INSTALLATION INSTRUCTIONS
EL296UHE
ELITE® SERIES GAS FURNACE
UPFLOW / HORIZONTAL AIR DISCHARGE

THIS MANUAL MUST BE LEFT WITH THE HOMEOWNER FOR FUTURE REFERENCE

This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.

⚠️ WARNING
Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional installer (or equivalent), service agency or the gas supplier.

⚠️ CAUTION
As with any mechanical equipment, personal injury can result from contact with sharp sheet metal edges. Be careful when you handle this equipment.

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EL296UHE Unit Dimensions - inches (mm)

1. Single side return air with transition, to accommodate 20 x 25 x 1 in. (508 x 635 x 25 mm) cleanable air filter. Required to maintain proper air velocity.
2. Single side return air with optional Return Air Base
3. Bottom return air.
4. Return air from both sides.
5. Bottom and one side return air.
See Blower Performance tables for additional information.

Optional External Side Return Air Filter Kit is not for use with the optional Return Air Base.

<table>
<thead>
<tr>
<th>Model No.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>in.</td>
<td>mm</td>
<td>in.</td>
<td>mm</td>
</tr>
<tr>
<td>EL296UH045XE36B</td>
<td>17−1/2</td>
<td>446</td>
<td>16−3/8</td>
<td>416</td>
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<td>EL296UH090XE48C</td>
<td>24−1/2</td>
<td>622</td>
<td>23−3/8</td>
<td>594</td>
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</tbody>
</table>
The EL296UHE Category IV gas furnace is shipped ready for installation in the upflow or horizontal position. The furnace is shipped with the bottom panel in place. The bottom panel must be removed if the unit is to be installed in horizontal or upflow applications with bottom return air.

**The EL296UHE can be installed as either a Direct Vent or a Non-Direct Vent gas central furnace.**

The furnace is equipped for installation in natural gas applications. A conversion kit (ordered separately) is required for use in propane/LP gas applications.

**NOTE - In Direct Vent installations, combustion air is taken from outdoors and flue gases are discharged outdoors. In Non-Direct Vent installations, combustion air is taken from indoors or ventilated attic or crawl space and flue gases are discharged outdoors. See figures 1 and 2 for applications involving roof termination.**

---

### Shipping and Packing List

**Package 1 of 1 contains**

1. Assembled EL296UHE unit
2. Bag assembly containing the following:
   - Snap bushing
   - Snap plug
   - Wire tie
   - Condensate trap
   - Condensate trap cap
   - Condensate trap clamp
   - 2" diameter debris screen
   - 3/4" Threaded street elbow

Check equipment for shipping damage. If you find any damage, immediately contact the last carrier.

The following items may also be ordered separately:

1. Thermostat
2. LP/Propane changeover kit
3. Return air base kit
4. Horizontal suspension kit
5. High altitude pressure switch

### Safety Information

**CAUTION**

As with any mechanical equipment, personal injury can result from contact with sharp sheet metal edges. Be careful when you handle this equipment.

**DANGER**

Danger of explosion.

There are circumstances in which odorant used with LP/propane gas can lose its scent. In case of a leak, LP/propane gas will settle close to the floor and may be difficult to smell. An LP/propane leak detector should be installed in all LP applications.

Use only the type of gas approved for use with this furnace. Refer to unit nameplate.

EL296UHE units are CSA International certified to ANSI Z21.47 and CSA 2.3 standards.

### Building Codes

In the USA, installation of gas furnaces must conform with local building codes. In the absence of local codes, units must be installed according to the current National Fuel Gas Code (ANSI-Z223.1/NFPA 54). The National Fuel Gas Code is available from the following address:

American National Standards Institute, Inc.
11 West 42nd Street
New York, NY 10036

In Canada, installation must conform with current National Standard of Canada CSA-B149 Natural Gas and Propane Installation Codes, local plumbing or waste water codes and other applicable local codes.
In order to ensure proper unit operation in non-direct vent applications, combustion and ventilation air supply must be provided according to the current National Fuel Gas Code or CSA-B149 standard.

**Installation Locations**

This furnace is CSA International certified for installation clearances to combustible material as listed on the unit nameplate and in the table in figure 12. Accessibility and service clearances must take precedence over fire protection clearances.

**NOTE** - For installation on combustible floors, the furnace shall not be installed directly on carpeting, tile, or other combustible material other than wood flooring.

For installation in a residential garage, the furnace must be installed so that the burner(s) and the ignition source are located no less than 18 inches (457 mm) above the floor. The furnace must be located or protected to avoid physical damage by vehicles. When a furnace is installed in a public garage, hangar, or other building that has a hazardous atmosphere, the furnace must be installed according to recommended good practice requirements and current National Fuel Gas Code or CSA B149 standards.

**NOTE** - Furnace must be adjusted to obtain a temperature rise within the range specified on the unit nameplate. Failure to do so may cause erratic limit operation and premature heat exchanger failure.

This EL296UHE furnace must be installed so that its electrical components are protected from water.

**Installed in Combination with a Cooling Coil**

When this furnace is used with cooling coils (figure 3), it shall be installed in parallel with, or on the upstream side of, cooling coils to avoid condensation in the heating compartment. With a parallel flow arrangement, a damper (or other means to control the flow of air) must adequately prevent chilled air from entering the furnace. If the damper is manually operated, it must be equipped to prevent operation of either the heating or the cooling unit, unless it is in the full HEAT or COOL setting.

When installed, this furnace must be electrically grounded according to local codes. In addition, in the United States, installation must conform with the current National Electric Code, ANSI/NFPA No. 70. The National Electric Code (ANSI/NFPA No. 70) is available from the following address:

National Fire Protection Association
1 Battery March Park
Quincy, MA 02269

In Canada, all electrical wiring and grounding for the unit must be installed according to the current regulations of the Canadian Electrical Code Part I (CSA Standard C22.1) and/or local codes.

**Use of Furnace as Construction Heater**

Lennox does not recommend the use of EL296UHE units as a construction heater during any phase of construction. Very low return air temperatures, harmful vapors and operation of the unit with clogged or misplaced filters will damage the unit.

EL296UHE units may be used for heating of buildings or structures under construction, if the following conditions are met:

- The vent system must be permanently installed per these installation instructions.
- A room thermostat must control the furnace. The use of fixed jumpers that will provide continuous heating is not allowed.
- The return air duct must be provided and sealed to the furnace.
- Return air temperature range between 60°F (16°C) and 80°F (27°C) must be maintained.
- Air filters must be installed in the system and must be maintained during construction.
- Air filters must be replaced upon construction completion.
The input rate and temperature rise must be set per the furnace rating plate.

One hundred percent (100%) outdoor air must be provided for combustion air requirements during construction. Temporary ducting may supply outdoor air to the furnace. Do not connect duct directly to the furnace. Size the temporary duct following these instructions in section for Combustion, Dilution and Ventilation Air in a confined space with air from outside.

The furnace heat exchanger, components, duct system, air filters and evaporator coils must be thoroughly cleaned following final construction clean-up.

All furnace operating conditions (including ignition, input rate, temperature rise and venting) must be verified according to these installation instructions.

General

These instructions are intended as a general guide and do not supersede local codes in any way. Consult authorities having jurisdiction before installation.

In addition to the requirements outlined previously, the following general recommendations must be considered when installing an EL296UHE furnace:

Place the furnace as close to the center of the air distribution system as possible. The furnace should also be located close to the vent termination point.

When the furnace is installed in non-direct vent applications, do not install the furnace where drafts might blow directly into it. This could cause improper combustion and unsafe operation.

When the furnace is installed in non-direct vent applications, do not block the furnace combustion air opening with clothing, boxes, doors, etc. Air is needed for proper combustion and safe unit operation.

When the furnace is installed in an attic or other insulated space, keep insulation away from the furnace.

When the furnace is installed in an unconditioned space, consider provisions required to prevent freezing of condensate drain system.

The “A” coil drain pan is high quality engineering polymer with a maximum service temperature of 500° F. However, adequate space must be provided between the drain pan and the furnace heat exchanger. At least 2” space is required for sectionalized heat exchanger and and 4” for drum-type or oil-fired furnace exchanger. Closer spacing may damage the drain pan and cause leaking.

CAUTION

EL296UHE unit should not be installed in areas normally subject to freezing temperatures.
piping. A portion of this information has been reprinted with permission from the National Fuel Gas Code (ANSI-Z223.1/NFPA 54). This reprinted material is not the complete and official position of the ANSI on the referenced subject, which is represented only by the standard in its entirety.

In Canada, refer to the CSA B149 installation codes.

**CAUTION**

Do not install the furnace in a corrosive or contaminated atmosphere. Meet all combustion and ventilation air requirements, as well as all local codes.

All gas-fired appliances require air for the combustion process. If sufficient combustion air is not available, the furnace or other appliance will operate inefficiently and unsafely. Enough air must be provided to meet the needs of all fuel-burning appliances and appliances such as exhaust fans which force air out of the house. When fireplaces, exhaust fans, or clothes dryers are used at the same time as the furnace, much more air is required to ensure proper combustion and to prevent a downdraft. Insufficient air causes incomplete combustion which can result in carbon monoxide.

In addition to providing combustion air, fresh outdoor air dilutes contaminants in the indoor air. These contaminants may include bleaches, adhesives, detergents, solvents and other contaminants which can corrode furnace components.

The requirements for providing air for combustion and ventilation depend largely on whether the furnace is installed in an unconfined or a confined space.

**Unconfined Space**

An unconfined space is an area such as a basement or large equipment room with a volume greater than 50 cubic feet (1.42 m³) per 1,000 Btu (.29 kW) per hour of the combined input rating of all appliances installed in that space. This space also includes adjacent rooms which are not separated by a door. Though an area may appear to be unconfined, it might be necessary to bring in outdoor air for combustion if the structure does not provide enough air by infiltration. If the furnace is located in a building of tight construction with weather stripping and caulking around the windows and doors, follow the procedures in the Air from Outside section.

**Confined Space**

A confined space is an area with a volume less than 50 cubic feet (1.42 m³) per 1,000 Btu (.29 kW) per hour of the combined input rating of all appliances installed in that space. This definition includes furnace closets or small equipment rooms. When the furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air **must be** handled by ducts which are sealed to the furnace casing and which terminate outside the space containing the furnace. This is especially important when the furnace is mounted on a platform in a confined space such as a closet or small equipment room. Even a small leak around the base of the unit at the platform or at the return air duct connection can cause a potentially dangerous negative pressure condition. Air for combustion and ventilation can be brought into the confined space either from inside the building or from outside.

**Air from Inside**

If the confined space that houses the furnace adjoins a space categorized as unconfined, air can be brought in by providing two permanent openings between the two spaces. Each opening must have a minimum free area of 1 square inch (645 mm²) per 1,000 Btu (.29 kW) per hour of total input rating of all gas-fired equipment in the confined space. Each opening must be at least 100 square inches (64516 mm²). One opening shall be within 12 inches (305 mm) of the top of the enclosure and one opening within 12 inches (305 mm) of the bottom. See figure 4.

![Figure 4](EQUIPMENT_IN_CONFINED_SPACE-ALL_AIR_FROM_INSIDE.png)

**NOTE** - Each opening shall have a free area of at least one square inch per 1,000 Btu (645 mm² per 29kW) per hour of the total input rating of all equipment in the enclosure, but not less than 100 square inches (64516mm²).
Air from Outside

If air from outside is brought in for combustion and ventilation, the confined space shall be provided with two permanent openings. One opening shall be within 12" (305mm) of the top of the enclosure and one within 12" (305mm) of the bottom. These openings must communicate directly or by ducts with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors or indirectly through vertical ducts. Each opening shall have a minimum free area of 1 square inch per 4,000 Btu (645mm² per 1.17kW) per hour of total input rating of all equipment in the enclosure (figures 5 and 8). When communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu (645mm² per .59kW) per total input rating of all equipment in the enclosure. It is also permissible to bring in air for combustion from a ventilated attic (figure 6) or ventilated crawl space (figure 7).

**FIGURE 5**

**EQUIPMENT IN CONFINED SPACE - ALL AIR FROM OUTSIDE**
(Inlet Air from Crawl Space and Outlet Air to Outside)

* NOTE: The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu (645mm² per 1.17kW) per hour of the total input rating of all equipment in the enclosure.

**FIGURE 6**

**EQUIPMENT IN CONFINED SPACE**
(Inlet Air from Ventilated Attic and Outlet Air to Outside)

* See table 6 for maximum vent lengths

**FIGURE 7**

**EQUIPMENT IN CONFINED SPACE**
(Inlet Air from Ventilated Crawl Space and Outlet Air to Outside)

* See table 6 for maximum vent lengths

**FIGURE 8**

**EQUIPMENT IN CONFINED SPACE**
(All Air Through Ventilated Attic)

* See table 6 for maximum vent lengths

**NOTE:** The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu (645mm² per 1.17kW) per hour of the total input rating of all equipment in the enclosure.
**Shipping Bolt Removal**

Units with 1/2 hp blower motor are equipped with three flexible legs and one rigid leg. The rigid leg is equipped with a shipping bolt and a flat white plastic washer (rather than the rubber mounting grommet used with a flexible mounting leg). See figure 10. **The bolt and washer must be removed before the furnace is placed into operation.** After the bolt and washer have been removed, the rigid leg will not touch the blower housing.

**Upflow Applications**

The EL296UHE gas furnace can be installed as shipped in the upflow position. Refer to figure 12 for clearances. Select a location that allows for the required clearances that are listed on the unit nameplate. Also consider gas supply connections, electrical supply, vent connection, condensate trap and drain connections, and installation and service clearances [24 inches (610 mm) at unit front]. **The unit must be level from side to side. The unit may be positioned from level to 1/4” toward the front. See figure 11.**

Allow for clearances to combustible materials as indicated on the unit nameplate.
Unit must be level side-to-side. Unit may be positioned from level to 1/2" toward the front to aid in draining.

FIGURE 11
WARNING
Improper installation of the furnace can result in personal injury or death. Combustion and flue products must never be allowed to enter the return air system or air in the living space. Use sheet metal screws and joint tape to seal return air system to furnace. In platform installations with furnace return, the furnace should be sealed airtight to the return air plenum. A door must never be used as a portion of the return air duct system. The base must provide a stable support and an airtight seal to the furnace. Allow absolutely no sagging, cracks, gaps, etc. For no reason should return and supply air duct systems ever be connected to or from other heating devices such as a fireplace or stove, etc. Fire, explosion, carbon monoxide poisoning, personal injury and/or property damage could result.

Installation Clearances

Top/Plenum | 1 in. (25 mm)
--- | ---
*Front | 0
Back | 0
Sides | 0†
Vent | 0
Floor | 0‡

*Front clearance in alcove installation must be 24 in. (610 mm). Maintain a minimum of 24 in. (610 mm) for front service access.
†Allow proper clearances to accommodate condensate trap.
‡For installations on a combustible floor, do not install the furnace directly on carpeting, tile or other combustible materials other than wood flooring.

Return Air Guidelines

Return air can be brought in through the bottom or either side of the furnace installed in an upflow application. If the furnace is installed on a platform with bottom return, make an airtight seal between the bottom of the furnace and the platform to ensure that the furnace operates properly and safely. The furnace is equipped with a removable bottom panel to facilitate installation.

Markings are provided on both sides of the furnace cabinet for installations that require side return air. Cut the furnace cabinet at the maximum dimensions shown on page 2.

Refer to Product Specifications for additional information.

EL296UHE applications which include side return air and a condensate trap installed on the same side of the cabinet (trap can be installed remotely within 5 ft.) require either a return air base or field-fabricated transition to accommodate an optional IAQ accessory taller than 14.5”. See figure 13.
Optional Return Air Base (Upflow Applications Only)

NOTE - Optional side return air filter kits are not for use with return air base.

1 Both the unit return air opening and the base return air opening must be covered by a single plenum or IAQ cabinet.
Minimum unit side return air opening dimensions for units requiring 1800 cfm of air and over (W x H): 23 x 11 in. (584 x 279 mm).
The opening can be cut as needed to accommodate plenum or IAQ cabinet while maintaining dimensions shown.
Side return air openings must be cut in the field. There are cutting guides stenciled on the cabinet for the side return air opening. The size of the opening must not extend beyond the markings on the furnace cabinet.
2 To minimize pressure drop, the largest opening height possible (up to 14 inches) is preferred.

Removing the Bottom Panel
Remove the two screws that secure the bottom cap to the furnace. Pivot the bottom cap down to release the bottom panel. Once the bottom panel has been removed, reinstall the bottom cap. See figure 15.

Horizontal Applications

WARNING
Do not install the furnace on its front or back. See figure 16.
The EL296UHE furnace can be installed in horizontal applications with either right- or left-hand air discharge. Refer to figure 17 for clearances in horizontal applications.

### Horizontal Application Installation Clearances

<table>
<thead>
<tr>
<th>Left End</th>
<th>Right End</th>
</tr>
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<tbody>
<tr>
<td><strong>Top</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Front</strong>*</td>
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</tr>
<tr>
<td><strong>Back</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Ends</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Vent</strong></td>
<td>0</td>
</tr>
<tr>
<td><strong>Floor</strong></td>
<td>0‡</td>
</tr>
</tbody>
</table>

*Front clearance in alcove installation must be 24 in. (610 mm). Maintain a minimum of 24 in. (610 mm) for front service access. **An 8" service clearance must be maintained below the unit to provide for servicing of the condensate trap.

‡For installations on a combustible floor, do not install the furnace directly on carpeting, tile or other combustible materials other than wood flooring.

### FIGURE 17

**Suspended Installation of Horizontal Unit**

This furnace may be installed in either an attic or a crawlspace. Either suspend the furnace from roof rafters or floor joists, as shown in figure 18, or install the furnace on a platform, as shown in figure 19. A horizontal suspension kit (51W10) may be ordered from Lennox or use equivalent.

**NOTE -** Heavy-gauge sheet metal straps may be used to suspend the unit from roof rafters or ceiling joists. When straps are used to suspend the unit in this way, support must be provided for both the ends. The straps must not interfere with the plenum or exhaust piping installation. Cooling coils and supply and return air plenums must be supported separately.

### FIGURE 18

**Platform Installation of Horizontal Unit**

1 - Select location for unit keeping in mind service and other necessary clearances. See figure 17.

2 - Construct a raised wooden frame and cover frame with a plywood sheet. If unit is installed above finished space, install an auxiliary drain pan under unit. Set unit in drain pan as shown in figure 19. Leave 8 inches for service clearance below unit for condensate trap.

3 - Provide a service platform in front of unit. When installing the unit in a crawlspace, a proper support platform may be created using concrete blocks.

4 - Route auxiliary drain line so that water draining from this outlet will be easily noticed by the homeowner.

5 - If necessary, run the condensate line into a condensate pump to meet drain line slope requirements. The pump must be rated for use with condensing furnaces. Protect the condensate discharge line from the pump to the outside to avoid freezing.

6 - Continue with exhaust, condensate and intake piping installation according to instructions.
Return Air -- Horizontal Applications

Return air may be brought in only through the end of a furnace installed in the horizontal position. The furnace is equipped with a removable bottom panel to facilitate installation. See figure 15.

Filters

This unit is not equipped with a filter or rack. A field-provided high velocity rated filter is required for the unit to operate properly. Table 1 lists recommended filter sizes. A filter must be in place whenever the unit is operating.

**IMPORTANT**

If a high-efficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. High-efficiency filters have a higher static pressure drop than standard-efficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced. The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer against the data given in the appropriate Lennox Product Specifications bulletin. Additional information is provided in Service and Application Note ACC-00-2 (August 2000).

<table>
<thead>
<tr>
<th>Furnace Cabinet Width</th>
<th>Filter Size</th>
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<tr>
<td></td>
<td>Side Return</td>
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<tr>
<td>17-1/2&quot;</td>
<td>16 X 25 X 1 (1)</td>
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<tr>
<td>21&quot;</td>
<td>16 X 25 X 1 (1)</td>
</tr>
<tr>
<td>24-1/2&quot;</td>
<td>16 X 25 X 1 (2)</td>
</tr>
</tbody>
</table>

**NOTE** - Return air must not be drawn from a room where this furnace, or any other gas-fueled appliance (i.e., water heater), or carbon monoxide-producing device (i.e., wood fireplace) is installed.

When return air is drawn from a room, a negative pressure is created in the room. If a gas appliance is operating in a room with negative pressure, the flue products can be pulled back down the vent pipe and into the room. This reverse flow of the flue gas may result in incomplete combustion and the formation of carbon monoxide gas. This raw gas or toxic fumes might then be distributed throughout the house by the furnace duct system.

Return air can be brought in through the bottom or either side of the furnace (return air brought into either side of furnace allowed only in upflow applications). If a furnace with bottom return air is installed on a platform, make an airtight seal between the bottom of the furnace and the platform to ensure that the unit operates properly and safely. Use fiberglass sealing strips, caulking, or equivalent sealing method between the plenum and the furnace cabinet to ensure a tight seal. If a filter is installed, size the return air duct to fit the filter frame.

**Pipe & Fittings Specifications**

All pipe, fittings, primer and solvent cement must conform with American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM) standards. The solvent shall be free flowing and contain no lumps, undissolved particles or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement shall show no gelation, stratification, or separation that cannot be removed by stirring. Refer to the table 2 below for approved piping and fitting materials.
**CAUTION**

Solvent cements for plastic pipe are flammable liquids and should be kept away from all sources of ignition. Do not use excessive amounts of solvent cement when making joints. Good ventilation should be maintained to reduce fire hazard and to minimize breathing of solvent vapors. Avoid contact of cement with skin and eyes.

**TABLE 2**

<table>
<thead>
<tr>
<th>PIPING AND FITTINGS SPECIFICATIONS</th>
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<tr>
<td>Schedule 40 PVC (Pipe)</td>
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<td>Schedule 40 PVC (Cellular Core Pipe)</td>
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<tr>
<td>Schedule 40 PVC (Fittings)</td>
</tr>
<tr>
<td>Schedule 40 CPVC (Pipe)</td>
</tr>
<tr>
<td>Schedule 40 CPVC (Fittings)</td>
</tr>
<tr>
<td>SDR-21 PVC or SDR-26 PVC (Pipe)</td>
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<td>SDR-21 CPVC or SDR-26 CPVC (Pipe)</td>
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<tr>
<td>Schedule 40 ABS Cellular Core DWV (Pipe)</td>
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<td>Schedule 40 ABS (Pipe)</td>
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<tr>
<td>Schedule 40 ABS (Fittings)</td>
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<tr>
<td>ABS-DWV (Drain Waste &amp; Vent) (Pipe &amp; Fittings)</td>
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<th>PRIMER &amp; SOLVENT CEMENT</th>
<th>ASTM SPECIFICATION</th>
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<tr>
<td>PVC &amp; CPVC Primer</td>
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<tr>
<td>PVC Solvent Cement</td>
<td>D2564</td>
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<td>CPVC Solvent Cement</td>
<td>F493</td>
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<tr>
<td>ABS Solvent Cement</td>
<td>D2235</td>
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<td>PVC/CPVC/ABS All Purpose Cement For Fittings &amp; Pipe of the same material</td>
<td>D2564, D2235, F493</td>
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<td>ABS to PVC or CPVC Transition Solvent Cement</td>
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<th>CANADA PIPE &amp; FITTING &amp; SOLVENT CEMENT</th>
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<tr>
<td>PVC &amp; CPVC Solvent Cement</td>
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<tr>
<td>ABS to PVC or CPVC Transition Cement</td>
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</table>

**IMPORTANT**

EL296UHE exhaust and intake connections are made of PVC. Use PVC primer and solvent cement when using PVC vent pipe. When using ABS vent pipe, use transitional solvent cement to make connections to the PVC fittings in the unit.

Use PVC primer and solvent cement or ABS solvent cement meeting ASTM specifications, refer to Table 2. As an alternate, use all purpose cement, to bond ABS, PVC, or CPVC pipe when using fittings and pipe made of the same materials. Use transition solvent cement when bonding ABS to either PVC or CPVC.

Low temperature solvent cement is recommended during installation in cooler weather. Metal or plastic strapping may be used for vent pipe hangers. Uniformly apply a liberal coat of PVC primer for PVC or use a clean dry cloth for ABS to clean inside socket surface of fitting and male end of pipe to depth of fitting socket.

**Canadian Applications Only** - Pipe, fittings, primer and solvent cement used to vent (exhaust) this appliance must be certified to ULC S636 and supplied by a single manufacturer as part of an approved vent (exhaust) system. In addition, the first three feet of vent pipe from the furnace flue collar must be accessible for inspection.

**Joint Cementing Procedure**

All cementing of joints should be done according to the specifications outlined in ASTM D 2855.

**DANGER**

**DANGER OF EXPLOSION!**

Fumes from PVC glue may ignite during system check. Allow fumes to dissipate for at least 5 minutes before placing unit into operation.

1 - Measure and cut vent pipe to desired length.
2 - Debur and chamfer end of pipe, removing any ridges or rough edges. If end is not chamfered, edge of pipe may remove cement from fitting socket and result in a leaking joint.
3 - Clean and dry surfaces to be joined.
4 - Test fit joint and mark depth of fitting on outside of pipe.
5 - Uniformly apply a liberal coat of PVC primer for PVC or use a clean dry cloth for ABS to clean inside socket surface of fitting and male end of pipe to depth of fitting socket.

**NOTE** - Check the inside of vent pipe thoroughly for any obstruction that may alter furnace operation.

1 - Test fit joint and mark depth of fitting on outside of pipe.
2 - Promptly apply solvent cement to end of pipe and inside socket surface of fitting. Cement should be applied lightly but uniformly to inside of socket. Take care to keep excess cement out of socket. Apply second coat to end of pipe.
3 - Immediately after applying last coat of cement to pipe, and while both inside socket surface and end of pipe are wet with cement, forcefully insert end of pipe into socket until it bottoms out. Turn PVC pipe 1/4 turn during assembly (but not after pipe is fully inserted) to distribute cement evenly. DO NOT turn ABS or cellular core pipe.

**NOTE** - Assembly should be completed within 20 seconds after last application of cement. Hammer blows should not be used when inserting pipe.
8 - After assembly, wipe excess cement from pipe at end of fitting socket. A properly made joint will show a bead around its entire perimeter. Any gaps may indicate an improper assembly due to insufficient solvent.

9 - Handle joints carefully until completely set.

### Venting Practices

**Piping Suspension Guidelines**

**SCHEDULE 40**

- PVC - 5’
- all other pipe* - 3’

* See table 2 for allowable pipe.

**NOTE** - Isolate piping at the point where it exits the outside wall or roof in order to prevent transmission of vibration to the structure.

**NOTE** - All horizontal runs of exhaust pipe must slope back toward unit a minimum of 1/4” (6mm) drop for each 12” (305mm).

**Wall Thickness Guidelines**

- 24” maximum
- 3/4” minimum

**FIGURE 20**

1 - In areas where piping penetrates joists or interior walls, hole must be large enough to allow clearance on all sides of pipe through center of hole using a hanger.

2 - When furnace is installed in a residence where unit is shut down for an extended period of time, such as a vacation home, make provisions for draining condensate collection trap and lines.

### Removal of the Furnace from Common Vent

In the event that an existing furnace is removed from a venting system commonly run with separate gas appliances, the venting system is likely to be too large to properly vent the remaining attached appliances.

Conduct the following test while each appliance is operating and the other appliances (which are not operating) remain connected to the common venting system. If the venting system has been installed improperly, you must correct the system as indicated in the general venting requirements section.

### WARNING

**CARBON MONOXIDE POISONING HAZARD**

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death. The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1 - Seal any unused openings in the common venting system.

2 - Inspect the venting system for proper size and horizontal pitch. Determine that there is no blockage, restriction, leakage, corrosion, or other deficiencies which could cause an unsafe condition.

3 - 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 appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

4 - Follow the lighting instructions. Turn on the appliance that is being inspected. Adjust the thermostat so that the appliance operates continuously.

5 - After the main burner has operated for 5 minutes, test for leaks of flue gases at the draft hood relief opening. Use the flame of a match or candle.

6 - After determining that each appliance connected to the common venting system is venting properly, (step 3) return all doors, widows, exhaust fans, fireplace dampers, and any other gas-burning appliances to their previous mode of operation.

7 - If a venting problem is found during any of the preceding tests, the common venting system must be modified to correct the problem.
Resize the common venting system to the minimum vent pipe size determined by using the appropriate tables in Appendix G. (These are in the current standards of the National Fuel Gas Code ANSI Z223.1.

If an EL296UHE furnace replaces a furnace which was commonly vented with another gas appliance, the size of the existing vent pipe for that gas appliance must be checked. Without the heat of the original furnace flue products, the existing vent pipe is probably oversized for the single water heater or other appliance. The vent should be checked for proper draw with the remaining appliance.

FIGURE 21

Exhaust Piping (Figures 22, 24 and 25)

Route piping to outside of structure. Continue with installation following instructions given in piping termination section.

**CAUTION**

Do not discharge exhaust into an existing stack or stack that also serves another gas appliance. If vertical discharge through an existing unused stack is required, insert PVC pipe inside the stack until the end is even with the top or outlet end of the metal stack.

**CAUTION**

The exhaust vent pipe operates under positive pressure and must be completely sealed to prevent leakage of combustion products into the living space.

**Vent Piping Guidelines**

The EL296UHE can be installed as either a Non-Direct Vent or a Direct Vent gas central furnace.

**NOTE** - In Non-Direct Vent installations, combustion air is taken from indoors or ventilated attic or crawlspace and flue gases are discharged outdoors. In Direct Vent installations, combustion air is taken from outdoors and flue gases are discharged outdoors.

**Intake and exhaust pipe sizing** -- Size pipe according to tables 3 and 5. Count all elbows inside and outside the home. Table 3 lists the minimum vent pipe lengths permitted. Table 5 lists the maximum pipe lengths permitted.

Regardless of the diameter of pipe used, the standard roof and wall terminations described in section Exhaust Piping Terminations should be used. Exhaust vent termination pipe is sized to optimize the velocity of the exhaust gas as it exits the termination. Refer to table 8.

In some applications which permit the use of several different sizes of vent pipe, a combination vent pipe may be used. Contact Lennox Application Department for assistance in sizing vent pipe in these applications.

**NOTE** - The exhaust collar on all models is sized to accommodate 2" Schedule 40 vent pipe. In horizontal applications, any transition to exhaust pipe larger than 2" must be made in vertical runs of the pipe. Therefore a 2" elbow must be added before the pipe is transitioned to any size larger than 2". This elbow must be added to the elbow count used to determine acceptable vent lengths. Contact the Application Department for more information concerning sizing of vent systems which include multiple pipe sizes.

**NOTE** - Exhaust pipe MUST be glued to furnace exhaust fittings.

**NOTE** - Exhaust piping should be checked carefully to make sure there are no sags or low spots.

**TABLE 3**

**MINIMUM VENT PIPE LENGTHS**

<table>
<thead>
<tr>
<th>EL296UHE MODEL</th>
<th>MIN. VENT LENGTH*</th>
</tr>
</thead>
<tbody>
<tr>
<td>045, 070, 090, 110, 135</td>
<td>15 ft. or 5 ft. plus 2 elbows or 10 ft. plus 1 elbow</td>
</tr>
</tbody>
</table>

*Any approved termination may be added to the minimum length listed.
Use the following steps to correctly size vent pipe diameter.

**FIGURE 23**

**Piping Size Process**

1. What is the furnace capacity? 045, 070, 090, 110 or 135?


3. Which needs most elbows? Intake or exhaust?


5. Desired pipe size? 2", 2-1/2", 3"

6. What is the altitude of the furnace installation?

7. Use table 5 or 6 to find max intake or exhaust pipe length. Includes all vent pipe and elbows inside and outside the house.

**IMPORTANT**

Do not use screens or perforated metal in exhaust or intake terminations. Doing so will cause freeze-ups and may block the terminations.
## TABLE 4
OUTDOOR TERMINATION USAGE

<table>
<thead>
<tr>
<th>Input Size</th>
<th>Vent Pipe Dia. in.</th>
<th>Standard</th>
<th>Concentric</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Field Fabricated</td>
<td>1-1/2 inch</td>
</tr>
<tr>
<td></td>
<td>51W11 (US) 51W12 (CA)</td>
<td>22G44 (US) 44J40 (US) 15F74</td>
<td>71M80 (US) 44W92 (CA)</td>
</tr>
<tr>
<td>045</td>
<td>2</td>
<td>3YES</td>
<td>3YES</td>
</tr>
<tr>
<td></td>
<td>2-1/2</td>
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<td>3YES</td>
</tr>
<tr>
<td>070</td>
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<td>3YES</td>
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<tr>
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<td>2-1/2</td>
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<td>3YES</td>
</tr>
<tr>
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<td>3YES</td>
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<td>3YES</td>
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<tr>
<td>135</td>
<td>3</td>
<td>3YES</td>
<td>YES</td>
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</tbody>
</table>

**NOTE** - Standard Terminations do not include any vent pipe or elbows external to the structure. Any vent pipe or elbows external to the structure must be included in total vent length calculations. See vent length tables.

1 Requires field-provided outdoor 1-1/2" exhaust accelerator.
2 Concentric kits 71M80 and 44W92 include 1-1/2" outdoor accelerator, when used with 045 and 070 input models.
3 Flush mount kit 51W11 and 51W12 includes 1-1/2 in. outdoor exhaust accelerator, required when used with 045, 070 and 090 input models.
4 Termination kits 30028, 44W92, 44W93 and 81J20 are certified to ULC S636 for use in Canada only.
5 See table 8 for vent accelerator requirements.
TABLE 5

Maximum Allowable Intake or Exhaust Vent Length in Feet

NOTE - Size intake and exhaust pipe length separately. Values in table are for Intake OR Exhaust, not combined total. Both Intake and Exhaust must be same pipe size.

NOTE - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.

### Standard Termination at Elevation 0 - 4500 ft

<table>
<thead>
<tr>
<th>Number Of 90° Elbows Used</th>
<th>2&quot; Pipe</th>
<th>2-1/2&quot; Pipe</th>
<th>3&quot; Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model</td>
<td>Model</td>
<td>Model</td>
</tr>
<tr>
<td></td>
<td>045</td>
<td>070</td>
<td>090</td>
</tr>
<tr>
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<td>66</td>
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</table>

### Standard Termination Elevation 4500 - 10,000 ft

<table>
<thead>
<tr>
<th>Number Of 90° Elbows Used</th>
<th>2&quot; Pipe</th>
<th>2-1/2&quot; Pipe</th>
<th>3&quot; Pipe</th>
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</table>

See concentric terminations next page.
Maximum Allowable Intake or Exhaust Vent Length in Feet

Size intake and exhaust pipe length separately. Values in table are for Intake OR Exhaust, not combined total. Both Intake and Exhaust must be same pipe size.

### Concentric Termination at Elevation 0 - 4500 ft

<table>
<thead>
<tr>
<th>Number Of 90° Elbows Used</th>
<th>2&quot; Pipe</th>
<th>2-1/2&quot; Pipe</th>
<th>3&quot; Pipe</th>
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<td>Model</td>
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### Concentric Termination Elevation 4501 - 10,000 ft

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<tr>
<td>10</td>
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</tbody>
</table>
### TABLE 6
Maximum Allowable Exhaust Vent Lengths With Furnace Installed in a Closet or Basement Using Ventilated Attic or Crawl Space For Intake Air in Feet

**NOTE** - Size intake and exhaust pipe length separately. Values in table are for Intake OR Exhaust, not combined total. Both Intake and Exhaust must be same pipe size.

**NOTE** - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.

<table>
<thead>
<tr>
<th>Number Of 90° Elbows Used</th>
<th>2&quot; Pipe</th>
<th>2-1/2&quot; Pipe</th>
<th>3&quot; Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>045</td>
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<tr>
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<td>26</td>
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</table>

### Standard Termination Elevation 4500 - 10,000 ft

<table>
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<tr>
<th>Number Of 90° Elbows Used</th>
<th>2&quot; Pipe</th>
<th>2-1/2&quot; Pipe</th>
<th>3&quot; Pipe</th>
</tr>
</thead>
<tbody>
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<td>045</td>
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<td>090</td>
<td>110</td>
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<tr>
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<tr>
<td>10</td>
<td>26</td>
<td>11</td>
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</tr>
</tbody>
</table>
FIGURE 24

TYPICAL EXHAUST AND INTAKE PIPE CONNECTIONS IN UPFLOW DIRECT OR NON-DIRECT VENT APPLICATIONS

EXHAUST INTAKE

2" 2"

TRANSITION

3" 3"

DO NOT transition from smaller to larger pipe in horizontal runs of exhaust pipe.

EXHAUST or INTAKE

* When transitioning up in pipe size, use the shortest length of 2" PVC pipe possible.

FIGURE 25

TYPICAL EXHAUST AND INTAKE PIPE CONNECTIONS IN HORIZONTAL DIRECT OR NON-DIRECT VENT APPLICATIONS (RIGHT HAND DISCHARGE SHOWN)

EXHAUST

2" 2" 2"

3" max.

INTAKE

2" or 2" 2"

TRANSITION

45° MAX

DO NOT transition from smaller to larger pipe in horizontal runs of exhaust pipe.

EXHAUST

3" 3"

INTAKE

* When transitioning up in pipe size, use the shortest length of 2" PVC pipe possible.
**Intake Piping**

The EL296UHE furnace may be installed in either **direct vent** or **non-direct vent** applications. In non-direct vent applications, when intake air will be drawn into the furnace from the surrounding space, the indoor air quality must be considered and guidelines listed in Combustion, Dilution and Ventilation Air section must be followed.

Follow the next two steps when installing the unit in **Direct Vent applications**, where combustion air is taken from outdoors and flue gases are discharged outdoors. **The provided air intake screen must not be used in direct vent applications (outdoors).**

1 - Use transition solvent cement or a sheet metal screw to secure the intake pipe to the inlet air connector.

2 - Route piping to outside of structure. Continue with installation following instructions given in general guidelines for piping terminations and intake and exhaust piping terminations for direct vent sections. Refer to table 5 for pipe sizes.

---

**TYPICAL AIR INTAKE PIPE CONNECTIONS**

**HORIZONTAL NON–DIRECT VENT APPLICATIONS**

(Horizontal Right–Hand Air Discharge Application Shown)

*NOTE* - Debris screen may be positioned straight out (preferred) or with an elbow rotated to face down.

---

**TYPICAL AIR INTAKE PIPE CONNECTIONS**

**UPFLOW NON–DIRECT VENT APPLICATIONS**

*NOTE* - Debris screen and elbow may be rotated, so that screen may be positioned to face forward or to either side.

---

Follow the next two steps when installing the unit in **Non-Direct Vent applications** where combustion air is taken from indoors or ventilated attic or crawlspace and flue gases are discharged outdoors.

1 - Use field-provided materials and the factory-provided air intake screen to route the intake piping as shown in figure 26 or 27. Maintain a minimum clearance of 3” (76mm) around the air intake opening. The air intake opening (with the protective screen) should always be directed forward or to either side in the upflow position, and either straight out or downward in the horizontal position.

**The air intake piping must not terminate too close to the flooring or a platform. Ensure that the intake air inlet will not be obstructed by loose insulation or other items that may clog the debris screen.**

2 - If intake air is drawn from a ventilated attic (figure 28) or ventilated crawlspace (figure 29) the exhaust vent length must not exceed those listed in table 6. If 3” diameter pipe is used, reduce to 2” diameter pipe at the termination point to accommodate the debris screen.

3 - Use a sheet metal screw to secure the intake pipe to the connector, if desired.
CAUTION

If this unit is being installed in an application with combustion air coming in from a space serviced by an exhaust fan, power exhaust fan, or other device which may create a negative pressure in the space, take care when sizing the inlet air opening. The inlet air opening must be sized to accommodate the maximum volume of exhausted air as well as the maximum volume of combustion air required for all gas appliances serviced by this space.

**General Guidelines for Vent Terminations**

In Non-Direct Vent applications, combustion air is taken from indoors or ventilated attic or crawlspace and the flue gases are discharged to the outdoors. The EL296UHE is then classified as a non-direct vent, Category IV gas furnace.

In Direct Vent applications, combustion air is taken from outdoors and the flue gases are discharged to the outdoors. The EL296UHE is then classified as a direct vent, Category IV gas furnace.

In both Non-Direct Vent and Direct Vent applications, the vent termination is limited by local building codes. In the absence of local codes, refer to the current National Fuel Gas Code ANSI Z223-1/NFPA 54 in U.S.A., and current CSA-B149 Natural Gas and Propane Installation Codes in Canada for details.

Position termination according to location given in figure 30 or 31. In addition, position termination so it is free from any obstructions and 12” above the average snow accumulation.

At vent termination, care must be taken to maintain protective coatings over building materials (prolonged exposure to exhaust condensate can destroy protective coatings). It is recommended that the exhaust outlet not be located within 6 feet (1.8m) of a condensing unit because the condensate can damage the painted coating.

**NOTE** - See table 7 for maximum allowed exhaust pipe length without insulation in unconditioned space during winter design temperatures below 32°F (0°C). If required exhaust pipe should be insulated with 1/2” (13mm) Armaflex or equivalent. In extreme cold climate areas, 3/4” (19mm) Armaflex or equivalent may be necessary. Insulation on outside runs of exhaust pipe must be painted or wrapped to protect insulation from deterioration. Exhaust pipe insulation may not be necessary in some specific applications.

**IMPORTANT**

For Canadian Installations Only:

In accordance to CSA International B149 installation codes, the minimum allowed distance between the combustion air intake inlet and the exhaust outlet of other appliances shall not be less than 12 inches (305mm).
<table>
<thead>
<tr>
<th>Winter Design Temperatures(^1) °F (°C)</th>
<th>Vent Pipe Diameter</th>
<th>Unit Input Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 to 21 (0 to -6)</td>
<td></td>
<td>045</td>
</tr>
<tr>
<td>2 in.</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>2-1/2 in.</td>
<td>15</td>
<td>22</td>
</tr>
<tr>
<td>3 in.</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>20 to 1 (-7 to -17)</td>
<td></td>
<td>2 in</td>
</tr>
<tr>
<td></td>
<td>2-1/2 in.</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>3 in.</td>
<td>6</td>
</tr>
<tr>
<td>0 to -20 (-18 to -29)</td>
<td></td>
<td>2 in</td>
</tr>
<tr>
<td></td>
<td>2-1/2 in.</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>3 in.</td>
<td>2</td>
</tr>
</tbody>
</table>

\(^1\)Refer to 99% Minimum Design Temperature table provided in the current edition of the ASHRAE Fundamentals Handbook.

NOTE - Maximum uninsulated vent lengths listed may include the termination (vent pipe exterior to the structure) and cannot exceed 5 linear feet or the maximum allowable intake or exhaust vent length listed in table 5 or 6 which ever is less.
VENT TERMINATION CLEARANCES
FOR NON-DIRECT VENT INSTALLATIONS IN THE US AND CANADA

**US Installations**

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
<th>US Installation Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Clearance above grade, veranda, porch, deck or balcony</td>
<td>12 inches (305mm) or 12 in. (305mm) above average snow accumulation.</td>
</tr>
<tr>
<td>B</td>
<td>Clearance to window or door that may be opened</td>
<td>4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening</td>
</tr>
<tr>
<td>C</td>
<td>Clearance to permanently closed window</td>
<td>* 12”</td>
</tr>
<tr>
<td>D</td>
<td>Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610 mm) from the center line of the terminal</td>
<td>* Equal to or greater than soffit depth.</td>
</tr>
<tr>
<td>E</td>
<td>Clearance to unventilated soffit</td>
<td>* Equal to or greater than soffit depth.</td>
</tr>
<tr>
<td>F</td>
<td>Clearance to outside corner</td>
<td>* No minimum to outside corner</td>
</tr>
<tr>
<td>G</td>
<td>Clearance to inside corner</td>
<td>* No minimum to inside corner</td>
</tr>
<tr>
<td>H</td>
<td>Clearance to each side of center line extended above meter / regulator assembly</td>
<td>3 feet (.9 m) within a height 15 feet (4.5 m) above the meter / regulator assembly</td>
</tr>
<tr>
<td>I</td>
<td>Clearance to service regulator vent outlet</td>
<td>* 3 feet (.9 m)</td>
</tr>
<tr>
<td>J</td>
<td>Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance</td>
<td>4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening</td>
</tr>
<tr>
<td>K</td>
<td>Clearance to mechanical air supply inlet</td>
<td>3 feet (.9 m) above if within 10 feet (3 m) horizontally</td>
</tr>
<tr>
<td>L</td>
<td>Clearance above paved sidewalk or paved driveway located on public property</td>
<td>7 feet (2.1 m)†</td>
</tr>
<tr>
<td>M</td>
<td>Clearance under veranda, porch, deck or balcony</td>
<td>* 12 inches (305 mm)‡</td>
</tr>
</tbody>
</table>

**Canadian Installations**

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
<th>Canadian Installation Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Clearance above grade, veranda, porch, deck or balcony</td>
<td>12 inches (305mm) or 12 in. (305mm) above average snow accumulation.</td>
</tr>
<tr>
<td>B</td>
<td>Clearance to window or door that may be opened</td>
<td>6 inches (152 mm) for appliances &lt; 10,000 Btu (3kw), 12 inches (305 mm) for appliances &gt; 10,000 Btu (3kw) and &lt; 100,000 Btu (30kw), 36 inches (9 m) for appliances &gt; 100,000 Btu (30kw)</td>
</tr>
<tr>
<td>C</td>
<td>Clearance to permanently closed window</td>
<td>* 12”</td>
</tr>
<tr>
<td>D</td>
<td>Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610 mm) from the center line of the terminal</td>
<td>* Equal to or greater than soffit depth.</td>
</tr>
<tr>
<td>E</td>
<td>Clearance to unventilated soffit</td>
<td>* Equal to or greater than soffit depth.</td>
</tr>
<tr>
<td>F</td>
<td>Clearance to outside corner</td>
<td>* No minimum to outside corner</td>
</tr>
<tr>
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<td>3 feet (.9 m) within a height 15 feet (4.5 m) above the meter / regulator assembly</td>
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<td>3 feet (.9 m)</td>
</tr>
<tr>
<td>J</td>
<td>Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance</td>
<td>6 inches (152 mm) for appliances &lt; 10,000 Btu (3kw), 12 inches (305 mm) for appliances &gt; 10,000 Btu (3kw) and &lt; 100,000 Btu (30kw), 36 inches (9 m) for appliances &gt; 100,000 Btu (30kw)</td>
</tr>
<tr>
<td>K</td>
<td>Clearance to mechanical air supply inlet</td>
<td>6 feet (1.8 m)</td>
</tr>
<tr>
<td>L</td>
<td>Clearance above paved sidewalk or paved driveway located on public property</td>
<td>7 feet (2.1 m)†</td>
</tr>
<tr>
<td>M</td>
<td>Clearance under veranda, porch, deck or balcony</td>
<td>12 inches (305 mm)‡</td>
</tr>
</tbody>
</table>

*1 In accordance with the current ANSI Z223.1/NFPA 54 Natural Fuel Gas Code
2 In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code
† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.
‡ Permuted only if veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor. Lennox recommends avoiding this location if possible.

*For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.*
### VENT TERMINATION CLEARANCES
FOR DIRECT VENT INSTALLATIONS IN THE US AND CANADA

**US Installations**

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
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<th>Canadian Clearances</th>
</tr>
</thead>
<tbody>
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<td>Clearance above grade, veranda, porch, deck or balcony</td>
<td>12 inches (305mm) or 12 in. (305mm) above average snow accumulation.</td>
<td>12 inches (305mm) or 12 in. (305mm) above average snow accumulation.</td>
</tr>
<tr>
<td>B</td>
<td>Clearance to window or door that may be opened</td>
<td>6 inches (152mm) for appliances &lt;10,000 Btu (3kw), 9 inches (228mm) for appliances &gt; 10,000 Btu (3kw) and &lt;50,000 Btu (15kw), 12 inches (305mm) for appliances &gt; 50,000 Btu (15kw)</td>
<td>6 inches (152mm) for appliances &lt;10,000 Btu (3kw), 12 inches (305mm) for appliances &gt; 10,000 Btu (3kw) and &lt;100,000 Btu (30kw), 36 inches (.9m) for appliances &gt; 100,000 Btu (30kw)</td>
</tr>
<tr>
<td>C</td>
<td>Clearance to permanently closed window</td>
<td>* 12&quot;</td>
<td>* 12&quot;</td>
</tr>
<tr>
<td>D</td>
<td>Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610mm) from the center line of the terminal</td>
<td>* Equal to or greater than soffit depth</td>
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</tr>
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<td>E</td>
<td>Clearance to unventilated soffit</td>
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<td>* Equal to or greater than soffit depth</td>
</tr>
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<td>F</td>
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<td>G</td>
<td>Clearance to inside corner</td>
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<td></td>
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<td>H</td>
<td>Clearance to each side of center line extended above meter / regulator assembly</td>
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<td>I</td>
<td>Clearance to service regulator vent outlet</td>
<td>* 3 feet (.9m)</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance</td>
<td>6 inches (152mm) for appliances &lt;10,000 Btu (3kw), 9 inches (228mm) for appliances &gt; 10,000 Btu (3kw) and &lt;50,000 Btu (15kw), 12 inches (305mm) for appliances &gt; 50,000 Btu (15kw)</td>
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<td>K</td>
<td>Clearance to mechanical air supply inlet</td>
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<tr>
<td>L</td>
<td>Clearance above paved sidewalk or paved driveway located on public property</td>
<td>* 7 feet (2.1m)†</td>
<td>7 feet (2.1m)†</td>
</tr>
<tr>
<td>M</td>
<td>Clearance under veranda, porch, deck or balcony</td>
<td>*12 inches (305mm)‡</td>
<td>12 inches (305mm)‡</td>
</tr>
</tbody>
</table>

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

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

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

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

*For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.*
Details of Intake and Exhaust Piping Terminations for Direct Vent Installations

**NOTE** - In Direct Vent installations, combustion air is taken from outdoors and flue gases are discharged to outdoors.

**NOTE** - Flue gas may be slightly acidic and may adversely affect some building materials. If any vent termination is used and the flue gasses may impinge on the building material, a corrosion-resistant shield (minimum 24 inches square) should be used to protect the wall surface. If the optional tee is used, the protective shield is recommended. The shield should be constructed using wood, plastic, sheet metal or other suitable material. All seams, joints, cracks, etc. in the affected area should be sealed using an appropriate sealant. See figure 35.

Intake and exhaust pipes may be routed either horizontally through an outside wall or vertically through the roof. In attic or closet installations, vertical termination through the roof is preferred. Figures 32 through 46 show typical terminations.

1 - Intake and exhaust terminations are not required to be in the same pressure zone. You may exit the intake on one side of the structure and the exhaust on another side (figure 33). You may exit the exhaust out the roof and the intake out the side of the structure (figure 34).

2 - Intake and exhaust pipes should be placed as close together as possible at termination end (refer to illustrations). Maximum separation is 3” (76MM) on roof terminations and 6” (152MM) on side wall terminations.

**NOTE** - When venting in different pressure zones, the maximum separation requirement of intake and exhaust pipe DOES NOT apply.

3 - On roof terminations, the intake piping should terminate straight down using two 90° elbows (See figure 32).

4 - Exhaust piping must terminate straight out or up as shown. A reducer may be required on the exhaust piping at the point where it exits the structure to improve the velocity of exhaust away from the intake piping. See table 8.

**NOTE** - Care must be taken to avoid recirculation of exhaust back into intake pipe.

5 - On field-supplied terminations for side wall exit, exhaust piping may extend a maximum of 12 inches (305MM) for 2” PVC and 20 inches (508MM) for 3” (76MM) PVC beyond the outside wall. Intake piping should be as short as possible. See figures 36 and 37.

6 - On field-supplied terminations, a minimum distance between the end of the exhaust pipe and the end of the intake pipe without a termination elbow is 8” and a minimum distance of 6” with a termination elbow. See figures 36 and 37.

### Figure 32

UNCONDITIONED ATTIC SPACE

8” (203MM) MIN

12” (305MM) ABOVE AVERAGE SNOW ACCUMULATION

3” (76MM) OR 2” (51MM) PVC

PROVIDE SUPPORT FOR INTAKE AND EXHAUST LINES

DIRECT VENT ROOF TERMINATION KIT (15F75 or 44J41)

### Figure 33

Exiting Exhaust and Intake Vent (different pressure zones)

- Exhaust Pipe
- Furnace
- Inlet Air (Minimum 12 in. 305 MM) above grade or snow accumulation

### Figure 34

Exiting Exhaust and Intake Vent (different pressure zones)

- Roof Terminated Exhaust Pipe
- Furnace
- Inlet Air (Minimum 12 in. 305 MM) above grade or snow accumulation

### Table 8

<table>
<thead>
<tr>
<th>EL296UHE MODEL</th>
<th>Termination Pipe Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>*045 and 070</td>
<td>1-1/2” (38MM)</td>
</tr>
<tr>
<td>*090</td>
<td>2” (51MM)</td>
</tr>
<tr>
<td>110</td>
<td>2” (51MM)</td>
</tr>
<tr>
<td>135</td>
<td>2” (51MM)</td>
</tr>
</tbody>
</table>

*EL296UHE-045, -070 and -090 units with the flush mount termination must use the 1-1/2”accelerator supplied with the kit.
7 - If intake and exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported every 24" (610MM) as shown in figures 36 and 37. In addition, close coupled wall termination kits must be extended for use in this application. See figures 44 and 45. When exhaust and intake piping must be run up an outside wall, the exhaust piping must be terminated with pipe sized per table 8. The intake piping may be equipped with a 90° elbow turndown. Using turndown will add 5 feet (1.5m) to the equivalent length of the pipe.

8 - A multiple furnace installation may use a group of up to four terminations assembled together horizontally, as shown in figure 41.

TABLE 9

<table>
<thead>
<tr>
<th></th>
<th>2&quot; (51MM) Vent Pipe</th>
<th>3&quot; (76MM) Vent Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Clearance above grade or average snow accumulation</td>
<td>12&quot; (305MM) Min.</td>
<td>12&quot; (305MM) Min.</td>
</tr>
<tr>
<td>B - Horizontal separation between intake and exhaust</td>
<td>6&quot; (152MM) Min.</td>
<td>6&quot; (152MM) Min.</td>
</tr>
<tr>
<td></td>
<td>24&quot; (610MM) Max.</td>
<td>24&quot; (610MM) Max.</td>
</tr>
<tr>
<td>C - Minimum from end of exhaust to inlet of intake</td>
<td>9&quot; (227MM) Min.</td>
<td>9&quot; (227MM) Min.</td>
</tr>
<tr>
<td>D - Exhaust pipe length</td>
<td>12&quot; (305MM) Min.</td>
<td>12&quot; (305MM) Min.</td>
</tr>
<tr>
<td></td>
<td>16&quot; (405MM) Max.</td>
<td>20&quot; (508MM) Max.</td>
</tr>
<tr>
<td>E - Wall support distance from top of each pipe (intake/exhaust)</td>
<td>6&quot; (152MM) Max.</td>
<td>6&quot; (152MM) Max.</td>
</tr>
</tbody>
</table>

1 The exhaust termination tee should be connected to the 2" or 3" PVC flue pipe as shown in the illustration. Do not use an accelerator in applications that include an exhaust termination tee. The accelerator is not required.
2 As required. Flue gas may be acidic and may adversely affect some building materials. If a side wall vent termination is used and flue gases will impinge on the building materials, a corrosion-resistant shield (24 inches square) should be used to protect the wall surface. If optional tee is used, the protective shield is recommended. The shield should be constructed using wood, sheet metal or other suitable material. All seams, joints, cracks, etc. in affected area, should be sealed using an appropriate sealant.
3 Exhaust pipe 45° elbow can be rotated to the side away from the combustion air inlet to direct exhaust away from adjacent property. The exhaust must never be directed toward the combustion air inlet.

FIGURE 35
See venting table 5 for maximum venting lengths with this arrangement.

* Use wall support every 24" (610MM). Use two wall supports if extension is greater than 24" (610MM) but less than 48" (1219 MM). NOTE - One wall support must be 6" (152MM) from top of each pipe (intake and exhaust).

### FIELD FABRICATED WALL TERMINATION OR (15F74) WALL RING TERMINATION KIT

<table>
<thead>
<tr>
<th>2&quot; (51MM) Vent Pipe</th>
<th>3&quot; (76MM) Vent Pipe</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Minimum clearance above grade or average snow accumulation</td>
<td>12&quot; (305MM)</td>
</tr>
<tr>
<td>B - Maximum horizontal separation between intake and exhaust</td>
<td>6&quot; (152MM)</td>
</tr>
<tr>
<td>C - Minimum from end of exhaust to inlet of intake</td>
<td>8&quot; (203MM)</td>
</tr>
<tr>
<td>D - Maximum exhaust pipe length</td>
<td>12&quot; (305MM)</td>
</tr>
<tr>
<td>E - Maximum wall support distance from top of each pipe (intake/exhaust)</td>
<td>6&quot; (152MM)</td>
</tr>
</tbody>
</table>

### FIELD FABRICATED WALL TERMINATION OR (15F74) WALL RING TERMINATION KIT

With INTAKE ELBOW

NOTE - FIELD-PROVIDED REDUCER MAY BE REQUIRED TO ADAPT LARGER VENT PIPE SIZE TO TERMINATION

<table>
<thead>
<tr>
<th>2&quot; (51MM) Vent Pipe</th>
<th>3&quot; (76MM) Vent Pipe</th>
</tr>
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<tbody>
<tr>
<td>A - Minimum clearance above grade or average snow accumulation</td>
<td>12&quot; (305MM)</td>
</tr>
<tr>
<td>B - Maximum horizontal separation between intake and exhaust</td>
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<td>6&quot; (152MM)</td>
</tr>
<tr>
<td>D - Maximum exhaust pipe length</td>
<td>12&quot; (305MM)</td>
</tr>
<tr>
<td>E - Maximum wall support distance from top of each pipe (intake/exhaust)</td>
<td>6&quot; (152MM)</td>
</tr>
</tbody>
</table>
FIGURE 38

2" EXTENSION FOR 2" PVC PIPE
1" EXTENSION FOR 3" PVC PIPE
FLUSH-MOUNT SIDE WALL TERMINATION
51W11 (US) or 51W12 (Canada)

FIGURE 39

1 1/2" (38mm) accelerator provided on 71M80 & 44W92 kits for EL296UH045E36B, & 070E36B
DIRECT VENT CONCENTRIC ROOFTOP TERMINATION
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

FIGURE 40

FIELD-PROVIDED REDUCER MAY BE REQUIRED TO ADAPT LARGER VENT PIPE SIZE TO TERMINATION
DIRECT VENT CONCENTRIC WALL TERMINATION
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

FIGURE 41

EXHAUST VENT
INTAKE AIR
Front View

EXHAUST VENT
INTAKE AIR
Top View
1/2" (13MM) Foam Insulation in Unconditioned Space
FIELD-PROVIDED REDUCER MAY BE REQUIRED TO ADAPT LARGER VENT PIPE SIZE TO TERMINATION
DIRECT VENT WALL TERMINATION KIT
(30G28 or 81J20)

FIGURE 42

EXHAUST VENT
INTAKE AIR
Top View
1/2" (13MM) Foam Insulation in Unconditioned Space
FIELD-PROVIDED REDUCER MAY BE REQUIRED TO ADAPT LARGER VENT PIPE SIZE TO TERMINATION
DIRECT VENT WALL TERMINATION KIT
(22G44 or 44J40)
WALL TERMINATION KITS (CLOSE−COUPLE)
EXTENDED VENT FOR GRADE CLEARANCE
2 inch (51 mm) 22G44 (US)
3 inch (76 mm) 44J40 (US)

If intake and exhaust pipe is less than 12 in. (305 MM) above snow accumulation or other obstructions, field−fabricated piping must be installed.

8" (203mm) Min. for 2" (51MM) & 3" (76MM) DIA. pipe between the end of the exhaust pipe and intake pipe
12" (305MM) Max. for 2" (51MM) Dia. Exhaust
20" (508MM) Max. for 3" (76MM) Dia. Exhaust

FIELD-PROVIDED REDUCER MAY BE REQUIRED TO ADAPT LARGER VENT PIPE SIZE TO TERMINATION

"Use wall support every 24" (610). Use two supports if extension is greater than 24" but less than 48".

WALL TERMINATION KITS (CLOSE−COUPLE)
EXTENDED VENT FOR GRADE CLEARANCE
2 inch (51 mm) 30G28 (WTK Canada)
3 inch (76 mm) 81J20 (WTK Canada)

See Installation Instructions for additional information.

FIELD-PROVIDED REDUCER MAY BE REQUIRED TO ADAPT LARGER VENT PIPE SIZE TO TERMINATION

"Use wall support every 24" (610). Use two supports if extension is greater than 24" but less than 48".
EL296UHE DIRECT VENT APPLICATION
USING EXISTING CHIMNEY

NOTE - Do not discharge exhaust gases directly into any chimney or vent stack. If vertical discharge through an existing unused chimney or stack is required, insert piping inside chimney until the pipe open end is above top of chimney and terminate as illustrated. In any exterior portion of chimney, the exhaust vent must be insulated.

FIGURE 46
Details of Exhaust Piping Terminations for Non-Direct Vent Applications
Exhaust pipes may be routed either horizontally through an outside wall or vertically through the roof. In attic or closet installations, vertical termination through the roof is preferred. Figures 47 through 50 show typical terminations.

1 - Exhaust piping must terminate straight out or up as shown. The termination pipe must be sized as listed in table 8. The specified pipe size ensures proper velocity required to move the exhaust gases away from the building.

2 - On field supplied terminations for side wall exit, exhaust piping may extend a maximum of 12 inches (305MM) for 2” PVC and 20 inches (508MM) for 3” (76MM) PVC beyond the outside wall. See figure 48.

3 - If exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported every 24 inches (610MM) as shown in figure 49. When exhaust piping must be run up an outside wall, any reduction in exhaust pipe size must be done after the final elbow.

FIGURE 48

FIGURE 49

*WALL SUPPORT OUTSIDE WALL SIZE TERMINATION PIPE PER TABLE 8.

Non-direct vent field supplied wall termination extended or (15F74) wall termination vent pipe extended
*Use wall support every 24” (610). Use two supports if extension is greater than 24” but less than 48”.

Non-direct vent roof termination kit (15F75 or 44J41)
Condensate Piping
This unit is designed for either right- or left-side exit of condensate piping in upflow applications. In horizontal applications, the condensate trap must extend below the unit. An 8” service clearance is required for the condensate trap. Refer to figures 51 and 53 for condensate trap locations. Figure 59 shows trap assembly using 1/2” PVC or 3/4” PVC.

NOTE - If necessary the condensate trap may be installed up to 5’ away from the furnace. Use PVC pipe to connect trap to furnace condensate outlet. Piping from furnace must slope down a minimum of 1/4” per ft. toward trap.

1 - Determine which side condensate piping will exit the unit, location of trap, field-provided fittings and length of PVC pipe required to reach available drain.

2 - Use a large flat head screw driver or a 1/2” drive socket extension and remove plug (figure 51) from the cold end header box at the appropriate location on the side of the unit. Install provided 3/4 NPT street elbow fitting into cold end header box. Use Teflon tape or appropriate pipe dope.

3 - Install the cap over the clean out opening at the base of the trap. Secure with clamp. See figure 59.

4 - Install drain trap using appropriate PVC fittings, glue all joints. Glue the provided drain trap as shown in figure 59. Route the condensate line to an open drain. Condensate line must maintain a 1/4” downward slope from the furnace to the drain.

5 - Figures 54 and 56 show the furnace and evaporator coil using a separate drain. If necessary the condensate line from the furnace and evaporator coil can drain together. See figures 55, 57 and 58.

Upflow furnace (figure 57) - In upflow furnace applications the field provided vent must be a minimum 1” to a maximum 2” length above the condensate drain outlet connection. Any length above 2” may result in a flooded heat exchanger if the combined primary drain line were to become restricted.

Horizontal furnace (figure 58) - In horizontal furnace applications the field provided vent must be a minimum 4” to a maximum 5” length above the condensate drain outlet connection. Any length above 5” may result in a flooded heat exchanger if the combined primary drain line were to become restricted.

NOTE - In horizontal applications it is recommended to install a secondary drain pan underneath the unit and trap assembly.

NOTE - Appropriately sized tubing and barbed fitting may be used for condensate drain. Attach to the drain on the trap using a hose clamp. See figure 52.
CAUTION

Do not use copper tubing or existing copper condensate lines for drain line.

6 - If unit will be started immediately upon completion of installation, prime trap per procedure outlined in Unit Start-Up section.

Condensate line must slope downward away from the trap to drain. If drain level is above condensate trap, condensate pump must be used. Condensate drain line should be routed within the conditioned space to avoid freezing of condensate and blockage of drain line. If this is not possible, a heat cable kit may be used on the condensate trap and line. Heating cable kit is available from Lennox in various lengths; 6 ft. (1.8m) - kit no. 26K68; 24 ft. (7.3m) - kit no. 26K69; and 50 ft. (15.2m) - kit no. 26K70.

CONDENSATE TRAP LOCATIONS

(Unit shown in upflow position with remote trap)

Trap can be installed a maximum 5' from furnace

*Piping from furnace must slope down a minimum of 1/4" per ft. toward trap.

FIGURE 53

FIGURE 52

FIGURE 54

FIGURE 55
EL296UHE with Evaporator Coil Using a Separate Drain
(Unit shown in horizontal left-hand discharge position)

Field Provided Vent
(4' min. to 5' max. above condensate connection)

5' max.
PVC Pipe Only

Piping from furnace and evaporator coil must slope down a minimum 1/4" per ft. toward trap

IMPORTANT
When combining the furnace and evaporator coil drains together, the A/C condensate drain outlet must be vented to relieve pressure in order for the furnace pressure switch to operate properly.

EL296UHE with Evaporator Coil Using a Common Drain
(Unit shown in horizontal left−hand discharge position)

Field–Provided Vent
(1' min. to 2' Max. above condensate drain connection)

Condensate Drain Connection

Evaporator drain line required

Piping from furnace and evaporator coil must slope down a minimum 1/4" per ft. toward trap
Optional Condensate Drain Connection

Adapter 3/4 inch slip X
3/4 inch mpt (not furnished)

90° Street Elbow
3/4 inch PVC
(not furnished)

Condensate Drain Connection In Unit

To Trap

Optional Drain Piping From Trap

Drain Assembly for 1/2 inch Drain Pipe

1/2 inch PVC Pipe
(Not Furnished)

90° Elbow
1/2 inch PVC
(Not Furnished)

To Drain

Drain Assembly for 3/4 inch Drain Pipe

90° Elbow
3/4 inch PVC
(Not Furnished)

To Drain

Coupling 3/4 inch slip X slip
(Not Furnished)

Drain Trap Assembly with 1/2 inch Piping

1 (25 mm) Min. 2 (50 mm) Max. Above Top Of Condensate Drain Connection In Unit

To Drain

Drain Trap Assembly with 3/4 inch Piping

1 (25 mm) Min. 2 (50 mm) Max. Above Top Of Condensate Drain Connection In Unit

To Drain

Condensate Drain Connection In Unit

FIGURE 59
**Gas Piping**

Gas supply piping should not allow more than 0.5"W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

**CAUTION**

If a flexible gas connector is required or allowed by the authority that has jurisdiction, black iron pipe shall be installed at the gas valve and extend outside the furnace cabinet. The flexible connector can then be added between the black iron pipe and the gas supply line.

**WARNING**

Do not exceed 600 in-lbs (50 ft-lbs) torque when attaching the gas piping to the gas valve.

1 - Gas piping may be routed into the unit through either the left- or right-hand side. Supply piping enters into the gas valve from the side of the valve as shown in figure 61.

2 - When connecting gas supply, factors such as length of run, number of fittings and furnace rating must be considered to avoid excessive pressure drop. Table 10 lists recommended pipe sizes for typical applications. **NOTE** - Use two wrenches when connecting gas piping to avoid transferring torque to the manifold.

3 - Gas piping must not run in or through air ducts, clothes chutes, chimneys or gas vents, dumb waiters or elevator shafts. Center gas line through piping hole. Gas line should not touch side of unit. See figures 61 and 62.

4 - Piping should be sloped 1/4 inch per 15 feet (6mm per 5.6m) upward toward the gas meter from the furnace. The piping must be supported at proper intervals, every 8 to 10 feet (2.44 to 3.05m), using suitable hangers or straps. Install a drip leg in vertical pipe runs to serve as a trap for sediment or condensate.

5 - A 1/8" N.P.T. plugged tap or pressure post is located on the gas valve to facilitate test gauge connection. See figure 66.

6 - In some localities, codes may require installation of a manual main shut-off valve and union (furnished by installer) external to the unit. Union must be of the ground joint type.

**IMPORTANT**

Compounds used on threaded joints of gas piping must be resistant to the actions of liquified petroleum gases.

**Leak Check**

After gas piping is completed, carefully check all piping connections (factory- and field-installed) for gas leaks. Use a leak detecting solution or other preferred means. Never use an open flame to test for gas leaks. Check all connections using a commercially available soap solution made specifically for leak detection. The furnace must be isolated from the gas supply system by closing its individual manual shut-off valve during any pressure testing of the gas supply system at pressures greater than or equal to 1/2 psig (3.48 kPa, 14 inches w.c.).

**FIGURE 60**

**IMPORTANT**

When testing pressure of gas lines, gas valve must be disconnected and isolated. See figure 60. Gas valves can be damaged if subjected to pressures greater than 1/2 psig (3.48 kPa).

**WARNING**

Failure to follow the safety warnings exactly could result in serious injury, death, or property damage. Never use an open flame to test for gas leaks. Check all connections using a commercially available soap solution made specifically for leak detection. Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed.
Left Side Piping (Standard)

Right Side Piping (Alternate)

NOTE - BLACK IRON PIPE ONLY TO BE ROUTED INSIDE OF CABINET

FIGURE 61

Horizontal Applications
Possible Gas Piping Configurations

Horizontal Application
Left-Side Air Discharge

Horizontal Application
Right-Side Air Discharge

NOTE - BLACK IRON PIPE ONLY TO BE ROUTED INSIDE OF CABINET

FIGURE 62
TABLE 10
GAS PIPE CAPACITY - FT³/HR (KL/HR)

<table>
<thead>
<tr>
<th>Nominal Iron Pipe Size inches (mm)</th>
<th>Internal Diameter inches (mm)</th>
<th>10 (3.048)</th>
<th>20 (6.096)</th>
<th>30 (9.144)</th>
<th>40 (12.192)</th>
<th>50 (15.240)</th>
<th>60 (18.288)</th>
<th>70 (21.336)</th>
<th>80 (24.384)</th>
<th>90 (27.432)</th>
<th>100 (30.480)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2 (12.7)</td>
<td>0.622</td>
<td>0.618</td>
<td>0.614</td>
<td>0.610</td>
<td>0.606</td>
<td>0.602</td>
<td>0.598</td>
<td>0.594</td>
<td>0.590</td>
<td>0.587</td>
<td>0.584</td>
</tr>
<tr>
<td>3/4 (19.05)</td>
<td>0.824</td>
<td>0.819</td>
<td>0.814</td>
<td>0.809</td>
<td>0.805</td>
<td>0.801</td>
<td>0.797</td>
<td>0.793</td>
<td>0.789</td>
<td>0.785</td>
<td>0.782</td>
</tr>
<tr>
<td>1 (25.4)</td>
<td>1.049</td>
<td>1.043</td>
<td>1.038</td>
<td>1.033</td>
<td>1.029</td>
<td>1.025</td>
<td>1.021</td>
<td>1.017</td>
<td>1.013</td>
<td>1.009</td>
<td>1.005</td>
</tr>
<tr>
<td>1-1/2 (38.1)</td>
<td>1.610</td>
<td>1.604</td>
<td>1.599</td>
<td>1.594</td>
<td>1.589</td>
<td>1.584</td>
<td>1.579</td>
<td>1.574</td>
<td>1.569</td>
<td>1.564</td>
<td>1.559</td>
</tr>
<tr>
<td>2 (50.8)</td>
<td>2.067</td>
<td>2.061</td>
<td>2.055</td>
<td>2.050</td>
<td>2.045</td>
<td>2.040</td>
<td>2.035</td>
<td>2.030</td>
<td>2.025</td>
<td>2.020</td>
<td>2.015</td>
</tr>
<tr>
<td>2-1/2 (63.5)</td>
<td>2.469</td>
<td>2.463</td>
<td>2.457</td>
<td>2.452</td>
<td>2.447</td>
<td>2.442</td>
<td>2.437</td>
<td>2.432</td>
<td>2.427</td>
<td>2.422</td>
<td>2.417</td>
</tr>
</tbody>
</table>

**NOTE** - Capacity given in cubic feet of gas per hour (kilo liters of gas per hour) and based on 0.60 specific gravity gas.

Electrical

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

**CAUTION**
Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

INTERIOR MAKE-UP BOX INSTALLATION

remove and relocate plug to unused opening on left side

Right Side

FIGURE 63

The unit is equipped with a field make-up box. The make-up box may be moved to the right side of the furnace to facilitate installation. Secure the excess wire to the existing harness to protect it from damage.

Refer to figure 64 for field wiring, schematic wiring diagram and troubleshooting.

The power supply wiring must meet Class I restrictions. Protected by either a fuse or circuit breaker, select circuit protection and wire size according to unit nameplate.

**NOTE** - Unit nameplate states maximum current draw. Maximum Over-Current Protection allowed is 15 AMP.

Holes are on both sides of the furnace cabinet to facilitate installation. Secure the excess wire to the existing harness to protect it from damage. Before connecting the thermostat check to make sure the wires will be long enough for servicing at a later date. Make sure that thermostat wire is long enough to facilitate future removal of blower for service.

Complete the wiring connections to the equipment. Use the provided unit wiring diagram and the field wiring diagram shown in figure 64. Use 18-gauge wire or larger that is suitable for Class II rating for thermostat connections.

Electrically ground the unit according to local codes or, in the absence of local codes, according to the current National Electric Code (ANSI/NFPA No. 70) for the USA and current Canadian Electric Code part 1 (CSA standard C22.1) for Canada. A green ground wire is provided in the field make-up box.

**NOTE** - The EL296UHE furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.
Accessory Terminals
One line voltage “ACC” 1/4” spade terminal is provided on the furnace integrated control. See figure 65 for integrated control configuration. This terminal is energized when the indoor blower is operating. Any accessory rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If an accessory rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

An unpowered, normally open (dry) set of contacts with a 1/4” spade terminal “HUM” are provided for humidifier connections and may be connected to 24V or 120V. Any humidifier rated up to one amp can be connected to these terminals. In 120V humidifier applications the neutral leg of the circuit can be connected to one of the provided neutral terminals. This terminal is energized in the heating mode.

Install the room thermostat according to the instructions provided with the thermostat. See figure 64 for thermostat designations. If the furnace is being matched with a heat pump, refer to the FM21 installation instruction or appropriate dual fuel thermostat instructions.

Indoor Blower Speeds
1 - When the thermostat is set to “FAN ON,” the indoor blower will run continuously on the field selectable fan speed (“LOW HEAT” is default) when there is no cooling or heating demand.
2 - When the EL296UHE is running in the heating mode, the indoor blower will run on the “LOW HEAT” or “HIGH HEAT” speed per demand.
3 - When there is a cooling demand, the indoor blower will run on the “LOW COOL” or “HIGH COOL” speed per demand.

Generator Use - Voltage Requirements
The following requirements must be kept in mind when specifying a generator for use with this equipment:

- The furnace requires 120 volts ± 10% (Range: 108 volts to 132 volts).
- The furnace operates at 60 Hz ± 5% (Range: 57 Hz to 63 Hz).
- The furnace integrated control requires both polarity and proper ground. Both polarity and proper grounding should be checked before attempting to operate the furnace on either permanent or temporary power.
- Generator should have a wave form distortion of less than 5% THD (total harmonic distortion).

On-Board Links and Diagnostic Push Button (Figure 65)

WARNING
Carefully review all configuration information provided. Failure to properly set DIP switches, jumpers and on-board links can result in improper operation!

On-Board Link W914 Dehum
On-board link W914, is a clippable connection between terminals R and DS on the integrated control. W914 must be cut when the furnace is installed with a thermostat which features humidity control. If the link is not cut, terminal “DS” will remain energized not allowing the blower to reduce to low cool speed upon a call for dehumidification.

On-Board Link W951 Heat Pump (R to O)
On-board link W951 is a clippable connection between terminals R and O on the integrated control. W951 must be cut when the furnace is installed in applications which include a heat pump unit and a thermostat which features dual fuel use. If the link is left intact, terminal “O” will remain energized eliminating the HEAT MODE in the heat pump.

On-Board Link W915 2 Stage Compr (Y1 to Y2)
On-board link W915 is a clippable connection between terminals Y1 and Y2 on the integrated control. W915 must be cut if two-stage cooling will be used. If the Y1 to Y2 link is not cut the outdoor unit will operate in second-stage cooling only.

Diagnostic Push Button
The diagnostic push button is located adjacent to the seven-segment diagnostic LED. This button is used to enable the Error Code Recall “E” mode and the Flame Signal “F” mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released.
FIGURE 65

THERMOSTAT CONNECTIONS (TB1)

DS = DEHUMIDIFICATION SIGNAL
W2 = HEAT DEMAND FROM 2ND STAGE T/STAT
W1 = HEAT DEMAND FROM 1ST STAGE T/STAT
R = CLASS 2 VOLTAGE TO THERMOSTAT
G = MANUAL FAN FROM T/STAT
C = THERMOSTAT SIGNAL GROUND CONNECTED TO TRANSFORMER GRD (TR) & CHASIS GROUND (GRD)
Y1 = THERMOSTAT 1ST STAGE COOL SIGNAL
Y2 = THERMOSTAT 2ND STAGE COOL SIGNAL
O = THERMOSTAT SIGNAL TO HEAT PUMP REVERSING VALVE
DH = NOT USED
L = NOT USED

3/16" QUICK CONNECT TERMINALS
FLAME SENSE SIGNAL
HI COOL 24VAC
HI HEAT 24VAC
LO COOL 24VAC
LO HEAT 24VAC
PARK
PARK
COMMON 24VAC

1/4" QUICK CONNECT TERMINALS
NEUTRALS = 120 VAC NEUTRAL
HUM = UNPOWERED NORMALLY OPEN (DRY) CONTACTS
LI = 120 VAC INPUT TO CONTROL
ACC = 120 VAC OUTPUT TO OPTIONAL ACCESSORY

.............
Integrated Control DIP Switch Settings

EL296UHE units are equipped with a two-stage integrated control. This control manages ignition timing, heating mode fan off delays and indoor blower speeds based on selections made using the control dip switches and jumpers. The control includes an internal watchguard feature which automatically resets the ignition control when it has been locked out. After one hour of continuous thermostat demand for heat, the watchguard will break and remake thermostat demand to the furnace and automatically reset the control to relight the furnace.

Heating Operation DIP Switch Settings
Switch 1 -- Thermostat Selection -- This unit may be used with either a single-stage or two-stage thermostat. The thermostat selection is made using a DIP switch which must be properly positioned for the particular application. The DIP switch is factory-positioned for use with a two-stage thermostat. If a single-stage thermostat is to be used, the DIP switch must be repositioned.

  a- Select “OFF” for two-stage heating operation controlled by a two-stage heating thermostat (factory setting);
  b - Select “ON” for two-stage heating operation controlled by a single-stage heating thermostat. This setting provides a timed delay before second-stage heat is initiated.

Switch 2 -- Second Stage Delay (Used with Single-Stage Thermostat Only) -- This switch is used to determine the second stage on delay when a single-stage thermostat is being used. The switch is factory-set in the OFF position, which provides a 7-minute delay before second-stage heat is initiated. If the switch is toggled to the ON position, it will provide a 12-minute delay before second-stage heat is initiated. This switch is only activated when the thermostat selector jumper is positioned for SINGLE-stage thermostat use.

Indoor Blower Operation DIP Switch Settings
Switches 3 and 4 -- Heating Mode Blower-Off Delay -- The blower-on delay of 30 seconds is not adjustable. The blower-off delay (time that the blower operates after the heating demand has been satisfied) can be adjusted by moving switches 3 and 4 on the integrated control. The unit is shipped from the factory with a blower-off delay of 90 seconds. The blower off delay affects comfort and is adjustable to satisfy individual applications. Adjust the blower off delay to achieve a supply air temperature between 90° and 110°F at the exact moment that the blower is de-energized. Longer off delay settings provide lower supply air temperatures; shorter settings provide higher supply air temperatures. Table 11 provides the blower off timings that will result from different switch settings.

<table>
<thead>
<tr>
<th>Table 11</th>
<th>Blower Off Heating Mode Delay Switch Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower Off Delay (Seconds)</td>
<td>Switch 3</td>
</tr>
<tr>
<td>60</td>
<td>On</td>
</tr>
<tr>
<td>90 (Factory)</td>
<td>Off</td>
</tr>
<tr>
<td>120</td>
<td>Off</td>
</tr>
<tr>
<td>180</td>
<td>On</td>
</tr>
</tbody>
</table>

Switch 5 -- Cooling Mode Blower-Off Delay-- The unit is shipped from the factory with the dip switch positioned OFF for a 45 second delay. Table 12 provides the cooling mode off delay settings.

<table>
<thead>
<tr>
<th>Table 12</th>
<th>Blower Off Cooling Mode Delay Switch Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blower Off Delay (Seconds)</td>
<td>Switch 5</td>
</tr>
<tr>
<td>45 (Factory)</td>
<td>Off</td>
</tr>
<tr>
<td>2</td>
<td>On</td>
</tr>
</tbody>
</table>

Switches 6 and 7 -- Continuous Fan Mode -- Continuous fan speed can be controlled by changing DIP switch positions. Table 13 below provides DIP switch settings for continuous fan mode.

<table>
<thead>
<tr>
<th>Table 13</th>
<th>Continuous Fan Mode Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuous Fan Mode</td>
<td>Switch 6</td>
</tr>
<tr>
<td>Low Heat Speed (factory)</td>
<td>Off</td>
</tr>
<tr>
<td>Low Cool Speed</td>
<td>Off</td>
</tr>
<tr>
<td>High High Speed</td>
<td>On</td>
</tr>
<tr>
<td>High Cool Speed</td>
<td>On</td>
</tr>
<tr>
<td>Thermostat</td>
<td>DIP Switch 1 Heating Stages</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>1 Heat / 1 Cool</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Heat / 2 Cool</td>
<td>ON</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Heat / 2 Cool</td>
<td>ON</td>
</tr>
<tr>
<td>with t'stat with humidity control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>DIP Switch 1 Heating Stages</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>2 Heat / 2 Cool</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Heat / 2 Cool with t'stat with humidity control</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Heat / 1 Cool</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Heat / 1 Cool</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Not required on all units.
### TABLE 14
EL296 Field Wiring Applications With Conventional Thermostat (Continued)

<table>
<thead>
<tr>
<th>Thermostat</th>
<th>DIP Switch Settings and On-Board Links (figure 65)</th>
<th>Wiring Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Fuel Single Stage Heating Stages</td>
<td>OFF</td>
<td></td>
</tr>
<tr>
<td>ComfortSense 7000 L7724U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control</td>
<td><a href="#">Diagram</a></td>
<td><img src="#" alt="Diagram" /></td>
</tr>
</tbody>
</table>

| Dual Fuel Two Stage Heat Pump             | OFF                                                 |                    |
| ComfortSense 7000 L7724U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control | [Diagram](#) | ![Diagram](#) |

* Connect W1 to W1 ONLY if using defrost tempering kit 67M41

**NOTE - Do NOT** make a wire connection between the room thermostat L terminal and the L terminal of the EL296 integrated control.
### TABLE 14
EL296 Field Wiring Applications With Conventional Thermostat (Continued)

<table>
<thead>
<tr>
<th>Thermostat</th>
<th>DIP Switch Settings and On-Board Links (figure 65)</th>
<th>On Board Links Must Be Cut To Select System Options</th>
<th>Wiring Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual Fuel Single Stage Heat Pump</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ComfortSense 7000 L7742U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dual Fuel Two Stage Heat Pump</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ComfortSense 7000 L7742U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Connect W1 to W1 ONLY if using defrost tempering kit 67M41

**NOTE** - **Do NOT** make a wire connection between the room thermostat L terminal and the L terminal of the EL296 integrated control.
Unit Start-Up
FOR YOUR SAFETY READ BEFORE OPERATING

⚠️ WARNING
Do not use this furnace if any part has been underwater. A flood-damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. Immediately call a qualified service technician to inspect the furnace and to replace all gas controls, control system parts, and electrical parts that have been wet or to replace the furnace, if deemed necessary.

⚠️ WARNING
Danger of explosion. Can cause injury or product or property damage. Should the gas supply fail to shut off or if overheating occurs, shut off the gas valve to the furnace before shutting off the electrical supply.

⚠️ CAUTION
Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

BEFORE LIGHTING the unit, smell all around the furnace area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

The gas valve on the EL296UHE is equipped with a gas control switch (lever). Use only your hand to move switch. Never use tools. If the the switch will not move by hand, do not try to repair it. Force or attempted repair may result in a fire or explosion.

Placing the furnace into operation:
EL296UHE units are equipped with an automatic hot surface ignition system. Do not attempt to manually light burners on this furnace. Each time the thermostat calls for heat, the burners will automatically light. The ignitor does not get hot when there is no call for heat on these units.

Priming Condensate Trap
The condensate trap should be primed with water prior to start-up to ensure proper condensate drainage. Either pour 10 fl. oz. (300 ml) of water into the trap, or follow these steps to prime the trap:
1 - Follow the lighting instructions to place the unit into operation.
2 - Set the thermostat to initiate a heating demand.
3 - Allow the burners to fire for approximately 3 minutes.
4 - Adjust the thermostat to deactivate the heating demand.
5 - Wait for the combustion air inducer to stop. Set the thermostat to initiate a heating demand and again allow the burners to fire for approximately 3 minutes.
6 - Adjust the thermostat to deactivate the heating demand and wait for the combustion air inducer to stop. At this point, the trap should be primed with sufficient water to ensure proper condensate drain operation.

⚠️ WARNING
If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or death.

Gas Valve Operation (Figure 66)

1 - STOP! Read the safety information at the beginning of this section.
2 - Set the thermostat to the lowest setting.
3 - Turn off all electrical power to the unit.
4 - This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5 - Remove the access panel.
6 - Move gas valve switch to OFF. See figure 66.
7 - Wait five minutes to clear out any gas. If you then smell gas, STOP! Immediately call your gas supplier from a neighbor’s phone. Follow the gas supplier’s instructions. If you do not smell gas go to next step.
8 - Move gas valve switch to ON. See figure 66.
9 - Replace the access panel.
10- Turn on all electrical power to to the unit.
11- Set the thermostat to desired setting.

NOTE - When unit is initially started, steps 1 through 11 may need to be repeated to purge air from gas line.

12- If the appliance will not operate, follow the instructions “Turning Off Gas to Unit” and call your service technician or gas supplier.

Turning Off Gas to Unit
1 - Set the thermostat to the lowest setting.
2 - Turn off all electrical power to the unit if service is to be performed.
3 - Remove the access panel.
4 - Move gas valve switch to OFF.
5 - Replace the access panel.

Failure To Operate
If the unit fails to operate, check the following:
1 - Is the thermostat calling for heat?
2 - Are access panels securely in place?
3 - Is the main disconnect switch closed?
4 - Is there a blown fuse or tripped breaker?
5 - Is the filter dirty or plugged? Dirty or plugged filters will cause the limit control to shut the unit off.
6 - Is gas turned on at the meter?
7 - Is the manual main shut-off valve open?
8 - Is the internal manual shut-off valve open?
9 - Is the unit ignition system in lockout? If the unit locks out again, inspect the unit for blockages.

Heating Sequence Of Operation
1 - When thermostat calls for heat, combustion air inducer starts.
2 - Combustion air pressure switch proves blower operation. Switch is factory set and requires no adjustment.
3 - After a 15-second prepurge, the hot surface ignitor energizes.
4 - After a 20-second ignitor warm-up period, the gas valve solenoid opens. A 4-second trial for ignition period begins."
5 - Gas is ignited, flame sensor proves the flame, and the combustion process continues.
6 - If flame is not detected after first ignition trial, the ignition control will repeat steps 3 and 4 four more times before locking out the gas valve ("WATCHGUARD" flame failure mode). The ignition control will then automatically repeat steps 1 through 6 after 60 minutes. To interrupt the 60-minute "WATCHGUARD" period, move thermostat from "Heat" to "OFF" then back to "Heat". Heating sequence then restarts at step 1.

Gas Pressure Adjustment

Gas Flow (Approximate)

<table>
<thead>
<tr>
<th>TABLE 15</th>
<th>GAS METER CLOCKING CHART</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL296 Unit</td>
<td>Seconds for One Revolution</td>
</tr>
<tr>
<td></td>
<td>Natural</td>
</tr>
<tr>
<td></td>
<td>1 cu ft Dial</td>
</tr>
<tr>
<td>-045</td>
<td>80</td>
</tr>
<tr>
<td>-070</td>
<td>55</td>
</tr>
<tr>
<td>-090</td>
<td>41</td>
</tr>
<tr>
<td>-110</td>
<td>33</td>
</tr>
<tr>
<td>-135</td>
<td>27</td>
</tr>
</tbody>
</table>

Natural-1000 btu/cu ft LP-2500 btu/cu ft

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in table 15. If manifold pressure matches table 17 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

NOTE - To obtain accurate reading, shut off all other gas appliances connected to meter.

Supply Pressure Measurement
An inlet post located on the gas valve provides access to the supply pressure. See figure 66. Back out the 3/32 hex screw one turn, connect a piece of 5/16 tubing and connect to a manometer to measure supply pressure. See table 17 for supply line pressure.

On multiple unit installations, each unit should be checked separately, with and without units operating. Supply pressure must fall within range listed in table 17.

Manifold Pressure Measurement
NOTE - Pressure test adapter kit (10L34) is available from Lennox to facilitate manifold pressure measurement.

A manifold pressure post located on the gas valve provides access to the manifold pressure. See figure 66. Back out the 3/32 hex screw one turn, connect a piece of 5/16 tubing and connect to a manometer to measure manifold pressure.

To correctly measure manifold pressure, the differential pressure between the positive gas manifold and the negative burner box must be considered.

1 - Connect the test gauge positive side "+" to manifold pressure tap on gas valve as noted above.
2 - Tee into the gas valve regulator vent hose and connect to test gauge negative "-".
3 - Ignite unit on low fire and let run for 5 minutes to allow for steady state conditions.
4 - After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in table 17.
5 - If necessary, make adjustments. Figure 66 shows location of high fire and low fire adjustment screws.
6 - Repeat steps 3, 4 and 5 on high fire. See values in table 17.

NOTE - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Re-start unit and check gas valve for gas leaks.
Proper Combustion

Furnace should operate minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue outlet and compare to the tables below.

### TABLE 16

<table>
<thead>
<tr>
<th>EL296 Model</th>
<th>CO₂% For Nat Low Fire</th>
<th>CO₂% For Nat High Fire</th>
<th>CO₂% For LP Low Fire</th>
<th>CO₂% For LP High Fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>045</td>
<td>5.4 - 6.4</td>
<td>7.5 - 8.5</td>
<td>6.4 - 7.4</td>
<td>8.8 - 9.8</td>
</tr>
<tr>
<td>070</td>
<td>5.3 - 6.3</td>
<td>7.4 - 8.4</td>
<td>6.3 - 7.3</td>
<td>8.7 - 9.7</td>
</tr>
<tr>
<td>090</td>
<td>5.8 - 6.8</td>
<td>7.6 - 8.6</td>
<td>6.8 - 7.8</td>
<td>8.9 - 9.9</td>
</tr>
<tr>
<td>110</td>
<td>6.1 - 7.1</td>
<td>8.0 - 9.0</td>
<td>7.1 - 8.1</td>
<td>9.3 - 10.3</td>
</tr>
<tr>
<td>135</td>
<td>6.1 - 7.1</td>
<td>7.8 - 8.8</td>
<td>7.1 - 8.2</td>
<td>9.1 - 10.1</td>
</tr>
</tbody>
</table>

The maximum carbon monoxide reading should not exceed 50 ppm.

### High Altitude Information

**NOTE** - In Canada, certification for installations at elevations over 4500 feet (1372 m) is the jurisdiction of local authorities.

Units may be installed at altitudes up to 10,000 ft. above sea level without manifold adjustment. Units installed at altitude of 4501 - 10,000 feet (1373 to 3048m) may require a pressure switch change which can be ordered separately. Table 18 lists conversion kit and pressure switch requirements at varying altitudes. The combustion air pressure switch is factory-set and requires no adjustment.

### TABLE 17

**Manifold and Supply Line Pressure 0-10,000ft.**

<table>
<thead>
<tr>
<th>EL296 Unit</th>
<th>Gas</th>
<th>Manifold Pressure in.w.g.</th>
<th>Supply Line Pressure in. w.g.</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sizes</td>
<td>Natural</td>
<td>Low Fire</td>
<td>1.7</td>
</tr>
<tr>
<td></td>
<td>LP/propane</td>
<td>High Fire</td>
<td>4.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min</td>
<td>3.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Max</td>
<td>10.0</td>
</tr>
</tbody>
</table>

**NOTE** - A natural to L.P. propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

### TABLE 18

**LP/Propane Conversion Kit and Pressure Switch Requirements at Varying Altitudes**

<table>
<thead>
<tr>
<th>EL296 Unit</th>
<th>Natural to LP/Propane</th>
<th>Natural Burner</th>
<th>High Altitude Burner</th>
<th>High Altitude Pressure Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 - 7500 ft (0 - 2286m)</td>
<td>7501 - 10,000 ft (2286 - 3038m)</td>
<td>7501 - 10,000 ft (2286 - 3038m)</td>
<td>4501 - 7500 ft (1373 - 2286m)</td>
</tr>
<tr>
<td>-045</td>
<td>*78W93</td>
<td>73W37</td>
<td>*78W96</td>
<td>93W81</td>
</tr>
<tr>
<td>-070</td>
<td></td>
<td></td>
<td></td>
<td>93W80</td>
</tr>
<tr>
<td>-090</td>
<td></td>
<td></td>
<td></td>
<td>93W82</td>
</tr>
<tr>
<td>-110</td>
<td></td>
<td></td>
<td></td>
<td>93W80</td>
</tr>
<tr>
<td>-135</td>
<td></td>
<td></td>
<td></td>
<td>93W83</td>
</tr>
</tbody>
</table>

* Conversion requires installation of a gas valve manifold spring which is provided with the gas conversion kit.
Pressure switch is factory set. No adjustment necessary. All models use the factory-installed pressure switch from 0-4500 feet (0-1370 m).
After the EL296UHE gas furnace has been started, the following test should be conducted to ensure proper venting and sufficient combustion air has been provided to the EL296UHE as well as to other gas-fired appliances which are separately vented.

If a EL296UHE furnace replaces a Category I furnace which was commonly vented with another gas appliance, the size of the existing vent pipe for that gas appliance must be checked. Without the heat of the original furnace flue products, the existing vent pipe is probably oversized for the single water heater or other appliance. The vent should be checked for proper draw with the remaining appliance. The test should be conducted while all appliances (both in operation and those not in operation) are connected to the venting system being tested. If the venting system has been installed improperly, or if provisions have not been made for sufficient amounts of combustion air, corrections must be made as outlined in the previous section.

1 - Seal any unused openings in the venting system.
2 - Visually inspect the venting system for proper size and horizontal pitch. Determine there is no blockage or restriction, leakage, corrosion, or other deficiencies which could cause an unsafe condition.
3 - To the extent that it is practical, close all building doors and windows and all doors between the space in which the appliances connected to the venting system are located and other spaces of the building.
4 - Close fireplace dampers.
5 - Turn on clothes dryers and any appliances not connected to the 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.
6 - Follow the lighting instruction to place the appliance being inspected into operation. Adjust thermostat so appliance will operate continuously.
7 - Use the flame of match or candle to test for spillage of flue gases at the draft hood relief opening after 5 minutes of main burner operation.
8 - If improper venting is observed during any of the above tests, the venting system must be corrected or sufficient combustion/make-up air must be provided. The venting system should be re-sized to approach the minimum size as determined by using the appropriate tables in appendix G in the current standards of the National Fuel Gas Code ANSI-Z223.1/NFPA 54 in the U.S.A., and the appropriate Natural Gas and Propane appliances venting sizing tables in the current standard of the CSA-B149 Natural Gas and Propane Installation Codes in Canada.
9 - After determining that each appliance remaining connected to the common venting system properly vents when tested as indicated in step 3, return doors, windows, exhaust fans, fireplace dampers and any other gas-burning appliance to their previous condition of use.
Other Unit Adjustments

Primary Limit.
The primary limit is located on the heating compartment vestibule panel. This limit is factory set and requires no adjustment.

Flame Rollout Switches (Two)
These manually reset switches are located on the front of the burner box.

Pressure Switch
The pressure switch is located in the heating compartment on the cold end header box. This switch checks for proper combustion air inducer operation before allowing ignition trial. The switch is factory-set and must not be adjusted.

Temperature Rise
Place the unit into operation with a second-stage heating demand. After supply and return air temperatures have stabilized, check the temperature rise. If necessary, adjust the heating blower speed to maintain the temperature rise within the range shown on the unit nameplate. Increase the blower speed to decrease the temperature rise. Decrease the blower speed to increase the temperature rise. Failure to properly adjust the temperature rise may cause erratic limit operation.

Electrical
1 - Check all wiring for loose connections.
2 - Check for the correct voltage at the furnace (furnace operating). Correct voltage is 120VAC + 10%
3 - Check amp-draw on the blower motor with blower access panel in place.
   Unit Nameplate__________Actual__________

Exhaust and Air Intake Pipe
1 - Check exhaust and air intake connections for tightness and to make sure there is no blockage.
2 - Is pressure switch closed? Obstructed exhaust pipe will cause unit to shut off at pressure switch. Check termination for blockages.
3 - Obstructed pipe or termination may cause rollout switches to open. Reset manual flame rollout switches on burner box assembly if necessary.

Heating Sequence of Operation

Electronic Ignition
The two-stage, variable speed integrated control used in EL296UHE units has an added feature of an internal Watchguard control. The feature serves as an automatic reset device for ignition control lockout caused by ignition failure. After one hour of continuous thermostat demand for heat, the Watchguard will break and remake thermostat demand to the furnace and automatically reset the control to begin the ignition sequence.

Applications Using a Two-Stage Thermostat

A - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 OFF in “Two-Stage” Position (Factory Setting)
1 - On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2 - Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.
   NOTE - If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.
3 - After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
4 - After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed, the HUM contacts close energizing the humidifier and 120V ACC terminal is energized. The furnace will continue this operation as long as the thermostat has a first-stage heating demand.
5 - If second-stage heat is required, the thermostat second-stage heat contacts close and send a signal to the integrated control. The integrated control initiates a 30-second second-stage recognition delay.
6 - At the end of the recognition delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
7 - When the demand for high fire (second stage) heat is satisfied, the combustion air inducer is switched to the low-fire heating speed and the high-fire (second stage) gas valve is de-energized. The low-fire (first stage) gas valve continues operation. The indoor blower motor is switched to the low-fire heating speed.
8 - When the thermostat demand for low-fire (first stage) heat is satisfied, the gas valve is de-energized and the field-selected indoor blower off delay begins. The combustion air inducer begins a 5-second post-purge period.
9 - When the combustion air post-purge period is complete, the inducer, the HUM contacts as well as the 120V ACC terminals are de-energized. The indoor blower is de-energized at the end of the off delay.

NOTE - The ignition control thermostat selection DIP switch is factory-set in the “TWO-STAGE” position.
Applications Using A Single-Stage Thermostat

B - Heating Sequence -- Integrated Control Thermostat Selection

DIP Switch 1 ON in “Single-Stage” Position

NOTE - In these applications, two-stage heat will be initiated by the integrated control if heating demand has not been satisfied after the field adjustable period (7 or 12 minutes).

1 - On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.

2 - Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed. 

NOTE - If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.

3 - After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.

4 - After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed and the HUM contacts are energized. The integrated control also initiates a second-stage on delay (factory-set at 7 minutes; adjustable to 12 minutes).

5 - If the heating demand continues beyond the second-stage on delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.

6 - When the thermostat heating demand is satisfied, the combustion air inducer begins a 5-second low speed post-purge. The field-selected indoor blower off delay begins. The indoor blower operates at the low-fire heating speed.

7 - When the combustion air post-purge period is complete, the inducer, the HUM contacts as well as the 120V ACC terminals are de-energized. The indoor blower is de-energized at the end of the off delay.

Repair Parts List

The following repair parts are available through Lennox dealers. When ordering parts, include the complete furnace model number listed on the CSA nameplate -- Example: EL296UH045XE24B-01. All service must be performed by a licensed professional installer (or equivalent), service agency, or gas supplier.

Cabinet Parts
- Outer access panel
- Blower access panel
- Top Cap

Control Panel Parts
- Transformer
- Integrated control board
- Door interlock switch

Blower Parts
- Blower wheel
- Motor
- Motor mounting frame
- Motor capacitor
- Blower housing cutoff plate

Heating Parts
- Flame Sensor
- Heat exchanger assembly
- Gas manifold
- Combustion air inducer
- Gas valve
- Main burner cluster
- Main burner orifices
- Pressure switch
- Ignitor
- Primary limit control
- Flame rollout switches
At the beginning of each heating season, system should be checked as follows by a qualified service technician:

**Blower**

Check the blower wheel for debris and clean if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.

**Filters**

All air filters are installed external to the unit. Filters should be inspected monthly. Clean or replace the filters when necessary to ensure proper furnace operation. Table 1 lists recommended filter sizes.

**Exhaust and air intake pipes**

Check the exhaust and air intake pipes and all connections for tightness and to make sure there is no blockage.

**Electrical**

1. Check all wiring for loose connections.
2. Check for the correct voltage at the furnace (furnace operating).
3. Check amp-draw on the blower motor.

**Winterizing and Condensate Trap Care**

1. Turn off power to the furnace.
2. Have a shallow pan ready to empty condensate water.
3. Remove the clean out cap from the condensate trap and empty water. Inspect the trap then reinstall the clean out cap.

**Cleaning The Burner Assembly**

If cleaning the burner assembly becomes necessary, follow the steps below:

1. Turn off electrical and gas power supplies to furnace. Remove upper and lower furnace access panels.
2. Disconnect the wires from the gas valve.
3. Remove the burner box cover (if equipped).
4. Disconnect the gas supply line from the gas valve. Remove gas valve/manifold assembly.
5. Mark and disconnect sensor wire from the sensor. Disconnect wires from flame rollout switches.
6. Disconnect combustion air intake pipe. It may be necessary to cut the existing pipe to remove burner box assembly.
7. Remove four screws which secure burner box assembly to vest panel. Remove burner box from the unit.
8. Use the soft brush attachment on a vacuum cleaner to gently clean the face of the burners. Visually inspect the inside of the burners and crossovers for any blockage caused by foreign matter. Remove any blockage.
9. Reinstall the burner box assembly using the existing four screws. Make sure that the burners line up in the center of the burner ports.
10. Reconnect the sensor wire and reconnect the 2-pin plug to the ignitor wiring harness. Reconnect wires to flame rollout switches.
11. Reinstall the gas valve manifold assembly. Reconnect the gas supply line to the gas valve. Reinstall the burner box cover.
12. Reconnect wires to gas valve.
13. Replace the blower compartment access panel.
14. Refer to instruction on verifying gas and electrical connections when re-establishing supplies.
15. Follow lighting instructions to light and operate furnace for 5 minutes to ensure that heat exchanger is clean and dry and that furnace is operating properly.
16. Replace heating compartment access panel.
Start-Up & Performance Check List

UNIT SET UP (typical)

Furnace:
Model Number
Serial Number

1. GAS SUPPLY
   - Natural Gas
   - LP Propane Gas
   - Piping Connections Tight
   - Leak Tested
   - Supply Line Pressure "W.C._

2. INTAKE / EXHAUST PIPE
   - All Joints Primed and Glued
   - Terminations Installed Properly
   - Horizontal Pipes Sloped (if applicable)
   - Condensate Trap Primed / Line Sloped
   - Pipes Supported
   - Heat Cable Installed and Operable (if applicable)

3. DUCT SYSTEM
   - SUPPLY AIR DUCT
     - Sealed
     - Insulated (if necessary)
   - RETURN DUCT
     - Sealed
     - Filter Installed and Clean
     - Grilles Unobstructed

4. VOLTAGE CHECK
   - Supply Voltage __________
   - Electrical Connections Tight

SUPPLY AIR

Line Voltage
UNIT OPERATION

HEATING MODE
1. GAS MANIFOLD PRESSURE "W.C._____
2. COMBUSTION SAMPLE CO₂% ____ CO PPM ______
3. INDOOR BLOWER AMPS_____
4. TEMPERATURE RISE
   Supply Duct Temperature ______
   Return Duct Temperature - ______
   Temperature Rise = ______
5. TOTAL EXTERNAL STATIC
   Supply External Static ______
   Return External Static + ______
   Total External Static = ______
6. CONDENSATE LINE
   □ Leak Free
7. VENT PIPE
   □ Leak Free

COOLING MODE
3. INDOOR BLOWER AMPS_____
4. TEMPERATURE DROP
   Return Duct Temperature ______
   Supply Duct Temperature - ______
   Temperature Drop = ______
5. TOTAL EXTERNAL STATIC (dry coil)
   Supply External Static ______
   Return External Static + ______
   Total External Static = ______
6. DRAIN LINE
   □ Leak Free
7. THERMOSTAT
   □ Adjusted and Programmed
   □ Explained Operation to Owner

Contractor's: Name_________________________Telephone_____________Checklist Completed____________________

Job Address_____-________________________________Technician's Name___________________________________

SUPPLY AIR

RETURN AIR

Combustion CO₂

Gas Manifold Pressure

Thermostat

Blower Motor Amps

Temperatures

Duct Static

High +

Low -
Requirements for Commonwealth of Massachusetts

Modifications to NFPA-54, Chapter 10

Revise NFPA-54 section 10.8.3 to add the following requirements:

For all side wall, horizontally vented, gas-fueled equipment installed in every dwelling, building or structure used in whole or in part for residential purposes, including those owned or operated by the Commonwealth and where the side wall exhaust vent termination is less than seven (7) feet above the finished grade in the area of the venting, including but not limited to decks and porches, the following requirements shall be satisfied:

1 - INSTALLATION OF CARBON MONOXIDE DETECTORS. At the time of installation of the side wall, horizontally vented, gas-fueled equipment, the installing plumber or gasfitter shall observe that a hard-wired carbon monoxide detector with an alarm and battery backup is installed on the floor level where the gas equipment is to be installed. In addition, the installing plumber or gasfitter shall observe that a battery-operated or hard-wired carbon monoxide detector with an alarm is installed on each additional level of the dwelling, building or structure served by the side wall, horizontally vented, gas-fueled equipment. It shall be the responsibility of the property owner to secure the services of qualified licensed professionals for the installation of hard-wired carbon monoxide detectors.

a - In the event that the side wall, horizontally vented, gas-fueled equipment is installed in a crawl space or an attic, the hard-wired carbon monoxide detector with alarm and battery back-up may be installed on the next adjacent floor level.

b - In the event that the requirements of this subdivision cannot be met at the time of completion of installation, the owner shall have a period of thirty (30) days to comply with the above requirements; provided, however, that during said thirty (30) day period, a battery-operated carbon monoxide detector with an alarm shall be installed.

2 - APPROVED CARBON MONOXIDE DETECTORS. Each carbon monoxide detector as required in accordance with the above provisions shall comply with NFPA 720 and be ANSI/UL 2034 listed and IAS certified.

3 - SIGNAGE. A metal or plastic identification plate shall be permanently mounted to the exterior of the building at a minimum height of eight (8) feet above grade directly in line with the exhaust vent terminal for the horizontally vented, gas-fueled heating appliance or equipment. The sign shall read, in print size no less than one-half (1/2) inch in size, "GAS VENT DIRECTLY BELOW. KEEP CLEAR OF ALL OBSTRUCTIONS."

4 - INSPECTION. The state or local gas inspector of the side wall, horizontally vented, gas-fueled equipment shall not approve the installation unless, upon inspection, the inspector observes carbon monoxide detectors and signage installed in accordance with the provisions of 248 CMR 5.08(2)(a) 1 through 4.

EXEMPTIONS: The following equipment is exempt from 24 CMR 5.08(2)(a) 1 through 4:

1 - The equipment listed in Chapter 10 entitled "Equipment Not Required to Be Vented" in the most current edition of NFPA 54 as adopted by the Board; and

2 - Product Approved side wall, horizontally vented, gas-fueled equipment installed in a room or structure separate from the dwelling, building or structure used in whole or in part for residential purposes.

MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM PROVIDED.

When the manufacturer of Product Approved side wall, horizontally vented, gas-fueled equipment provides a venting system design or venting system components with the equipment, the instructions provided by the manufacturer for installation of the equipment and the venting system shall include:

1 - Detailed instructions for the installation of the venting system design or the venting system components:

2 - A complete parts list for the venting system design or venting system.

MANUFACTURER REQUIREMENTS - GAS EQUIPMENT VENTING SYSTEM NOT PROVIDED.

When the manufacturer of Product Approved side wall, horizontally vented, gas-fueled equipment does not provide the parts for venting the flue gases, but identifies "special venting systems," the following requirements shall be satisfied by the manufacturer:

1 - The referenced "special venting system" instructions shall be included with the appliance or equipment installation instructions; and

2 - The "special venting systems" shall be Product Approved by the Board, and the instructions for that system shall include a parts list and detailed installation instructions.

A copy of all installation instructions for all Product Approved side wall, horizontally vented, gas-fueled equipment, all venting instructions, all parts lists for venting instructions, and/or all venting design instructions shall remain with the appliance or equipment at the completion of the installation.