



PVC, CPVC, PP & SS Vent Supplement

CHALLENGER

SOLO: CC50s, CC85s, CC105s, CC125s, CC125Hs, CC150s
COMBI: CC105, CC125, CC125C, CC125H



WARNING

This document is intended to be used by a qualified heating contractor or service technician. Read all instructions within this document and within the CHALLENGER Installation and Maintenance Manual, before proceeding with the installation. It is recommended to follow the procedures in the steps given, skipping or missing procedural steps could result in substantial property damage, serious injury or death.

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

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Section I: Appliance & Safety Information

1.1 Definitions

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the appliance.

DANGER

Indicates the presence of a hazardous situation which, if ignored, will result in substantial property damage, serious injury, or death.

WARNING

Indicates a potentially hazardous situation which, if ignored, can result in substantial property damage, serious injury, or death.

CAUTION

Indicates a potentially hazardous situation which, if ignored, may result in substantial property damage or minor injury.

NOTICE

Indicates special instructions on installation, operation, or maintenance, which are important to equipment but not related to personal injury hazards.

BEST PRACTICE

Indicates recommendations made by ACV-Triangle Tube for the installers which will help to ensure optimum operation and longevity of the equipment.

1.2 Installer

WARNING

Read all instructions as outlined in this manual and in the CHALLENGER installation manual. Failure to comply with these instructions in the order presented can result in substantial property damage, serious injury, or death.

This document is a supplement to the CHALLENGER Installation and Maintenance manual. The purpose of this supplement is for the proper installation of the vent and combustion air piping to the appliance.

WARNING

All CHALLENGER vent and combustion air piping must be installed, terminated and joints sealed as outlined in this manual. Failure to comply with installation procedures outlined in this manual can result in substantial property damage, serious injury or death.

NOTICE

This vent supplement outlines Direct Vent Installations using PVC, CPVC, PP and SS materials. For other venting options (materials, terminations, etc.) contact ACV-Triangle Tube.

1.3 Homeowner

- This manual is intended for use by a qualified heating contractor or service technician.
- Please reference the User Information manual for additional information.
- Ensure this document and all pertaining documents are kept near the appliance to be used by the qualified heating contractor or service technician for future reference.

NOTICE

ACV-Triangle Tube reserves the right to modify the technical specifications and components of its products without prior notice.

2. Pre-Installation Requirements

Section II: Pre-Installation Requirements

2.1 Removal of an Existing Boiler and/or Water Heater from a Common Vent System



Do not install the CHALLENGER into a common vent with any other gas or oil appliances. This will cause flue gas spillage or appliance malfunction, resulting in substantial property damage, serious injury or death.

When an existing boiler and/or water heater is removed from a common venting system, the common venting system is likely to be too large for proper venting of the remaining appliances. At the time of removal of an existing boiler and/or water heater, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.
3. Insofar as is practical, close all building doors, windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliance not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.
4. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.
6. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
7. Any improper operation of the common venting system should be corrected so the installation conforms with the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1). When resizing any portion of the common venting system, the common venting system should be resized to approach the minimum size as determined using the appropriate tables in Part 11 of the National Fuel Gas Code (ANSI 223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

2.2 Vent/Combustion Air Piping Materials

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

The CHALLENGER requires a Category IV venting system which is designed for pressurized venting and condensate.



The vent and combustion air materials (piping, fittings and cement) must meet the listed requirements in this manual. Failure to comply with these material requirements can result in substantial property damage, serious injury or death.

2.2.1 PVC and CPVC Vent and Combustion Air Piping and Fittings:

- PVC Schedule 40 - ANSI/ASTM D1785
- PVC-DWV - ANSI/ASTM D2665
- CPVC Schedule 40 - ASNSI/ASTM F441

2.2.2 PVC and CPVC Pipe Cement and Primer

- PVC - ANSI/ASTM D2564
- CPVC - ANSI/ASTM F493

NOTICE

For installations in Canada, all piping fittings and cement/primer must be certified and listed to ULC-S636. Ipex Inc. is an approved vent manufacturer of ULC-S626 vent components.

NOTICE

Use of cellular core PVC (ASTM F891), cellular core CPVC, or Radel® (polyphenolsulfone) in venting systems is prohibited. Cellular core pipe may be used for combustion air piping.



DO NOT mix a PVC/CPVC vent system & components with other vent system materials & components. Seal all PVC and CPVC pipe and fittings with the appropriate primer and cement. Failure to comply with this requirement could cause the venting system to fail resulting in leakage of flue products into the living space.

2.2.3 AL29-4C® Stainless Steel Vent Piping and Fittings

The following is a list of approved vent manufacturers and vent systems:

- Heatfab (SelKirk Corp.)
5030 Corporate Exchange Boulevard
Grand Rapids, MI 49512
Phone: 800-992-8368
Email: custsvc@selkirkinc.com
- ProTech Systems (Muelink and Grol B.V./Dura Vent)
877 Cotting Court
Vacaville, CA 95688
Phone: 800-835-4429
Email: customerservice@duravent.com
- Z-Flex (Nova Flex Group/Flexmaster Canada Limited)
452 Attwell Drive
Etobicoke, Ontario M9W 5C3
Canada
Phone: 800-654-5600
Email: sales@z-flex.com

Reference Table 1 for a listing of approved stainless steel vent adapters and terminations.

NOTICE

A specific vent adapter is required to transition from the boiler vent outlet adapter to specific stainless steel vent system. Contact the appropriate AL29-4C® vent manufacturer for transition adapter information.

NOTICE

The stainless steel AL29-4C® vent system must be installed per the vent manufacturer's instructions. Contact the vent manufacturer for appropriate vent adapters, materials, terminations, clearance and installation instructions.

NOTICE

When using stainless steel for the vent system, PVC or CPVC pipe meeting the listed requirements in this manual may be utilized for the combustion air piping.

2.2.4 Polypropylene (PP) Vent Piping and Fittings

The following is a list of approved vent manufacturers and vent systems:

- Centrotherm Eco Systems, L.L.C
75 Champlain Street
Albany, NY 12204
Phone: 877-434-3432
Email: info@controtherm.us.com
- Muelink and Grol B.V./Dura Vent
877 Cotting Court
Vacaville, CA 95688
Phone: 800-835-4429
Email: customerservice@duravent.com

Reference Tables 2 - 5 on pages 4 & 5 for a listing of approved polypropylene vent adapters, terminations and supports.

NOTICE

A specific vent adapter is required to transition from the boiler vent outlet adapter to specific polypropylene vent system. Contact the appropriate PP vent manufacturer for transition adapter information.

NOTICE

When using polypropylene for the vent system, PVC or CPVC pipe meeting the listed requirements in this manual may be utilized for the combustion air piping.

Table 1: Approved Stainless Steel Vent Adapters and Terminations

Description	Heatfab (SelKirk Corp.) Saf-T Vent, EZ Seal or Saf-T Vent SC	ProTech Systems (M&G/Dura Vent) FasNSeal or FasNSeal CVS	Z-Flex (Nova Flex Group) Z-Vent
3" Vent Adapter	9301PVC	FSA-ULT3	2SVSTTA03
3" Roof Termination	9392	300186	2SVSTPF03
3" Side Wall & 45° Elbow Termination	9311TERM	300130 & 300186	2SVSTEX0345
3" Side Wall Tee Termination	9390TEE	300311	2SVSTTF03

2. Pre-Installation Requirements

Table 2: Approved 2" (60mm) Rigid Polypropylene Vent Adapters, Terminations and Supports

Description	Centrotherm Eco Systems, L.L.C	Muelink and Grol B.V./Dura Vent
3" (80 mm) Appliance Vent Adapter	ISAAL0303	3PPS-03PVCM-3PPF
3" (80 mm) to 2" (60 mm) Reducer	ISRD0302	3PPS-R2
2" (60 mm) Roof Termination - UV Resistant	ISEP02 (20"/51cm) or ISEP0239 (39"/99cm)	2PPS-12B (12"/30cm) or 2PPS-36B (36"/91cm)
2" (60 mm) 45° Elbow Termination - UV Resistant	ISELL0245UV	2PPS-E45B
2" (60 mm) Tee Termination - UV Resistant	ISTT0220	2PPS-TB
2" (60 mm) Pipe Lengths - UV Resistant	ISVL022UV (26.5"/67cm)	2PPS-12B (12"/30cm) or 2PPS-36B (36"/91cm)
2" (60 mm) 90° Elbow - UV Resistant	ISELL0287UV	2PPS-E90B or 2PPS-E90EB
2" (60 mm) Bird Guard Screen - UV Resistant	IASPP02	2PPS-BG
2" (60 mm) Concentric Side Wall Termination	ICWT242 & ICTC0224	2PPS-HK
2" (60 mm) Concentric Roof Termination	ICRT2439 & ICTC0224	2PPS-VK
2" (60 mm) Locking Band Clamp or Connector Ring	IANS02	2PPS-LBC
2" (60 mm) Wall Strap or Support Clamp	IASC02	2PPS-WSM (gal.) & 2PPS-WSM-SS (SS)
2" (60 mm) Wall Plate	IAWP02B (black)	2PPS-WPB (black)

Table 3: Approved 3" (80 mm) Rigid Polypropylene Vent Adapters, Terminations and Supports

Description	Centrotherm Eco Systems, L.L.C	Muelink and Grol B.V./Dura Vent
3" (80 mm) Appliance Vent Adapter	ISAAL0303	3PPS-03PVCM-3PPF
3" (80 mm) Roof Termination - UV Resistant	ISEP03 (20"/51cm) ISEP0339 (39"/99cm)	3PPS-12B (12"/30cm) or 3PPS-36B (36"/91cm)
3" (80 mm) 45° Elbow Termination - UV Resistant	ISELL0345UV	3PPS-E45B
3" (80 mm) Tee Termination - UV Resistant	ISTT0320	3PPS-TB
3" (80 mm) Pipe Lengths - UV Resistant	ISVL032UV (26.5"/67cm)	3PPS-12B (12"/30cm) or 3PPS-36B (36"/91cm)
3" (80 mm) 90° Elbow - UV Resistant	ISELL0387UV	3PPS-E90B or 3PPS-E90EB
3" (80 mm) Bird Guard Screen - UV Resistant	IASPP03	3PPS-BG
3" (80 mm) Concentric Side Wall Termination	ICWT352 & ICTC0335	3PPS-HK
3" (80 mm) Concentric Roof Termination	ICRT3539 & ICTC0335	3PPS-VK
3" (80 mm) Locking Band Clamp or Connector Ring	IANS03	3PPS-LBC
3" (80 mm) Wall Strap or Support Clamp	IASC03	3PPS-WSM (gal.) & 3PPS-WSM-SS (SS)
3" (80 mm) Wall Plate	IAWP03B (black) or IAWP03W (white)	3PPS-WPB (black)

Table 4: Approved 2" (60 mm) Flex Polypropylene Vent Adapters, Terminations and Supports

Description	Centrotherm Eco Systems, L.L.C	Muelink and Grol B.V./Dura Vent
3" (80 mm) Appliance Vent Adapter	ISAAL0303	3PPS-03PVCM-3PPF
3" (80 mm) to 2" (60 mm) Reducer	ISRDO302	3PPS-R2
2" (60 mm) Wall Plate	IAWP02B (black)	2PPS-WPB (black)
2" (60 mm) Chimney Support Elbow or Base Support	ISBS0287	2PPS-SE90X
2" (60 mm) Support Bracket - Bottom of Chimney or Chase	Included with Base Support	PPS-SUP or 2PPS-SUP (Chimney)
2" (60 mm) Flex Support Bracket - Top of Chimney or Chase	N/A	2PPS-FSB
2" (60 mm) Spacer	IASP02	2PPS-S
2" (60 mm) Chimney Cap or Cover & End Pipe - UV Resistant	ISCP02 & IFEP02	2PPS-FCT

Table 5: Approved 3" (80 mm) Flex Polypropylene Vent Adapters, Terminations and Supports

Description	Centrotherm Eco Systems, L.L.C	Muelink and Grol B.V./Dura Vent
3" (80 mm) Appliance Vent Adapter	ISAAL0303	3PPS-03PVCM-3PPF
3" (80 mm) Wall Plate	IAWP03B (black) or IAWP03W (white)	3PPS-WPB (black)
3" (80 mm) Chimney Support Elbow or Base Support	ISBS0387	3PPS-SE90X
3" (80 mm) Support Bracket - Bottom of Chimney or Chase	Included with Base Support	PPS-SUP or 3PPS-SUP (Chimney)
3" (80 mm) Flex Support Bracket - Top of Chimney or Chase	N/A	3PPS-FSB
3" (80 mm) Spacer	IASP03	3PPS-S
3" (80 mm) Chimney Cap or Cover & End Pipe - UV Resistant	ISCP03 & IFEP03	3PPS-FCT

Table 6: Maximum Allowable Vent or Combustion Air Piping Length

CHALLENGER Model	2" (60mm) Polypropylene Vent Piping*		3" (80mm) Piping	
	Feet [meters]	Elbows	Feet [meters]	0
CC50s	30 [9.1]	0	85 [23.9]	0
CC85s	30 [9.1]	0	85 [23.9]	0
CC105, CC105s	30 [9.1]	0	85 [23.9]	0
CC125, CC125H, CC125s, CC125Hs, CC125C	30 [9.1]	0	85 [23.9]	0
CC150s	30 [9.1]	0	85 [23.9]	0

* When utilizing 2" (60 mm) polypropylene vent the combustion air piping must utilize 3" (80 mm) piping at the same maximum length as the 2" (60 mm) polypropylene vent of 30' (9.1 m).

2. Pre-Installation Requirements

2.3 Vent/Combustion Air Equivalent Lengths

- For all venting applications, PVC/CPVC, AL29-4C® SS, or Polypropylene, the maximum allowable length should not exceed those lengths listed in Table 6 on page 5.
- For PVC/CPVC or AL29-4C® SS vent systems, reduce the maximum allowable length for each for each elbow as follows:
 - 3 feet [0.9 m] for every 45° elbow
 - 5 feet [1.5 m] for every 90° elbow
- For polypropylene vent systems, reduce the maximum allowable length for each elbow as follows:
 - 5 feet [1.5 m] for every 45° elbow
 - 10 feet [3 m] for every 90° elbow

2.4 2" (60 mm) Vent System Restriction

- The use of 2" (60 mm) vent system is restricted to polypropylene only.



The use of 2" PVC/CPVC/SS to vent a CHALLENGER is not allowed. Failure to properly install the vent system can lead to carbon monoxide poisoning or fire due to joint separation of pipe breakage.

2.5 Rigid Polypropylene Vent System Restrictions



Contact approved polypropylene vent manufacturer for a copy of their installation instructions. Read, understand and follow all of the vent manufacturer's instructions before beginning the installation. Contact vent manufacturer if you require any technical support. Failure to properly install and support vent system can lead to carbon monoxide poisoning or fire due to joint separation or pipe breakage.

- Rigid polypropylene vent pipe must be installed with locking band clamps or connector rings and supports (wall strap or clamp, elbow or base, etc.). Consult vent manufacturer for complete list of other parts required.
- Maintain 5/8" per foot slope back toward appliance on all horizontal runs.
- The use of a wall plate is required to seal rigid polypropylene vent pipe at the entrance of the chimney or chase to prevent mortar or cement from contacting the polypropylene vent pipe.
- Any termination piping external to the building must be UV resistant (black).

- Do not apply insulation directly to vent. Maintain vent manufacturer's clearances to combustibles.
- Plastic venting systems shall not pass through rated fire separations without approved fire stopping installed in accordance with fire stopping manufacturer's instructions.
- Prior to assembly of any joints, ensure joint gasket is present and properly installed. Contact vent manufacturer if gasket is missing or damaged. Verify the integrity of joints upon completion of the vent system.

2.6 Flex Polypropylene Vent System Restrictions



Contact approved polypropylene vent manufacturer for a copy of their installation instructions. Read, understand and follow all of the vent manufacturer's instructions before beginning the installation. Contact vent manufacturer if you require technical support. Failure to properly install and support vent system can lead to carbon monoxide poisoning or fire due to joint separation or pipe breakage.

- Approved for vertical installations only, where a clean, structurally sound unused chimney or chase is used as a raceway.
- Vertical offsets must not exceed 45° and are limited to a maximum number of 2.
- Requires rigid polypropylene vent pipe with locking band clamps or connector rings and wall straps or support clamps from the appliance to the entrance of the chimney or chase.
- Maintain 5/8" per foot slope back toward appliance on all horizontal runs of rigid polypropylene vent pipe.
- The use of a wall plate is required to seal rigid polypropylene vent pipe at the entrance of the chimney or chase to prevent mortar or cement from contacting the polypropylene vent pipe.
- Requires supports (elbow or base, flex chimney and bracket), spacers, chimney cap and end pipe. Consult vent manufacturer for complete list of other parts required.
- Any termination piping external to the building must be UV resistant (black).
- Do not apply insulation directly to vent. Maintain vent manufacturer's clearances to combustibles.
- Flex plastic venting systems shall not pass through fire rated separations.
- Prior to assembly of any joints, ensure joint gasket is present and properly installed. Contact vent manufacturer if gasket is missing or damaged. Verify the integrity of joints upon completion of the vent system.

2.7 Combustion Air Contamination

 **WARNING**

The combustion air must be piped directly from the outdoors to the appliance. If the CHALLENGER combustion air inlet is located in an area likely to cause or contain contamination, the combustion air must be repiped and terminated at another location. Contaminated combustion air will damage the appliance and its burner system, resulting in substantial property damage, serious injury or death.

 **DANGER**

Do not operate the CHALLENGER if its combustion air inlet is located near a laundry room or pool facility. These areas will always contain hazardous contaminants.

Pool and laundry products, common household and hobby products often contain fluorine or chlorine compounds. When these chemicals pass through the burner and vent system, they can form strong acids. These acids will corrode the heat exchanger, burner components and vent system, causing serious damage and presenting possible flue gas spillage or water leakage into the surrounding area.

Please read the information listed below. If contaminating chemicals are located near the area of the combustion air inlet, the installer should pipe the combustion air inlet to an outside area free of these chemicals.

Potential contaminating products:

- Spray cans containing chloro/fluorocarbons
- Permanent wave solutions
- Chlorinated wax
- Chlorine-based swimming pool chemicals/cleaners
- Calcium Chloride used for thawing ice
- Sodium Chloride used for water softening
- Refrigerant leaks
- Paint or varnish removers
- Hydrochloric acid/muriatic acid
- Cements and glues
- Antistatic fabric softeners used in clothes dryers
- Chlorine-type bleaches, detergents, and cleaning solvents found in household laundry rooms
- Adhesives used to fasten building products and other similar products

Areas likely to contain these products:

- Dry cleaning/laundry areas and establishments
- Beauty salons
- Metal fabrication shops
- Swimming pools and health spas
- Refrigeration repair shops
- Photo processing plants
- Auto body shops
- Plastic manufacturing plants
- Furniture refinishing areas and establishments
- New building construction
- Remodeling areas
- Garages with workshops

3. Direct Vent Installation of Vent/Air Piping

Section III: Direct Vent Installation of Vent/Air Piping

A Direct Vent appliance utilizes uncontaminated outdoor air (piped directly to the appliance) for combustion.

3.1 Direct Vent - Vertical - Through the Roof or Unused Chimney

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

NOTICE

When using an inoperative chimney as a means of a chase for the vent and air, the surrounding space within the chimney cannot be used to draw combustion air or vent another appliance.

WARNING

A gas vent extending through a roof should not terminate near an adjacent wall or below any building extensions such as roof eaves, balconies or decks. Failure to comply with the required clearances in this manual can result in substantial property damage, serious injury or death.

NOTICE

The information and diagrams outlining the fittings and method of terminating the vent/combustion air are directly related to PVC/CPVC vent systems. When utilizing an AL29-4C® or polypropylene vent system, there may be some variations. Consult the appropriate vent manufacturer for recommendations and clarifications.

3.1.1 Determine Termination Location

Locate the vent and combustion air termination using the following guidelines:

1. The total length of the vent or combustion air piping must not exceed the limits given in Table 6 on page 5.

NOTICE

Do not include the two 90° elbows or tee used to terminate the combustion air inlet exterior of the building when determining the total length of pipe.

2. The combustion air piping must terminate in an upside down "U" shape fashion using two 90° elbows as shown in Fig. 1 on page 9 or with a tee as shown in Fig. 2 on page 9. The termination must be installed 12" [30.5 cm] (18" [45.7 cm] Canada) above the highest anticipated snow level.
3. The vent must terminate vertically with a coupling to accept the bird screen and must be located 12" to 24" [30.5 cm to 61 cm] above the combustion air inlet as shown in Fig. 1 & Fig. 2 on page 9.
4. The vent and combustion air terminations must be located a radial distance of 12" to 24" [30.5 cm to 61 cm] from centerline of vent termination to centerline of termination as shown in Figs. 1 & 2 on page 9.
5. The following should be considered when determining the location of the vent and combustion air terminations:
 - a. Locate the vent termination where flue vapors will not damage surrounding shrubs, plants or air conditioning equipment or be objectionable to the homeowner.
 - b. The flue products will form a noticeable plume of water vapor as they condense in colder air. Avoid terminating the vent in areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of flue gas condensation and a buildup of water/ice on surrounding plants, building surfaces or combustion air inlet.
 - d. Avoid locations where prevailing winds could affect the performance of the appliance or cause recirculation of the flue gases, such as inside corners of buildings, near adjacent buildings, vertical surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
 - e. Do not terminate the vent above doors or windows. Flue condensate could freeze causing ice formations.
 - f. Locate the vent termination to prevent possible condensate damage to exterior finishes.
 - g. Avoid locations of possible accidental contact of flue vapors with people or pets

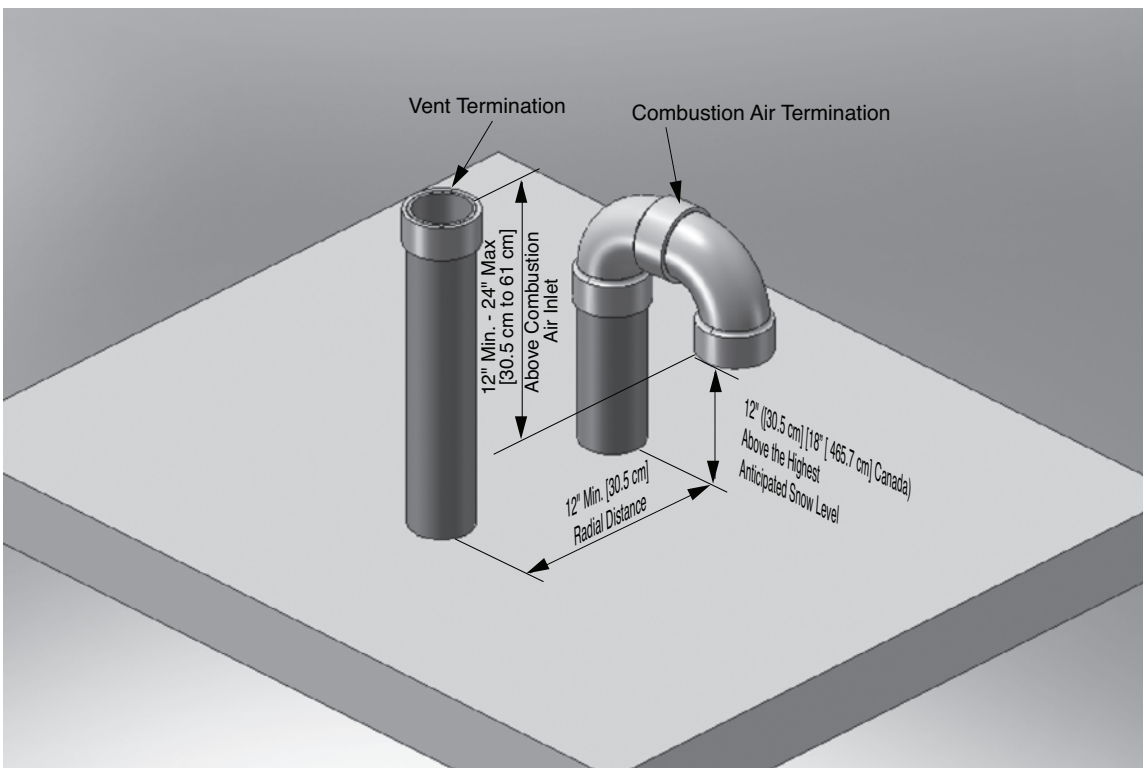


Fig. 1: Direct Vent - Vertical Termination of Vent and Combustion Air Piping

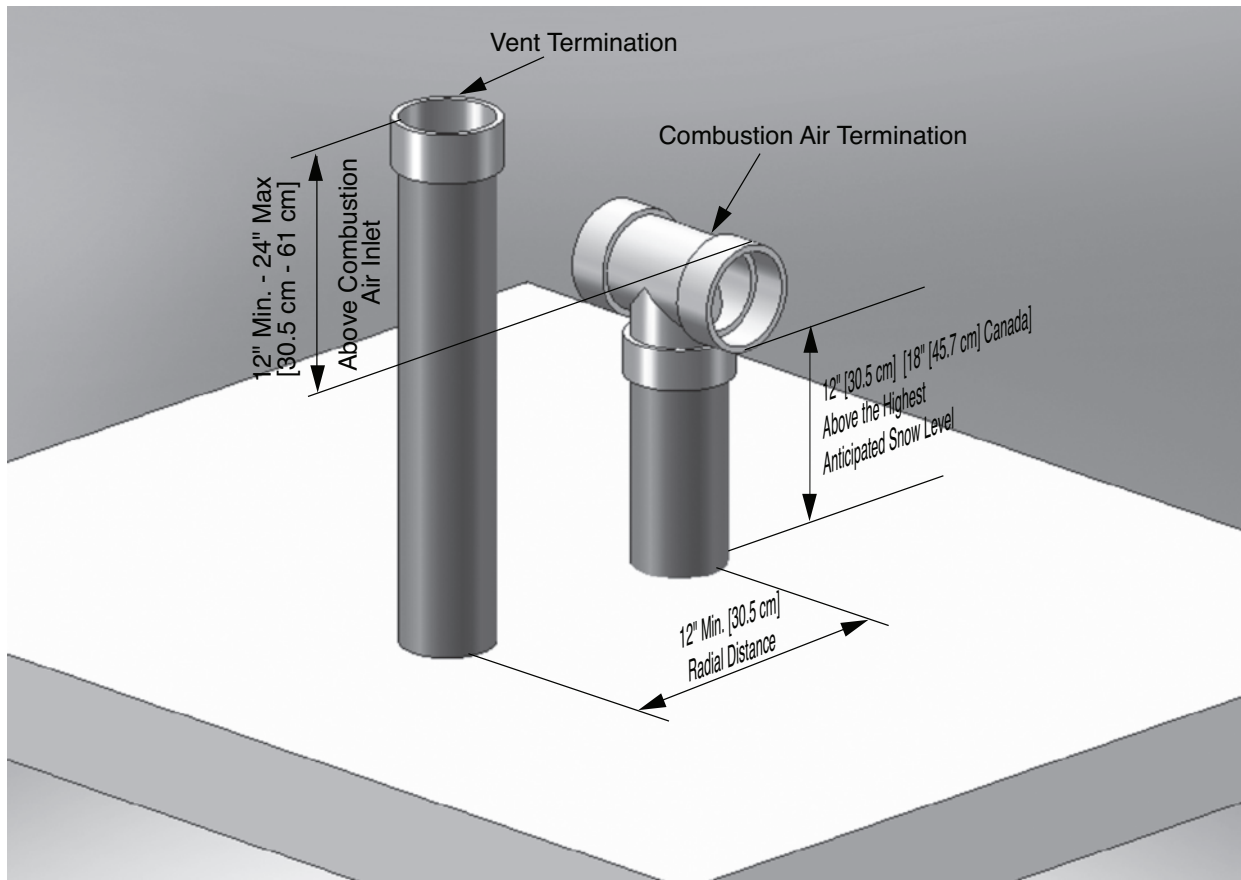


Fig. 2: Direct Vent - Vertical Termination of Vent and Combustion Air Piping

3. Direct Vent Installation of Vent/Air Piping

6. The vent termination must also maintain the following clearances (shown in Fig. 3):
 - a. At least 3 feet [0.9 m] from adjacent walls.
 - b. At least 3 feet [0.9 m] below roof overhangs.
 - c. At least 7 feet [2.1 m] above any public walkways.
 - d. At least 3 feet [0.9 m] above any forced air intake within 10 feet [3 m] (does not apply to the combustion air inlet of a direct vent appliance).
 - e. No closer than 12" [30.5 cm] below or horizontally from any door or window or gravity air inlet.
 - f. Must be at least 4 feet [1.2 m] from any electric meters, gas meters-regulators, relief valves or other equipment. Never terminate the vent above or below any of these items within 4 feet [1.2 m] horizontally.
 - g. A minimum of 12" [30.5 cm] horizontal spacing from other fan assisted appliance vents such as clothes dryer vent, kitchen exhaust vent, etc. Never terminate the vent above or below any fan assisted vent within 12" [30.5 cm] horizontally.
7. Locate the vent and combustion air terminations in a manner to protect them from damage by foreign objects, such as stones, balls, or buildup of leaves or sediment.
8. Do not connect any other appliance to the vent pipe or multiple appliances to a common vent pipe.

3.2 Direct Vent - Vent Installation - Through the Roof

1. Vent and Combustion Air Penetration
 - Vent pipe penetration through combustible or non-combustible wall material should maintain a minimum 1/4" [6 mm] clearance for a 3" PVC/CPVC vent. Vent may be installed through a wall thickness of up to 20" [50.8 cm] maximum. The diameter of the penetration hole should be 4" [10.2 cm] minimum for 3" pipe. When using polypropylene or stainless steel vent, refer to the vent manufacturer's installation instructions, supplied with the vent for clearances.
 - Combustion air pipe penetration can maintain zero clearance. The diameter of the penetration hole should be 3-1/2" [8.9cm] minimum for 3" pipe.
2. The installer must use a galvanized metal thimble for the vent pipe penetration.
3. Locate the vent and combustion air pipe penetrations to provide clearances as described in Figs. 1 & 2 on page 9.
4. The installer must comply with all local codes for isolating the vent and combustion air pipes as they pass through floors, ceilings and roofs.
5. The installer should provide adequate flashing and sealing boots sized for the vent pipe and combustion air pipe.

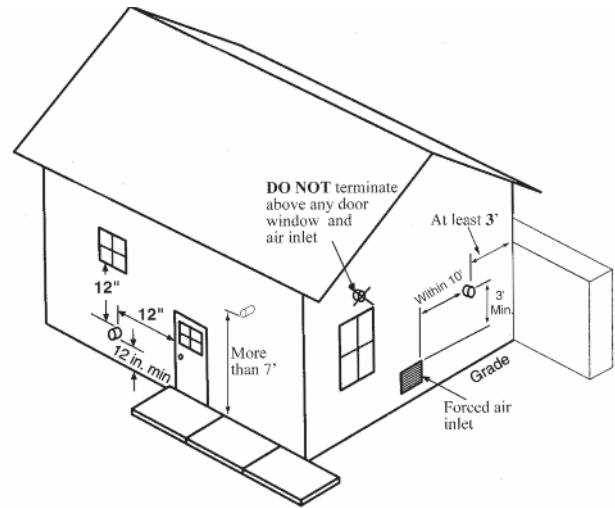


Figure 3: Termination Clearances of Direct Vent System

3.2.1 Termination Fittings - Through the Roof

1. The vent and combustion air terminations must include a factory supplied "bird screen" installed as shown in Figs. 4, 5 & 6 on page 11.
2. The combustion air piping must terminate in an upside down "U" shape fashion using two 90° elbows as shown in Fig. 1 on page 9 or with a tee as shown in Fig. 2 on page 9.
3. The vent piping must terminate vertically with a coupling as shown in Figs. 1 & 2 on page 9.



Do not extend the vent pipe above the roof beyond the dimensions shown in Figs. 1 & 2 on page 9. Extended exposure of the vent pipe could cause condensate to freeze and block the vent pipe.

3.3 Direct Vent - Multiple Appliance Installation - Through the Roof

1. On installations of multiple CHALLENGER appliances, terminate the vent and combustion air piping as described in this manual
2. The roof penetration of the vent and combustion air piping should be such that the combustion air inlet is a minimum of 12" [30.5 cm] from the adjacent vent pipe of the other appliance for installations in the U.S. as shown in Fig. 7 on page 12. For installations in Canada, provide clearances as required by CAN/CSA B149.1.

NOTICE

The combustion air inlet of the CHALLENGER is defined as being part of a direct vent system. It is not considered as a forced air intake. The required clearance of an adjacent boiler vent to a forced air inlet does not apply in an installation of multiple CHALLENGERS.

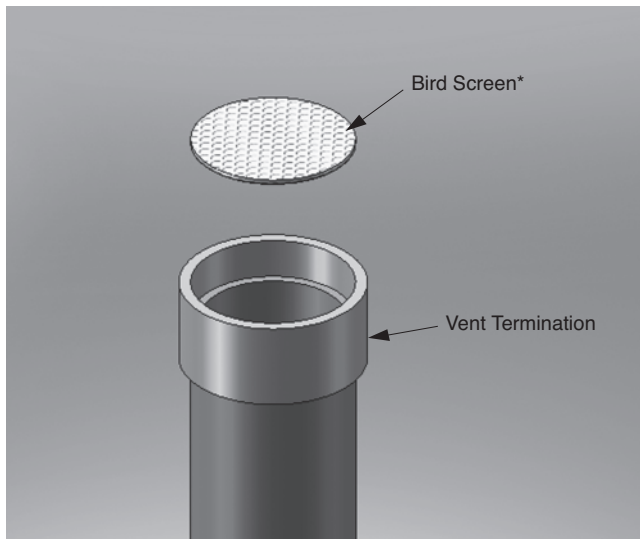


Fig. 4: Vertical Vent Bird Screen Installation

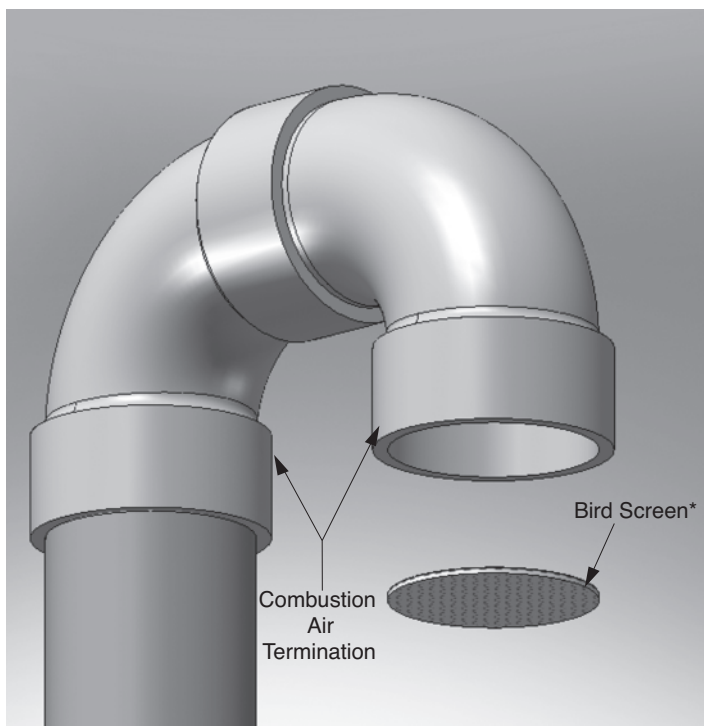


Fig. 5: Vertical Combustion Air Bird Screen Installation with 90° Elbow Termination

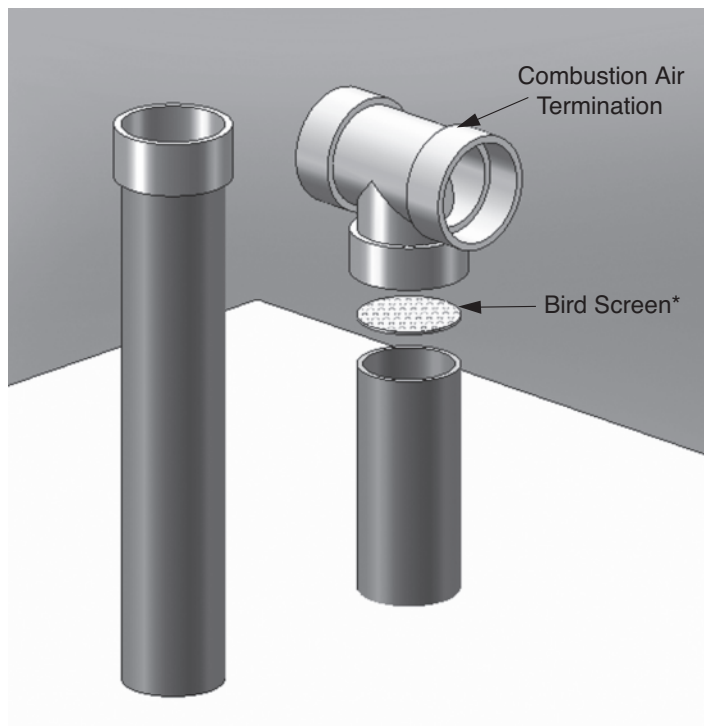


Fig. 6: Vertical Combustion Air Bird Screen Installation with Tee Termination

NOTICE

***Installer must install the factory supplied "bird screens" on the vent and combustion air terminations.**

3. Direct Vent Installation of Vent/Air Piping

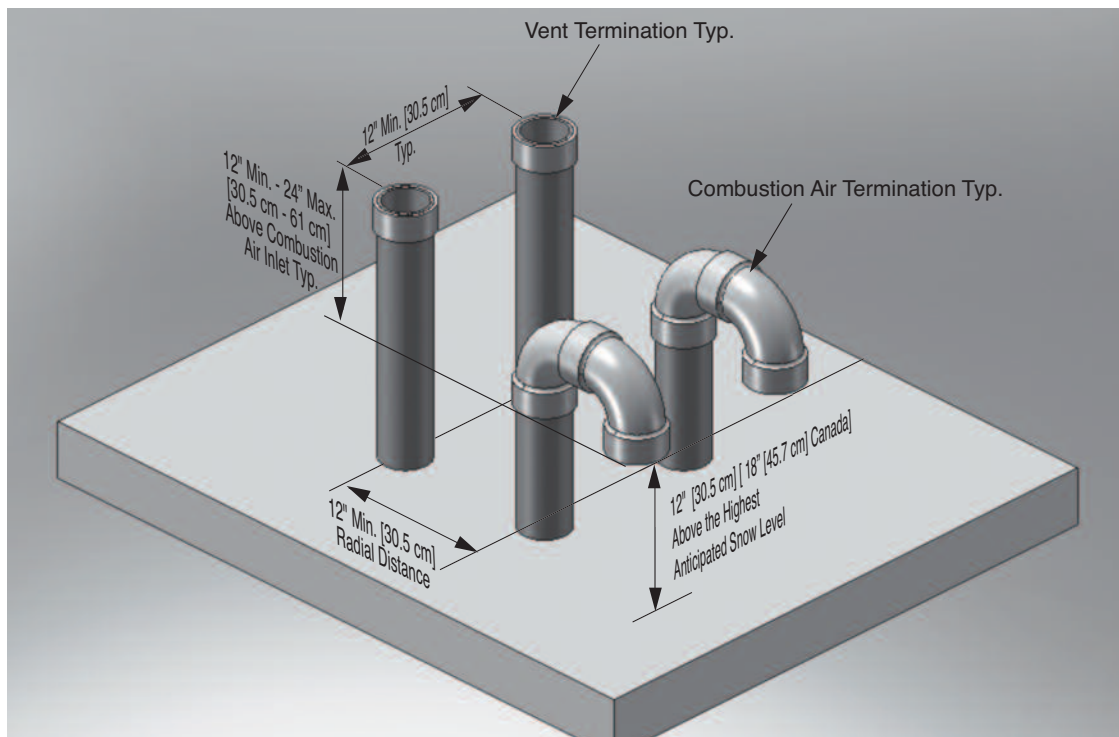


Fig. 7: Direct Vent - Vertical Termination of Multiple Appliances

3.4 Direct Vent - Horizontal - Sidewall

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

NOTICE

For direct vent (sidewall) installations in the Commonwealth of Massachusetts, the installer must comply with the additional requirements outlined in Section V.

WARNING

A gas vent extending through a sidewall should not terminate near an adjacent wall or below any building extensions such as roof eaves, balconies or decks. Failure to comply with the required clearances in this manual can result in substantial property damage, serious injury or death.

BEST PRACTICE

To reduce the potential of the combustion air inlet freezing up, it is recommended to separate the vent and air terminations in both a horizontal and vertical plain as shown in Figures 8 and 9 on page 13.

BEST PRACTICE

If the vent is terminated on a sidewall which is subject to high winds, it is recommended to terminate the vent using a 45° elbow or tee. A tee provides the best protection against wind but can expose the exterior of the house to condensate, while a 45° elbow provides improved protection from both wind and condensate.

NOTICE

The information and diagrams outlining the fittings and method of terminating the vent/combustion air are directly related to the PVC/CPVC vent systems. When utilizing AL29-4C® or polypropylene vent systems, there may be some variations. Consult the appropriate vent manufacturer for recommendations and clarifications.

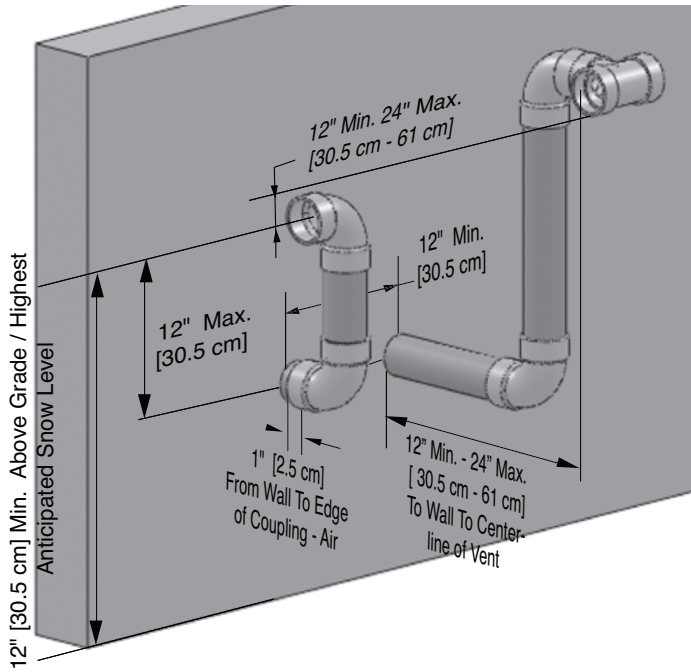


Fig. 8: Direct Vent - Sidewall Snorkel Termination of Vent and Combustion Air Piping with Tee Vent Termination

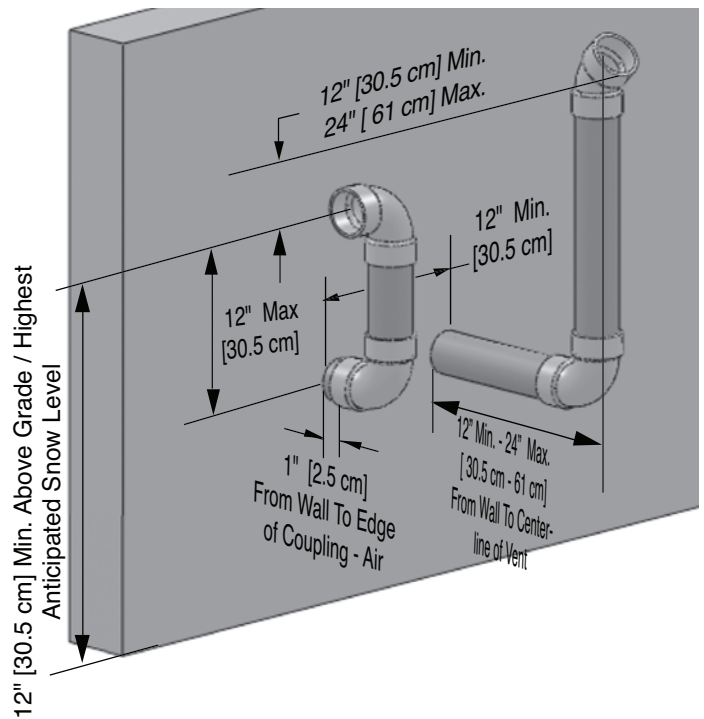


Fig. 9: Direct Vent - Sidewall Snorkel Termination of Vent and Combustion Air Piping with 45° Vent Termination

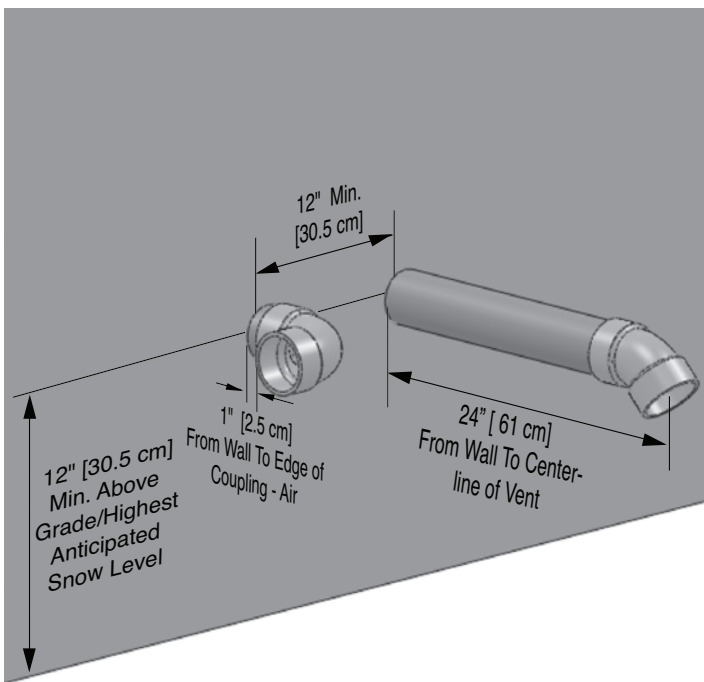


Fig. 10: Direct Vent - Sidewall Termination of Vent and Combustion Air Piping with Tee Vent Termination

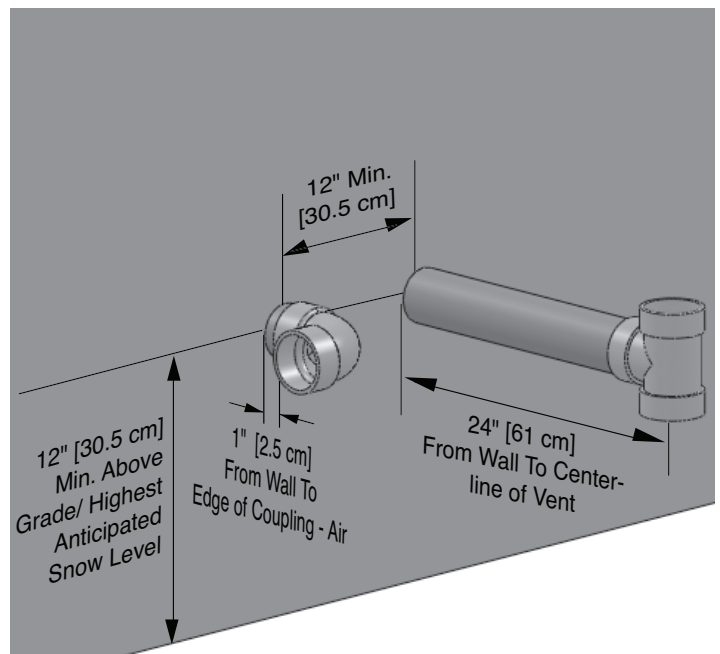


Fig. 11: Direct Vent - Sidewall Termination of Vent and Combustion Air Piping with 45° Vent Termination

NOTICE

Combustion Air Termination should slope downward at 15° angle

3. Direct Vent Installation of Vent/Air Piping

3.4.1 Determine Termination Location

Locate the vent and combustion air termination using the following guidelines:

1. The total length of the vent or combustion air piping must not exceed the limits given in Table 6 on page 5.

NOTICE

DO NOT include the 45° or 90° elbows or tee used to terminate the combustion air inlet and vent exterior of the building when determining the total length of pipe.

2. The combustion air pipe must terminate using a 90° elbow directed away from the vent termination. The combustion air termination must be installed 12" [30.5 cm] minimum above grade/highest anticipated snow level and as shown in Figs. 8 through 11 on page 13.

NOTICE

The combustion air termination can be placed on either side of the vent termination. The vent and combustion air terminations must be a minimum 12" [30.5 cm] apart. The vent and combustion air terminations are not required to be in the same pressure zone. The combustion air termination must be directed away from the vent. See Figs. 8 through 11 on page 13.

3. The vent pipe can terminate:
 - Using a tee as shown in Figs. 8 or 11 on page 13.
 - Using a 45° elbow as shown in Figs. 9 or 10 on page 13.

The vent termination must be installed 12" [30.5 cm] minimum above grade/highest anticipated snow level.



WARNING

Do not extend the vent pipe outside the sidewall beyond the dimensions shown in Figs. 8 through 11 on page 13. Extended exposure of the vent could cause condensate to freeze and block the vent pipe.

4. The combustion air and vent pipe center lines must be a minimum of 12" [30.5 cm] apart as shown in Figs. 8 through 11 on page 13.
5. The following should be considered when determining the location of the vent and combustion air termination:
 - a. Locate the vent termination where flue vapors will not damage surrounding shrubs, plants, air conditioning equipment or be objectionable to the homeowner.
 - b. The flue products will form a noticeable plume of water vapor as they condense in colder air. Avoid terminating the vent in areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of flue gas condensation and a buildup of water/ice on surrounding plants, building surfaces, or combustion air inlet.

- d. Avoid locations where prevailing winds could affect the performance of the appliance or cause recirculation of the flue gases, such as inside corners of buildings, near adjacent buildings, vertical surfaces, window wells, stairwells, alcoves, courtyards or other recessed areas.
 - e. Do not terminate the vent above doors or windows: flue condensate could freeze causing ice formations.
 - f. Locate the vent termination to prevent possible condensate damage to exterior finishes.
 - g. Avoid locations of possible accidental contact of flue vapors with people or pets.
6. The vent termination must also maintain the following clearances, as shown in Fig. 3 on page 10:
 - a. At least 3 feet [0.9 m] from adjacent walls.
 - b. At least 3 feet [0.9 m] below roof overhangs.
 - c. At least 7 feet [2.1 m] above any public walkways.
 - d. At least 3 feet [0.9 m] above any forced air intake within 10 feet [3 m] (does not apply to the combustion air inlet of a direct vent appliance).
 - e. No closer than 12" [30.5 cm] below or horizontally from any door, window or gravity air inlet
 - f. Must be at least 4 feet [1.2 m] from electric meters, gas meters-regulators, relief valves or other equipment. Never terminate the vent above or below any of these items or within 4 feet [1.3 m] horizontally.
 - g. A minimum of 12" [30.5 cm] or a maximum of 24" [61 cm] beyond the exterior wall when snorkled (see Figs. 8 & 9 on page 13) or 24" [61 cm] when vent and air terminate on the same horizontal plane (see Figs. 10 and 11 on page 13).
 - h. A minimum of 12" [30.5 cm] horizontal spacing from other fan assisted appliance vents, see Fig. 3 on page 10.
 7. The edge of the combustion air termination coupling must extend 1" [2.5 cm] beyond the exterior wall as shown in Figs. 8 through 11 on page 13.
 8. Locate the vent and combustion air terminations in a manner so as to protect from damage by foreign objects, such as stones, balls, buildup of leaves or sediment.
 9. Do not connect any other appliance to the vent pipe or multiple appliances to a common vent pipe.

3.5 Direct Vent - Vent Installation - Sidewall

1. Vent and Combustion Air Penetration
 - Vent pipe penetration through combustible or non-combustible wall material should maintain a minimum 1/4" [6 mm] clearance for 3" PVC/CPVC vent. Vent may be installed through a wall thickness of up to 20" [50.8 cm] maximum. The diameter of the penetration hole should be 4" minimum [10.2 cm] for 3" pipe. When using polypropylene or stainless steel vent, refer to vent manufacturer's installation instructions supplied with the vent for clearances.
 - Combustion air pipe penetration can maintain zero clearance. The diameter of the penetration hole should be 3-1/2" [8.9 cm] minimum for 3" pipe.

2. The installer must use a galvanized metal thimble for the vent pipe penetration.
3. Locate the vent and combustion air pipe penetrations to provide clearances as described in Figs. 8 through 11 on page 13.
4. The installer must comply with all local codes for isolating the vent pipe as it passes through floors and walls.
5. The installer should seal all exterior openings around penetration with an exterior silicon caulk.

3.5.1 Termination Fittings - Sidewall

1. The vent and combustion air terminations must include a factory supplied "bird screen" installed as shown in Figs. 12 through 14.
2. The combustion air pipe must terminate using a 90° elbow as shown in Figs. 8 through 11 on page 13.
3. The vent can terminate:
 - Using a tee as shown in Figs. 8 and 11 on page 13.
 - Using a 45° elbow as shown in Figs. 9 and 10 on page 13.

The vent termination must be installed 12" minimum [30.5 cm] above grade/highest anticipated snow level.



Do not extend the vent pipe outside the sidewall beyond the dimensions shown in Figs. 8 through 11 on page 13. Extended exposure of the vent pipe could cause condensate to freeze and block the vent pipe.

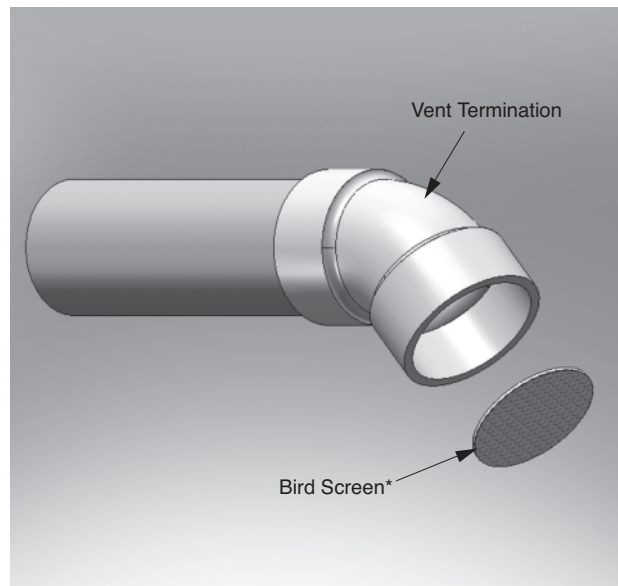


Fig. 12: Horizontal Vent Bird Screen Installation with 45° Elbow Termination

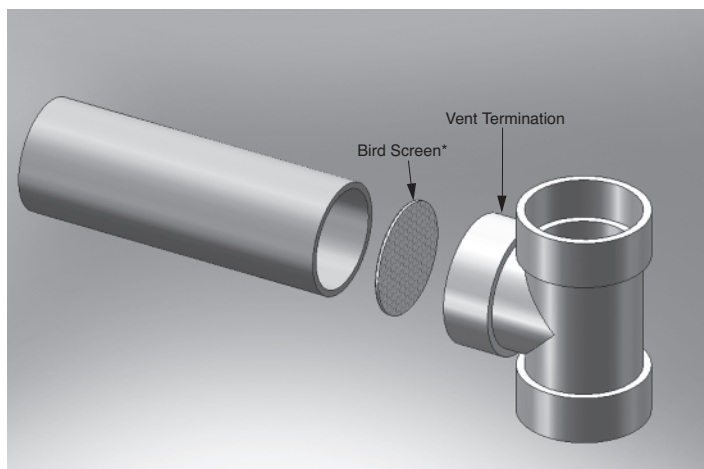


Fig. 13: Horizontal Vent Bird Screen Installation with Tee Termination

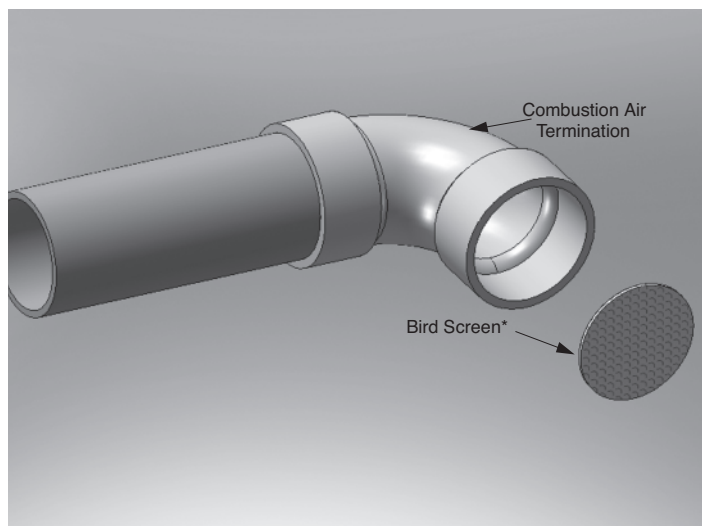


Fig. 14: Horizontal Combustion Air Bird Screen Installation with 90° Elbow Termination



***Installer must install the factory supplied "bird screens" on the vent and combustion air inlet terminations.**

3. Direct Vent Installation of Vent/Air Piping

3.6 Direct Vent - Multiple Appliance Installation - Sidewall

1. On installations of multiple CHALLENGER appliances, terminate each vent and combustion air pipe as shown in Fig. 15.
2. The wall penetration of the vent and combustion air pipe should be such that the combustion air inlet is a minimum 12" [30.5 cm] from the adjacent vent pipe of the other appliance for installations in the U.S. as shown in Fig. 15. For installations in Canada, provide clearances as required by CAN/CSA B149.1.

NOTICE

The combustion air inlet of the CHALLENGER is defined as being part of a direct vent system. It is not considered as a forced air intake. The required clearance of an adjacent boiler vent to a forced air inlet does not apply in an installation of multiple CHALLENGERS.

3.7 Direct Vent - Vertical and Sidewall Combustion Air

WARNING

Direct vent vertical combustion air and side wall vent is prohibited.

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or to the Natural Gas and Propane Installation Code (CAN/CSA B149.1).

NOTICE

When using an inoperative chimney as a means of a chase for the vent, the surrounding space within the chimney cannot be used to draw combustion air or vent another appliance.

WARNING

A gas vent extending through a roof should not terminate near an adjacent wall or below any building extensions such as roof eaves, balconies or decks. Failure to comply with the required clearances in this manual can result in substantial property damage, serious injury or death.

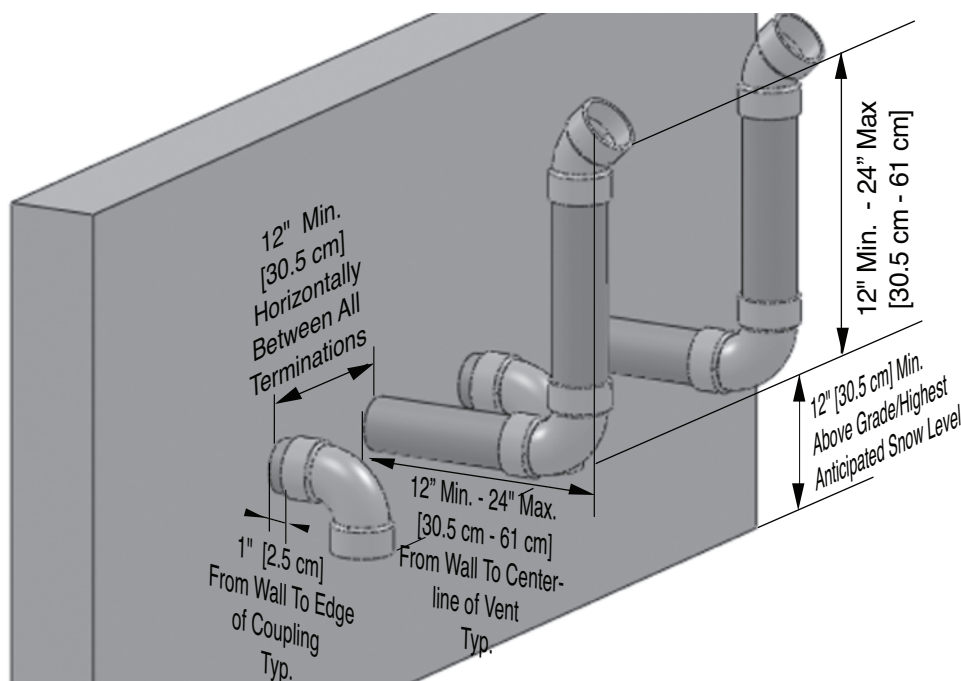


Fig. 15: Direct Vent - Horizontal Termination of Multiple Appliances

3.7.1 Determine Termination Location

Locate the vent and combustion air termination using the following guidelines:

1. The total length of the vent or combustion air piping must not exceed the limits given in Table 6 on page 5.

NOTICE

Do not include the 90° elbow coupling used to terminate the combustion air inlet or vent exterior of the building when determining the total length of pipe.

2. The combustion air piping must terminate with a 90° elbow. Fig. 16 shows a snorkel termination option. The combustion air pipe can also terminate using a 90° elbow directed to the left or right as shown in Fig. 10 on page 13. The termination must be installed 12" [30.5] minimum above grade/highest anticipated snow level and as shown in Fig. 10 on page 13 or Fig. 16.
3. The vent must terminate vertically with a coupling to accept the bird screen and must be located 12" [30.5 cm] (18" [45.7 cm] in Canada) above the highest anticipated snow level.
4. The following should be considered when determining the location of the vent and combustion air termination:
 - a. Locate the vent termination where flue vapors will not damage surrounding shrubs, plants or air conditioning equipment or be objectionable to the homeowner.
 - b. The flue products will form a noticeable plume of water vapor as they condense in colder air. Avoid terminating the vent in areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of flue gas condensation and a buildup of water/ice on surrounding plants, building surfaces or combustion air inlet.
 - d. Avoid locations where prevailing winds could affect the performance of the boiler or cause recirculation of the flue gases, such as inside corners of buildings, near adjacent buildings, vertical surfaces, window wells, stairwells, alcoves, courtyards or other recessed areas.
 - e. Do not terminate the vent above doors or windows: flue condensate could freeze causing ice formations.
 - f. Locate the vent termination to prevent possible condensate damage to exterior finishes.
 - g. Avoid locations of possible accidental contact of flue vapors with people or pets.
5. The vent termination must also maintain the following clearances as shown in Fig. 3 on page 10:
 - a. At least 3 feet [0.9 m] from adjacent walls.
 - b. At least 3 feet [0.9 m] below roof over hangs.
 - c. At least 7 feet [2.1 m] above any public walkways.
 - d. At least 3 feet [0.9 m] above any forced air intake within 10 feet [3 m] (does not apply to the combustion air inlet of a direct vent appliance).

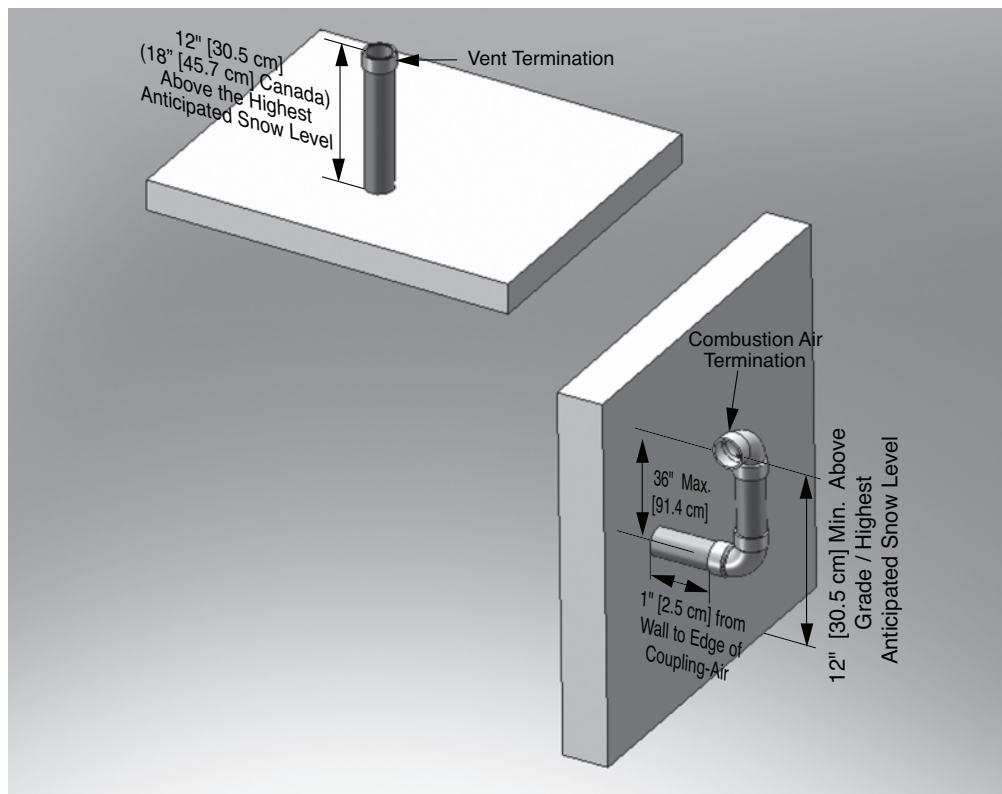


Fig. 16: Direct Vent - Vertical Termination of Vent and Sidewall Termination of Combustion Air of Multiple Appliances

3. Direct Vent Installation of Vent/Air Piping

- e. No closer than 12" [30.5 cm] below or horizontally from any door or window or gravity air inlet.
 - f. Must be at least 4 feet [1.2 m] from any electric meters, gas meters-regulators, relief valves or other equipment. Never terminate the vent above or below any of these items within 4 feet [1.2 m] horizontally.
6. The edge of the combustion air termination coupling must extend 1" [2.5 cm] beyond the exterior wall as shown in Figs. 8 through 11 on page 13.
 7. Locate the vent termination and combustion air inlet in a manner to protect from damage by foreign objects, such as stones, balls, or buildup of leaves or sediment.
 8. Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe.

3.8 Direct Vent - Vent Installation - Through the Roof

1. Vent pipe penetration through combustible or non-combustible wall material should maintain a minimum 1/4" [6 mm] clearance for 3" PVC/CPVC vent. The diameter of the penetration hole should be 4" [10.2 cm] minimum for 3" pipe. When using polypropylene or stainless steel vent, refer to the vent manufacturer's installation instructions supplied with the vent for clearances.
2. The installer must use a galvanized metal thimble for the vent pipe penetration.
3. The vent must terminate 12" [30.5 cm] (18" [45.7 cm] in Canada) above the highest anticipated snow level.
4. The installer must comply with all local codes for isolating the vent pipe as it passes through floors, ceilings and roofs.
5. The installer should provide adequate flashing and sealing boots sized for the vent pipe.

3.9 Direct Vent - Combustion Air Installation - Sidewall

1. Combustion air pipe penetration can maintain zero clearance. The diameter of the penetration hole should be 3-1/2" [8.9 cm] minimum for 3" pipe.
2. The combustion air termination must be installed 12" [30.5 cm] minimum above grade/highest anticipated snow level and as shown in Fig. 10 on page 13 or Fig. 16 on page 17.
3. The installer must comply with all local codes for isolating the combustion air pipe as it passes through floors and walls.
4. The installer should seal all exterior openings around penetration with an exterior silicon caulk.

3.9.1 Termination Fittings

1. The vent and combustion air terminations must include a factory supplied "bird screen" installed as shown in Fig. 4 on page 11 and Fig. 14 on page 15.
2. The combustion air piping must terminate through the sidewall using a 90° elbow as shown in Figs. 8 through 11 on page 13.

3. The vent piping must terminate vertically through the roof with a coupling to accept the bird screen and must be located 12" [30.5 cm] (18" [45.7 cm] in Canada) above the highest anticipated snow level.



WARNING

Do not extend the vent pipe above the roof beyond the dimension shown in Fig. 16 on page 17. Extended exposure of the vent pipe could cause condensate to freeze and block the vent pipe.

3.10 Direct Vent - Multiple Appliance Installation - Vertical Vent and Sidewall Combustion Air

1. On installations of multiple CHALLENGERS, terminate each vent and combustion air piping as described in this manual.
2. Each vent and combustion air termination must be a minimum 12" [30.5 cm] from the adjacent termination for installations in the U.S as shown in Fig. 17. For installations in Canada, provide clearances as required by CAN/CSA B149.1.

NOTICE

The combustion air inlet of the CHALLENGER is defined as being part of a direct vent system. It is not considered as a forced air intake. The required clearance of an adjacent boiler vent to a forced air inlet does not apply in an installation of multiple CHALLENGERS.

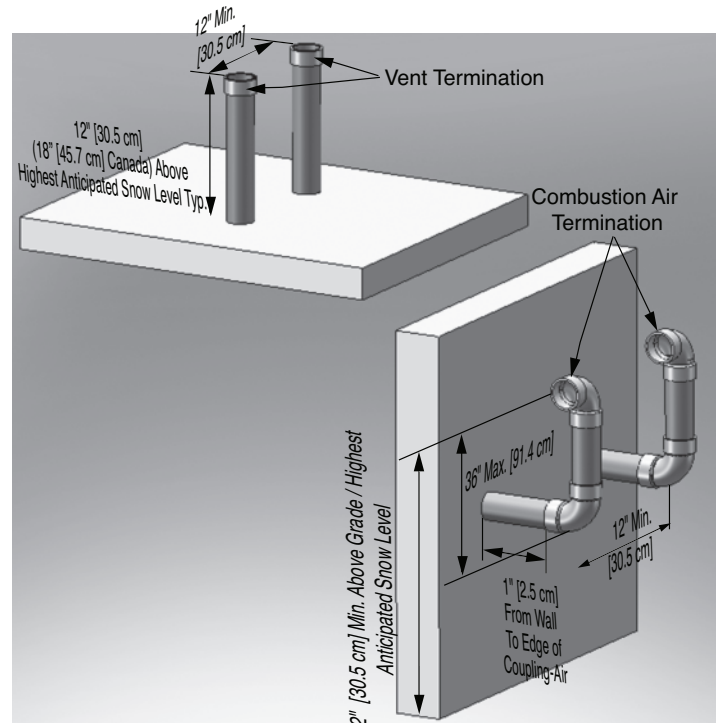


Fig. 17: Direct Vent - Vertical Termination of Vent and Sidewall Termination of Combustion Air of Multiple Appliances

3.11 Direct Vent - Vertical - Polypropylene Concentric

WARNING

Contact approved polypropylene vent manufacturer for a copy of their installation instructions. Read, understand and follow all of the vent manufacturer's instructions before beginning the installation. Contact vent manufacturer if you require any technical support. Failure to properly install and support vent system can lead to carbon monoxide poisoning or fire due to joint separation or pipe breakage. See section 2.5 for rigid polypropylene vent system restrictions.

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

NOTICE

When using an inoperative chimney as a means of a chase for the vent and air, the surrounding space within the chimney cannot be used to draw combustion air or vent another appliance.

WARNING

A gas vent extending through a roof should not terminate near an adjacent wall or below any building extensions such as roof eaves, balconies or decks. Failure to comply with the required clearances in this manual can result in substantial property damage, serious injury or death.

3.11.1 Determine Termination Location

Locate the concentric termination using the following guidelines:

1. The total length of the vent or combustion air piping must not exceed the limits given in Table 6 on page 5.
2. The termination must be installed 12" [30.5 cm] (18" [45.7 cm] Canada) above the highest anticipated snow level.

3. The following should be considered when determining the location of the concentric termination:
 - a. Locate the vent termination where flue vapors will not damage surrounding shrubs, plants or air conditioning equipment or be objectionable to the homeowner.
 - b. The flue products will form a noticeable plume of water vapor as they condense in colder air. Avoid terminating the vent in areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of flue gas condensation and a buildup of water/ice on surrounding plants, building surfaces or combustion air inlet.
 - d. Avoid locations where prevailing winds could affect the performance of the appliance or cause recirculation of the flue gases, such as inside corners of buildings, near adjacent buildings, vertical surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
 - e. Do not terminate the vent above doors or windows. Flue condensate could freeze causing ice formations.
 - f. Locate the vent termination to prevent possible condensate damage to exterior finishes.
 - g. Avoid locations of possible accidental contact of flue vapors with people or pets
4. The vent termination must also maintain the following clearances (shown in Fig. 3 on page 10):
 - a. At least 3 feet [0.9 m] from adjacent walls.
 - b. At least 3 feet [0.9 m] below roof overhangs.
 - c. At least 7 feet [2.1 m] above any public walkways.
 - d. At least 3 feet [0.9 m] above any forced air intake within 10 feet [3 m] (does not apply to the combustion air inlet of a direct vent appliance).
 - e. No closer than 12" [30.5 cm] below or horizontally from any door or window or gravity air inlet.
 - f. Must be at least 4 feet [1.2 m] from any electric meters, gas meters-regulators, relief valves or other equipment. Never terminate the vent above or below any of these items within 4 feet [1.2 m] horizontally.
 - g. A minimum of 12" [30.5 cm] horizontal spacing from other fan assisted appliance vents such as clothes dryer vent, kitchen exhaust vent, etc. Never terminate the vent above or below any fan assisted vent within 12" [30.5 cm] horizontally.
5. Locate the concentric termination in a manner to protect it from damage by foreign objects, such as stones, balls, or buildup of leaves or sediment.
6. Do not connect any other appliance to the vent pipe or multiple appliances to a common vent pipe.

3. Direct Vent Installation of Vent/Air Piping

3.12 Direct Vent - Polypropylene Concentric Vent Installation - Through the Roof

1. Vent may be installed through a wall thickness of up to 20" [50.8 cm] maximum.
2. Drill or cut an appropriate size hole for the polypropylene concentric termination as recommended by the polypropylene manufacturer.
3. The installer must comply with all local codes for isolating the vent and combustion air pipes as they pass through floors, ceilings and roofs.
4. The installer should provide adequate flashing and sealing boots sized for the concentric termination.

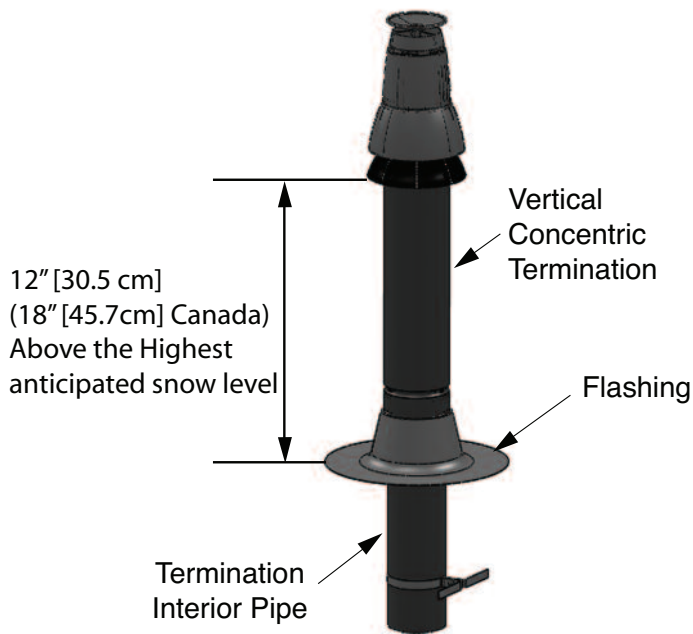


Fig. 18: Typical Vertical Concentric Termination

3.13 Direct Vent - Horizontal - Polypropylene Concentric



WARNING

Contact approved polypropylene vent manufacturer for a copy of their installation instructions. Read, understand and follow all of the vent manufacturer's instructions before beginning the installation. Contact vent manufacturer if you require any technical support. Failure to properly install and support vent system can lead to carbon monoxide poisoning or fire due to joint separation or pipe breakage. See section 2.5 for rigid polypropylene vent system restrictions.

NOTICE

The installation must conform to the requirements of the authority having jurisdiction or, in the absence of such requirements, to the National Fuel Gas Code (ANSI Z223.1/NFPA 54) and/or Natural Gas and Propane Installation Code (CAN/CSA B149.1).

NOTICE

For direct vent (sidewall) installations in the Commonwealth of Massachusetts, the installer must comply with the additional requirements outlined in Section V.



WARNING

A gas vent extending through a sidewall should not terminate near an adjacent wall or below any building extensions such as roof eaves, balconies or decks. Failure to comply with the required clearances in this manual can result in substantial property damage, serious injury or death.

3.13.1 Determine Termination Location

Locate the concentric termination using the following guidelines:

1. The total length of the vent or combustion air piping must not exceed the limits given in Table 6 on page 5.
2. The termination must be installed 12" [30.5 cm] (18" [45.7 cm] Canada) minimum above grade/highest anticipated snow level.
3. The following should be considered when determining the location of the concentric termination:
 - a. Locate the vent termination where flue vapors will not damage surrounding shrubs, plants or air conditioning equipment or be objectionable to the homeowner.
 - b. The flue products will form a noticeable plume of water vapor as they condense in colder air. Avoid terminating the vent in areas where the plume could obstruct window views.
 - c. Prevailing winds could cause freezing of flue gas condensation and a buildup of water/ice on surrounding plants, building surfaces or combustion air inlet.
 - d. Avoid locations where prevailing winds could affect the performance of the appliance or cause recirculation of the flue gases, such as inside corners of buildings, near adjacent buildings, vertical surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
 - e. Do not terminate the vent above doors or windows. Flue condensate could freeze causing ice formations.
 - f. Locate the vent termination to prevent possible condensate damage to exterior finishes.
 - g. Avoid locations of possible accidental contact of flue vapors with people or pets

4. The vent termination must also maintain the following clearances (shown in Fig. 3 on page 10):
 - a. At least 3 feet [0.9 m] from adjacent walls.
 - b. At least 3 feet [0.9 m] below roof overhangs.
 - c. At least 7 feet [2.1 m] above any public walkways.
 - d. At least 3 feet [0.9 m] above any forced air intake within 10 feet [3 m] (does not apply to the combustion air inlet of a direct vent appliance).
 - e. No closer than 12" [30.5 cm] below or horizontally from any door or window or gravity air inlet.
 - f. Must be at least 4 feet [1.2 m] from any electric meters, gas meters-regulators, relief valves or other equipment. Never terminate the vent above or below any of these items within 4 feet [1.2 m] horizontally.
 - g. A minimum of 12" [30.5 cm] horizontal spacing from other fan assisted appliance vents such as clothes dryer vent, kitchen exhaust vent, etc. Never terminate the vent above or below any fan assisted vent within 12" [30.5 cm] horizontally.
5. Locate the concentric termination in a manner to protect it from damage by foreign objects, such as stones, balls, or buildup of leaves or sediment.
6. Do not connect any other appliance to the vent pipe or multiple appliances to a common vent pipe.

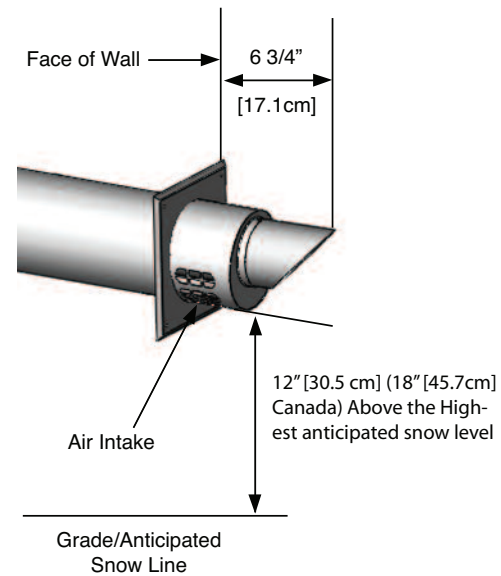


Fig. 19: Installations Requirements - Horizontal

3.15 Multiple Polypropylene Concentric Terminations

For multiple appliance installations, maintain a minimum of 12 inches [30.5 cm] from centerlines as illustrated in Fig. 20.

3.14 Direct Vent - Polypropylene Concentric Vent Installation - Sidewall

1. Vent may be installed through a wall thickness of up to 20" [50.8 cm] maximum.
2. Drill or cut an appropriate size hole for the polypropylene concentric termination as recommended by the polypropylene manufacturer.
3. The installer must comply with all local codes for isolating the vent and combustion air pipes as they pass through floors and walls.

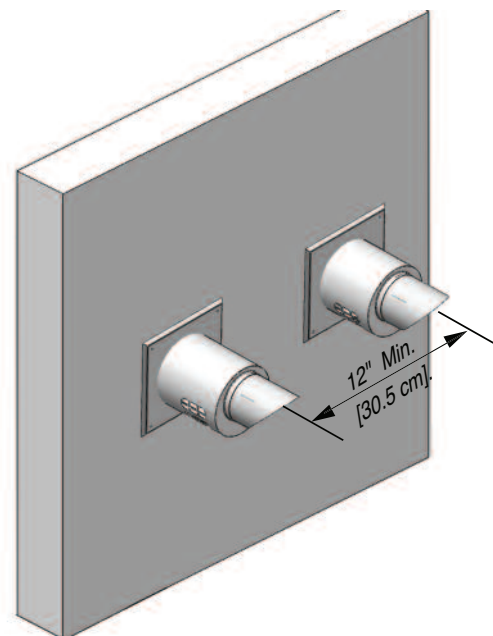


Fig. 20: Multiple Concentric Termination - Horizontal or Vertical (not shown)

4. Installation Requirements

Section IV: Installation Requirements

4.1 3" to 60mm Polypropylene Vent Transition and 3" Combustion Air

NOTICE

Section 4.1 outlines the installation of venting and combustion air piping when the vent system must transition from the 3" outlet to a 60mm polypropylene vent system.

- The transition from 3" vent system to 60 mm polypropylene vent system must occur at the appliance vent outlet.
- The transition from 3" vent to 60 mm polypropylene vent must occur in a vertical run only.

WARNING

Transition of 3" vent to 60mm polypropylene vent in a horizontal run may result in pooling of the condensate and potential vent blockage. Failure to comply can result in substantial property damage, serious injury, or death.

- Use a 3" (80 mm) appliance vent adapter and 3" (80 mm) to 2" (60 mm) reducer to make the transition to 60 mm polypropylene vent. See table 2 on page 4.
- The 60 mm polypropylene vent should not transition back to 3" (80 mm) vent at any point in the vent system.
- The PVC combustion air piping shall not transition from 3" to 2".
- The total equivalent length of the 3" (80 mm) vent and 60 mm polypropylene vent combined shall not exceed the length listed for a 60 mm vent in Table 6 on page 5.
- The total equivalent length of 3" combustion air piping shall not exceed the length listed for 60 mm vent in Table 6 on page 5.
- The total equivalent length of 3" (80 mm) combustion air piping shall not exceed the length listed for 60 m vent in Table 6 on page 5.

4.2 Insert Piping to Appliance Adapters

1. The installer must clean, deburr and chamfer the pipe ends.

WARNING

The pipe ends must be smooth, free of sharp edges, chamfered and wiped clean to prevent possible damage to the sealing gasket in the vent and combustion air adapters. Failure to comply with this requirement could result in leakage of flue products causing possible severe personal injury or death.

2. Prior to inserting the pipe, inspect the vent and combustion air adapters to verify there are no obstructions or packing material inside the adapters and the gaskets are in place.

3. Ensure the adapter banding strap is loose prior to inserting the pipe.
4. Apply a small amount of silicon grease or water to the insertion end of the pipe to ease insertion into the adapter.
5. Insert the pipe into the adapter until it is fully seated.

WARNING

Do not apply excessive force, twist or bend the adapter or vent/combustion air pipe when inserting. The adapter gasket could be damaged, resulting in possible flue gas leakage.

6. Secure the vent and combustion air pipe by tightening the adapter banding strap. Do not overtighten the strap. The seal is made with gasket inside the adapter.

4.3 Vent and Combustion Air Piping Installation Guidelines

4.3.1 PVC/CPVC Vent System

1. The installer should install the vent/combustion air piping working from the appliance to the piping termination. The piping should not exceed the lengths given in Table 6 on page 5 for either the vent or combustion air.
2. The installer should cut the pipe to the required lengths and deburr the inside and outside of both ends.
3. The installer should chamfer the outside of the pipe ends to allow even distribution of cement when joining.
4. The installer should dry assemble the vent or combustion air system prior to assembling any joints to ensure proper fit.
5. The pipe ends and fittings should be cleaned and dried thoroughly prior to assembly of the joint.
6. When assembling a joint, the installer should:
 - a. Handle fitting and pipes carefully to prevent contamination of surfaces.
 - b. Apply liberal amount of primer to both surfaces - the end of the pipe and the insert socket of the fitting.
 - c. Apply a light uniform coating of approved cement to both surfaces - the end of the pipe and the insert socket of the fitting.
 - d. A second coat of approved cement should be applied to the mating surfaces. The installer should avoid, however, using too much cement on the socket of the fitting to prevent a buildup of cement on the inside.
 - e. With the cement still wet, the pipe end should be inserted into the socket of the fitting and twisted 1/4 of a full turn. Ensure the pipe end is inserted fully into the socket of the fitting.
 - f. Any excess cement should be wiped clean from the joint. Inspect the joint to ensure a smooth bead of cement is visible around the entire joint seam.

- The installer should use perforated metal strap hangers or equivalent pipe hangers suitable for plastic pipe to support the piping. The hangers must be spaced at a maximum of every 5 feet [1.5 m] of horizontal and vertical run of piping. A support must be placed at the appliance and at every change in direction vertical or horizontal (i.e. elbow). Do not penetrate any part of the piping of vent system with a fastener.

NOTICE

Pipe hangers should not be tightly clamped to the pipe to allow for thermal expansion/contraction movement. Pipe clamps or hangers should not contain any sharp edges which can damage the pipe.

- The vent and combustion air piping should be sloped continuously from the termination back to the appliance with at least 1/4" drop per foot [6 mm/30 cm] of run. Do not allow any sags in the run of piping.

! WARNING

Do not pitch the vent or combustion air piping downward away from the appliance. Potential condensate damage to the building exterior or to the surrounding landscape and/or potential risks of icing and blockage of the vent piping could occur.

- Maintain a minimum clearance of 1/4" [6 mm] between the vent pipe and all materials, combustible or non-combustible for 3" PVC/CPVC vent. The installer must seal any wall, floor or ceiling penetrations as per local code requirements.

BEST PRACTICE

It is recommended that the installer uses the same number of elbows and length of piping on the venting and combustion air inlet systems.

NOTICE

Covering PVC/CPVC vent pipe and fittings with thermal insulation is prohibited.

4.3.2 Polypropylene or Stainless Steel Vent Systems

NOTICE

When using polypropylene or stainless steel vent, refer to vent manufacturer's installation instructions supplied with the vent for proper installation.

NOTICE

Covering polypropylene vent pipe and fittings with thermal insulation is prohibited.

Section V: Commonwealth of Massachusetts

5.1 Installations with the Direct Vent Termination Elevation at or below 4 feet of Grade:

NOTICE

The following instructions apply to the installation of a direct vented appliance whose vent termination and combustion air inlet are installed at or below a four foot elevation above the grade.

1. If not already present in the structure of the building, a carbon monoxide detector and alarm must be installed in the living area outside the bedroom(s). The carbon monoxide detector and alarm is provided by the installer.

NOTICE

The carbon monoxide detector and alarm installed in the living space outside the bedrooms must comply with the latest edition of NFPA 720.

2. A carbon monoxide detector and alarm shall be installed in the mechanical room in which the direct vent appliance is located. The carbon monoxide detector and alarm shall:
 - Be installed on the same 120 volt service circuit as the appliance such that only one service switch services both the appliance and the carbon monoxide detector.
 - Provide battery back-up power in case of power failure.

NOTICE

The carbon monoxide detector and alarm installed within the same room as the direct vent appliance must meet ANSI/UL 2034 standards and comply with the latest edition of NFPA 720. The carbon monoxide detector and alarm must be tested, approved and listed with a Nationally Recognized Testing Lab as recognized under 527 cm.

3. The direct vent termination must be approved for the appliance and when applicable, the combustion air inlet must be approved for the appliance. Installation of the vent termination and combustion air inlet shall be in strict compliance with the installation instructions provided with the appliance.

NOTICE

The installer must leave the appliance installation manual and any documentation regarding the installation of the venting, vent termination and combustion air inlet with the appliance upon completion of the installation.

4. A metal or plastic identification plate (provided by the installer) must be mounted on the exterior wall of the building 4 feet directly above the location of the vent termination and combustion air inlet. The identification plate shall read "Gas Vent Directly Below". The size of the plate and lettering shall be of sufficient size to be easily read from a distance of 8 feet.

5.2 Installations with the Direct Vent Termination Elevation Above 4 feet of Grade:

NOTICE

The following instructions apply to the installation of a direct vented appliance whose vent termination and combustion air inlet are installed above a four foot elevation above the grade.

1. If not already present in the structure of the building, a carbon monoxide detector and alarm must be installed in the living area outside the bedroom(s). The carbon monoxide detector and alarm is provided by the installer.

NOTICE

The carbon monoxide detector and alarm installed in the living space outside the bedrooms must comply with the latest edition of NFPA 720.

2. A carbon monoxide detector and alarm shall be installed in the mechanical room in which the direct vent appliance is located. The carbon monoxide detector and alarm shall:
 - Be either hard wired or battery powered or both.

NOTICE

The carbon monoxide detector and alarm installed within the same room as the direct vent appliance must comply with the latest edition of NFPA 720.

3. The direct vent termination must be approved for the appliance and, when applicable, the combustion air inlet must be approved for the appliance. Installation of the vent termination and combustion air inlet shall be in strict compliance with the installation instructions provided with the appliance.

NOTICE

The installer must leave the appliance installation manual and any documentation regarding the installation of the venting, vent termination and combustion air inlet with the appliance upon completion of the installation.

Section VI: Notes

Additional Quality Water Heating Equipment Available From



Maxi-Flo Pool and Spa Heat Exchangers



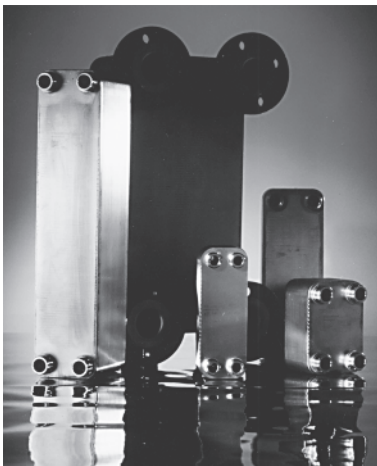
- Constructed of high quality corrosion resistant stainless steel (AISI 316) or titanium
- Specially designed built-in flow restrictor to assure maximum heat exchange
- Compact and light weight
- Available in 8 sizes that can accommodate any size pool or spa

SMART/COMFORT Indirect Fired Water Heaters



- Exclusive Tank-in-Tank design
- Stainless steel construction
- Self cleaning/Self descaling heat exchanger
- SMART available in 7 sizes; COMFORT available in 2 sizes
- SMART: Limited LIFETIME residential warranty / Limited 6 year commercial warranty
- COMFORT: Limited 10 year warranty

TTP Brazed Plate Heat Exchangers



- For domestic water, snow melting, radiant floor, and more
- Plates made of stainless steel, with 99.9% copper brazing ensuring a high resistance to corrosion.
- Self Cleaning / Self Descaling
- Computerized sizing available from ACV - Triangle Tube
- Available in capacities from 25,000 BTUH to 5,000,000 BTUH



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