

FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. **DO NOT** try to light any appliance.
3. **DO NOT** use electrical switches.
4. **DO NOT** use any telephone in your building.
5. Extinguish any open flame.
6. Leave the building.
7. Immediately call your local gas supplier after leaving the building. Follow the gas supplier's instructions.
8. If you cannot reach your gas supplier, call the Fire Department.

⚠ WARNING



Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the Installation, Operation and Service Manual thoroughly before installing or servicing this equipment.

Installation must be done by a contractor qualified in the installation and service of gas-fired heating equipment or your gas supplier.



HEATRITETM ES

Gas Fired, Low Intensity Unitary Heater

Installation, Operation & Service Manual

ES-40
ES-60
ES-80
ES-100
ES-125
ES-150
ES-175
VES-U45

Installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place in order to provide your service technician with necessary information.



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TABLE OF CONTENTS

| | | | |
|---|-----------|--|-----------|
| SECTION 1: Heater Safety | 1 | 10.5 Ladder Diagram | 45 |
| 1.1 Manpower Requirements | 1 | SECTION 11: Operation and Maintenance | 46 |
| 1.2 Safety Labels and Their Placement | 1 | 11.1 Sequence of Operation | 46 |
| 1.3 California Proposition 65 | 1 | 11.2 To Shut Off Heater..... | 46 |
| SECTION 2: Installer Responsibility | 4 | 11.3 To Start Heater | 46 |
| 2.1 Wall Tag | 4 | 11.4 Pre-Season Maintenance and Annual Inspection..... | 46 |
| 2.2 Corrosive Chemicals..... | 4 | 11.5 Maintenance Checklist | 47 |
| 2.3 National Standards and Applicable Codes | 4 | SECTION 12: Troubleshooting | 49 |
| SECTION 3: Clearances to Combustibles | 5 | 12.1 Troubleshooting Flow Chart | 50 |
| 3.1 Required Clearances to Combustibles..... | 5 | 12.2 Manifold Gas Pressure Setting | 52 |
| SECTION 4: National Standards and Applicable Codes | 9 | SECTION 13: Replacement Parts | 53 |
| 4.1 Gas Codes | 9 | SECTION 14: General Specifications | 55 |
| 4.2 Aircraft Hangars | 9 | 14.1 Material Specifications..... | 55 |
| 4.3 Public Garages | 9 | 14.2 Heater Specifications..... | 55 |
| 4.4 Electrical | 9 | 14.3 Suspension Specifications..... | 55 |
| 4.5 Venting..... | 9 | 14.4 Controls Specifications | 55 |
| 4.6 High Altitude | 9 | | |
| SECTION 5: Major Components | 10 | | |
| 5.1 Standard Parts List | 12 | | |
| SECTION 6: Heater Installation | 15 | | |
| SECTION 7: Optional Heater Accessories | 25 | | |
| 7.1 U-Tube/VES-U45 Configuration..... | 25 | | |
| 7.2 Elbow Package Configuration..... | 29 | | |
| 7.3 Reflector Side Extension | 31 | | |
| 7.4 Lower Clearance Shield Installation | 32 | | |
| SECTION 8: Venting | 33 | | |
| 8.1 Venting..... | 33 | | |
| 8.2 Unvented Operation..... | 34 | | |
| 8.3 Horizontal Venting..... | 34 | | |
| 8.4 Vertical Venting | 34 | | |
| 8.5 Unvented Operation Tube Termination | 34 | | |
| 8.6 Length Requirements | 34 | | |
| 8.7 Vent Material Recommendations | 34 | | |
| 8.8 Horizontal Ventilation 4" (10 cm) Pipe..... | 35 | | |
| 8.9 Vertical Ventilation 4" (10 cm) Pipe..... | 35 | | |
| 8.10 Common Side Wall Venting | 36 | | |
| 8.11 Common Vertical Venting | 37 | | |
| 8.12 Outside Combustion Air Supply | 38 | | |
| SECTION 9: Gas Piping | 41 | | |
| SECTION 10: Wiring | 43 | | |
| 10.1 Line Voltage Thermostat Wiring | 43 | | |
| 10.2 Low Voltage Thermostat with One Burner | 43 | | |
| 10.3 Low Voltage Thermostat Wiring with Multiple Burners . | 44 | | |
| 10.4 Internal Wiring..... | 44 | | |

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SECTION 1: HEATER SAFETY



Your Safety is Important to Us!
This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these

sections.

Installation, service and annual inspection of heater must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation or service of this equipment.

This heater is designed for heating nonresidential indoor spaces. Do not install in residential spaces. This heater is not certified to meet the requirements of NFPA30A-2012 Section 7.6.6. (maximum tube temperature of 750 °F (399 °C)). Do not install this heater in facilities where compressed natural gas (CNG) or liquid natural gas (LNG) are present. These instructions, the layout drawing, local codes and ordinances, and applicable standards that apply to gas piping, electrical wiring, venting, etc. must be thoroughly understood before proceeding with the installation.

Protective gear is to be worn during installation, operation and service in accordance to the Occupational Safety and Hazard Administration (OSHA). Gear must be in accordance to NFPA 70E, latest revision when working with electrical components. Thin sheet metal parts have sharp edges. To prevent injury, the use of work gloves is recommended. The use of gloves will also prevent the transfer of body oils from the hands to the surface of the reflector.

Before installation, check that local distribution conditions, nature of gas and pressure, and adjustment of the appliance are compatible.

This heater must be applied and operated under the general concepts of reasonable use and installed using best building practices.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

For additional copies of the Installation, Operation and Service Manual, please contact Val-Co.

1.1 Manpower Requirements

To prevent personal injury and damage to the heater, two persons will be required for installation.

1.2 Safety Labels and Their Placement

Product safety signs or labels should be replaced by the product user when they are no longer legible. Please contact Val-Co or your VAL-CO independent distributor to obtain replacement signs or labels. See *Page 2, Figure 1 through Page 3, Figure 2*.

1.3 California Proposition 65

In accordance with California Proposition 65 requirements, a warning label must be placed in a highly visible location on the outside of the equipment (i.e., near equipment's serial plate). See label placement drawing on *Page 3, Figure 2* for label location. Avoid placing label on areas with extreme heat, cold, corrosive chemicals or other elements. To order additional labels, please contact Val-Co or your VAL-CO independent distributor.

FIGURE 1: Top and Bottom Panel Label Placement

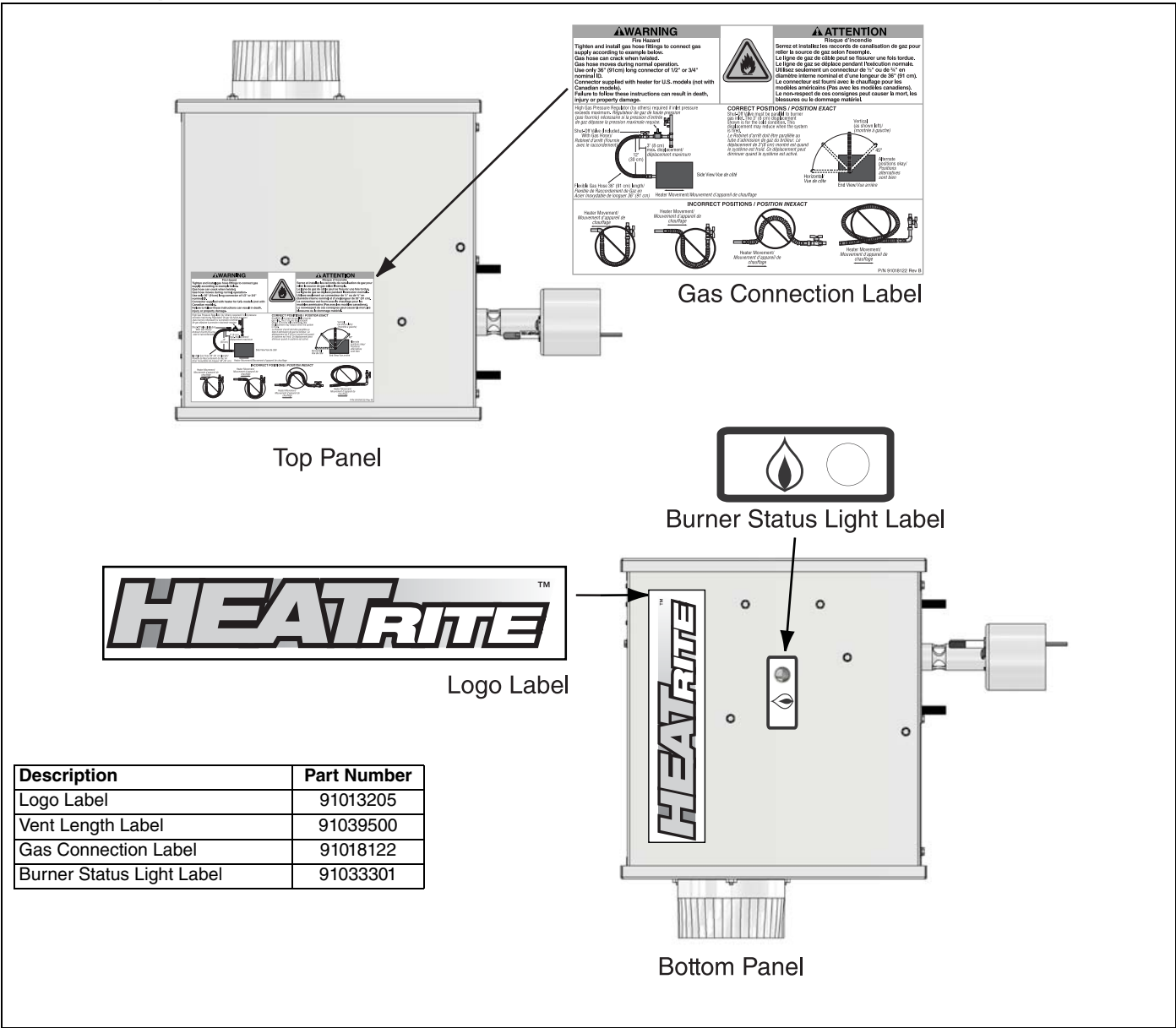
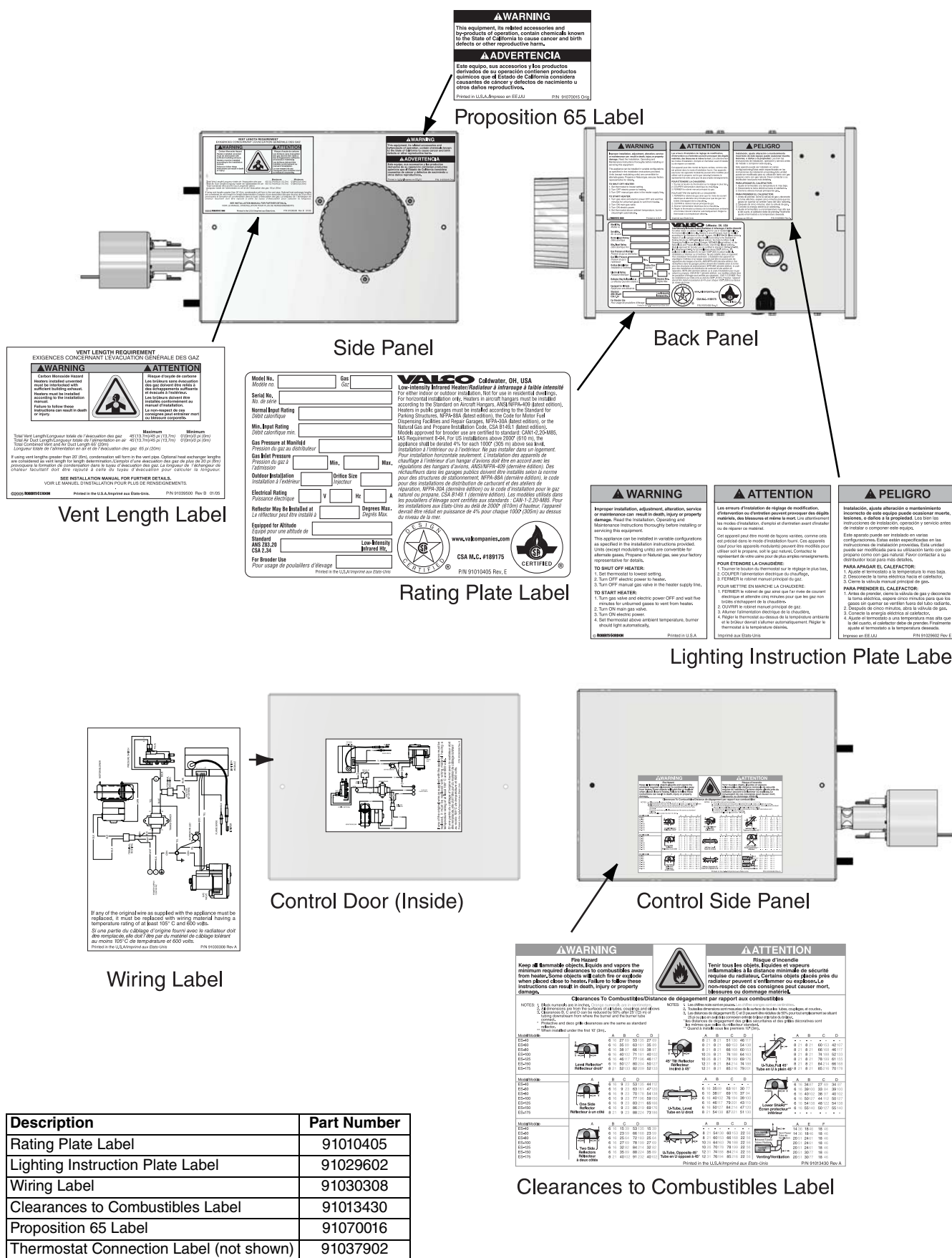


FIGURE 2: Side and Back Panel Label Placement



SECTION 2: INSTALLER RESPONSIBILITY

The installer is responsible for the following:

- To install the heater, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. Val-Co recommends the installer contact a local Building Inspector or Fire Marshal for guidance.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To install the heater in accordance with the clearances to combustibles.
- To furnish all needed materials not furnished as standard equipment.
- To plan location of supports.
- To provide access on all sides for burner servicing and removal.
- To provide the owner with a copy of this Installation, Operation and Service Manual.
- To never use heater as a support for a ladder or other access equipment and never hang or suspend anything from heater.
- To ensure there is adequate air circulation around the heater and to supply air for combustion, ventilation and distribution in accordance with local codes.
- To safely and adequately install heater using materials with a minimal working load of 75 lbs (33 kg).
- To ensure the heater is placed in an approved application.

2.1 Wall Tag

A laminated wall tag is available for the heater as a permanent reminder of the safety instructions and the importance of the required clearances to combustibles. Please contact Val-Co or your VAL-CO independent distributor to obtain the wall tag. Affix the tag by peeling off the backing of the adhesive strips on the rear surface and position the tag on a wall near the heater (e.g. thermostat or VAL-CO Controller). A copy of the wall tag (P/N 91037912) is illustrated on the back cover. For an immediate solution, you may affix this copy on the wall near the heater. Know your model number and installed configuration. Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual. See Page 6, Figure 3 through Page 8, Figure 10. Write the proper clearance dimensions in

permanent ink according to your model number and configuration in the open spaces on the tag.

2.2 Corrosive Chemicals

| |
|---|
| ! CAUTION |
|  |
| <p style="text-align: center;">Product Damage Hazard</p> <p>Do not use heater in area containing corrosive chemicals.</p> <p>Refer to appropriate Material Safety Data Sheets (MSDS).</p> <p>Failure to follow these instructions can result in product damage.</p> |

Val-Co cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the sub-contractor, or the owner identifies the presence of combustible materials, corrosive chemicals or halogenated hydrocarbons* anywhere in the premises.

** **Halogenated Hydrocarbons** are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the heater components will be greatly reduced. An outside air supply must be provided to the burners whenever the presence of these compounds is suspected. Warranty will be invalid if the heater is exposed to halogenated hydrocarbons.*

2.3 National Standards and Applicable Codes

All appliances must be installed in accordance with the latest revision of the applicable standards and national codes. This refers also to the electric, gas and venting installation. Note: Additional standards for installations in public garages, aircraft hangars, etc. may be applicable.

SECTION 3: CLEARANCES TO COMBUSTIBLES

3.1 Required Clearances to Combustibles

Clearances are the required distances that combustible objects must be away from the heater to prevent serious fire hazards. Combustibles are materials that may catch on fire and include common items such as wood, paper, rubber, fabric, etc.

Maintain clearances to combustibles at all times for safety.

Clearances for all heater models are located on the burner of the heater and on *Page 6, Figure 3 through Page 8, Figure 10* in this manual. Check the clearances on each burner for the model heater being installed to make sure the product is suitable for your application and the clearances are maintained. Read and follow the safety guidelines below:

- Keep gasoline or other combustible materials including flammable objects, liquids, dust or vapors away from this heater or any other appliance.
- The stated clearances to combustibles represents a surface temperature of 90 °F (32 °C) above room temperature. Building materials with a low heat tolerance (such as plastics, vinyl siding, canvas, tri-ply, etc) may be subject to degradation at lower temperatures. It is the installer's responsibility to assure that adjacent materials are protected from degradation.
- Maintain clearances from heat sensitive equipment and workstations.
- Maintain clearances from vehicles parked below the heater.
- Maintain clearances from swinging and overhead doors, overhead cranes, vehicle lifts, partitions, storage racks, hoists, building construction, etc.
- In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles. Signs must be posted adjacent to the heater thermostat. In the absence of a thermostat, signs must be posted in a conspicuous location.
- Consult local Fire Marshal, Fire Insurance Carrier or other authorities for approval of proposed installation when there is a possibility of exposure to combustible airborne materials or vapors.
- Hang heater in accordance to the minimum suspension requirements on *Page 16, Figure 13*.

! WARNING



Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

- If the radiant tubes must pass through the building structure, be sure that adequate sleeving and fire stop is installed to prevent scorching and/or fire hazard.

- NOTE:** 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
 2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.

FIGURE 3: LEVEL REFLECTOR

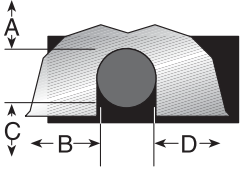
| | Model | (inches) | | | | (centimeters) | | | |
|---|--------|----------|----|----|----|---------------|-----|-----|-----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | 6 | 27 | 53 | 27 | 16 | 69 | 135 | 69 |
| | ES-60 | 6 | 35 | 63 | 35 | 16 | 89 | 161 | 89 |
| | ES-80 | 6 | 38 | 66 | 38 | 16 | 97 | 168 | 97 |
| | ES-100 | 6 | 40 | 71 | 40 | 16 | 102 | 181 | 102 |
| | ES-125 | 6 | 46 | 77 | 46 | 16 | 117 | 196 | 117 |
| | ES-150 | 6 | 50 | 80 | 50 | 16 | 127 | 204 | 127 |
| | ES-175 | 8 | 52 | 82 | 52 | 21 | 133 | 209 | 133 |

FIGURE 4: LEVEL SIDE REFLECTOR

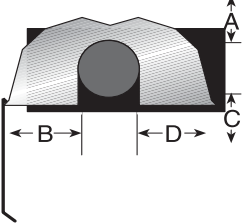
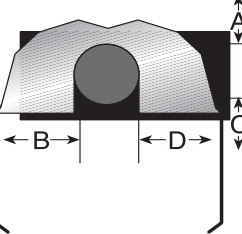
| | Model | (inches) | | | | (centimeters) | | | |
|--|--------|----------|---|----|----|---------------|----|-----|-----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | 6 | 9 | 53 | 44 | 16 | 23 | 135 | 112 |
| | ES-60 | 6 | 9 | 63 | 47 | 16 | 23 | 161 | 120 |
| | ES-80 | 6 | 9 | 70 | 54 | 16 | 23 | 178 | 138 |
| | ES-100 | 6 | 9 | 77 | 59 | 16 | 23 | 196 | 150 |
| | ES-125 | 6 | 9 | 83 | 65 | 16 | 23 | 211 | 166 |
| | ES-150 | 6 | 9 | 86 | 69 | 16 | 23 | 219 | 176 |
| | ES-175 | 8 | 9 | 88 | 73 | 21 | 23 | 224 | 186 |

FIGURE 5: TWO SIDE REFLECTORS

| | Model | (inches) | | | | (centimeters) | | | |
|---|--------|----------|----|----|----|---------------|-----|-----|-----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | 6 | 15 | 53 | 15 | 16 | 39 | 135 | 39 |
| | ES-60 | 6 | 23 | 66 | 23 | 16 | 59 | 168 | 59 |
| | ES-80 | 6 | 25 | 72 | 25 | 16 | 64 | 183 | 64 |
| | ES-100 | 6 | 27 | 78 | 27 | 16 | 69 | 199 | 69 |
| | ES-125 | 6 | 32 | 84 | 32 | 16 | 82 | 214 | 82 |
| | ES-150 | 6 | 35 | 88 | 35 | 16 | 89 | 224 | 89 |
| | ES-175 | 8 | 40 | 91 | 40 | 21 | 102 | 232 | 102 |

- NOTE:** 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
 2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.

FIGURE 6: U-TUBE, LEVEL REFLECTOR

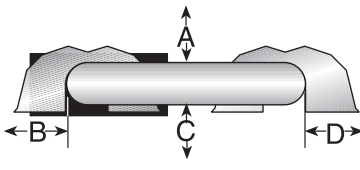
| | Model | (inches) | | | | (centimeters) | | | |
|---|--------|-----------------------|----|----|----|-----------------------|-----|-----|-----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | - UNAPPROVED - | | | | - UNAPPROVED - | | | |
| | ES-60 | 6 | 35 | 63 | 30 | 16 | 89 | 161 | 77 |
| | ES-80 | 6 | 38 | 69 | 37 | 16 | 97 | 176 | 94 |
| | ES-100 | 6 | 40 | 76 | 39 | 16 | 102 | 194 | 100 |
| | ES-125 | 6 | 46 | 79 | 43 | 16 | 117 | 201 | 110 |
| | ES-150 | 6 | 50 | 84 | 47 | 16 | 127 | 214 | 120 |
| | ES-175 | 8 | 54 | 87 | 51 | 21 | 138 | 221 | 130 |

FIGURE 7: 2-FOOT DECO GRILLE AND PROTECTIVE GRILLE

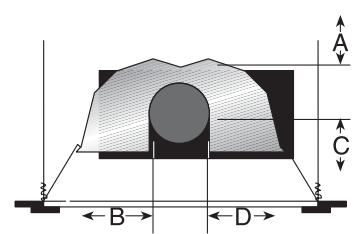
| | Model | (inches) | | | | (centimeters) | | | |
|--|--------|----------|----|----|----|---------------|-----|-----|-----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | 6 | 27 | 53 | 27 | 16 | 69 | 135 | 69 |
| | ES-60 | 6 | 35 | 63 | 35 | 16 | 89 | 161 | 89 |
| | ES-80 | 6 | 38 | 66 | 38 | 16 | 97 | 168 | 97 |
| | ES-100 | 6 | 40 | 71 | 40 | 16 | 102 | 181 | 102 |
| | ES-125 | 6 | 46 | 77 | 46 | 16 | 117 | 196 | 117 |
| | ES-150 | 6 | 50 | 80 | 50 | 16 | 127 | 204 | 127 |
| | ES-175 | 8 | 52 | 82 | 52 | 21 | 133 | 209 | 133 |

FIGURE 8: U-TUBE, 45°

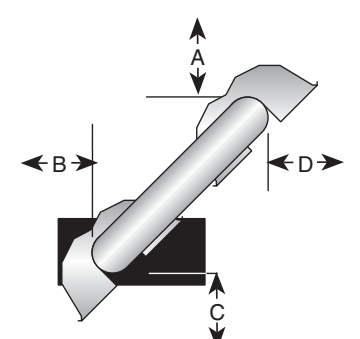
| | Model | (inches) | | | | (centimeters) | | | |
|---|--------|-----------------------|---|----|----|-----------------------|----|-----|-----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | - UNAPPROVED - | | | | - UNAPPROVED - | | | |
| | ES-60 | 8 | 8 | 60 | 42 | 21 | 21 | 153 | 107 |
| | ES-80 | 8 | 8 | 66 | 46 | 21 | 21 | 168 | 117 |
| | ES-100 | 8 | 8 | 74 | 52 | 21 | 21 | 188 | 133 |
| | ES-125 | 8 | 8 | 78 | 61 | 21 | 21 | 199 | 155 |
| | ES-150 | 8 | 8 | 84 | 66 | 21 | 21 | 214 | 168 |
| | ES-175 | 8 | 8 | 85 | 70 | 21 | 21 | 216 | 178 |

FIGURE 9: U-TUBE, OPPOSITE 45° REFLECTOR

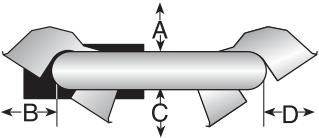
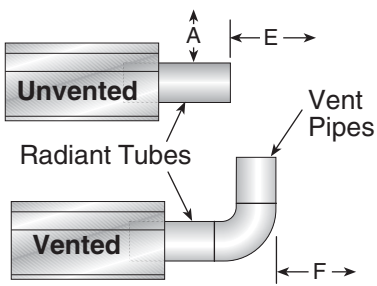
| | Model | (inches) | | | | (centimeters) | | | |
|---|--------|-----------------------|----|----|----|-----------------------|-----|-----|----|
| | | A | B | C | D | A | B | C | D |
|  | ES-40 | - UNAPPROVED - | | | | - UNAPPROVED - | | | |
| | ES-60 | 8 | 54 | 60 | 22 | 21 | 138 | 153 | 56 |
| | ES-80 | 8 | 60 | 66 | 22 | 21 | 153 | 168 | 56 |
| | ES-100 | 10 | 64 | 74 | 22 | 26 | 163 | 188 | 56 |
| | ES-125 | 10 | 70 | 78 | 22 | 26 | 178 | 199 | 56 |
| | ES-150 | 12 | 74 | 84 | 22 | 31 | 188 | 214 | 56 |
| | ES-175 | 12 | 76 | 85 | 22 | 31 | 194 | 216 | 56 |

FIGURE 10: VENTING

| | Model | (inches) | | | (centimeters) | | |
|--|--------|----------|----|----|---------------|----|----|
| | | A | E | F | A | E | F |
|  | ES-40 | 14 | 18 | 18 | 36 | 46 | 46 |
| | ES-60 | 14 | 18 | 18 | 36 | 46 | 46 |
| | ES-80 | 20 | 24 | 18 | 51 | 61 | 46 |
| | ES-100 | 20 | 24 | 18 | 51 | 61 | 46 |
| | ES-125 | 20 | 24 | 18 | 51 | 61 | 46 |
| | ES-150 | 20 | 30 | 18 | 51 | 77 | 46 |
| | ES-175 | 20 | 30 | 18 | 51 | 77 | 46 |

SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

4.1 Gas Codes

Type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.

United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

4.2 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, NFPA 409 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

In aircraft storage and servicing areas, heaters shall be installed at least 10' (3 m) above the upper surface of wings or of engine enclosures of the highest aircraft which may be housed in the hangar. The measurement shall be made from the wing or engine enclosure (whichever is higher from the floor) to the bottom of the heater.

- In shops, offices and other sections of aircraft hangars communicating with aircraft storage or servicing areas, heaters shall be installed not less than 8' (2.4 m) above the floor.
- Suspended or elevated heaters shall be so located in all spaces of aircraft hangars that they shall not be subject to injury by aircraft, cranes, movable scaffolding or other objects. Provisions shall be made to assure accessibility to suspended heaters for recurrent maintenance purposes.

4.3 Public Garages

Installation in garages must be in accordance with the following codes:

United States: Refer to Standard for Parking Structures NFPA 88A - latest revision or the Code for Motor Fuel Dispensing Facilities and Repair Garages, NFPA 30A - latest revision.
Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

- Heaters must not be installed less than 8' (2.4 m) above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.
- When installed over hoists, minimum clearances to combustibles must be maintained from the upper most point of objects on the hoist.

4.4 Electrical

Heater must be electrically grounded in accordance with the following codes:

United States: Refer to National Electrical Code®, NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances and any special diagrams furnished.

Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

4.5 Venting

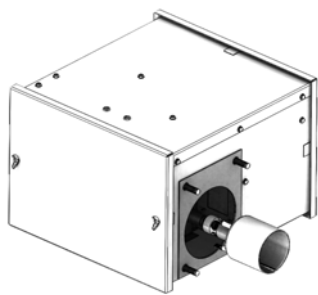
Venting must be installed in accordance with the requirements within this manual and the following codes:

United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

4.6 High Altitude

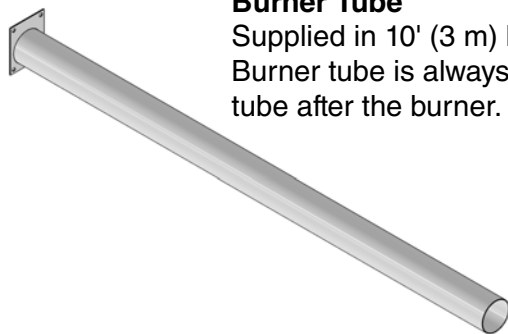
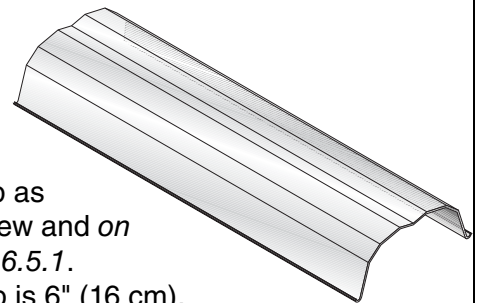
These heaters are approved for installations up to 2000' (610 m) (US), 4500' (1370 m) (Canada) without modification. Consult factory if US installation is above 2000' (610 m) or Canadian installation is above 4500' (1370 m).

SECTION 5: MAJOR COMPONENTS**FIGURE 11: Major Component Descriptions - Standard Reflector****Burner with Tube Gasket**

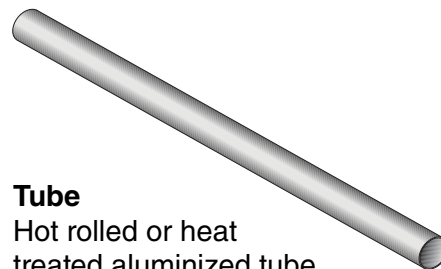
Must be installed with the flame observation window facing down.

Standard Reflector (Aluminum or Stainless Steel)

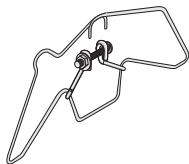
Alternate overlap as shown on overview and on Page 23, Figure 6.5.1. Minimum overlap is 6" (16 cm).

**Burner Tube**

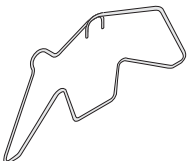
Supplied in 10' (3 m) lengths. Burner tube is always the first tube after the burner.

**Tube**

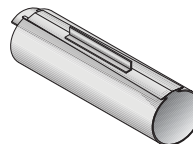
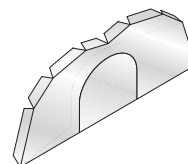
Hot rolled or heat treated aluminized tube supplied in 10' (3 m) lengths.

**Tube and Reflector Hanger with Clamp Package**

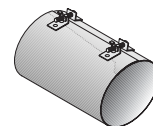
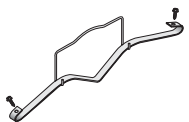
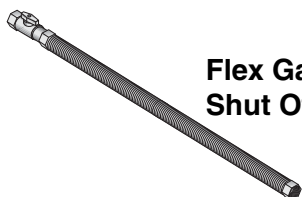
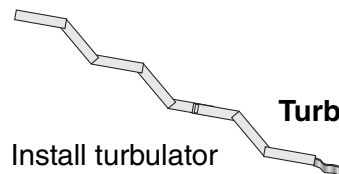
Position this hanger no more than 4" (10 cm) away from the burner.

**Tube and Reflector Hanger**

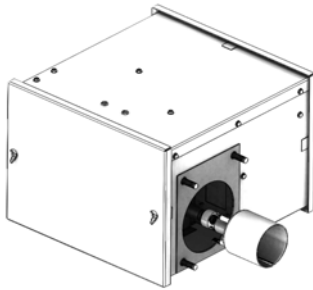
Suspend system from these hangers.

**Coupling Assembly with Lock****Reflector End Cap**

Punch out center section to accommodate tube.

**Vent Adapter****Reflector Support Strap & Wire Form****Flex Gas Line with Shut Off Cock****Turbulator**

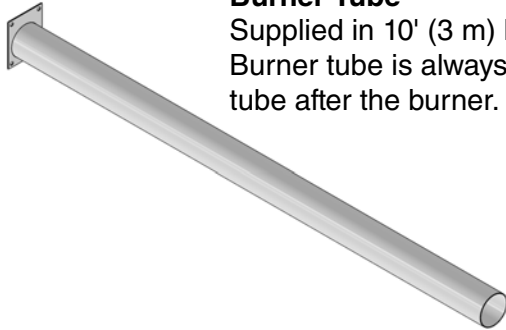
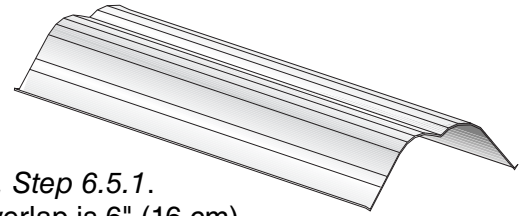
Install turbulator as specified in the "Turbulator Installation" chart. See Page 21, Step 6.4. Turbulator is not required on the ES-175.

FIGURE 12: Major Component Descriptions - High Efficiency Reflector
Burner with Tube Gasket

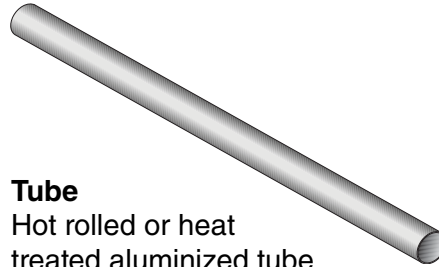
Must be installed with the flame observation window facing down.

High Efficiency Reflector (Aluminum only)

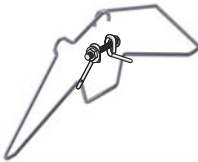
Alternate overlap as shown on overview and on Page 23, Step 6.5.1. Minimum overlap is 6" (16 cm).


Burner Tube

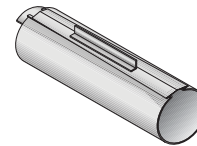
Supplied in 10' (3 m) lengths. Burner tube is always the first tube after the burner.


Tube

Hot rolled or heat treated aluminized tube supplied in 10' (3 m) lengths.

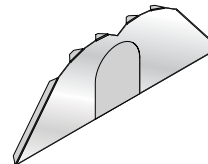

Tube and Reflector Hanger with Clamp Package-EF

Position this hanger no more than 4" (10 cm) away from the burner.

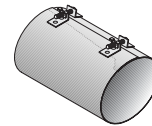
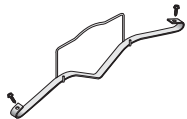
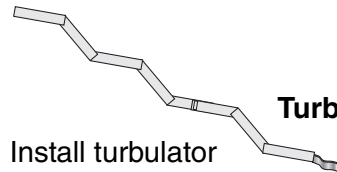

Coupling Assembly with Lock

Tube and Reflector Hanger-EF

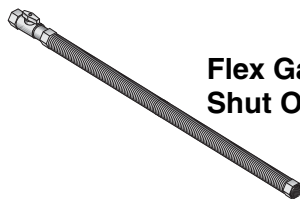
Suspend system from these hangers.


Reflector End Cap-EF

Punch out center section to accommodate tube.


Vent Adapter

Reflector Support Strap & Wire Form

Turbulator

Install turbulator as specified in the "Turbulator Installation" chart. See Page 21, Step 6.4. Turbulator is not required on the ES-175.


Flex Gas Line with Shut Off Cock

5.1 Standard Parts List

Table 1: Contents of the Burner Carton

| Part No. | Description | ES-40 | ES-60 | ES-80 | ES-100 | ES-125 | ES-150 | ES-175 |
|------------|---|-------|-------|-------|--------|--------|--------|--------|
| 47481X | Burner Assembly (Rate and Fuel Varies) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 92700025 | Gasket (Burner to Burner Tube) | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| VES36100NA | Installation, Operation and Service Manual | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 92113900 | Hex Head Nuts 5/16" - 18 Rolok | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 96411600 | Split Lock washer | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 91201708 | Pipe Nipple (Black) 1/2" NPT x 4" | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 91317300 | 1/4" Quick Disconnect (Wire) | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| *91412200 | Flexible Stainless Steel Gas Hose - 1/2" NPT (US Models Only) | 1 | 1 | 1 | 1 | 1 | | |
| *91412204 | Flexible Stainless Steel Gas Hose - 3/4" NPT (US Models Only) | - | - | - | - | - | 1 | 1 |
| 03051503 | Turbulator Adapter | 1 | 1 | 1 | 1 | 1 | 1 | - |
| 03051504 | Turbulator Aluminized Steel | 3 | 4 | 5 | 4 | 2 | 1 | - |
| 03051505 | Turbulator Stainless Steel | 1 | - | - | - | - | - | - |

*Canadian Models: Rubber (Type 1) Gas Hoses available as an accessory. *See Page 41, Section 9.*

Table 2: Contents of Standard Core and Extension Packages

| Part No. | Description | Core Packages | | | | Extension Packages | | | |
|-------------|--|---------------|-------------|-------------|--------------|--------------------|-------------|-------------|--------------|
| | | Aluminized | | | | Aluminized | | | |
| | | 10' (3m) | 20' (6m) | 30' (9m) | 40' (12m) | 10' (3m) | 20' (6m) | 30' (9m) | 40' (12m) |
| 91409408 | Tube, HT Aluminized, 10' (3 m) | - | 1 | 2 | 3 | 1 | 2 | 3 | 4 |
| 03051105 | Burner Tube ST, ALUMI-THERM® Steel, 10' (3 m) | - | - | 1 | 1 | - | - | - | - |
| 474833 | Burner Tube ST, HT ALUMI-THERM® Steel, 10' (3 m) | 1 | 1 | - | - | - | - | - | - |
| 01312700 | Coupling Assembly | - | 1 | 2 | 3 | 1 | 2 | 3 | 4 |
| 02750303 | Standard Reflector, 8' (3.5 m) | 2 | 3 | 4 | 6 | 2 | 3 | 4 | 6 |
| 02750800 | End Cap | 2 | 2 | 2 | 2 | - | - | - | - |
| 03090101 | Tube and Reflector Hanger, Wide Pattern | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 |
| 91907302 | S-Hook | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 |
| 03050011 | Reflector Support Package (Strap, Wire Form, Screws), Wide Pattern | 1 | 2 | 3 | 5 | 2 | 3 | 4 | 6 |
| 91107720 | U-Clip Package | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 03090101 | Vent Adapter | 1 | 1 | 1 | 1 | - | - | - | - |
| 01318901 | Tube Clamp Package | 1 | 1 | 1 | 1 | - | - | - | - |
| Part Number | | CPWST10ALUM | 474828 | 474829 | 472830 | EXPW10ALUM | EXPW20ALUM | EXPW30ALUM | EXPW40ALUM |

Table 3: Contents of High Efficiency Core and Extension Packages

| Part No. | Description | Core Packages | | | | Extension Packages | | | |
|-------------|--|---------------|-------------|--------------|--------------|--------------------|-------------|-------------|--------------|
| | | Aluminized | | | | Aluminized | | | |
| | | 10' (3m) | 20' (6m) | 30' (9m) | 40' (12m) | 10' (3m) | 20' (6m) | 30' (9m) | 40' (12m) |
| 91409408 | Tube, HT Aluminized, 10' (3 m) | - | 1 | 2 | 3 | 1 | 2 | 3 | 4 |
| 03051105 | Burner Tube ST, ALUMI-THERM® Steel, 10' (3 m) | - | - | 1 | 1 | - | - | - | - |
| 474833 | Burner Tube ST, HT ALUMI-THERM® Steel, 10' (3 m) | 1 | 1 | - | - | - | - | - | - |
| 01312700 | Coupling Assembly | - | 1 | 2 | 3 | 1 | 2 | 3 | 4 |
| 474884 | High Efficiency Reflector, 8' (3.5 m) | 2 | 3 | 4 | 6 | 2 | 3 | 4 | 6 |
| 474885 | End Cap, High Efficiency | 2 | 2 | 2 | 2 | - | - | - | - |
| 474886 | Tube and Reflector Hanger, High Efficiency | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 |
| 474887 | S-Hook | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 |
| 03050012 | Reflector Support Package (Strap, Wire Form, Screws) | 1 | 2 | 3 | 5 | 2 | 3 | 4 | 6 |
| 91107720 | U-Clip Package | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 90508701 | Vent Adapter | 1 | 1 | 1 | 1 | - | - | - | - |
| 474888 | Tube Clamp Package - EF | 1 | 1 | 1 | 1 | - | - | - | - |
| Part Number | | CPST10ALUMEF | 474871 | CPST30ALUMEF | CPST40ALUMEF | EXP10ALUMEF | EXP20ALUMEF | EXP30ALUMEF | EXP40ALUMEF |

Table 4: Component Package Guide

| Model | Tubing Length | Standard Core Packages-Wide Pattern |
|--------|---------------|-------------------------------------|
| | Minimum | Aluminized |
| ES-40 | 10' (3m) | CPWST10ALUM |
| ES-60 | 20' (6m) | 474828 |
| ES-80 | 20' (6m) | 474828 |
| ES-100 | 30' (9m) | 474829 |
| ES-125 | 40' (12m) | 474830 |
| ES-150 | 50' (15m) | 474829 + EXPW20ALUM |
| ES-175 | 60' (18m) | 474829 + EXPW30ALUM |

Table 5: Component Package Guide

| Model | Tubing Length | High Efficiency Core Packages |
|--------|---------------|-------------------------------|
| | Minimum | Aluminized |
| ES-40 | 10' (3m) | CPST10ALUMEF |
| ES-60 | 20' (6m) | 474871 |
| ES-80 | 20' (6m) | CPST20ALUMEF |
| ES-100 | 30' (9m) | CPST30ALUMEF |
| ES-125 | 40' (12m) | CPST40ALUMEF |
| ES-150 | 50' (15m) | CPST30ALUMEF + EXP20ALUMEF |
| ES-175 | 60' (18m) | CPST30ALUMEF + EXP30ALUMEF |

Although not recommended, additional tube lengths may be added to the heater. Tubing must be aluminized (heat-treated or non-heat-treated), or porcelain coated. Additional tube lengths beyond the specified minimum tubing length are considered vent pipe for length determination. Maximum vent length allowed is 45' (13.7 m) total.

SECTION 6: HEATER INSTALLATION**! WARNING****Severe Injury Hazard**

Secure burner to burner tube with nuts and lockwashers.

Hang heater with materials with a minimum working load of 75 lbs (33 kg).

Failure to follow these instructions can result in death, injury or property damage.

Expansion and contraction of the tube dictates that the minimum suspension lengths must be maintained. *See table on Page 16, Figure 13.*

! WARNING**Cut/Pinch Hazard**

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

To ensure your safety and comply with the terms of the warranty, all units must be installed in accordance with these instructions.

The gas or the electrical supply lines must not be used to support the heater.

Do not locate the gas or electric supply lines directly over the path of the flue products from the heater.

The heater must be installed in a location that it is readily accessible for servicing.

The heaters must be installed in accordance with clearances to combustibles as indicated on the rating plate and in this instruction manual.

The minimum and maximum gas inlet pressures must be maintained as indicated on the rating plate.

Typical installation configurations are shown on *Page 16, Figure 13.*

FIGURE 13: Critical Hanger Placement

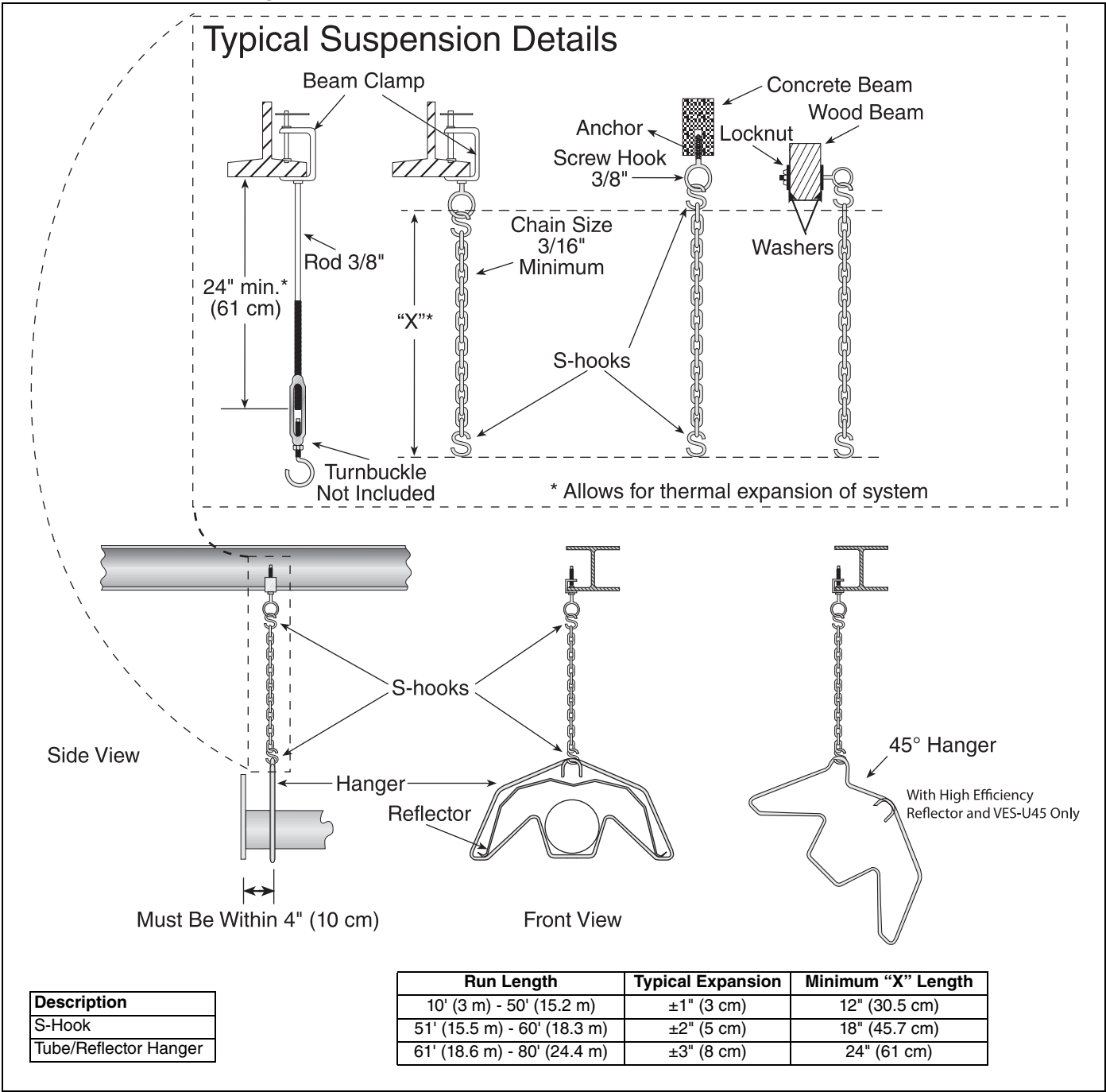


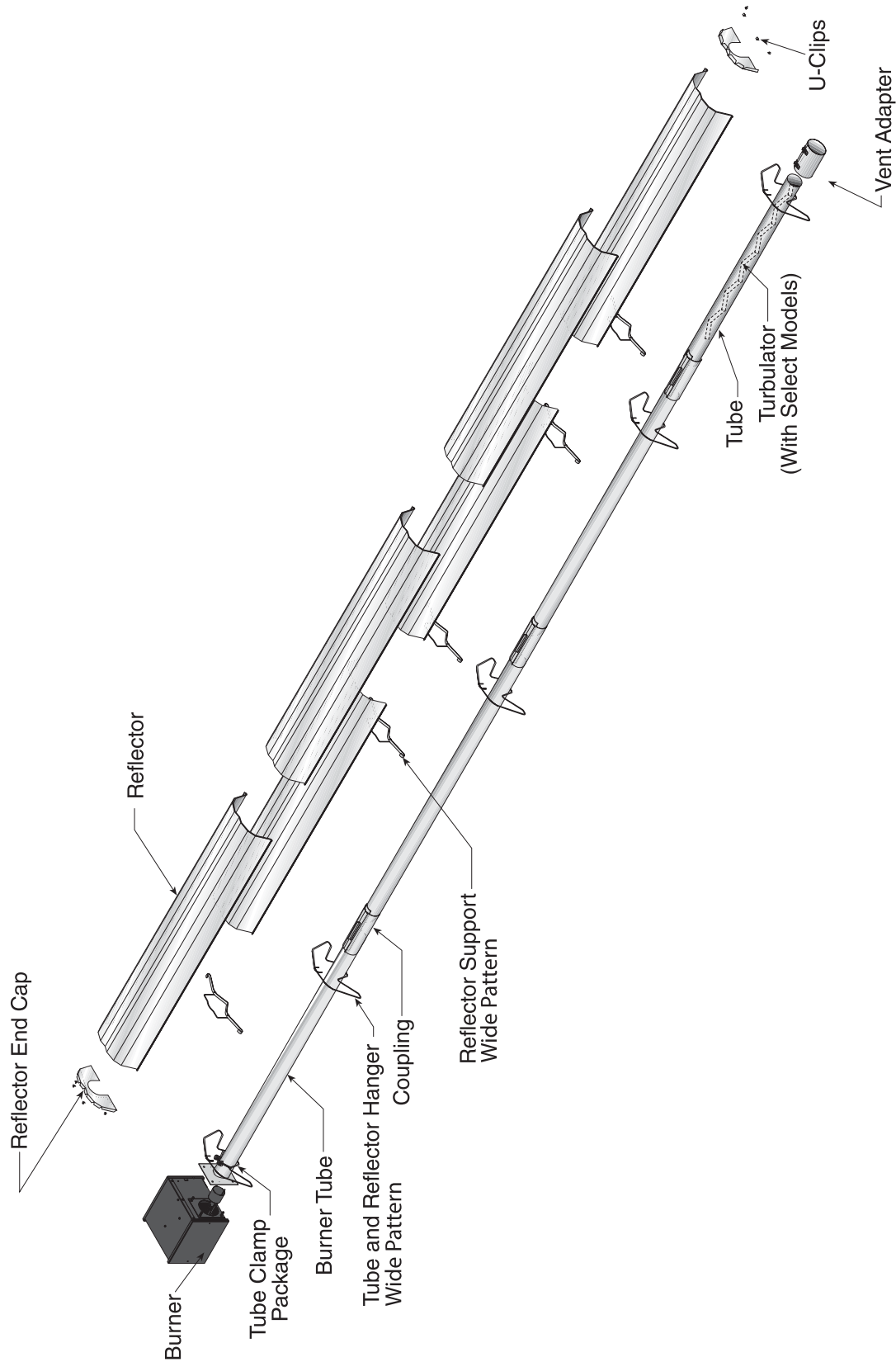
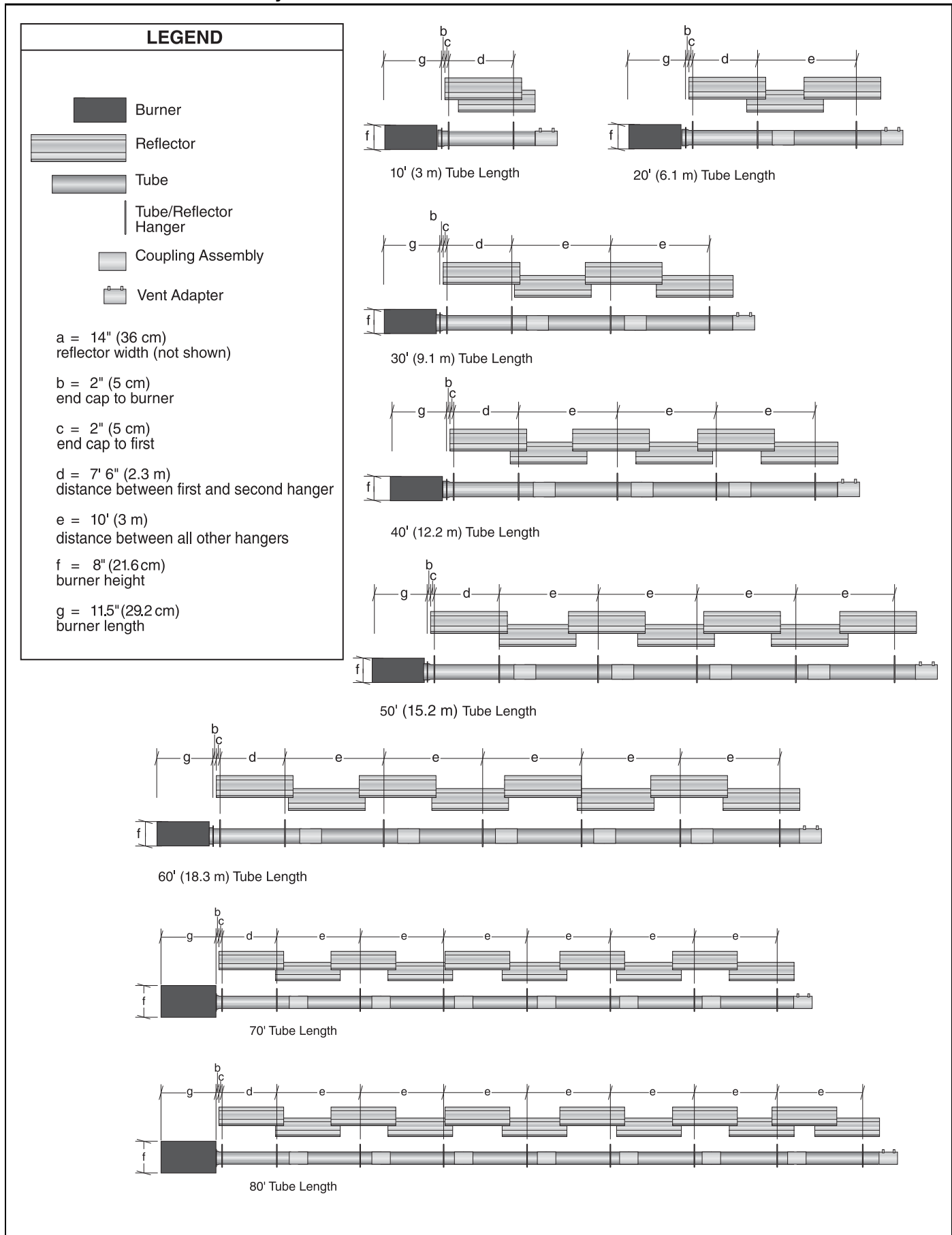
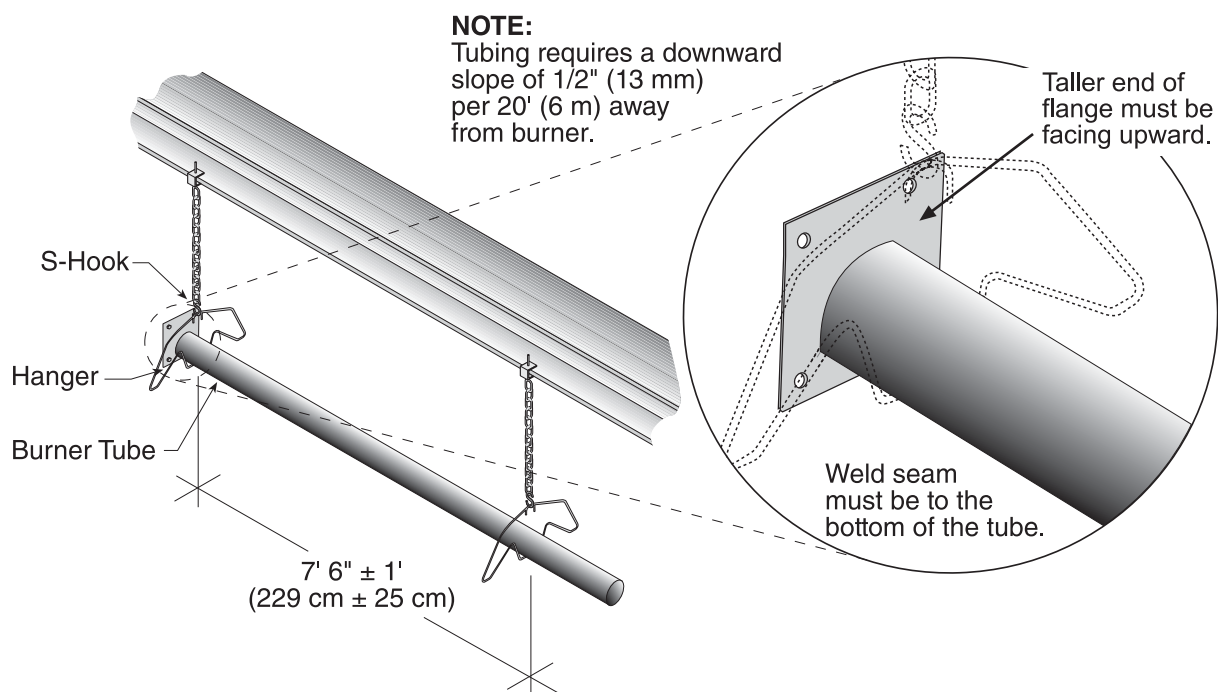
FIGURE 14: Linear Heater Assembly Overview

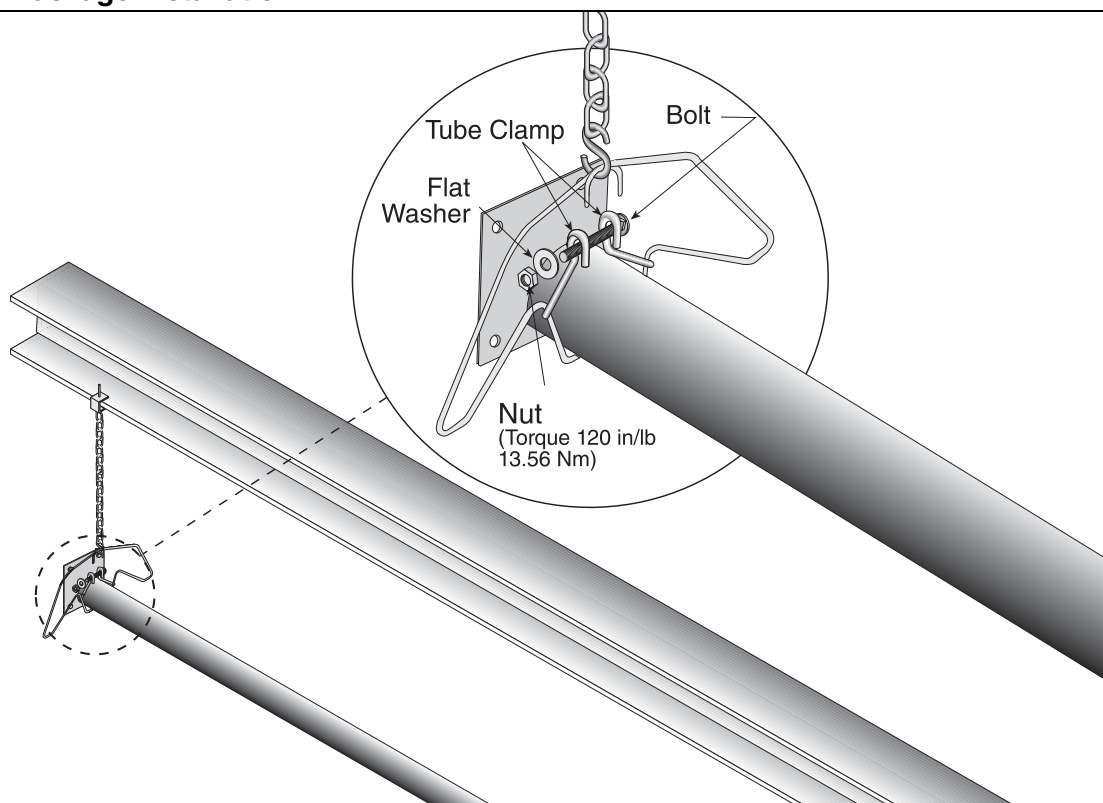
FIGURE 15: Linear Heater Layout Overview

Step 6.1 Burner Tube Installation



| Description |
|-----------------------|
| Burner Tube |
| S-Hook |
| Tube/Reflector Hanger |

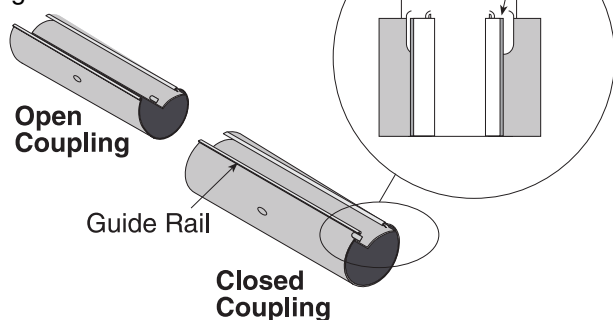
Step 6.2 Tube Clamp Package Installation



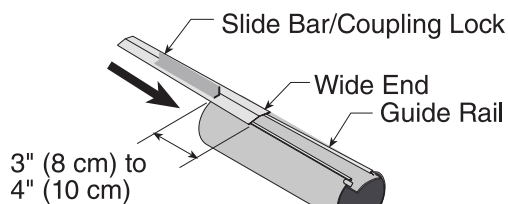
| Description |
|--------------------|
| Tube Clamp Package |

Step 6.3 Coupling and Tube Assembly

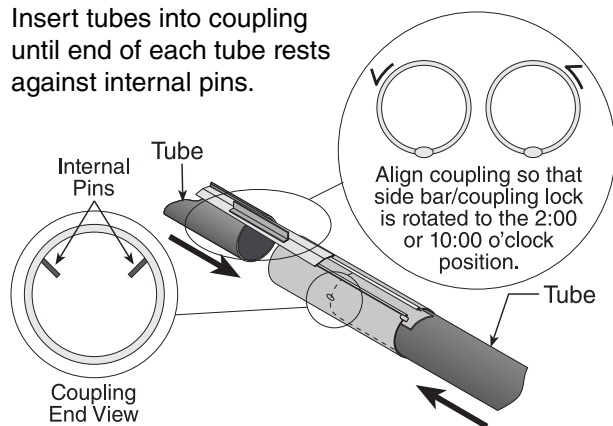
- A** Close coupling and slide opposite end into tab. Position tab underneath guide rail.



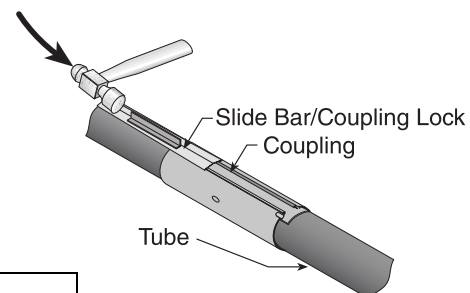
- B** Insert wide end of slide bar/coupling lock into guide rail on opposite end of tabs. Slide the slide bar/coupling lock up the guide rail until snug (approximately 3" (8 cm) to 4" (10 cm)).



- C** Insert tubes into coupling until end of each tube rests against internal pins.



- D** Strike slide bar/coupling lock with mallet or hammer until tight.

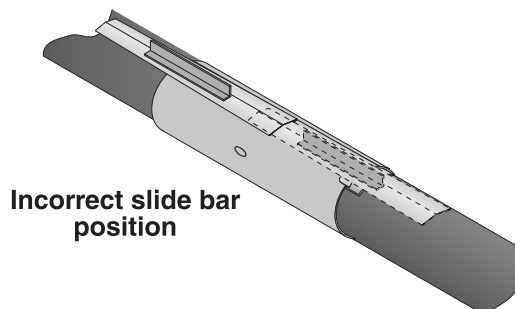
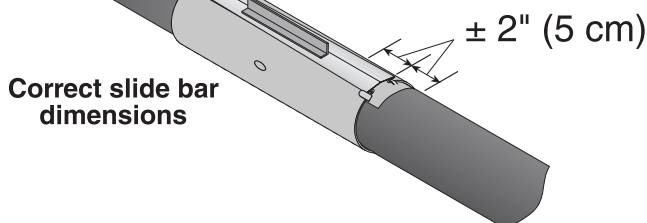


| Description |
|-------------------------|
| Coupling |
| Slide Bar/Coupling Lock |
| Tube |

Step 6.3.1 Coupling and Tube Assembly (Continued)

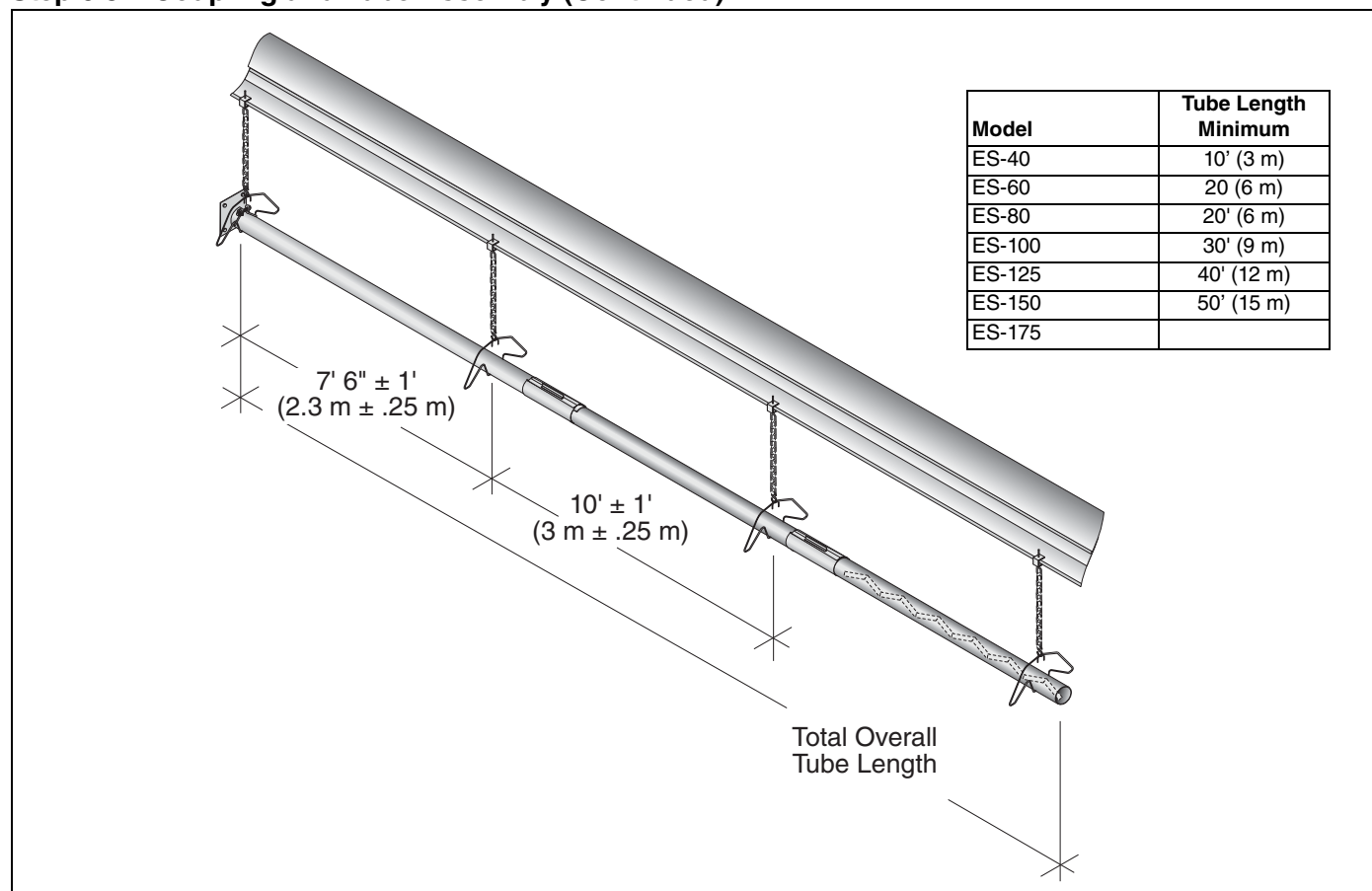
Tighten slide bar as shown below.

Be sure not to over tighten slide bar/coupling lock. Slide bar/coupling lock should be within tolerance listed below.

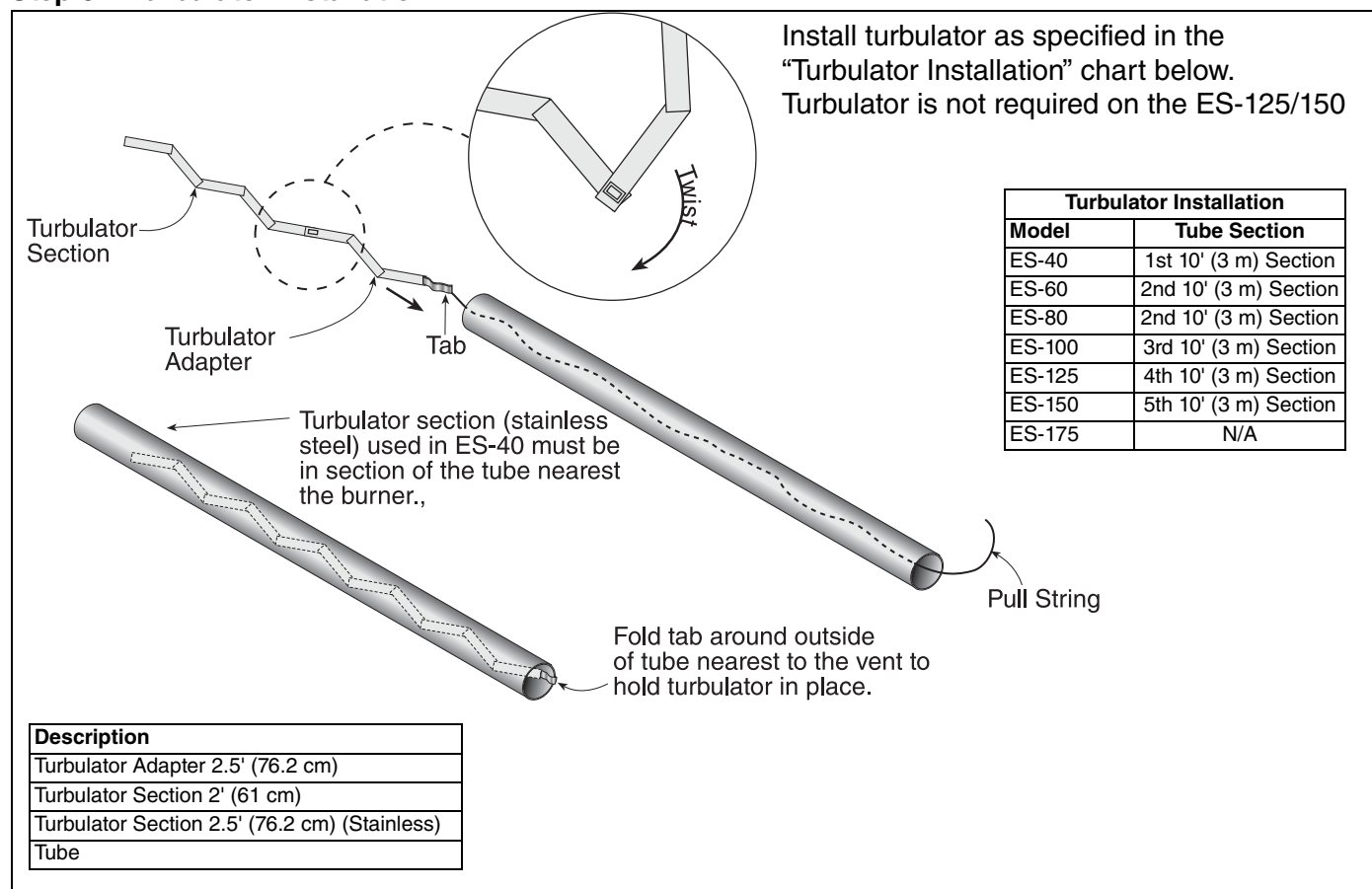


- Repeat Step 6.3 A - D until all tubes are assembled. See Page 21, Step 6.3.2.

Step 6.3.2 Coupling and Tube Assembly (Continued)



Step 6.4 Turbulator Installation



Step 6.5 Reflector Installation

⚠

WARNING

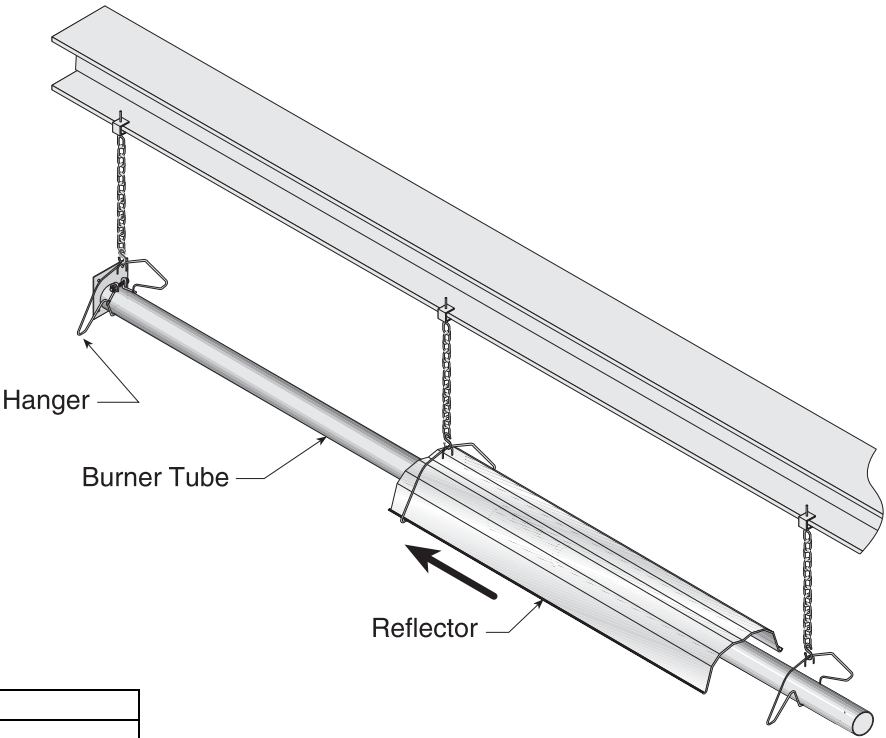


Fire Hazard

Support reflector with reflector hanger and support strap.

Reflector must not touch tube.

Failure to follow these instructions can result in death, injury or property damage.



| Description |
|------------------------|
| Tube/Reflector Hanger |
| Burner Tube |
| Reflector 96" (244 cm) |

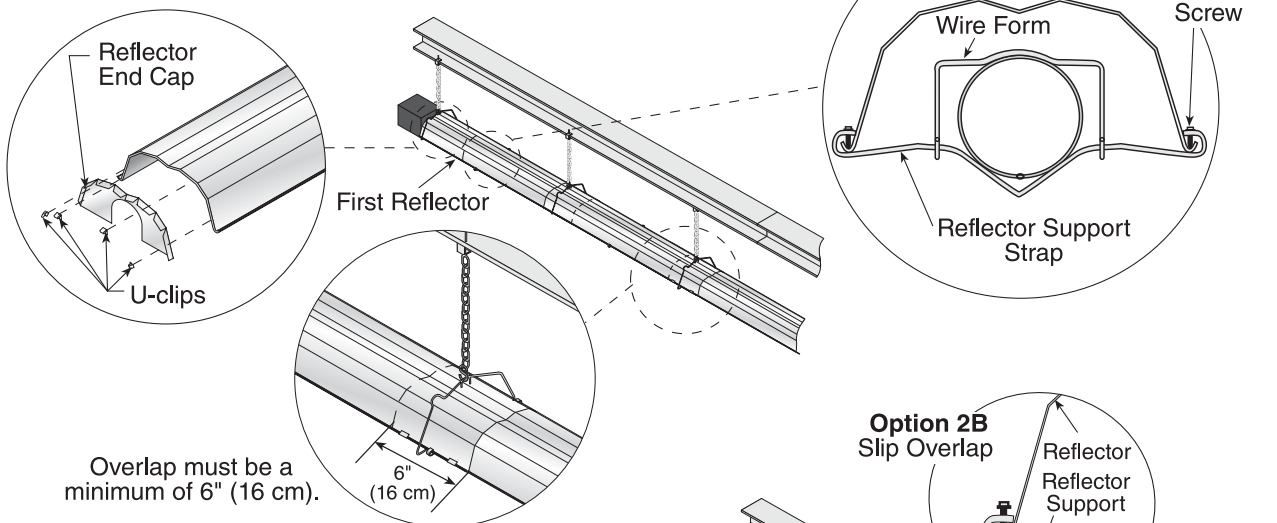
Step 6.5.1 Reflector, U-Clip and Reflector Support Installation

The pictorial drawings of the heater construction in *Section 6* are schematic only and provide a general guideline of where hangers, reflector supports and U-clips are to be installed.

To ensure proper expansion and contraction movement of the reflectors, a combination of U-clips and reflector supports are used. The positioning of

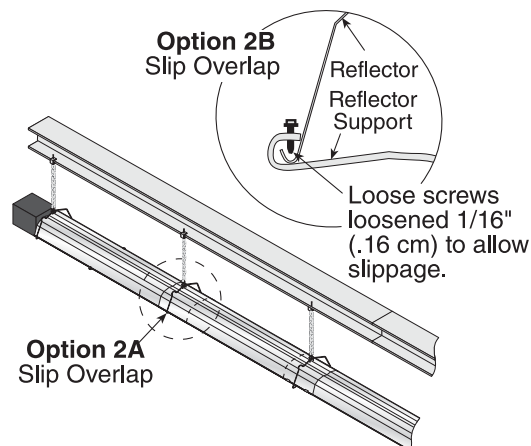
reflector supports and U-clips depend on the individual installation. Use either pop rivets or sheet metal screws instead of u-clips when installing end caps and joint pieces in areas where impact and high wind may be a factor. The following rules must be observed.

1. Slide first reflector after burner a minimum 2" (4 cm) through first hanger and ensure reflector end cap is securely fastened via U-clips, pop rivets, or sheet metal screws. Position reflector support with tight screws in middle of first reflector.



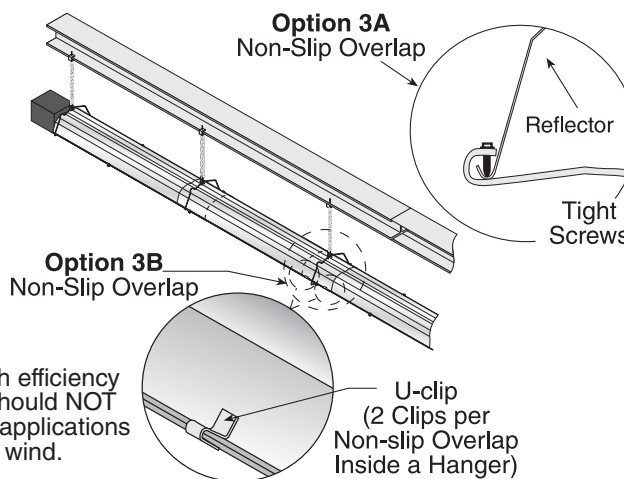
2. The overlap at the first and second reflector is a **slip overlap**. Thereafter, every third reflector joint is a slip overlap. A slip overlap is achieved by either:
 - a.) both reflectors lay inside a hanger.

- (No reflector support needed.)
- b.) using a reflector support with loose screws at the reflector overlap.



3. The remaining reflector overlaps require a **non-slip overlap** connection. To affix the reflectors together in a non-slip overlap either:
 - a.) use reflector support and tight screws.
 - b.) if both reflectors lay inside a hanger, u-clips or sheet metal screws may be used.

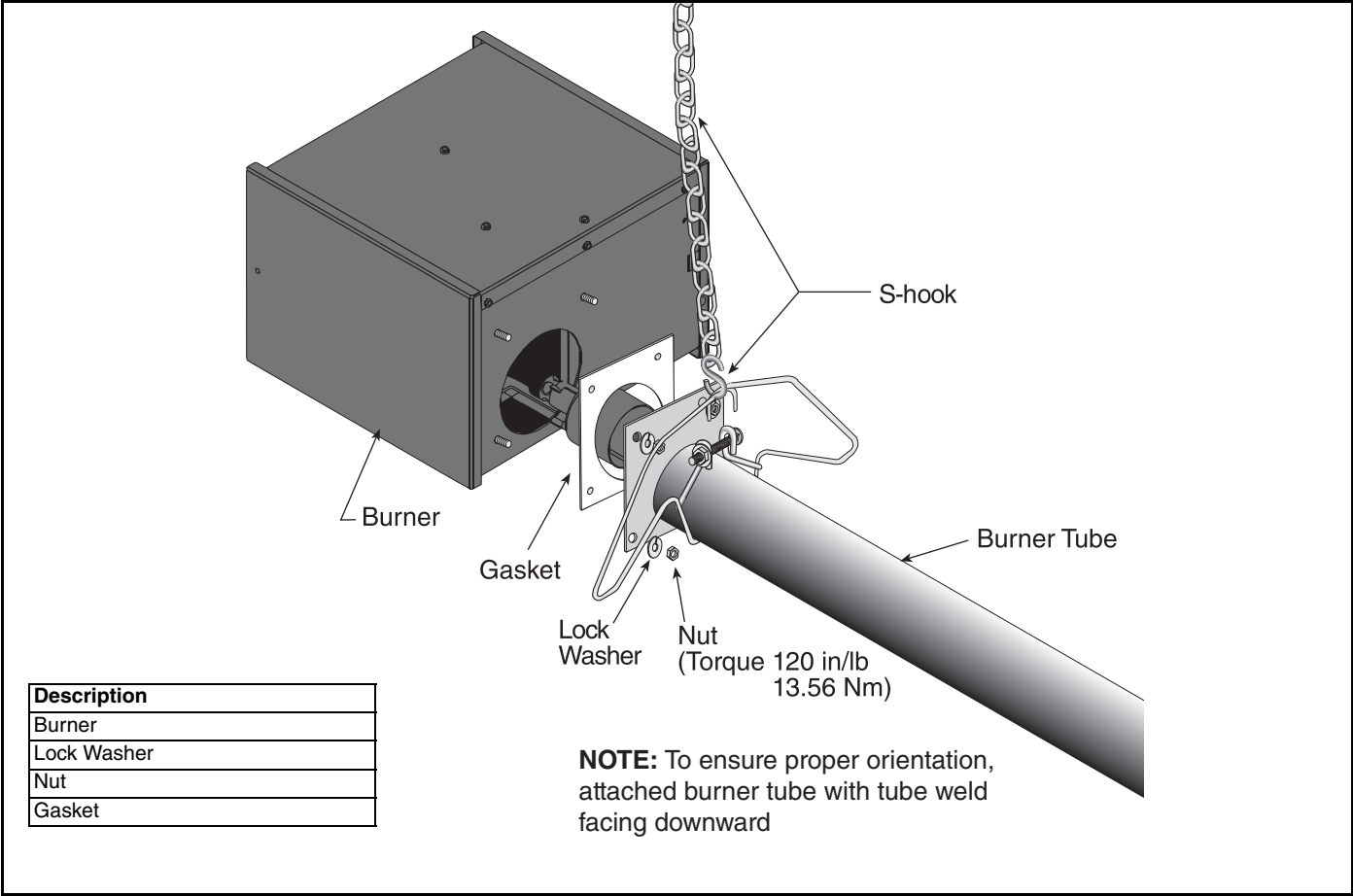
This section of three reflectors joined together must be affixed to the tube with at least one reflector support with tight screws.



NOTE: High efficiency reflectors should NOT be used in applications exposed to wind.

| Description |
|---------------------------------------|
| Reflector Support Package |
| Wire Form |
| Reflector Support Strap, Wide Pattern |
| Screw #8 x 3/4" |
| U-Clip Package |
| Reflector End Cap |

Step 6.6 Burner Installation



SECTION 7: OPTIONAL HEATER ACCESSORIES

| |
|---|
| ! WARNING |
|  |
| <p>Cut/Pinch Hazard</p> <p>Wear protective gear during installation, operation and service.</p> <p>Edges are sharp.</p> <p>Failure to follow these instructions can result in injury.</p> |

7.1 U-Tube/VES-U45 Configuration

Heaters (except ES-40) are approved for optional U-tube configurations.

The U-tube may be installed in a standard horizontal position. When using a U-tube configuration, the following additional rules must be adhered to:

- A minimum of 10' (3 m) on ES-60/80 and a minimum of 15' (4.5 m) on ES-100/125/150/175 is required between the burner and the U-tube.
- The correct turbulator (*See Page 21, Step 6.4*) must be installed in the last standard section of the tube.
- The burner must never be operated in a tilted position.
- The heater must be properly supported at all locations. *See Page 29, Figure 7.2.*

FIGURE 16: U-Tube Heater Assembly Overview (Level Reflector)

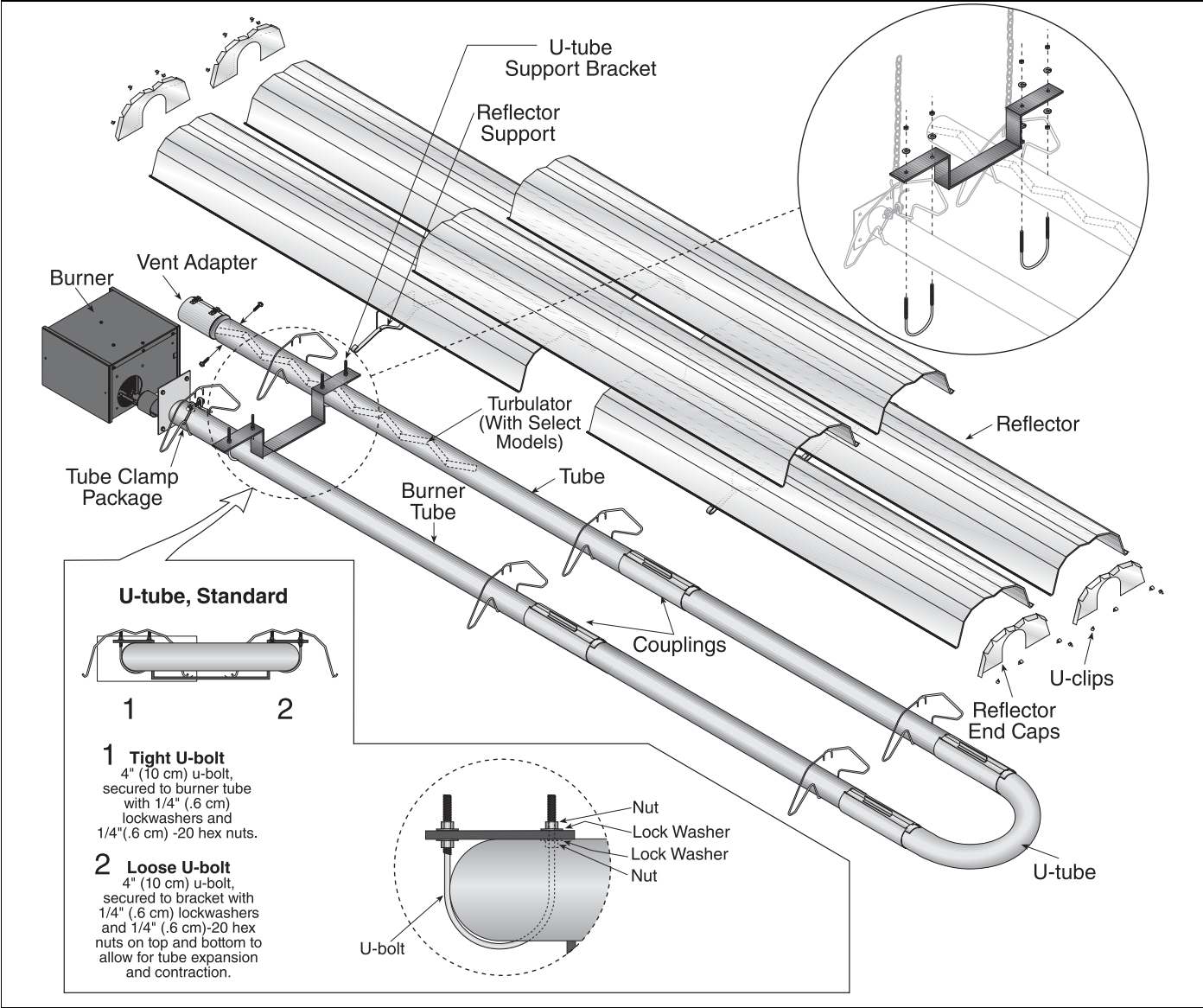


FIGURE 17: U-Tube Reflector Kit (Optional for Level Reflector Only)

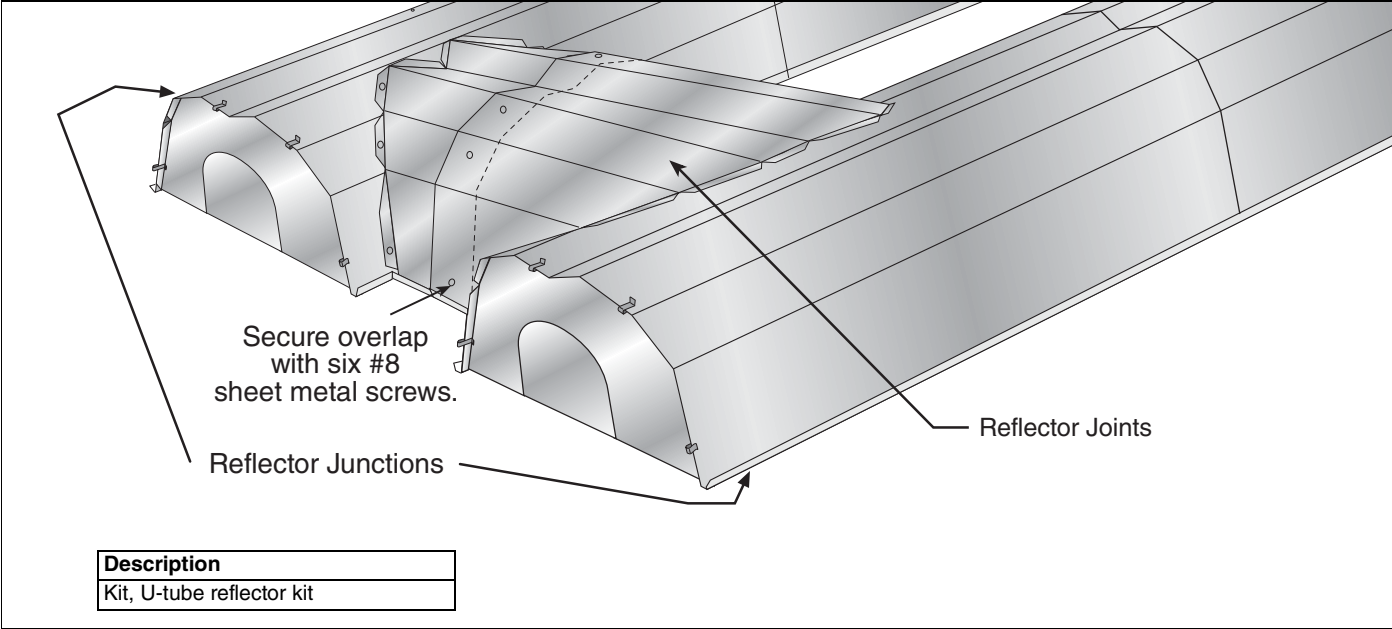


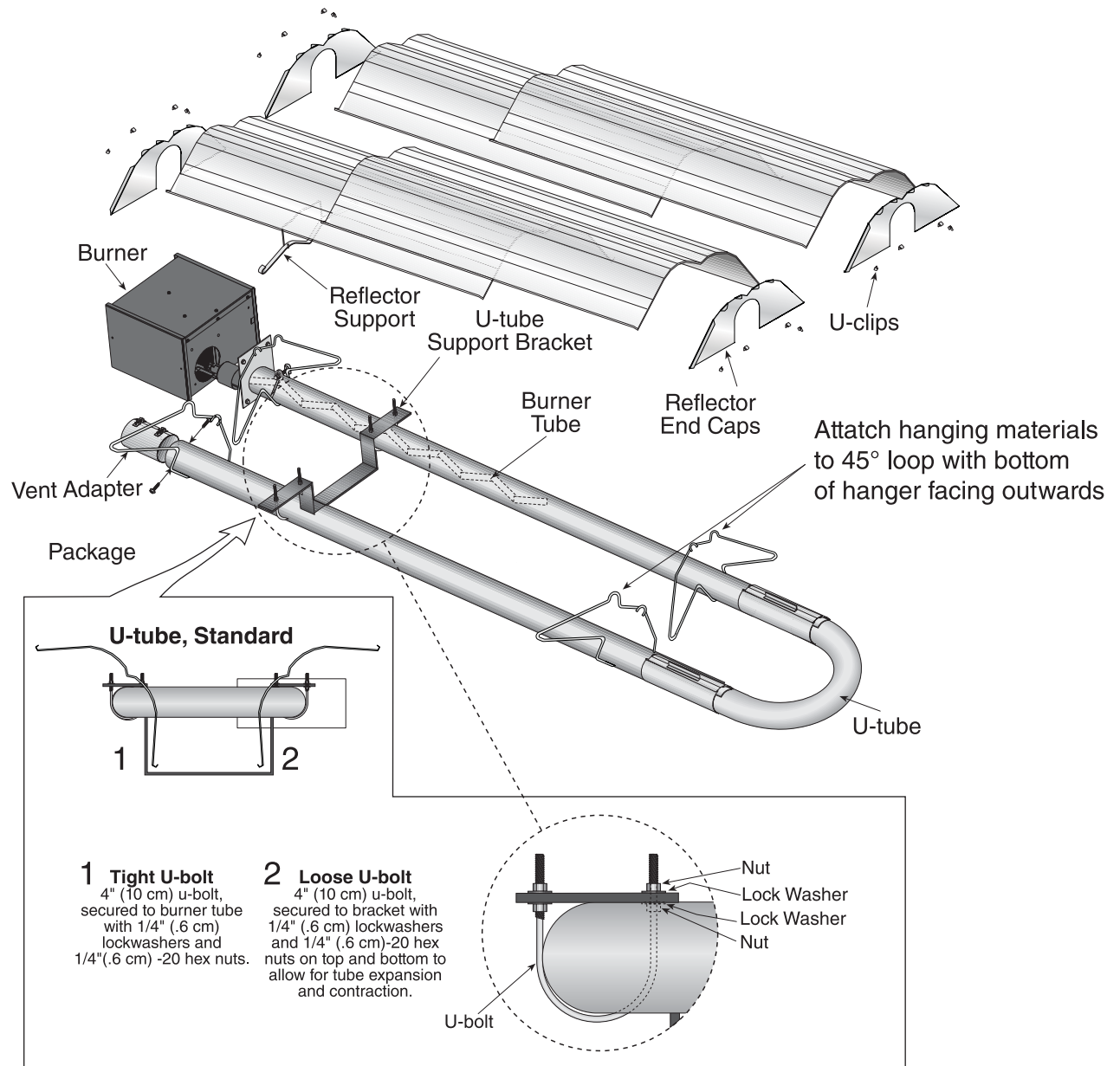
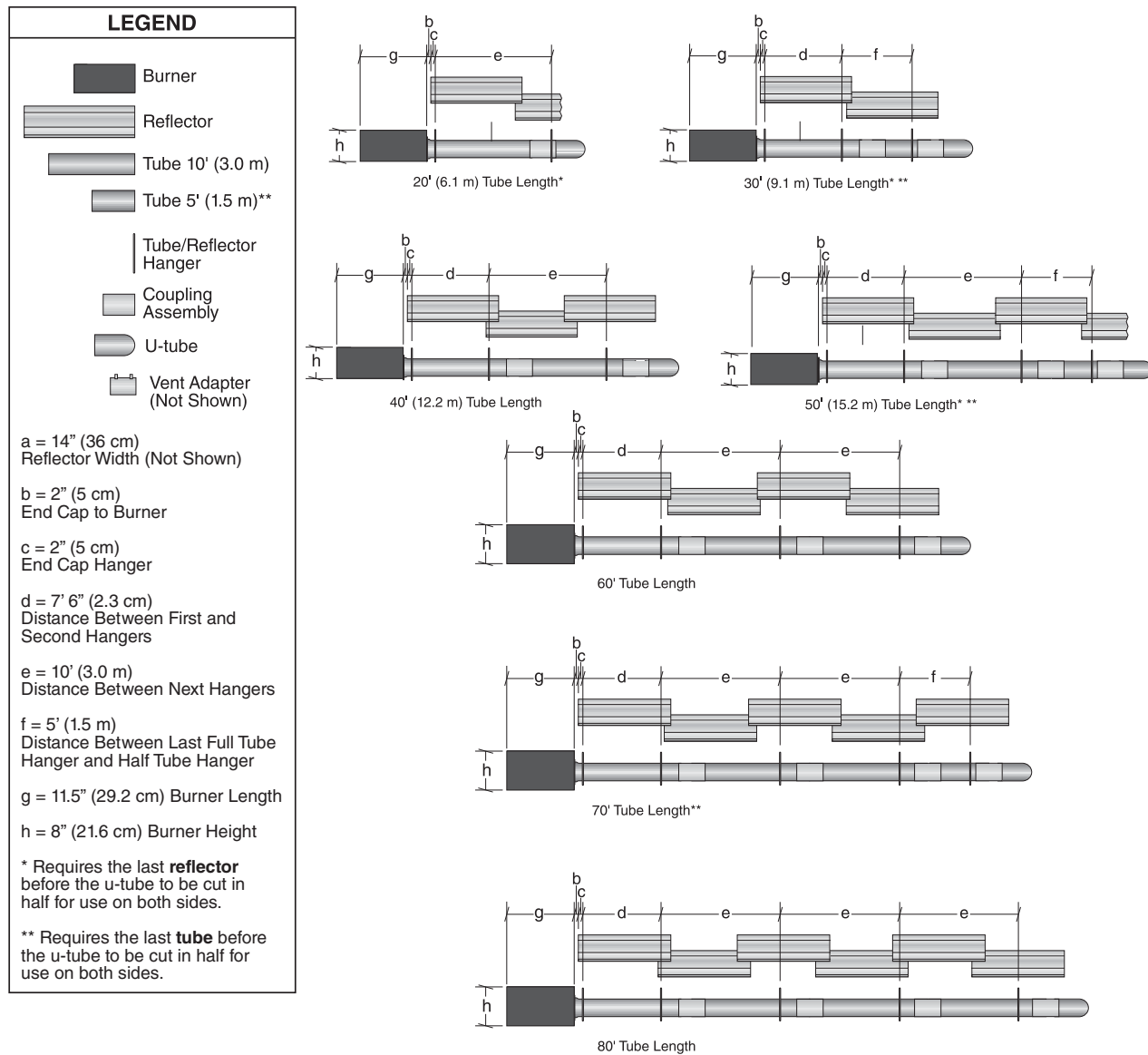
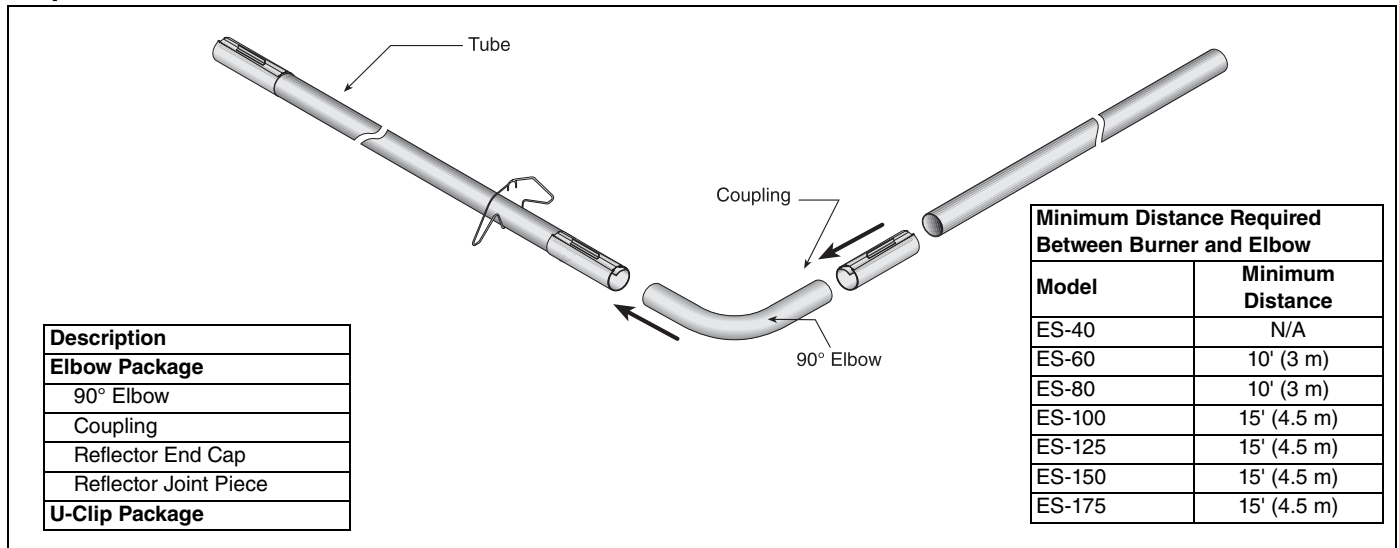
FIGURE 18: VES-U45 Assembly Overview

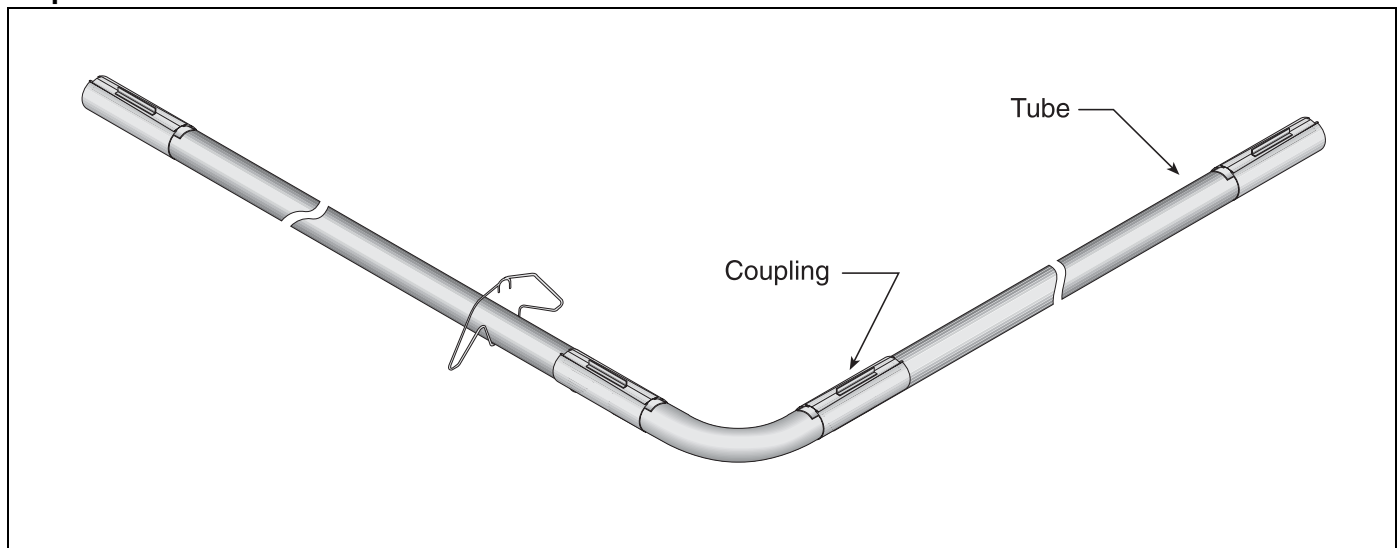
FIGURE 19: U-Tube Heater Layout Overview

7.2 Elbow Package Configuration

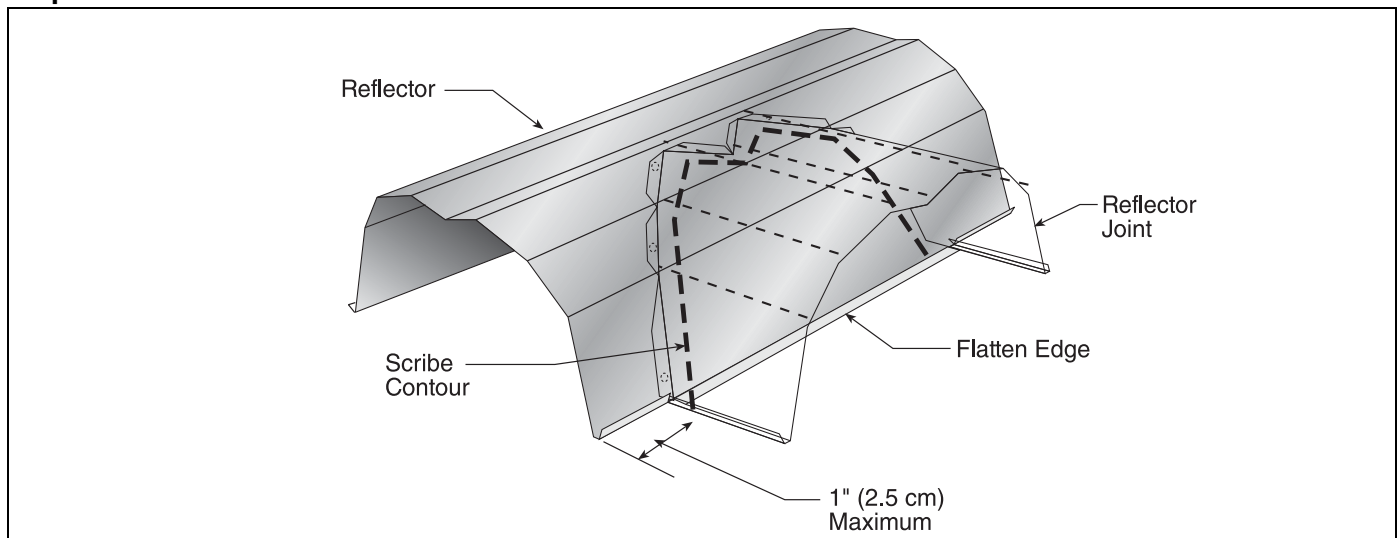
Step 7.2.1 Elbow Installation



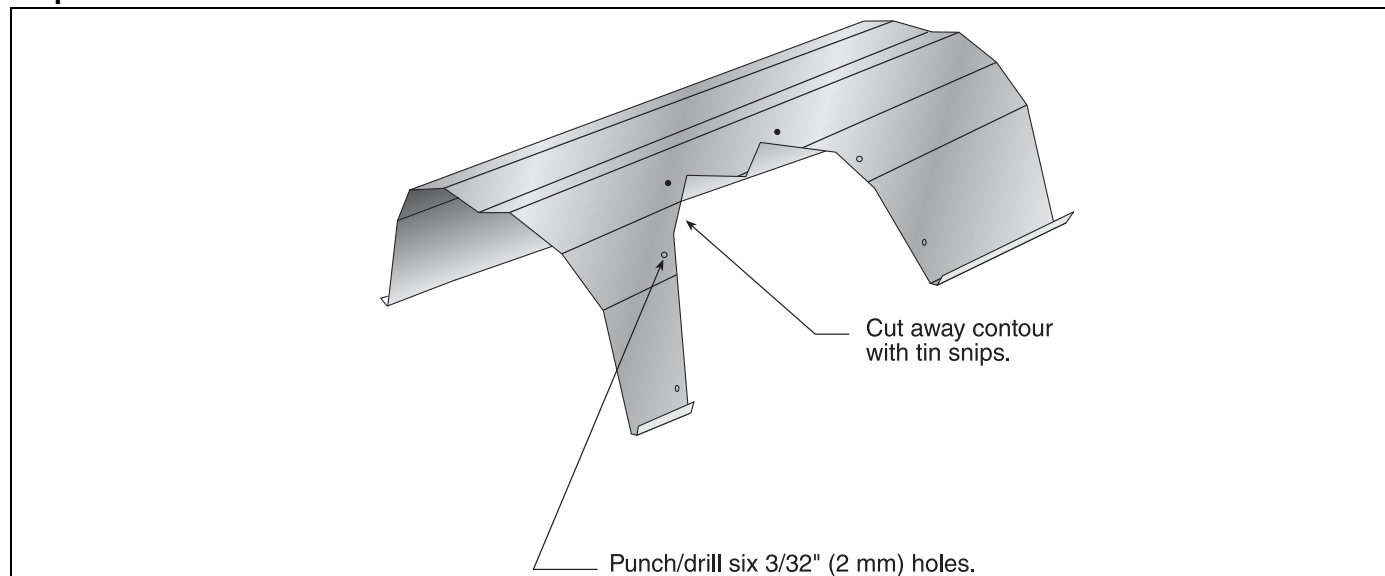
Step 7.2.2 Elbow Installation



Step 7.2.3 Reflector Joint Installation



Step 7.2.4 Reflector Joint Installation



Step 7.2.5 Reflector Joint Detail

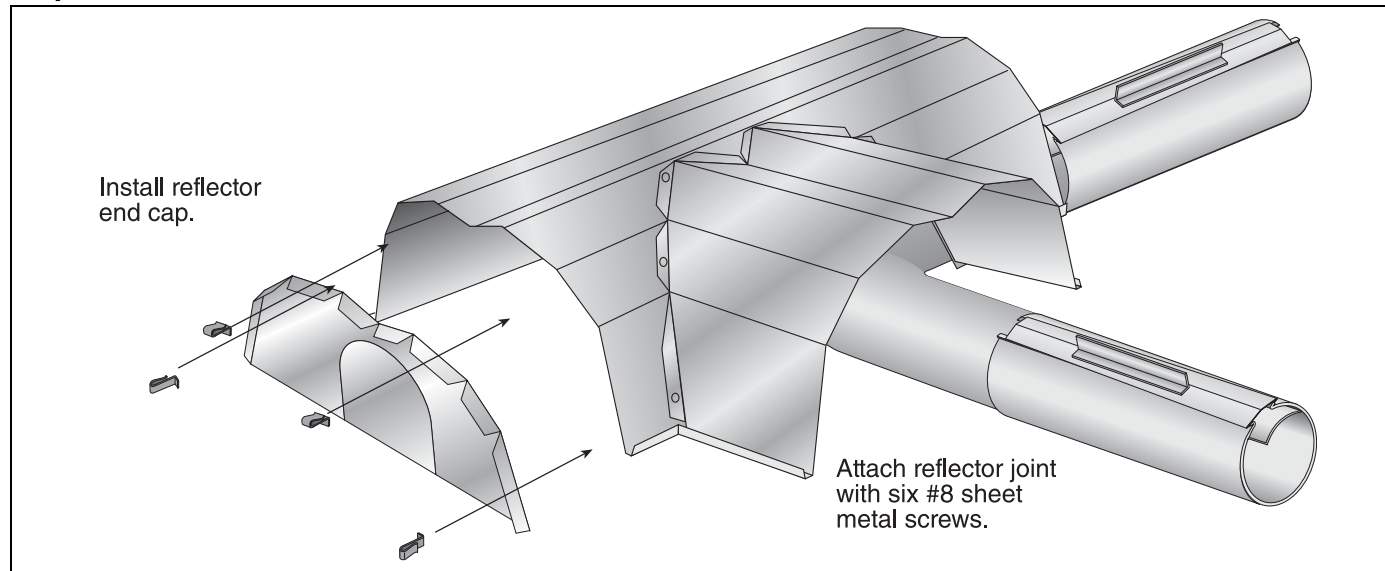
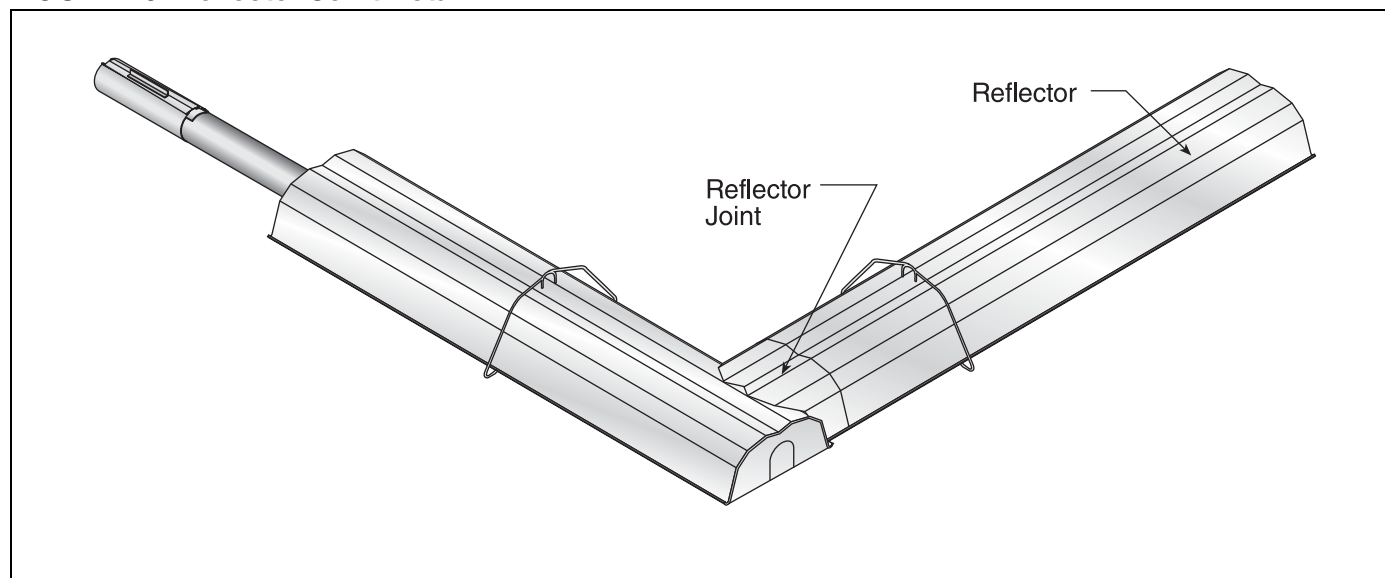
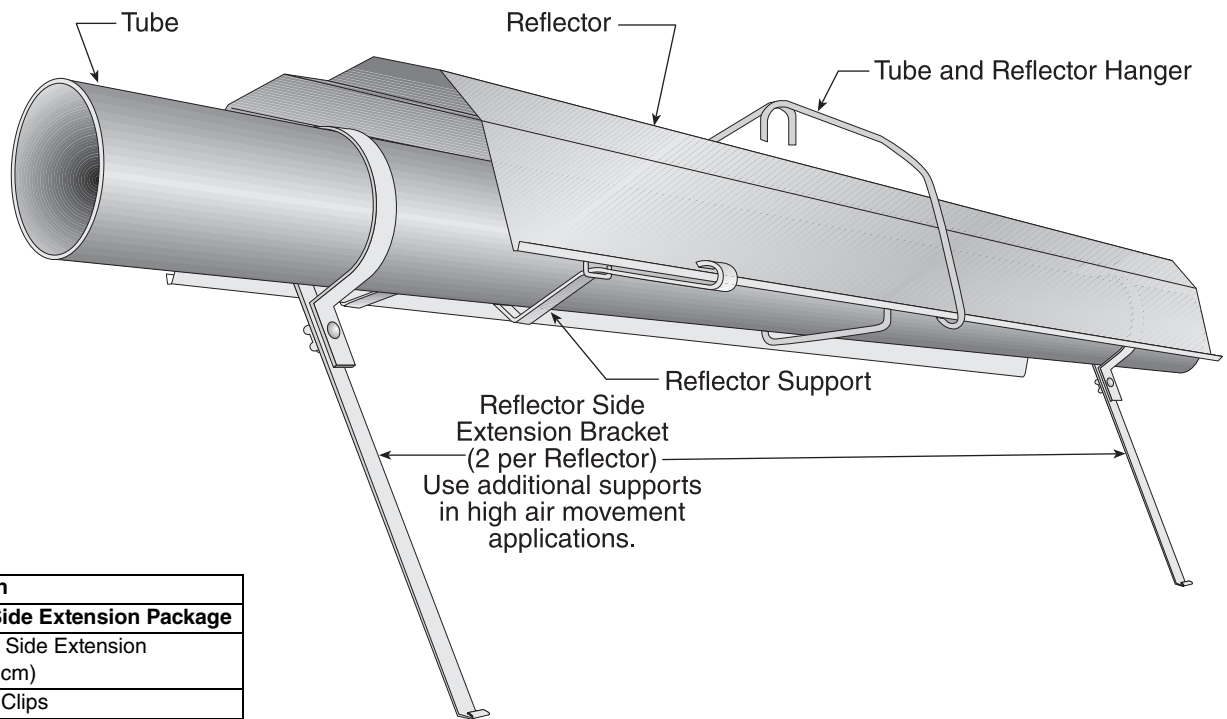


FIGURE 20: Reflector Joint Detail



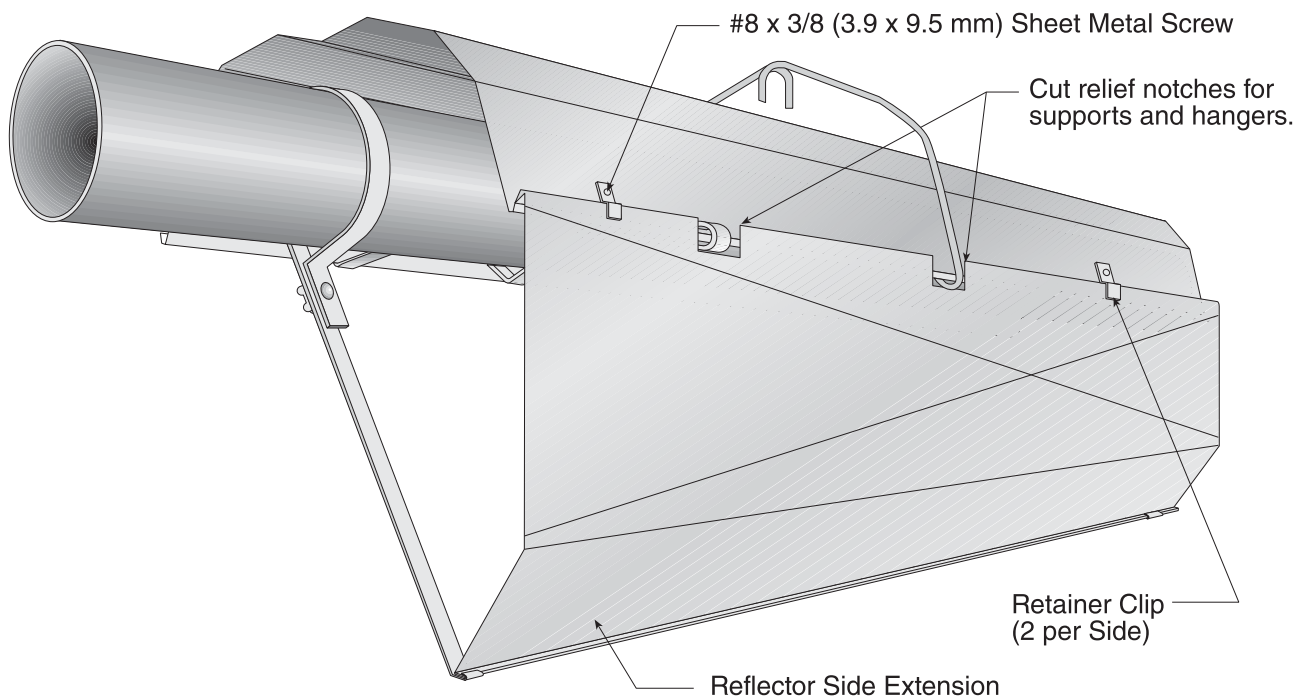
7.3 Reflector Side Extension

Step 7.3.1 Bracket Installation

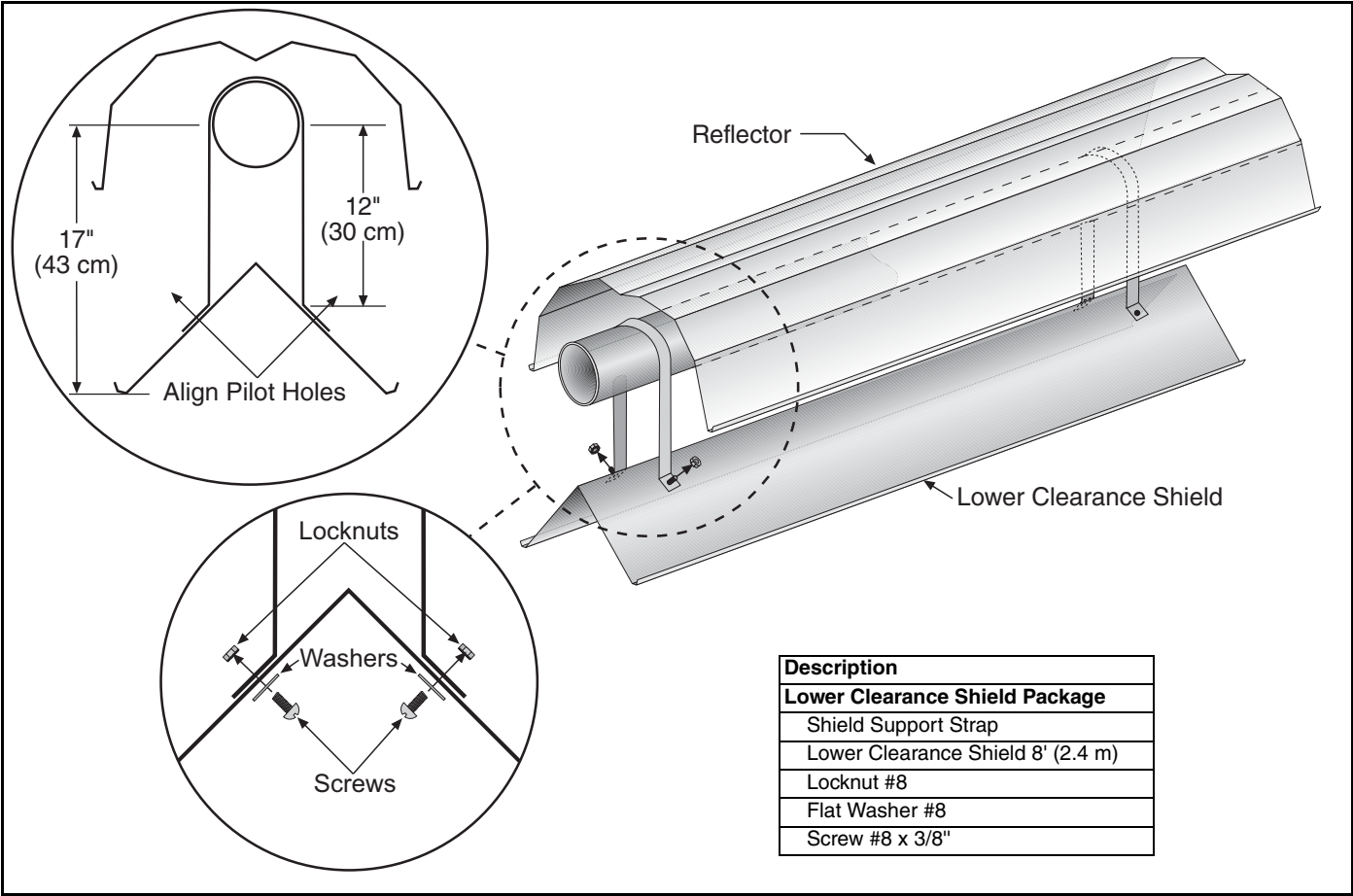


| Description |
|---|
| Reflector Side Extension Package |
| Reflector Side Extension |
| 96" (244 cm) |
| Retainer Clips |
| Sheet Metal Screws |
| |
| Order Separately |
| Reflector Side Extension Bracket |

Step 7.3.2 Side Reflector Installation



7.4 Lower Clearance Shield Installation
Step 7.4.1 Shield Support Strap Assembly



SECTION 8: VENTING

! WARNING**Carbon Monoxide Hazard**

Heaters installed unvented must be interlocked with sufficient building exhaust.

Heaters must be installed according to the installation manual.

Failure to follow these instructions can result in death or injury.

Any portion of vent pipe passing through a combustible wall must have an approved thimble to conform with the above listed codes.

Vent pipe must be sloped downward away from the heater 1/2" (1 cm) for every 20' (6 m).

The heater may be individually vented or common vented. When venting horizontally, a maximum of two heaters can be commonly vented. *See Page 36, Section 8.10.* When venting vertically, a maximum of four heaters can be commonly vented. *See Page 37, Section 8.11.*

The heater may also be installed unvented in certain circumstances according to building ventilation codes. Refer to the above codes *and Page 34, Section 8.2* for further information. Unvented operation also requires compliance with the clearances to combustibles given *on Page 8, Figure 10.*

The bottom of the vent or air intake terminal shall not be located less than 1' (0.3 m) above grade level.

The vent shall not terminate less than 7' (2.1 m) above grade where located adjacent to public walkways.

Vent terminal must be installed at a height sufficient to prevent blockage by snow, and building materials protected from degradation by flue gases.

Secure all joints with #8 x 3/8 sheet metal screws. Seal all joints with high temperature silicone sealant.

Vent terminal must be beyond any combustible overhang.

! WARNING**Cut/Pinch Hazard**

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

8.1 Venting

This heater must be vented in accordance with the rules contained in this manual and with the following national codes and any state, provincial or local codes which may apply:

United States: Refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision.

Canada: Refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision.

Exhaust end of heater will accept a 4" (10 cm) vent pipe using the vent adapter. To prevent leakage of condensation, install the vent adapter with the seam on top and seal the joint using a high temperature silicone sealant.

8.1.1 United States Requirements

Vent must terminate at least 3' (0.9 m) above any forced air inlet located within 10' (3.1 m).

Vent must terminate at least 4' (1.2 m) below, 4' (1.2 m) horizontally from, or 1' (0.3 m) above any door, operable window, or gravity air inlet into any building.

8.1.2 Canadian Requirements

The vent shall not terminate within 6' (1.8 m) of a mechanical air supply inlet to any building.

The vent shall not terminate within 3' (0.9 m) of a window or door that can be opened in any building, any non-mechanical air supply inlet to any building, or of the combustion air inlet of any other appliance.

8.2 Unvented Operation

Sufficient ventilation must be provided in the amount of 4 cfm per 1000 Btu/h firing rate (United States); 3 cfm per 1000 Btu/h firing rate (Canada).

Use of optional outside combustion air is not recommended with unvented heaters.

If exhaust fans are used to supply ventilation air, an interlock switch must be used to prevent the heater from coming on when the fans are off. This may be done using a pressure switch.

8.3 Horizontal Venting

In noncombustible walls only, vent terminal may be used.

For 4" (10 cm) vents in either combustible or noncombustible walls, use Tjernlund VH1-4 or equivalent, insulated vent terminal. Follow the manufacturer's instructions for proper installation.

For 6" (15 cm) common vents in either combustible or noncombustible walls, use Tjernlund VH1-6 or equivalent, insulated vent terminal. Follow the manufacturer's instructions for proper installation.

8.4 Vertical Venting

For 4" (10 cm) common vent, an approved vent cap must be used.

For 6" (15 cm) common vent, an approved vent cap must be used.

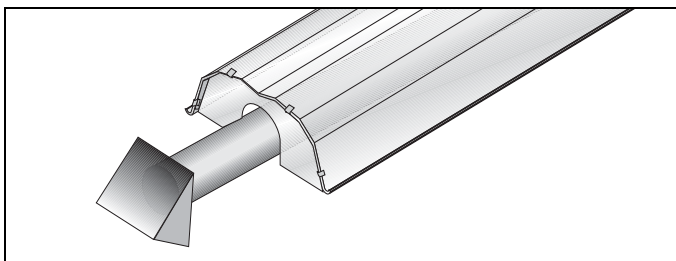
For common vertical venting of more than two heaters, See *Page 37, Section 8.11*.

A vent shall not extend less than 2' (0.6m) above the highest point where it passes through a flat roof of a building.

8.5 Unvented Operation Tube Termination

Turndown type vent terminal with a screen must be installed at the exhaust end of the tube. Vent terminal design shall not incorporate backdraft flap.

FIGURE 21: Tube Termination



8.6 Length Requirements

The maximum vent length allowed is 45' (13.7 m). The maximum outside air supply duct length allowed is 45' (13.7 m).

The total vent length, plus outside air duct length, plus any extensions to minimum heat exchanger lengths, cannot exceed 65' (19.8 m).

Vent length should be limited to less than 20' (6 m). If using vent lengths greater than 20' (6 m), condensation will form in the vent pipe. Insulation and additional sealing measures (high temperature silicone at all seams) are required. Optional heat exchanger beyond minimum lengths is considered as vent length for length determination.

Subtract 15' (4.6 m) of maximum allowed vent or duct length per vent elbow if more than two are used.

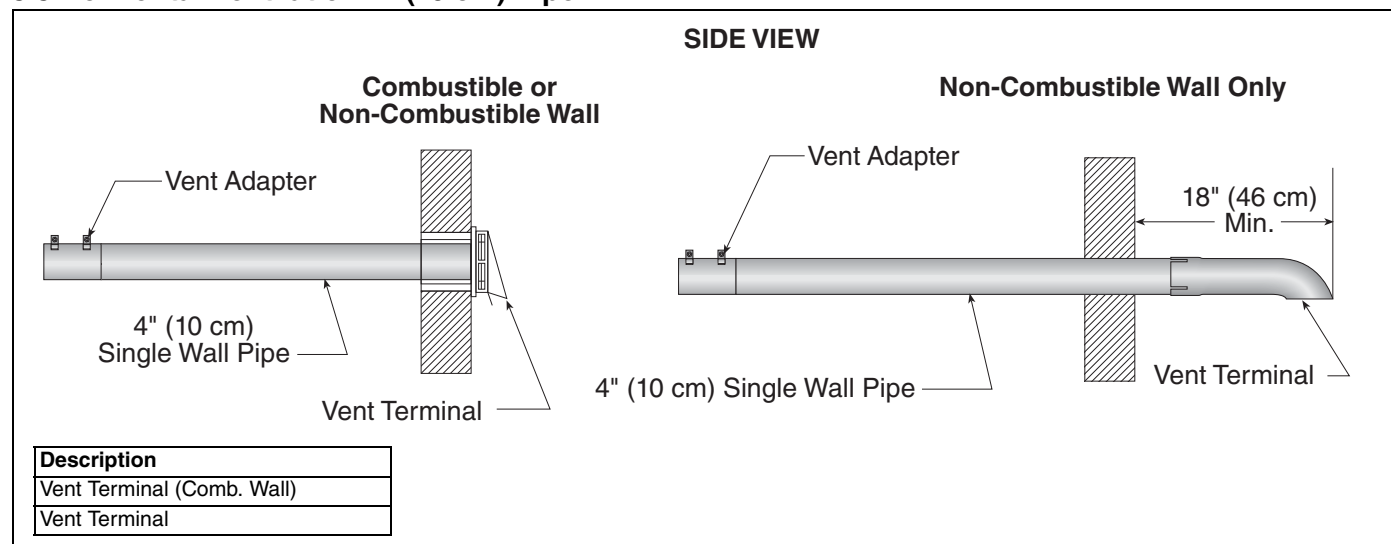
8.7 Vent Material Recommendations

Vent recommendations:

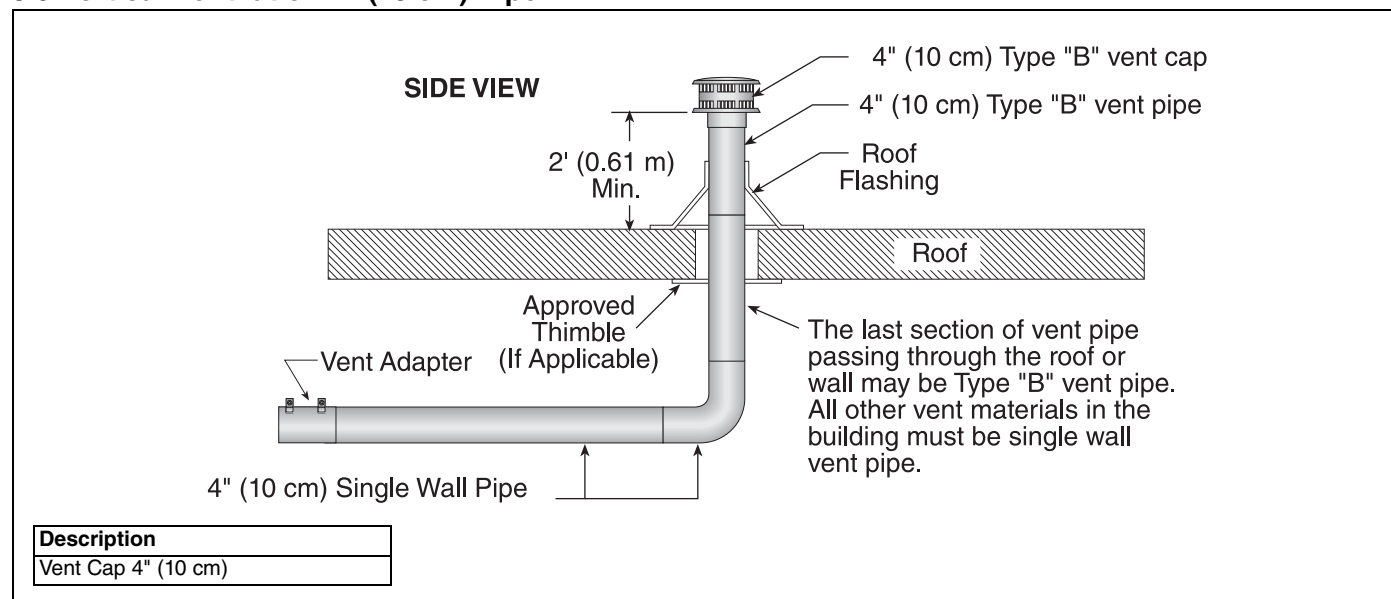
1. Porcelain coated tubing 4" (10 cm) O.D.
2. Heat treated aluminized tubing 4" (10 cm) O.D.
Heat treated aluminized tubing 6" (15 cm) O.D.
3. Single wall flue pipe - minimum 26 ga.
(Supplied by others)

NOTE: 4" (10 cm) O.D. Porcelain coated tubing, 4" (10 cm) O.D. Heat treated aluminized tubing, and 6" (15 cm) O.D. Heat treated aluminized tubing are equivalent to single wall flue pipe.

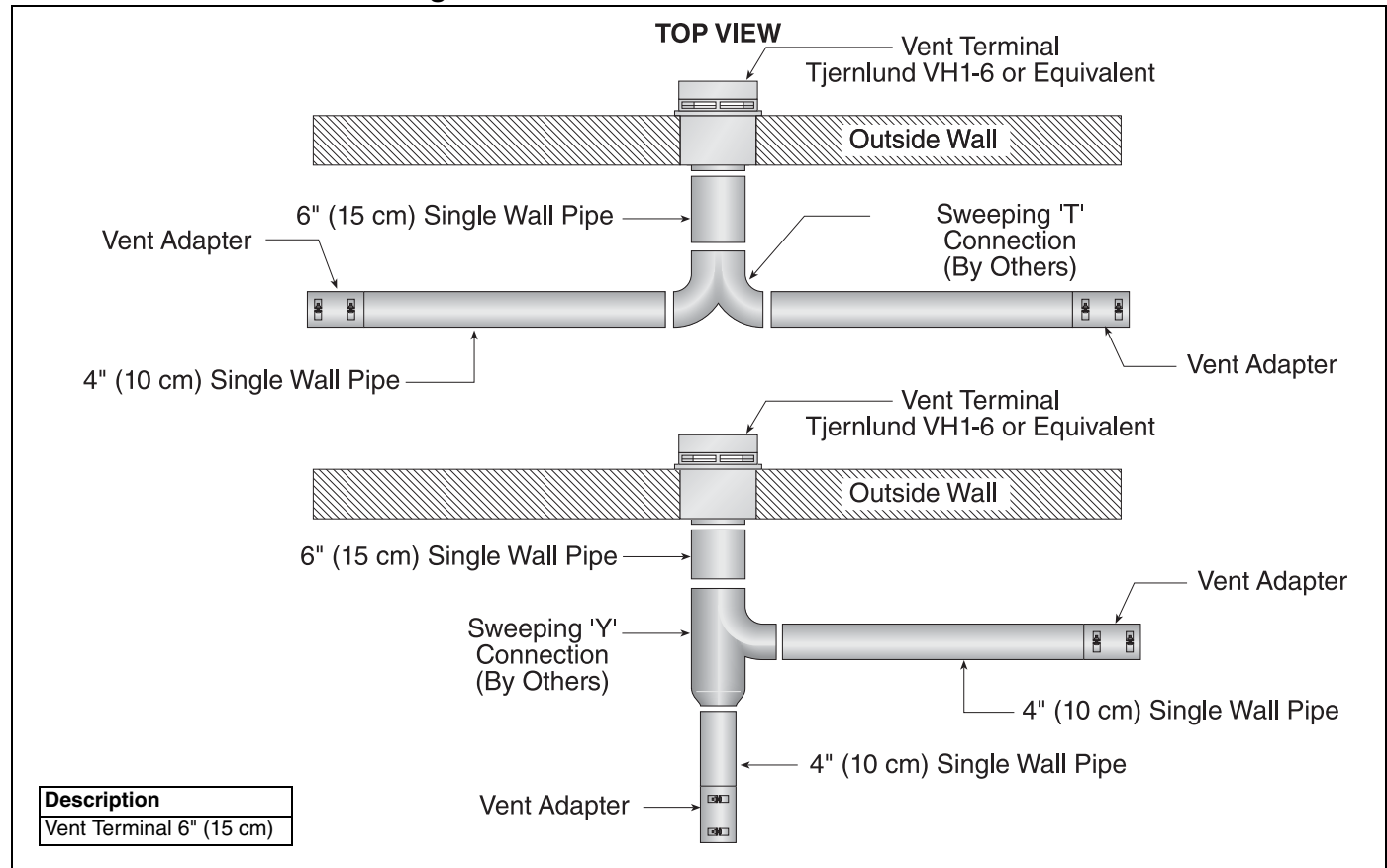
8.8 Horizontal Ventilation 4" (10 cm) Pipe



8.9 Vertical Ventilation 4" (10 cm) Pipe



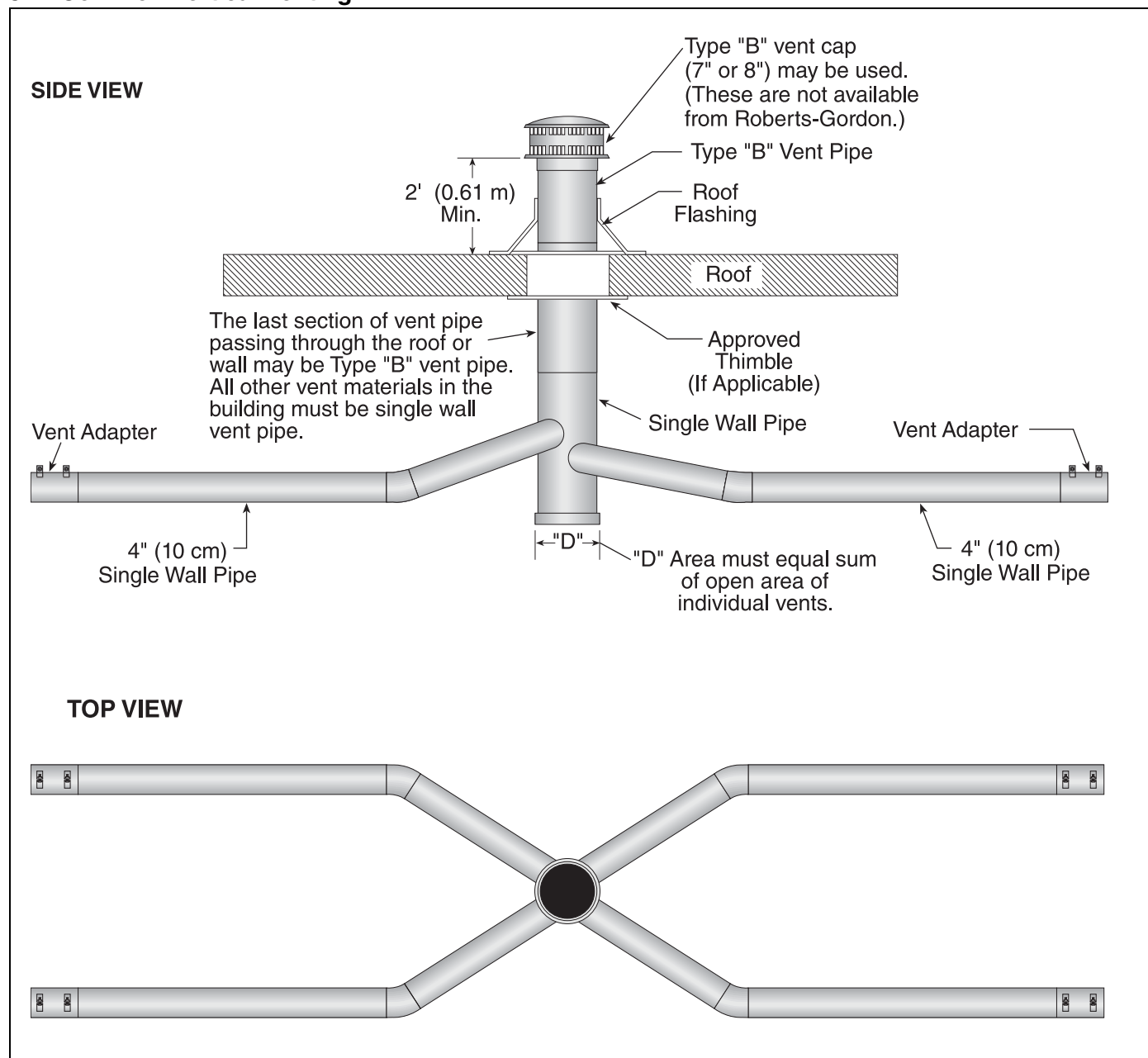
8.10 Common Side Wall Venting



Requirements:

- Maximum of two heaters can be commonly vented through a side wall.
- Heaters must be of the same BTU output.
- Heaters must be controlled by a common thermostat.

8.11 Common Vertical Venting



Requirements:

- Maximum of four heaters can be commonly vented through the roof.
- Heaters must be of the same BTU output.
- Heaters must be controlled by a common thermostat.
- Connections to a common stack must be positioned to avoid direct opposition between streams of combustion gases.

8.12 Outside Combustion Air Supply

IMPORTANT: If the building has a slight negative pressure or corrosive contaminants, such as halogenated hydrocarbons, are present in the air, an outside combustion air supply to the heater is required. Seal all combustion air pipe joints.

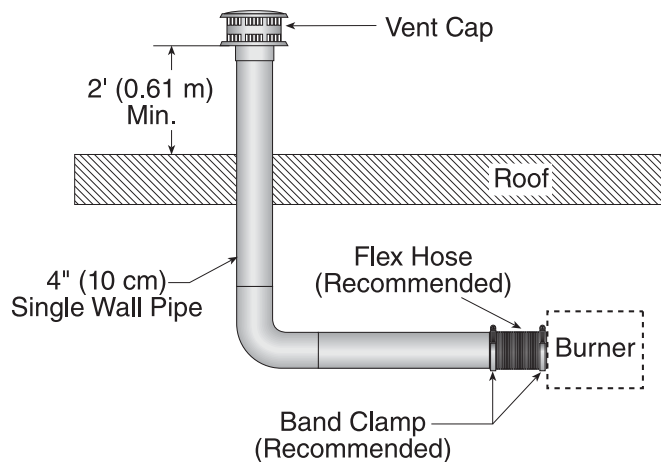
Use of optional outside combustion air is not recommended with unvented heaters.

The air supply duct may have to be insulated to prevent condensation on the outer surface. The outside air terminal must not be more than 1' (31 cm) above the vent termination while maintaining a minimum distance of 3' (93 cm) for both vertical and horizontal venting.

8.12.1 Length Requirements

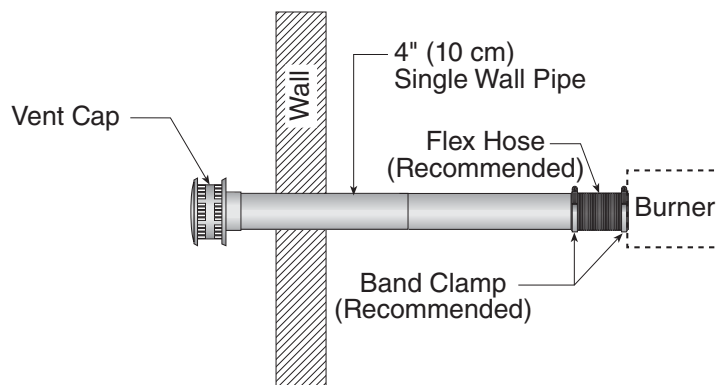
Follow the constraints listed on *Page 34, Section 8.6*.

8.12.2 Vertical Outside Air Supply for Single Heater Installation



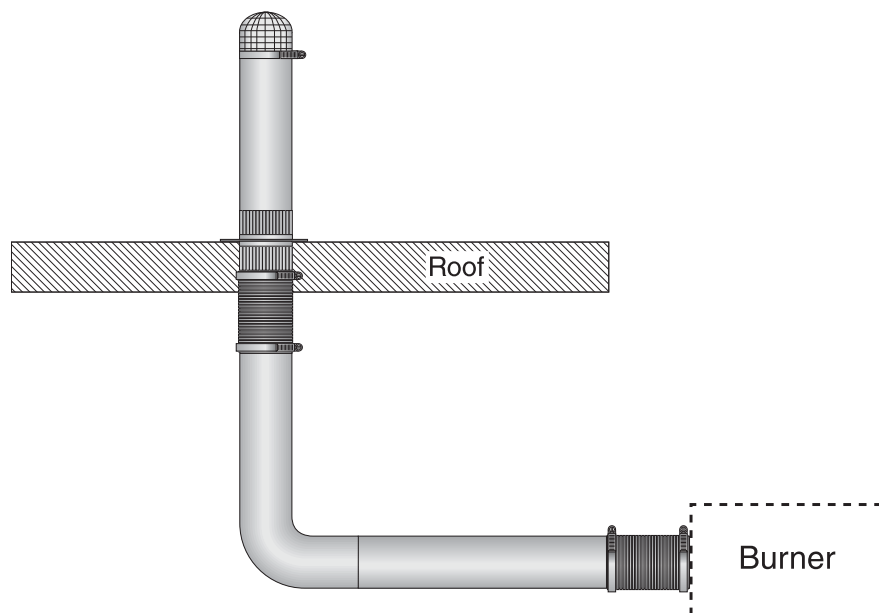
| Description |
|---------------------|
| Vent Cap 4" (10 cm) |

8.12.3 Horizontal Outside Air Supply for Single Heater Installation


Description

Vent Cap 4" (10 cm)

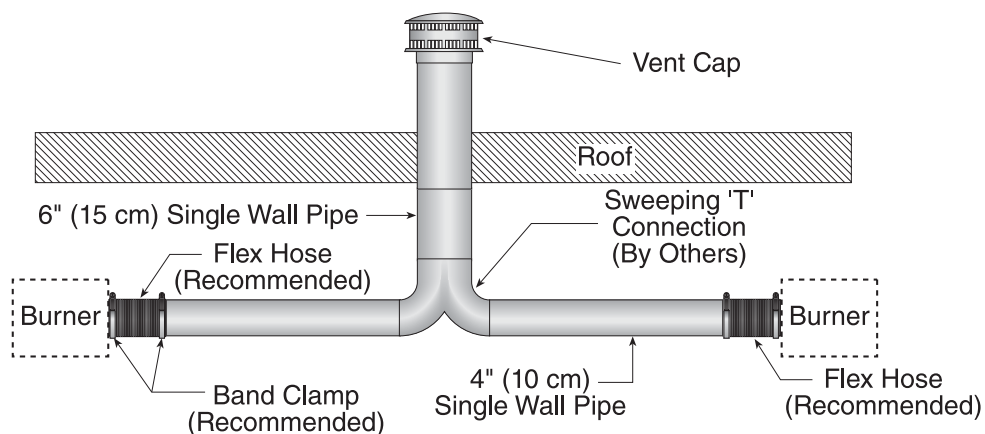
8.12.4 Vertical Outside Air with Outside Air Inlet Kit



| Description | Part Number |
|---------------------------------|-----------------|
| Outside Air Inlet Kit 4" | 90502401 |
| Bird Screen | 01365400 |
| Hose Clamp - 4" | 93901300 |
| Vent Pip - 4" OD | 90507200 |
| Flange - 4" | 90507001 |
| Flexible Vent Pipe - 4" OD | 91409603 |
| Screw #12 Hex hd (Self tap) | 13404 |

| Description | Part Number |
|---------------------------------|-----------------|
| Outside Air Inlet Kit 5" | 90502403 |
| Bird Screen | 01397400 |
| Hose Clamp - 5" | 90901301 |
| Vent Pip - 5" OD | 90507201 |
| Flange - 5" | 90507002 |
| Flexible Vent Pipe - 5" OD | 91409604 |
| Screw #12 Hex hd (Self tap) | 13404 |

8.12.5 Vertical Outside Air Supply for Double Heater Installation

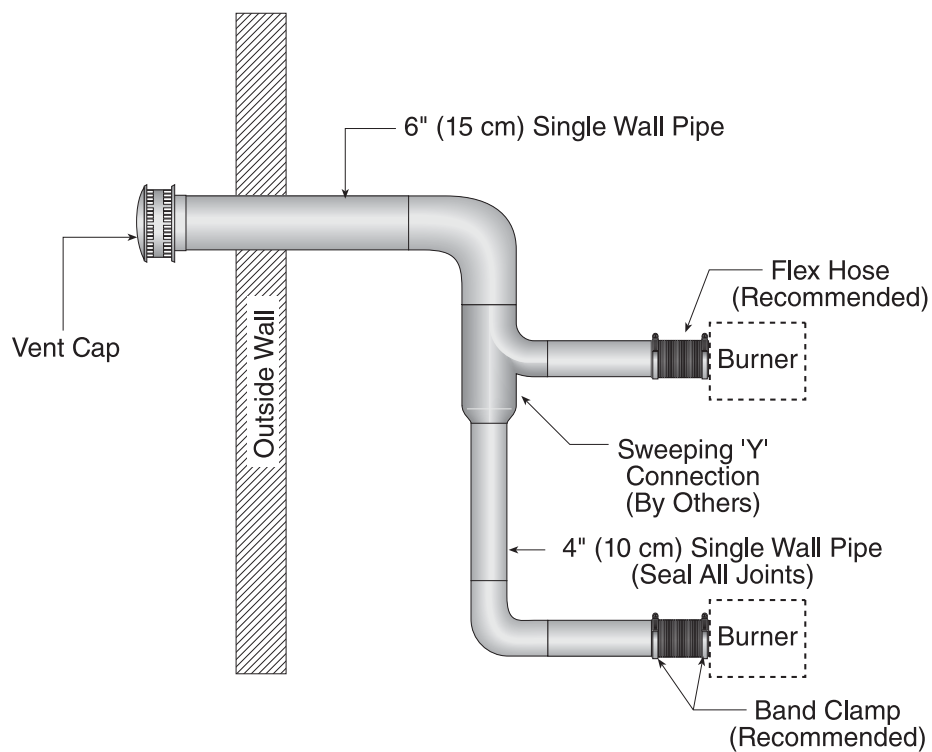


| Description |
|---------------------|
| Vent Cap 6" (15 cm) |

Requirements:

- Heaters must be controlled by a common thermostat.

8.12.6 Horizontal Outside Air Supply for Double Heater Installation



| Description |
|-------------|
| Vent Cap 30 |
| 6" (15 cm) |

Requirements:

- Heaters must be controlled by a common thermostat.

SECTION 9: GAS PIPING

! WARNING**Fire Hazard**

Tighten gas hose fittings to connect gas supply according to Figure 23.

Gas hose can crack when twisted.

Gas hose moves during normal operation.

Use only 36" (91 cm) long connector of 1/2" or 3/4" nominal ID.

Connector supplied with heater for U.S. models (not with Canadian models).

Failure to follow these instructions can result in death, injury or property damage.

! WARNING**Explosion Hazard**

Leak test all components of gas piping before operation.

Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with heater connected.

Failure to follow these instructions can result in death, injury or property damage.

Install the gas hose as shown on *Page 42, Figure 22*. The gas hose accommodates expansion of the heating system and allows for easy installation and service of the burner. Before connecting the burners to the supply system, verify that all high pressure testing of the gas piping has been completed. There is an expansion of the tube with each firing cycle; this will cause the burner to move with respect to the gas hose. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made strictly in accordance with *Figure 22 on Page 42*.

Meter and service must be large enough to handle all the burners being installed plus any other connected load. The gas hose which feeds the system must be large enough to supply the required gas with a maximum pressure drop of 1/2" w.c. When gas piping is not included in the layout drawing, the local gas supplier will usually help in planning the gas piping.

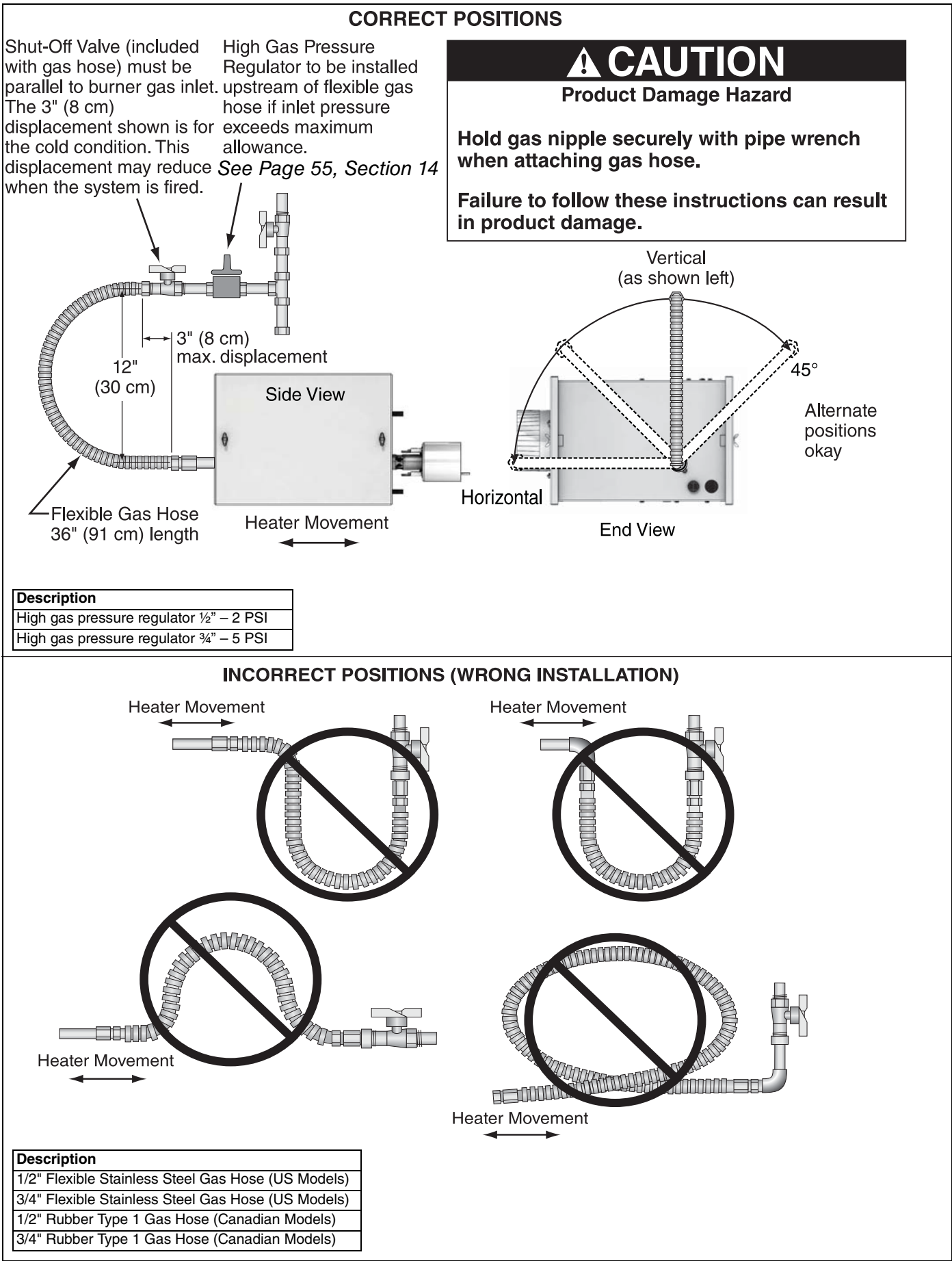
Gas lines must meet applicable codes:

United States: The Flexible Stainless Steel Gas Hose (US models) supplied with the heater is certified per the Standard for Connectors for Gas Appliances, ANSI Z21.24/CSA 6.10 - latest revision.

Canada: The Rubber Type 1 Gas Hose (Canadian models) optional with the heater is certified as being in compliance with the Standard for Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas, CAN/CGA 8.1 - Latest revision.

- **Check the pipe and tubing ends for leaks before placing heating equipment into service. When checking for gas leaks, use a soap and water solution; never use an open flame.**

FIGURE 22: Gas Connection with Flexible Gas Hose



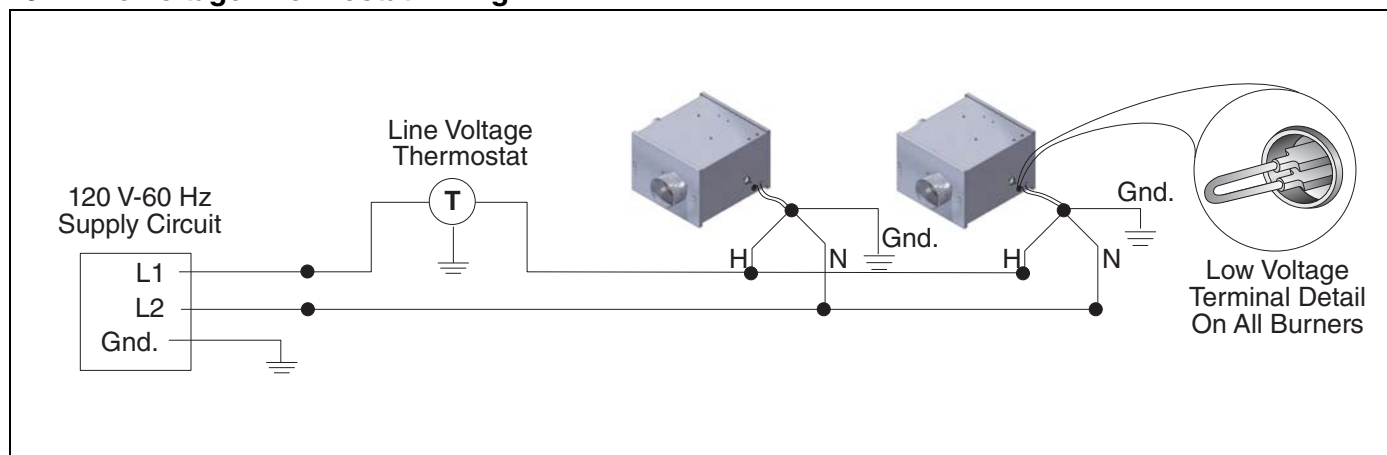
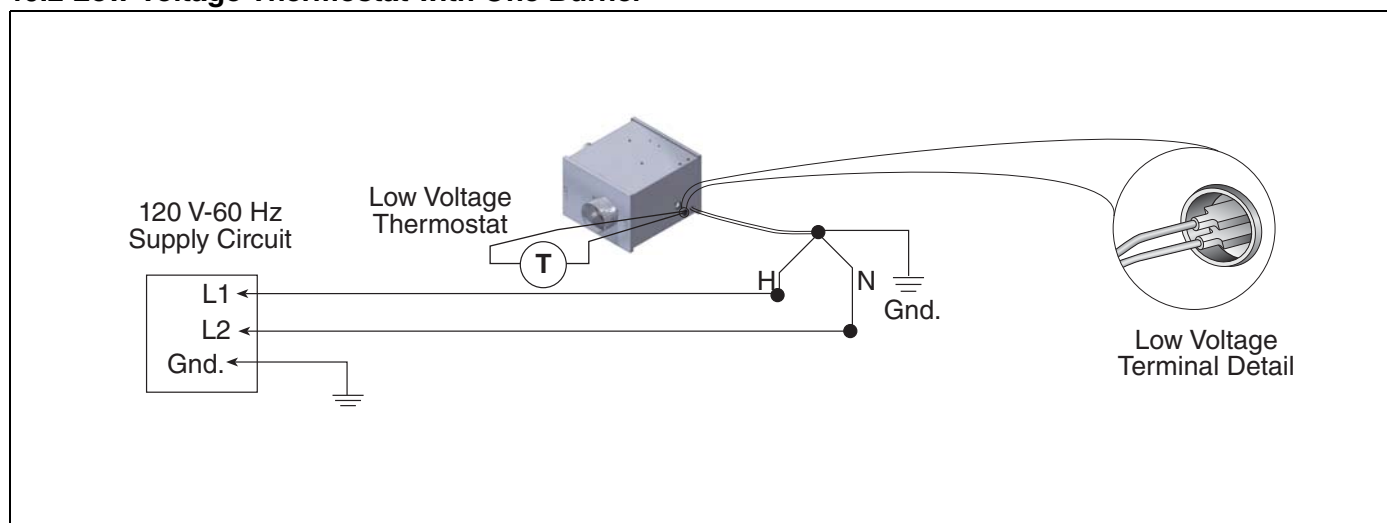
SECTION 10: WIRING

⚠ DANGER**Electrical Shock Hazard****Disconnect electric before service.****Heater must be properly earthed.****Failure to follow these instructions can result in death or electrical shock.**

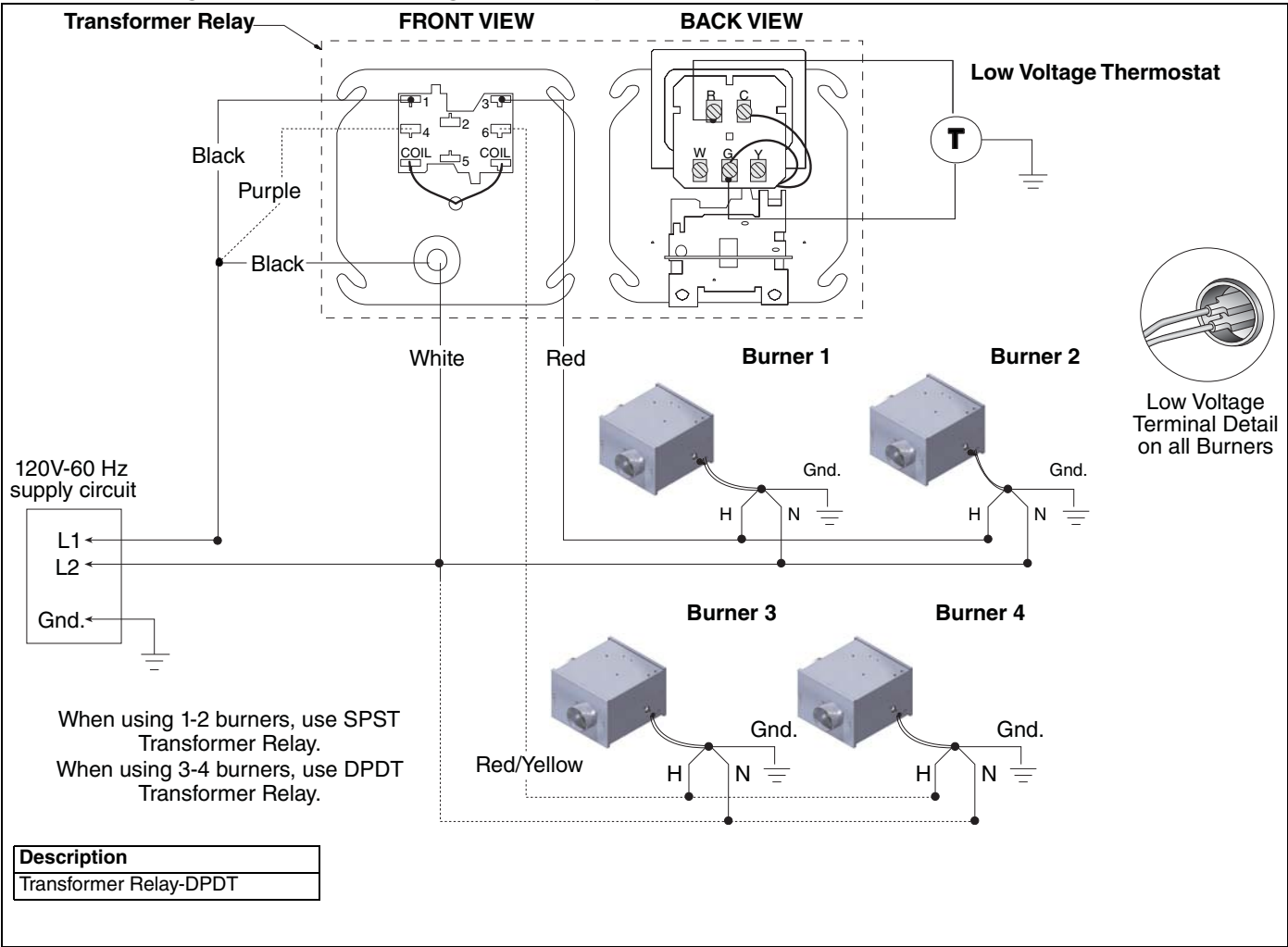
Heaters can be controlled using several methods. Normally thermostats are used to control the heaters but they can also be controlled by an energy management system. *Section 10.1* illustrates the connection for heaters controlled by a line voltage thermostat.

For heaters on a low voltage thermostat, See *Page 43, Section 10.1*. Heaters must be grounded in accordance with applicable codes: United States: Refer to National Electrical Code® NFPA 70 - latest revision; Canada: Refer to Canadian Electrical Code CSA C22.1 Part I - latest revision.

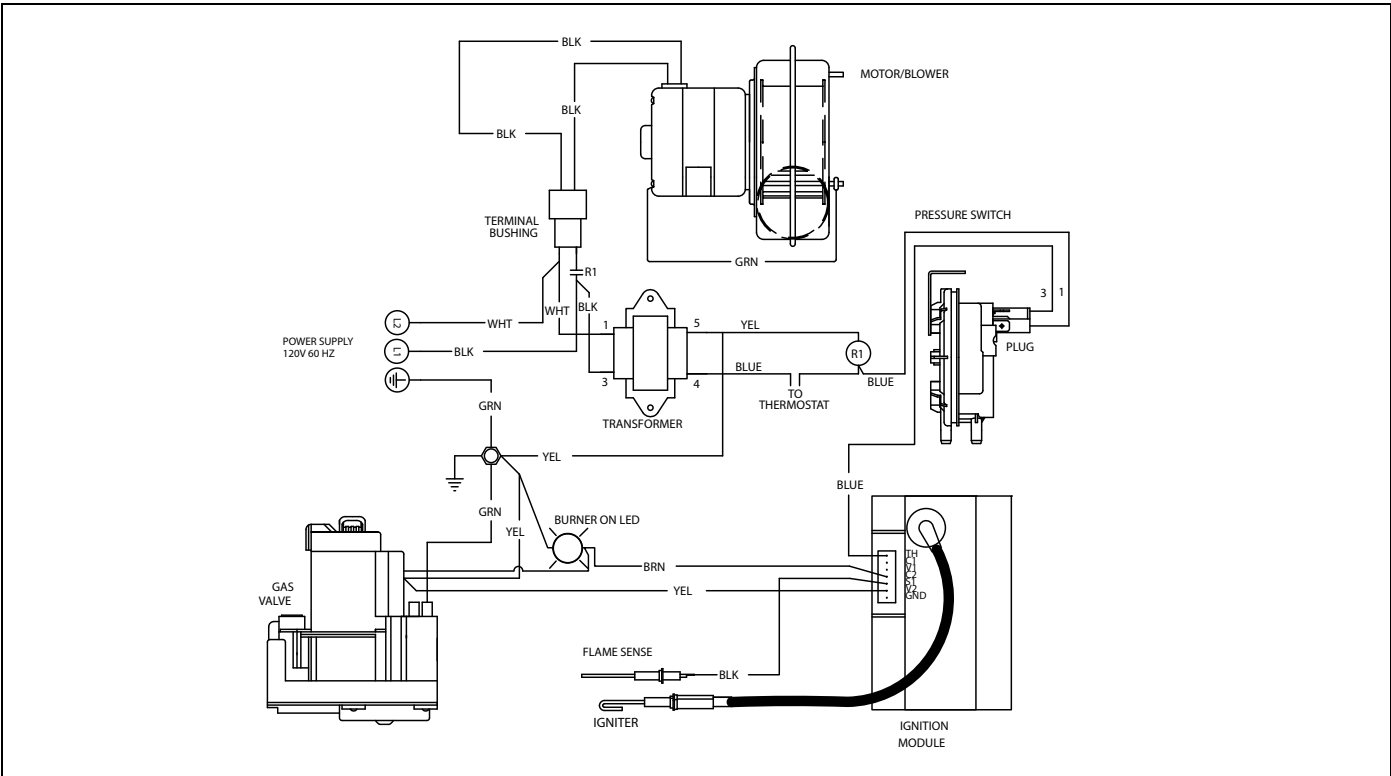
If any of the original internal wiring must be replaced, it must be replaced with wiring materials having a temperature rating of at least 105 °C and 600 volts.

10.1 Line Voltage Thermostat Wiring**10.2 Low Voltage Thermostat with One Burner**

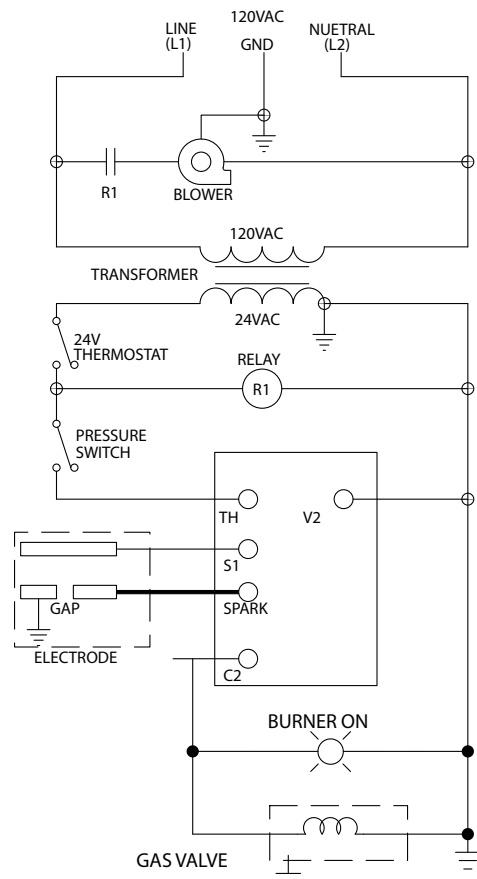
10.3 Low Voltage Thermostat Wiring with Multiple Burners







10.4 Internal Wiring



10.5 Ladder Diagram



SECTION 11: OPERATION AND MAINTENANCE

| ⚠ DANGER | ⚠ WARNING | | |
|---|---|--|---|
|  |  |  |  |
| Electrical Shock Hazard Disconnect electric before service. Heater must be connected to a properly grounded electrical source. | Explosion Hazard Turn off gas supply to heater before service. | Burn Hazard Allow heater to cool before service. Tubing may still be hot after operation. | Cut/Pinch Hazard Wear protective gear during installation, operation and service. Edges are sharp. |
| Failure to follow these instructions can result in death, electric shock, injury or property damage. | | | |

This heater is equipped with a direct spark ignition system.

11. When thermostat is satisfied, all power to the unit is shut off.

11.1 Sequence of Operation

4. Turn the thermostat up. When the thermostat calls for heat, the blower motor will energize.
5. When the motor approaches nominal running RPM, the pressure switch closes and activates the ignition module.
6. After a 45 second prepurge, the ignition module then opens the gas valve and energizes the spark igniter.
7. When the flame is established, the sparking sequence ceases.
8. If the flame is not established during the ignition sequence, the ignition module closes the gas valve and purge begins. Module will try 2 additional times for ignition (with purges in between trials). If ignition is not established, the module will lockout.
9. If the flame extinguishes during operation, the ignition module will attempt the multiple trial sequence described in step 5. If ignition is not re-established, the module will lockout for one hour or until reset.
10. After lockout, the control can be reset by turning down thermostat for five seconds, and then raising it again to desired temperature, or by disconnecting power and then reconnecting.

11.2 To Shut Off Heater

Set thermostat to lowest setting.
 Turn OFF electric power to heater.
 Turn OFF manual gas valve in the heater supply line.

11.3 To Start Heater

Turn gas valve and electric power OFF and wait five minutes for unburned gases to vent from heater.
 Turn ON main gas valve.
 Turn ON electric power.
 Set thermostat to desired temperature.
 Burner should light automatically.

11.4 Pre-Season Maintenance and Annual Inspection

To ensure your safety and years of trouble-free operation of the heating system, service and annual inspections must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Turn off gas and electric supplies before performing service or maintenance. Allow heater to cool before servicing.

Before every heating season, a contractor qualified in the installation and service of gas-fired heating equipment must perform a thorough safety inspection of the heater.

For best performance, the gas, electrical, thermostat connections, tubing, venting, suspensions and

overall heater condition should be thoroughly inspected.

NOTE: Gas flow and burner ignition are among the first things that should be thoroughly inspected. Please see *Page 47, Section 11.5* for suggested items to inspect.

11.5 Maintenance Checklist

Installation Code and Annual Inspections:

All installation and service of VAL-CO equipment must be performed by a contractor qualified in the installation and service of equipment sold and

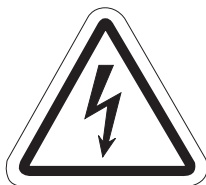
supplied by Val-Co and conform to all requirements set forth in the VAL-CO manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment.

To help facilitate optimum performance and safety, Val-Co recommends that a qualified contractor conduct, at a minimum, annual inspections of your VAL-CO equipment and perform service where necessary, using only replacement parts sold and supplied by Val-Co.

| | |
|-----------------------------------|--|
| The Vicinity of the Heater | <p>Do not store or use flammable objects, liquids or vapors near the heater. Immediately remove these items if they are present.</p> <p><i>See Page 5, Section 3.</i></p> |
| Vehicles and Other Objects | <p>Maintain the clearances to combustibles.</p> <p>Do not hang anything from, or place anything on, the heater.</p> <p>Make sure nothing is lodged underneath the reflector, in between the tubes or in the decorative or protective grilles (included with select models).</p> <p>Immediately remove objects in violation of the clearances to combustibles.</p> <p><i>See Page 5, Section 3.</i></p> |
| Reflector | <p>Support reflector with reflector hanger and support strap.</p> <p>Reflector must not touch tube.</p> <p>Make sure there is no dirt, sagging, cracking or distortion.</p> <p>Do not operate if there is sagging, cracking or distortion.</p> <p>Make sure reflectors are correctly overlapped. <i>See Page 23, Section 6.5.1.</i></p> <p>Clean outside surface with a damp cloth.</p> |
| Vent Pipe | <p>Venting must be intact. Using a flashlight, look for obstructions, cracks on the pipe, gaps in the sealed areas or corrosion.</p> <p>The area must be free of dirt and dust.</p> <p>Remove any carbon deposits or scale using a wire brush.</p> <p><i>See Page 33, Section 8.</i></p> |
| Outside Air Inlet | <p>Inlet must be intact. Look for obstructions, cracks on the pipe, gaps in the sealed areas or corrosion.</p> <p>The area must be free of dirt and dust. Clean and reinstall as required.</p> |
| Tubes | <p>Make sure there are no cracks.</p> <p>Make sure tubes are connected and suspended securely.</p> <p><i>See Page 15, Section 6.</i></p> <p>Make sure there is no sagging, bending or distortion.</p> <p>Clean or replace as required.</p> |
| Gas Line | <p>Check for gas leaks. <i>See Page 41, Section 9.</i></p> |
| Burner Observation Window | <p>Make sure it is clean and free of cracks or holes.</p> <p>Clean and replace as required.</p> |

| | |
|--|---|
| Blower Scroll, Wheel and Motor | Compressed air or a vacuum cleaner may be used to clean dust and dirt. |
| Burner Cup and Orifice | Clear of obstructions (even spider webs will cause problems). Carefully remove any dust and debris from the burner. |
| Electrode | Replace if there are cracked ceramics, excessive carbon residue, or erosion of the electrode. The electrode gap should be 1/8" (3.2 mm). |
| Thermostat | There should be no exposed wire or damage to the thermostat. <i>See Page 43, Section 10.</i> |
| Suspension Points | Make sure the heater is hanging securely. Look for signs of wear on the chain or ceiling. <i>See Page 16, Figure 13.</i> |
| Lower Clearance Shield (optional) | The lower shield must be securely attached. Inspect shield support straps and lower clearance shield anchor points. <i>See Page 32, Section 7.4.</i> Make sure shield is installed correctly and secured in place if necessary. <i>See Page 32, Section 7.4.</i> |
| Wall Tag | If wall tag is present, make sure it is legible and accurate. Please contact Val-Co or your VAL-CO independent distributor, if you need a wall tag. <i>See Page 4, Section 2.1</i> |
| Safety Labels | Product safety signs or labels should be replaced by the product user when they are no longer legible. Please contact Val-Co or your VAL-CO independent distributor to obtain replacement signs or labels. <i>See Page 2, Figure 1 through Page 3, Figure 2.</i> |

SECTION 12: TROUBLESHOOTING

⚠ DANGER**Electrical Shock Hazard**

Disconnect electric before service.

Heater must be properly earthed.

Failure to follow these instructions can result in death or electrical shock.

⚠ WARNING**Fire Hazard**

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

**Explosion Hazard**

Turn off gas supply to heater before service.

**Burn Hazard**

Allow heater to cool before service.

Tubing may still be hot after operation.

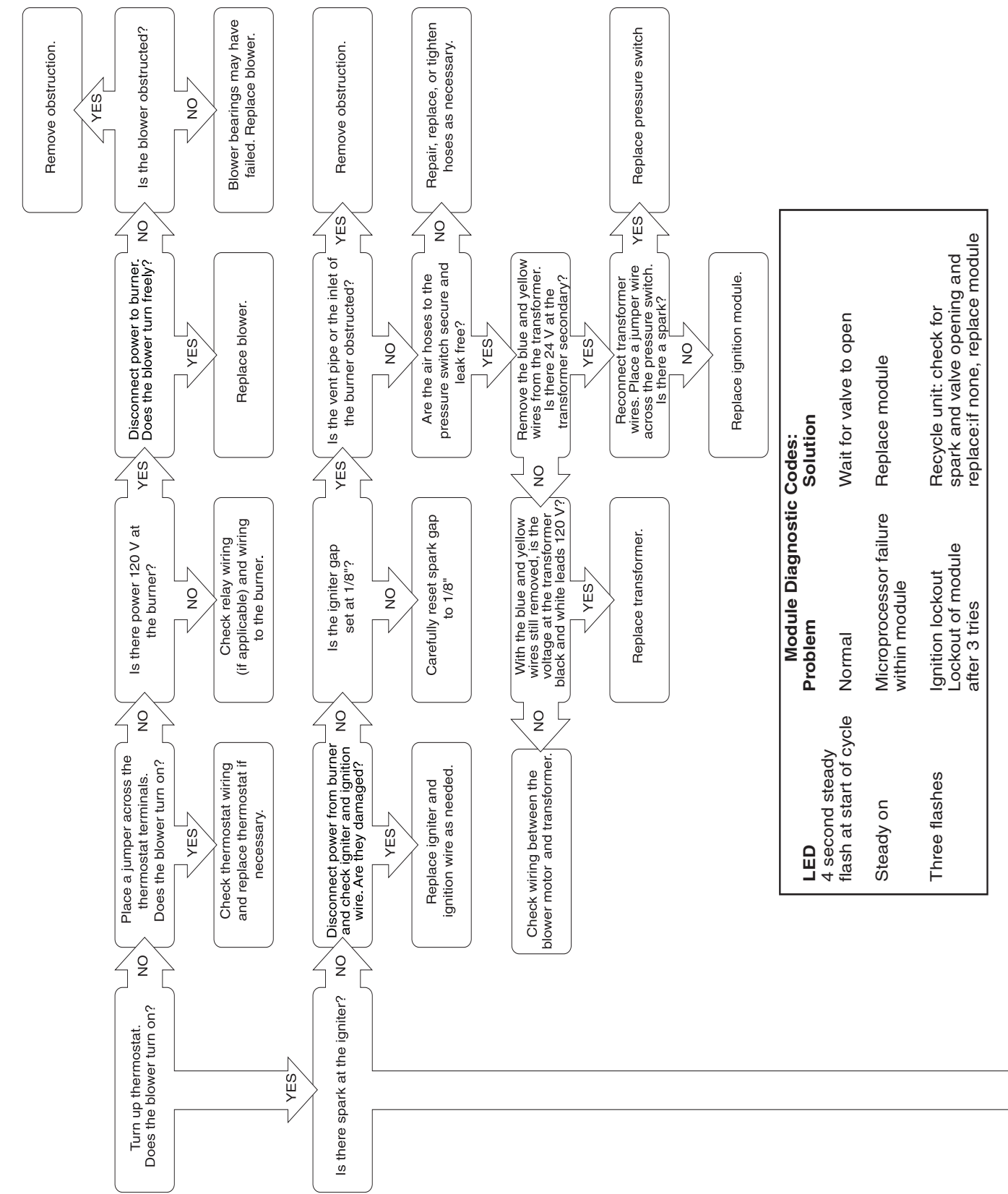
**Cut/Pinch Hazard**

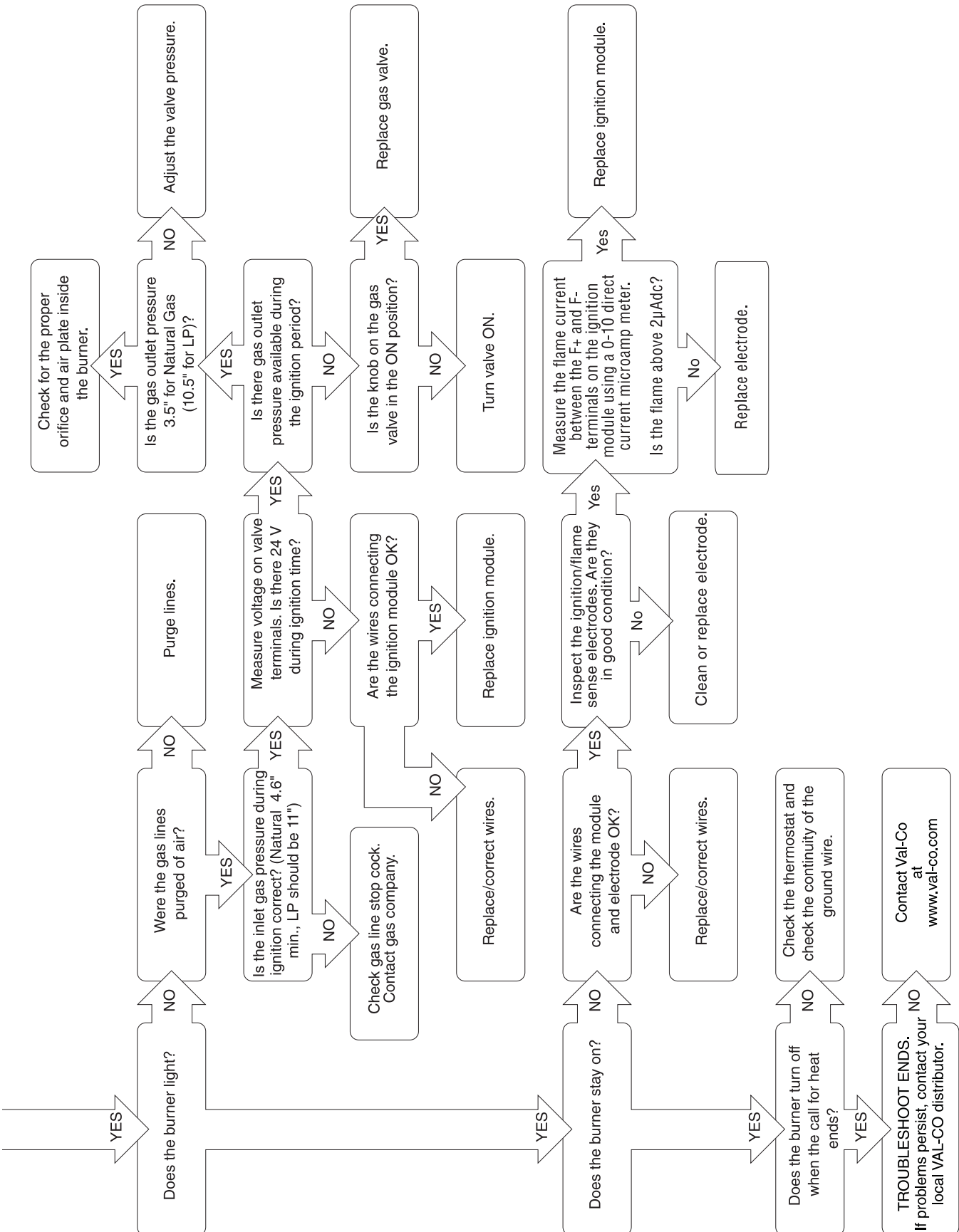
Wear protective gear during installation, operation and service.

Edges are sharp.

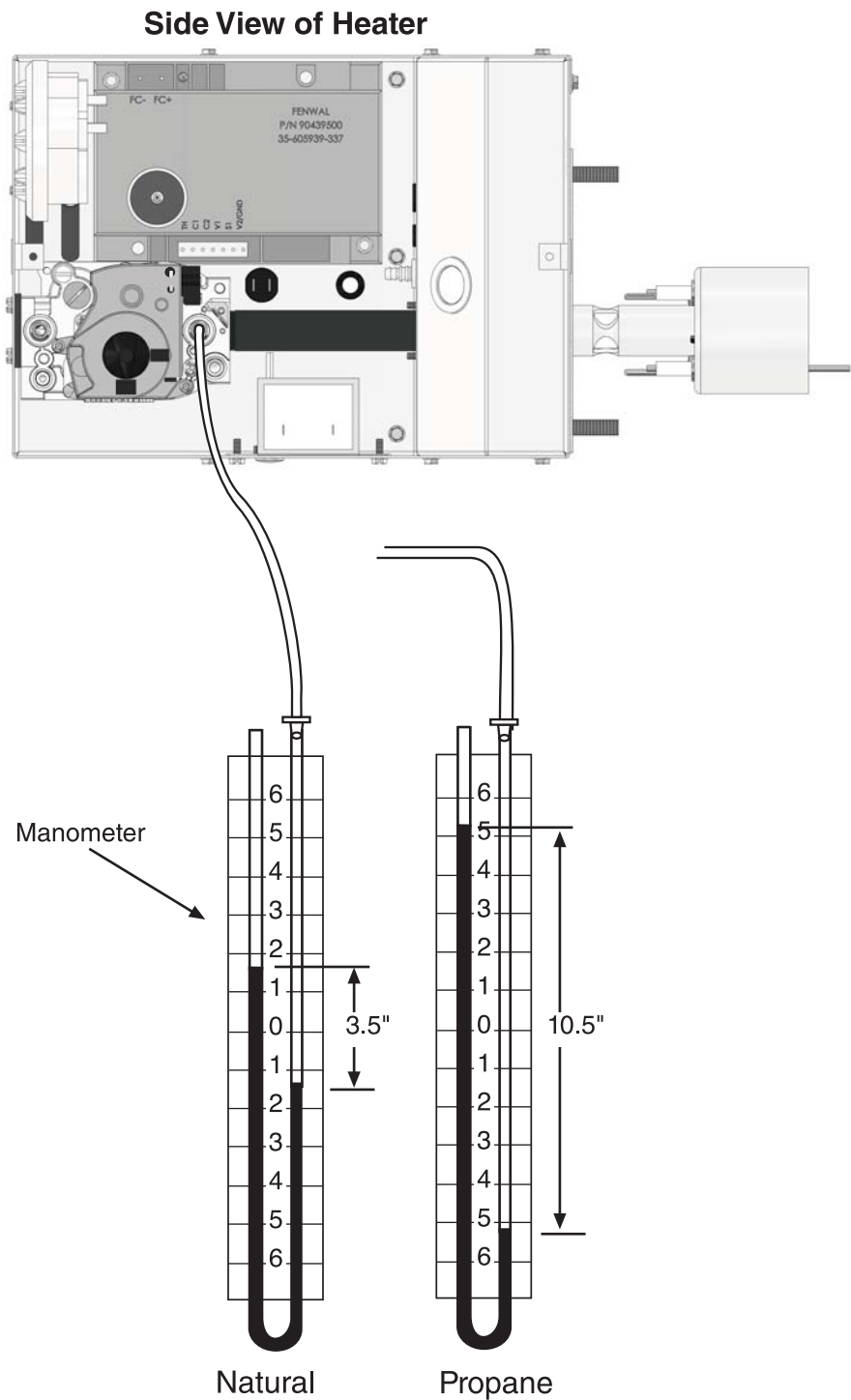
Failure to follow these instructions can result in death, injury or property damage.

12.1 Troubleshooting Flow Chart









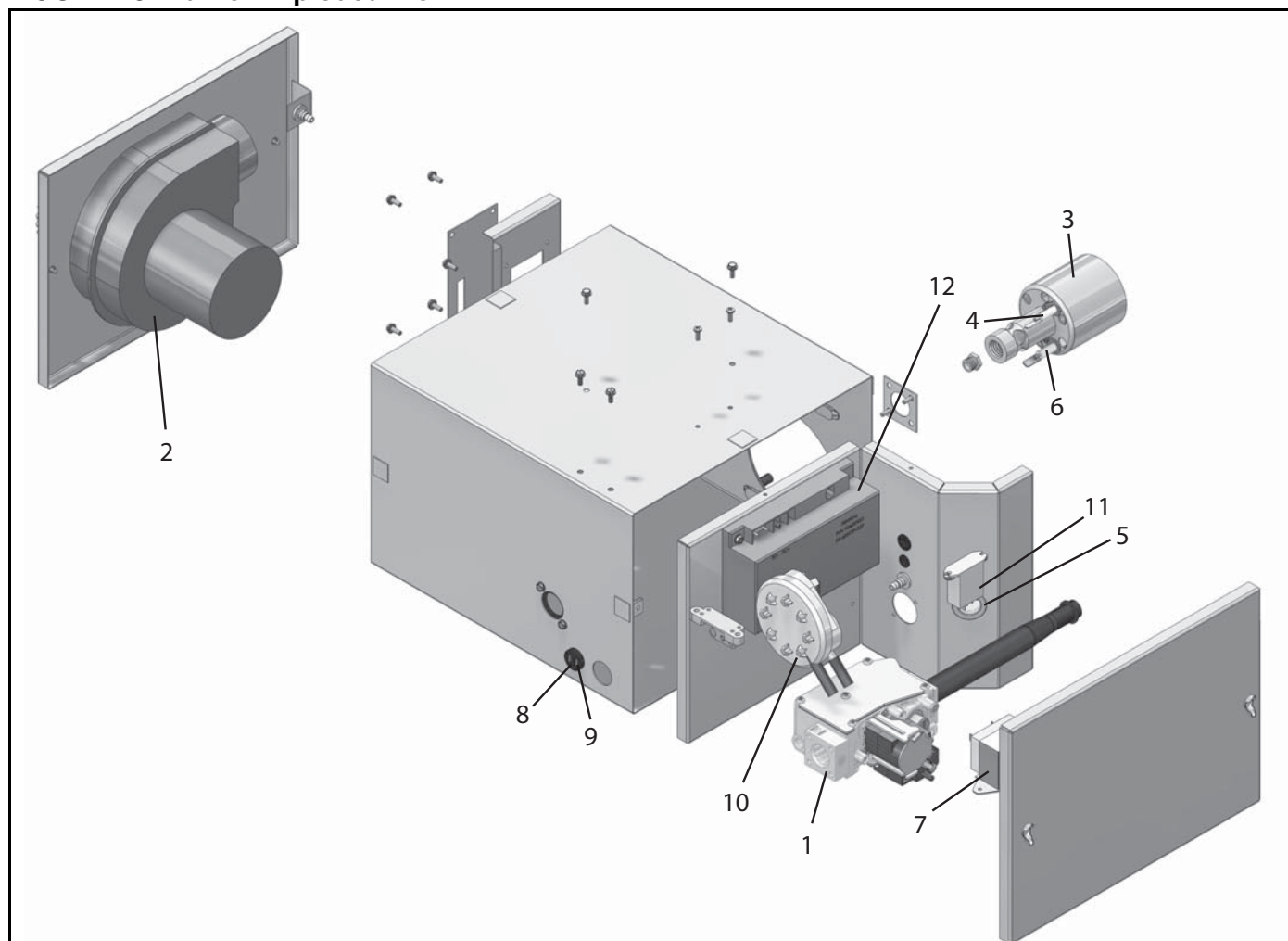
12.2 Manifold Gas Pressure Setting



SECTION 13: REPLACEMENT PARTS

| ⚠ DANGER | | ⚠ WARNING | |
|--|---|--|---|
|  |  |  |  |
| Electrical Shock Hazard | Explosion Hazard | Fire Hazard | Carbon Monoxide Hazard |
| <p>Use only genuine ROBERTS GORDON® replacement parts per this installation, operation and service manual.</p> <p>Failure to follow these instructions can result in death, electric shock, injury or property damage.</p> | | | |

See warnings and important information before removing or replacing parts. After any maintenance or repair work, always test fire the heater in accordance with the start-up instructions *on Page 46, Section 11* to help ensure all safety systems are in working order before leaving the heater to operate. Minor faults may be traced by using the troubleshooting charts *on Page 49, Section 12 through Page 52, Figure 12.2*.

FIGURE 23: Burner Exploded View

| | Description | Val-Co Part Number |
|----|-------------------------------------|--------------------|
| 1 | Gas Valve (Natural) | 474834 |
| 1 | Gas Valve (LP) | 474835 |
| | Tube Gasket (Not Shown) | 474820 |
| | Blower Inlet Gasket (Not Shown) | 03050900 |
| 2 | Motor and Blower Assembly | 90708600-P |
| | Air Adapter Collar (Not Shown) | 91911700 |
| 3 | Burner Cup Assembly | 474828 |
| 4 | Igniter | 474822 |
| 5 | Mica Window Assembly | 02553203 |
| 6 | Flame Sensor | 90439300 |
| 7 | Transformer | 90436900K |
| 8 | Thermostat Connection | 91317900 |
| 9 | Jumper Wire | 03090900 |
| 10 | Pressure Switch: | |
| | (80, 100, 125, 150, 175) | 90439803K |
| | (40) | 90439807K |
| | (60) | 90439805K |
| | LED Burner Status Light (Not Shown) | 474826 |
| 11 | 24 Vac Relay | 474836 |
| 12 | DSI Ignition Module | 474094 |

SECTION 14: GENERAL SPECIFICATIONS

14.1 Material Specifications

14.1.1 Reflectors

.024 Aluminum

(Optional .024 Stainless Steel Type 304)

14.2 Heater Specifications

14.2.1 Ignition

Fully automatic, three-try, direct spark, electronic ignition control, 100% safety shut-off.

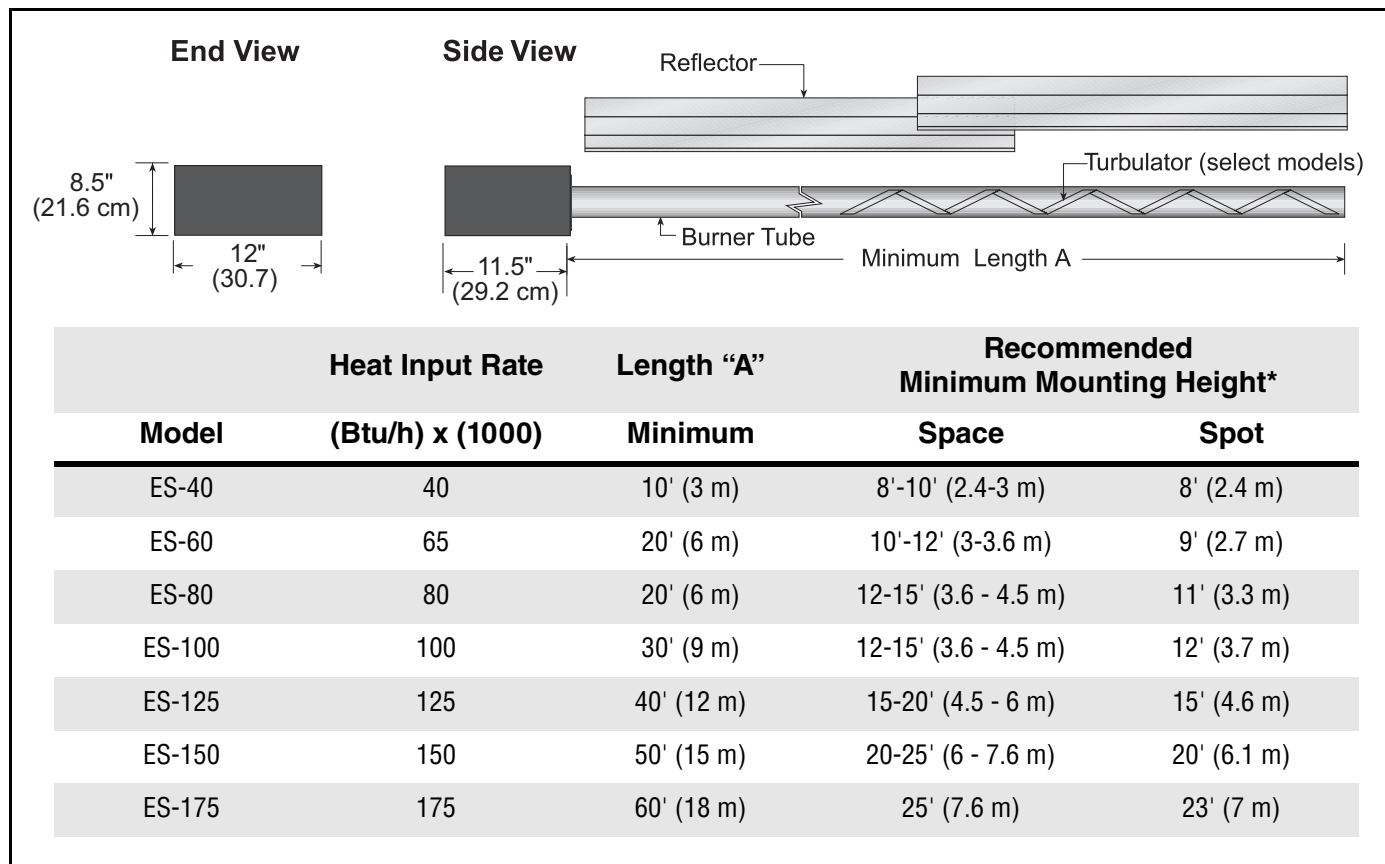
General Specifications for ES-Series heaters are as follows:

14.3 Suspension Specifications

Hang heater with materials with a minimum working load of 75 lbs (33 kg). *See Page 16, Figure 13.*

14.4 Controls Specifications

Time switches, thermostats, etc. can be wired into the electrical supply. External controls supplied as an optional extra.



*See Page 5, Section 3 for clearances to combustibles.

GAS PRESSURE AT MANIFOLD:

Natural Gas: 3.5" wc

LP Gas: 10.5" wc

PIPE CONNECTION:

1/2" NPT (for ES-40, 60, 80, 100 & 125)

3/4" NPT (for ES-150 and 175)

DIMENSIONS:

Vent Connection Size: 4" (10 cm)

Outside Air Connection Size: 4" (10 cm)

Refer to figure above for dimensional information.

GAS INLET PRESSURE:

Natural Gas:

for ES-40, 60, 80, 100, 125, 150 4.6" wc Minimum
for ES-175 5.0"wc Minimum

14.0" wc Maximum

LP Gas:

11.0" wc Minimum

14.0" wc Maximum

ELECTRICAL RATING (ALL MODELS):

120 V - 60 Hz, 1 A (run)

Attach this information to a wall near the VAL-CO® heater.



Performance You Can Count On

Read the Installation, Operation, and Service Manual thoroughly before installation, operation, or service.

Know your model number and installed configuration.

Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual.

Write the largest clearance dimensions with permanent ink according to your model number and configuration in the open spaces below.

OPERATING INSTRUCTIONS

1. STOP! Read all safety instructions on this information sheet.
2. Open the manual gas valve in the heater supply line.
3. Turn on electric power to the heater.
4. Set the thermostat to desired setting.

TO TURN OFF THE HEATER

1. Set the thermostat to off or the lowest setting.

IF THE HEATER WILL NOT OPERATE, TO ENSURE YOUR SAFETY, FOLLOW THESE INSTRUCTIONS TO SHUT DOWN YOUR HEATER

1. Set the thermostat to off or the lowest setting.
2. Turn off electric power to the heater.
3. Turn off the manual gas valve in the heater supply line.
4. Call your registered installer/contractor qualified in the installation and service of gas-fired heating equipment.

⚠ WARNING



Fire Hazard

Keep all flammable objects, liquids and vapors the minimum required clearances to combustibles away from heater.

Some objects will catch fire or explode when placed close to heater.

Failure to follow these instructions can result in death, injury or property damage.

**Maintain _____ clearance
to the side and
_____ clearance below
the heater from vehicles
and combustible materials.**

VAL-CO.
210 East Main Street
P.O. Box 117
Coldwater, OH 45828-2526
Telephone: 800-998-2526
Fax: 419-678-2200

Installation Code and Annual Inspections:

All installation and service of VAL-CO® equipment must be performed by a contractor qualified in the installation and service of equipment sold and supplied by VAL-CO and conform to all requirements set forth in the VAL-CO® manuals and all applicable governmental authorities pertaining to the installation, service, operation and labeling of the equipment. To help facilitate optimum performance and safety, VAL-CO recommends that a qualified contractor conduct, at a minimum, annual inspections of your VAL-CO® equipment and perform service where necessary, using only replacement parts sold and supplied by VAL-CO.

Further Information: Applications, engineering and detailed guidance on systems design, installation and equipment performance is available through VAL-CO® representatives.

Please contact us for any further information you may require, including the Installation, Operation and Service Manual.

This product is not for residential use.

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