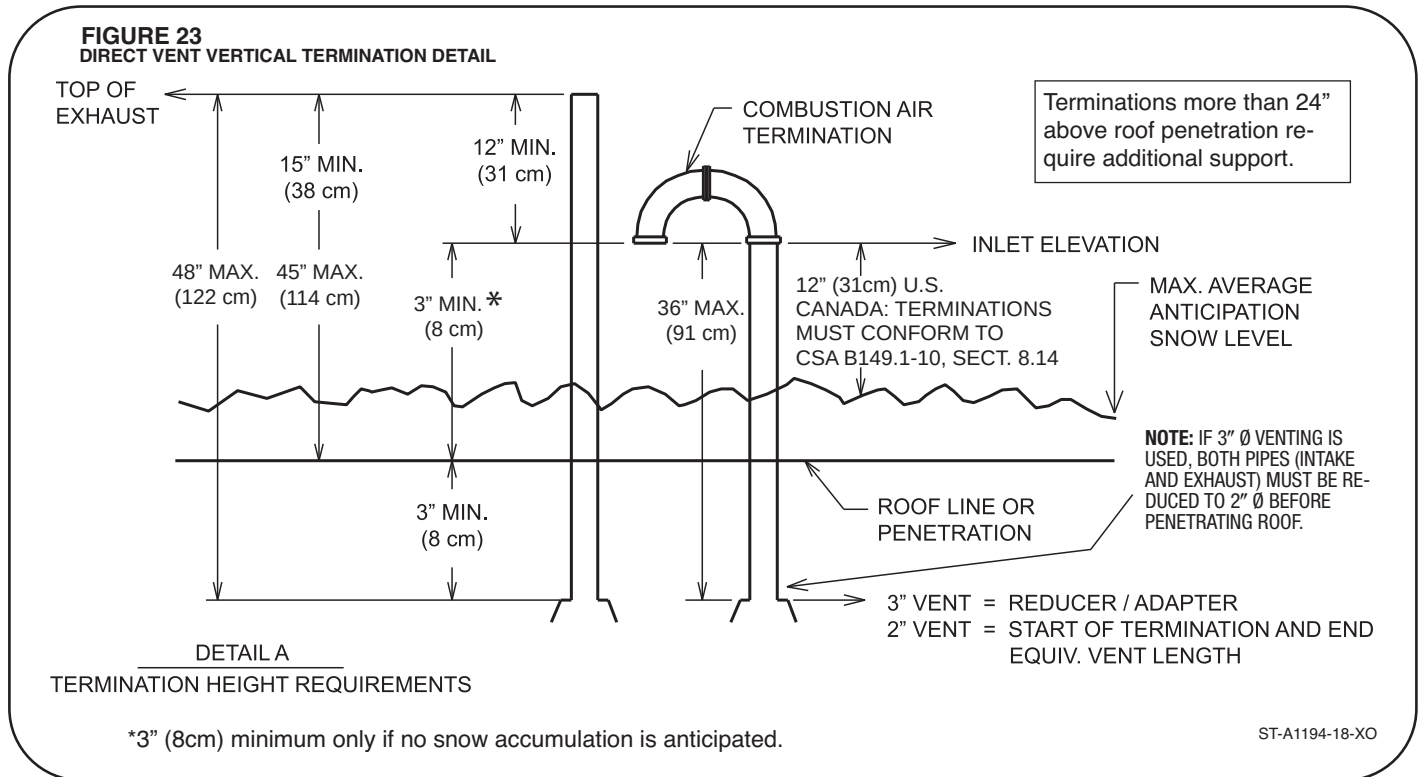


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FIG J

GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT (cont.)

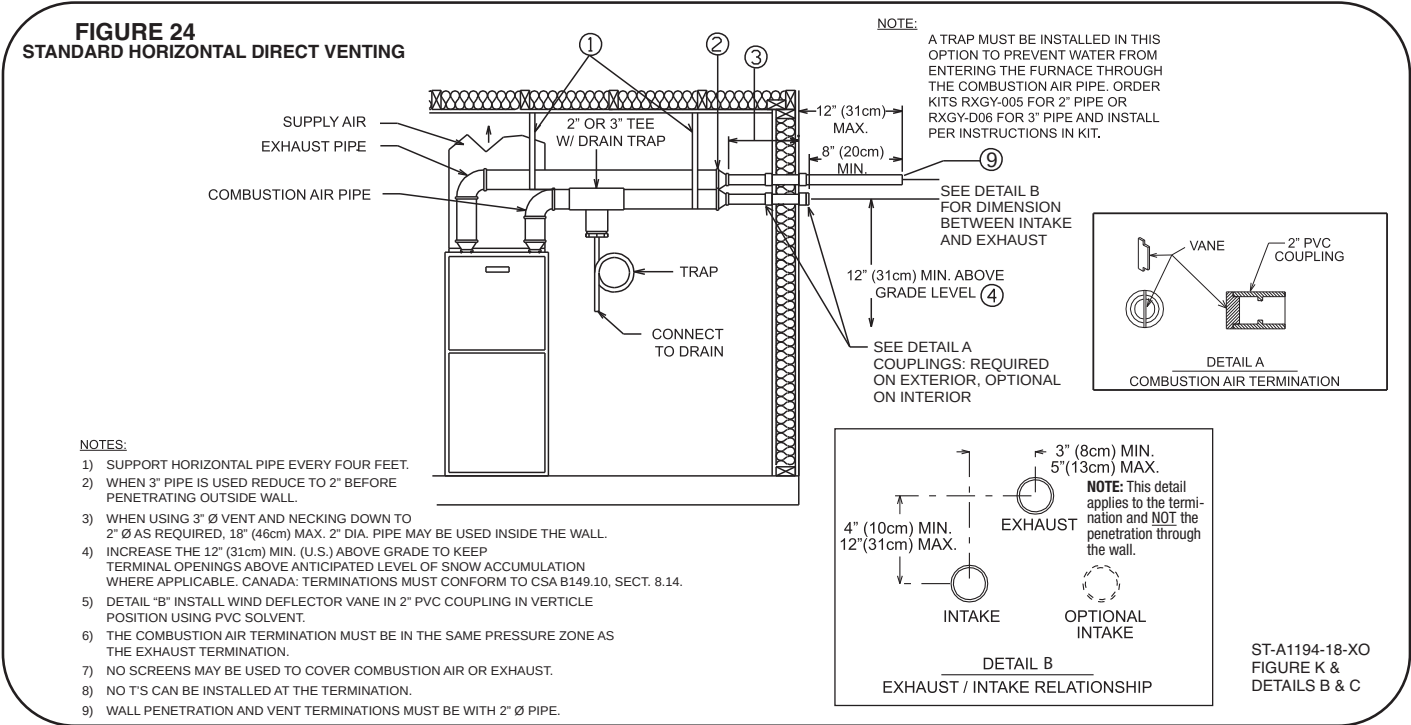
Figure 23 below shows the necessary detail for the roof penetration on a standard direct-vent vertical termination.



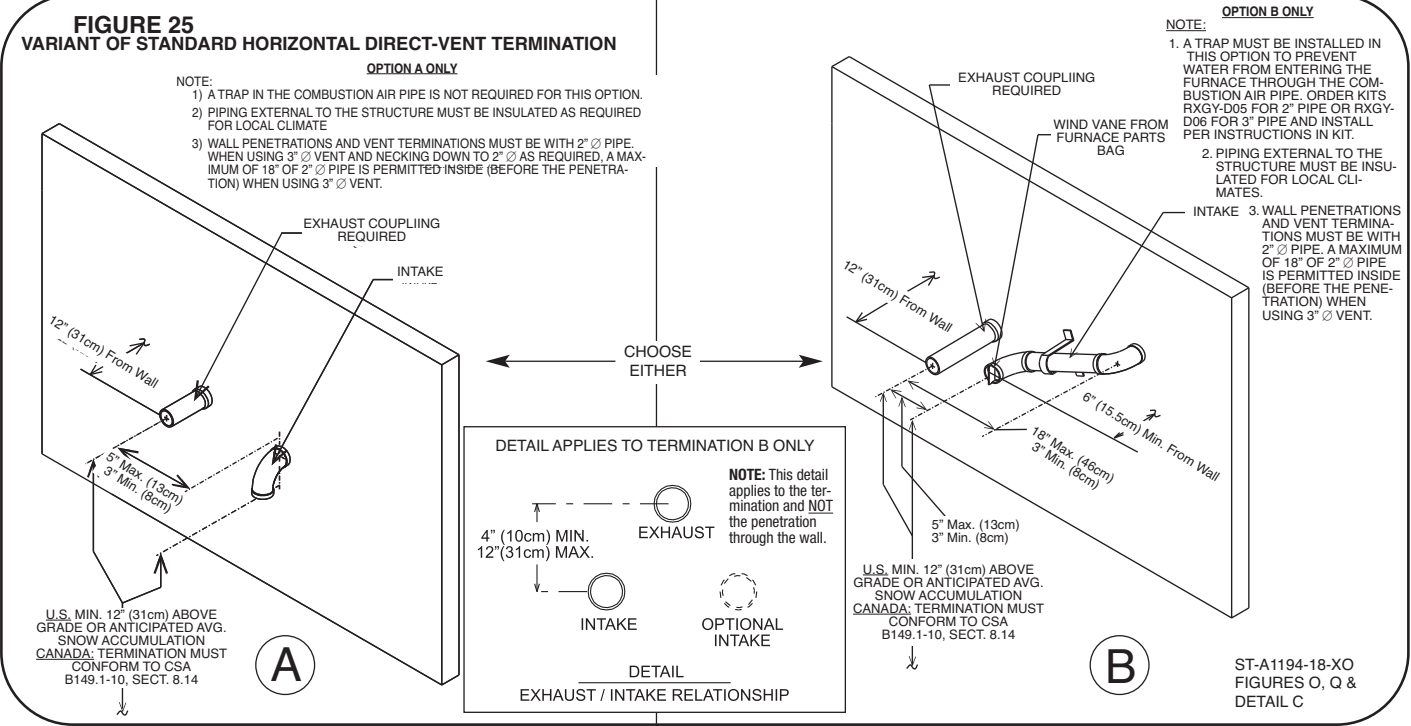
GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT (cont.)

OPTION 2: STANDARD HORIZONTAL DIRECT-VENT TERMINATION



OPTION 3: VARIANT OF STANDARD HORIZONTAL DIRECT-VENT TERMINATION



DIRECT VENT (cont.)

FIGURE 26
TYPICAL HORIZONTAL VENTED 2 PIPE TERMINALS



FIGURE 27
VARIANT OF ALTERNATE
HORIZONTAL DIRECT-VENT
TERMINATION



GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT (cont.)

OPTIONAL TERMINATION ANGLES FOR OPTION FOR ALT. HORIZ. AND VARIANT OF ALT. HORIZ. DIRECT-VENT TERMINATIONS (OPTIONS 4 & 5)

NOTE: These optional termination angles apply only to direct-vent termination options 4 and 5 above (alternate horizontal and variant of optional horizontal) in this section. Do not use these angled terminations with any other termination option.

NOTE: This option is recommended for installations where the distance from the vent pipe perpendicular to another structure is less than 10 feet.

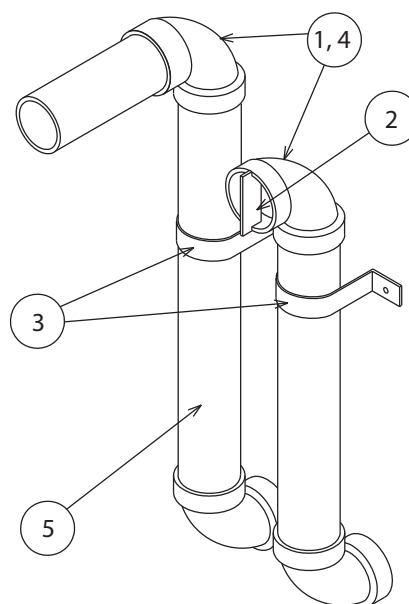
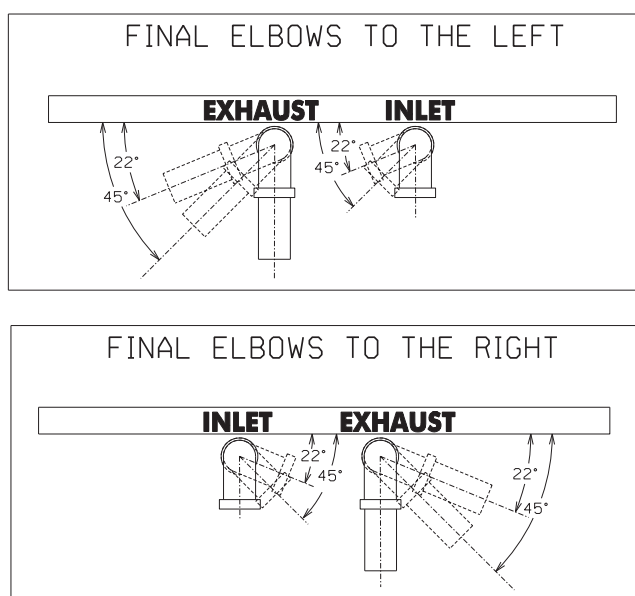
Top view for using 22° or 45° termination on a single furnace.

Using alternate vent terminations from options 4 or 5 above, simply rotate the final elbows 22 or 45 degrees from the wall as shown below.

1. Both the combustion air and exhaust final termination elbows must be at the same angle and face the same direction (left or right).
2. A wind vane must be installed in the combustion air inlet pipe as shown in the diagram.
3. Number and distance between (recommended) support straps must provide rigid support.

4. Mark the final (22° or 45°) angles on the top of the vertical risers and final elbows before gluing into place to ensure that the final angles are correct.
5. Insulating the exhaust termination vertical riser may be necessary in some areas, depending on the total length and expected temperatures in the area.
6. Do not angle (22° or 45°) into an inside corner.
7. Do not use screens on the inlet or exhaust pipes.
8. Angled terminations cannot be used on pairs of vents.
9. This termination may cause discoloration over time to the external surface of the structure.
10. Wall penetrations and vent terminations must be with 2" Ø pipe to reduce the possibility of ice forming at the termination. A maximum of 18" of 2" Ø pipe is permitted inside (before the penetration) when using 3" Ø vent.

FIGURE 28



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GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT (cont.)

**OPTIONS 6 & 7: VERTICAL OR HORIZONTAL CONCENTRIC VENT TERMINATION
FOR 2" PIPE: RXGY-E02 (U.S. ONLY) OR RXGY-E02A (U.S. AND CANADA)
FOR 3" PIPE: RXGY-E03 (U.S. ONLY) OR RXGY-E03A (U.S. AND CANADA)**

CONCENTRIC TERMINATIONS

These kits are for vertical/horizontal intake air/vent runs and may be installed through roofs or sidewalls. One 5 inch diameter hole (RXGY-E03 & RXGY-E03A) or 3-5/8 inch diameter hole (RXGY-E02 & RXGY-E02A) is required for the installation. See **Figure 29** for the general layout. Complete instructions are included with each kit.

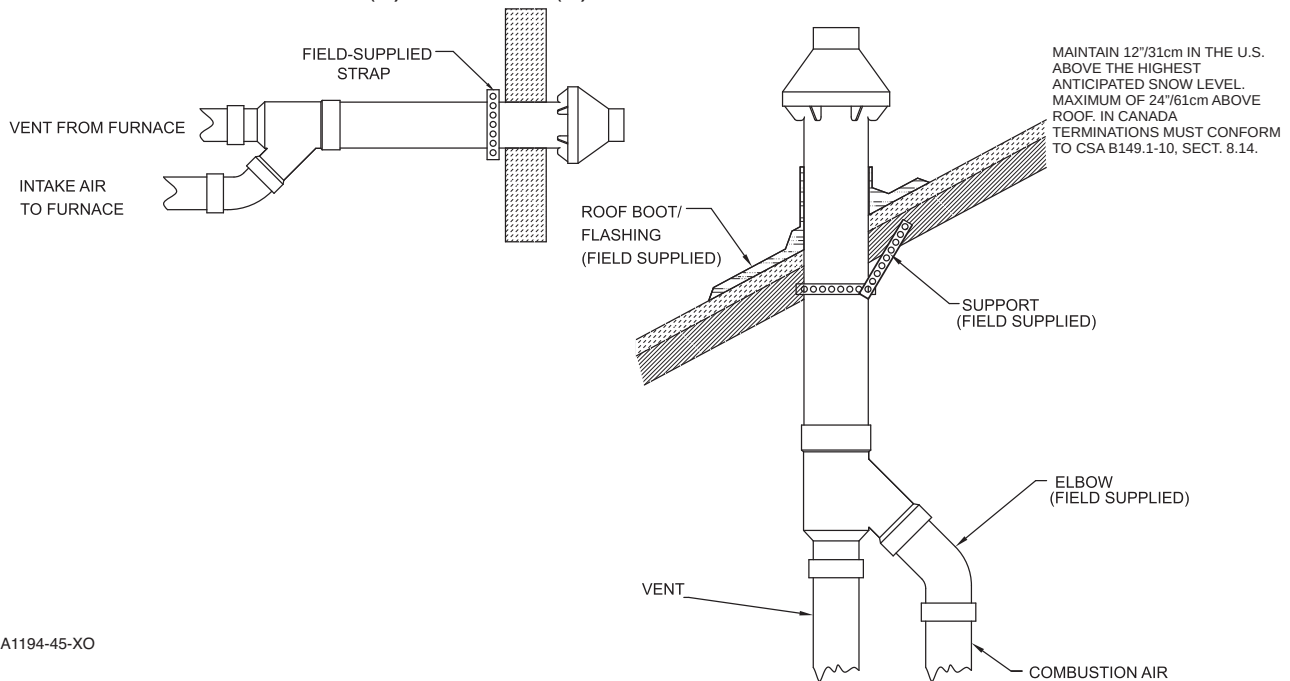
NOTE: The following IPEX brand concentric vent termination (System 636) may be purchased in the field and used in place of the kits offered by the furnace manufacturer.

3" Concentric Vent Kit = Item #196006

NOTE: Maximum equivalent lengths specified in the **VENT PIPE SIZING AND MAXIMUM VENT LENGTHS** section of this manual are in addition to the concentric vent.

NOTE: With this option a trap on the inlet air pipe is NOT required.

FIGURE 29
CONCENTRIC VENT KIT NO. RXGY-E02A (2") AND RXGY-E03A (3")



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GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT (cont.)

OPTIONS 8 & 9: 2" & 3" SIDE WALL VENT TERMINATIONS

FOR 2" PIPE: RXGY-G02

FOR 3" PIPE: RXGY-G01

This termination is for horizontal venting only. This termination may be installed with either a non-direct-vent or a direct-vent system. When installed as non-direct vent, only one wall penetration is necessary for the exhaust vent.

IMPORTANT: Do not install on the prevailing winter wind side of the structure.

IMPORTANT: Maintain a minimum of 12 inches (U.S.) above grade or the highest anticipated average snow level (whichever is greater) to the bottom of the vent cover or, in Canada, terminations must conform with CSA B149.1-10, Sect. 8.14, Canadian Natural Gas and Propane Installation Code.

NOTE: Dimensions between the inlet and outlet pipes (direct-vent only) are fixed by the sidewall termination. Other drawings in this manual which specify minimum and/or maximum distances (vertical and horizontal) between pipes do not apply to the sidewall termination kit.

NOTE: Multiventing – NO COMMON VENTING IS PERMITTED WITH THIS KIT.

NOTE: With this option a trap on the inlet combustion air pipe is NOT required.

NOTE: Install the vent and air intake piping into the vent plate openings. Seal all gaps between the pipes and wall. **BE SURE TO USE SILICONE SEALANT** to seal the vent pipe to the vent cap to permit field disassembly for annual inspection and cleaning. Also seal all pipe penetrations in the wall. **DO NOT INSTALL VENT KITS ONE ABOVE THE OTHER** to prevent the possibility of condensate freeze-up or recirculation.

NOTE: Vent should protrude a maximum of 2-1/4 inches beyond the vent plate. Air intake should protrude a maximum of 1 inch beyond the vent plate.

NOTE: The RXGY-G02 termination can be used with 3" vent pipe. A maximum of 18" of 2" Ø pipe can be used before penetrating the wall.

Complete installation instructions are included with these kits.

FIGURE 30
VENT KIT INSTALLATION OPTIONS

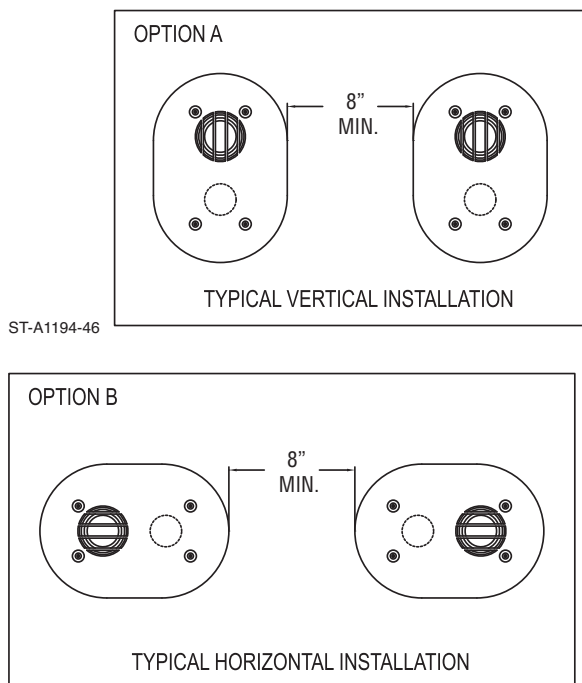
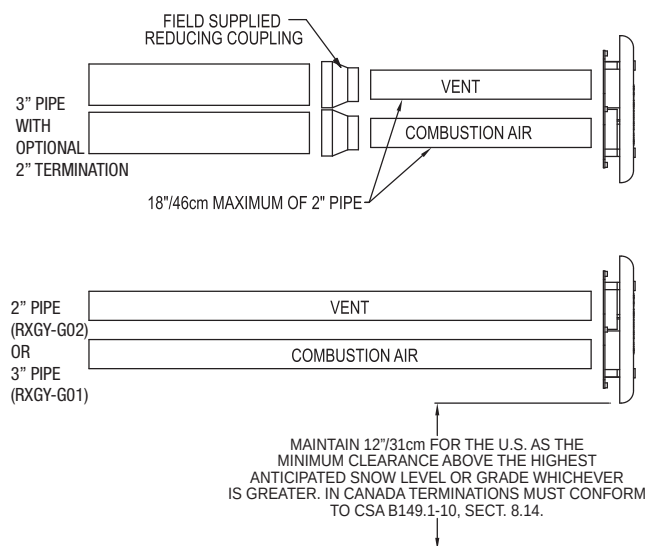


FIGURE 31
TYPICAL INSTALLATION – DIRECT-VENT

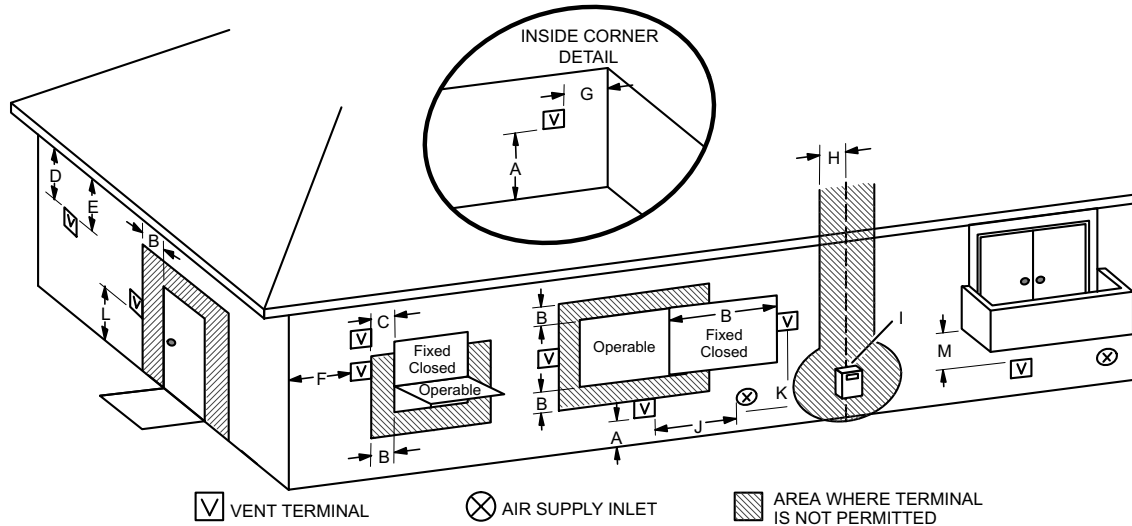


GENERAL VENTING REQUIREMENTS AND GUIDELINES

DIRECT VENT TERMINATION CLEARANCES

Figure 32 shows minimum clearances that must be used for direct venting terminations.

FIGURE 32
DIRECT VENT TERMINAL CLEARANCES



	US Installations ¹	Canadian Installations ²
A = Clearance above grade, veranda, porch, deck or balcony	12 inches (305mm) or 12 in. 305mm) above average snow accumulation.	Must conform to CSA B149.1-10, Sect. 8.14.
B = Clearance to window or door that may be opened	6 inches (152mm) for appliances <10,000 Btuh (3kw), 9 inches (305mm) for appliances >10,000 Btuh (3kw), and <50,000 Btuh (15kw), 12 inches (.9m) for appliances > 50,000 Btuh (15kw)	6 inches (15cm) for appliances <10,000 Btuh (3kw), 12 inches (305mm) for appliances >10,000 Btuh (3kw), and <100,000 Btuh (30kw), 36 inches (.9m) for appliances > 100,000 Btuh (30kw)
C = Clearance to permanently closed window	* 12" (30cm)	* 12" (30cm)
D = Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (0.6m) from the center line of the terminal	* Equal to or greater than soffit depth	* 3 ft. (0.9m)
E = Clearance to unventilated soffit	* Equal to or greater than soffit depth	* 2 ft. (0.6m)
F = Clearance to outside corner	* No minimum to outside corner	* No minimum to outside corner
G = Clearance to inside corner	* 3 ft. (.9m), 10 ft. (3.05 m) preferred	* 3 ft. (.9m), 10 ft. (3.05m) preferred
H = Clearance to each side of center line extended above meter / regulator assembly	3 feet (.9m) within a height 15 feet (4.5m) above the meter / regulator assembly	3 feet (.9m) within a height 15 feet (4.5m) above the meter / regulator assembly
I = Clearance to service regulator vent outlet	3 feet (.9m)*	*3 feet (.9m)
J = Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6 inches (152mm) for appliances <10,000Btuh (3kw), 9 inches (305mm) for appliances > 10,000 Btuh (3kw) and <50,000 Btuh (15kw), 12 inches (.9m) for appliances > 50,000 Btuh (15kw)	6 inches (15cm) for appliances <10,000Btuh (3kw), 12 inches (30cm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36 inches (.9m)for appliances > 100,000 Btuh (30kw)
K = Clearance to mechanical air supply inlet	3 feet (.9m) above if within 10 feet (3m) horizontally	6 feet (1.8m)
L = Clearance above paved sidewalk or paved driveway located on public property	* 7 feet (2.1m)	7 feet (2.1m)†
M = Clearance under veranda, porch, deck or balcony	*12 inches (305mm)‡	12 inches (30cm) ‡

¹ In accordance with the current ANSI Z223.1/NFPA 54 Natural Fuel Gas Code

² In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

† Vent shall not terminate less than 7 ft. (2.1m) above a paved sidewalk or paved driveway that is located on public property.

‡ Permitted only if veranda, porch, deck or balcony is full open on a minimum of two sides beneath the floor. We recommend avoiding this location if possible.

*For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions."

GENERAL VENTING REQUIREMENTS AND GUIDELINES

MULTIVENTING OF DIRECT-VENT FURNACES

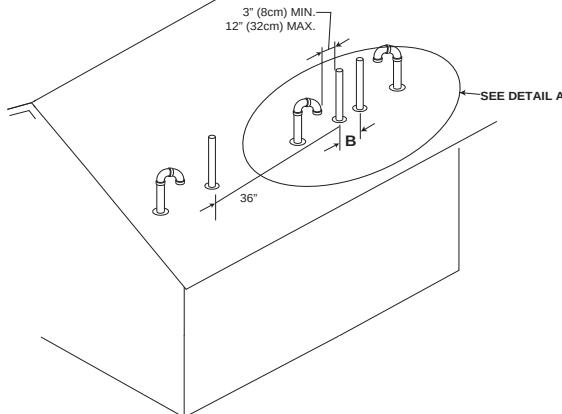
Figures 33 & 34: NOTE: WHEN VENTING MULTIPLE FURNACES IN CLOSE PROXIMITY, EACH FURNACE MUST BE INDIVIDUALLY VENTED – NO COMMON VENTING IS PERMITTED. See **Figures 33 & 34** for positioning of the terminations. When more than two furnaces are to be vented, there must be at least 3 feet between the first two furnaces and the third and etc. **Figure 33, (Detail A)** below shows the necessary detail for the roof penetration on a standard direct-vent vertical termination.

**FIGURE 33
TWO FURNACE VENTING**

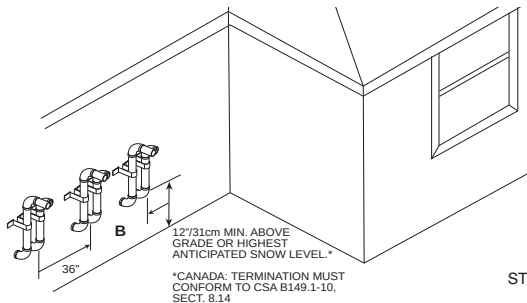
TWO PIPE VENTING THROUGH ROOF

TERMINATIONS MORE THAN 24" ABOVE ROOF PENETRATION REQUIRE ADDITIONAL SUPPORT.

NOTE: IF 3" Ø VENTING IS USED, BOTH PIPES (INTAKE AND EXHAUST) MUST BE REDUCED TO 2" Ø BEFORE PENETRATING ROOF.

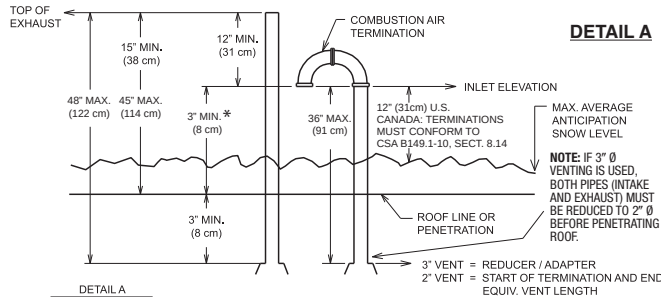


TWO PIPE VENTING THROUGH WALL



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DIRECT VENT VERTICAL TERMINATION DETAIL



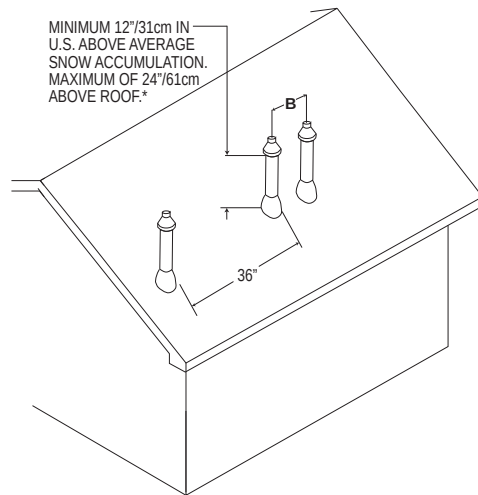
DETAIL A
TERMINATION HEIGHT REQUIREMENTS

*3" (8cm) minimum only if no snow accumulation is anticipated.

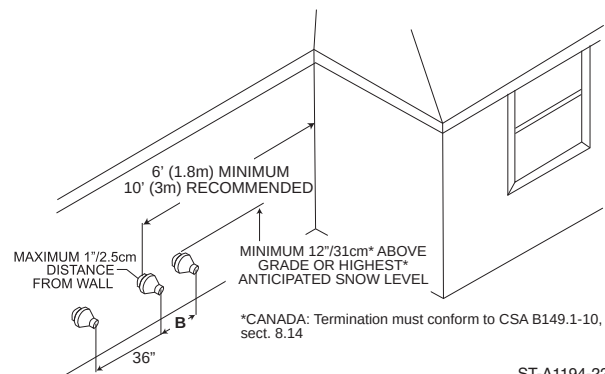
ST-A1194-18
DETAIL A

**FIGURE 34
TWO FURNACE VENTING WITH CONCENTRIC VENTING
CONCENTRIC VENTING THROUGH ROOF**

MINIMUM 12"/31cm IN U.S. ABOVE AVERAGE SNOW ACCUMULATION. MAXIMUM OF 24"/61cm ABOVE ROOF.*



CONCENTRIC VENTING THROUGH WALL



ST-A1194-22

For 2 Direct Vent Furnace Installations

B 1. Terminations must be 9-24" apart.

2. Canada: 12" (300mm) for inputs 10k Btuh (3kW) up to and including 100K Btuh (30kW)

36" (900mm) for inputs exceeding 100K Btuh (30kW)

For 3 or More Direct Vent Furnace Installations

Furnace terminations require 36" between each additional pair of terminations for US and Canada.