REZNOR®

Form I-SHH-V (Version .3)
Obsoletes I-SHH-V (Version .2)

# Installation of Vent/Combustion Air System with Vent Condensate Drain

Applies to: **High-Efficiency Model SHH**


## FOR YOUR SAFETY

**If you smell gas:**

- **Open windows.**
- **Do not touch any electrical switches.**
- **Extinguish any open flame.**
- **Immediately call your gas supplier.**

## FOR YOUR SAFETY

**The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.**

## WARNING:

**Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.**

## WARNING:

**Do not use an existing venting system. A Model SHH heater requires installation of the combustion air/vent system specifically designed for a high efficiency unit. Use the kit ordered with the Model SHH heater, either Option CC6 for a horizontal terminal or Option CC2 for a vertical terminal. Failure to comply could result in severe personal injury or death and/or property damage.**

## Contents



## 1. General

This manual applies only to venting and combustion air inlet instructions and **must** be used with the Model SHH installation manual, Form I-PDH/SDH/PEH/SHH, P/N 211408. Both manuals are shipped with the heater. If either manual is missing, contact your distributor before beginning installation. **The instructions in this manual apply only to high efficiency Model SHH.**

### CAUTION

**Model SHH heaters should not be used in an application where the heated space temperature is below 50°F. The combination of low space and combustion air temperatures may result in condensate freezing in the secondary heat exchanger and/or the condensate drain.**

## 2. Venting and Combustion Air Requirements for High Efficiency, Separated-Combustion Model SHH

Venting must be in accordance with local codes and the National Fuel Gas Code NFPA 54 / ANSI Z223.1 or CAN/CSA B149.1 Natural Gas and Propane Installation Code. Local requirements supersede national requirements.

Model SHH units MUST BE equipped with both combustion air and exhaust piping to the outdoors. The unique concentric adapter box required with this heater allows for both combustion air and exhaust piping with only one horizontal or vertical penetration hole in the building.

Concentric horizontal and vertical vent/combustion air systems (Option CC6 or CC2) are the only venting/combustion air systems approved for Model SHH separated-combustion high-efficiency heaters.

Model SHH units are certified as Category IV heaters. This heater is very thermal efficient and will produce condensate during operation. Both the heater and its venting system must be connected to a drain.

Read and understand all requirements and applicable instructions before beginning installation. Some field-supplied components will vary by installation; make notes of items needed.

The following factory-shipped parts must be at the installation site:

| Description | Shipped | P/N |
|---|---|---|
| Either ONE of the Vent/Inlet Combustion Air Kits, See FIGURE 10, page 9: | | |
| Kit for Horizontal Vent Terminal, Option CC6 | In a Separate Carton | **221247** |
| Kit for Vertical Vent Terminal, Option CC2 | | **221248** |

## 2.1 Type, Size, and Lengths of Pipe

Provide field-supplied pipe in the types listed. Sealant, hardware, and supports appropriate for the type of pipe must also be supplied. Read the instructions for the type (vertical or horizontal) of vent/combustion air system being installed to determine length requirements.

**Vent Pipe (indoor and outdoor)** - Schedule 40 PVC or CPVC pipe. In Canada, all PVC vent pipe must be approved to ULC 636.

Indoor **Combustion Air Inlet Pipe** - Sealed PVC drain pipe or sealed, single-wall galvanized pipe.

Outdoor section of **Combustion Air Inlet Pipe** - Sealed, single-wall galvanized pipe.

Minimum length of indoor pipes between the heater and the concentric adapter box is 3 ft (914mm). The minimum/maximum requirements of the length of vent pipe that extends outdoors are different for horizontal and vertical vent terminals.Determine the outdoor length from the instructions for Option CC2 or Option CC6,

### Vent Pipe Diameter and Maximum Vent Run Length

**Vent Pipe Diameter and Maximum Vent Pipe Length from Heater to Terminal End for Vertical and Horizontal Vent**

| Model SHH | Vent Pipe Diameter | | Maximum Vent Pipe Length | | Equivalent Straight Length for a 90° Sweep Elbow | | Equivalent Straight Length for a 45° Elbow | |
|---|---|---|---|---|---|---|---|---|
| | inches | mm | feet | M | feet | M | feet | M |
| 130, 180, 260 | 4 | 102 | 50 | 15.2 | 8 | 2.4 | 4 | 1.2 |
| 350 | | | 40 | 12.2 | | | | |

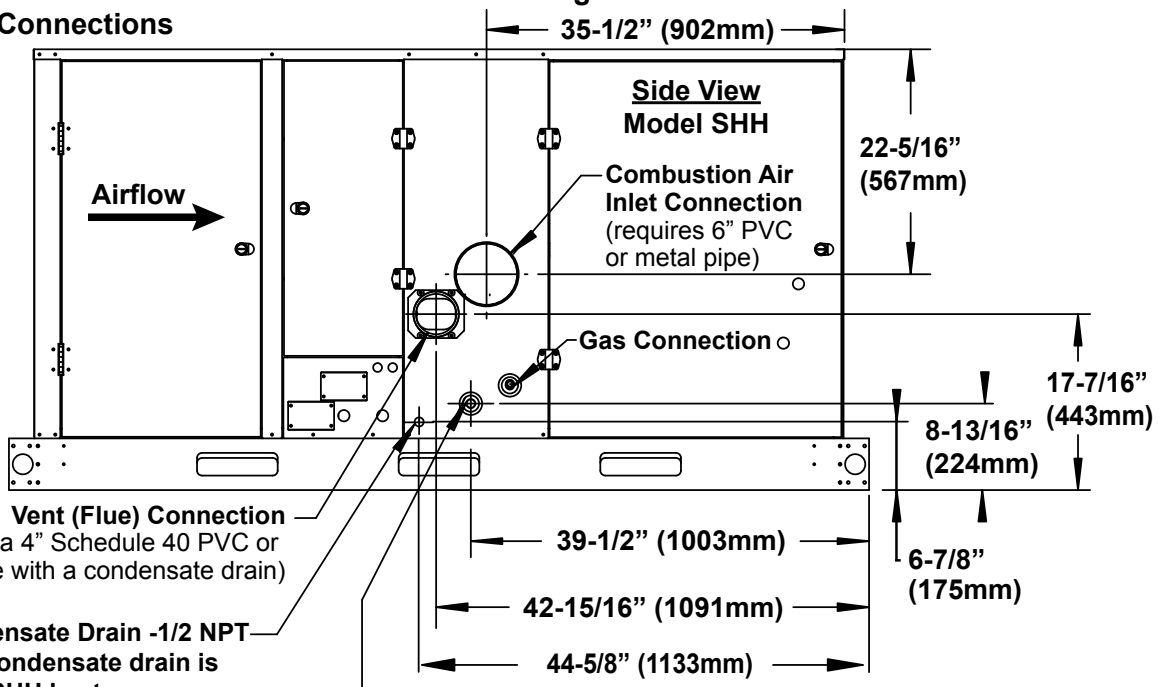
### Combustion Air Pipe Diameter and Length

**Diameter and Length of the Combustion Air Inlet Pipe**

| Model SHH 130, 180, 260, 350 | Diameter | Length |
|---|---|---|
| Section From Heater to Concentric Adapter Box (all indoor) | 6" (152mm) | Same as Vent Pipe |
| Section From Concentric Adapter Box to Outdoor Terminal | 8" (203mm) | See Instructions for Option CC2 or CC6 |

## 2.2 Venter Outlet and Combustion Air Inlet Connections at the Heater

**FIGURE 1 - Control Side of a Model SHH Heater showing the Locations of Both Inlet Air and Venter Outlet Connections**




**Vent (Flue) Connection**
(requires a 4" Schedule 40 PVC or CPVC pipe with a condensate drain)

**Burner Condensate Drain -1/2 NPT**
**This burner condensate drain is on all Model SHH heaters.**
-- If the system includes a cooling module (Option AU), install a drain line with a trap.
-- If the system does not include a cooling module, put a cap on this connection.

**Secondary Heat Exchanger Condensate Drain Connection, 1/2" PVC**
(Always requires a drain line with a trap. Refer to the heater installation manual.)

## 2. Venting and Combustion Air Requirements (cont'd)

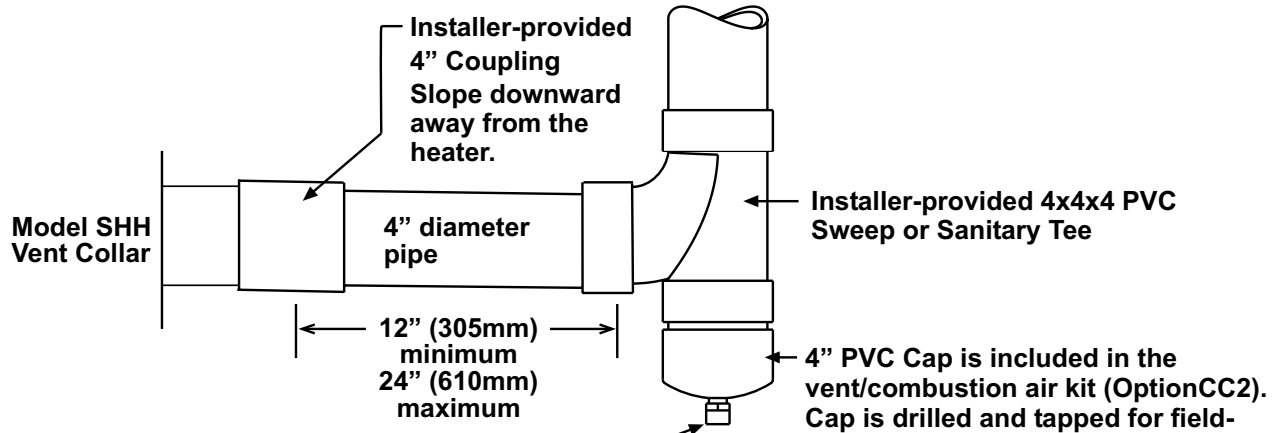
### 2.3 Vent Condensate Drain Connection

A condensate drain is required in the vent pipe. See **FIGURES 2A and 2B** for vertical vent or **FIGURES 3A and 3B** for horizontal vent run with either horizontal or vertical terminal. For Canadian installation, refer to **FIGURE 2B or 3B** only. In Canada, all PVC vent pipe used must be approved to ULC S636.

The 4" PVC cap with drain connection opening shown in **FIGURES 2A and 3A** is supplied with every heater. The drain connection, drain piping, and 4x4x4 PVC vent pipe tee are field supplied. All of the vent and drain components shown in **FIGURES 2B and 3B** are field supplied.

**FIGURE 2A - U.S. INSTALLATION ONLY - Vertical Vent showing Where to Install the Condensate Drain Connection using factory-provided 4" PVC Cap**

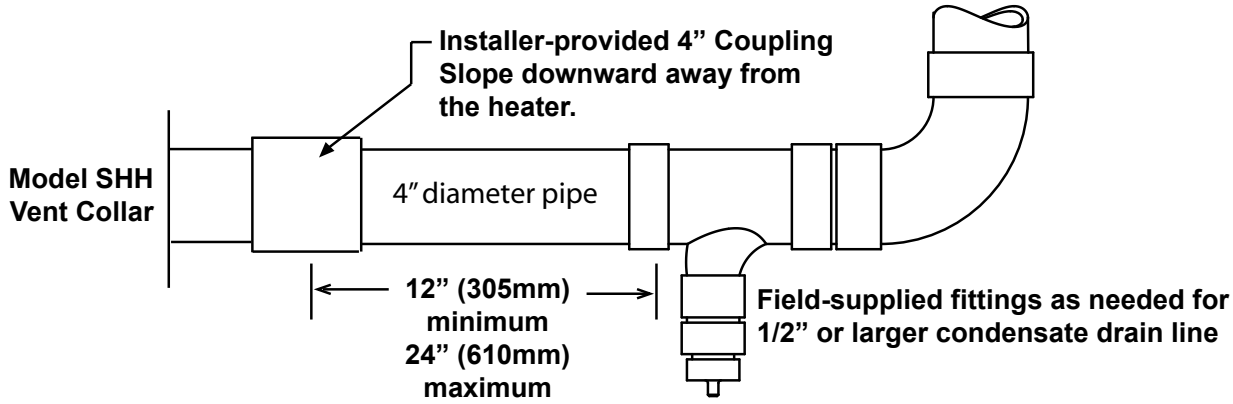
**THIS PVC PIPING ARRANGEMENT APPLIES TO U.S. INSTALLATIONS ONLY;**
**IT DOES NOT APPLY TO CANADIAN INSTALLATIONS.**




Both the vent condensate drain and the heat exchanger condensate drain require a trap and must go into a sanitary drain. (See Paragraph 4, page 18, for requirements on installing the condensate drain.) All drain parts except the 4" PVC cap shown here are field supplied.

**FIGURE 2B - CANADIAN OR U.S. INSTALLATION Vertical Vent showing Where to Install the Condensate Drain Connection**

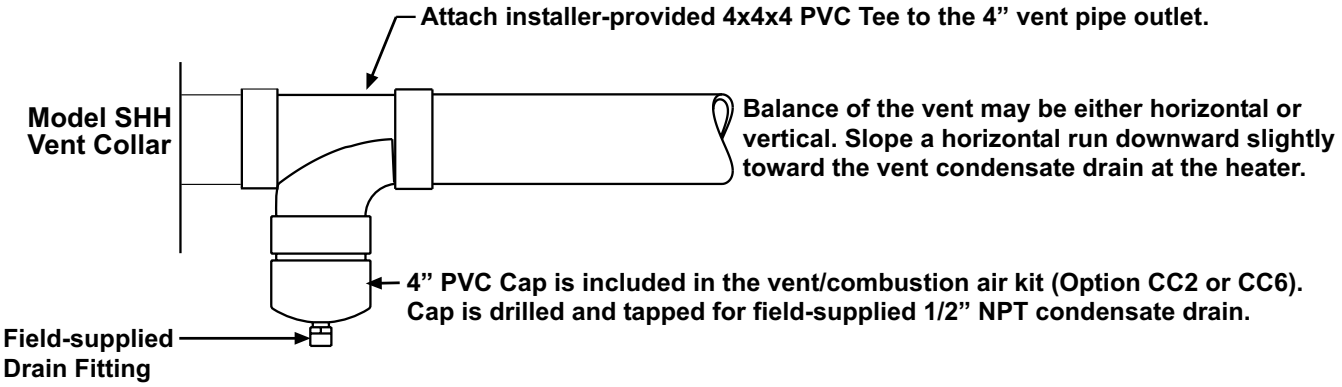
**THIS PVC PIPING ARRANGEMENT APPLIES TO ALL CANADIAN INSTALLATIONS.**
**In Canada, all PVC vent pipe must be approved to ULC S636. All PVC venting and drain parts in this illustration are field supplied. This is an acceptable alternate PVC piping arrangement for installations in the United States.**




Both the vent condensate drain and the heat exchanger condensate drain require a trap and must go into a sanitary drain. (See Paragraph 4, page 18, for requirements on installing the condensate drain.) ALL vent and drain parts in this illustration are field supplied.

**FIGURE 3A - U.S. INSTALLATION ONLY - Horizontal or Vertical Vent showing Where to Install the Condensate Drain Connection in the Horizontal Vent Run using factory-provided 4" PVC Cap**

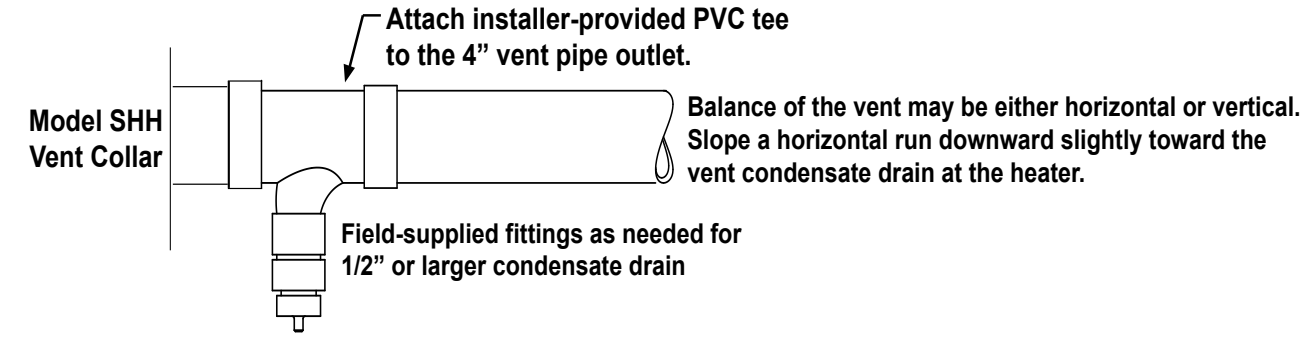
**THIS PVC PIPING ARRANGEMENT APPLIES TO U.S. INSTALLATIONS ONLY;**
**IT DOES NOT APPLY TO CANADIAN INSTALLATIONS.**




Both the vent condensate drain and the heat exchanger condensate drain require a trap and must go into a sanitary drain. (See Paragraph 4, page 18, for requirements on installing the condensate drain.) All drain parts except the 4" PVC cap shown here are field supplied.

**FIGURE 3B - CANADIAN OR U.S. INSTALLATION Horizontal or Vertical Vent showing Where to Install the Condensate Drain Connection in the Horizontal Vent Run**

**THIS PVC PIPING ARRANGEMENT APPLIES TO ALL CANADIAN INSTALLATIONS.**
**In Canada, all PVC vent pipe mustbe approved to ULC S636. All venting and drain parts in this illustration are field supplied. This is an acceptable alternate PVC piping arrangement for installations in the United States.**




Both the vent condensate drain and the heat exchanger condensate drain require a trap and must go into a sanitary drain. (See Paragraph 4, page 18, for requirements on installing the condensate drain.) ALL vent and drain parts in this illustration are field supplied.

## 2.4 Joints

Provide pipes and fittings as required. **When ready to install the vent system, follow the instructions below to make joints.**

### Combustion Air Pipe

**Single-wall Metal Pipe** - Secure metal, 6" diameter, single-wall combustion air pipe to the inlet air collar and at all slip-joint connections with sheetmetal screws or rivets. Seal all joints and seams in the combustion air pipe with aluminium tape or silicone sealant.

Follow the instructions for the horizontal or vertical vent/combustion air terminal in Paragraph 3.1 or 3.2 for attaching the outdoor section of 8" diameter, single-wall, metal combustion air pipe.

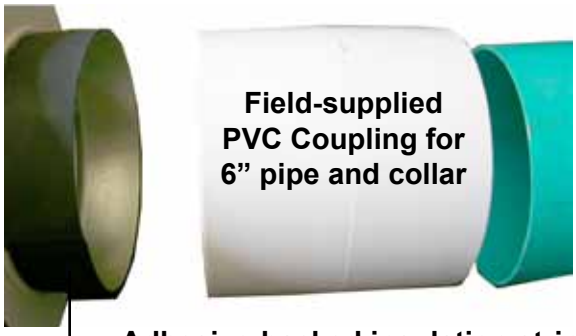
**PVC Drain Pipe (used for indoor portion of combustion air pipe) -** Insulation and a coupling are required where the combustion air pipe attaches to the inlet air collar on the heater. The insulation is provided with the unit; it is shipped in the Literature Bag with this manual. The coupling to fit over the 6" collar, sealant, and sheetmetal screws are field supplied. See illustration and instructions in **FIGURE 4**.

## 2. Venting and Combustion Air Requirements (cont'd)

## 2.4 Joints (cont'd)

### Combustion Air Pipe (cont'd)

**FIGURE 4 - Use a field-supplied coupling to attach a PVC Combustion Air Pipe to the Flue Collar on the Heater**




1. On the side of the heater, locate the combustion air inlet collar. Position the insulation strip (shipped in the literature bag) around the collar. Remove the backing and carefully adhere the insulation to the collar.
2. Slide the coupling over the insulated collar. Attach the coupling to the collar with four sheetmetal screws spaced evenly around the collar.
3. At the heater cabinet, use silicone sealant and seal completely around the end of the coupling.

The 6" PVC drain pipe will slide into the coupling. When installing the combustion air run, secure and seal the pipe to the coupling. Secure and seal all joints in the combustion air run between the heater and the concentric adapter box.

### Vent Pipe

The Schedule 40 PVC or CPVC vent system should be installed in a manner consistent with normal industry standards and in compliance with all local fire and building code requirements. Failure to follow proper installation practices, procedures, or techniques can result in system failure, property damage, or personal injury. The installer is responsible for the installation. Read all of the procedures below before beginning installation. Make joints one at a time as pipe and fitting should be assembled quickly while cement is fluid.

**1. Cut the pipe square.** An angled cut may result in joint failure.

a) Remove burrs using a deburring tool, a file, or a knife edge. Remove all burrs from the inside and outside diameter of the cut end of the pipe. Chamfer (bevel) the end of the pipe 10° to 15°.

b) Use a clean dry cloth to remove surface dirt, grease, and moisture from the pipe sections and fittings.

**2. Check for Proper Fit**

With light pressure, test the fit. A dry pipe should go one-half to one-third of the way into the fitting hub. Do not use pipe or fittings that are too tight or too loose.

**3. Primer, Cement, and Applicator Requirements**

a) Primer for joints should conform to ASTM F 656.

b) Cement for joints should conform to ASTM D 2564.

c) Use a 2-3" applicator brush for the 4" pipe and fittings.

**4. Applying Primer and Cement** (NOTE: Make joints one at a time as pipe and fitting should be assembled quickly while cement is fluid.)

a) Apply primer to pipe and fitting surfaces. Do not allow primer to puddle inside the system.

b) Apply a first coat of cement on the pipe O.D. Apply a full even layer of cement for a distance slightly greater than the depth of the socket of the coupler (fitting).

c) Coat the coupler (fitting) socket with a medium layer of cement, avoiding puddling inside the system.

d) Apply a second full even layer of cement on the pipe O.D.

**5. Join Pipe and Coupler (fitting)**

Assemble pieces quickly while cement is fluid. Insert the pipe into the coupler (fitting) until it touches the socket bottom. Turn the pipe a quarter turn. Hold the joint together until the pipe will not pull out.

Clean excessive cement from the exterior. A properly made joint will have a continuous bead of cement around the perimeter.

## 2.5 Support

**Vent Pipe Support** - For continued safe operation, the vent system must be properly supported. A ten-foot (3M) length of pipe weighs 20 pounds (9kg) and has an expansion rate of four times that of metal pipe.

Horizontal CPVC or PVC vent must be supported every six feet (1.8M). The hangers should provide as much bearing surface as possible and must be free of sharp edges and burrs. Hangers must allow the pipe to expand laterally. Consider pipe expansion when placing hangers. Changes in pipe direction will allow for expansion. Hangers must be placed to allow for some direction movement. The slip joint at the concentric adapter is designed to permit some limited expansion. DO NOT USE THE HEATER OR CONCENTRIC ADAPTER BOX TO PROVIDE VENT PIPE SUPPORT.

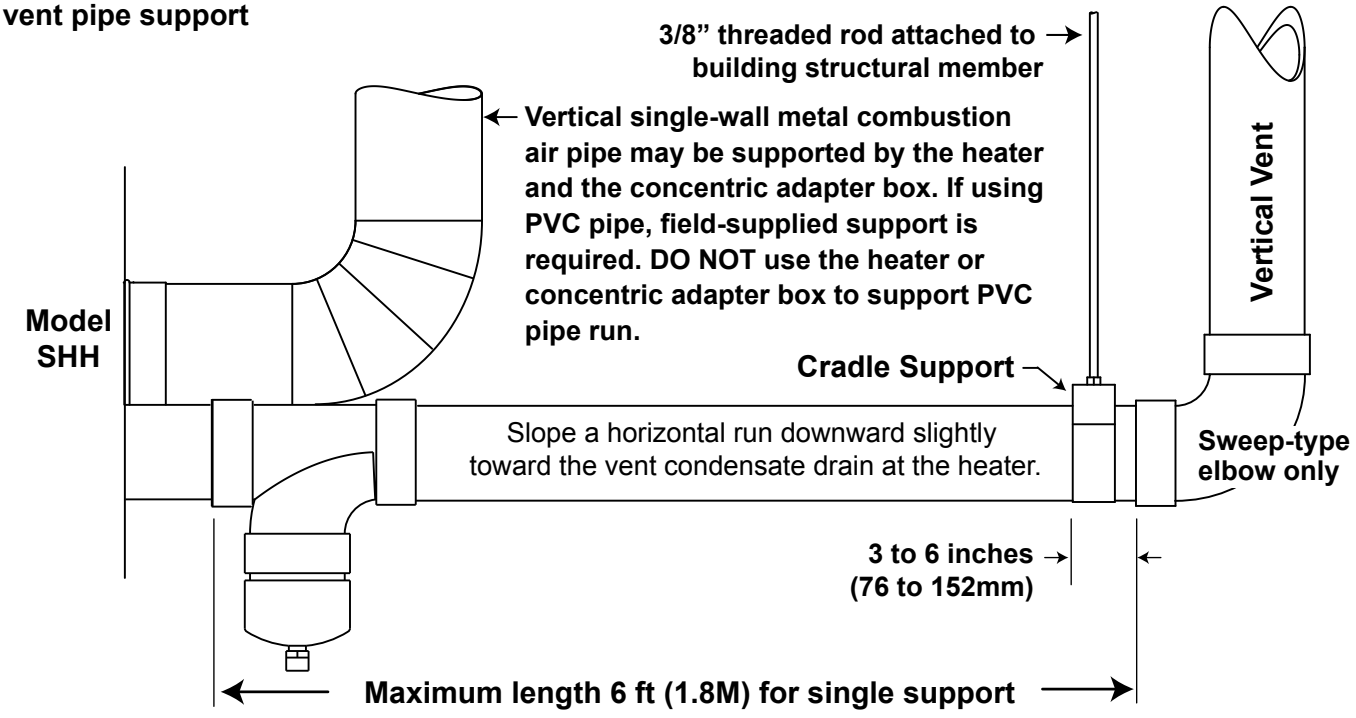
For a vertical CPVC or PVC vent, it is recommended that an engineer design the vertical support system. An acceptable support for a simple vertical vent that is 30 feet (9.1M) or less and rises closely from the heater is illustrated in **FIGURE 5**. DO NOT USE THE HEATER OR CONCENTRIC ADAPTER TO PROVIDE VENT PIPE SUPPORT.

**Combustion Air Pipe Support** - Support a horizontal combustion air run of either metal or PVC pipe a minimum of every six feet (1.8M).

Support a **vertical single-wall metal combustion air pipe** in accordance with accepted industry practices. The heater and concentric adapter box may be used to support a vertical combustion air pipe.

Support a **vertical PVC combustion air pipe** in accordance with accepted industry practices. DO NOT USE THE HEATER OR CONCENTRIC ADAPTER TO PROVIDE SUPPORT FOR PVC PIPE.

**FIGURE 5 - To allow for expansion, use a field-supplied cradle-type vent pipe support**



## 2. Venting and Combustion Air Requirements (cont'd)

### 2.6 Pipe Clearance

Do not install the vent piping near any high temperature steam lines, radiant heaters, or other sources of heat.

If using PVC drain pipe for combustion air, do not install the combustion air piping near any high temperature steam lines, radiant heaters, or other sources of heat

### 2.7 Concentric Adapter Box

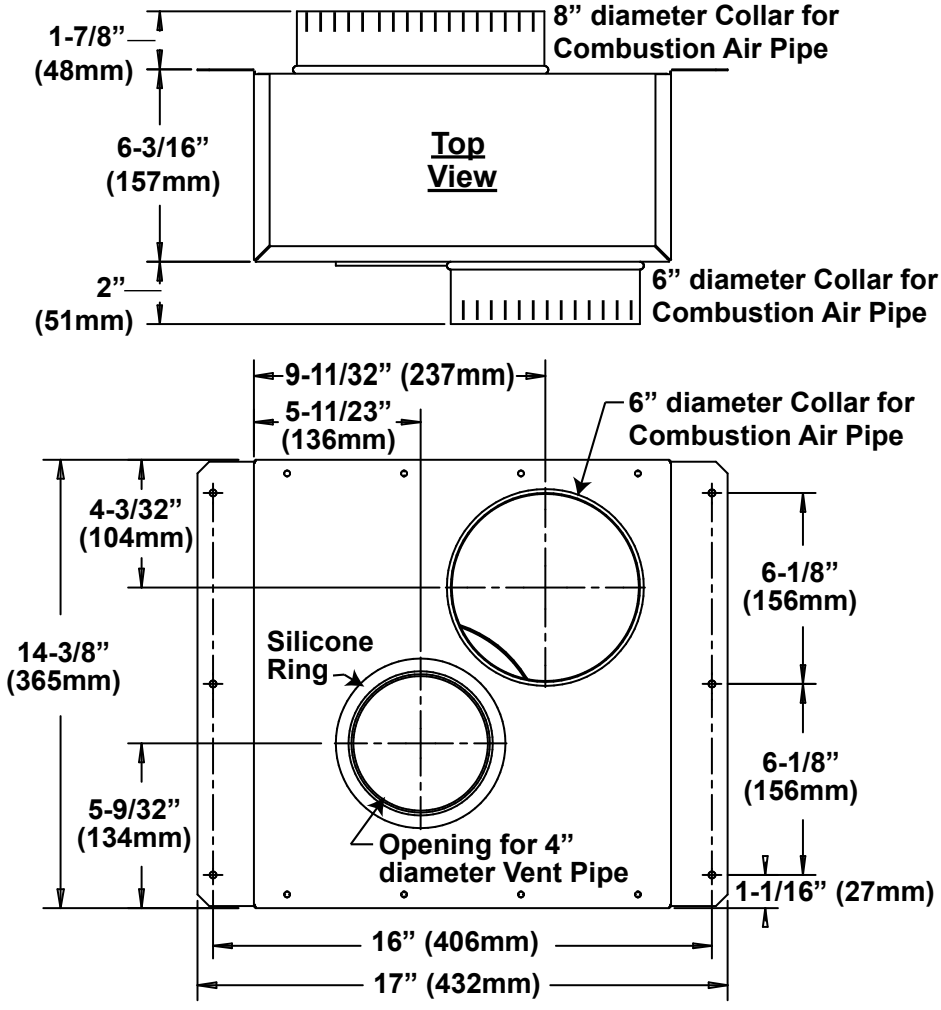
All Model SHH installations require a concentric adapter box as illustrated in **FIGURES 6, 7, 8, and 9**. The concentric adapter box is included in both the horizontal and vertical vent/combustion air kits. Installation is included in the Option CC6 and Option CC2 instructions.

**FIGURE 6 - A Concentric Adapter Box is a Required Part of all Model SHH Installations**

A vent/combustion air kit which includes the concentric adapter box is ordered with the heater. A horizontal terminal vent/combustion air kit is Option CC6; a vertical terminal vent/combustion air kit is Option CC2.

**Heater Side View of the Concentric Adapter Box**

**FIGURE 7 - Concentric Adapter Box Dimensions**




**Concentric Box Side View (side toward the heater)**

**FIGURE 8 - Concentric Adapter Box Airflow**

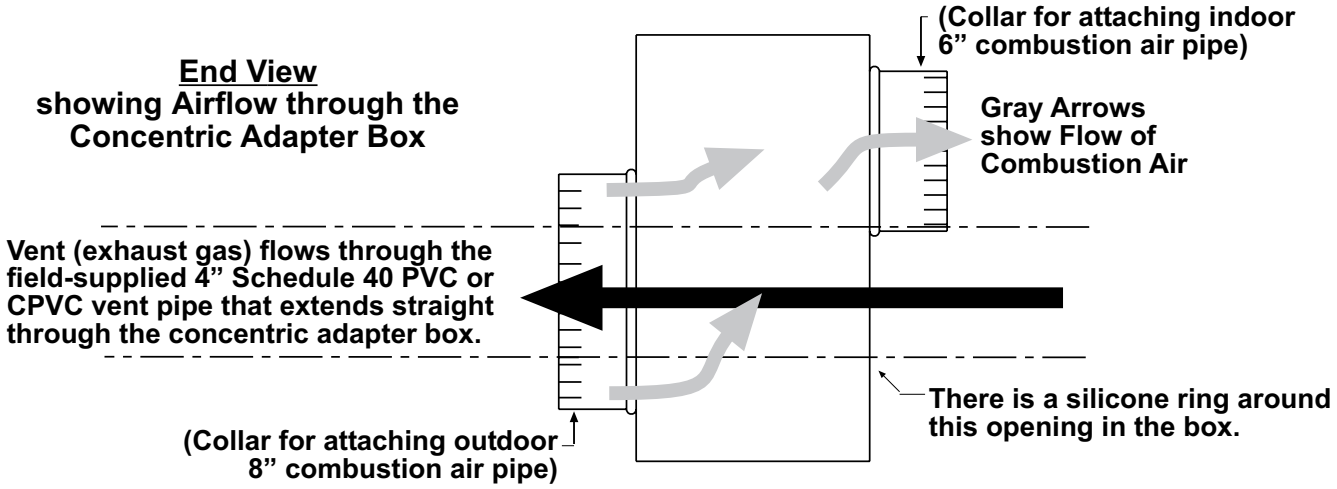
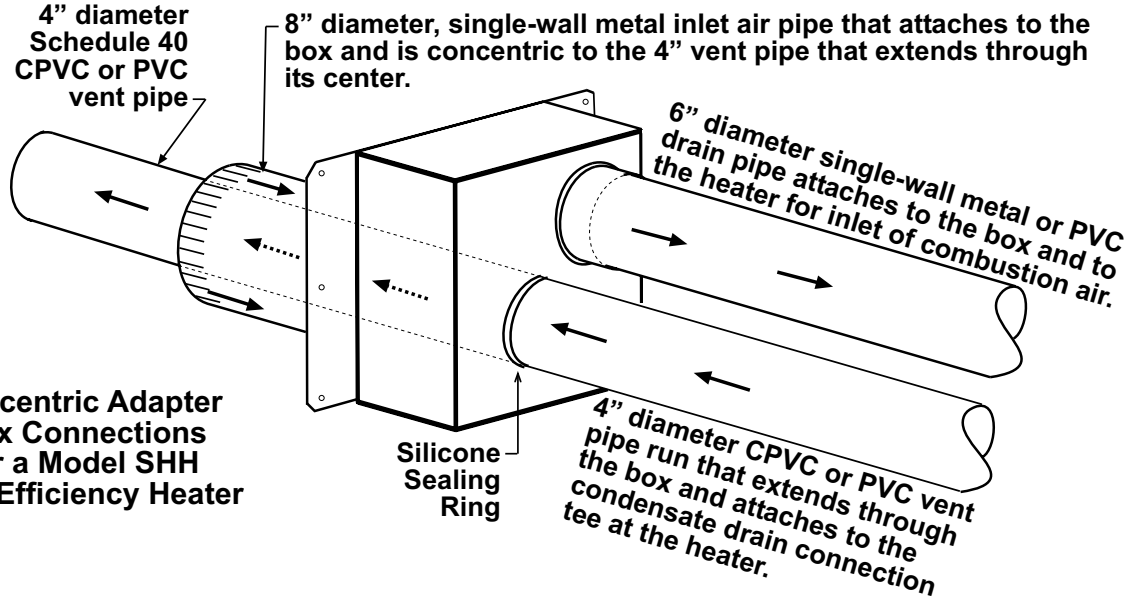
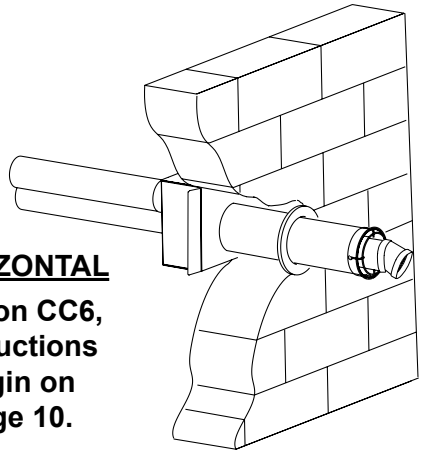



**FIGURE 9 - Concentric Adapter Box Connections**




# IS THE VENT TERMINAL HORIZONTAL OR VERTICAL?

**FIGURE 10 - Typical Horizontal and Vertical Vent Terminals for Model SHH - follow the instructions that apply.**

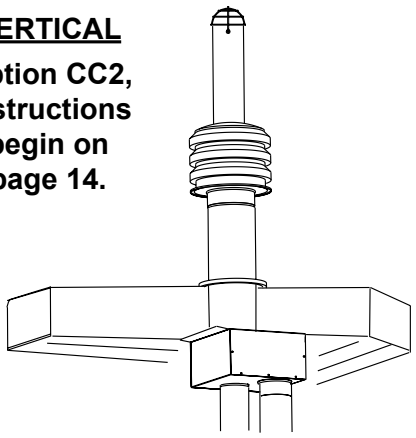


**HORIZONTAL**

**Option CC6, instructions begin on page 10.**

**VERTICAL**

**Option CC2, instructions begin on page 14.**



## 3. Combustion Air Inlet/Vent Terminal Instructions

## 3.1 HORIZONTAL VENT TERMINAL Installation - Option CC6

**Parts in the Horizontal Vent/Combustion Air Terminal Package (Option CC6)**

**Components Required - Factory and Field**

| **Complete Horizontal Vent/Combustion Air Terminal Kit (Same as Option CC6), P/N 221247** | | |
|---|---|---|
| **Qty** | **P/N** | **Description** |
| 1 | 221069 | Concentric Adapter Box with Silicone Sealing Ring (See **Paragraph 2.7**, pages 8-9.) |
| 1 | 221089 | Bird Screen for Exhaust Outlet  |
| 1 | 124940 | Ring Guard for Air Inlet  |
| 4 | 37661 | #10-16x1/2" lg Screws to attach the inlet air guard |
| 4 | 221186 | Spacers for inlet air guard |
| 1 | 221091 | 4" PVC Cap for Vent Condensate Drain Connection (See **FIGURE 2A and 3A** on page 4 and 5.) |

Field-supplied requirements:

- Vent pipes and fittings as illustrated in **FIGURE 2A, 2B, 3A or 3B** on pages 4 and 5 and an elbow (22.5° elbow if available) as shown in **FIGURE 11**, page 13
- Combustion air pipes (6” and 8” single-wall galvanized pipe)
- Flashing
- Sheetmetal screws, tape, primer, cement, and sealant as required

Before beginning, verify that the kit is at the site and that all components are correct for the installation. Be sure all required field-supplied parts are available.

**Installation Instructions for Horizontal Vent/ Combustion Air Kit Option CC6**
(in compliance with requirements in Paragraph 2)

**1. Determine the location on the outside wall for the vent/combustion air terminal.** Location must comply with vent length requirement in Paragraph 2.1 on page 3. Also, read the “Hazards of Chlorine” in the heater installation manual concerning location of the combustion air inlet.

In most applications, the terminal will be on approximately the same level as the heater. Allow for 1/4” per foot (6mm per 305mm) **downward pitch of the vent pipe from the concentric adapter toward the heater** for condensate to drain.

Minimum clearances for the horizontal vent terminal are shown in the table on page 11. Avoid positioning the vent terminal above a walkway as there may be a small amount of condensate that drips from the end of the vent/combustion air terminal. In cold climates, the condensate may form icicles. Also, select a location that complies with adjoining building clearances as shown in **FIGURE 11**, page 13.

Products of combustion can cause discoloring of some building finishes and deterioration of masonry materials. Applying a clear silicone sealant that is normally used to protect concrete driveways can protect masonry materials. If discoloration is an esthetic problem, re-locate the vent or install a vertical vent.

**WARNING: In climates with below freezing temperatures, condensate may form icicles on the vent terminal. Locate the terminal where a falling icicle would not be a hazard.**

**WARNING: All vent terminals must be positioned or located away from fresh air intakes, doors and windows to preclude combustion products from entering occupied space. Failure to comply could result in severe personal injury or death and/ or property damage.**

### Clearances to Horizontal Vent Terminal

| Structure | Minimum Clearances for Vent Terminal Location (all directions unless specified) |
|---|---|
| Forced air inlet within 10 ft (3.1M)* | 3 ft (0.9M) above |
| Combustion air inlet of another appliance | 6 ft (1.8M) |
| Door, window, or gravity air inlet (any building opening) | 4 ft (1.2M) horizontally |
| | 4 ft (1.2M) below |
| | 1 ft (305mm) above |
| Electric meter, gas meter ** and relief equipment | U.S. - 4 ft (1.2M) horizontally |
| | Canada - 6 ft (1.8M) |
| Gas regulator ** | 3 ft (0.9M) horizontally |
| Adjoining building or parapet | 6 ft (1.8M) |
| Adjacent public walkways | 7 ft (2.1M) above |
| Grade (ground level) | 3 ft (0.9M) above*** |
| *Does not apply to the inlet of a direct vent appliance. **Do not terminate the vent directly above a gas meter or service regulator. *** Consider local snow depth conditions. The vent must be at least 6” (152mm) higher than anticipated snow depth. | |

**2. Install the vent pipe and combustion air pipe runs (from the heater to near the location selected through the wall).**

- Use the type of pipe specified in Paragraph.2.1, page 3.
- Comply with the requirements in Paragraph 2.2 and 2.3, pages 3-5, when attaching pipes to the heater and installing the condensate drain connection in the vent.
- Overall vent length must comply with the table in Paragraph 2.1, page 3
- Make all joints according to the instructions in Paragraph 2.4 page 5-7. Extend the runs close to the wall location selected in Step 1 above. Provide 1/4” per foot (6mm per 305mm) **downward pitch of the vent pipe toward the heater** for condensate to drain (**NOTE**: The vent pipe will extend through the wall after the concentric adapter box is installed. The indoor combustion air pipe will end at the concentric adapter box.)
- Support pipes as required in Paragraph 2.5, page 7.

**3. Prepare a 9” diameter clearance hole through the outside wall for the 8” diameter combustion air pipe**.

Outside wall construction thickness should be 1” (25mm) minimum and 48” (1219mm) maximum. Position the box against the wall. Being sure that the location and box orientation are correct, mark the location where the combustion air pipe will extend through the wall. Cut a 9” diameter hole so that the 8” pipe will be centered through the 9” opening.

**4. Prepare the concentric adapter box.**

**4a) Determine the length of the 8” diameter combustion air pipe and attach it to the box.**

Comply with the requirements in **FIGURE 11**. Determine the length of the pipe by measuring the wall thickness, ***plus*** 4 to 16” (102-406 mm) beyond the wall, ***minus*** the width of the pipe crimp which will be cut off.

So that the 8” inlet air guard will fit properly, cut the crimp off the end of the combustion air pipe. Turn the combustion air pipe so that the seam will be toward the top side of the box and slide it on the collar. Attach the combustion air pipe to the collar with sheetmetal screws. Seal the joint and seam with sealant or tape.

**4b) Drill a drain hole.** On the bottom side of the pipe, mark a location that will be outside between the end of pipe and the building (about 2/3 of the distance from the end of the pipe to the edge of the building) when the box is installed. Drill a 1/2” diameter drain hole in the pipe at that location.

## 3. Combustion Air Inlet/Vent Terminal Instructions (cont'd)

## 3.1 HORIZONTAL VENT TERMINAL Installation - Option CC6 (cont'd)

**Installation Instructions for Horizontal Vent/Combustion Air Kit Option CC6 (cont'd)**

**5. Attach the concentric adapter box to the wall.**

Insert the combustion air pipe with inlet guard attached out through the wall. Position the box so that the pipe is centered in the opening. Attach the brackets to the wall with field-supplied hardware.

**6. Determine length and install the "terminal-end" vent pipe.**

**6a) Determine length of pipe.** The length of the continuous piece of terminal-end vent pipe is determined by the installation within the maximum and minimum requirements. See **FIGURE 11** to determine lengths of each segment and calculate the total length required. The "terminal-end" vent pipe extending through the box and concentric through the inlet air pipe must be one piece of vent pipe without joints.

**6b) Drill a hole to attach the elbow at the end and install the pipe.** Being sure the vent pipe is in the proper flow direction, temporarily fit the elbow on the exhaust end of the vent pipe. For easier future service, the elbow is being attached using one field-provided 3/4" long sheetmetal screw. Using a drill that is a size smaller than the 3/4" long sheetmetal screw, with the elbow pointing down, drill a pilot hole through the top center of the elbow socket and the vent pipe.

Remove the elbow. In the elbow only, enlarge the drilled hole to 7/32". The elbow will be attached from the outside in Step 8b).

With the pipe turned so that the drilled hole is at the top, slide the end of the vent pipe out through the box and the combustion air pipe. Position the vent pipe so that it will extend between 3" (76mm) and 6" (152mm) past the end of the combustion air pipe. Adjust the pipe so that the screw hole is in the top center. Verify that the silicone sealing ring on the box is properly seated. **Do not add sealant to the ring**.

Join the "terminal end" vent pipe to the vent pipe run. Re-check the silicone ring to be sure that it is still properly seated.

**7. Attach the indoor portion of the combustion air pipe.** Use sheetmetal screws to attach the single-wall combustion air pipe run to the collar on the concentric adapter box. Seal with tape or sealant.

**8. On the outside, install the inlet air guard spacers, attach the elbow, install the bird screen, and seal or flash around the combustion air pipe.**

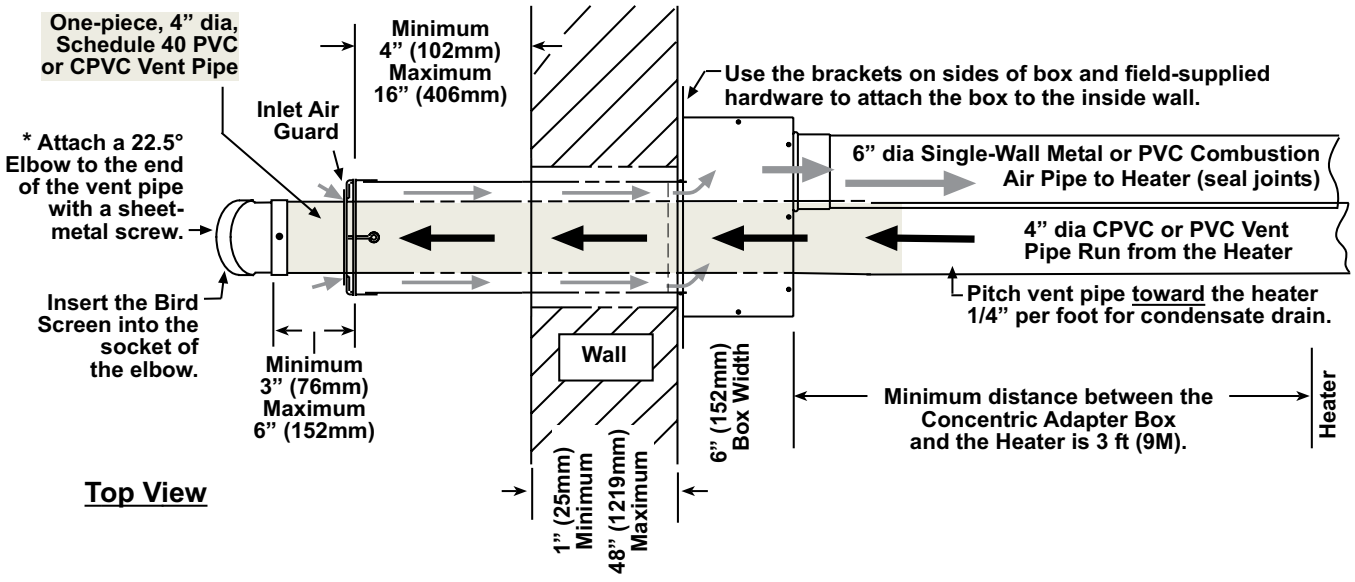
**8a)** Remove the screws holding the inlet air guard (installed in Step 4c). Slide the spacers onto the ends of the four spokes that support the vent pipe. Re-attach the guard.

**8b)** Slide the elbow over the end of the vent pipe and attach it with the field-provided 3/4" long sheetmetal screw. Slide the bird screen into the socket on the open end of the elbow. The elbow must be pointing down.

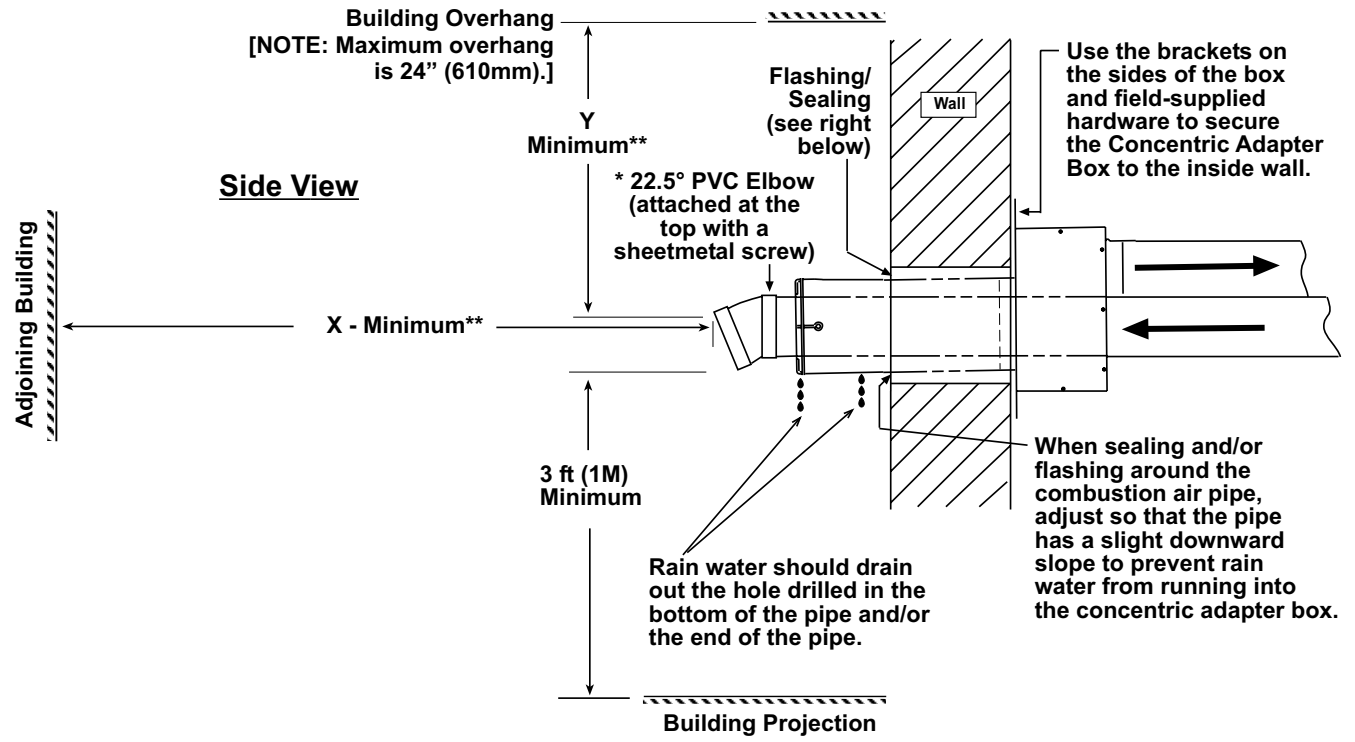
**8c)** Seal around the combustion air pipe with an outdoor caulking material or a masonry cement or a combination of flashing and caulking. Adjust the sealant and the pipe so that the metal pipe will have a slight downward slope to the outside. The downward slope and the 1/2" drain hole (Step 4b) will prevent rain water from running through the pipe into the concentric adapter box.

Installation of the horizontal vent and combustion air system on your separated-combustion unit is complete. Verify compliance with all venting installation requirements, pages 2-9, and **FIGURE 11**.

**FIGURE 11 - Typical Installation of a Model SHH High Efficiency, Separated-Combustion Unit with a Horizontal Vent/Combustion Air Terminal (Option CC6)**




*** A 90° or 45° elbow may be used in place of the 22.5° elbow.**




*** A 90° or 45° elbow may be used in place of the 22.5° elbow.**

| SHH Sizes | X | | Y | |
|---|---|---|---|---|
| **130, 180** | 8 ft | 2.4 M | 36" | 914 mm |
| **260, 350** | 10 ft | 3.0 M | 48" | 1219 mm |

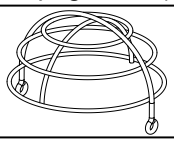
*Minimum - Check for and comply with local Codes.

## 3. Combustion Air Inlet/Vent Terminal Instructions (cont'd)

### 3.2 VERTICAL VENT TERMINAL Installation - Option CC2

**Components Required - Factory and Field**

**Parts in the Vertical Vent Terminal/ Combustion Air Package (Option CC2)**

| Complete Vertical Vent/Combustion Air Kit (Same as Option CC2), P/N 221248 | | |
|---|---|---|
| **Qty** | **P/N** | **Description** |
| 1 | 221069 | Concentric Adapter Box with Silicone Sealing Ring (See **Paragraph 2.7**, pages 8-9.) |
| 1 | 221215 | Bird Guard  |
| 2 | 37661 | Screws for Bird Guard. #10x1/2" self-drilling |
| 1 | 221250 | Combustion Air Inlet  |
| 1 | 221185 | Rain Collar  |
| 1 | 221091 | 4" PVC Cap for Vent Condensate Drain Connection (See **FIGURE 2A and 3A** on pages 4 and 5.) |

Field-supplied requirements:

- Vent pipes and fittings as illustrated in **FIGURE 2A, 2B, 3A or 3B,** pages 4 and 5
- Combustion air pipes (6" and 8" single-wall galvanized pipe)
- Flashing
- Sheetmetal screws, tape, primer, cement, and sealant as required

Before beginning, verify that the kit is at the site and that all components are correct for the installation. Be sure all required field-supplied parts are available.

**Installation Instructions for Vertical Vent/ Combustion Air Kit Option CC2**
(in compliance with requirements on pages 8-9)

**1. Determine the location of the vent terminal.**
Select a location away from fresh air intakes, allowing space for the concentric adapter box inside. Vent terminal must be located from adjacent buildings as shown in **FIGURE 15**, page 17.

**WARNING: All vent terminals must be positioned or located away from fresh air intakes, doors, and windows to preclude combustion products from entering occupied space. Failure to comply could result in severe personal injury or death and/or property damage.**

If more than one vertical concentric vent/combustion air terminal (Option CC2) is being installed, the minimum spacing between vent centerlines is determined by the minimum outdoor design temperature (most extreme outdoor condition at the installation site).

**Minimum Vent Terminal Spacing when Installing more than one Heater**

| Minimum Outdoor Design Temperature | | Minimum Spacing between Centerlines of Vent Pipes in Vertical Combustion Air/Vent Terminals (Option CC2) | |
|---|---|---|---|
| **°F** | **°C** | **inches** | **mm** |
| 31 or warmer | 0 or warmer | 36 | 914 |
| -10 to 30 | -23 to -1 | 60 | 1524 |
| less than -10 | less than -23 | 84 | 2134 |

**2. Install the Vent Pipe and Combustion Air Pipe Runs (from the heater to near the location selected through the roof).**

- Use the type of pipe specified in Paragraph 2.1, page 3.
- Comply with requirements in Paragraph 2.2 and 2.3, pages 3-5, when attaching pipes to the heater when installing the condensate drain connection.
- Overall vent length must comply with table in Paragraph 2.1, page 3.
- Make all joints according to the instructions in Paragraph 2.4, pages 5-7. Extend the runs close to the roof location selected in Step 1 above. (**NOTE**: The vent pipe will extend through the roof after the concentric adapter box is installed. The indoor combustion air pipe will end at the box.)
- Support pipes as required in Paragraph 2.5, page 7.

**3. Cut a clearance hole through the roof for the 8" diameter combustion air pipe.**

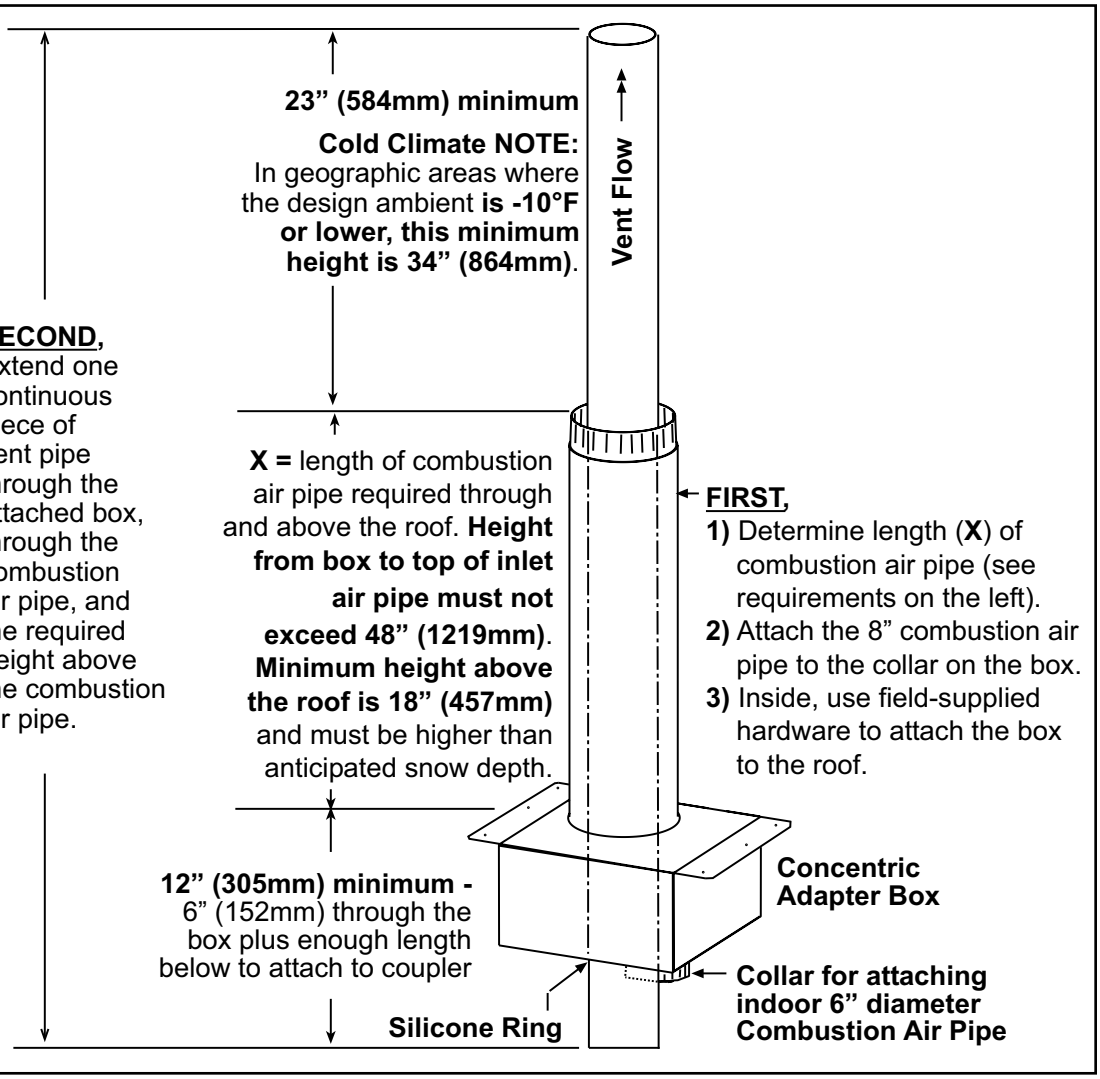
Position the concentric adapter box against the inside of the roof. Being sure that the location and orientation of the box are correct, mark and cut the hole for the 8" combustion air pipe.

**4. Attach the combustion air pipe to the concentric adapter box.**

**4a)** Determine the length of the 8" outdoor combustion air pipe so that dimension "X" in **FIGURE 12** is equal to the roof thickness plus anticipated snow depth, but does not exceed 48" (1219mm) or have less than 18" (457mm) of pipe above the roof.

**4b)** Attach the combustion air pipe to the collar of the concentric adapter box with sheetmetal screws. Seal joint and seam with tape or sealant.

**FIGURE 12 - Concentric Adapter, Outdoor Combustion Air Pipe, and Concentric Vent Pipe**



## 3. Combustion Air Inlet/Vent Terminal Instructions (cont'd)

## 3.2 VERTICAL VENT TERMINAL Installation - Option CC2 (cont'd)

**Installation Instructions for Vertical Vent/Combustion Air Kit Option CC2 (cont'd)**

**5. Attach the concentric adapter box to the underside of the roof.**

(Hardware and flashing are field supplied.) On the inside, insert the combustion air pipe up through the opening, position the box to match the pipe runs, and attach the brackets to the roof.

**FIGURE 13 - Outside View of Combustion Air Pipe with Box Attached to Under Side of Roof**


**6. Determine the length and install the "terminal end" vent pipe.**

**6a)** Refer to **FIGURE 12** and determine the required length of the continuous section of vent pipe. The length of the vent pipe extending through the box, through the combustion air inlet pipe, and the height required above the combustion air inlet air pipe must be one piece of pipe without joints.

Determine the length by adding the requirements:

Starting with at least 6" (152mm) below the box for attaching to the coupler;

***plus*** 6" (152mm) through the concentric adapter box;

***plus*** the length of the combustion air pipe;

***plus*** a **minimum** of 23" (584mm) beyond the top of the combustion air pipe.

Total is the **minimum length** of the vent pipe section.

**NOTE: A longer vent pipe may be required; see FIGURE 12.**

**6b) Install the "terminal end" vent pipe.**

Being sure the pipe is in the proper flow direction, slide the end into the box and out through the combustion air pipe. Position the pipe so that it extends beyond the combustion air pipe the height determined in **6a)** above. Verify that the silicone ring is seated properly.

Join the terminal vent pipe to the vent pipe run. Re-check the silicone ring to be sure that it is still properly seated.

7**. Attach the indoor combustion air pipe**. Use field-supplied sheetmetal screws to attach the single-wall combustion air pipe run to the collar on the concentric adapter box. Seal with tape or sealant.

**8. On the outside, install the combustion air inlet, the rain collar, the bird screen, and field-supplied flashing.**

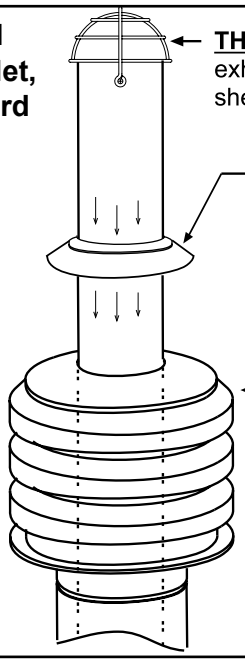
**8a)** Slide the combustion air inlet over the vent pipe and fasten the collar to the combustion air pipe with sheetmetal screws. Seal the joint with tape or sealant. See **FIGURE 14**.

**8b)** To prevent rain water leakage, slide the rain collar over the end of the 4" vent pipe and seat it flush on the top of combustion air inlet. **Do not** use sealant.

**8c)** Attach the bird guard with the two sheetmetal screws provided (See **FIGURE 14**.

**8d)** On the outside (See **FIGURE 13**), flash the combustion air pipe to the roof. Flashing is field-supplied.

**FIGURE 14 - Install Combustion Air Inlet, Rain Collar, and Bird Screen**



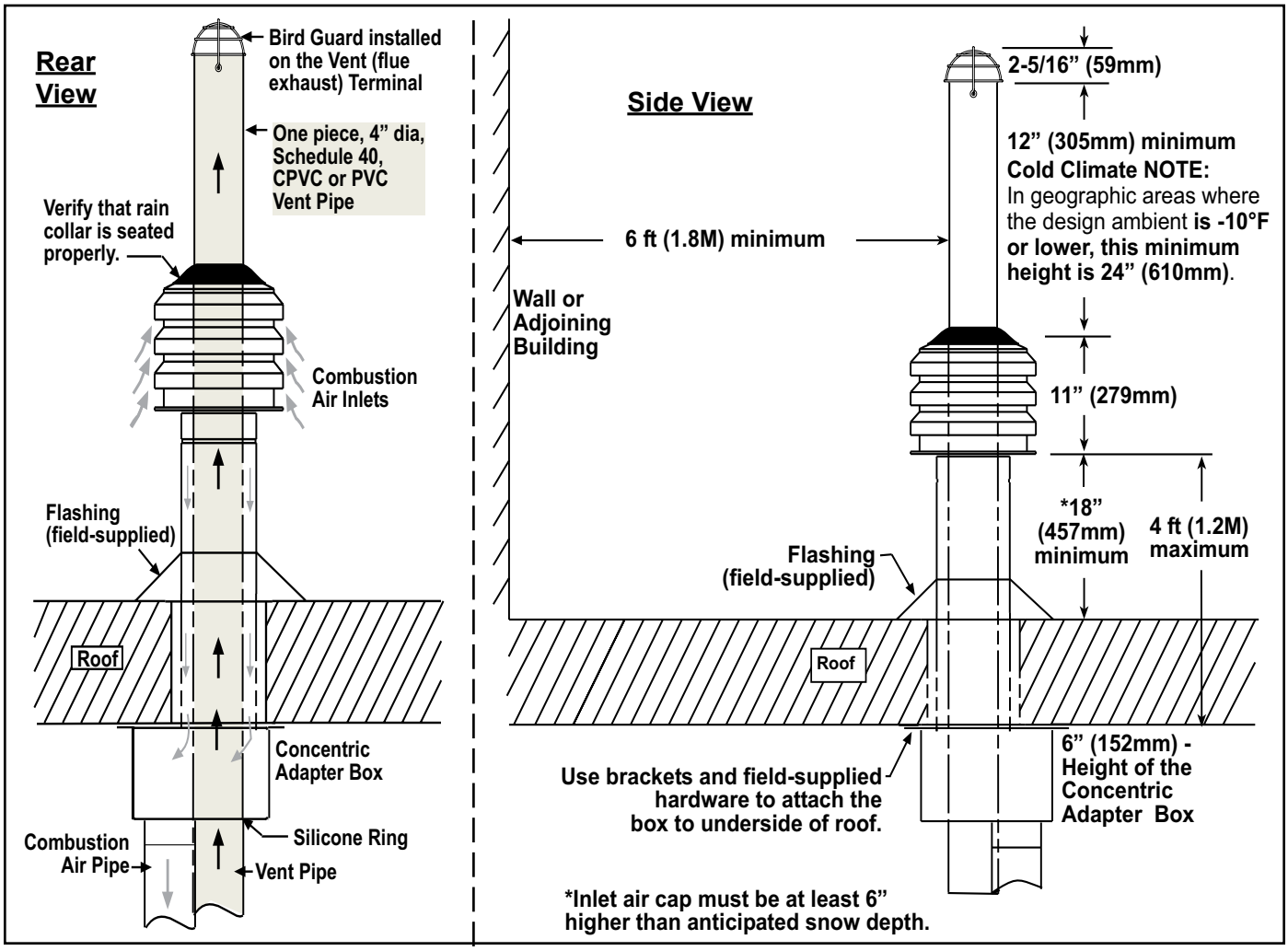
**THIRD,** Attach the bird guard on the exhaust (vent) terminal with the sheetmetal screws provided.

**SECOND**, Slide the rubber rain cover down over the end of the 4" vent pipe until it is seated flush on the top of the combustion air inlet. **Do Not** paint or use petroleum based products on the rain cover. Silicone sealant is allowed.

**FIRST, Install the Combustion Air Inlet.**
**1)** Slide the combustion air inlet down over the vent pipe.
**2)** Fasten bottom of inlet to the combustion air pipe with sheetmetal screws. Be sure not to penetrate the vent pipe.

Installation of the vertical vent and combustion air system on your separated-combustion unit is complete. Verify compliance with all venting installation requirements, pages 2-9, and **FIGURE 15**.

**FIGURE 15 - Typical Installation of a Model SHH High Efficiency, Separated-Combustion Unit with a Vertical Vent/Combustion Air Terminal (Option CC2)**



## 4. Condensate Drain System

The installer must provide a condensate drain system. A 4" PVC cleanout cap (**FIGURE 16**) that is drilled and tapped for a 1/2" NPT fitting is furnished with the heater for the vent pipe drain. All other material must be field supplied.

During operation, condensate is both produced in the heater and collected from the venting system. Therefore, the installation requires both a condensate drain from the secondary heat exchanger (**FIGURE 17**) and a condensate drain from the vent pipe (**FIGURE 16**).

In addition, if the system includes a cooling coil module, a third heat section condensate line is required at the burner condensate drain (See **FIGURE 1**, page 3). If the installation does not include a cooling coil module, cap the burner condensate 1/2" NPT connection.

For safe performance of the heater, each condensate drain **must** include a trap as shown in **FIGURES 16 and 17**. Fill all traps with water.

### Condensate Drain Traps

A condensate drain trap is required for each condensate drain line.

- **FIGURE 16** illustrates the vent pipe drain trap and lists the required length difference for the trap legs.
- **FIGURE 17** illustrates the trap required in a secondary heat exchanger drain (For more information on the secondary heat exchanger condensate drain and the burner condensate drain, see the installation manual, Form I-PDH/SDH/PEH/SHH/PXH, Paragraph 6.2.)

The most important part of fabricating and assembling the traps is the length of the individual legs of the traps. If the difference in the lengths of the legs of the traps is not as illustrated, it could prevent proper drainage of the condensate and possibly permit vent gas to enter the building. (The length difference is also what provides a "water seal" that prevents leakage of vent gas into the sanitary drain.)

**FIGURE 16 - Vent Pipe Condensate Drain Trap Requirements**

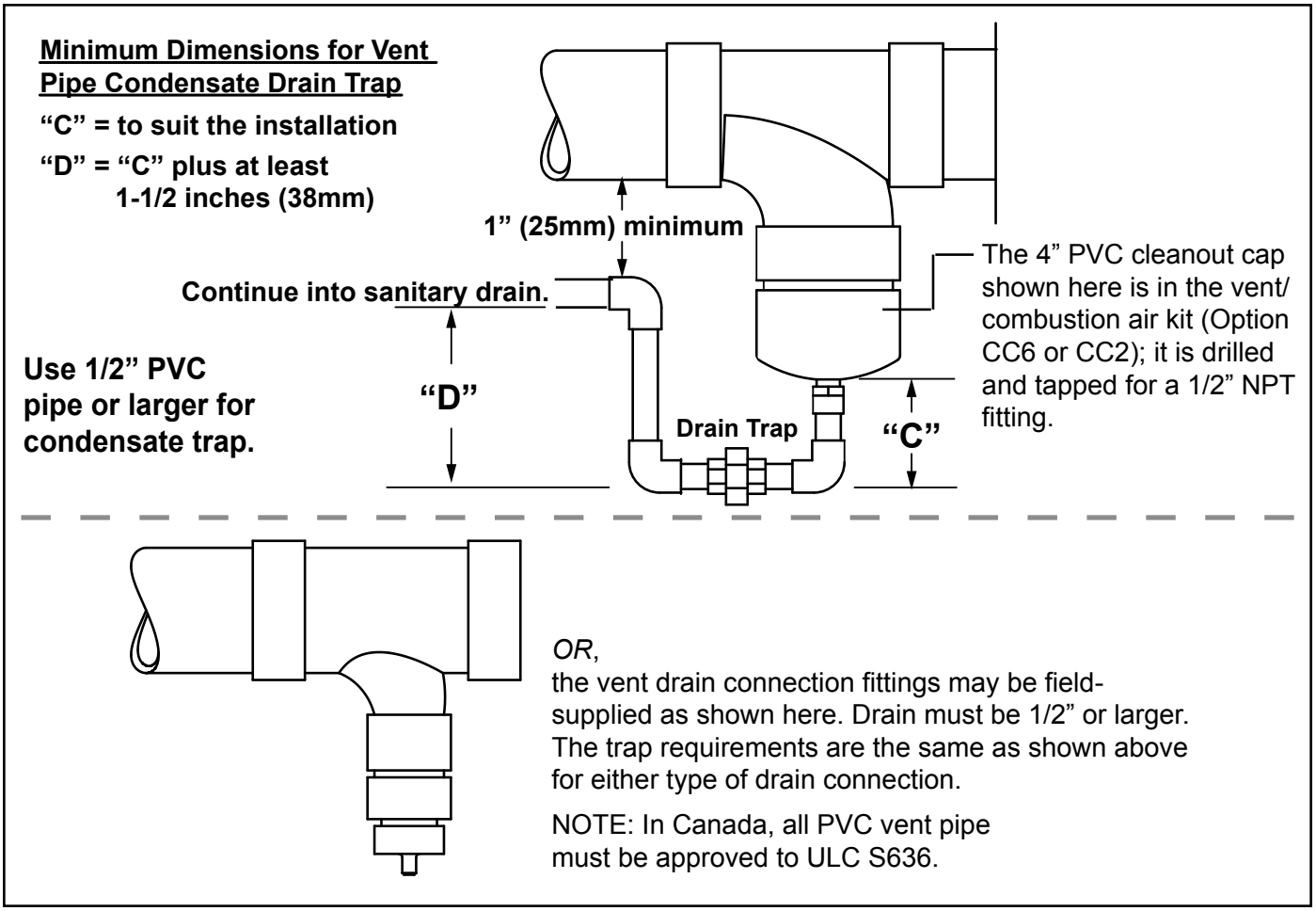
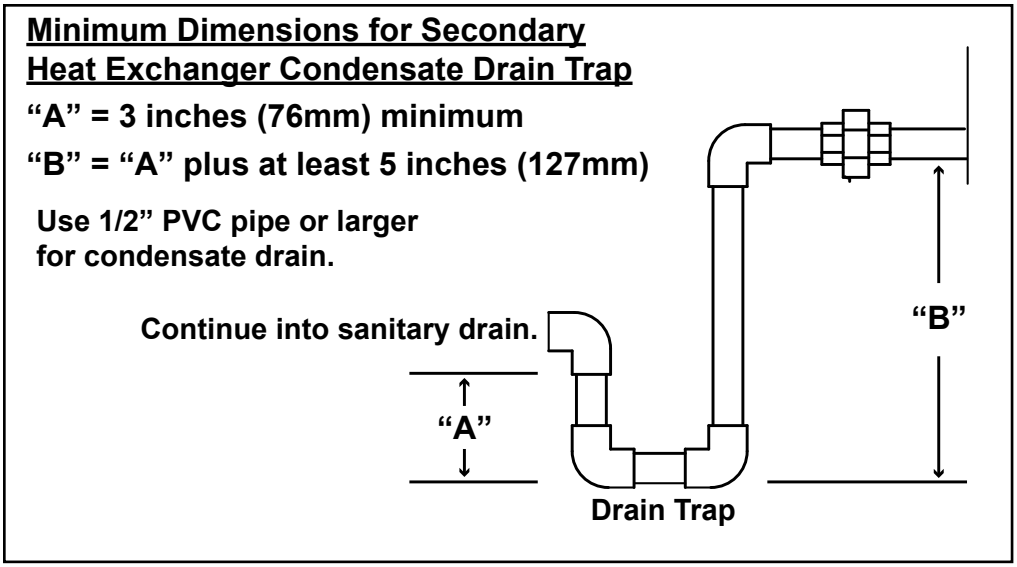


**FIGURE 17 - Model SHH Secondary Heat Exchanger Condensate Drain Trap Requirements**




## Condensate Disposal System

**CAUTION: Apply generally accepted plumbing practices if pipe insulation or heat tapes are required to prevent freezing of the condensate drain system.**

The orientation of the piping is not critical and may be arranged to suit the installation. Unions are recommended to permit maintenance of the drains and to facilitate service of the heater. A union is shown in the traps and a third union is recommended in the drain pipe. If pipe insulation or heat tapes are required to prevent freezing, use should be in accordance with generally accepted plumbing practices.

Downstream from the traps, the condensate drains may be joined and both must be connected to a sanitary drain within the building. Check codes to be certain that this is permitted. (Condensate from the heater has a PH of 6. Actual PH my vary depending on fuel and combustion air constituents.) Model SHH Sizes 130 and 180 will produce approximately one gallon (4 liters) of condensate per hour. Sizes 260 and 350 will produce approximately two gallons (8 liters) of condensate per hour.

A condensate disposal system that relies on gravity should be satisfactory for most suspended installations since these heaters are normally several feet above the floor. If a gravity system is not possible with the installation, a condensate pump may be installed. There are a number of commercially available pumps made for this purpose. If using a condensate pump, follow the pump manufacturer's installation recommendations.

All parts of the condensate drain system should be cleaned periodically. Clean the drain pans, traps, and piping. Fill the traps with clean water. If the trap has a cleanout, be sure to close the cleanout after cleaning and filling the trap.

## Condensate Drain Pressure Switch

All Model SHH heaters are equipped with a condensate drain pressure switch. If the condensate drain from the secondary heat exchanger is blocked causing the sensing pressure to be outside the switch setpoint, the pressure switch will function to shut off the gas valve. The burner will remain off until the problem is corrected.

**Model SHH Installation with Cooling NOTES:**
If the system includes a cooling coil, a burner condensate drain is required (See **FIGURE 1, page 3**). The cooling coil module will also require a condensate drain. See the heater installation manual for requirements.

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