1 Determine boiler location

Table 1B Corrosive Contaminants and Sources

Products to avoid:
Spray cans containing chloro/fluorocarbons
Permanent wave solutions
Chlorinated waxes/cleaners
Chlorine-based swimming pool chemicals
Calcium chloride used for thawing
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 have contaminants:
Dry cleaning/laundry areas and establishments
Swimming pools
Metal fabrication plants
Beauty shops
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

When using an existing vent system to install a new boiler:

⚠WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

Check the following venting components before installing:

- **Material** - For materials listed for use with this appliance, see Section 3 - General Venting.
- **Size** - To ensure proper pipe size is in place, see Table 3A. Check to see that this size is used throughout the vent system.
- **Manufacturer** - For a stainless steel or polypropylene application, you must use only the listed manufacturers and their type product listed in the General Venting Section for CAT IV positive pressure venting with flue producing condensate.
- **Supports** - Non-combustible supports must be in place allowing a minimum 1/4" rise per foot. The supports should adequately prevent sagging and vertical slippage by distributing the vent system weight. For additional information, consult the vent manufacturer's instructions for installation.
- **Terminations** - Carefully review Sections 3 through 5 to ensure requirements for the location of the vent and air terminations are met and orientation of these fit the appropriate image from the Sidewall or Vertical options listed in the General Venting Section.
- **Seal** - With prior requirements met, the system should be tested to the procedure listed in parts (c) through (f) of the Removal of an Existing Boiler Section.

With polypropylene and stainless steel vent, seal and connect all pipe and components as specified by the vent manufacturer used; with PVC/CPVC vent, see the Installing Vent or Air Piping Section.

⚠WARNING If any of these conditions are not met, the existing system must be updated or replaced for that concern. Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

1 Determine boiler location *(continued)*

When removing a boiler from existing common vent system:

⚠ DANGER Do not install the Knight Wall Hung Fire Tube boiler into a common vent with any other appliance. This will cause flue gas spillage or appliance malfunction, resulting in possible severe personal injury, death, or substantial property damage.

⚠ WARNING Failure to follow all instructions can result in flue gas spillage and carbon monoxide emissions, causing severe personal injury or death.

At the time of removal of an existing boiler, 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.

a. Seal any unused openings in the common venting system.

b. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion, or other deficiencies, which could cause an unsafe condition.

c. Test vent system – Insofar as is practical, close all building doors and 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.

d. Place in operation the appliance being inspected. Follow the lighting instructions. Adjust thermostat so appliance will operate continuously.

e. 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.

f. After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined herein, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous conditions of use.

g. 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 CAN/CSA B149.1, Natural Gas and Propane Installation Code. 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 Z223.1/NFPA, and/or CAN/CSA B149.1, Natural Gas and Propane Installation Code.

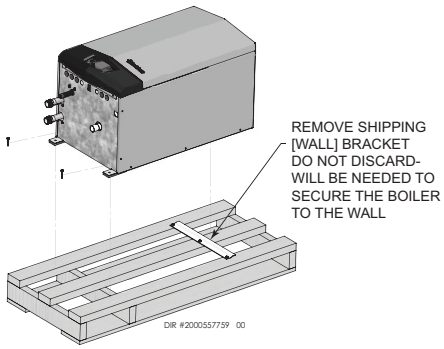
2 Prepare boiler

Remove boiler from wood pallet

1. After removing the outer shipping carton from the boiler, remove the parts box.
2. To remove the boiler from the pallet:
   a. Remove the two (2) lag bolts securing the bottom of the unit to the pallet.
   b. Lift the boiler off the wall bracket mounted to the pallet.
3. Remove the three (3) lag bolts securing the wall bracket to the wood pallet. Be certain not to lose the wall bracket as it will be needed for securing the boiler to the wall (FIG. 2-1).

NOTICE Do not drop the boiler or bump the jacket on the floor or pallet. Damage to the boiler can result.

Figure 2-1 *Boiler Mounted on Shipping Pallet*



Gas conversions

⚠WARNING For a boiler already installed, you must turn off gas supply, turn off power, and allow boiler to cool before proceeding. You must also completely test the boiler after conversion to verify performance as described under Start-up, Section 10 of this manual. Failure to comply could result in severe personal injury, death, or substantial property damage.

For models 55 - 399, you must install a propane venturi and any additional components supplied in the kit to operate the Knight Wall Hung Fire Tube boiler on propane gas. Verify when installing that the venturi label and orifice marking match the boiler size (see Table 2A).

Table 2A *LP Conversion Table*

Model	Kit #	Venturi Ø (mm)	Orifice Ø		Air Shutter	Orifice Stamping
			Bottom	Top		
55	100268040	20 mm	2.45 mm	2.65 mm	100150434	N/A
85	100268104	20 mm	2.45 mm	2.55 mm	100150434	N/A
110	100285815	22 mm	3.00 mm	2.85 mm	100284510	.250
155	100285817	24 mm	3.35 mm	2.95 mm	100284509	.302
199	100285818	24 mm	3.40 mm	3.00 mm	100150947	.302
285	100268109	30 mm	4.20 mm	4.00 mm	100150947	N/A
399	100350354	38 mm	4.90 mm	5.40 mm	100309612	N/A

*Note: The WHB199L air shutter should have the hole oriented towards the back right corner of the unit.

To gain access and remove the venturi - All Models:

1. If boiler is already installed, you must turn off the gas supply, turn off the power, and allow the boiler to cool before proceeding.
2. Remove the front access cover from the unit (no tools required for removal).
3. Disconnect the air inlet piping from the venturi by loosening the band clamp around the rubber boot coupling. Slide the rubber boot off of the venturi.
4. Disconnect the gas piping from the valve or venturi. On Models 55 - 399, loosen the threaded nut on the venturi. Remove the gasket between the gas piping and venturi.
5. Remove the bolts (using a 4 mm Allen wrench for models 55 - 285 and a 6 mm Allen wrench on the 399 model) connecting the venturi to the fan and proceed to remove the venturi from the unit, making sure not to damage the blower O-ring gasket (FIG.'s 2-2 and 2-3).

LP conversion procedure - Models 55 - 399

1. Install the LP air shutter provided in the kit (see Table 2A).
   a. Disconnect the wiring from the fan and remove the bolts securing the fan to the combustion chamber access cover.
   b. Remove the fan and gasket. Install the LP air shutter.

   Note: On the WHB199L model, the air shutter MUST be installed in the proper direction. Install the air shutter so that the hole in the corner is oriented towards the back right corner of the unit (opposite the front door and gas piping).

   c. Replace all torn or damaged gaskets and reassemble the fan.
   d. Reconnect the wiring harness before operation.
2. Install the propane venturi and verify the following:
   a. The UP arrow on the plastic housing is pointing up.
   b. The threaded connection for the gas piping is facing towards the front of the unit.
3. LP Models 110 - 199 ONLY require an orifice to be installed in the threaded venturi connection:
   a. Locate the propane orifice from the conversion kit bag and verify the stamping on the orifice matches the boiler size (see Table 2A).
   b. With the stamped side facing inwards, place the orifice in the cavity provided in the threaded connection.
4. Reassemble the gas pipe to the threaded connection on the venturi. Replace torn or damaged gasket(s) and ensure the venturi gasket is seated properly before tightening the nut on the venturi.

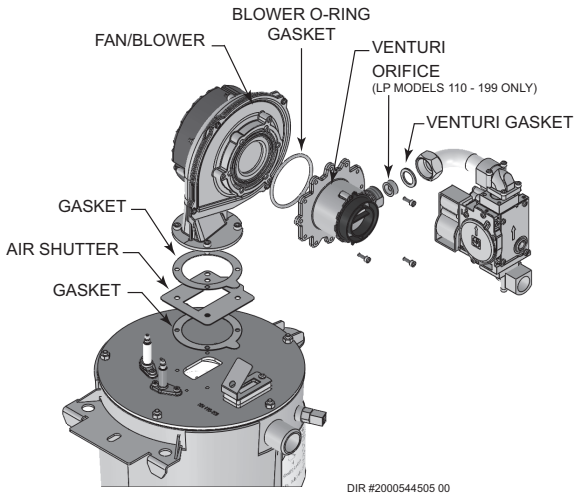
2 Prepare boiler *(continued)*

Reassemble the appliance and complete installation - All Models

1. Reconnect the rubber boot on the air inlet to the venturi inlet and tighten the band clamp at this connection.
2. After installation is complete, attach the propane conversion label (inside the conversion kit) next to the boiler rating plate. Attach the LP caution label (inside the conversion kit bag) to the left side of the boiler underneath the gas supply piping.
3. Replace the front access cover removed in Step 2 of the *"To Gain Access and Remove the Venturi"* section on page 12 and resume operation.

⚠ DANGER When removing the natural gas venturi, inspect the gasket at the gas connection and the O-ring at the blower. These gaskets must be in good condition and must be installed. Failure to comply will cause a gas leak, resulting in severe personal injury or death.

Figure 2-2 *Install LP Air Shutter and Orifice - Models 55 - 399*



⚠ WARNING After converting to LP, check combustion per the Start-up procedure in Section 10 of this manual. Failure to check and verify combustion could result in severe personal injury, death, or substantial property damage.

Mounting the boiler

See Section 1 - Determining Boiler Location of this manual for boiler mounting location instructions.

NOTICE The Knight Wall Hung Fire Tube boiler is not intended for floor installation.

Mounting to a wood studded wall:

1. The wall mount bracket is designed for a stud spacing of 16 inches from center. For other stud spacing a solid mounting surface must be provided by the installer.

⚠ WARNING Do not mount the boiler to a hollow wall. Be sure to mount the boiler to the studs only.

2. Mount the wall bracket using the 3 1/4" lag bolts provided. Make sure the top edge of the bracket is away from the wall. Ensure the bracket is level when mounted. Extreme care is needed to ensure the bolts are secured in the center of the studs.
3. Hang the boiler on the bracket and secure the bottom of the boiler with two (2) additional lag bolts provided.

2 Prepare boiler

⚠WARNING The boiler is too heavy for a single person to lift. A minimum of two people is needed for mounting the boiler onto the bracket.

Mounting to a concrete wall:

1. Mount the wall bracket using the two (2) wedge anchor bolts provided with the bracket. To mount the wedge anchor bolts, drill a 1/4" diameter hole 1-1/8" deep and insert anchor. Hang the bracket from the anchor and secure with the two nuts provided. Make sure the top edge of the bracket is away from the wall. Ensure bracket is level when mounted. Extreme care is needed to ensure the bolts are secured in the center of the studs.

Note: If wall thickness does not allow a 1-1/8" deep hole, field supplied hardware suitable for the application should be provided.

2. Hang the boiler on the bracket and secure the bottom of the boiler with two (2) remaining anchors, following the instructions above.

⚠WARNING The boiler is too heavy for a single person to lift. A minimum of two people is needed for mounting the boiler onto the bracket.

Mounting to a metal studded wall:

1. The wall mount bracket is designed for a stud spacing of 16 inches from center. For other stud spacing a solid mounting surface must be provided by the installer.

⚠WARNING Do not mount the boiler to a hollow wall. Be sure to mount the boiler to the studs only.

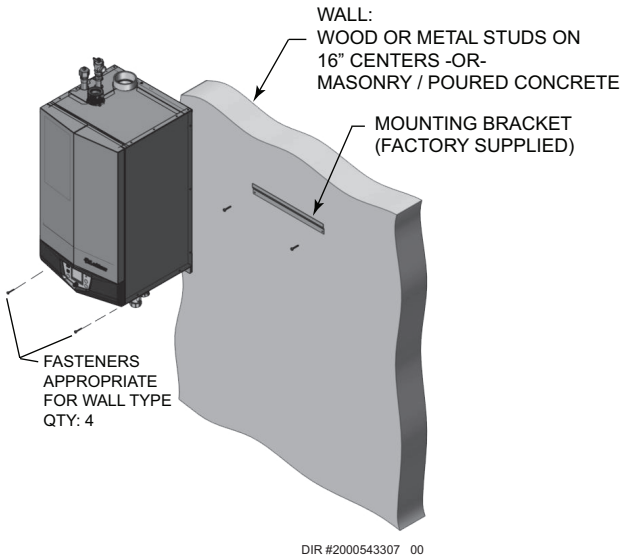
2. Mount the wall bracket using two (2) field supplied toggle bolts capable of supporting 100 pounds each.

   Ensure the top edge of the bracket is away from the wall. Ensure the bracket is level when mounted. Extreme care is needed to ensure the bolts are secured in the center of the studs.

3. Hang the boiler on the bracket and secure the bottom of the boiler with two (2) field supplied toggle bolts.

⚠WARNING The boiler is too heavy for a single person to lift. A minimum of two people is needed for mounting the boiler onto the bracket.

Figure 2-3 *Mounting the Boiler*



3 General venting

Direct venting options - Sidewall Vent

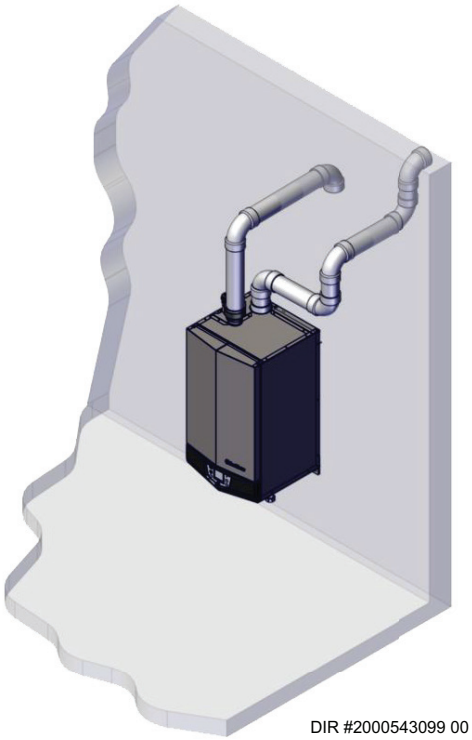


Figure 3-1 *Two-Pipe Sidewall Termination*

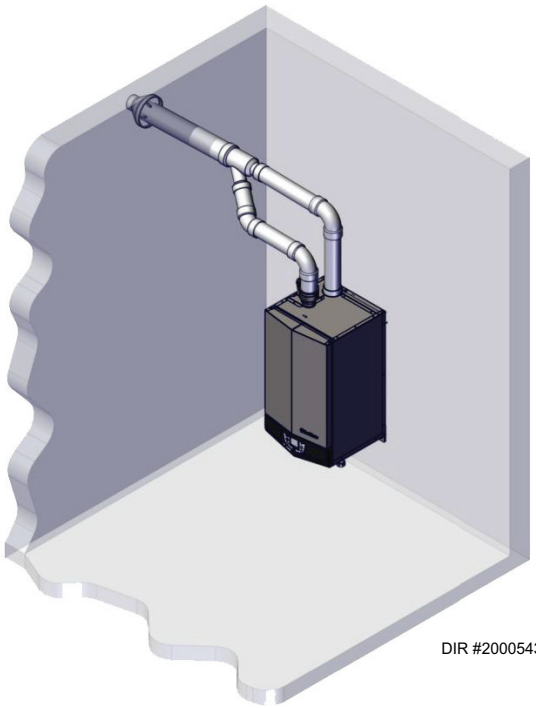


Figure 3-2 *PVC/CPVC Concentric Sidewall Termination*

Direct venting options - Vertical Vent

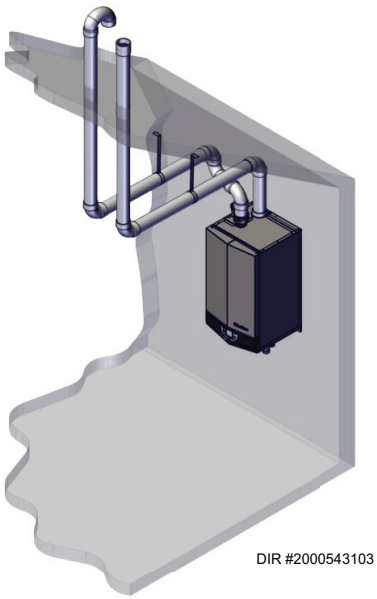


Figure 3-3 *Two-Pipe Vertical Termination*

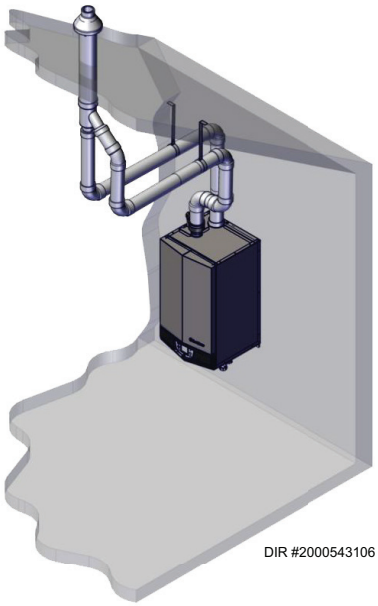


Figure 3-4 *PVC/CPVC Concentric Vertical Termination*

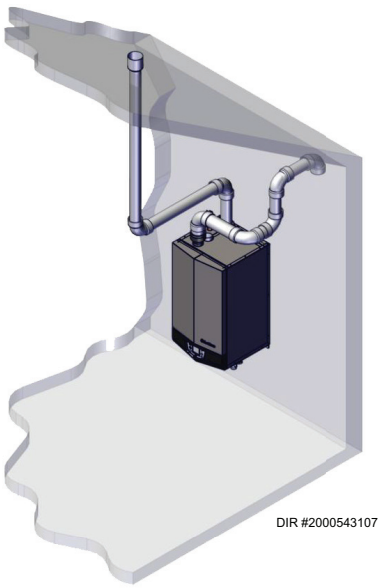


Figure 3-5 *Vertical Vent, Sidewall Air*

3 General venting

Install vent and combustion air piping

⚠ DANGER The Knight Wall Hung Fire Tube boiler must be vented and supplied with combustion and ventilation air as described in this section. Ensure the vent and air piping and the combustion air supply comply with these instructions regarding vent system, air system, and combustion air quality. See also Section 1 of this manual.

Inspect finished vent and air piping thoroughly to ensure all are airtight and comply with the instructions provided and with all requirements of applicable codes. Failure to provide a properly installed vent and air system will cause severe personal injury or death.

⚠ WARNING This appliance requires a special venting system. Use only approved stainless steel, PVC, CPVC, or polypropylene pipe and fittings listed for vent pipe, and fittings. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING DO NOT mix components from different systems. The vent system could fail, causing leakage of flue products into the living space. Mixing of venting materials will void the warranty and certification of the appliance.

⚠ WARNING Do not connect any other appliance to the vent pipe or multiple boilers to a common vent pipe. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠ WARNING For closet and alcove installations, CPVC, polypropylene, or stainless steel material MUST BE used in a closet/alcove structure. Failure to follow this warning could result in fire, personal injury, or death.

⚠ CAUTION Improper installation of venting systems may result in injury or death.

NOTICE Installation must comply with local requirements and with the National Fuel Gas Code, ANSI Z223.1 for U.S. installations or CSA B149.1 for Canadian installations.

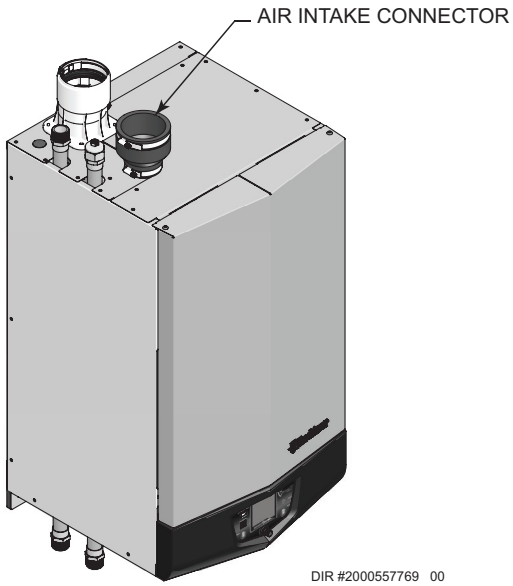
You may use any of the vent / air piping methods covered in this manual. Do not attempt to install the Knight Wall Hung Fire Tube boiler using any other means. Follow the procedures in this manual for the method chosen.

Air intake/vent connections

1. **Combustion Air Intake Connector** (FIG. 3-6) - Used to provide combustion air directly to the unit from outdoors. On Models 110 - 399 a fitting is provided on the unit for final connection. Combustion air piping must be supported per guidelines listed in the National Mechanical Code, Section 305, Table 305.4 or as local codes dictate.
2. **Vent Connector** - Used to provide a passageway for conveying combustion gases to the outside. A transition fitting sized for PVC/CPVC, polypropylene, or stainless steel is provided on the unit for final connection. Reference the appropriate venting section to determine if an adapter is needed to connect to the specific manufacturer's vent. Vent piping must be supported per the National Building Code, Section 305, Table 305.4 or as local codes dictate.

Approved Air Intake Terminations	Approved Vent Terminations
• Elbow with Screen • Stainless Steel Hood Intake • Room Air Kit (see Table 3A)	• Elbow with Screen • Coupling with Screen • Rain Cap • Chimney Cover
Approved Vent Kits	
• Sidewall Vent Kit (see Table 3B) • Concentric Vent Kit (see Table 3C) **NOTE:** When using the Sidewall Vent Kit with polypropylene, an adapter kit must be used.	

Figure 3-6 Near Boiler Air Intake / Vent Connections



Air intake / vent terminations

The Knight Wall Hung Fire Tube boiler vent and air piping can be installed through the roof or through a sidewall. Intake air must be supplied from outside to the boiler air intake adapter unless following the Optional Room Air instructions in this manual. The resultant installation is direct vent (sealed combustion). Use only approved stainless steel, PVC, CPVC, or polypropylene vent terminations listed. The location and orientation of vent and air terminations must comply with the requirements given in Section 3 through 5. Vent and air must terminate near one another unless otherwise specified. Ensure the location and orientation of the vent and air terminations are met and comply with the requirements given in the Sidewall Direct Venting or Vertical Direct Venting Section.

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3 General venting *(continued)*

Air intake / vent location

The total length of piping for vent or air must not exceed the limits given in the General Venting - Sizing Section. Follow all instructions given in the specific venting section. Locate the vent / air terminations using the following guidelines:

1. Position the vent termination where vapors will not damage nearby shrubs, plants, air conditioning equipment, or be objectionable.
2. The flue products will form a noticeable plume as they condense in cold air. Avoid areas where the plume could obstruct window views.
3. Prevailing winds could cause freezing of condensate and water /ice build-up where flue products impinge on building surfaces or plants.
4. Avoid possibility of accidental contact of flue products with people or pets.
5. Do not locate the terminations where wind eddies could affect performance or cause recirculation, such as inside building corners, near adjacent buildings or surfaces, window wells, stairwells, alcoves, courtyards, or other recessed areas.
6. Do not terminate above any door or window. Condensate can freeze, causing ice formations.
7. Locate or guard vent to prevent condensate damage to exterior finishes.
8. Locate terminations so they are not likely to be damaged by foreign objects, such as stones or balls, or subject to build-up of leaves or sediment.
9. Vent must terminate:
   - At least 6 feet from adjacent walls.
   - No closer than 12 inches below roof overhang.
   - At least 7 feet above any public walkway.
   - At least 3 feet above any forced air intake within 10 feet.
   - No closer than 12 inches below or horizontally from any door or window or any other gravity air inlet.
10. Do not terminate closer than 4 feet horizontally from any electric meter, gas meter, regulator, relief valve, or other equipment. Never terminate above or below any of these within 4 feet horizontally.
11. Air inlet must terminate at least 12 inches above grade or snow line, and at least 12 inches below the vent.

Optional room air

Commercial applications utilizing the Knight Wall Hung Fire Tube boiler may be installed with a single pipe carrying the flue products to the outside while using combustion air from the equipment room.

Table 3A *Optional Room Air Kit*

Model	Vent Size	Kit Number
55 - 85	2 inch	100157614
110 - 285	3 inch	100157615
399	4 inch	100157616

NOTICE Optional room air is intended for commercial applications. Combustion air piping to the outside is recommended for residential applications.

In order to use the room air venting option the following conditions and considerations must be followed.

- The unit MUST be installed with the appropriate room air kit.
- The equipment room MUST be provided with properly sized openings to assure adequate combustion air. Please refer to instructions provided with the room air kit.
- There will be a noticeable increase in the noise level during normal operation from the inlet air opening.
- Using the room air kit makes the unit vulnerable to combustion air contamination from within the building. Take precautions to ensure proper installation.
- Vent system and terminations must comply with the standard venting instructions set forth in this manual.

⚠WARNING When utilizing the single pipe method, provisions for combustion and ventilation air must be in accordance with Air for Combustion and Ventilation, of the latest edition of the National Fuel Gas Code, ANSI Z223.1, in Canada, the latest edition of CGA Standard B149 Installation Code for Gas Burning Appliances and Equipment, or applicable provisions of the local building codes.

Air contamination

Pool and laundry products and common household and hobby products often contain fluorine or chlorine compounds. When these chemicals pass through the boiler, they can form strong acids. The acid can eat through the boiler wall, causing serious damage and presenting a possible threat of flue gas spillage or boiler water leakage into the building.

Please read the information given in Table 1B listing contaminants and areas likely to contain them. If contaminating chemicals will be present near the location of the boiler combustion air inlet, have your installer pipe the boiler combustion air and vent to another location, per this manual.

⚠WARNING If the boiler combustion air inlet is located in a laundry room or pool facility, for example, these areas will always contain hazardous contaminants.

⚠WARNING To prevent the potential of severe personal injury or death, check for areas and products listed in Table 1B before installing the boiler or air inlet piping.

If contaminants are found, you MUST:

- Remove contaminants permanently.

—OR—

- Relocate air inlet and vent terminations to other areas.

3 General venting

Requirements for installation in Canada

1. Installations must be made with a vent pipe system certified to ULC S636.
2. The first three (3) feet of plastic vent pipe from the appliance flue outlet must be readily accessible for visual inspection.
3. The components of the certified vent system must not be interchanged with other vent systems or unlisted pipe/fittings. For existing concentric vent installations, the inner vent tube must be replaced with field supplied certified vent material to comply with this requirement.
4. The 2", 3" and 4" Concentric and Sidewall Vent Kits available from Lochinvar, IPEX, and Centrotherm (see Tables 3B and 3C) are approved for use on the Knight Wall Hung Fire Tube boiler. All kits are listed to the ULC S636 standard for use in Canada.

***Table 3B** Approved Sidewall Vent Kits*

Vent Diameter	Vent Supplier	Part Number
2 inch	Lochinvar	100157609
3 inch	Lochinvar	100157610
4 inch	Lochinvar	100157611
2 inch	Centrotherm	ISLPT0202
3 inch	Centrotherm	ISLPT0303
4 inch	Centrotherm	ISLPT0404

***Table 3C** Approved Concentric Vent Systems*

Vent Diameter	Lochinvar PVC	IPEX PVC	IPEX CPVC
2 inch	100140485	196005	--
3 inch	100274637	196006	197009
4 inch	100140484	196021	197021
Vent Diameter	**Centrotherm Roof Terminations**	**Centrotherm Wall Terminations**	
2 inch	ICRT2435	ICWT242	
3 inch	ICRT3539	ICWT352	
4 inch	ICRT4679	ICWT462	

Sizing

The Knight Wall Hung Fire Tube boiler uses model specific combustion air intake and vent piping sizes as detailed in Table 3D. When venting with flexible polypropylene, refer to the General Venting - Polypropylene Section for allowable vent diameters and maximum lengths.

If the specific polypropylene vent manufacturer's instructions do not list equivalent lengths for standard fittings, reference Table 3E for guidelines.

Unless otherwise stated by the vent manufacturer, add 5 feet for each 90° elbow and 3 feet for each 45° elbow of PVC/CPVC or stainless steel venting material.

***Table 3D** Air Intake/Vent Piping Sizes*

Model	Inlet Diameter	Vent Diameter	Maximum Equivalent Length
55	2 inches / 3 inches	2 inches / 3 inches	80 feet / 100 feet
85	2 inches / 3 inches	2 inches / 3 inches	50 feet / 100 feet
110	2 inches / 3 inches	2 inches / 3 inches	40 feet / 100 feet
155	3 inches	3 inches	100 feet
199	3 inches	3 inches	100 feet
285	3 inches / 4 inches	3 inches / 4 inches	50 feet / 100 feet
399	4 inches	4 inches	100 feet

***Table 3E** Equivalent Length Guidelines - Polypropylene*

Vent Ø	Vent Pipe	45° Elbow	90° Elbow	Tee
2 inch	1 ft	3 ft	5 ft	9 ft
3 inch	1 ft	4 ft	7 ft	15 ft
4 inch	1 ft	5 ft	10 ft	20 ft

See the Polypropylene Venting Section for flexible vent installation guidelines and specific manufacturer equivalent lengths.

***Table 3F** Equivalent Length - Concentric Vent Kits*

Vent Diameter	Kit Number	Equivalent Length
2 inch	100140485	30 ft
3 inch	100269005	30 ft
4 inch	100140484	30 ft

EXAMPLE: 20 feet of 2" polypropylene pipe + (4) 90° elbows + (2) 45° elbows = 20 + 4(5) + 2(3) = 46 equivalent feet

NOTICE Increasing or decreasing combustion air or vent piping sizes is not authorized, unless referenced in manual.

NOTICE For Models 55 - 110 using 2" venting and Model 285 using 3" venting, the first seven (7) equivalent feet of vent must be CPVC, polypropylene, or stainless steel (field supplied). This includes any transition piece used to increase or decrease the vent diameter.

NOTICE The minimum combustion air length is 12 equivalent feet, and the minimum vent piping length is 12 equivalent feet.

NOTICE The appliance output rating will reduce by up to 2.3% for each 25 feet of vent length. Consult factory to determine de-rate values.

3 General venting *(continued)*

Materials

Air inlet pipe materials:

The air inlet pipe(s) must be sealed. Choose acceptable combustion air inlet pipe materials from the following list:

PVC, CPVC, Polypropylene, or ABS
Dryer Vent or Sealed Flexible Duct (not recommended for rooftop air inlet)
Galvanized steel vent pipe with joints and seams sealed as specified in this section.
Type "B" double-wall vent with joints and seams sealed as specified in this section.
AL29-4C, stainless steel material to be sealed to specification of its manufacturer.

An adapter may be required to transition between the air inlet connection on the appliance and the air inlet pipe.

⚠ WARNING Using air intake materials other than those specified can result in personal injury, death, or property damage.

NOTICE The use of double-wall vent or insulated material for the combustion air inlet pipe is recommended in cold climates to prevent the condensation of airborne moisture in the incoming combustion air.

Sealing of Type "B" double-wall vent material or galvanized vent pipe material used for air inlet piping on a sidewall or vertical rooftop combustion air supply system:

a. Seal all joints and seams of the air inlet pipe using either aluminum foil duct tape meeting UL Standard 723 or 181A-P or a high quality UL Listed silicone sealant such as those manufactured by Dow Corning or General Electric.
b. Do not install seams of vent pipe on the bottom of horizontal runs.
c. Secure all joints with a minimum of three (3) sheet metal screws or pop rivets. Apply aluminum foil duct tape or silicone sealant to all screws or rivets installed in the vent pipe.
d. Ensure that the air inlet pipes are properly supported.

The PVC, CPVC, or ABS air inlet pipe should be cleaned and sealed with the pipe manufacturer's recommended solvents and standard commercial pipe cement for the material used. The PVC, CPVC, ABS, Dryer Vent, or Flex Duct air inlet pipe should use a silicone sealant to ensure a proper seal at the appliance connection and the air inlet cap connection. Dryer vent or flex duct should use a screw type clamp to seal the vent to the appliance air inlet and the air inlet cap. Proper sealing of the air inlet pipe ensures that combustion air will be free of contaminants and supplied in proper volume.

Follow the polypropylene manufacturer's instructions when using polypropylene material as an inlet pipe.

When a sidewall or vertical rooftop combustion air supply system is disconnected for any reason, the air inlet pipe must be resealed to ensure that combustion air will be free of contaminants and supplied in proper volume.

⚠ DANGER Failure to properly seal all joints and seams as required in the air inlet piping may result in flue gas recirculation, spillage of flue products, and carbon monoxide emissions causing severe personal injury or death.

Vent pipe materials:

The Knight Wall Hung Fire Tube boiler requires a special vent system, designed for pressurized venting. Use only approved manufacturers and materials for vent pipe and fittings.

Refer to the appropriate PVC/CPVC, Polypropylene, or Stainless Steel Vent Section of this manual for approved manufacturers and additional information.

Approved materials certified for Category IV and Direct Vent appliance venting:

1. PVC - Schedule 40, Schedule 80, DWV
2. CPVC - Schedule 40, Schedule 80
3. AL29-4C Stainless Steel - UL-1738 and ULC S636 Listed from approved manufacturers
4. Polypropylene - ULC S636 Listed from approved manufacturers

3 General venting

PVC/CPVC

This product has been approved for use with the PVC/CPVC vent materials listed in Table 3G.

Installing vent and air piping

NOTICE Use only cleaners, primers, and solvents that are approved for the materials which are joined together.

NOTICE All PVC vent pipes must be glued, properly supported, and the exhaust must be pitched a minimum of a 1/4 inch per foot back to the boiler (to allow drainage of condensate).

⚠CAUTION Allow for all primers, glues, and cements to fully cure before start-up. Failure to follow this warning could result in property damage and/or personal injury.

⚠WARNING Insulation should not be used on PVC or CPVC venting materials. The use of insulation will cause increased vent wall temperatures, which could result in vent pipe failure.

Table 3G PVC/CPVC Vent Pipe, and Fittings

Approved PVC/CPVC Vent Pipe and Fittings		
Item	**Material**	**Standard**
Vent pipe	PVC Schedule 40, 80	ANSI/ASTM D1785
	PVC - DWV	ANSI/ASTM D2665
	CPVC Schedule 40, 80	ANSI/ASTM F441
Vent fittings	PVC Schedule 40	ANSI/ASTM D2466
	PVC Schedule 80	ANSI/ASTM D2467
	CPVC Schedule 40	ANSI/ASTM F438
	CPVC Schedule 80	ANSI/ASTM F439
	PVC - DMV	ANSI/ASTM D2665
Pipe Cement / Primer	PVC	ANSI/ASTM D2564
	CPVC	ANSI/ASTM F493
NOTICE: DO NOT USE CELLULAR (FOAM) CORE PIPE		

NOTE: In Canada, CPVC and PVC vent pipe, fittings, and cement/primer must be ULC-S636 certified.

1. Work from the boiler to vent or air termination. Do not exceed the lengths given in this manual for the air or vent piping.
2. Cut pipe to the required lengths and deburr the inside and outside of the pipe ends.
3. Chamfer outside of each pipe end to ensure even cement distribution when joining.
4. Clean all pipe ends and fittings using a clean dry rag. (Moisture will retard curing and dirt or grease will prevent adhesion.)
5. Dry fit vent or air piping to ensure proper fit up before assembling any joint. The pipe should go a third to two-thirds into the fitting to ensure proper sealing after cement is applied.
6. Priming and Cementing:
   a. Handle fittings and pipes carefully to prevent contamination of surfaces.
   b. Apply a liberal even coat of primer to the fitting socket and to the pipe end to approximately 1/2" beyond the socket depth.
   c. Apply a second primer coat to the fitting socket.
   d. While primer is still wet, apply an even coat of approved cement to the pipe equal to the depth of the fitting socket along with an even coat of approved cement to the fitting socket.
   e. Apply a second coat of cement to the pipe.
   f. While the cement is still wet, insert the pipe into the fitting, if possible twist the pipe a 1/4 turn as you insert it. **NOTE:** If voids are present, sufficient cement was not applied and joint could be defective.
   g. Wipe excess cement from the joint removing ring or beads as it will needlessly soften the pipe.

3 General venting *(continued)*

Polypropylene

This product has been approved for use with polypropylene venting from the manufacturers listed in Table 3H.

All terminations must comply with listed options in this manual and be a single-wall vent offering.

For support and special connections required, see the manufacturer's instructions. All vent is to conform to standard diameter and equivalent length requirements established in the General Venting - Sizing Section.

The vent connector provided with the unit is sized for PVC/CPVC, polypropylene, or stainless steel venting. An adapter is not required for the listed venting options, except for Centrotherm 4", which will require the use of a Centrotherm ISAAL0404 adapter.

Flexible polypropylene

For use of flex pipe, it is recommended to have the vent material in 32°F or higher ambient space before bending at installation. No bends should be made to greater than 45° and ONLY installed in vertical or near vertical installations.

When venting with flexible polypropylene it is acceptable to increase piping sizes by one vent diameter. Up-sized flexible polypropylene may be considered as equivalent to one (1) foot of smaller diameter rigid pipe. Do not exceed the maximum flexible vent lengths given in Table 3I. When venting with same diameter flexible and rigid pipe refer to Table 3J for manufacturer equivalent vent lengths.

Sidewall vent kits

When using the Sidewall Vent Kit (see Table 3B), an adapter kit provided by the vent manufacturer must be used to make the final connection. Reference Table 3L for specific manufacturer's part numbers.

⚠WARNING Use only the manufacturers and vent adapters listed. DO NOT mix vent systems of different types or manufacturers. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠WARNING Insulation should not be used on polypropylene venting materials. The use of insulation will cause increased vent wall temperatures, which could result in vent pipe failure.

NOTICE All vent connections MUST be secured by the vent manufacturer's joint connector. Installation of a polypropylene system should adhere to the manufacturer's installation instructions supplied with the vent system.

NOTICE Installations must comply with applicable national, state, and local codes. For Canadian installation, polypropylene vent must be listed as a ULC S636 approved system.

***Table 3H** Approved Polypropylene Vent Manufacturers*

Manufacturers	Model	Type
DuraVent	PolyPro	Single Wall / Flex
Centrotherm	InnoFlue	Single Wall / Flex
Heat Fab	PolyFlue	Single Wall / Flex
Z-Vent	Z-Dens	Single Wall / Flex

***Table 3I** Flexible Polypropylene Maximum Vent Lengths*

Model	Maximum Flexible Vent Length (Rigid Equivalent)		
	2 inch Flex	3 inch Flex	4 inch Flex
55	40 ft (80 ft 2 inch)*	50 ft (100 ft 3 inch)*	100 ft (100 ft 3 inch)*
85	25 ft (50 ft 2 inch)*	50 ft (100 ft 3 inch)*	100 ft (100 ft 3 inch)*
110	20 ft (40 ft 2 inch)*	50 ft (100 ft 3 inch)*	100 ft (100 ft 3 inch)*
155	--	50 ft (100 ft 3 inch)*	100 ft (100 ft 3 inch)*
199	--	50 ft (100 ft 3 inch)*	100 ft (100 ft 3 inch)*
285	--	25 ft (50 ft 3 inch)*	50 ft (50 ft 3 inch)*
399**	--	--	50 ft (100 ft 4 inch)*

*Length shown in parentheses reflects the maximum rigid pipe vent length.

**Model 399 may be vented with 100 feet of Duravent 5 inch vent

NOTE: Maximum vent lengths are based on 2 foot rigid equivalent. Reference Table 3J for specific manufacturer equivalent lengths.

***Table 3J** Flexible Polypropylene Equivalent Length*

Manufacturer	Flexible Vent Diameter		
	2 inch	3 inch	4 inch
DuraVent	2 ft	2 ft	2 ft
Centrotherm	2 ft	2 ft	2.7 ft
Heat Fab	2.5 ft	2.3 ft	2.7 ft
Z-Flex	3.2 ft	2 ft	2 ft

***Table 3K** Sidewall Vent Kit Adapters*

Manufacturer	Vent Diameter	Sidewall Adapter
DuraVent	(2", 3", 4")	(2,3,4)PPS-HLKL
Centrotherm	(2", 3", 4")	ISLTK0(2,3,4)
Z-Flex	(2", 3", 4")	2ZDHKLPA(2,3,4)

3 General venting

Stainless steel vent

This product has been approved for use with stainless steel venting from the manufacturers listed in Table 3L. The vent connector provided with the unit is sized for stainless steel venting. No additional vent adapter is needed to connect to the unit.

All terminations must comply with listed options in this manual and be a single-wall vent offering. See Table 3M for specific manufacturer terminations.

For support and special connections required, see the manufacturer's instructions. All vent is to conform to standard diameter and equivalent length requirements established.

FasNSeal Flex

Use of FasNSeal Flex smooth inner wall vent is to be used in vertical or near vertical sections ONLY, taking precaution to ensure no sagging occurs of the vent system. Connect to the FasNSeal rigid vent using specially designed adapters and sealing method. See manufacturer's instructions.

Table 3L *Approved Stainless Steel Vent*

Manufacturer	Model
DuraVent	FasNSeal / FasNSeal Flex
Heat Fab	Saf-T Vent EZ Seal
Z-Flex	Z-Vent

Note: DuraVent FasNSeal Flex stainless steel vent may be used as an equivalent substitute for rigid pipe.

⚠WARNING Use only the materials, vent systems, and terminations from listed manufacturers. DO NOT mix vent systems of different types or manufacturers. Failure to comply could result in severe personal injury, death, or substantial property damage.

NOTICE Installations must comply with applicable national, state, and local codes. Stainless steel vent systems must be listed as a UL-1738 approved system for the United States and a ULC S636 approved system for Canada.

NOTICE Installation of a stainless steel vent system should adhere to the stainless steel vent manufacturer's installation instructions supplied with the vent system.

Table 3M *Stainless Steel Vent Terminations*

Manufacturer	Vent Diameter	Screen Termination*	Elbow with Screen*	Rain Cap*
DuraVent	(3", 4")	FSBS(3,4)	FSELB900(3,4) with FSBS(3,4)	FSRC(3,4)
Heat Fab	(3", 4")	9(3,4)90	9(3,4)14TERM	5(3,4)00CI
Z-Flex	(3", 4")	2SVSTPF0(3,4)	2SVSTEX0(3,4)90	2SVSRCF0(3,4)

*To the best of our knowledge, manufacturer part numbers are accurate as of the date of publication, but may be subject to change. Contact the manufacturer to verify specific terminations.

4 Sidewall direct venting

Vent/air termination – sidewall

⚠WARNING Follow instructions below when determining vent location to avoid possibility of severe personal injury, death, or substantial property damage.

⚠WARNING A gas vent extending through an exterior wall shall not terminate adjacent to a wall or below building extensions such as eaves, parapets, balconies, or decks. Failure to comply could result in severe personal injury, death, or substantial property damage.

⚠WARNING Sidewall vent and air intake terminations must terminate in the same pressure zone.

Determine location

Reference the General Venting - Air Intake / Vent Location Section of this manual for required clearances and guidelines on locating vent and air intake terminations.

When using a sidewall termination, follow installation instructions and maintain clearances as shown in this section:

1. Air inlet must terminate at least 12 inches above grade or snow line, and at least 12 inches below the vent termination.
2. For installations where the vent terminates in an elbow outside the building, the vent piping must not extend more than 24 inches vertically (FIG. 4-1). To prevent blockages due to freezing condensate, the recommended maximum length of vent piping is 15 inches.

   Do not exceed the maximum lengths of the outside vent piping. Excessive length exposed to the low temperatures could cause freezing of condensate in the vent pipe, resulting in potential boiler shutdown.
3. Vent piping must terminate no closer than 12 inches below a roof overhand, or 12 inches below or horizontally from any door, window, or other gravity air inlet (FIG. 4-2).
4. Vent must terminate at least 3 feet above any forced air intake within 10 feet (FIG. 4-3).

Multiple vent / air terminations

Multiple vent terminations must be placed to maintain a minimum clearance of 12 inches (U.S. installations) between the edge of the air inlet and adjacent vent outlet (FIG. 4-4).

For Canadian installations, provide clearances required by CSA B149.1 Installation Code.

The air inlet of a Knight Wall Hung Fire Tube boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

⚠WARNING All vent pipes and air inlets must terminate at the same height to avoid recirculation of flue products and the possibility of severe personal injury, death, or substantial property damage.

Sidewall vent kit

When venting out a sidewall using PVC, CPVC, or polypropylene vent material, an optional sidewall vent termination kit can be ordered (FIG. 4-5A). See General Venting Section for kit numbers.

Field supplied fittings

The air piping must terminate in a down-turned elbow. This arrangement avoids recirculation of flue products into the combustion air stream. The vent piping must terminate in an elbow pointed outward or away from the air inlet, as shown in FIG. 4-5B.

Figure 4-1 *Field Supplied Fittings with Vent Termination Elbow*

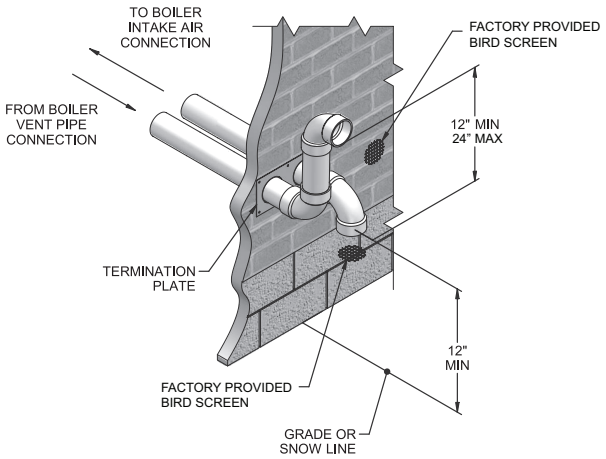
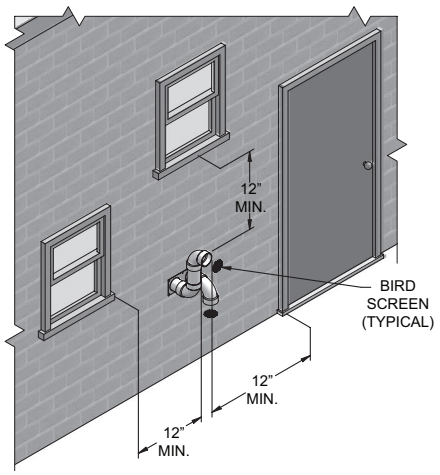


Figure 4-2 *Clearance to Gravity Air Inlets (Field Supplied Fittings Shown)*



4 Sidewall direct venting

Vent/air termination – sidewall

Figure 4-3 *Clearance to Forced Air Inlets (Sidewall Vent Kit Shown)*

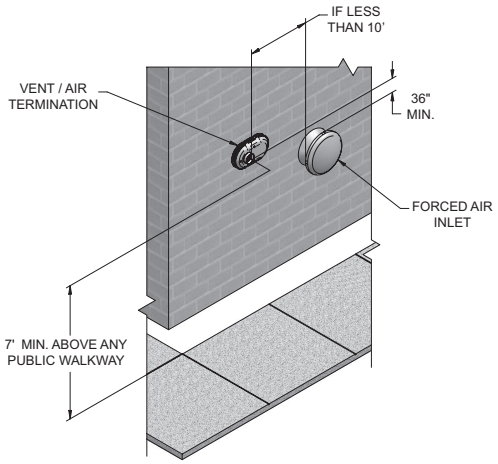


Figure 4-4 *Multiple Vent Terminations (Field Supplied Fittings Shown)*

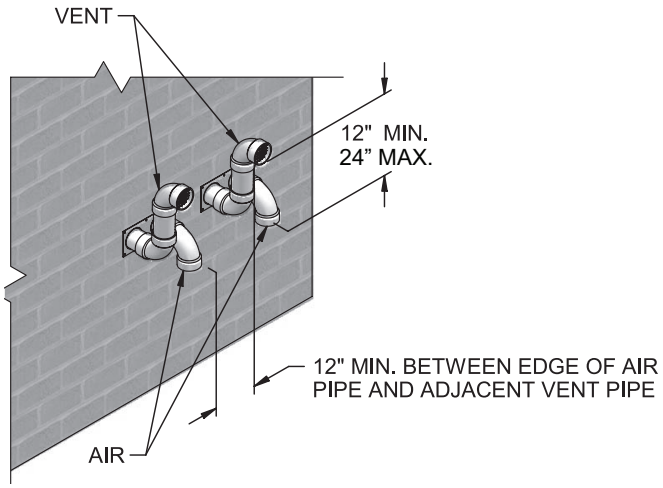


Figure 4-5A *Sidewall Vent Kit*

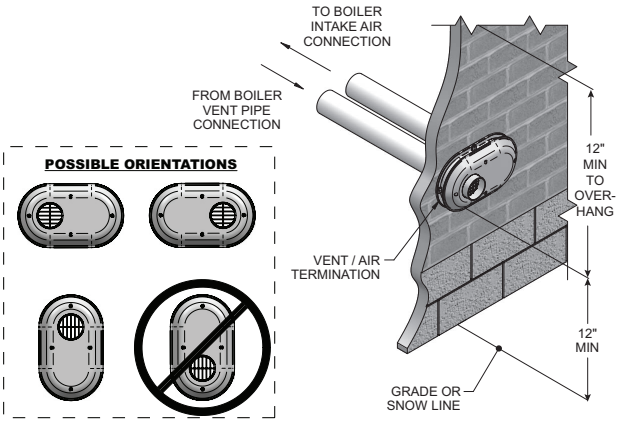


Figure 4-5B *Field Supplied Fittings with Vent Termination Coupling*

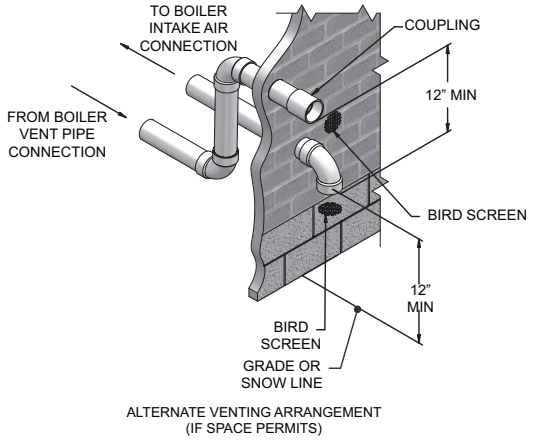


Figure 4-5C *Typical Stainless Steel Sidewall Termination with Field Supplied Fittings and Hood Intake*

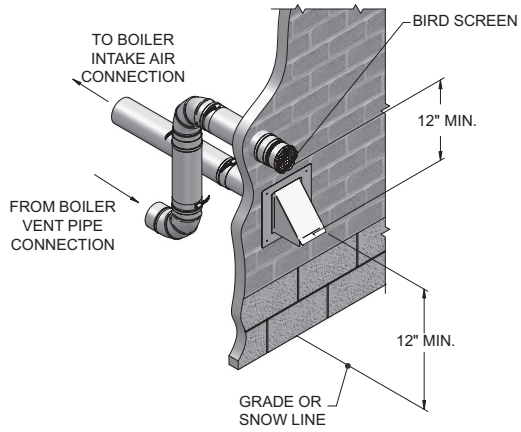
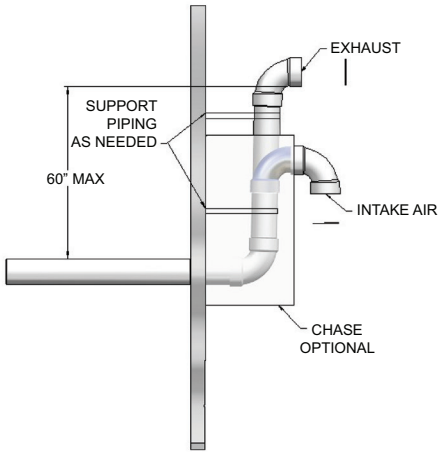


Figure 4-5D *Sidewall Snorkel Vent Installation - Side View*



4 Sidewall direct venting *(continued)*

Vent/air termination – sidewall

Prepare wall penetrations - Sidewall vent kit

The PVC/CPVC and polypropylene sidewall vent terminations are designed to accommodate any wall thickness of standard construction.

Install the sidewall vent kit as shown in FIG. 4-6 and per the directions found in this manual.

1. Use the factory supplied wall plate as a template to locate the vent and air intake holes and mounting holes.
2. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
3. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter:
   - 3½ inch hole for 2 inch vent pipe
   - 4½ inch hole for 3 inch vent pipe
   - 5½ inch hole for 4 inch vent pipe
4. Drill 3/16" diameter holes for inserting the plastic anchors into the wall.
5. **Polypropylene Venting:** Install the vent and air intake sidewall adapters listed in the General Venting - Polypropylene Section into the vent plate. Slide the sidewall retaining bracket down the sidewall adapters flush to the vent plate.

   PVC/CPVC Venting: Install the vent and air intake piping through the wall into the vent plate openings. Use RTV silicone sealant to seal the air pipe. Use the cement/primer listed in the General Venting - PVC/CPVC Section to seal the vent pipe.
6. Mount and secure the vent plate to the wall, using stainless steel screws.
7. Seal all gaps between the pipes and wall. Seal around the plate to the wall assuring no air gaps.
8. Assemble the vent cap to the vent plate. Insert the stainless steel screws into the vent cap screw hole openings and securely attach the vent cap to the vent plate.
7. Seal all wall cavities and exterior openings.

Prepare wall penetrations - Field supplied fittings

PVC/CPVC and polypropylene sidewall vent terminations are designed to accommodate any wall thickness of standard construction. Stainless steel terminations are designed to penetrate a wall with a thickness up to 9.25 inches of standard construction.

1. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter:
   - 3½ inch hole for 2 inch vent pipe
   - 4½ inch hole for 3 inch vent pipe
   - 5½ inch hole for 4 inch vent pipe
3. Insert a galvanized metal thimble in the vent pipe hole as shown in FIG. 4-7.
4. For installations using a vent elbow termination, use the sidewall termination plate as a template for correct location of hole centers.
5. Follow all local codes for isolation of vent pipe when passing through floors or walls.
6. Seal exterior openings thoroughly with exterior caulk.

Figure 4-6 *Sidewall Vent Kit Assembly*

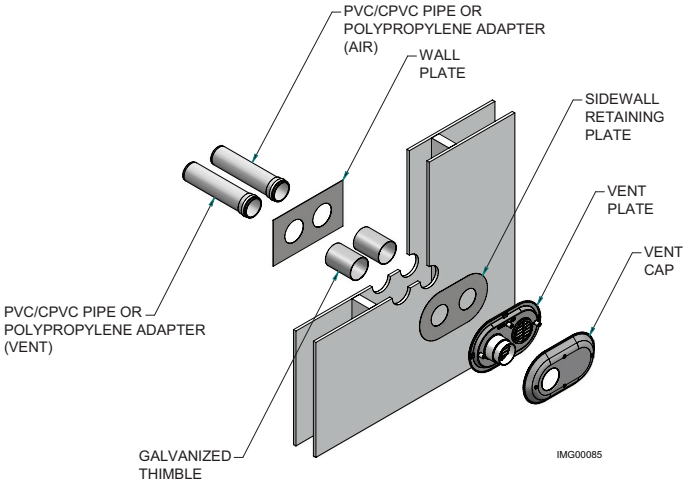
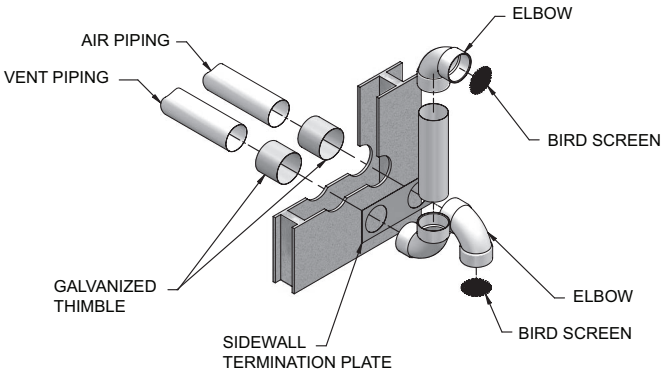


Figure 4-7 *Field Supplied Termination Assembly*



4 Sidewall direct venting

Sidewall termination – optional concentric vent

Description and usage

Lochinvar offers optional concentric combustion air and vent pipe termination kits (see the General Venting Section for part numbers). Both combustion air and vent pipes must attach to the termination kit. The termination kits must terminate outside the structure and must be installed as described in the General Venting - Air Intake / Vent Location Section, and as shown below in FIG. 4-8.

The required combustion air and vent pipe materials are listed in the General Venting - PVC/CPVC Section of this manual.

Concentric sidewall installation

1. Cut one (1) hole into the structure to install the termination kit.
   - 5 inch diameter for 2 inch concentric vent kit
   - 4 inch diameter for 3 inch concentric vent kit
   - 7 inch diameter for 4 inch concentric vent kit
2. Partially assemble the concentric vent termination kit. Clean and cement using the procedures found in these instructions (FIG.'s 4-9A and 4-9B).
   a. Cement the Y concentric fitting to the larger kit pipe.
   b. Cement the rain cap to the smaller diameter kit pipe.

Figure 4-8 *Concentric Sidewall Termination*

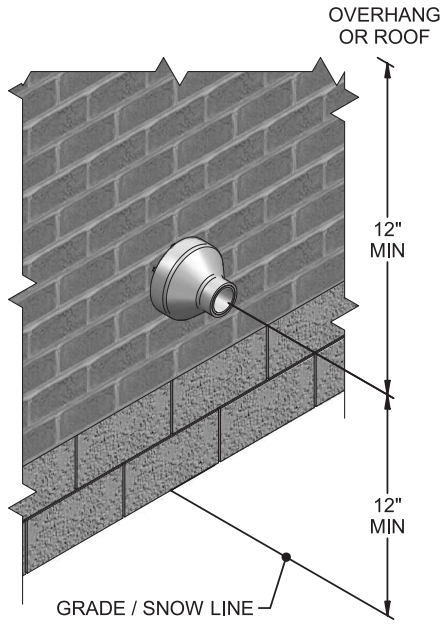


Figure 4-9A *2 and 3 Inch Concentric Vent Kits (reference the General Venting Section)*

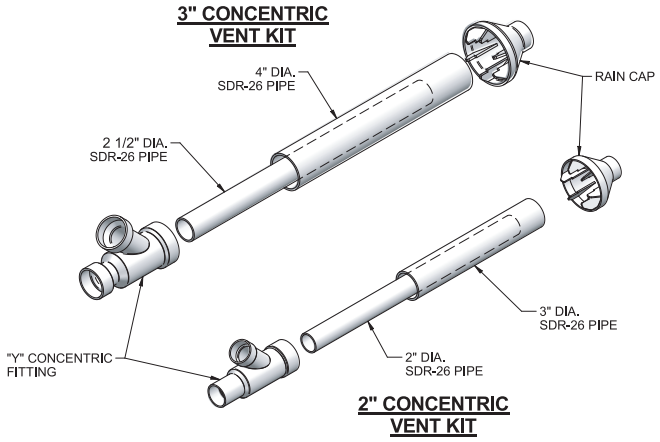
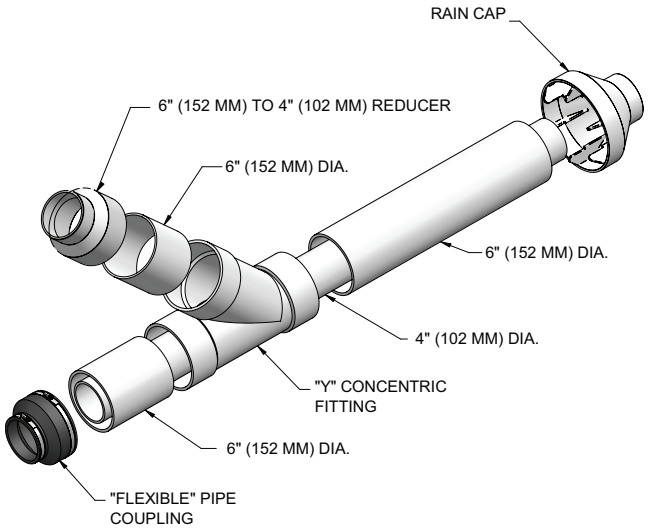


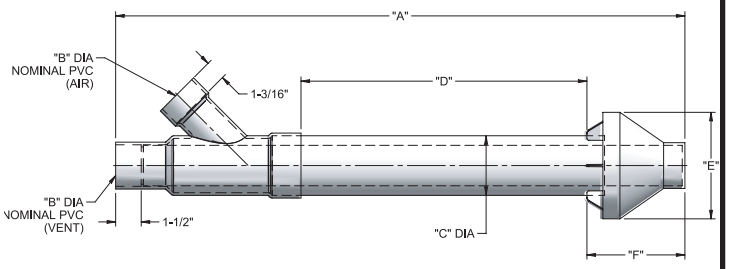
Figure 4-9B *4 Inch Concentric Vent Kit (reference the General Venting Section)*



4 Sidewall direct venting *(continued)*

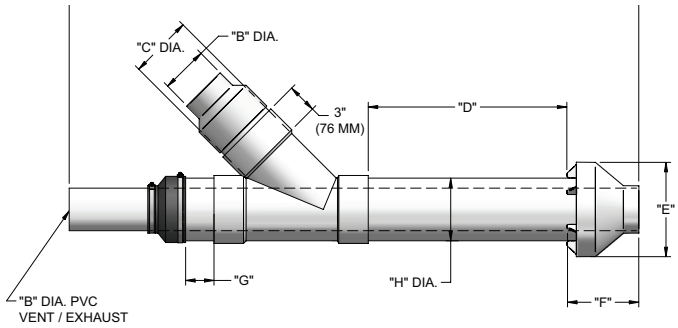
Sidewall termination – optional concentric vent

Figure 4-10A *2 and 3 Inch Concentric Vent Dimensions (reference the General Venting Section)*



	"A"	"B"	"C"	"D"	"E"	"F"
2" VENT KIT	33-3/8"	2"	3-1/2"	16-5/8"	6-1/4"	5-3/4"
3" VENT KIT	38-7/8"	3"	4-1/2"	21-1/8"	7-3/8"	6-1/2"

Figure 4-10B *4 Inch Concentric Vent Dimensions (reference the General Venting Section)*



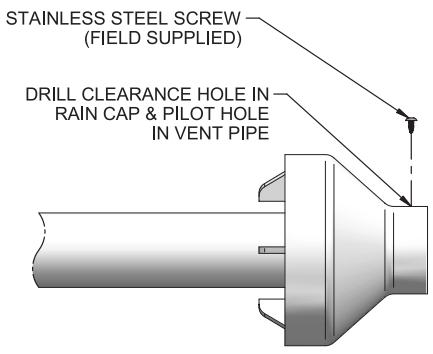
A	B	C	D	E	F	G	H
60" (1524 MM)	4" (102 MM)	6" (152 MM)	21 1/8" (537 MM)	10" (254 MM)	7 5/8" (194 MM)	3" (76 MM)	6 5/8" (168 MM)

NOTICE Instead of cementing the smaller pipe to the rain cap, a field supplied stainless steel screw may be used to secure the two (2) components together when field disassembly is desired for cleaning (see FIG. 4-11).

⚠WARNING When using the alternate screw assembly method, drill a clearance hole in the rain cap and a pilot hole in the vent pipe for the screw size being used. Failure to drill adequate holes may cause cracking of PVC components, allowing combustion products to be recirculated. Failure to follow this warning could result in personal injury or death.

⚠WARNING Do not operate the appliance with the rain cap removed or recirculation of combustion products may occur. Water may also collect inside the larger combustion air pipe and flow to the burner enclosure. Failure to follow this warning could result in product damage or improper operation, personal injury, or death.

Figure 4-11 *Rain Cap to Vent Pipe Alternate Assembly*



3. Install the Y concentric fitting and pipe assembly through the structure's hole from an inside wall.

NOTICE Do not allow insulation or other materials to accumulate inside the pipe assembly when installing through the hole.

4. Install the rain cap and small diameter pipe assembly into the Y concentric fitting and large pipe assembly from an outside wall. Ensure small diameter pipe is bottomed and cemented in the Y concentric fitting for 2 and 3 inch installations and fastened tightly into the rubber adapter for 4 inch installations.

5. Secure the assembly to the structure as shown in FIG. 4-12 using field supplied metal strapping or equivalent support material.

NOTICE Ensure termination location clearance dimensions are as shown in FIG. 4-8.

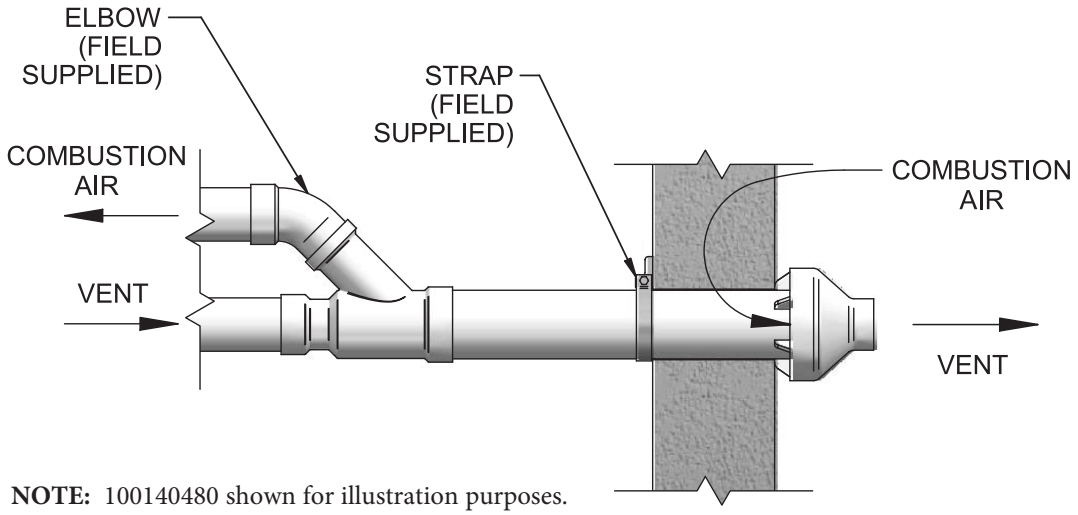
NOTICE If assembly needs to be extended to allow sidewall thickness requirement, the two (2) pipes supplied in the kit may be replaced by using the same diameter, field supplied SDR-26 PVC (D2241) pipe for 2 and 3 inch kits and standard Schedule 40 PVC for 4 inch. Do not exceed dimension "D" more than 60 inches (see FIG.'s 4-10A and 4-10B).

NOTICE If assembly depth needs to be reduced, dimension D can be as short as possible.

4 Sidewall direct venting

Sidewall termination – optional concentric vent

Figure 4-12 *Concentric Vent Sidewall Attachment*



NOTE: 100140480 shown for illustration purposes.

CAUTION DO NOT use field supplied couplings to extend pipes. Airflow restriction will occur and may cause intermittent operation.

6. Cement appliance combustion air and vent pipes to the concentric vent termination assembly. See FIG. 4-12 for proper pipe attachment.

7. Operate the appliance one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

Multi-venting sidewall terminations

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see FIG. 4-13). NEVER common vent or breach vent this appliance. When two (2) or more direct vent appliances are vented near each other, two (2) vent terminations may be installed as shown in FIG. 4-13. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

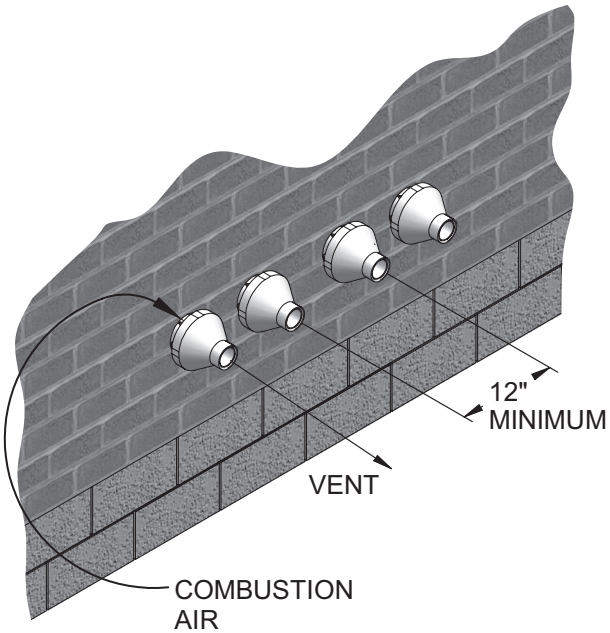


Figure 4-13 *Concentric Vent and Combustion Air Termination*

5 Vertical direct venting

Vent/air termination – vertical

⚠WARNING Follow instructions below when determining vent location to avoid possibility of severe personal injury, death or substantial property damage.

Determine location

Reference the General Venting - Air Intake / Vent Location Section of this manual for required clearances and guidelines on locating vent and air intake terminations.

When using vertical termination methods, follow installation instructions and maintain clearances as shown in this section.

1. The air intake must terminate in a down-turned 180° return pipe with a bird screen installed.
2. The vent pipe must terminate in either an up-turned coupling with a bird screen installed or a stainless steel rain cap.
3. The air intake must terminate at least 6 inches above the roof or snow line.
4. The vent must terminate at least 3 feet (36 inches) above the highest place in which the vent penetrates the roof and at least 2 feet (24 inches) above any part of a building within 10 horizontal feet.
5. The top of the PVC/CPVC or polypropylene vent coupling must be at least 1 foot (12 inches) above the air intake.

   The discharge opening of a stainless steel coupling or rain cap termination must maintain at least 3 feet (36 inches) above the air inlet.
6. The air inlet pipe and vent pipe can be located in any desired position on the roof, but must always be no further than 2 feet (24 inches) apart. This placement avoids recirculation of flue products into the combustion air stream.
7. Do not extend exposed vent pipe outside of building more than shown in this document. Condensate could freeze and block vent pipe.

⚠WARNING Rooftop vent and air inlet terminations must terminate in the same pressure zone, unless vertical vent sidewall air is set up as shown in the General Venting - Vertical Vent, Sidewall Air Section.

Figure 5-1A *PVC/CPVC/Polypropylene Vertical Termination of Air and Vent*

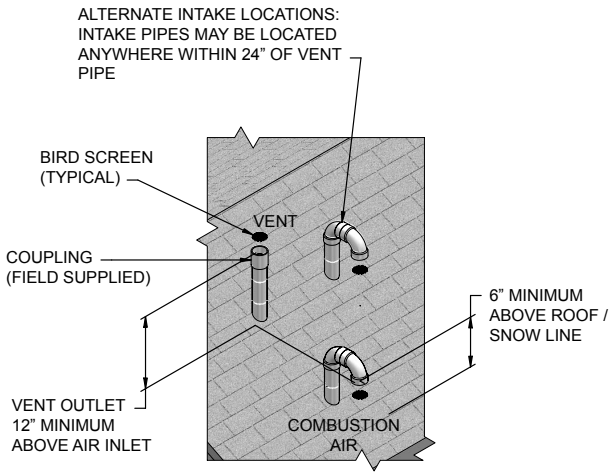
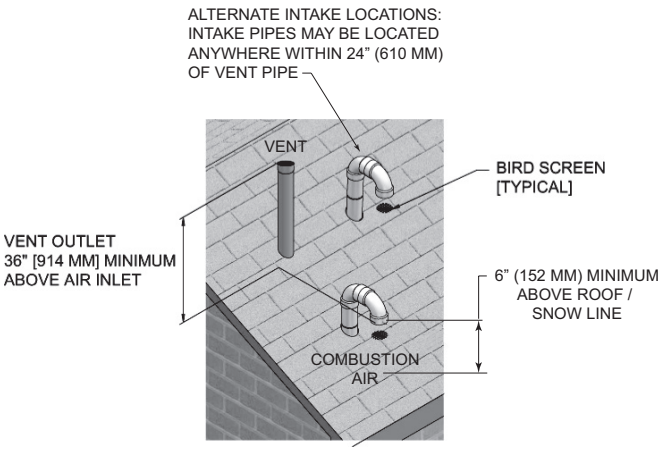


Figure 5-1B *Stainless Steel Vertical Termination of Air and Vent*



Multiple vent / air terminations

Multiple vent terminations must be placed to maintain a minimum clearance of 12 inches (U.S. installations) between the edge of the air inlet and adjacent vent outlet (FIG. 5-2A).

For Canadian installations, provide clearances required by CSA B149.1 Installation Code.

The air inlet of a Knight Wall Hung Fire Tube boiler is part of a direct vent connection. It is not classified as a forced air intake with regard to spacing from adjacent boiler vents.

5 Vertical direct venting

Vent/air termination – vertical

Figure 5-2A *Vertical Terminations with Multiple Boilers*

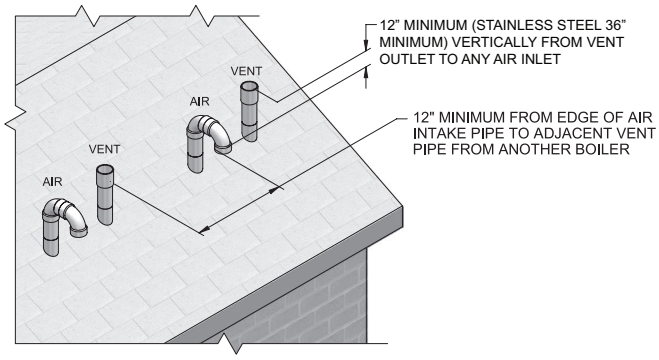
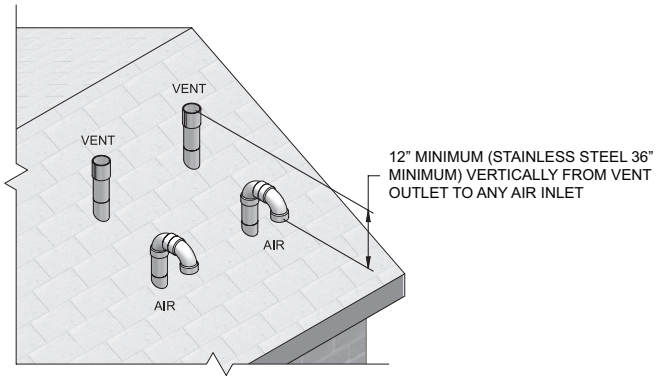


Figure 5-2B *Alternate Vertical Terminations with Multiple Boilers*



⚠WARNING Terminate all vent pipes at the same height and all air pipes at the same height to avoid possibility of severe personal injury, death, or substantial property damage.

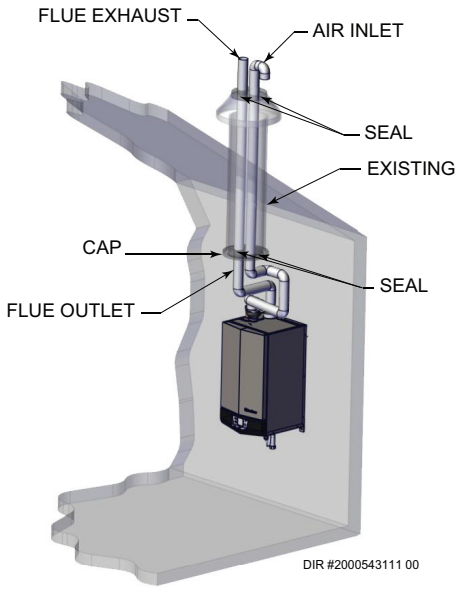
Prepare roof penetrations

1. Cut a hole for the air pipe. Size the air pipe hole as close as desired to the air pipe outside diameter.
2. Cut a hole for the vent pipe. For either combustible or noncombustible construction, size the vent pipe hole with at least a 1/2 inch clearance around the vent pipe outer diameter:
   - 3 1/2 inch hole for 2 inch vent pipe
   - 4 1/2 inch hole for 3 inch vent pipe
   - 5 1/2 inch hole for 4 inch vent pipe
3. Insert a galvanized metal thimble in the vent pipe hole.
4. Maintain clearances as described in both the General Venting and the Vertical Direct Venting sections of this manual.
5. Follow all local codes for isolation of vent pipe when passing through floors, ceilings, and roofs.
6. Provide flashing and sealing boots sized for the vent and air pipe.

Existing vent as a chase

Follow all existing termination and clearance requirements and allowable pipe lengths. Use only approved venting materials listed in the General Venting Section of this manual.

Figure 5-3 *Existing Vent as a Chase*



*For concept illustration only. Individual installations may vary due to job site specific equipment.

5 Vertical direct venting *(continued)*

Vertical termination – optional concentric vent

Lochinvar offers an optional concentric combustion air and vent pipe termination kit. Both combustion air and vent pipes must attach to the termination kit. The kit must terminate outside the structure and must be installed as shown in this section.

Field supplied pipe and fittings are required to complete the installation. The required combustion vent pipe and fittings are listed in the General Venting Section of this manual.

Vertical termination installation

Maintain clearances as described in both the General Venting and the Vertical Direct Venting sections of this manual, where applicable.

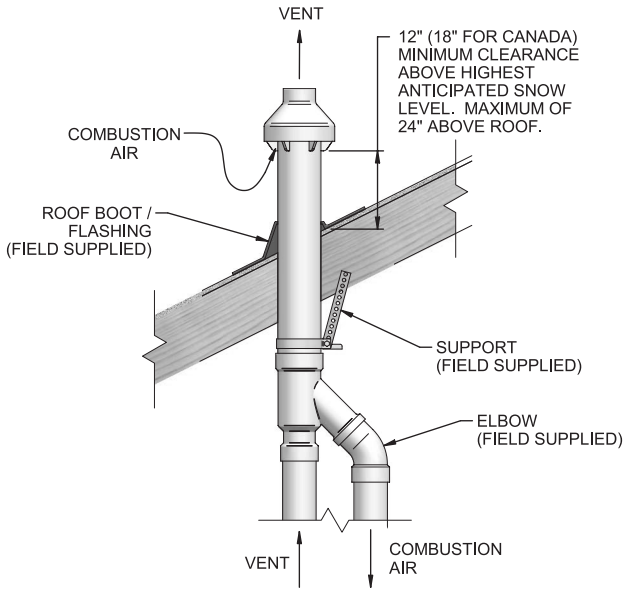
1. Cut one (1) hole (5 inch diameter for 2 inch installations, 4 inch diameter for 3 inch installations, or 7 inch diameter for 4 inch installations) into the structure to install the termination kit.
2. Partially assemble the concentric vent termination kit. Clean and cement following the cleaning procedures in these instructions.
   a. Cement the Y concentric fitting to the larger diameter kit pipe.
   b. Cement rain cap to the smaller diameter kit pipe.

   See the Sidewall Direct Venting - Optional Concentric Vent Section for details.
3. Install the Y concentric fitting pipe assembly up through the structure's hole and field supplied roof boot/flashing.
4. Secure the assembly to the roof structure as shown in FIG. 5-4 using field supplied metal strapping or equivalent support material.
5. Cement the appliance combustion air and vent pipes to the concentric vent termination assembly. See FIG. 5-4 for proper pipe attachment.
6. Operate the appliance through one (1) heat cycle to ensure combustion air and vent pipes are properly connected to the concentric vent termination connections.

NOTICE Instead of cementing the smaller pipe to the rain cap, a field supplied stainless steel screw may be used to secure the two (2) components together when field disassembly is desired for cleaning.

⚠WARNING When using the alternate screw assembly method, drill a clearance hole in the rain cap and a pilot hole in the vent pipe for the screw size being used. Failure to drill adequate holes may cause cracking of PVC components, allowing combustion products to be recirculated. Failure to follow this warning could result in personal injury or death.

Figure 5-4 *Concentric Vent Vertical Installation*



⚠WARNING Do not operate the appliance with the rain cap removed or recirculation of combustion products may occur. Water may also collect inside the larger combustion air pipe and flow to the burner enclosure. Failure to follow this warning could result in product damage or improper operation, personal injury, or death.

NOTICE Do not allow insulation or other materials to accumulate inside the pipe assembly when installing through the hole.

NOTICE Ensure termination height is above the roof surface or anticipated snow level (12 inches in U.S.A. or 18 inches in Canada) as shown in FIG. 5-4.

NOTICE If assembly is too short to meet height requirement, the two (2) pipes supplied in the kit may be replaced by using the same diameter, field supplied SDR-26 PVC (D2241) pipe for 100140480/100140485 and standard schedule 40 PVC for 4 inch. Do not extend dimension "D" more than 60 inches. Refer to the Sidewall Direct Venting - Optional Concentric Vent Section.

CAUTION DO NOT use field supplied couplings to extend pipes. Airflow restriction will occur.

5 Vertical direct venting

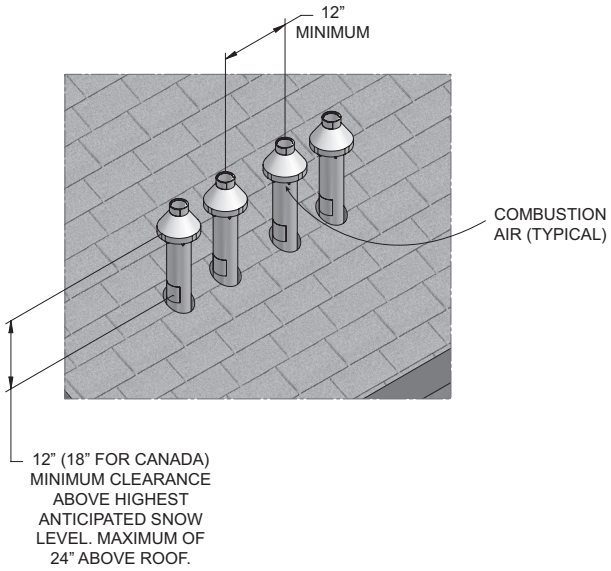
Vertical termination – Concentric vent kit

Figure 5-5 *Do Not Install U-Bend to Rain Cap*

Multi-venting vertical terminations

When two (2) or more direct vent appliances are vented near each other, each appliance must be individually vented (see FIG. 5-6). NEVER common vent or breach vent this appliance. When two (2) or more direct vent appliances are vented near each other, two (2) vent terminations may be installed as shown in FIG. 5-6. It is important that vent terminations be made as shown to avoid recirculation of flue gases.

Figure 5-6 *Multiple Concentric Vent Terminations*



5 Vertical direct venting *(continued)*

Vertical termination - Alternate concentric venting

This appliance may be installed with a concentric vent arrangement where the vent pipe is routed through an existing unused venting system or by using the existing unused venting system as a chase for vent and combustion air routing.

Concentric venting arrangement

The venting is to be vertical through the roof. The annular space between the O.D. of the vent pipe and the I.D. of the existing unused venting system is utilized for the combustion air source.

The minimum size of the existing vent system required to achieve enough annular space for combustion air can be found in Table 5A below.

The upper and lower termination as well as any other unsealed joints in the existing vent system **must be** sealed to ensure that all combustion air is drawn from under the vent cap as shown in FIG.'s 5-7A and 5-7B.

Approved venting materials must be used as specified in the General Venting Section of this manual.

Follow all vent / air termination and clearance requirements per this section to the appropriate example. Installation must comply with local requirements and with the National Fuel Gas Code.

The maximum allowable equivalent vent and air intake lengths for this venting arrangement are to be determined from the General Venting Section.

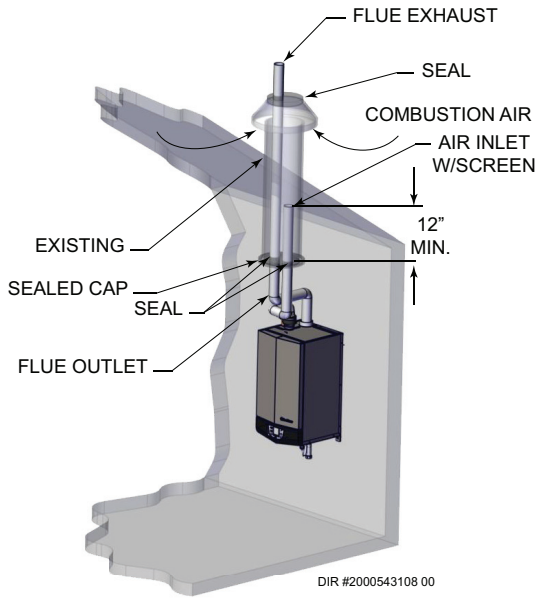
If an existing unused venting system is converted for use with this method of concentric venting, the installer must ensure that the existing venting system is clean and free from particulate contamination that will harm this appliance and cause increased nuisance calls or maintenance. See the Corrosive Contaminants and Sources table in the Determine Boiler Location Section for a list of corrosive contaminants and sources.

Two example scenarios of a concentric venting arrangement are shown for illustrative purposes in FIG.'s 5-7A and 5-7B.

Table 5A *Alternate Vertical Concentric Vent / Chase Sizes*

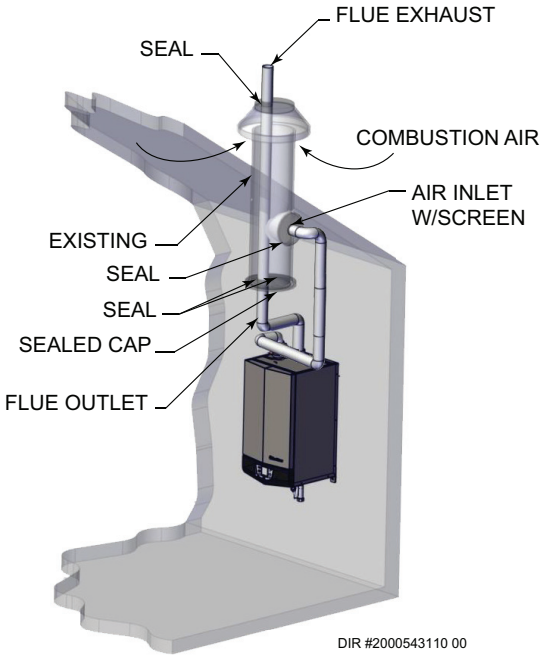
Vent / Air Inlet Size	Minimum Existing Vent / Chase Size
2 inch	4 inch
3 inch	5 inch
4 inch	7 inch

Figure 5-7A *Concentric Vent Example 1*



*For concept illustration only. Individual installations may vary due to job site specific equipment.

Figure 5-7B *Concentric Vent Example 2*



*For concept illustration only. Individual installations may vary due to job site specific equipment.