

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.



HEATRITE™ VST DSI Gas-Fired, Low Intensity Unitary Heater Installation, Operation & Service Manual DIRECT SPARK IGNITION

VST-40
VST-60
VST-80
VST-100
VST-125
VST-150
VST-175

⚠ 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.

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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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 edition) 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 no 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 2, Figure 1* 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

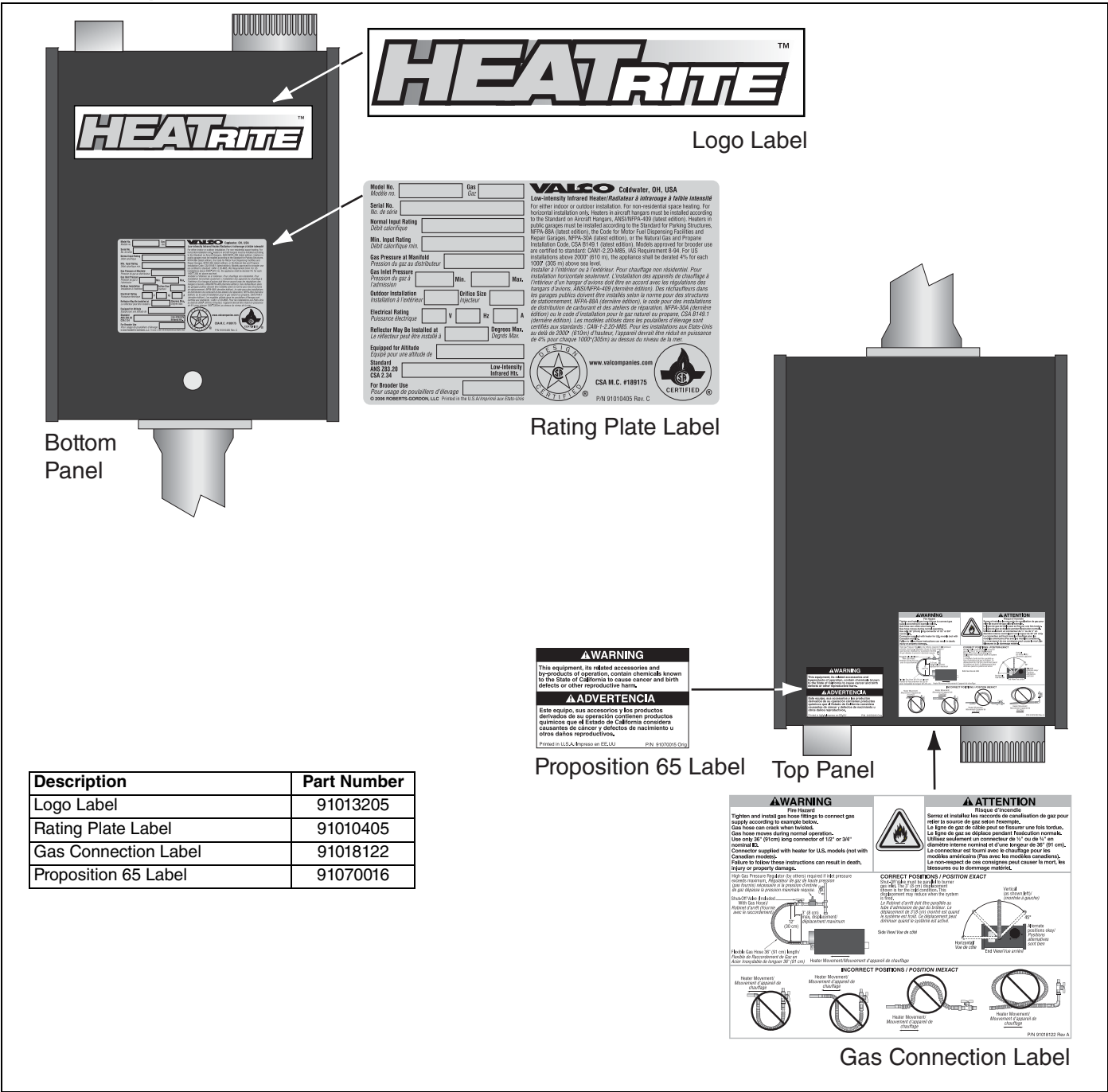
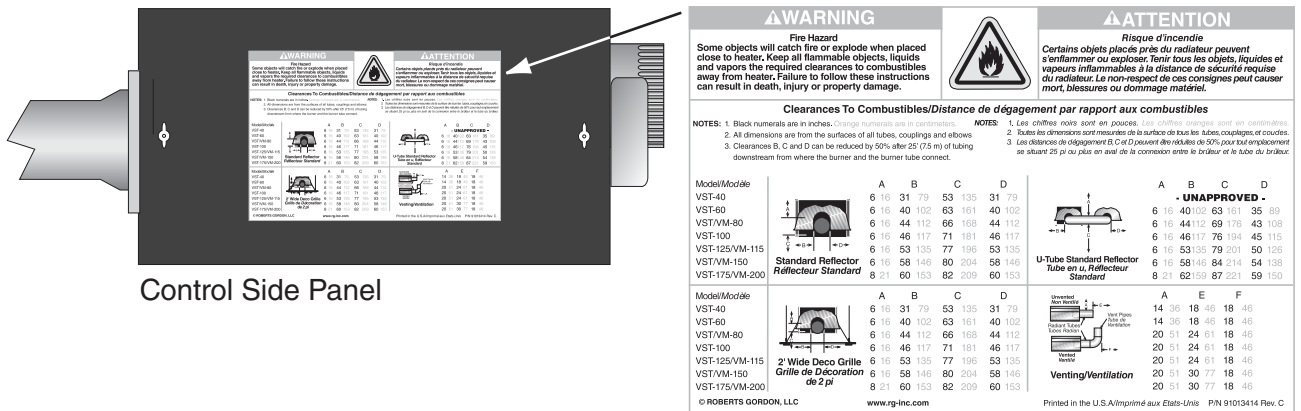
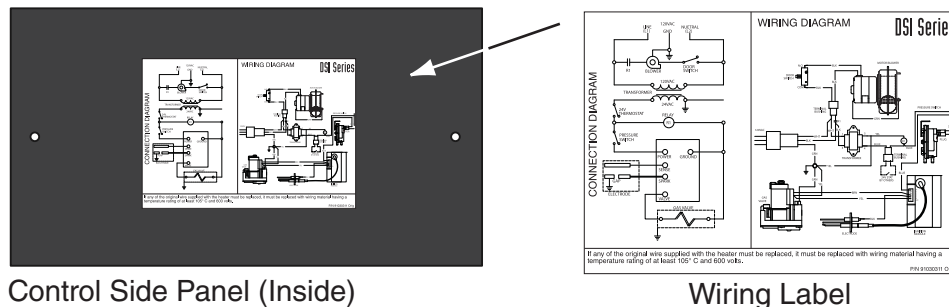


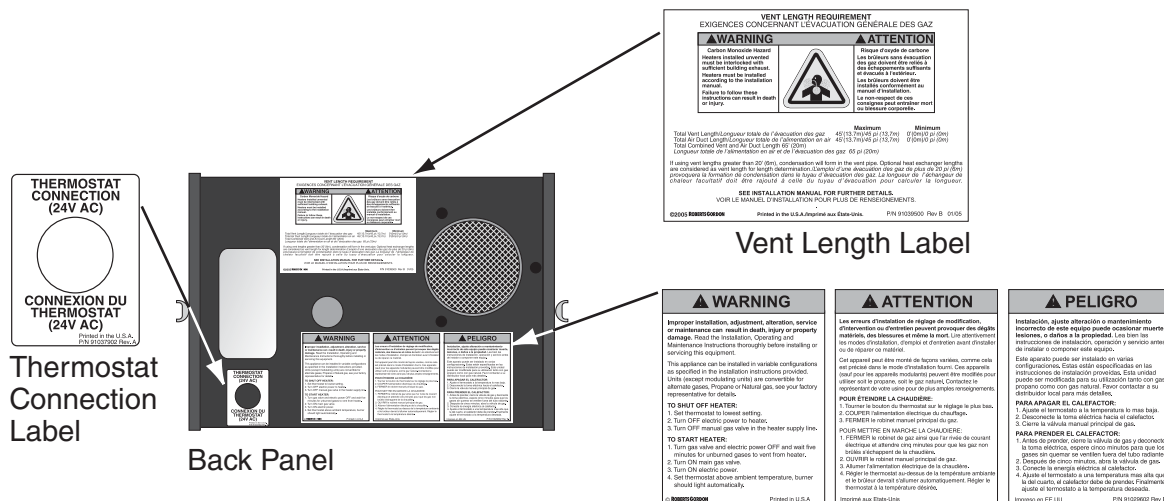
FIGURE 2: Side and Back Panel Label Placement



Clearances to Combustibles Label



Wiring Label



Vent Length Label

Thermostat Connection Label

Back Panel

Lighting Instruction Plate Label

Description	Part Number
Clearances to Combustibles Label	91013414
Wiring Label	91030311
Thermostat Connection Label	91037902
Vent Length Label	91039500
Lighting Instruction Plate Label	91029602

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 to burners for servicing on all sides for burner removal.
- To provide the owner with a copy of this installation, operation and service manual.
- To never use heater as 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).

A copy of the wall tag (P/N 91037917) 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 9. Write the proper clearance dimensions in permanent ink according to your model number and configuration in the open spaces on the tag.

2.2 Brooder Wall Tag

 ROBERTS GORDON
⚠ ATTENTION
VENTILATION REQUIREMENTS
Be sure the air inlet grills, louvers and dampers are inspected regularly and that they are clear and free of dust, dirt, snow, ice, frost and other foreign material so that air may freely enter into the building to provide adequate combustion and ventilating air.
For proper and safe operation of the brooder installation, there shall be provided a combined infiltration and natural and mechanical ventilation rate of not less than 1/4 S.C.F.M. (standard cubic foot per minute) per bird.
⚠ ATTENTION
EXIGENCES RELATIVES À LA VENTILATION
S'assurer que les grilles d'entrée d'air, volets et événements sont inspectés régulièrement et qu'ils sont exempts de poussière, de saleté de neige, de glace, de gel et de toute autre matière étrangère afin que l'air puisse entrer librement dans le bâtiment pour aider à la combustion et à la ventilation.
Pour une installation adéquate et sécuritaire du couvoir, le taux combiné d'infiltration et de ventilation naturelle et mécanique ne devra pas être inférieur à 1/4 de P.C.S.M. (pied cube standard par minute) par oiseau.
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2.3 Corrosive Chemicals

⚠ CAUTION

Product Damage Hazard
Do not use heater in area containing corrosive chemicals.
Refer to appropriate Material Safety Data Sheets (MSDS).
Failure to follow these instructions can result in product damage.

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.*

2.4 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 9* 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.
- Do not spray aerosols near this appliance.
- The stated clearances to combustibles represents a surface temperature of 90° F (50° 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.

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.

! 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.

- 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 14, Figure 11*.
- 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.

FIGURE 3: STANDARD REFLECTOR

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-40	6	31	53	31	16	79	135	79
	VST-60	6	40	63	40	16	102	161	102
	VST-80	6	44	66	44	16	112	168	112
	VST-100	6	46	71	46	16	117	181	117
	VST-125	6	53	77	53	16	135	196	135
	VST-150	6	58	80	58	16	146	204	146
	VST-175	8	60	82	60	21	153	209	153

- 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 4: ONE SIDE REFLECTOR

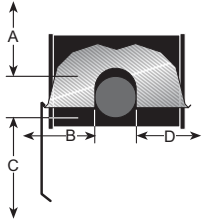
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-40	6	10	53	51	16	26	135	129
	VST-60	6	10	63	54	16	26	161	138
	VST-80	6	10	70	62	16	26	178	159
	VST-100	6	10	77	68	16	26	196	173
	VST-125	6	10	83	75	16	26	211	191
	VST-150	6	10	86	79	16	26	219	202
	VST-175	8	10	88	84	21	26	224	214

FIGURE 5: TWO SIDE REFLECTORS

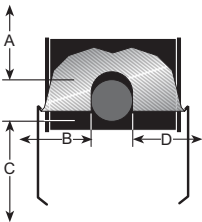
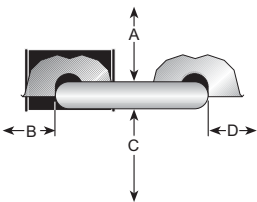
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-40	6	17	53	17	16	45	135	45
	VST-60	6	26	66	26	16	68	168	68
	VST-80	6	29	72	29	16	74	183	74
	VST-100	6	31	78	31	16	79	199	79
	VST-125	6	37	84	37	16	94	214	94
	VST-150	6	40	88	40	16	102	224	102
	VST-175	8	46	91	46	21	117	232	117

FIGURE 6: U-TUBE, STANDARD REFLECTOR

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-40	- UNAPPROVED -				- UNAPPROVED -			
	VST-60	6	40	63	35	16	102	161	89
	VST-80	6	44	69	43	16	112	176	108
	VST-100	6	46	76	45	16	117	194	115
	VST-125	6	53	79	50	16	135	201	126
	VST-150	6	58	84	54	16	146	214	138
	VST-175	8	62	87	59	21	159	221	150

- 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 7: 2-FOOT DECO GRILLE AND PROTECTIVE GRILLE

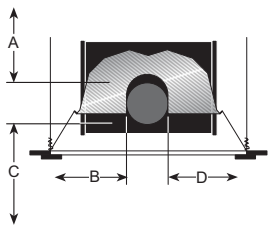
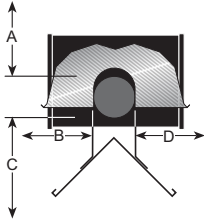
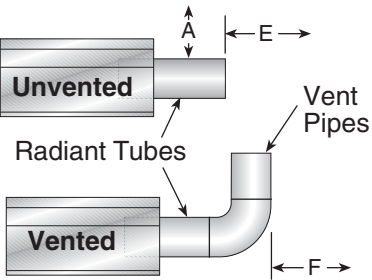
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-40	6	31	53	31	16	79	135	79
	VST-60	6	40	63	40	16	102	161	102
	VST-80	6	44	66	44	16	112	168	112
	VST-100	6	46	71	46	16	117	181	117
	VST-125	6	53	77	53	16	135	196	135
	VST-150	6	58	80	58	16	146	204	146
	VST-175	8	60	82	60	21	153	209	153

FIGURE 8: LOWER CLEARANCE SHIELD*

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-40	6	39	27	39	16	100	69	100
	VST-60	6	45	33	45	16	115	84	115
	VST-80	6	46	38	46	16	117	97	117
	VST-100	6	58	44	58	16	146	112	146
	VST-125	6	62	48	62	16	158	122	158
	VST-150	6	63	50	63	16	161	127	161
	VST-175	- UNAPPROVED -				- UNAPPROVED -			

*When installed in the first 10' (3 m).

FIGURE 9: VENTING

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

SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

4.1 Gas Codes

The 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

The 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

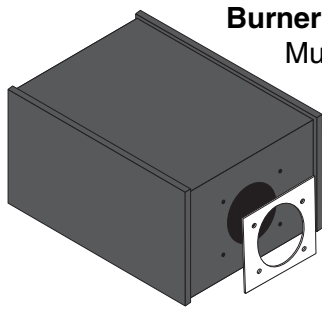
The venting must be installed in accordance with the requirements within this manual and the following codes:

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

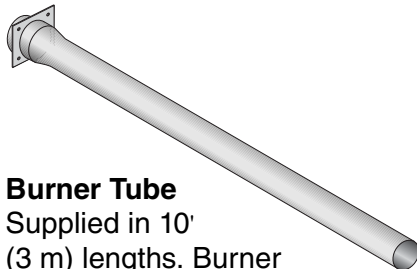
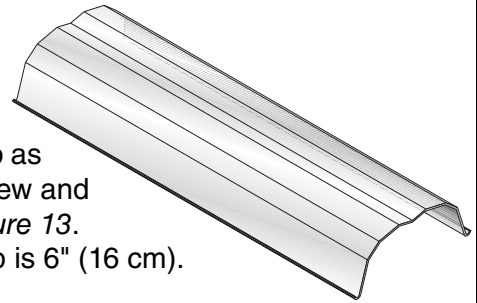
These heaters are approved for installations up to 2000' (610 m)(US), 4500' (1370 m)(Canada) without modification. Consult factory if US installation is above 2000' (610 m) or Canadian installation is above 4500' (1370 m).

SECTION 5: MAJOR COMPONENTS**FIGURE 10: Major Component Descriptions**

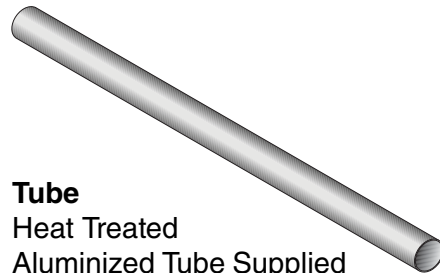
Burner with Tube Gasket
Must be installed with the flame observation window facing down.

Reflector (Aluminum or Stainless Steel)

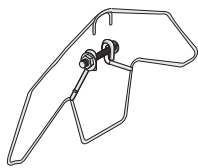
Alternate overlap as shown on overview and on Page 16, Figure 13. Minimum overlap is 6" (16 cm).



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

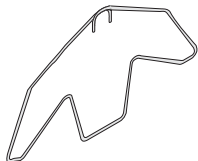


Tube
Heat Treated Aluminized Tube Supplied in 10' (3 m) lengths.



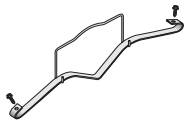
Tube and Reflector Hanger, Wide Pattern with Clamp Package

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

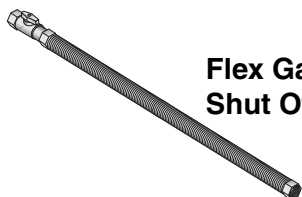


Tube and Reflector Hanger, Wide Pattern

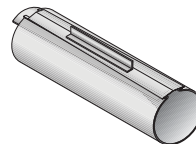
Suspend system from these hangers.



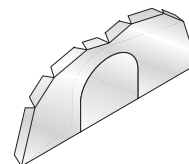
Reflector Support Strap, Wide Pattern & Wire Form



Flex Gas Line with Shut Off Cock

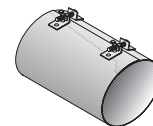


Coupling Assembly with Lock

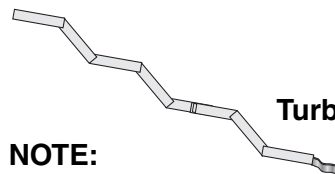


Reflector End Cap

Punch out center section to accommodate tube.



Vent Adapter



Turbulator

NOTE:

Install turbulator as specified in the "Turbulator Installation" chart. See Page 20, Section 6.4. Turbulator is not required on the VST-125/150/175.

5.1 Standard Parts List

Table 1: Contents of the Burner Carton

Part No.	Description	VST-40	VST-60	VST-80	VST-100	VST-125	VST-150	VST-175
VST31XXXXX	VST Burner Assembly (Rate and Fuel Varies)	1	1	1	1	1	1	1
02568200	Gasket (Burner to Burner Tube)	1	1	1	1	1	1	1
VST130200NA	Installation, Operation and Service Manual	1	1	1	1	1	1	1
94273914	Hex Head Bolts 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	-	-	-
03051504	Turbulator Aluminized Steel	2	4	4	2	-	-	-
03051505	Turbulator Stainless Steel	1	-	-	-	-	-	-

*Canadian Models: Rubber (Type 1) Gas Hoses available as an accessory. See Page 42, Section 9.

Table 2: Contents of Wide Pattern Core and Wide Pattern Extension Packages

Part No.	Description	Wide Pattern Core Packages				Wide Pattern 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
03051101	Burner Tube, ALUMI-THERM® Steel, 10' (3 m)	-	-	1	1	-	-	-	-
03051601	Burner Tube, HT ALUMI-THERM® Steel, 10' (3 m)	1	1	-	-	-	-	-	-
01312700	Coupling Assembly	-	1	2	3	1	2	3	4
02750303	Standard Reflector, 8' (2.5 m)	2	3	4	6	2	3	4	6
02750800	End Cap	2	2	2	2	-	-	-	-
03090101	Tube and Reflector Hanger, Wide Pattern	2	5	6	7	1	2	3	4
91907302	S-Hook	2	5	6	7	1	2	3	4
03050011	Reflector Support Package, Wide Pattern (Strap, Wire Form, Screws)	1	4	5	7	2	3	4	6
91107720	U-Clip Package	1	1	1	1	1	1	1	1
90502700	Vent Adapter	1	1	1	1	-	-	-	-
01318901	Tube Clamp Package	1	1	1	1	-	-	-	-
Part Number		CPW10ALUM	CPW20ALUM	CPW30ALUM	CPW40ALUM	EXPW10ALUM	EXPW20ALUM	EXPW30ALUM	EXPW40ALUM

Table 3: Component Package Guide

Model	Tubing Length	Wide Pattern Core Packages
	Minimum	Aluminized
VST-40	10' (3 m)	CPW10ALUM
VST-60	20' (6 m)	CPW20ALUM
VST-80	20' (6 m)	CPW20ALUM
VST-100	30' (9 m)	CPW30ALUM
VST-125	40' (12 m)	CPW40ALUM
VST-150	50' (15 m)	CPW30ALUM + EXPW20ALUM
VST-175	60' (18 m)	CPW30ALUM + EXPW30ALUM

Additional tubing length may be added to heater. Tubing must be heat-treated, aluminized or porcelain coated. Any additional tubing lengths are considered as vent length for length determination. Maximum venting length for minimum heater length is 45' (13.7 m) total.

SECTION 6: HEATER INSTALLATION

⚠ WARNING**Severe Injury Hazard**

Secure burner to burner tube with bolts 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.

ment.

Typical installation configurations are shown in *Figure 11*.

Expansion and contraction of the tube dictates that the minimum suspension lengths in the table on *Page 14, Figure 11* be maintained.

⚠ 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 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.

Hanging Chain is not supplied as standard equip-

FIGURE 11: Critical Hanger Placement

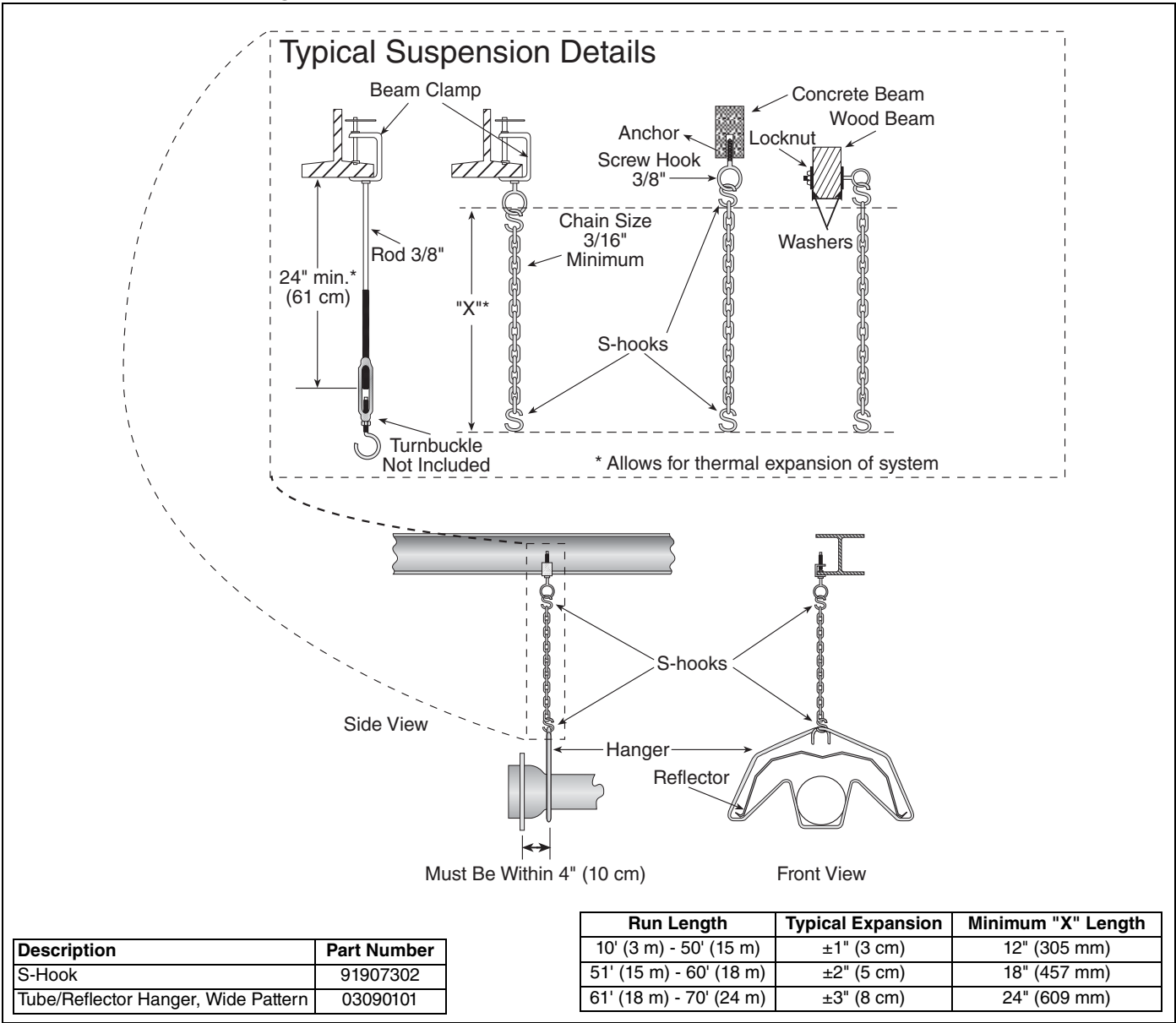


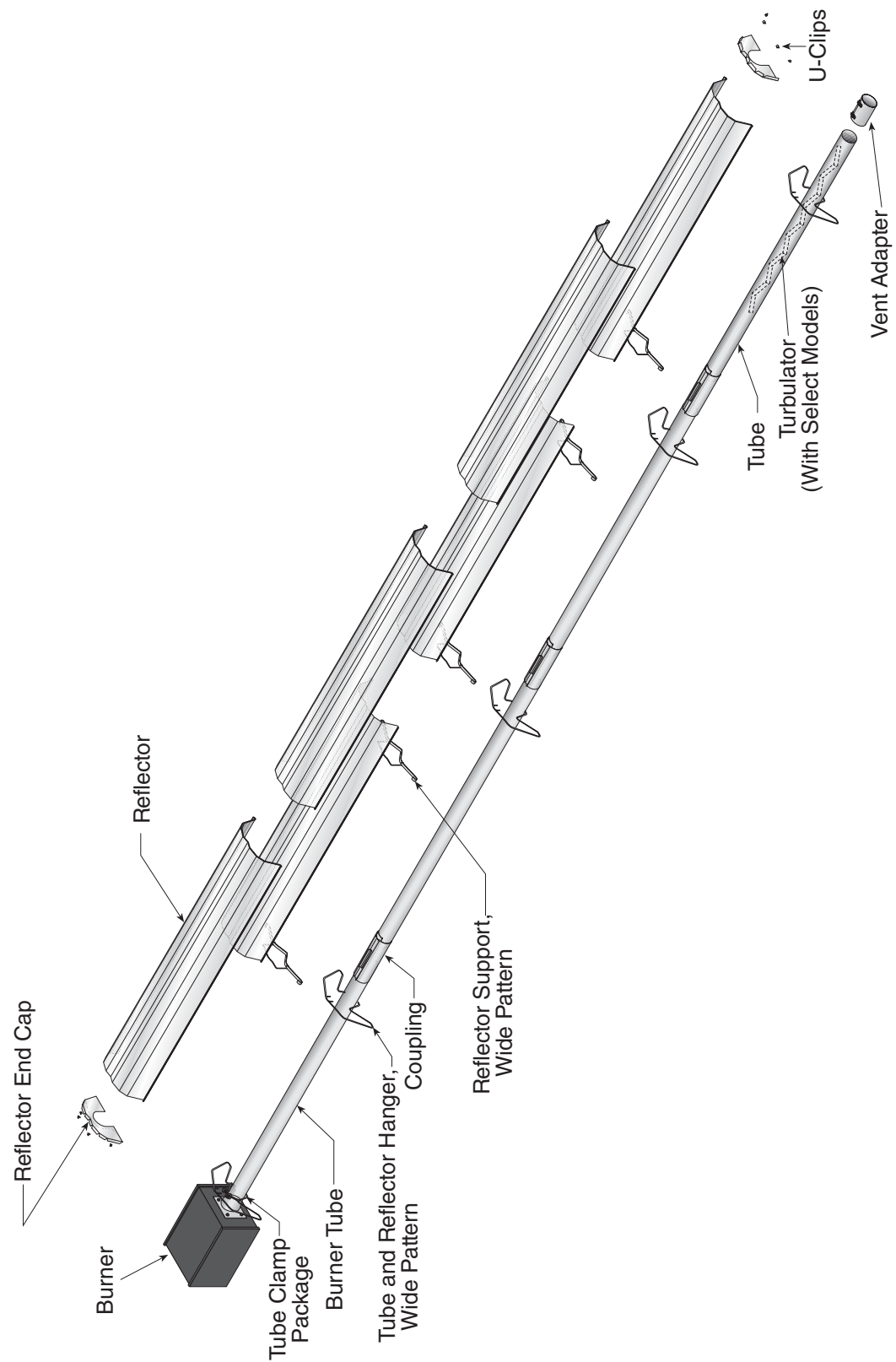



FIGURE 12: Linear Heater Assembly Overview


FIGURE 13: Linear Heater Layout Overview


LEGEND


 Burner

 Reflector

 Tube

 Tube/Reflector
Hanger, Wide
Pattern

 Coupling
Assembly

 Vent Adapter

a = 14" (36 cm)
reflector width (not shown)

b = 2" (5 cm)
end cap to burner

c = 2" (5 cm)
end cap to hanger

d = 7'6" (229 cm)
distance first hanger

e = 10' (305 cm)
distance between hangers

f = 9.5" (24 cm)
burner height

g = 17.5" (44 cm)
burner length

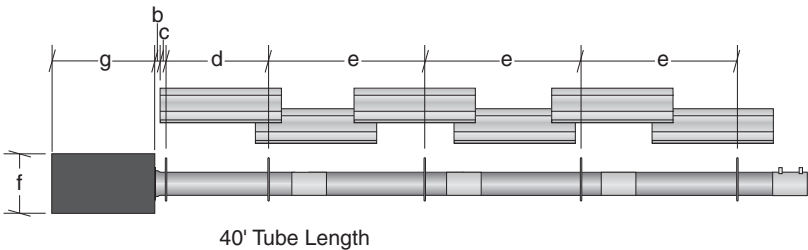
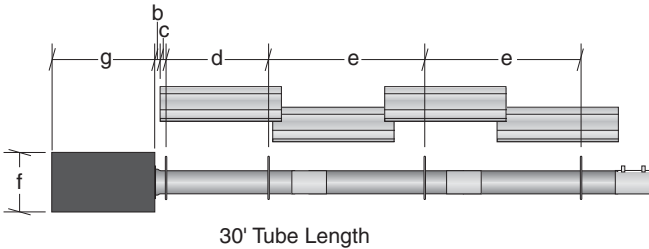
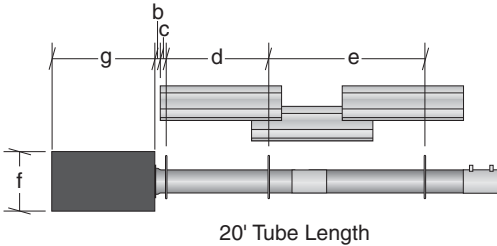
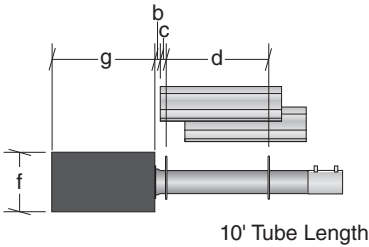
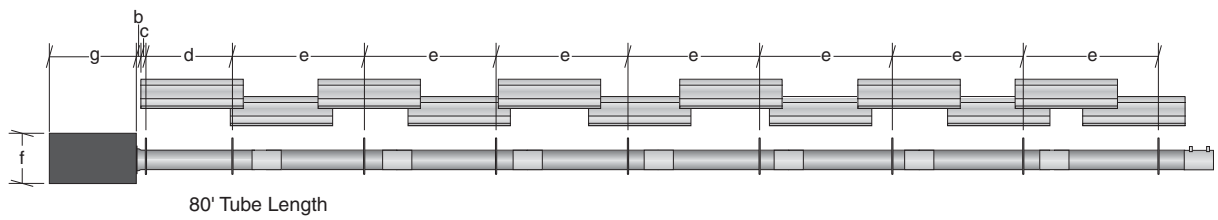
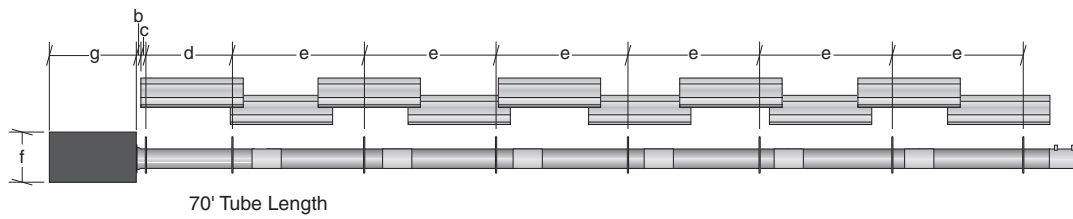
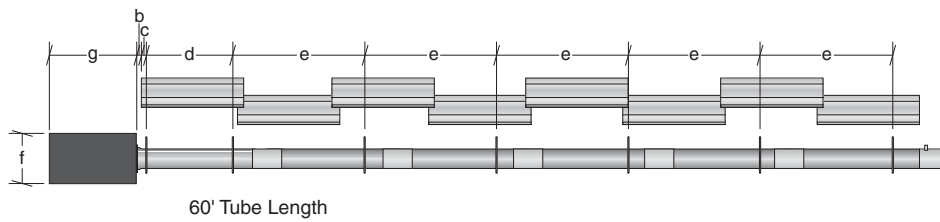
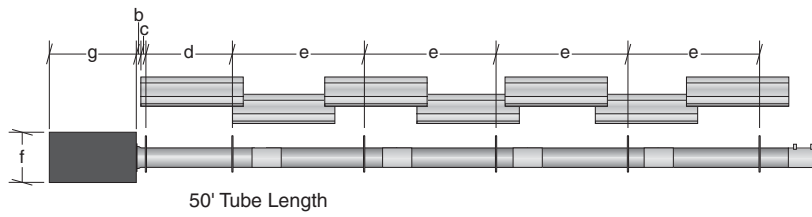


FIGURE 14: Linear Heater Layout Overview (Continued)

Step 6.1 Burner Tube Installation

NOTE:
Tubing requires a downward slope of 1/2" (13 mm) per 20' (6 m) away from burner.

S-Hook

Hanger, Wide Pattern

Burner Tube

7' 6" ± 1' (229 cm ± 25 cm)

Offset mounting hole must be to the top.

Weld seam must be to the bottom of the tube.

Description	Part Number
Burner Tube	03051XXX
S-Hook	91907302
Tube/Reflector Hanger, Wide Pattern	03090101

Step 6.2 Tube Clamp Package Installation

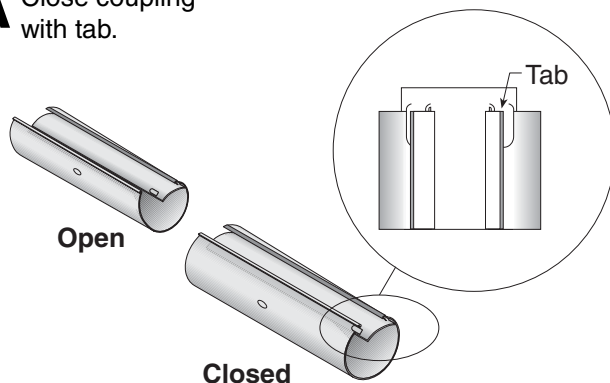
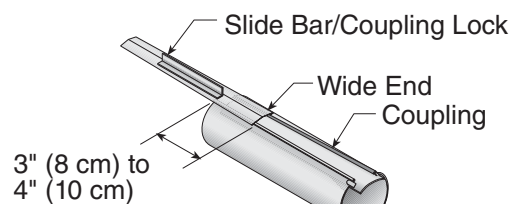
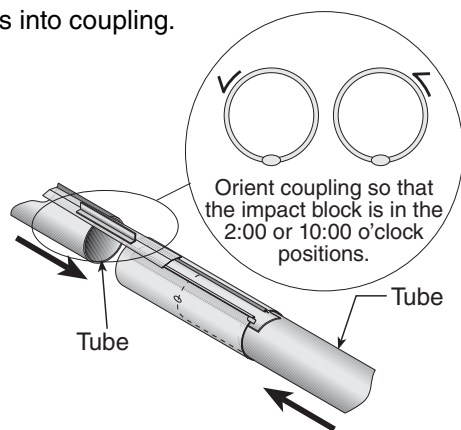
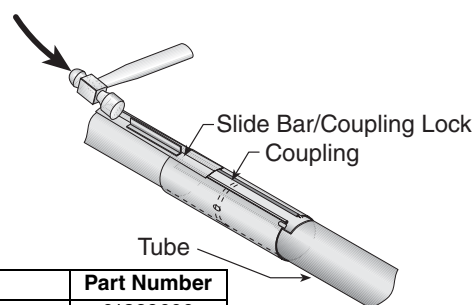
Tube Clamp

Bolt

Flat Washer

Nut (Torque 120 in/lb 13.56 Nm)

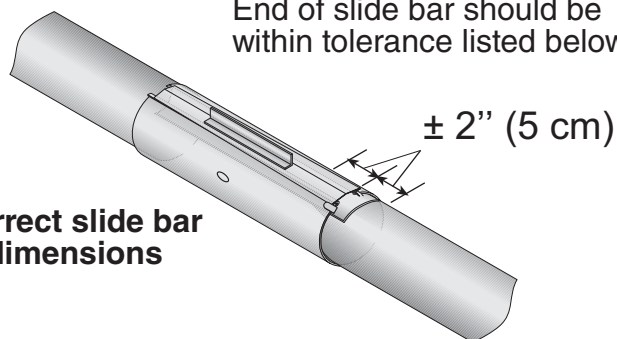
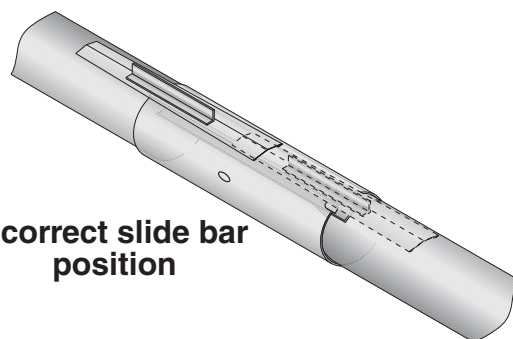
Description	Part Number
Tube Clamp Package	01318901
Tube Clamp	01396801
Bolt	97113940
Flat Washer	95211600
Nut	92113900

Step 6.3 Coupling and Tube Assembly**A** Close coupling with tab.**B** Start slide bar/coupling lock onto coupling.**C** Insert tubes into coupling.**D** Tighten coupling to join tubes.

Description	Part Number
Coupling	01329600
Slide bar/coupling lock	01329700
Tube	91409XXX

Step 6.3.1 Coupling and Tube Assembly (Continued)

Tighten slide bar as shown below.

Drive slide bar until tight.
End of slide bar should be within tolerance listed below.**Correct slide bar dimensions****Incorrect slide bar position**

- Repeat Step 6.3 A - D until all tubes are assembled. See Page 20, Section 6.3.2.

Step 6.3.2 Coupling and Tube Assembly (Continued)

The diagram illustrates the assembly of a VST tube. It shows a long tube with a coupling section. Dimensions are provided for the coupling section: $7' 6'' \pm 1'$ (229 cm \pm 25 cm) and $10' \pm 1'$ (305 cm \pm 25 cm). The total overall tube length is indicated by a dimension line.

Model	Tube Length Minimum
VST-40	10' (3 m)
VST-60	20' (6 m)
VST-80	20' (6 m)
VST-100	30' (9 m)
VST-125	40' (12 m)
VST-150	50' (15 m)
VST-175	60' (18 m)

Step 6.4 Turbulator Installation

The diagram shows the installation of a turbulator. A 'Turbulator Section' is shown being attached to a 'Turbulator Adapter' which is already on a 'Tab'. A circular inset shows a 'Twist' in the installation. A 'Pull String' is shown at the end of the tube. A note indicates that the 'Turbulator Section (stainless)' used in VST-40 heaters must be in the section of tube nearest to the burner. Another note says to 'Fold tab around outside of tube nearest to the vent to hold turbulator in place. Where a vent sleeve is used, do not fold tab.'

NOTE:
Install turbulator as specified in the "Turbulator Installation" chart below. Turbulator is not required on the VST-125/150/175.

Turbulator Installation	
Model	Tube Section
VST-40	1st 10' Section
VST-60	2nd 10' Section
VST-80	2nd 10' Section
VST-100	3rd 10' Section
VST-125	N/A
VST-150	N/A
VST-175	N/A

Description	Part Number
Turbulator Adapter	03051503
Turbulator Section	03051504
Turbulator Section (stainless)	03051505
Tube	91409XXX

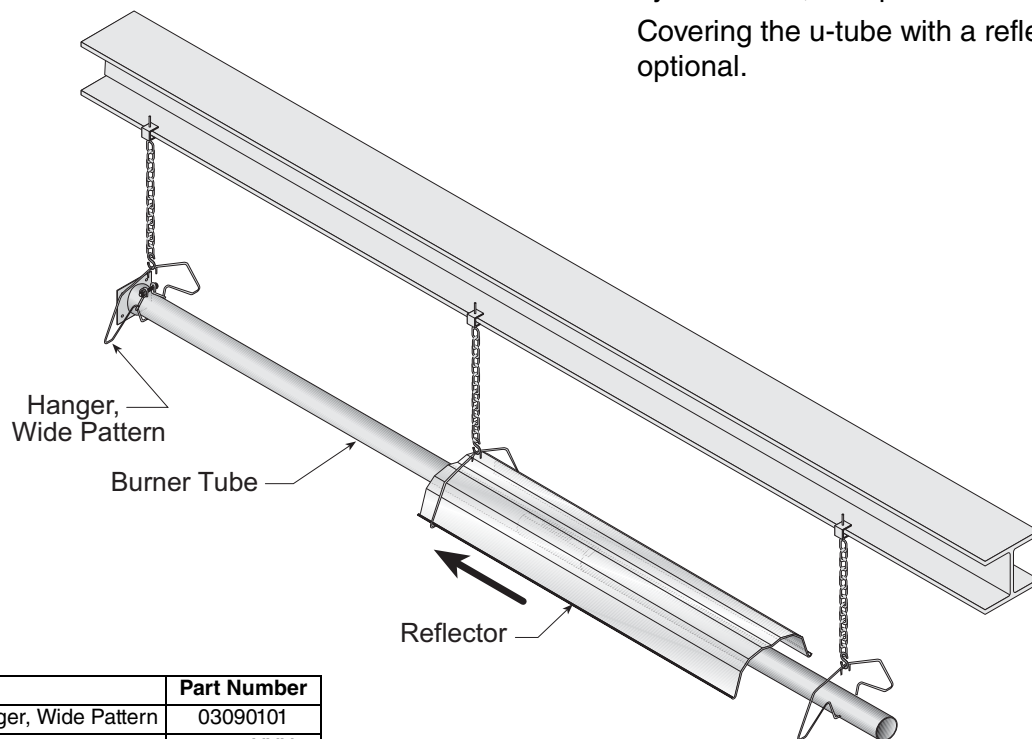
Step 6.5 Reflector Installation**! WARNING****Fire Hazard**

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.

NOTE: All tube surfaces must be covered by a reflector, except for a U-tube. Covering the u-tube with a reflector is optional.



Description	Part Number
Tube/Reflector Hanger, Wide Pattern	03090101
Burner Tube	03051XXX
Reflector - 96 in (244 cm)	02750303

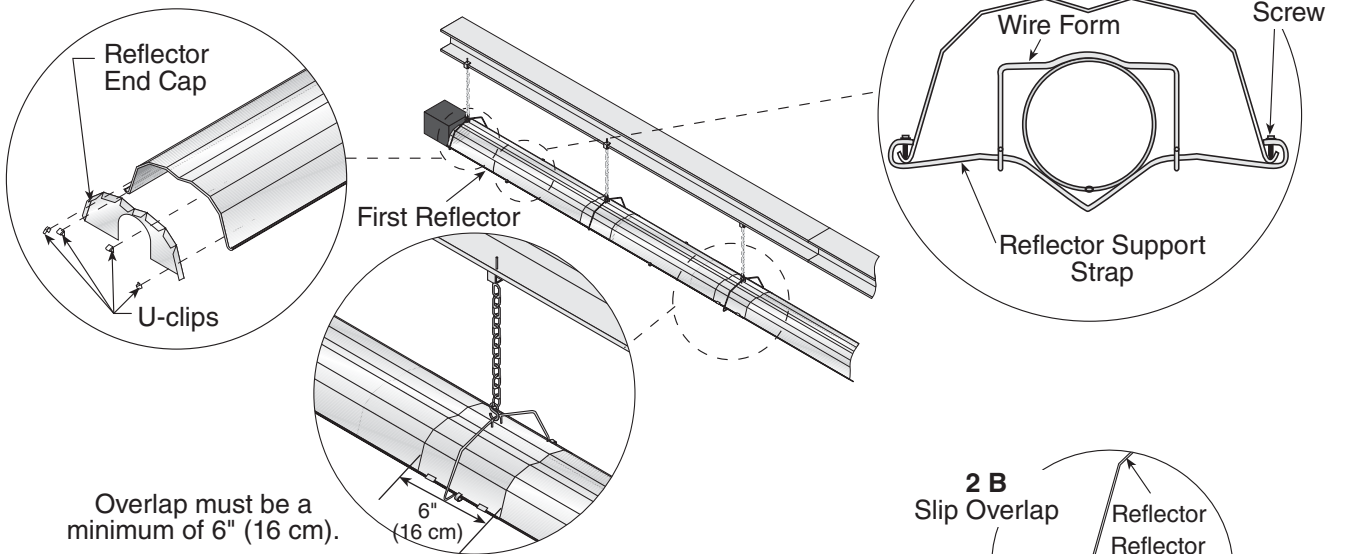
Step 6.5.1 Reflector, U-Clip and Reflector Support Installation

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.

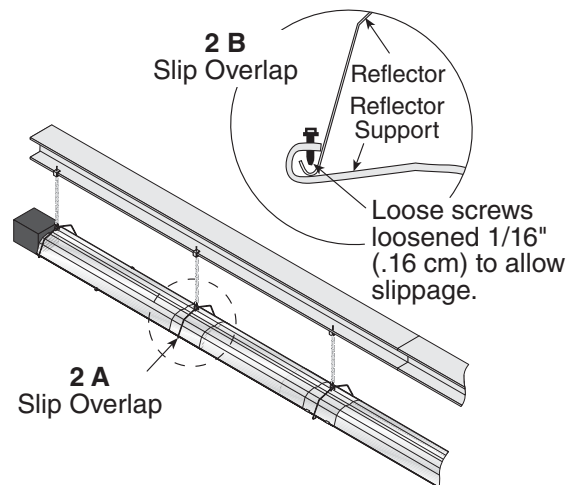
To ensure proper expansion and contraction movement of the reflectors, a combination of U-clips and reflector supports are used. The positioning of reflec-

tor supports and U-clips depends 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. The first reflector after the burner must be affixed in the middle of the reflector with a reflector support and tight screws.

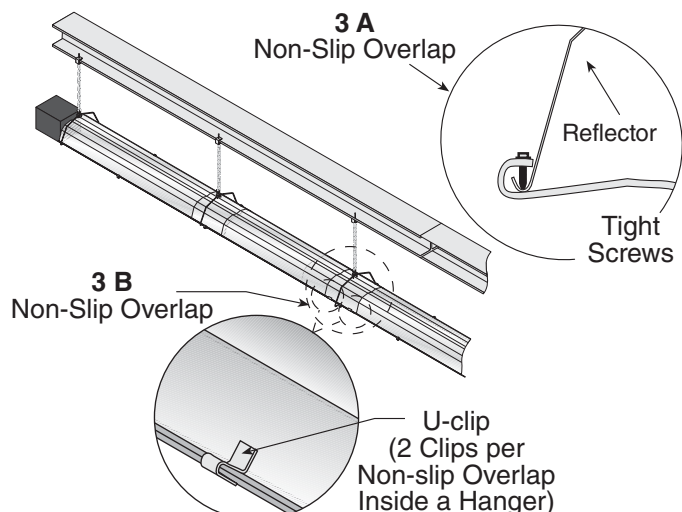


2. The overlap at the first and second reflector is a **slip overlap**. Thereafter, every third reflector joint is a slip overlap. A slip overlap is achieved by either:
 - a.) both reflectors lay inside a hanger. (No reflector support needed.)
 - b.) using a reflector support with loose screws at the reflector overlap.



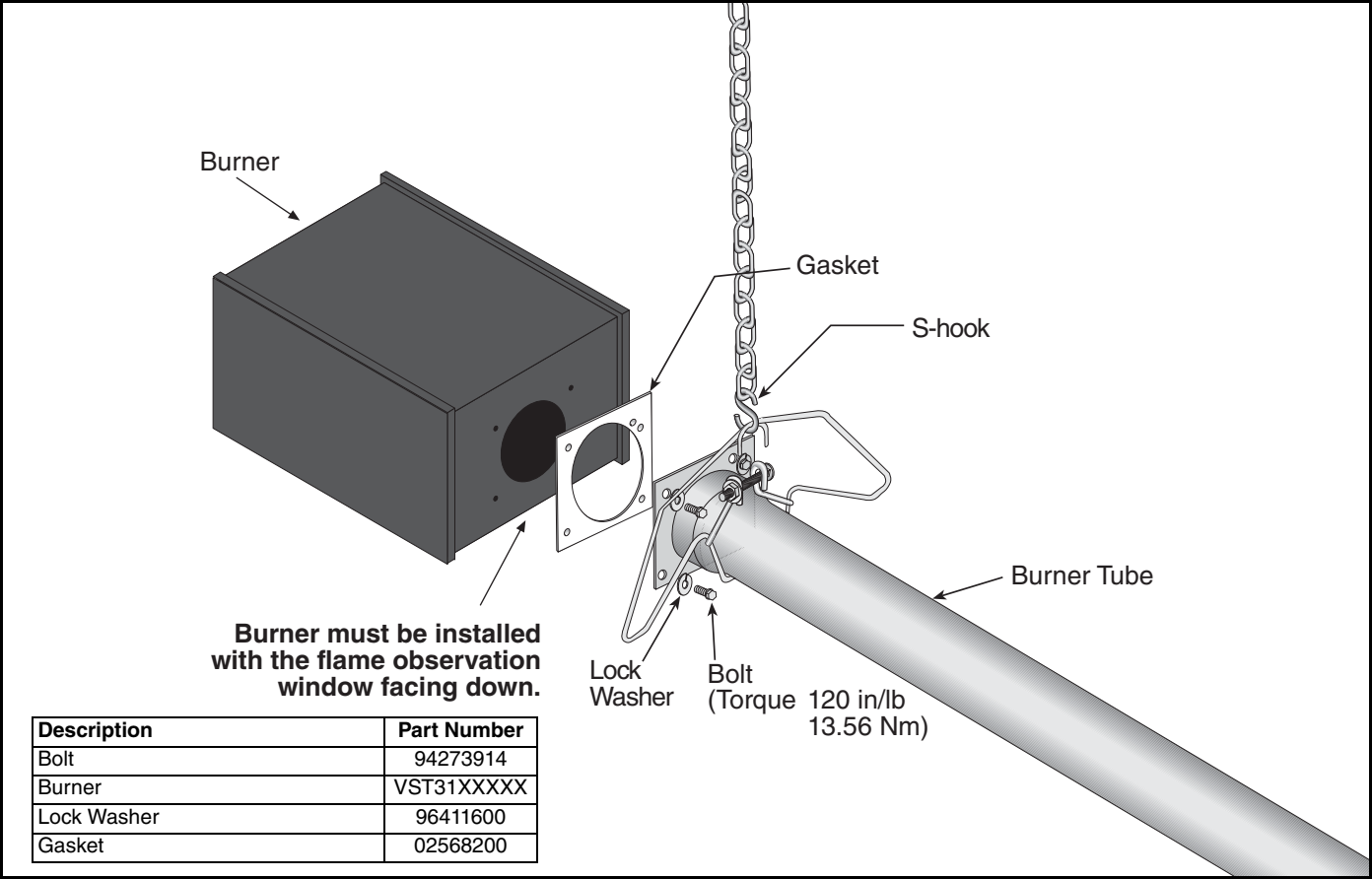
3. The remaining reflector overlaps require a **non-slip overlap** connection. To affix the reflectors together in a non-slip overlap either:
 - a.) use reflector support and tight screws.
 - b.) if both reflectors lay inside a hanger, u-clips or sheet metal screws may be used.

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



Description	Part Number
Reflector Support Packag, Wide Pattern	03050011
Wire Form	91908004
Reflector Support Strap, Wide Pattern	03050001
Screw #8 x 3/4	94320812
U-Clip Package	91107720
Reflector End Cap	027508XX

Step 6.6 Burner Installation



SECTION 7: OPTIONAL HEATER ACCESSORIES**! WARNING****Cut/Pinch Hazard**

Wear protective gear during installation, operation and service.

Edges are sharp.

Failure to follow these instructions can result in injury.

7.1 U-Tube Configuration

Heaters (except VST-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 VST-60/80 and a minimum of 15' (4.5 m) on VST-100/125/150/175 is required between the burner and the U-Tube.
- The correct turbulator (See *Page 20, Figure 6.4*) must be installed in the last standard section of tube.
- The burner must never be operated in a tilted position.
- The heater must be properly supported at all locations. See *Page 27, Figure 17*.
- Covering the U-tube with a reflector is optional.

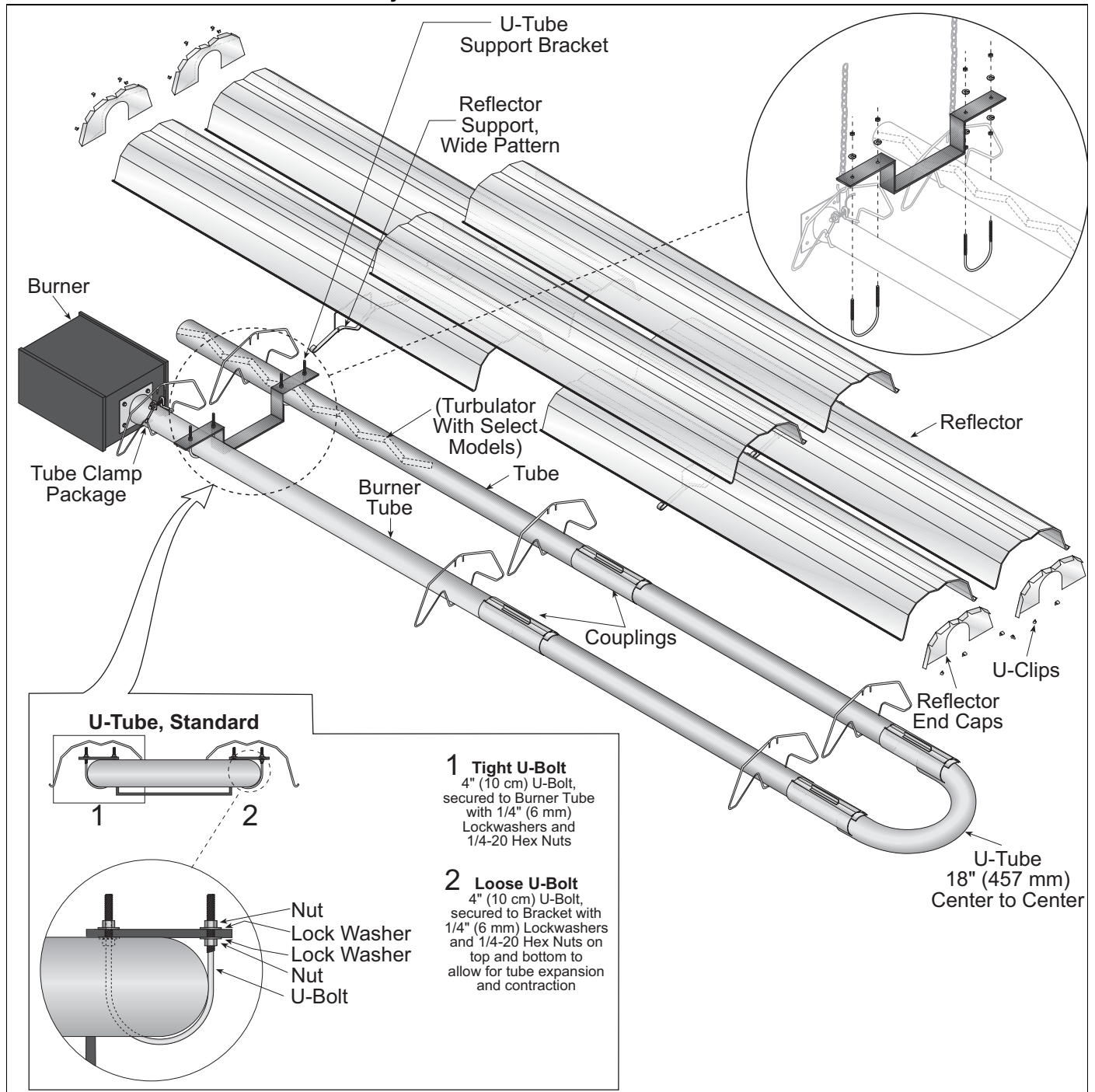
FIGURE 15: U-Tube Heater Assembly Overview

FIGURE 16: U-tube reflector kit (optional)

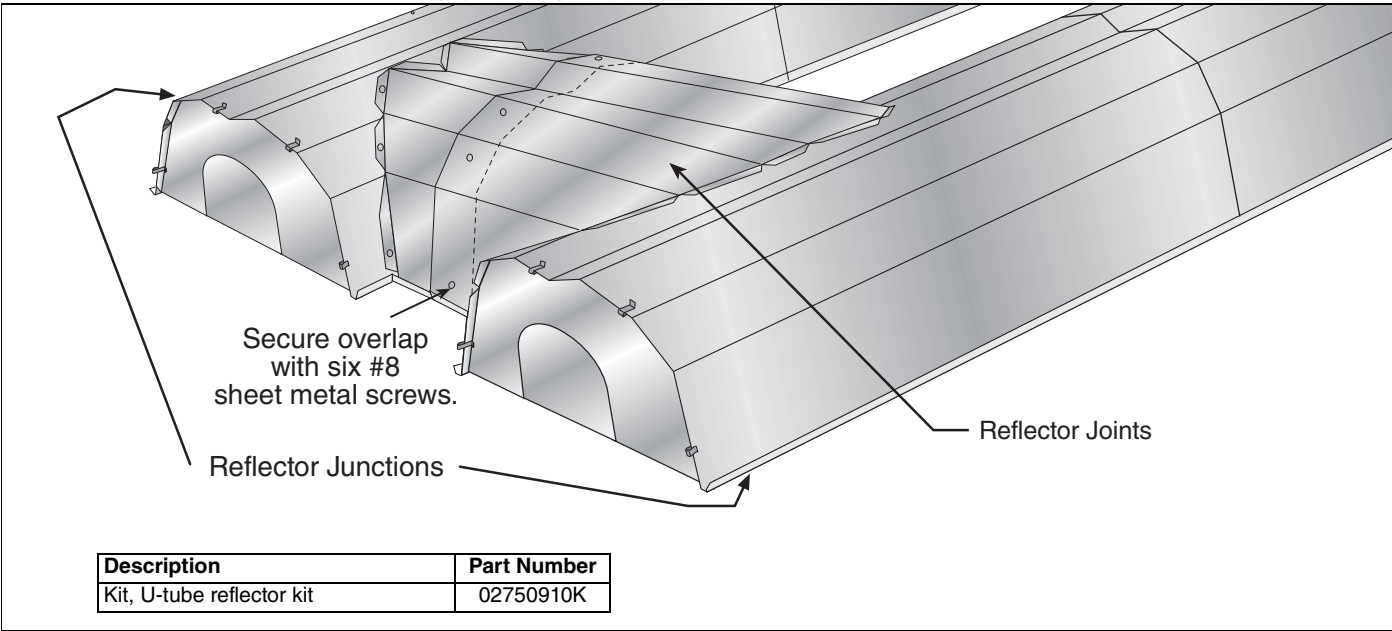


FIGURE 17: U-Tube Heater Layout Overview

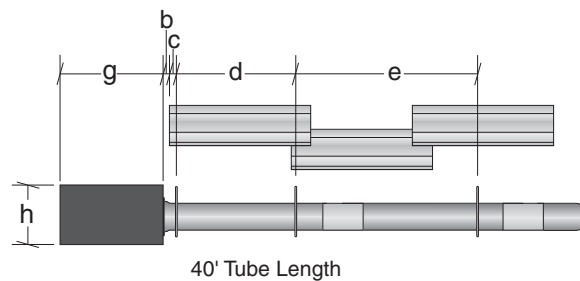
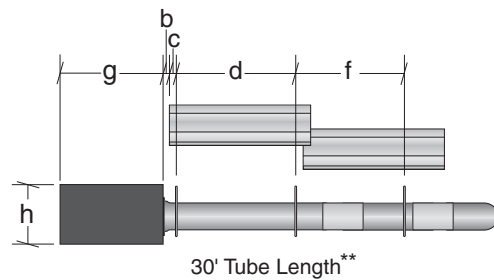
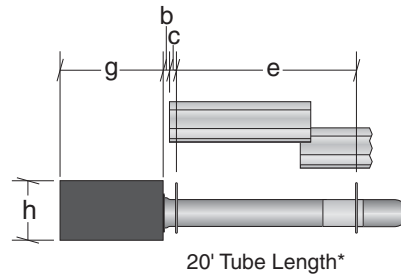
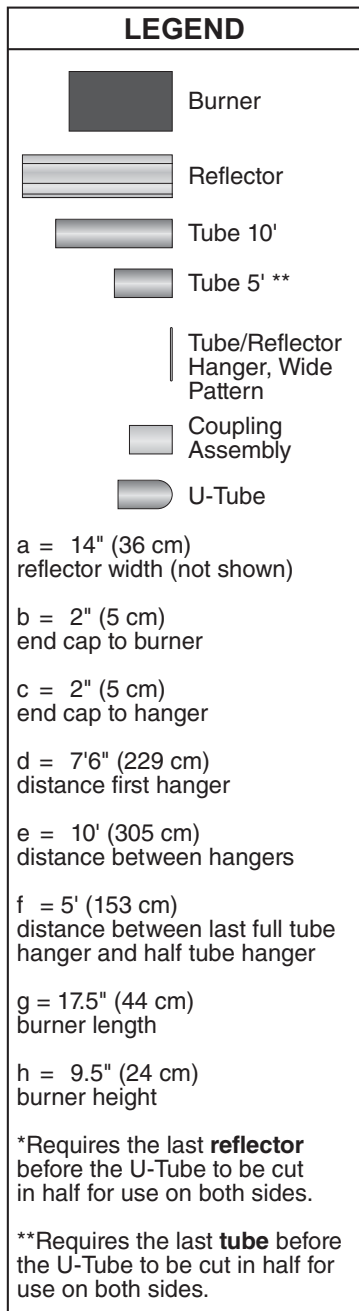
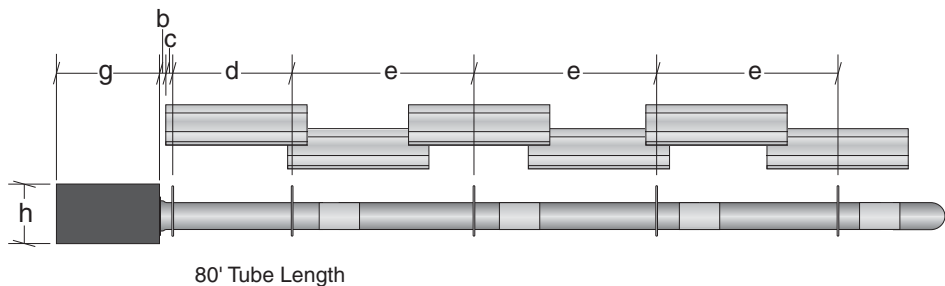
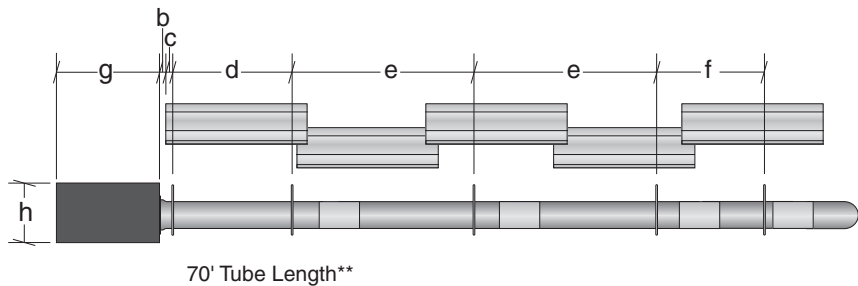
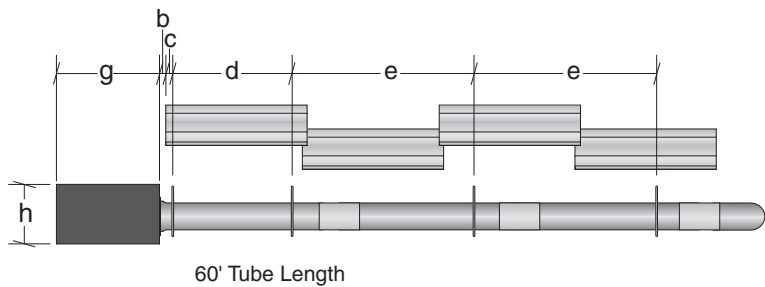
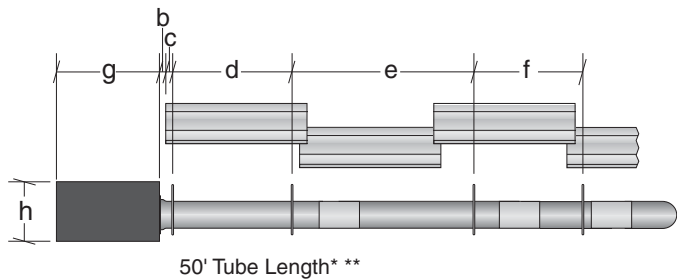
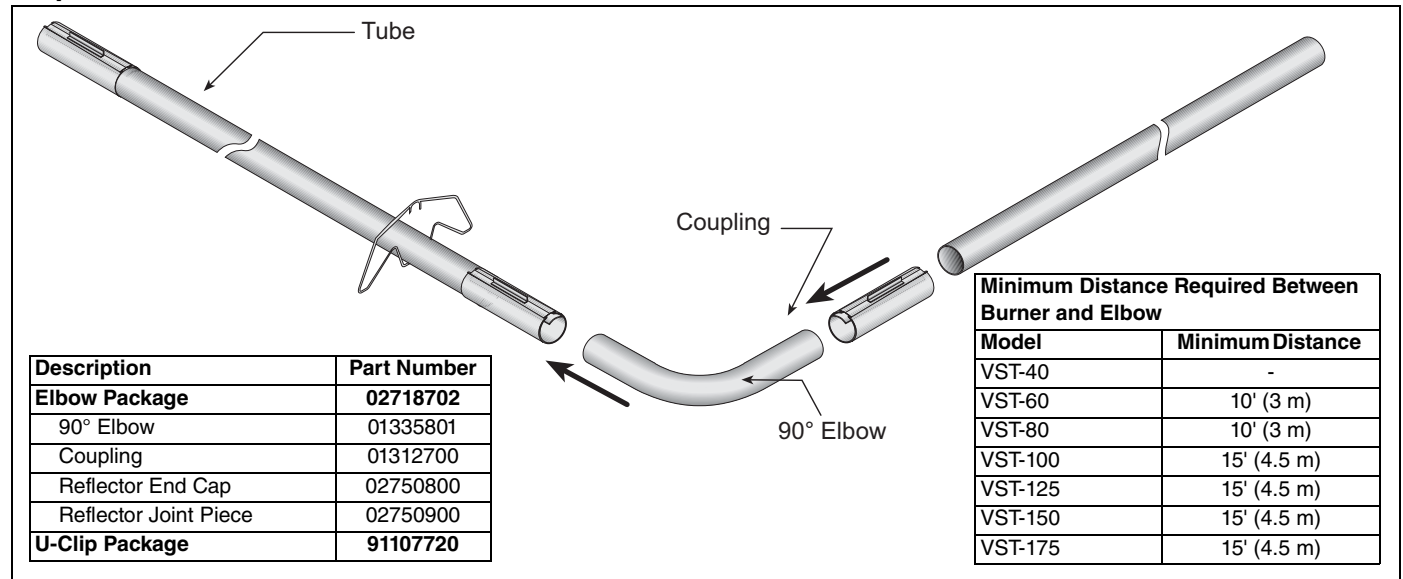


FIGURE 18: U-Tube Heater Layout Overview (Continued)

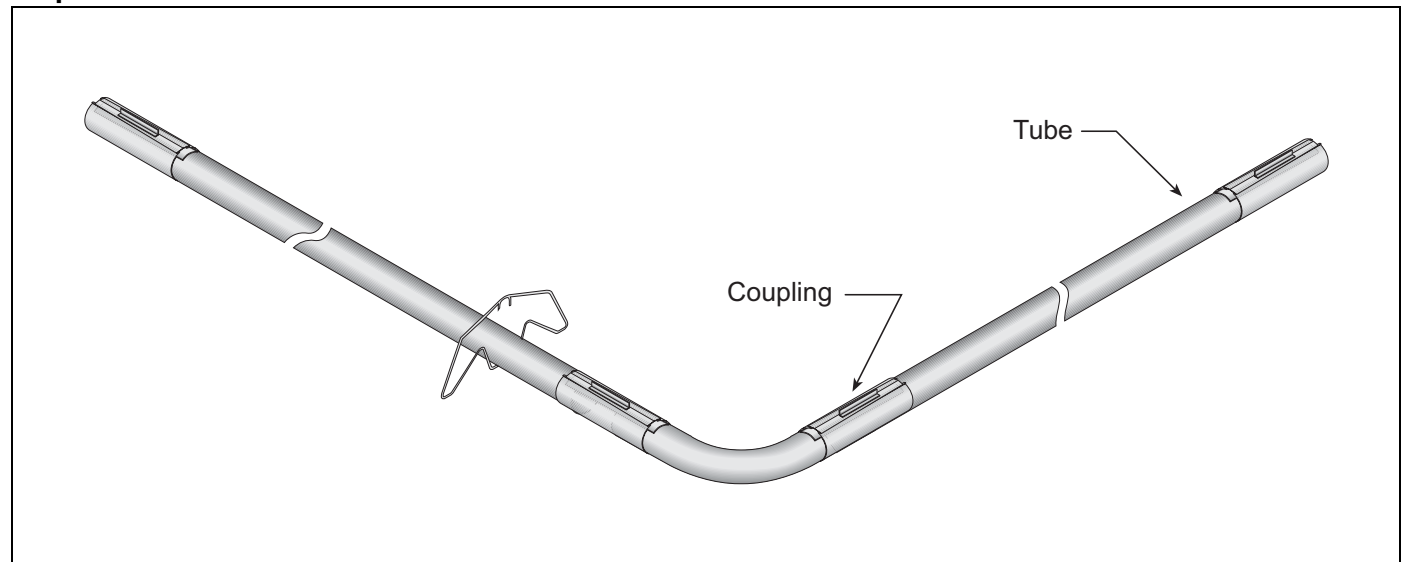


7.2 Elbow Package Configuration

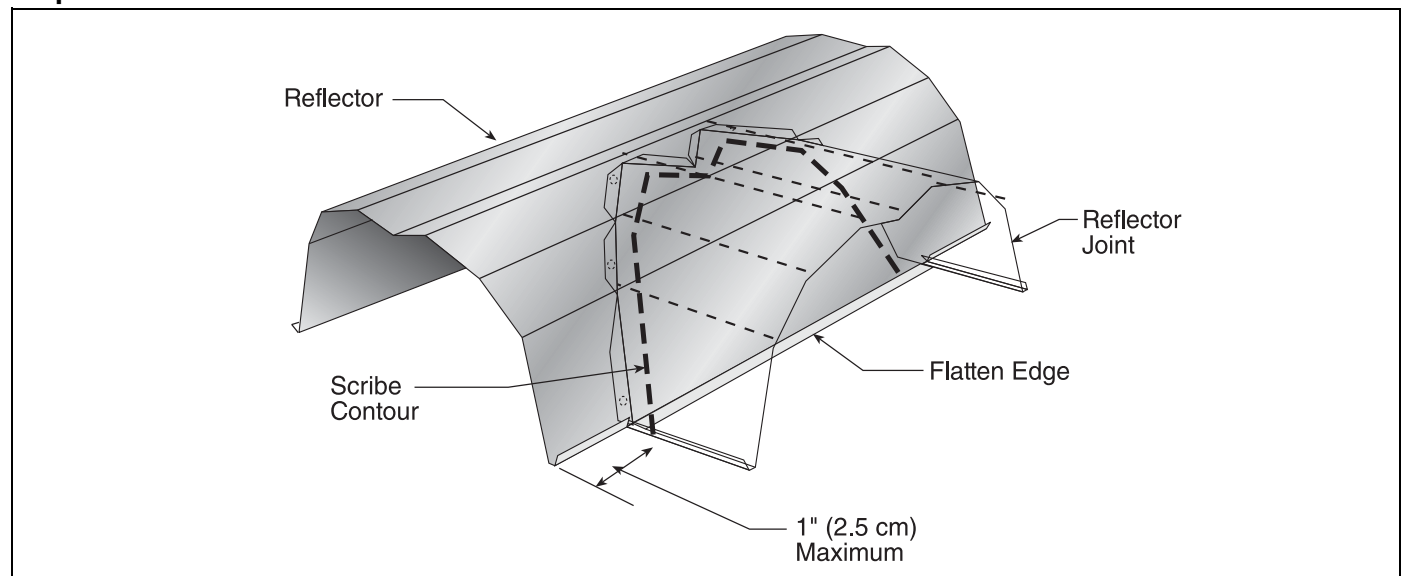
Step 7.2.1 Elbow Installation



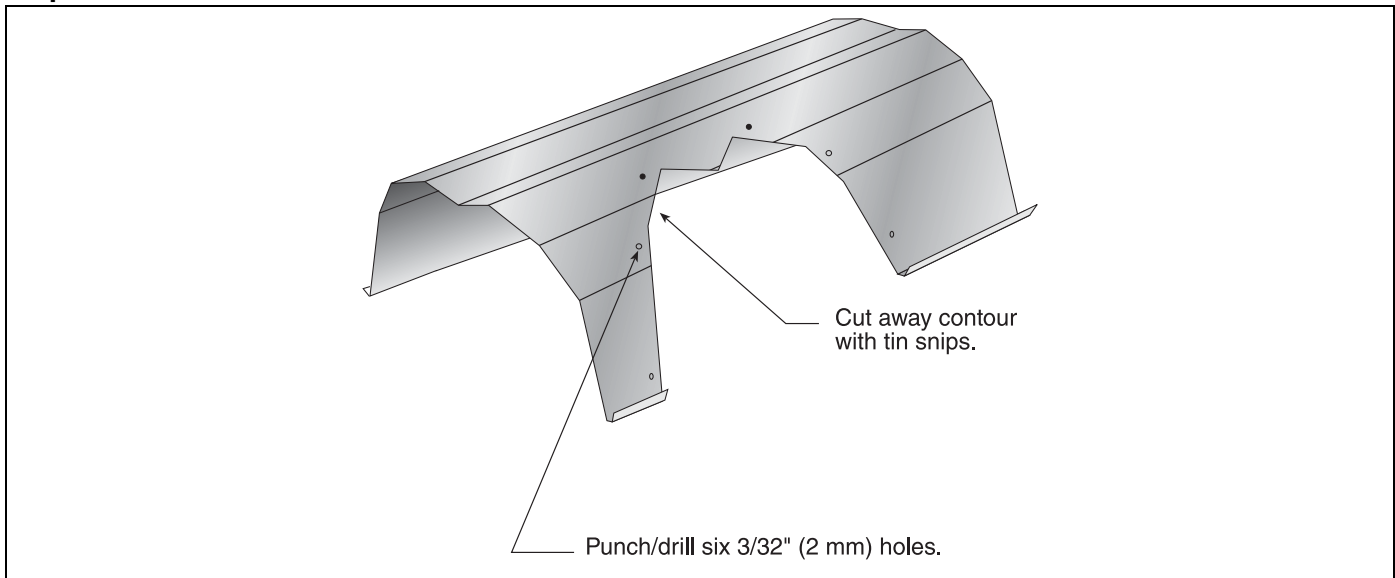
Step 7.2.2 Elbow Installation



Step 7.2.3 Reflector Joint Installation



Step 7.2.4 Reflector Joint Installation



Step 7.2.5 Reflector Joint Detail

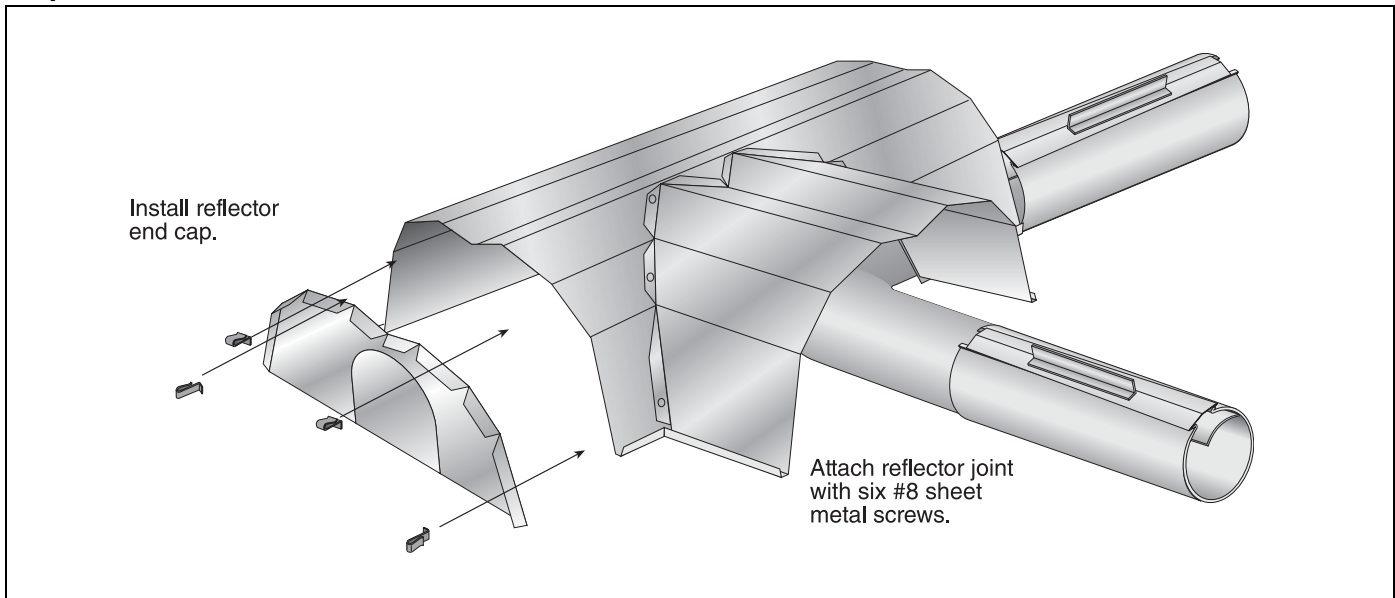
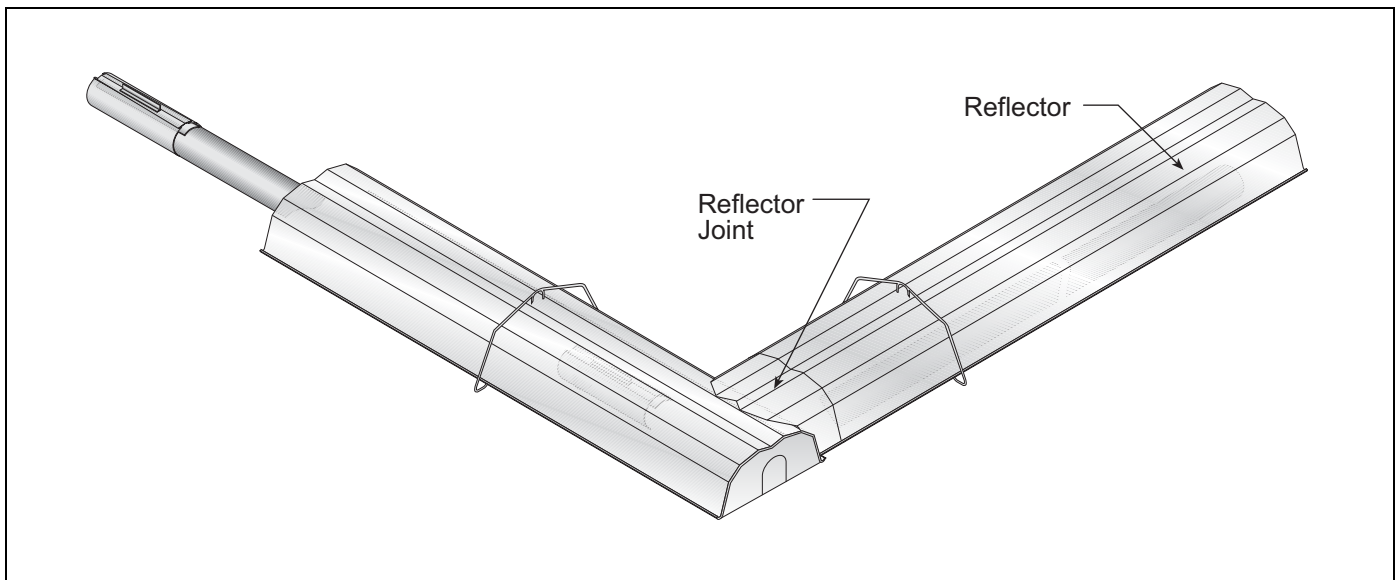
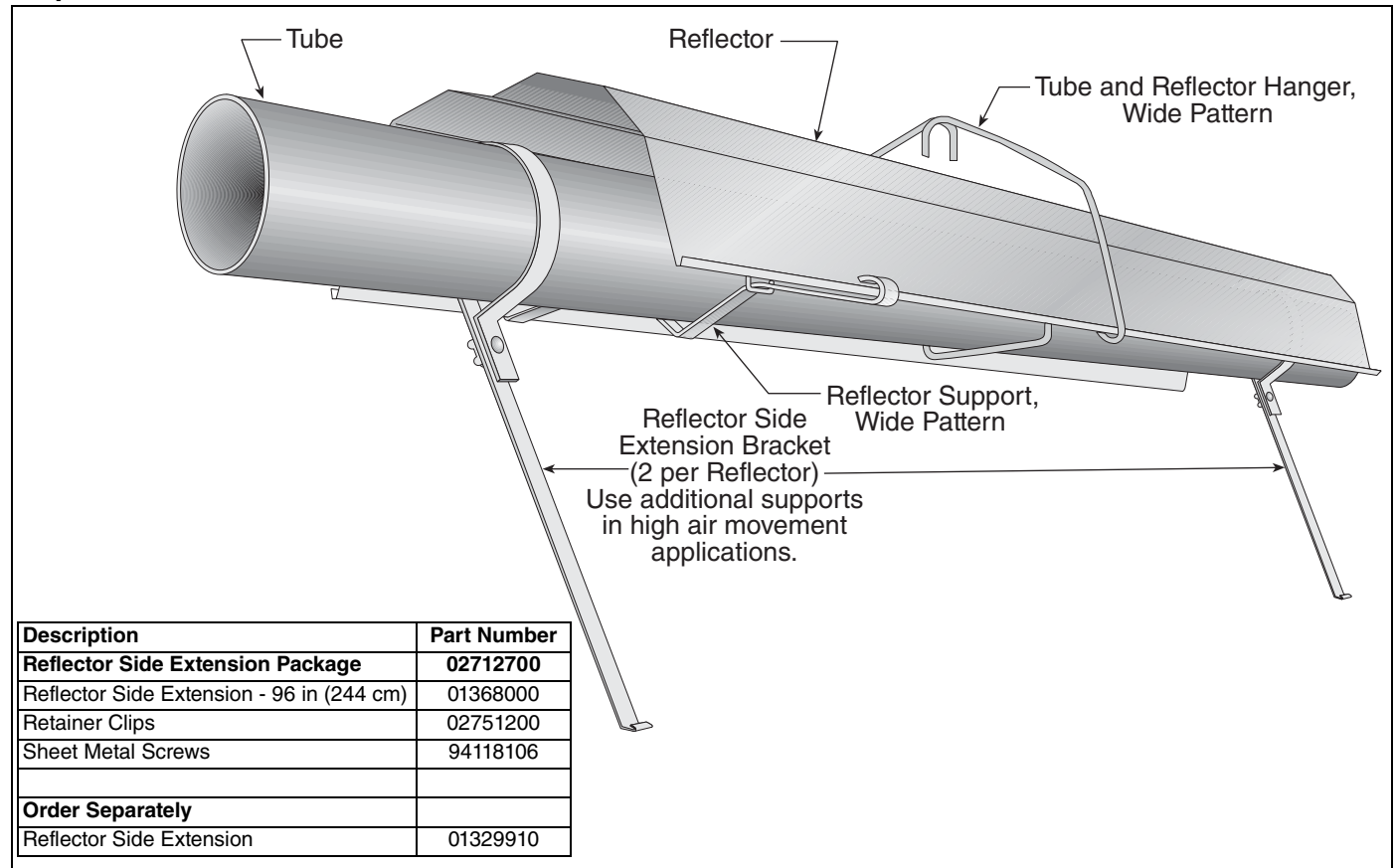


FIGURE 19: Reflector Joint Detail

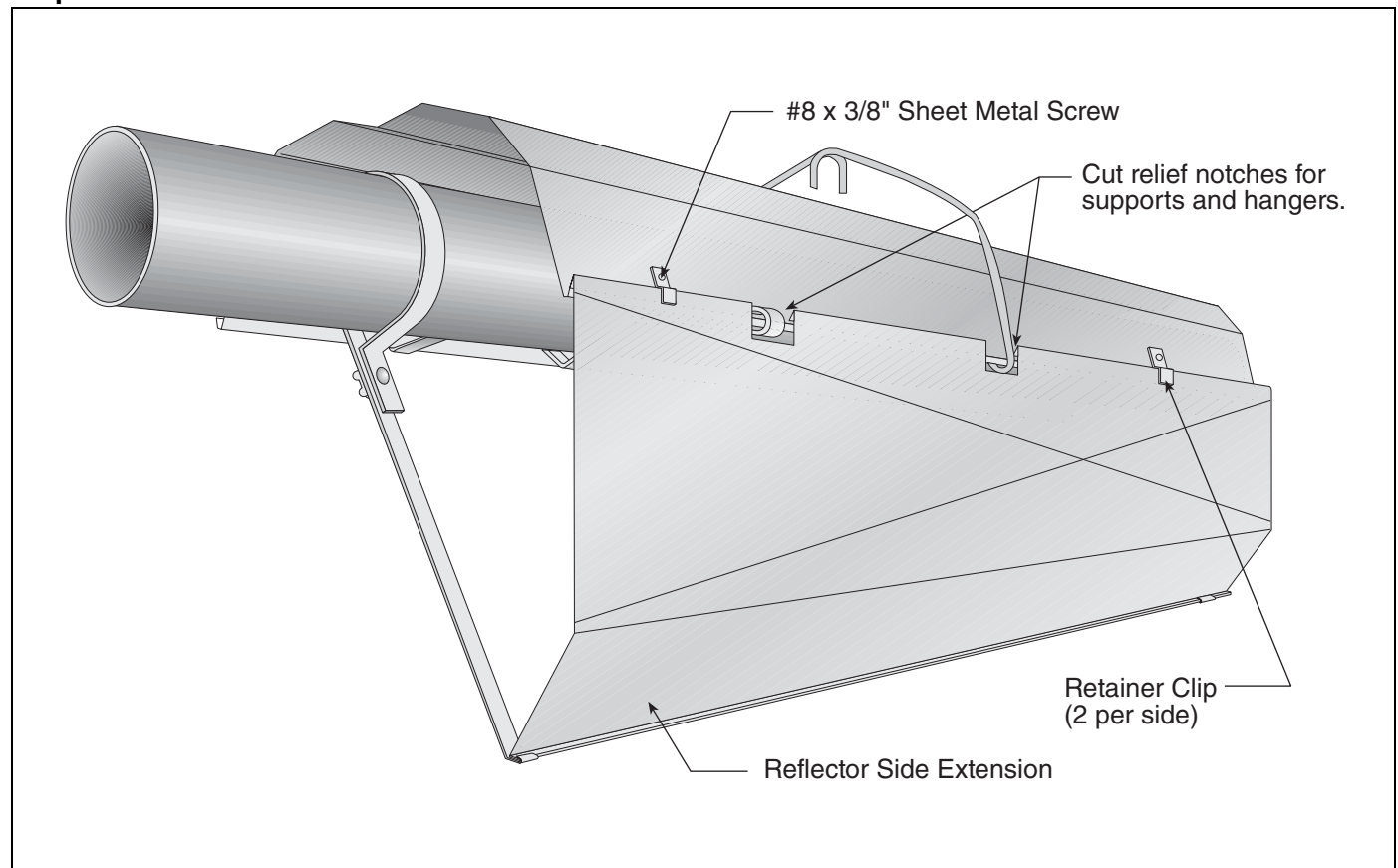


7.3 Reflector Side Extension

Step 7.3.1 Bracket Installation

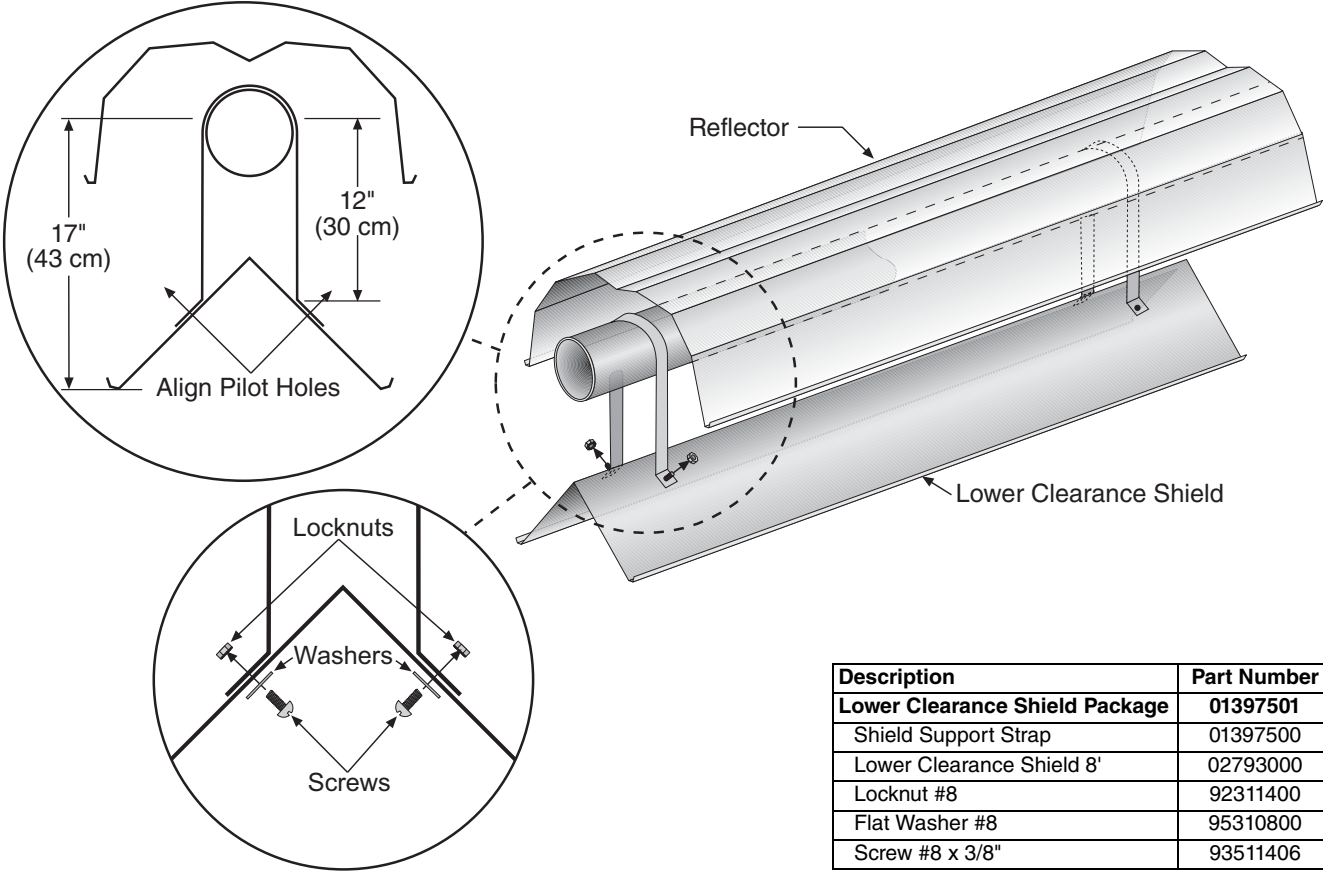


Step 7.3.2 Side Reflector Installation



7.4 Lower Clearance Shield Installation

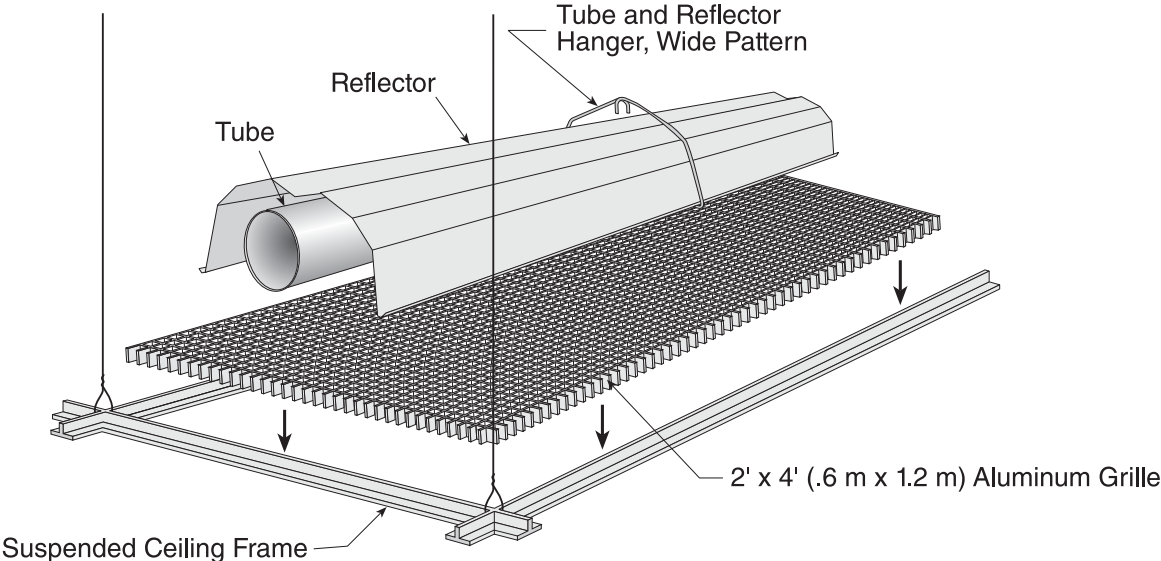
Step 7.4.1 Shield Support Strap Assembly



Description	Part Number
Lower Clearance Shield Package	01397501
Shield Support Strap	01397500
Lower Clearance Shield 8'	02793000
Locknut #8	92311400
Flat Washer #8	95310800
Screw #8 x 3/8"	93511406

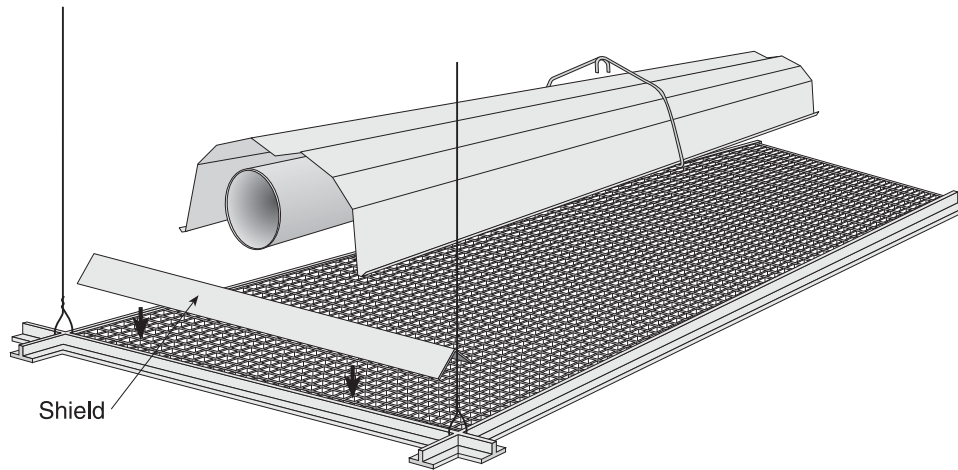
7.5 Two-Foot Decorative Grille Installation

Step 7.5.1 Grille Installation



Description	Part Number
Aluminum Grille 2' x 4'	91407000

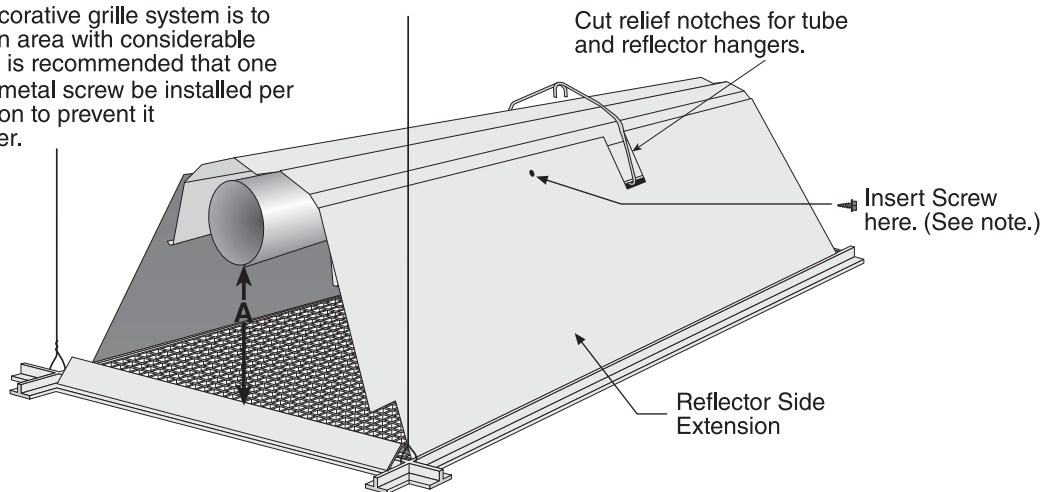
Step 7.5.2 Frame Shield Installation



Description	Part Number
Deco Grille Shield - 24 in (61 cm)	01365900

Step 7.5.3 Reflector Side Extension Installation for Decorative Grilles

NOTE: If the decorative grille system is to be installed in an area with considerable air movement, it is recommended that one #8 x 3/8" sheet metal screw be installed per reflector extension to prevent it from blowing over.

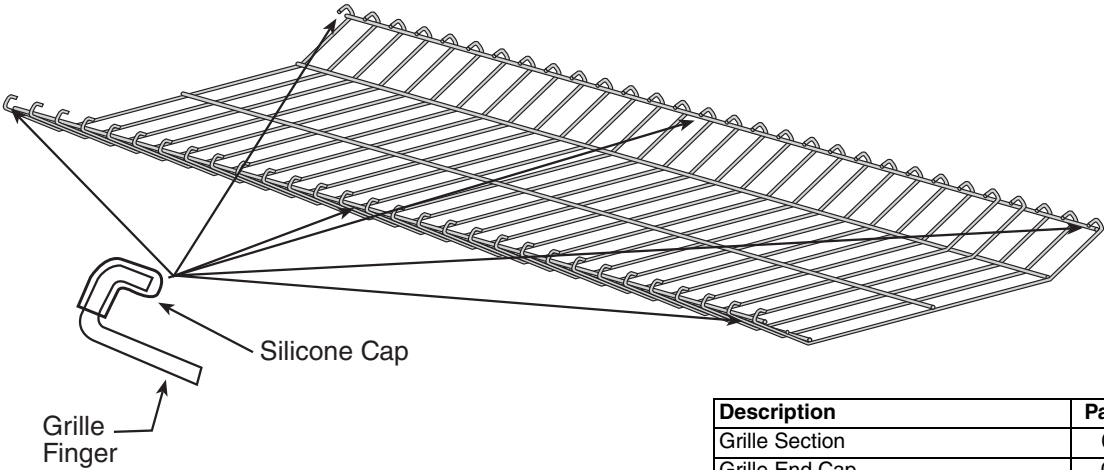


Distance "A"		Extension	
Minimum	Maximum	Part No.	Width
2" (4 cm)	6" (15 cm)	01370408	8" (20 cm)
6" (15 cm)	10" (26 cm)	01370412	12" (30 cm)
10" (26 cm)	14" (37 cm)	01370416	16" (40 cm)

Description	Part Number
Reflector Side Extension - 48 in (122 cm)	01370412

7.6 Protective Grille Installation

Step 7.6.1 Silicone Cap Installation



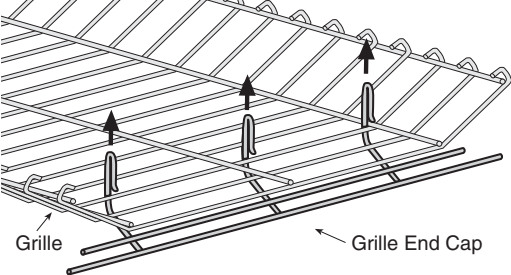
Grille Finger

Silicone Cap

Description	Part Number
Grille Section	08050001
Grille End Cap	08050002
Silicone Cap	91915951-6P

Step 7.6.2 Grille End Cap Installation

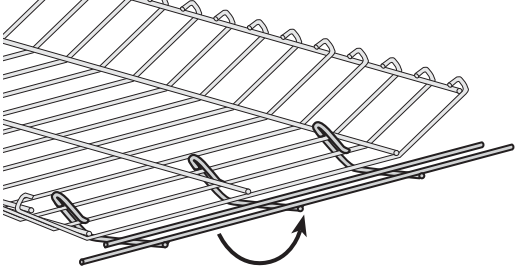
A



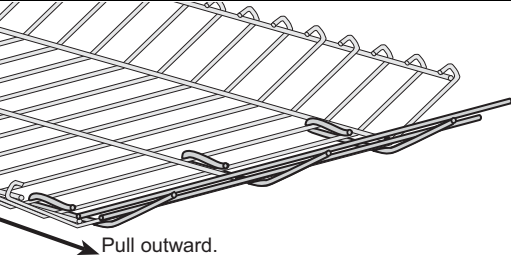
Grille

Grille End Cap

B

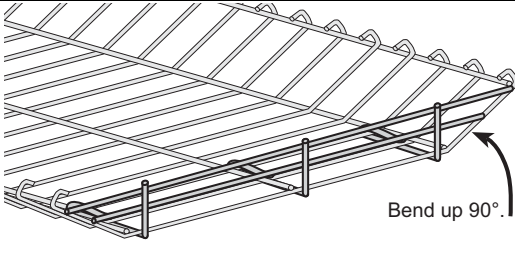


C



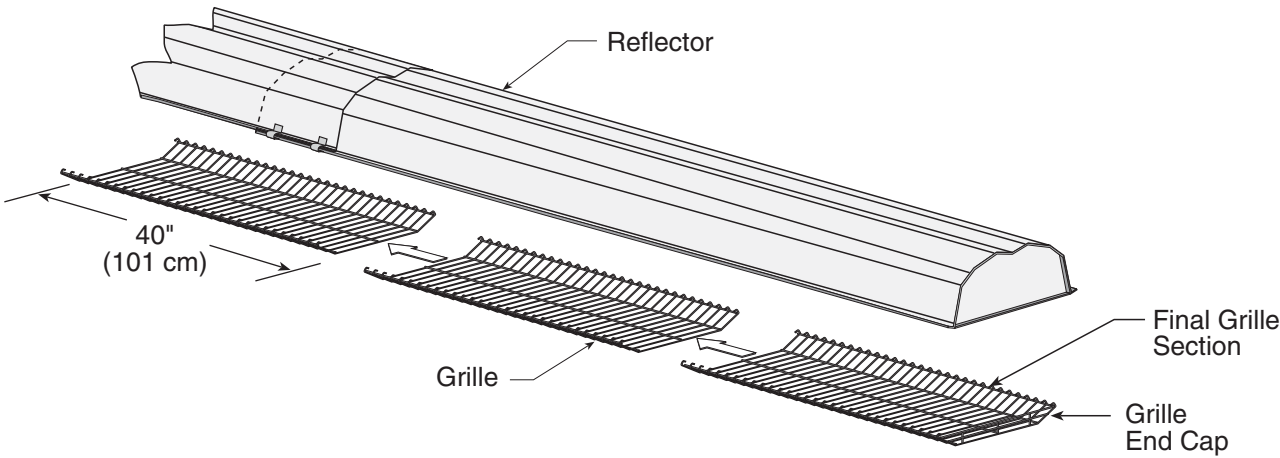
Pull outward.

D



Bend up 90°.

Step 7.6.3 Grille Installation



Reflector

40" (101 cm)

Grille

Final Grille Section

Grille End Cap

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.

! 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.

In brooder installations, affix Brooder Ventilation Wall Tag (P/N 91039300) adjacent to the heater thermostat. In the absence of a thermostat, the wall tag must be posted in a conspicuous location.

Exhaust end of heater will accept a 4" (10 cm) vent pipe using the vent adapter (P/N 90502700). To prevent leakage of condensation, install the vent adapter with the seam on top and seal the joint using a high temperature silicone sealant.

Any portion of vent pipe passing through a combustible wall must have an approved thimble (P/N 90505600) to conform with the above listed codes.

Vent pipe must be sloped downward away from the burner 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 37, Section 8.9.* When venting vertically, a maximum of four heaters can be commonly vented. *See Page 38, Section 8.10.*

The heater may also be installed unvented in certain circumstances according to building ventilation codes. Refer to the above codes and *Page 35, Section 8.2* for further information. Unvented operation also requires compliance with the clearances to combustibles given on *Page 8, Figure 9.*

The bottom of the vent or air intake terminal shall not be located less than 1' (.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.

8.1.1 United States Requirements

Vent must terminate at least 3' (.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' (.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' (.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).

8.3 Horizontal Venting

In noncombustible walls only, vent terminal (P/N 02537801-1P) may be used.

For 4" (10 cm) vents in either combustible or noncombustible walls, use P/N 90502100 (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 P/N 90502101 (Tjernlund VH1-6) or equivalent insulated vent terminal. Follow the manufacturer's instructions for proper installation.

8.4 Vertical Venting

For 4" (10 cm), an approved vent cap (P/N 90502300) must be used.

For 6" (15 cm) common vent, an approved vent cap (P/N 90502302) must be used.

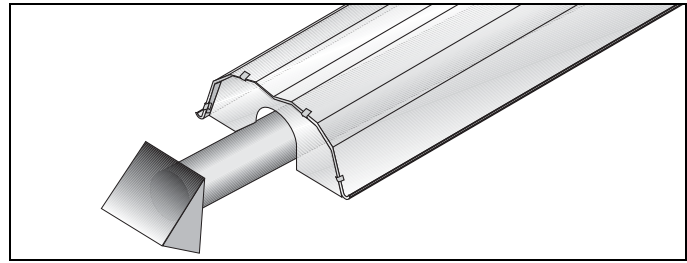
For common vertical venting of more than two heaters, See Page 38, Section 8.10.

A vent shall not extend less than 2' (.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.

FIGURE 20: Tube Termination



8.6 Length Requirements

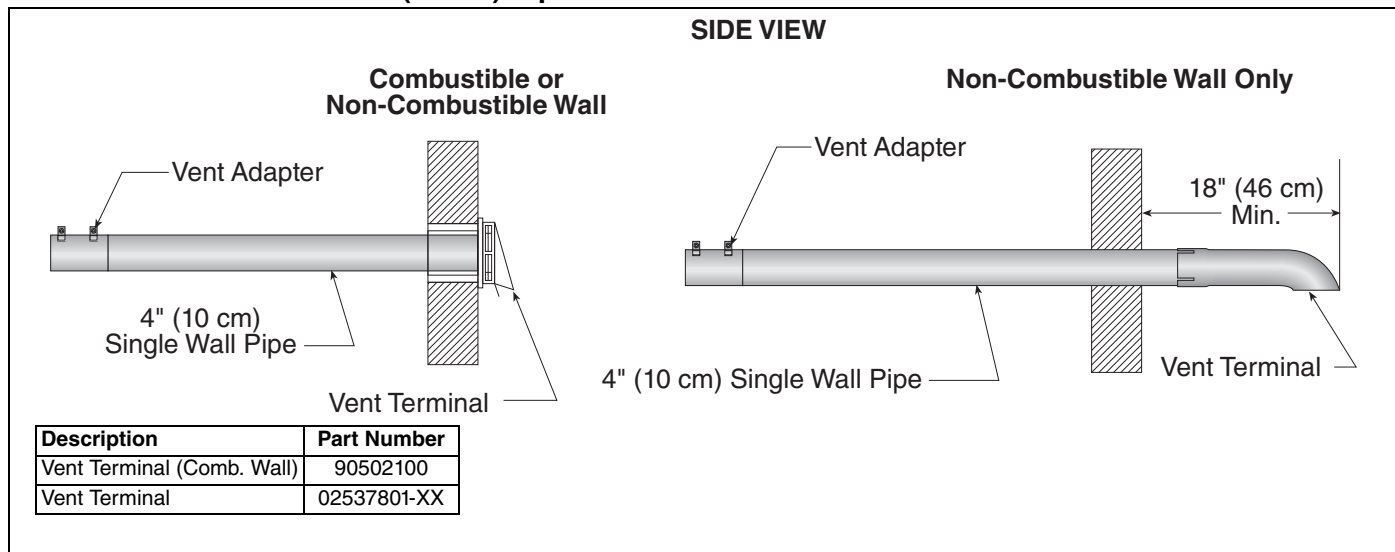
The maximum vent length allowed is 45' (13.7 m). The maximum outside air supply duct length allowed is 45' (13.7 m).

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

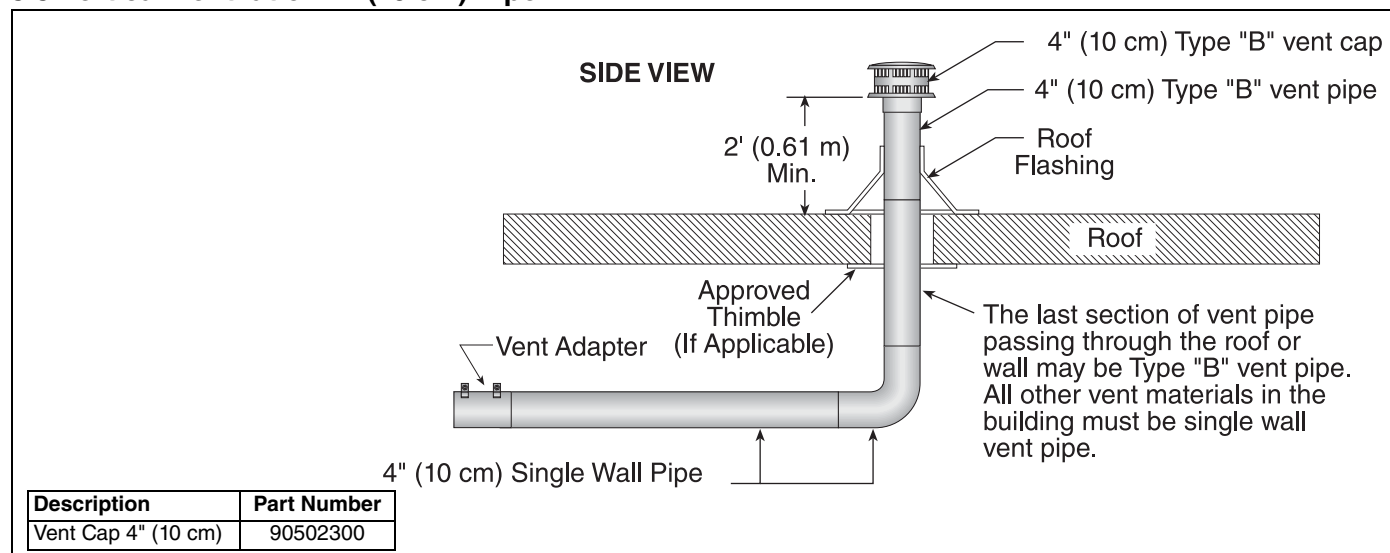
Vent length should be limited to less than 20' (6 m). If using vent lengths greater than 20' (6 m), condensation will form in the vent pipe. Insulation and additional sealing measures (high temperature silicone at all seams) are required. Optional heat exchanger beyond minimum lengths is considered as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

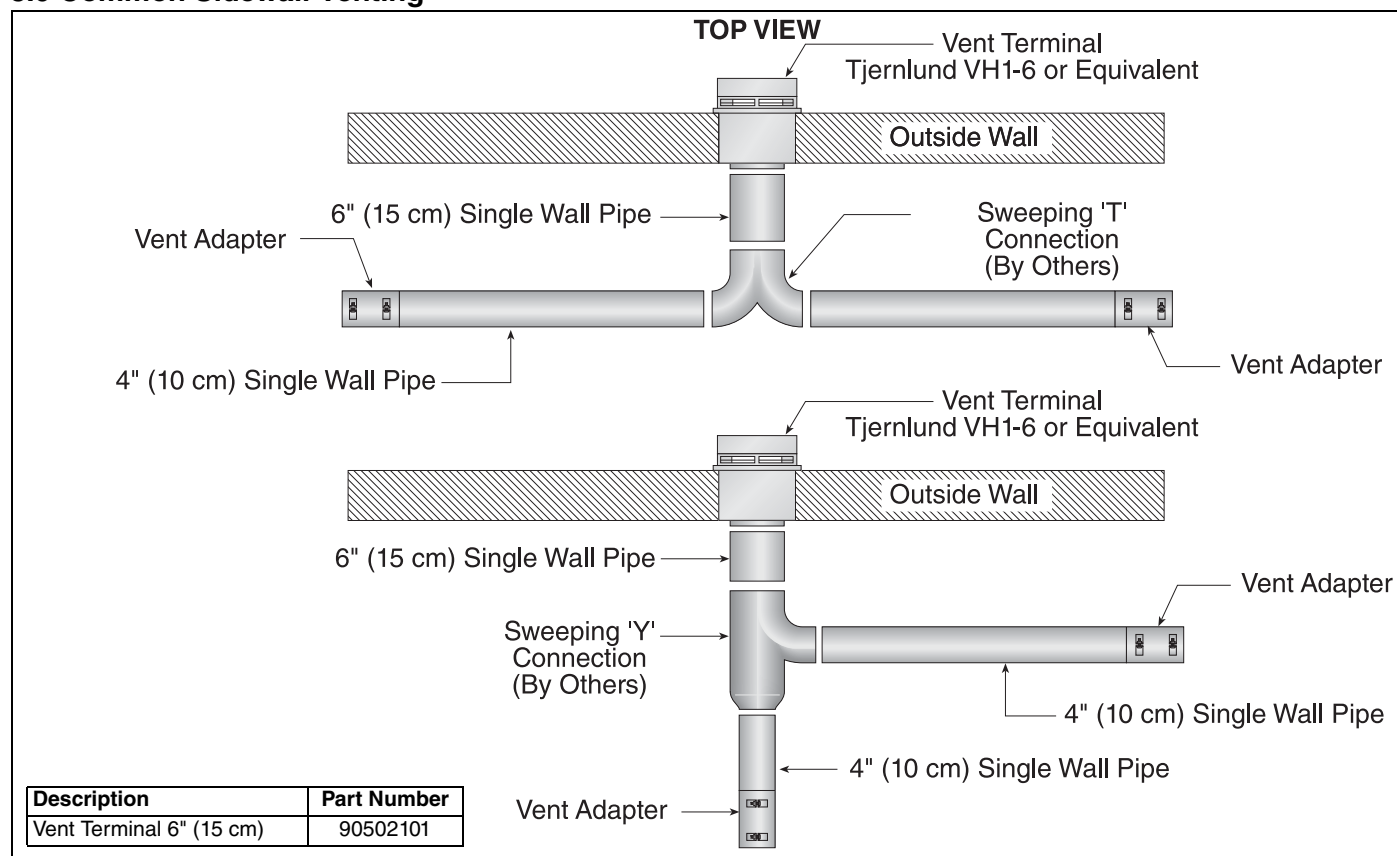
8.7 Horizontal Ventilation 4" (10 cm) Pipe



8.8 Vertical Ventilation 4" (10 cm) Pipe



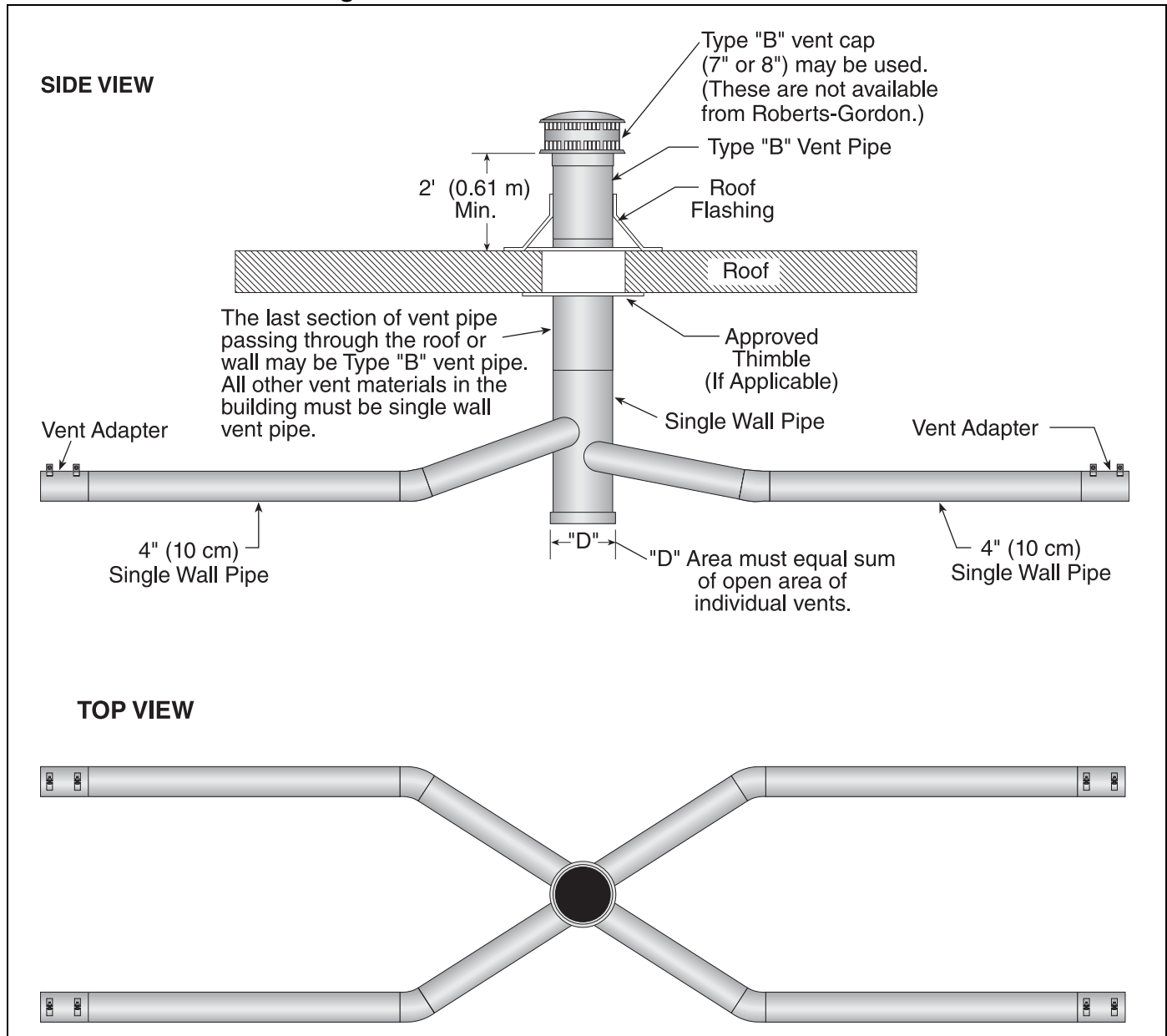
8.9 Common Sidewall Venting



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.

8.10 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.

8.11 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.

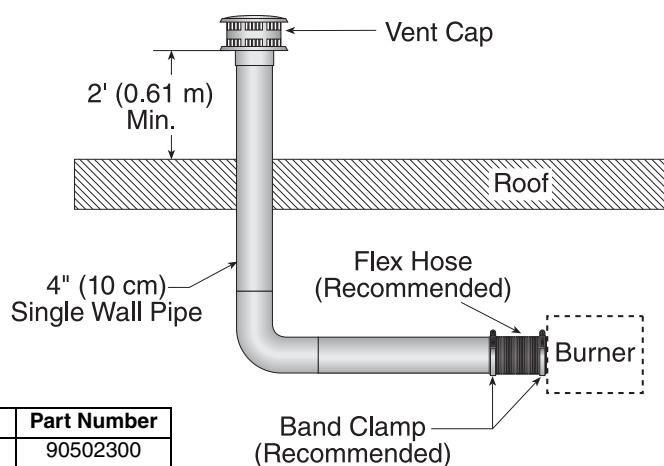
Use of optional outside combustion air is not recommended with unvented heaters.

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 terminal.

8.11.1 Length Requirements

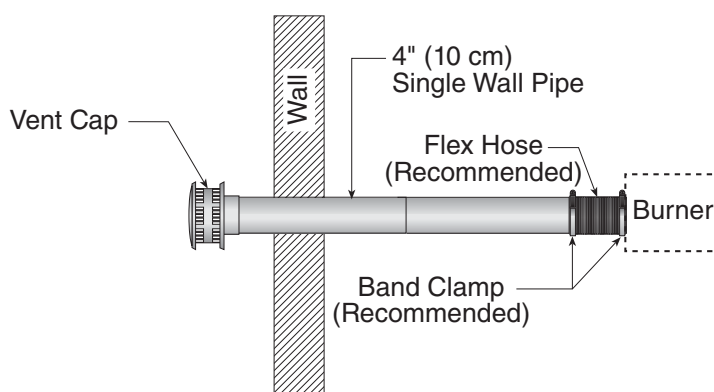
Follow the constraints listed on *Page 36, Section 8.6*.

8.11.2 Vertical Outside Air Supply for Single Heater Installation



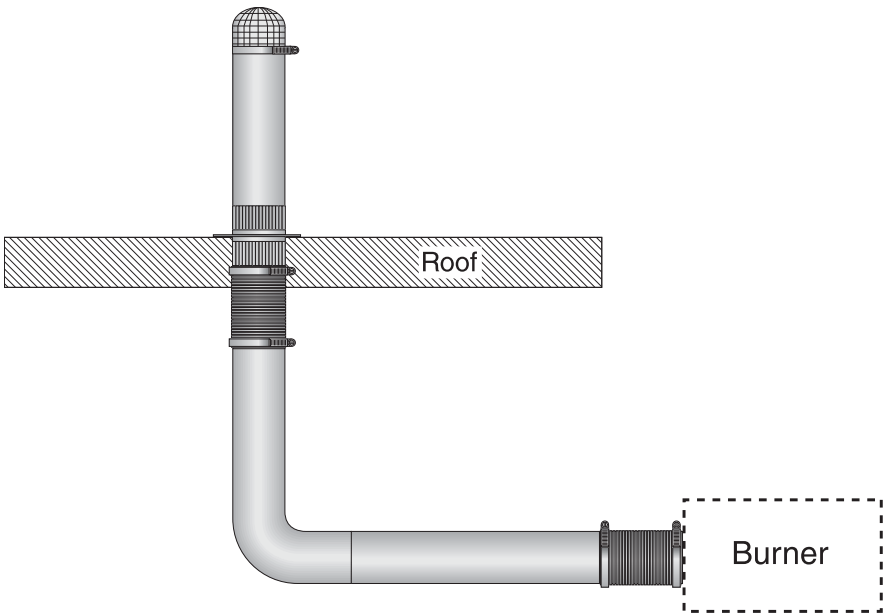
Description	Part Number
Vent Cap 4" (10 cm)	90502300

8.11.3 Horizontal Outside Air Supply for Single Heater Installation



Description	Part Number
Vent Cap 4" (10 cm)	90502300

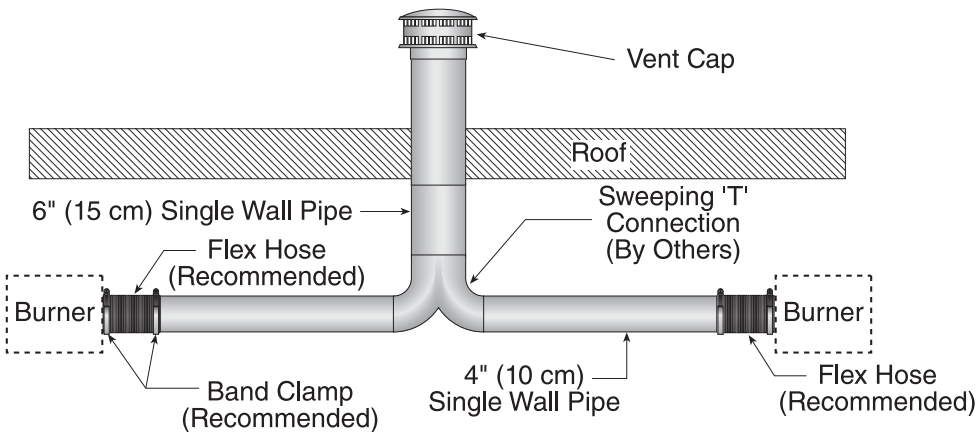
8.11.4 Vertical Outside Air with Outside Air Inlet Kit



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

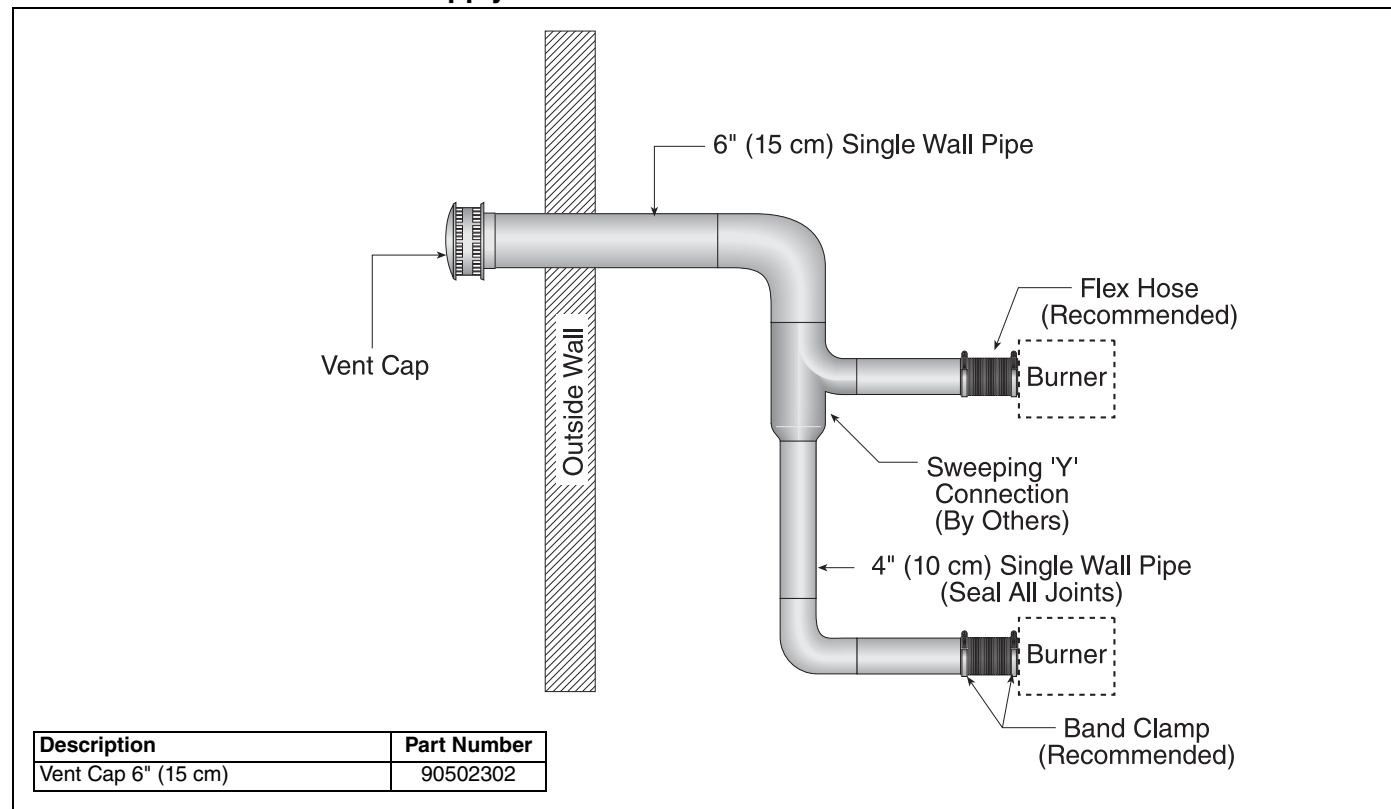
8.11.5 Vertical Outside Air Supply for Double Heater Installation



Description	Part Number
Vent Cap 6" (15 cm)	90502302

- Requirements:
- Heaters must be controlled by a common thermostat.

8.11.6 Horizontal Outside Air Supply for Double Heater Installation



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 20.

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.

There is an expansion of the tube with each firing cycle. This will cause the burner to move with respect to the gas line. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made in strict accordance with *Figure 21*.

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

- **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.**

⚠ WARNING**Explosion Hazard**

Leak test all components of gas piping before operation.

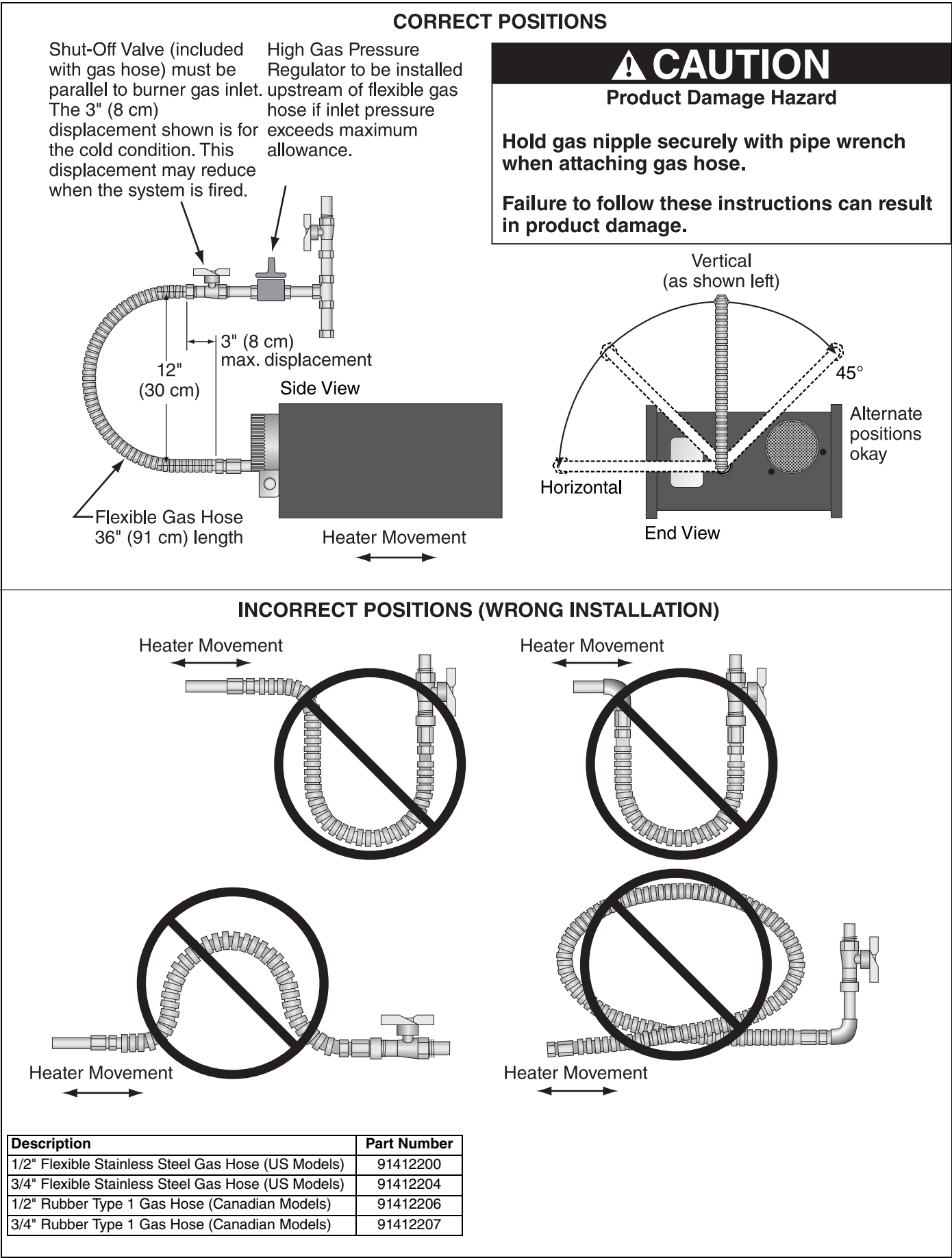
Gas can leak if piping is not installed properly.

Do not high pressure test gas piping with heater connected.

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

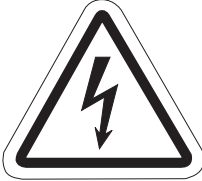
Install the gas hose as shown in *Figure 21*. The gas hose accommodates expansion of the heating system and allows for easy installation and service of the burner. Before connecting the burners to the supply system, verify that all high pressure testing of the gas piping has been completed.

FIGURE 21: Gas Connection with Flexible Gas Hose



SECTION 10: WIRING

⚠ DANGER



Electrical Shock Hazard

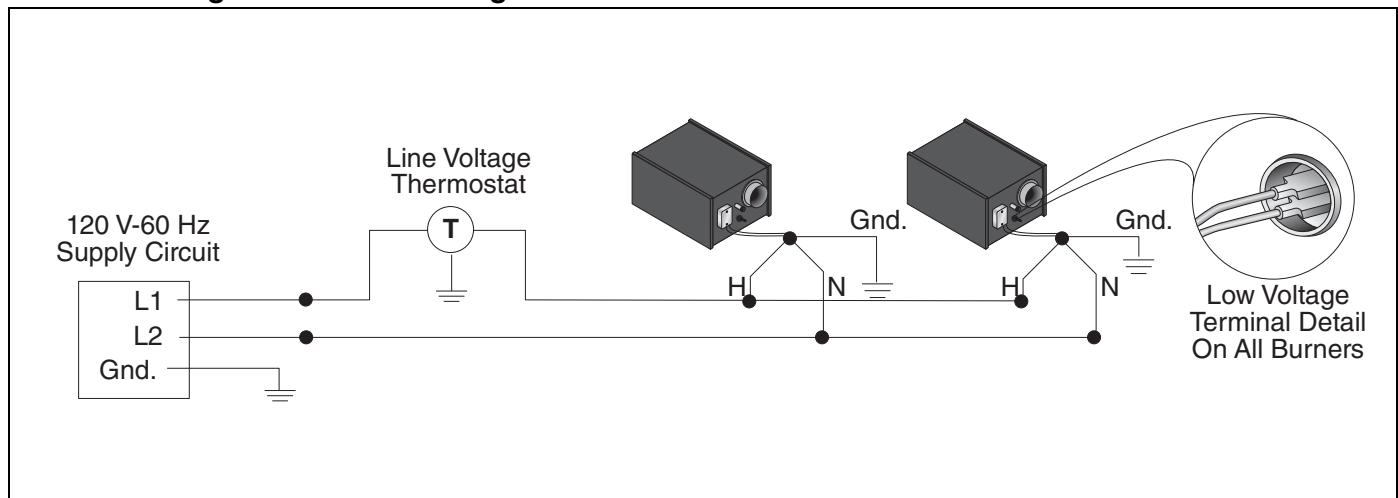
Disconnect electric before service.

Heater must be properly grounded.

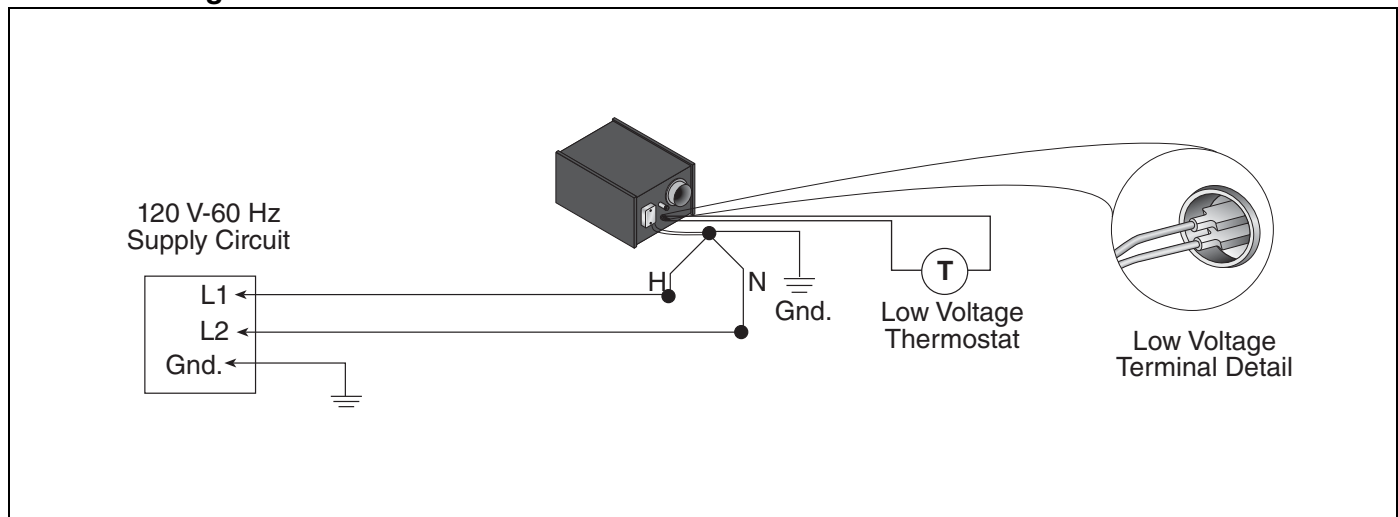
Failure to follow these instructions can result in death or electrical shock.

Heaters can be controlled using several methods. Normally thermostats are used to control the heaters but they can also be controlled by an Energy

10.1 Line Voltage Thermostat Wiring

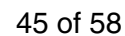


10.2 Low Voltage Thermostat with One Burner

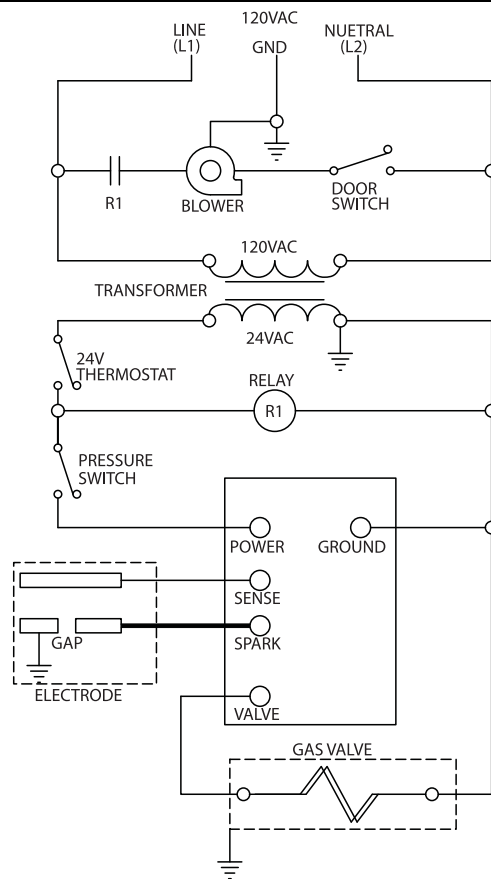


Management System. *Section 10.1* below illustrates the connection for heaters controlled by a line voltage thermostat. NOTE: In order to use line voltage thermostats, the low voltage terminal located at the back of each burner must be connected as shown in the detail. For a single heater on a low voltage thermostat, See *Section 10.2* below. To control multiple heaters on one low voltage thermostat, See *Page 45, Section 10.3*. NOTE: In order to control multiple heaters on one low voltage thermostat, the low voltage terminals on each heater must be connected as shown in detail. 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.

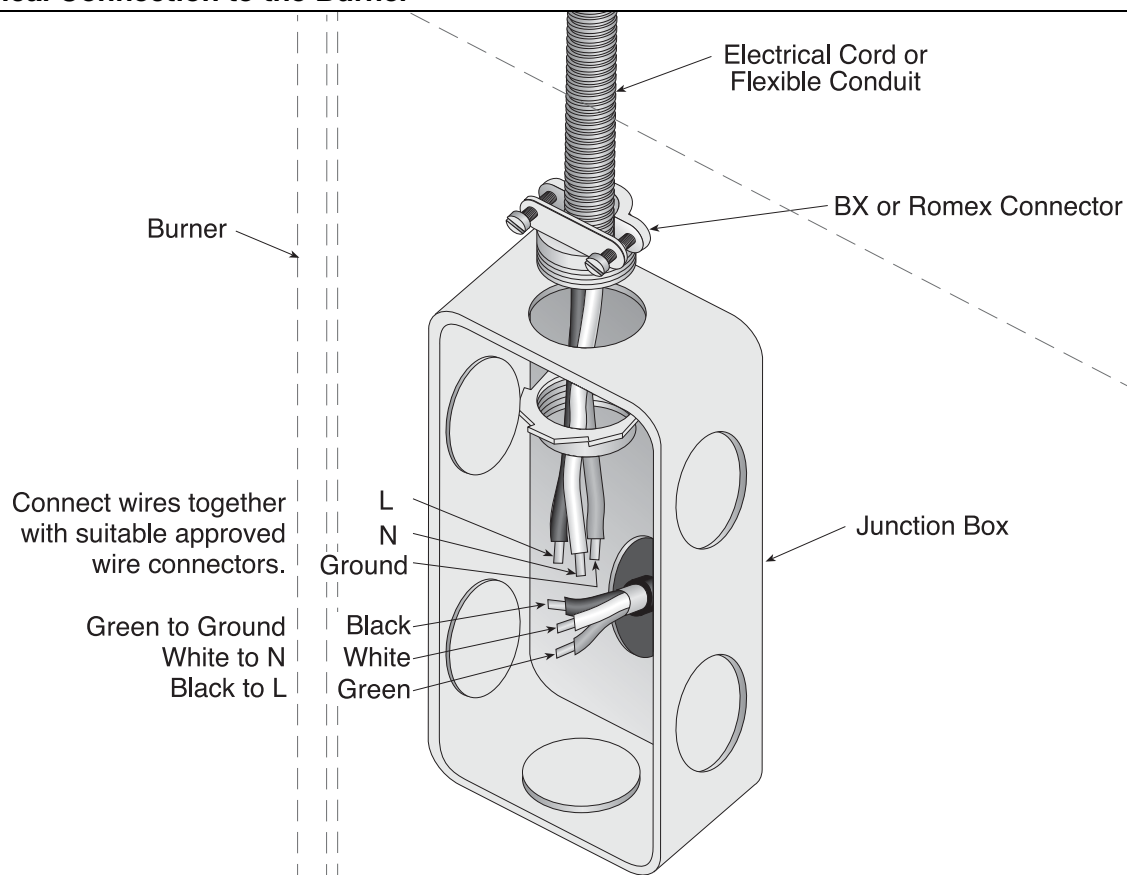
If any of the original internal wiring must be replaced, it must be replaced with wiring materials having a temperature rating of at least 105° C and 600 V.






10.5 Ladder Diagram



10.6 Electrical Connection to the Burner



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.	

The VST-Series DSI heater is equipped with a direct spark ignition system.

11.1 Sequence of Operation

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

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

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 inspected.

Please see *Page 48, Section 11.5* for suggested items to inspect.

11.5 Maintenance Checklist

Installation Code and Annual Inspections:

All installations 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 6, 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 6, 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. Make sure reflectors are correctly overlapped. <i>See Page 22, 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 35, 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 13, 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 42, Section 9.</i></p>

Burner Observation Window	Make sure it is clean and free of cracks or holes. Clean and replace as required.
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.
Igniter	Replace if cracked or broken.
Thermostat	There should be no exposed wire or damage to the thermostat. <i>See Page 44, 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 14, Figure 11.</i>
Decorative and Protective Grille (optional)	The grille must be securely attached. Check that the side reflector extensions are installed correctly and secured in place if necessary. (Decorative grille only.) <i>See Page 32, Section 7.5 and Page 34, Section 7.6.</i> Make sure shield is installed correctly and secured in place if necessary. (Decorative grille only.) <i>See Page 33, Section 7.5.2.</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.

More than one disconnect switch may be required to disconnect electric from heater.

Heater must be properly grounded.

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.



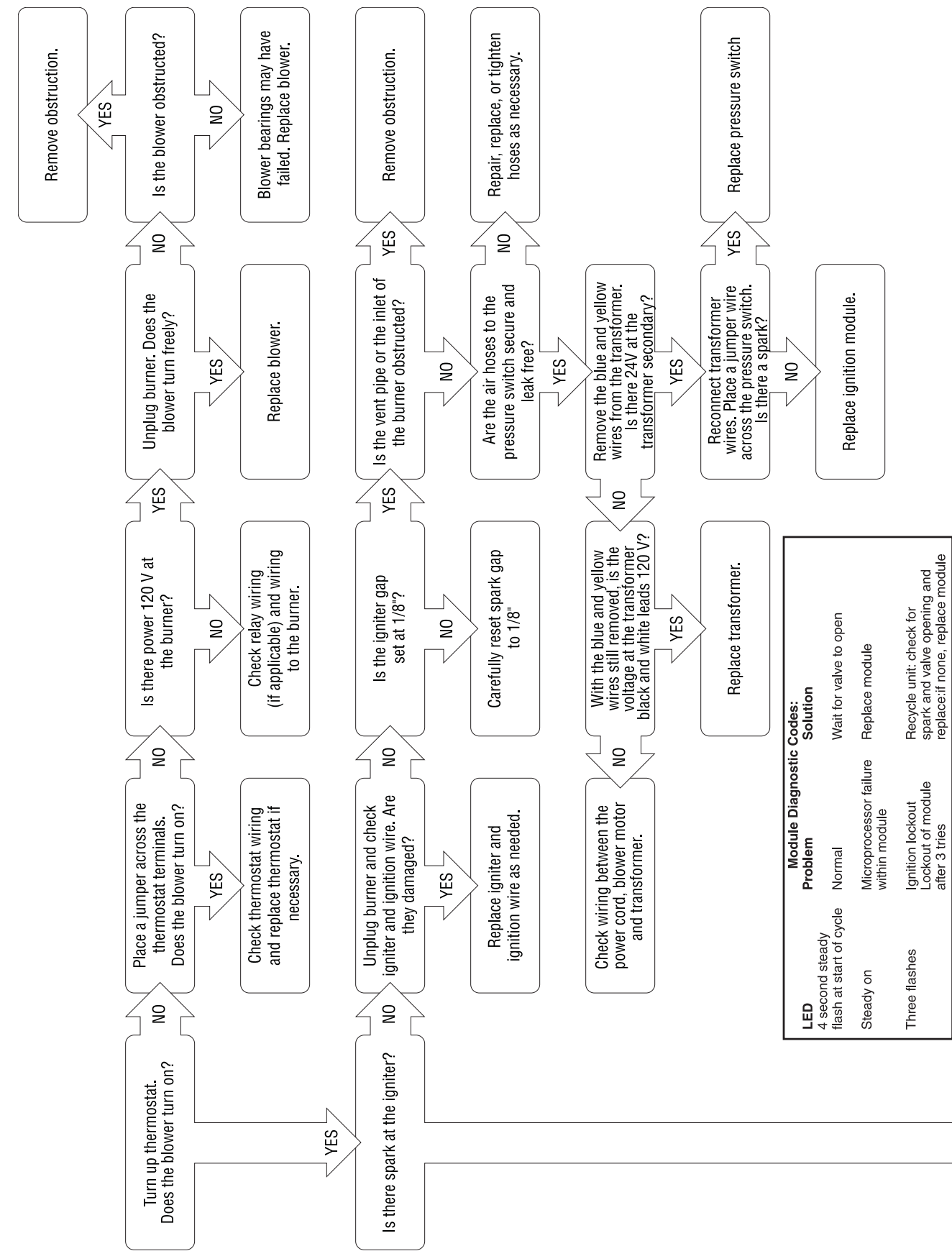
Cut/Pinch Hazard

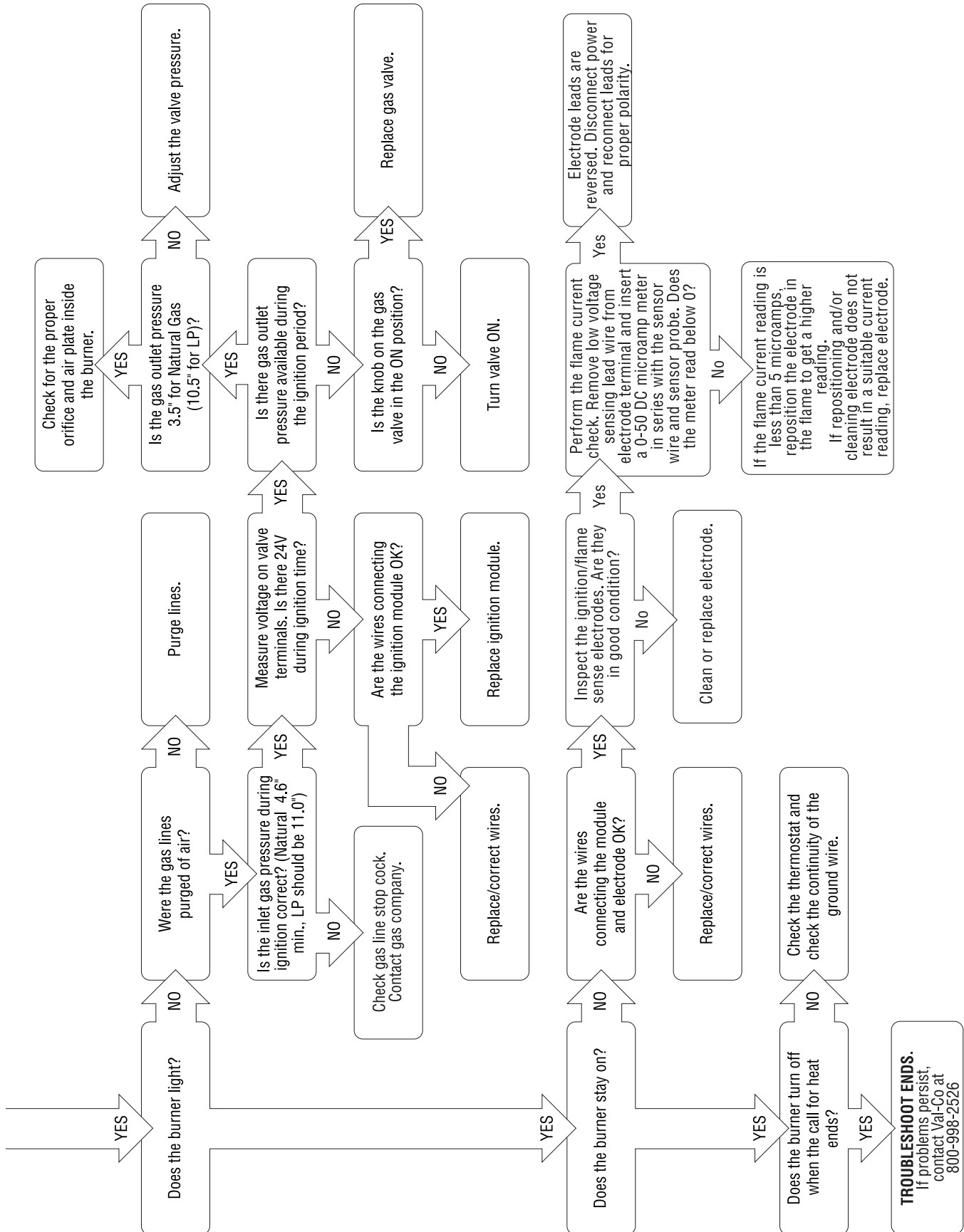
Wear protective gear during installation, operation and service.

Edges are sharp.

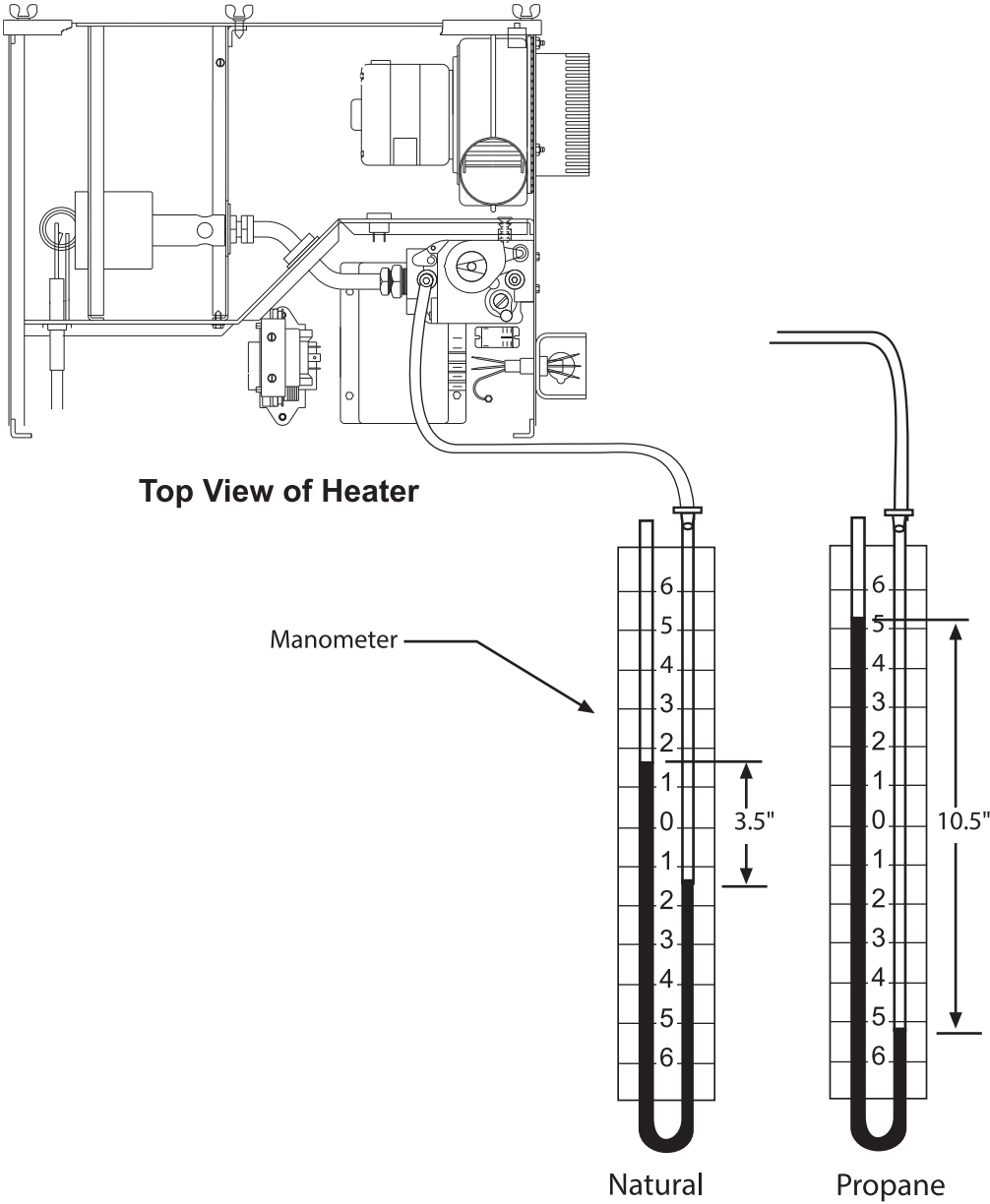
Failure to follow these instructions can result in death, injury or property damage.

12.1 Troubleshooting Flow Chart









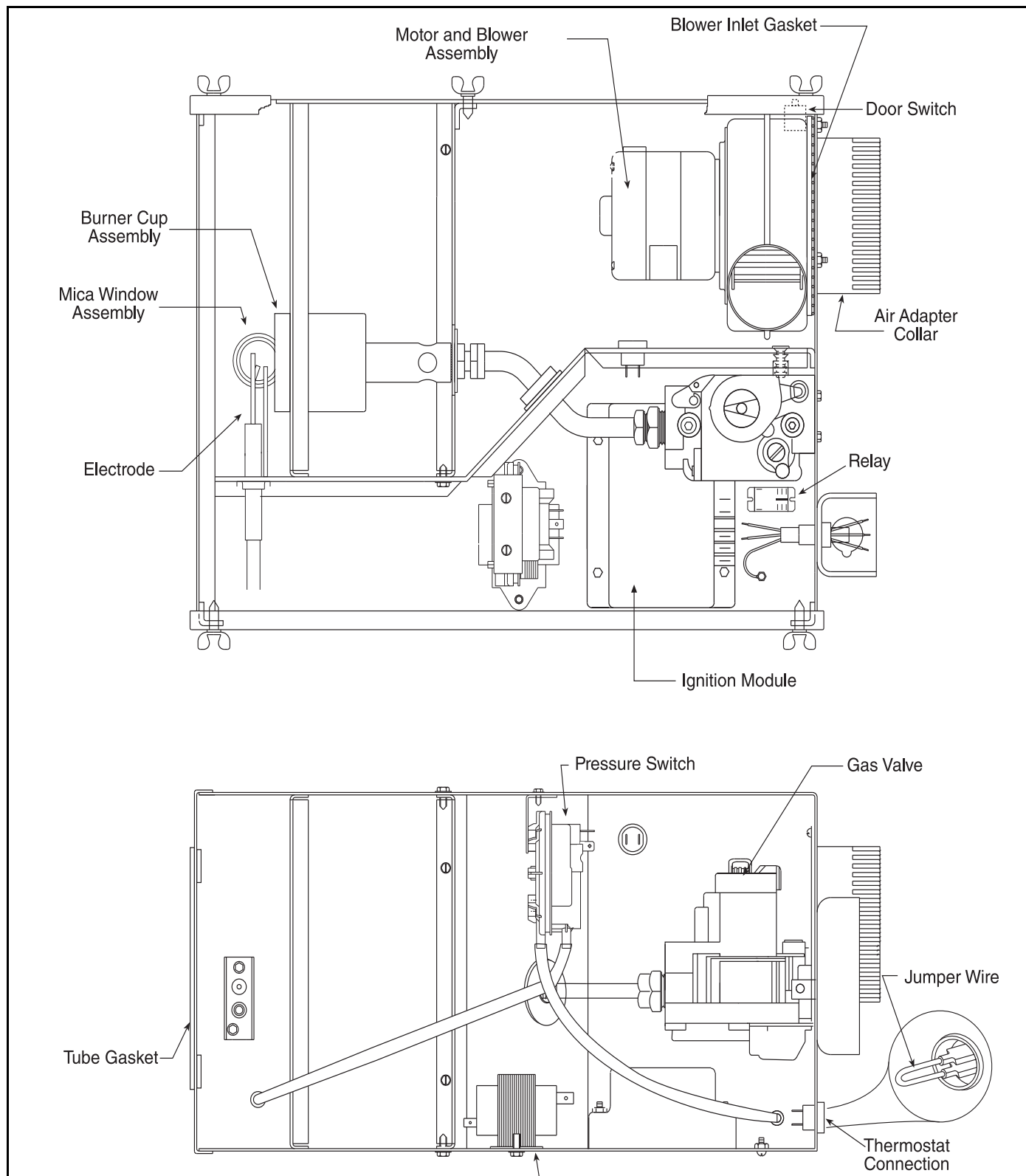
12.2 Manifold Gas Pressure Setting



SECTION 13: REPLACEMENT PARTS

⚠ DANGER		⚠ WARNING	
			
Electrical Shock Hazard	Explosion Hazard	Fire Hazard	Carbon Monoxide Hazard
<p>Use only genuine VAL-CO® 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 47, Section 11.3* 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 51, Section 12 through Page 54*.



Description	Part Number
Gas Valve (Natural)	90032500
Gas Valve (LP)	90032502
Tube Gasket	02568200
Blower Inlet Gasket	03050900
Motor and Blower Assembly	90708600-P
Air Adapter Collar	91911700
Door Switch	90436800
Burner Cup Assembly	03020100
Electrode	90427400
Mica Window Assembly	02553203
Ignition Module	90439500K
Transformer	90436900K
Pressure Switch:	
(175)	90439802K
(100)	90439803K
(80,150)	90439810K
(40, 60, 125)	90439805K
Gas Valve (Natural)	90068300
24 VAC Relay	07105

SECTION 14: GENERAL SPECIFICATIONS

14.1 Material Specification

14.1.1 Reflectors

.024 Aluminum
(optional .024 Stainless Steel Type 304)

14.2 Heater Specifications

14.2.1 Ignition

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

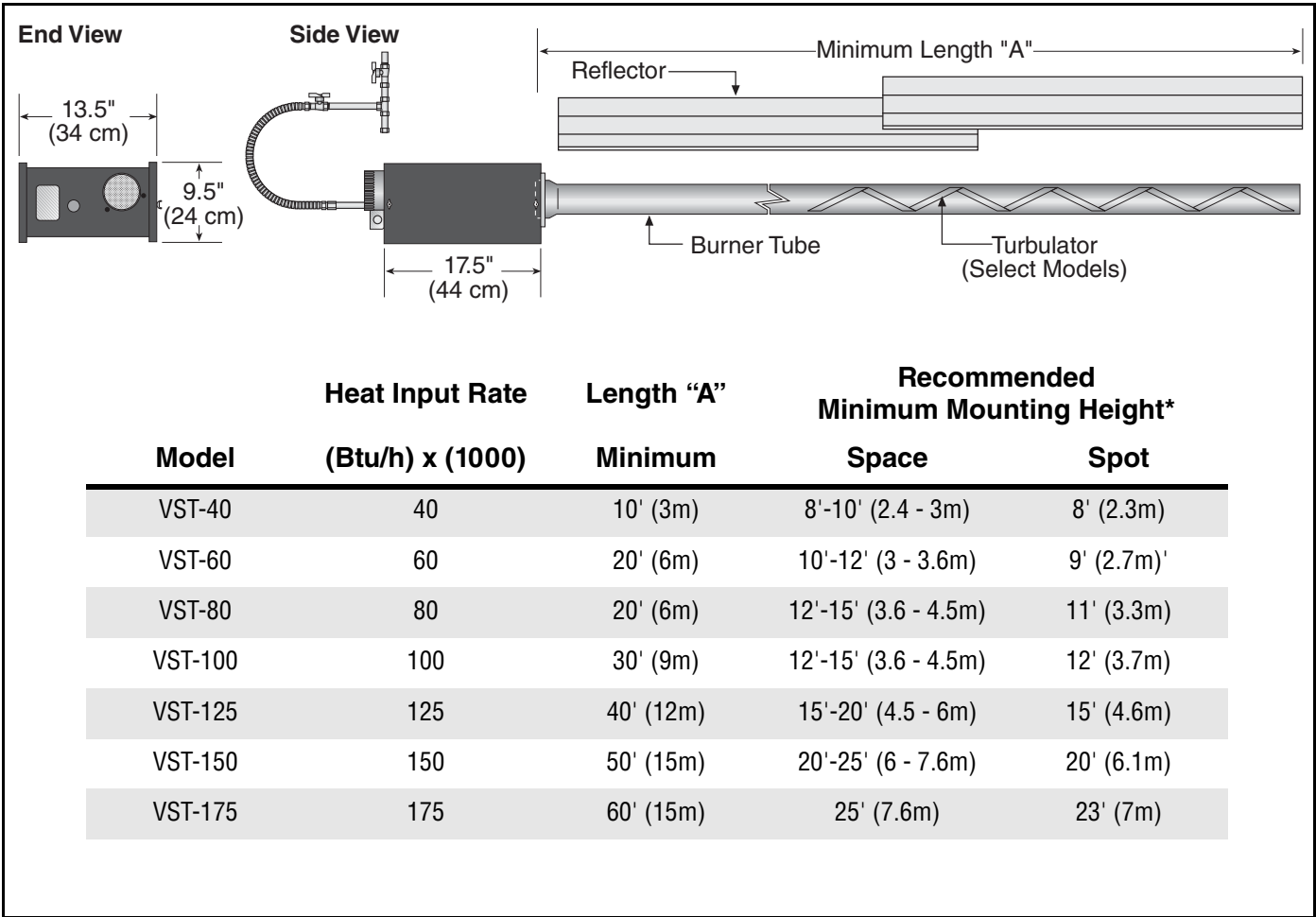
14.3 Suspension Specifications

Hang heater with materials with a minimum working load of 75 lbs (33 kg). See Page 14, Figure 11.

14.4 Controls Specifications

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

General Specifications for the heaters are as follows:



*See Page 6, 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 40, 60, 80, 100, 125)
3/4" NPT (for 150 & 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 40,60,80,100,125,150 4.6" wc Minimum
for 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., 1.0 A (Start)

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



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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