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# installation, operation, and maintenance instructions

## DELUXE GAS-FIRED CONDENSING FURNACE

**398A**
**Sizes 040 thru 120**
**Series E**

Cancels: New

40398DP85-A
9/1/87

## SUPPLEMENT INSTALLATION INSTRUCTIONS FOR CANADIAN INSTALLATIONS

APPROVED

### INTRODUCTION

These instructions supplement the Installation, Start-Up and Service Instructions for deluxe gas-fired condensing furnaces and provide information for Canadian installations.

Use this publication in conjunction with the furnace Installations, Start-Up and Service Instructions. Before installing this furnace, refer to Installation Guidelines, Procedures for Condensing Furnaces (packaged with furnace) for information on combustion, piping and other standard installation practices. *Venting procedures illustrated in this supplement supersede those found in Procedures for Condensing Furnaces and Accessory Vent Terminal kit instructions.*

Installations made in Canada must comply with CAN1-B149.1 and .2 national installation codes for natural gas burning appliances and equipment. Gas lines must be purged in accordance with same CAN1-149 codes.

Before installing this furnace, read the unit instructions and procedures instructions for installation information and refer to applicable local codes and requirements.

### FOR YOUR SAFETY

**WHAT TO DO IF YOU SMELL GAS**

1. Open windows.
2. Do not touch any electrical switch.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

### FOR YOUR SAFETY

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

### INSTALLATION

Provide clearances to combustibles as shown on unit. Always provide adequate clearances for servicing and for combustion and ventilating air supply. Refer to the CAN1-B149 codes for further details.

Models are shipped from the factory equipped for altitudes of 0 to 2000 ft above sea level. Models installed at altitudes of 2000 to 4500 ft above sea level must be converted at C.G.A.-approved conversion stations in Canada and marked accordingly.

The installation must be adjusted to obtain a temperature rise within the range specified on the furnace. See Table 1.

The outlet duct shall be provided with a removable access panel. This panel shall be accessible when installed and be of a size to permit the observance of light or smoke, indicating the presence of leaks in the heat exchanger. Panel must be attached to prevent leaks.

Make electrical connections in accordance with CSA Standard C22.1, Canadian Electrical Code Part 1. Refer to wiring diagram on furnace.

**NOTE:** The blower control center is equipped with an inline fuse designed to protect transformer. If unit does not run, check blower door to be sure it is fastened securely, and then check fuse. If fuse requires replacement, obtain one from your dealer.

### Table 1—Ratings and Performance

| MODEL 398A | ALTITUDE 0-2000 ft | | ALTITUDE 2000-4500 ft | | TEMP RISE RANGE (F) | HEATING | | COOLING | | PSC MOTOR HP | APPROX SHIP. WT (lb) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Input Btuh | Capacity Btuh* | Input Btuh† | Capacity Btuh†** | | Ext Static Press. (in.) | Cfm‡ | Ext Static Press. (in.) | Cfm‡ | | |
| 040 | 44,000 | 41,000 | 39,600 | 36,700 | 20-50 | 0.10 | 1310 | | 1160 | 1/3 | 170 |
| 060 | 66,000 | 61,000 | 59,400 | 55,100 | 30-60 | 0.12 | 1290 | | 1205 | 1/3 | 177 |
| 080 | 88,000 | 82,000** | 79,200 | 73,500 | 45-75 | 0.15 | 1380 | | 1235 | 1/3 | 190 |
| 080 | 88,000 | 82,000** | 79,200 | 73,500 | 35-65 | 0.15 | 1625 | 0.5 | 1630 | 1/2 | 195 |
| 100 | 110,000 | 102,000 | 99,000 | 91,900 | 45-75 | 0.20 | 1565 | | 1670 | 1/2 | 221 |
| 100 | 110,000 | 102,000 | 99,000 | 91,900 | 35-65 | 0.20 | 2040 | | 1970 | 3/4 | 228 |
| 120 | 132,000 | 122,000 | 118,800 | 110,200 | 50-80 | 0.20 | 2005 | | 1945 | 1/2 | 263 |

*CGA-approved. Determined by U.S. Government tests.
†Ratings reduced by 10% for high altitudes (2000-4500 feet).
‡Air delivery above 1800 cfm requires that both sides, or a combination of one side and bottom, or bottom only of the furnace be used for return air.
**Tentative.

**NOTE:** Units for high altitude (2000-4500 ft above sea level) are converted by C.G.A.-approved conversion stations in Canada and marked accordingly.

## MAINTENANCE

The furnace should be inspected and serviced at least once a year by a properly trained service technician. See your Owner's Manual for further details.

**NOTE:** Vent system should be inspected by a qualified service technician once per year.

## COMBUSTION-AIR, VENT, AND CONDENSATE PIPING

**NOTE:** This furnace shall not be connected to any Type-B, -BW or -L vent or vent connector and shall not be connected to any portion of a factory-built or masonry chimney.

Construct all combustion-air and vent pipes for this unit of CSA or ULC certified schedule-40 PVC, PVC-DWV or ABS-DWV pipe and pipe cement. The accessory vent terminal kit described below must be used in constructing the vent terminal for this unit. Pipes must terminate through either roof or sidewall; roof termination is preferable. Locate sidewall termination to prevent damage to shrubs or siding materials. Table 2 gives clearance requirements.

### Table 2—Combustion-Air and Vent Terminal Clearances

| LOCATION | CLEARANCE (ft) |
|---|---|
| Above anticipated snow depth | 1 |
| Dryer vent | 4 |
| From plumbing vent stack | 3 |
| Gas appliance vent terminal | 4 |
| From any opening where vent gases could enter building | 3 |
| Above grade level | 3 |
| From combustion air opening of any appliance | 6 |
| From a fresh air intake | 6 |
| From service regulator vent | 6 |
| Above grade when adjacent to public walkway | 7 |

**NOTE:** Do not terminate above a meter and regulator assembly.

When a previously common-vented system (furnace and water heater) is converted to water heater only, vent system may be drastically oversized for water heater. Consult Installation Code for natural gas burning appliances and equipment CAN1-B149.1 for proper sizing and revise vent system if necessary.

**CAUTION:** Combustion air must not be taken from inside the structure because that air frequently is contaminated by halogens, which include fluorides, chlorides, bromides, and iodides. These elements are found in aerosols, detergents, bleaches, cleaning solvents, salts, air fresheners and other household products. Vapors from these products are highly corrosive to gas-fired furnaces, even in extremely low concentrations (as low as 0.5 ppm).

Maintain a minimum of 48 in. between combustion-air inlet and clothes-dryer vent.

Locate combustion-air inlet as far as possible from swimming pool and swimming pool pump house.

**Combustion-Air and Vent Piping**—Vent may be run horizontally through the wall or vertically through a masonry or factory-built chimney. The chimney must not serve any other appliance. If vent runs through any unheated area or an outside chimney, insulate vent. Horizontal piping must be supported every 3 feet.

See Tables 3 and 4 for pipe sizing and Fig. 1-5 for exterior piping arrangements. See High-Altitude Pipe Sizing Procedure section for high-altitude applications.

**WARNING:** Solvent cements are combustible. Keep away from heat, sparks, and open flame. Use only in well ventilated areas. Do NOT breathe vapors. Avoid contact with the skin or eyes. A failure to adhere to this warning can cause a fire or physical injury.

**WARNING:** All combustion-air and vent pipes must be airtight and watertight. Pipes must terminate exactly as shown in Fig. 1-5. A failure to adhere to this warning can cause property damage, physical injury or death.

Furnace is shipped from factory assembled for right-hand vent pipe connection. When left-hand vent connection is desired, remove cap from left-hand side of inducer outlet box and install over hole in right-hand side of box.

Remove plastic plug from left-hand casing side panel and install plug in unused hole in the right-hand casing side panel.

**NOTE:** The unit is shipped with a 2-1/2- x 2-1/2-in. rubber coupling. Optional couplings size 3 x 2-1/2-in. and 2-1/2 x 2-in. are available through the Replacement Parts department. See unit Parts Replacement Guide for the part number.

1. To determine pipe diameter:
   a. Using Table 3, determine preliminary combustion air pipe diameter. For high-altitude applications, use Tables 3 and 4.
   b. Using Table 3, determine vent pipe diameter. For high-altitude applications, use Tables 3 and 4.
   c. Use largest diameter determined in (a) and (b) above for both pipes.

   EXAMPLE: A 10-ft combustion-air pipe having two 90-degree elbows would require a 1-1/2-in. diameter pipe according to Table 3. If vent pipe had three 90-degree elbows and were 8 ft long, a 2-in. diameter pipe would be required. Because vent pipe requires a larger diameter pipe, the larger 2-in. diameter pipe must be used for both the vent and combustion-air pipes.
2. Working from furnace to outside, cut PVC or ABS pipe to required length(s).
3. Deburr inside and outside of pipe.
4. Chamfer outside edge of pipe for better distribution of primer and cement.
5. Clean and dry all surfaces to be joined.
6. Check dry fit of pipe and mark insertion depth on pipe.

   **NOTE:** All pipe should be cut, prepared and preassembled before any joint is permanently cemented.
7. After pipes have been cut and preassembled, apply generous layer of PVC or ABS primer to pipe fitting socket and end of pipe to insertion mark. Quickly apply PVC or ABS cement (over primer) to end of pipe and fitting socket. Apply cement in light, uniform coat on inside of socket to prevent buildup of excess cement. Apply second coat of cement to end of pipe.

## Table 3—398A Vent Diameter Chart (in.)

| PIPE LENGTH (ft) | FURNACE SIZE | NUMBER OF 90-DEGREE ELBOWS (See Notes) | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 5 | 040 | 1-1/2 | 1-1/2 | 1-1/2 | 1-1/2 | 2 |
| | 060 | 1-1/2 | 1-1/2 | 1-1/2 | 2 | 2 |
| | 080 | 2 | 2 | 2 | 2 | 2 |
| | 100 | 2 | 2 | 2-1/2 | 2-1/2 | 2-1/2 |
| | 120 | 3 | 3 | 3 | 3 | 3 |
| 10 | 040 | 1-1/2 | 1-1/2 | 1-1/2 | 2 | 2 |
| | 060 | 1-1/2 | 1-1/2 | 2 | 2 | 2 |
| | 080 | 2 | 2 | 2 | 2 | 2-1/2 |
| | 100 | 2 | 2-1/2 | 2-1/2 | 2-1/2 | 3 |
| | 120 | 3 | 3 | 3 | 3 | 3 |
| 15 | 040 | 1-1/2 | 1-1/2 | 2 | 2 | 2 |
| | 060 | 1-1/2 | 2 | 2 | 2 | 2 |
| | 080 | 2 | 2 | 2 | 2-1/2 | 2-1/2 |
| | 100 | 2-1/2 | 2-1/2 | 2-1/2 | 3 | 3 |
| | 120 | 3 | 3 | 3 | 3 | 3 |
| 20 | 040 | 1-1/2 | 2 | 2 | 2 | 2 |
| | 060 | 2 | 2 | 2 | 2 | 2 |
| | 080 | 2 | 2 | 2-1/2 | 2-1/2 | 2-1/2 |
| | 100 | 2-1/2 | 2-1/2 | 3 | 3 | 3 |
| | 120 | 3 | 3 | 3 | 3 | 3 |
| 25 | 040 | 2 | 2 | 2 | 2 | 2 |
| | 060 | 2 | 2 | 2 | 2 | 2 |
| | 080 | 2 | 2-1/2 | 2-1/2 | 2-1/2 | 2-1/2 |
| | 100 | 2-1/2 | 3 | 3 | 3 | 3 |
| | 120 | 3 | 3 | 3 | 3 | 3 |
| 30 | 040 | 2 | 2 | 2 | 2 | 2 |
| | 060 | 2 | 2 | 2 | 2 | 2 |
| | 080 | 2-1/2 | 2-1/2 | 2-1/2 | 2-1/2 | 2-1/2 |
| | 100 | 3 | 3 | 3 | 3 | 3 |
| | 120 | 3 | 3 | 3 | 3 | 3 |
| 35 | 040 | 2 | 2 | 2 | 2 | 2 |
| | 060 | 2 | 2 | 2 | 2 | 2 |
| | 080 | 2-1/2 | 2-1/2 | 2-1/2 | 2-1/2 | 2-1/2 |
| | 100 | 3 | 3 | 3 | 3 | 3 |
| | 120 | 3 | 3 | 3 | 3 | 3 |

**NOTES:**
1. Size both the air and vent pipe diameter independently, then use the larger diameter for both pipes.
2. Assume two 45-degree elbows equal one 90-degree elbow.
3. Pipe lengths are up to and including the tabulated values.
4. Diameters listed are for schedule-40 PVC, PVC-DWV or ABS-DWV pipe.
5. Long radius elbows are desirable.
6. Elbows and pipe sections supplied in vent terminal kit should not be included in count.
7. Do not exceed 35 linear feet.

## Table 4—Vent and Combustion-Air Adjustment Chart

| ALTITUDE (ft above sea level) | MEASURED LENGTH OF PIPE | | | | ELBOW ADDER (ft per elbow) |
|---|---|---|---|---|---|
| | 0 to 5 ft | 5-1 to 15 ft | 15-1 to 25 ft | 25-1 to 35 ft | |
| Sea Level – 2000 | 0 ft-0 in. | | | | |
| 2001-3000 | 0 ft-6 in. | 1 ft-6 in. | 2 ft-6 in. | 3 ft-6 in. | 0.5 |
| 3001-4000 | 1 ft-0 in. | 2 ft-6 in. | 4 ft-0 in. | 5 ft-6 in. | 1.0 |
| 4001-4500 | 1 ft-0 in. | 3 ft-6 in. | 5 ft-6 in. | 7 ft-6 in. | 1.0 |

8. While the cement is still wet, insert pipe into socket with a 1/4-turn twist. Be sure pipe is fully inserted into fitting socket.
9. Wipe excess cement from joint. A continuous bead of cement is visible around perimeter of a properly made joint.
10. Handle pipe joints carefully until cement sets.
11. Attach factory-supplied flexible coupling to furnace combustion-air inlet connection and secure with stainless steel hose clamp. Ensure that factory-supplied, perforated metal combustion-air disc is installed in the flexible coupling.
12. Support piping every 3 ft (minimum) using perforated metal hanging strap. Slope combustion-air and vent pipes toward furnace a minimum of 1/4-in./lineal ft with no sags between hangers.
13. Use appropriate methods to seal openings where vent and combustion-air pipes pass through roof or sidewall.

**CAUTION:** When the vent pipe is exposed to temperatures below freezing—that is, when it passes through an unheated space or when a chimney is used as a raceway—the pipe must be insulated with 1/2-in. thick Armaflex insulation.

**CAUTION:** When the combustion-air pipe is installed above a suspended ceiling, the pipe must be insulated with 1/2 in. Armaflex insulation.

The combustion-air pipe should also be insulated in warm, humid spaces such as basements.

### High-Altitude Pipe Sizing Procedure

1. Measure the length of pipe and number of elbows required for installation of the unit.
2. Select appropriate vent length adder from vent adjustment chart (Table 4) for the specific altitude and measured vent length.
3. Again using the vent adjustment chart, multiply the number of elbows determined in step 1 by the elbow vent length adder for the altitude specified.
4. Add the values determined in steps 2 and 3 to the measured length determined in step 1 to obtain the adjusted vent length.
5. Select the pipe diameter from the vent sizing chart (Table 3) using the adjusted vent length and measured number of elbows.

   EXAMPLE: Assume that a Model 398A100, located in a city 4200 ft above sea level, requires 14 ft, two 90-degree elbows and two 45-degree elbows for the flue pipe. At sea level to 2000 ft, this would normally require 2-1/2-in. pipe. The pipe diameter required for a city, at 4200 ft above sea level, is determined as follows:

   a. The vent length adder for a 14-ft run at an altitude of 4200 ft is 3.5 feet.
   b. The elbow length adder for the same altitude is 1.0 feet. Multiplying the adder by the number of elbows (1.0 x 3.0) results in a 3.00 adder.
   c. The adjusted vent length is 14 + 3.5 + 3.0 = 20.50.
   d. From the 398A Model 100 vent sizing chart, the pipe diameter for this installation is selected using 20.50 ft and 3 elbows. The required diameter is now 3 in. compared to the 2-1/2-in. diameter required at sea level.

**Vent Terminal Kit Installation**—The combustion-air and vent pipes must terminate outside the structure. The accessory vent termination kit (required) must be installed as shown in Fig. 1-5.

Two termination kits are available. Use the 2-in. kit with 1-1/2- or 2-in. diameter vent pipe. The 3-in. kit can be used with 2-1/2- or 3-in. diameter pipe systems. Each kit contains extra parts.

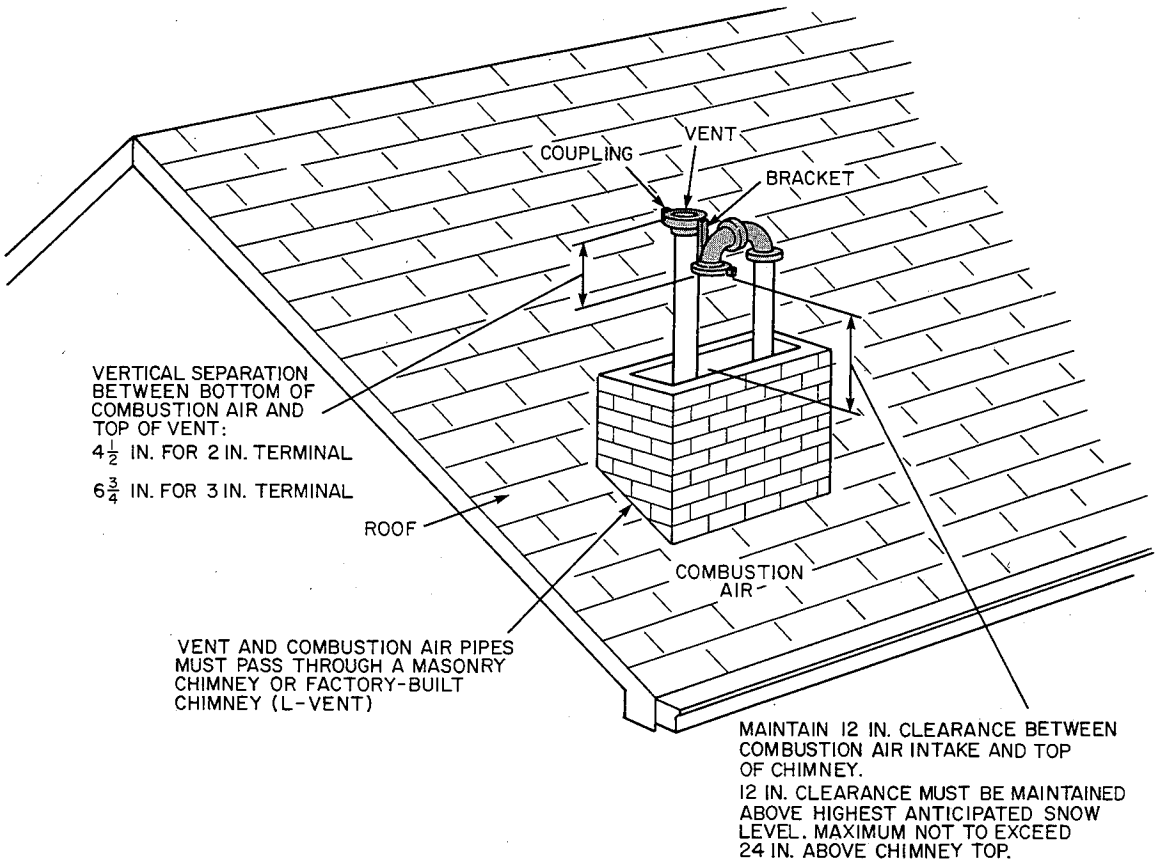


**Fig. 1—Rooftop Vent Termination**

**NOTE:** The shaded portions of Fig. 1-5 are considered part of the vent terminal and are provided in the vent terminal kit. They should not be counted, therefore, in pipe diameter calculations.

ROOFTOP VENT TERMINAL INSTALLATION (Fig. 1)

1. Remove one 90-degree elbow from elbow and bracket assembly provided in kit. Loosen screw so other elbow can turn.
2. Install 90-degree vent street ell into 90-degree elbow on bracket assembly, making a U-fitting. Install the open end of the 90-degree vent street ell onto the combustion-air pipe.
3. Loosely install pipe coupling, provided in kit, on properly cut vent pipe. Position coupling so that bracket will mount as shown in Fig. 1.
4. Disassemble loose pipe fittings. Clean them and apply cement using procedures described in Combustion-Air and Vent Piping.
5. Install bracket as shown in Fig. 1.

SIDEWALL VENT TERMINAL INSTALLATION—Maintain 36-in. clearance above grade or 12-in. clearance above highest anticipated snow level, whichever is greater.

Install kit as follows when combustion-air and vent pipes exit through sidewall above snow level or grade. (Fig. 2 and 3)

**NOTE:** The arrangement in Fig. 2 is preferred. The arrangement in Fig. 3 is an option for the vent pipe only.

1. Loosely install elbow and bracket assembly on combustion-air and vent pipes.
2. Remove and disassemble elbows and bracket assembly.

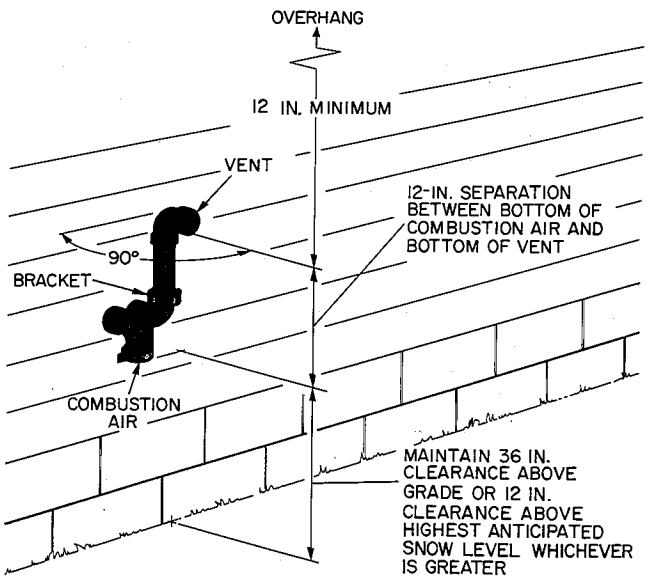


**Fig. 2—Sidewall Vent Termination Above Snow Level or Grade (Preferred)**

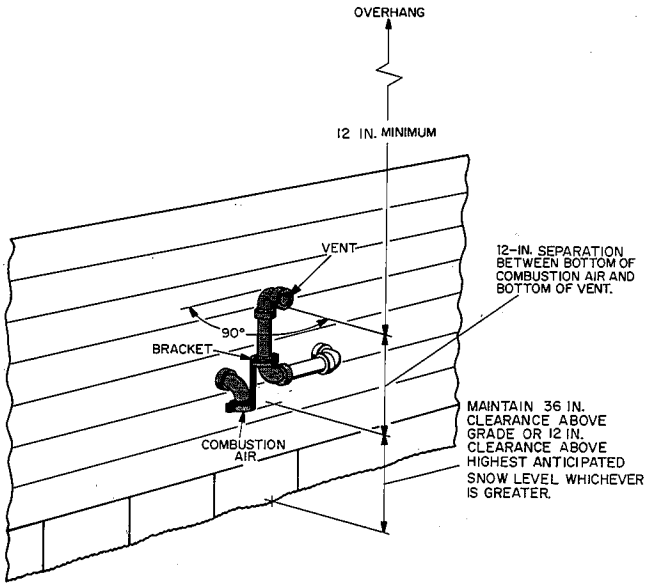


**Fig. 3—Sidewall Vent Termination Above Snow Level or Grade (Option)**

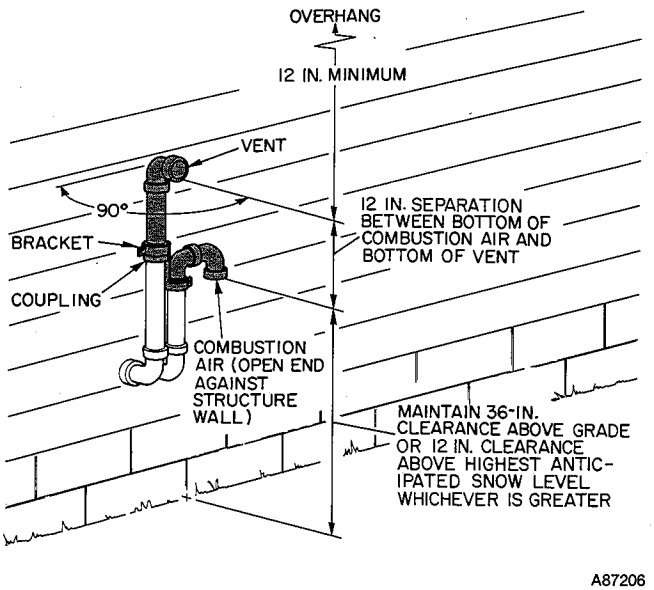


**Fig. 4—Sidewall Vent Termination Below Snow Level or Too Close to Grade (Preferred)**

3. Install elbows as shown in Fig. 2 or 3. Clean them and apply cement using procedures described in Combustion-Air and Vent Piping.
4. Install bracket as shown in Fig. 2 or 3.
5. Position vent-pipe assembly, maintaining a 12-in. separation. Cement vent pipe in elbow as shown in Fig. 2 or 3.
6. For applications using vent-pipe option (indicated in Fig. 3), rotate vent elbow 90 degrees from position shown in Fig. 2.

Install kit as follows when combustion-air and vent pipes exit through sidewall below snow level or too close to grade. (Fig. 4 and 5).

**NOTE:** The arrangement in Fig. 4 is preferred. The arrangement shown in Fig. 5 is an option for the vent pipe only.

1. Remove one elbow from the elbow and bracket assembly. (The elbow remaining will be connected to the combustion-air pipe.)
2. Install the 90-degree vent street ell into the 90-degree elbow remaining in the elbow and bracket assembly to make a U-fitting.
3. Loosely install coupling on end of vent pipe.
4. Loosely install U-fitting and bracket as shown in Fig. 4. Position U-fitting so open end is against structure wall.
5. Loosely install vent-pipe assembly in coupling as shown in Fig. 4 or 5.
6. Check required dimensions as shown in Fig. 4 or 5.
7. Disassemble loose pipe fittings. Clean them and apply cement using procedures described in Combustion-Air and Vent Piping.
8. Install bracket as shown in Fig. 4 or 5.

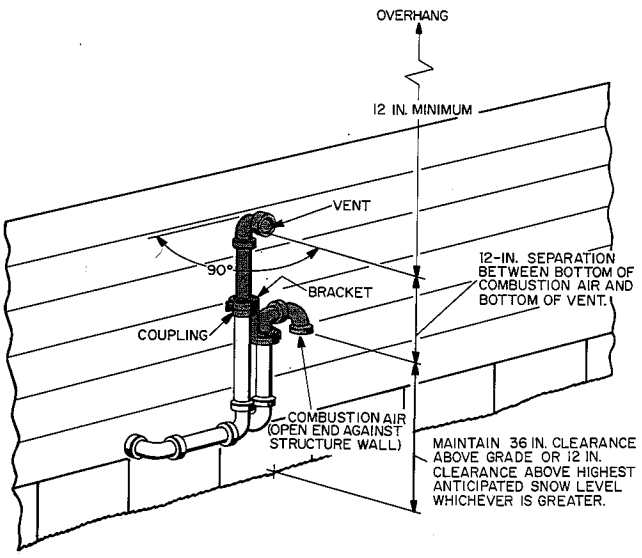


**Fig. 5—Sidewall Vent Termination Below Snow Level or Too Close to Grade (Option)**

**Condensate Drain**—Route the condensate to a nearby floor drain or condensate pump. If a condensate pump is required, it should have a corrosion-resistant impeller and tank.

Use CSA or ULC certified schedule-40 PVC or CPVC drain piping and cement.

For proper condensate drainage, furnace must be within 1/2-in. of level. Highest corner of furnace must not be more than 1/2-in. above lowest corner.

**NOTE:** The furnace contains an internal condensate trap; do NOT install external trap.

1. Determine the side of furnace from which drain will exit. Cut and preassemble drain piping (field supplied) directly to an open drain. Refer to Combustion-Air and Vent Piping for instructions on preparing and cementing plastic pipe.
2. Cement elbow on pipe assembly (factory supplied) to condensate trap mounted on blower housing.
3. Using a second wrench to hold assembly, attach first section of field-supplied drain pipe to compression coupling provided.
4. When using schedule-40 PVC drain pipe, connect adapter provided to end of pipe installed in compression fitting.
5. Attach field-supplied schedule-40 PVC adapter to threaded factory adapter.
6. Cement remaining pipe joints.

**Complete remainder of installation and start-up procedures as instructed in literature supplied with furnace.**