

# ITH-SERIES GAS-FIRED INFRARED TUBE HEATERS TECHNICAL MANUAL

## **⚠WARNING:**

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

## **FOR YOUR SAFETY**

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

## **FOR YOUR SAFETY**

If you smell gas:

1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.



## **INSTALLER**

Read and thoroughly understand these instructions before attempting any installation.

## **OWNER**

Retain this manual for reference.

***CAUTION: FIRE OR EXPLOSION HAZARD***

Maintain clearance to combustible constructions as further specified in this manual. Failure to do so could result in a serious fire hazard. Heaters should not be located in hazardous atmospheres containing flammable vapors or combustible dusts. Signs should be provided in storage areas specifying maximum safe stacking height.

***CAUTION: MECHANICAL HAZARD***

This equipment expands and contracts with each operating cycle. The gas connection, suspension hardware and the installation itself must safely allow this movement. Failure to do so could result in serious fire or explosion hazard.

***CAUTION: FIRE OR EXPLOSION HAZARD***

This heater is equipped with an automatic ignition device. Do not attempt to light the burner by hand. Failure to comply could result in a serious fire and personal injury hazard.

***CAUTION: MECHANICAL HAZARD***

Do not use high pressure (above 14.0" W.C.) to test the gas supply system with the burner connected. Failure to do so could result in damage to the burner and its control components, requiring replacement.

***CAUTION: SERVICE LIFE RISK***

Do not install equipment in atmospheres containing halogenated hydrocarbons or other corrosive chemicals. Failure to do so may lead to premature equipment failure and invalidation of the warranty. Additionally, it is recommended that the equipment be installed with a slope downward and away from the burner of ¼" in 10' to allow start-up condensate drainage.

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# Introduction

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Established in 1963, Cambridge Engineering, Inc. is a manufacturing company with strong R&D, engineering and customer oriented problem solving capabilities.

High quality, energy efficient Genuine Cambridge heaters reduce operating costs and are engineered to provide trouble-free service for years to come. Cambridge heaters are supported by factory-trained sales/service representatives.

Cambridge ITH-Series, Infrared Tube Heaters are low intensity, high performance gas-fired radiant heaters. This field assembled unitary space heater design includes a premium, high efficiency reflector for additional energy savings in a wide variety of commercial and industrial applications.

## **Important**

These instructions, the layout drawing, local codes and ordinances, and applicable standards such as apply to gas piping and electrical wiring comprise the basic information needed to complete the installation, and must be thoroughly understood along with general building codes before proceeding. Only personnel who have been trained and understand all applicable codes should undertake the installation.

## **Installation Codes**

Installations must comply with local building codes, or in their absence, the latest edition of the national regulations and procedures as listed below.

### ***General Installation and Gas Codes***

Heaters must be installed only for use with the type of gas appearing on the rating plate, and the installation must conform to the National Fuel Gas Code, ANSI Z223.1/NFPA 54.

This heater is approved for indoor installation. Not for use in residential dwellings, refer to Rating plate.

### ***Aircraft Hangar Installation***

Installation in aircraft hangars must conform to the Standard for Aircraft Hangars, ANSI/NFPA 409.

### ***Public Garage Installation***

Installation in public garages must conform to the Standard for Parking Structures, NFPA-88A or Standard for Repair Garages, NFPA 88B.

### ***Parking Structures***

Technical requirements are outlined in ANSI/NFPA 88B.

### ***Gas Supply Lines***

Gas supply pipe sizing must be in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54.

A 1/8" NPT plugged tap must be installed in the gas line connection immediately upstream of the burner farthest from the gas supply meter to allow checking of system gas pressure.

### ***Electrical***

All heaters must be electrically grounded in accordance with the National Electric Code, ANSI/NFPA 70, and must comply with all local requirements.

### ***Venting***

Refer to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 for proper location, sizing and installation of vents as well as information on clearance requirements when penetrating combustible walls for venting purposes.

## General Specifications

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### General Specifications

#### Gas Supply

##### *Inlet Pressure*

Natural Gas:	Minimum	5.0" W.C.	Propane Gas:	Minimum	11.5" W.C.
	Maximum	14.0" W.C.		Maximum	14.0" W.C.

##### *Manifold Pressure*

Natural Gas:	3.5" W.C.	Propane Gas:	10.5" W.C.
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##### *Inlet Connection*

Natural Gas or Propane: 1/2" female NPT

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#### Electric Supply

120 VAC, 60 HZ, 1 Amp: 36" cord with grounded 3 prong plug

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#### Flue and Outside Air Connection

4" O.D. male connection for flue adapter and outside air (optional) provided at the heater

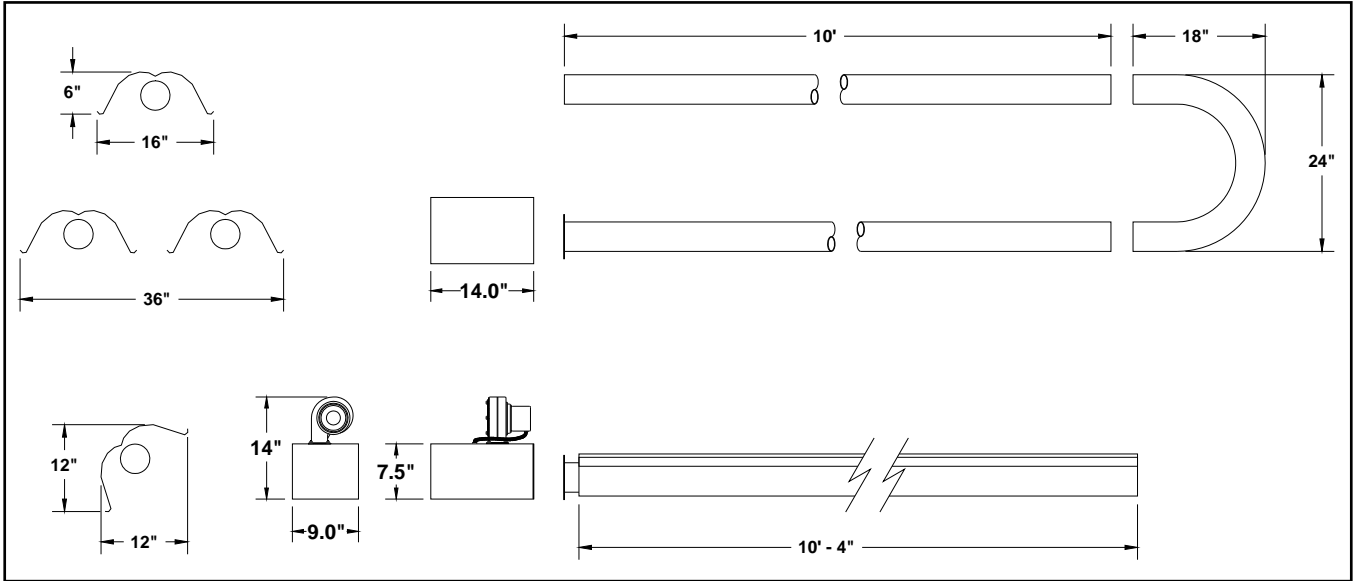


Figure 1: Overall Dimensional Information

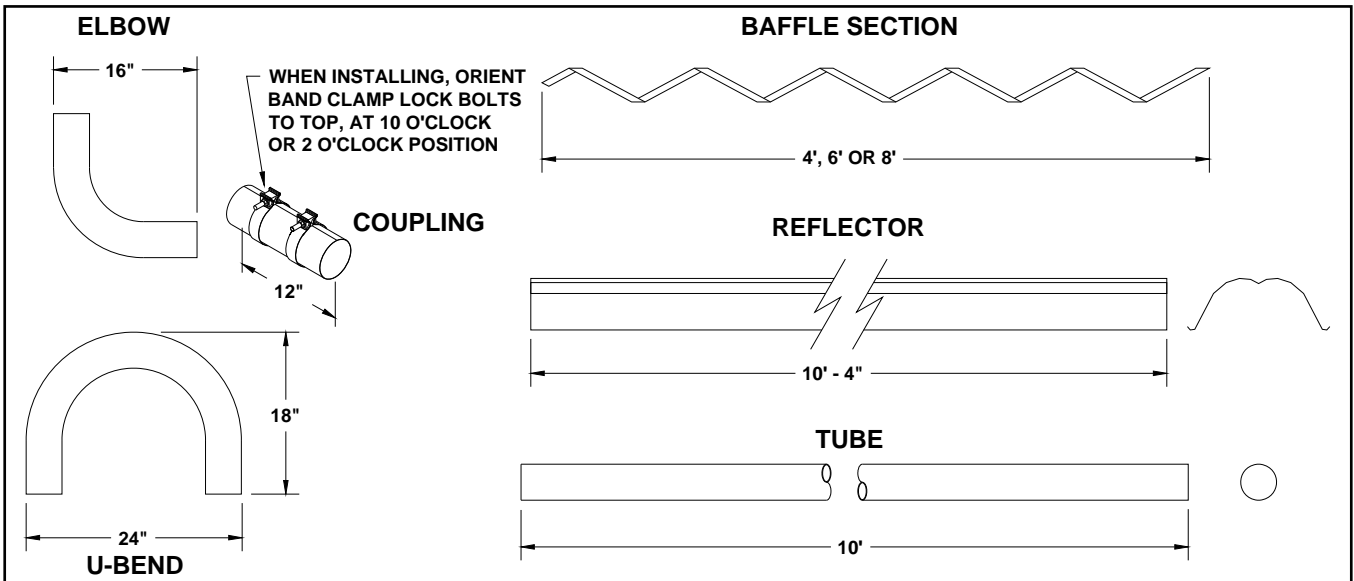


Figure 2: Component Dimensional Information

# Configurations

Model	Rate (BTU/Hr)	Heat Exchanger Length (ft.)		Baffle Length (ft.)	Baffle Kit P/N
		Minimum	Maximum		
ITH-40	40,000	10	20	6	CMCT045
ITH-60	60,000	20	30	6	CMCT046
ITH-80	80,000	20	30	12	CMCT047
ITH-100	100,000	20	30	12	CMCT047
ITH-125	125,000	30	50	12	CMCT047
ITH-150	150,000	40	60	6	CMCT046
ITH-175	175,000	50	60		
ITH-205	205,000	60	70		
ITH-220	220,000	60	70		

Table 1: Configuration Information

**Note:**

- Baffles are always placed in the last section of radiant tube.
- Baffles are either aluminized or stainless steel sections 4', 6' or 8' long.
- When only 6' is required an aluminized steel baffle is installed, except on the ITH-40 where a special 6' stainless steel baffle with a red identification tab must be installed.
- When 12' is required the aluminized steel baffle is lengthened forward (*toward the burner*) with a 6' stainless steel section.

**Part numbers for reference are:**

- CMCT016 Baffle for ITH-40 only, 6' long, stainless steel with red identification tab.
- CMCT007 Baffle 6' long, aluminized steel
- CMCT006 Baffle extension, 6' long stainless steel.

**The following special configurations are also approved:**

- 80,000 BTU/Hr 40' heat exchanger with NO baffle or 6' aluminized baffle.
- 100,000 BTU/Hr 40' or 50' heat exchanger with NO baffle or 6' aluminized baffle
- 125,000 BTU/Hr 40' or 50' heat exchanger with 6' aluminized baffle
- 150,000 BTU/Hr 60' heat exchanger with NO baffle
- 205,000 BTU/Hr 50' heat exchanger with a 4' baffle at 40', and a 8' baffle at 50' (See Figure 3)

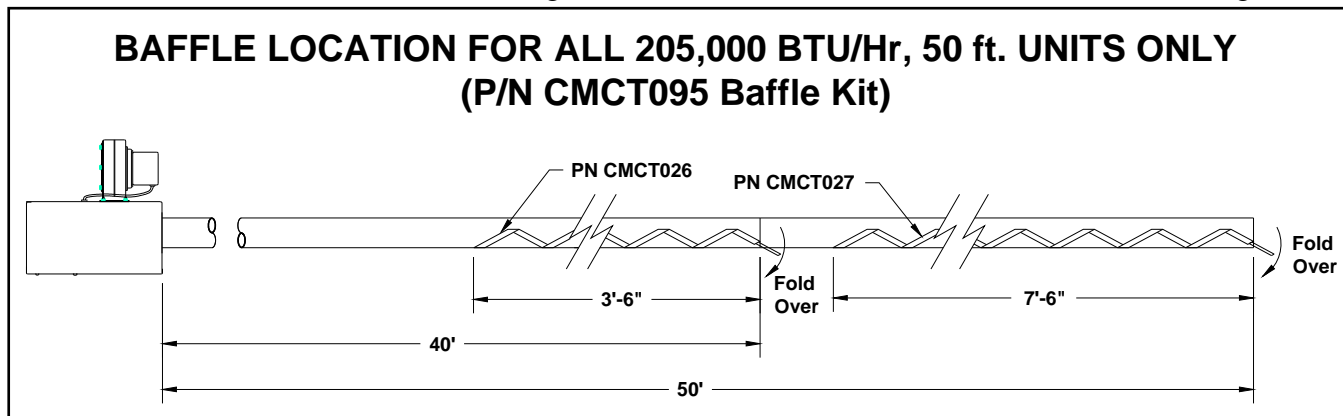


Figure 3: Baffle Location ITH-205 Models



A general clearance of 18” in every direction is recommended for servicing only around each Burner and End Vent Cap air supply (at the far end of each Radiant Branch) also to ensure adequate air flow in and around the Heating System.

**In addition to this it is very important to observe the minimum clearance to combustibles at all times to avoid any possibility of property damage or personal injury.**

### WARNING

- Clearances as marked on the heater body must be maintained from vehicles parked beneath. Signs should be posted identifying any possible violation of the clearance distances from the heater in all vehicle areas.
- Maximum allowable stacking height in storage areas should be identified with signs or appropriate markings adjacent to the thermostat or in a conspicuous location.

Table 2 lists the minimum clearance to combustible materials for various installation configurations. Note that standard clearances also apply to installation above T-bar ceilings and above decorative grills. Additional clearance may be required for glass, painted surfaces and other materials which may be damaged by radiant or convective heat.

*Combustible materials are considered to be wood, compressed paper, plant fibers, plastics, Plexiglas or other materials capable of being ignited and burned. Such materials shall be considered combustible even though flame-proofed, fire-retardant treated or plastered.*

Elbows and U-bends are un-heat treated aluminized material and are typically installed without reflectors. Reflector miter kits are available for U-bends and elbows.

Adequate clearance to sprinkler heads must be maintained.

The stated clearance to combustibles represents a surface temperature of 90°F above room temperature. Building materials with 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.**

#### Note 1:

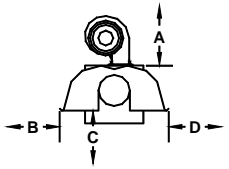
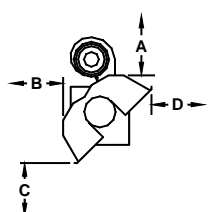
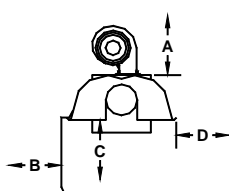
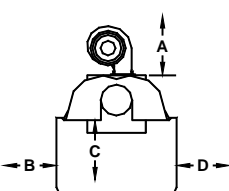
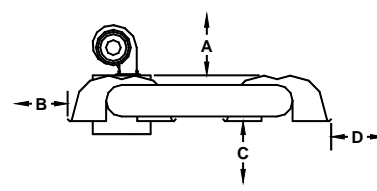
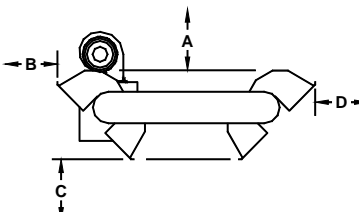
Bottom Shields are approved for all burner sizes. The “below” clearance (dimension C in Table 2) may be reduced by 25% when an approved Bottom Shield is used.

#### Note 2:

Reduced clearances downstream from the burner are approved for all configurations. Dimensions “B”, “C”, and “D” in Table 2 can be reduced for locations 25’ or more downstream from a burner. Before the next burner, maximum reduction is 50%.

# Clearance to Combustibles

Table 2: Minimum Clearance to Combustibles

Reflector Configurations	Dim	Model No.: ITH								
		40	60	80	100	125	150	175	205	220
Horizontal 	A	2"	2"	2"	2"	4"	4"	6"	6"	6"
	B	18"	25"	26"	30"	33"	36"	40"	44"	46"
	C	45"	58"	62"	67"	71"	74"	78"	80"	83"
	D	18"	25"	26"	30"	33"	36"	40"	44"	46"
45° Reflector Tilt 	A	4"	4"	4"	4"	6"	6"	8"	8"	8"
	B	4"	4"	4"	4"	4"	4"	4"	4"	4"
	C	40"	50"	58"	67"	70"	71"	74"	78"	81"
	D	38"	46"	50"	58"	63"	64"	67"	72"	77"
One Side Extension 	A	2"	2"	2"	2"	4"	4"	6"	6"	6"
	B	4"	4"	4"	4"	4"	4"	6"	6"	6"
	C	50"	58"	63"	73"	76"	78"	80"	84"	84"
	D	35"	38"	42"	45"	50"	52"	54"	56"	58"
Two Side Extension 	A	2"	2"	2"	4"	4"	4"	6"	6"	6"
	B	9"	16"	18"	18"	22"	24"	26"	29"	31"
	C	50"	58"	64"	71"	78"	80"	82"	86"	88"
	D	9"	16"	18"	18"	22"	25"	26"	29"	31"
U-Tube, Horizontal 	A	-	2"	2"	2"	4"	4"	6"	6"	6"
	B	-	25"	28"	30"	34"	37"	40"	45"	46"
	C	-	59"	62"	71"	74"	76"	78"	82"	88"
	D	-	22"	26"	30"	33"	36"	40"	44"	46"
U-Tube, Opposite 45° 	A	-	4"	4"	4"	4"	4"	8"	10"	10"
	B	-	46"	50"	54"	63"	64"	67"	72"	74"
	C	-	51"	54"	64"	69"	71"	74"	78"	81"
	D	-	16"	18"	18"	22"	24"	26"	29"	32"
Unvented	Above End	12"	12"	18"	18"	18"	18"	18"	18"	18"
	End	26"	26"	26"	26"	26"	32"	32"	32"	32"
Vented	End	18"	18"	18"	18"	18"	18"	18"	18"	18"

## Installation Sequence

Generally, there is no unique sequence for installation of the burner or heat exchanger. A review of the job site will usually indicate a logical installation order. However, time and expense can be saved if installation is begun at the most critical dimension, watching for interference from overhead doors, cranes, auto lifts, etc. Figure 4 provides a general overview of the components utilized in the installation, as well as their general relationship.

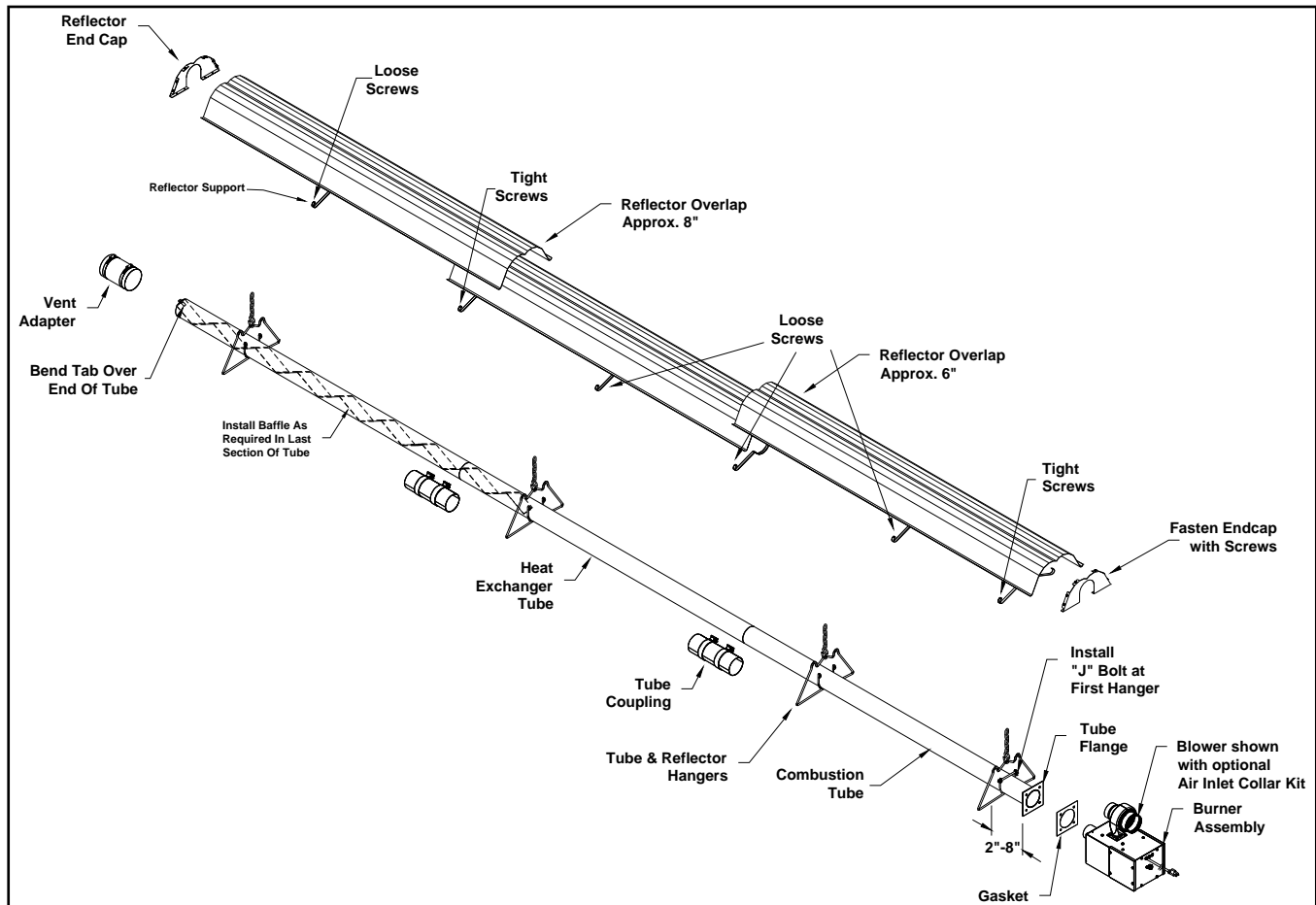


Figure 4: General Overview of Installation

A general ordered sequence for installation is provided below for reference.

## HANGERS INSTALLATION

- Suspension mechanism must allow for lateral tubing expansion. A minimum 12" length welded link chain with a working load limit of at least 200 lbs. is recommended. (Figure 5). **Close all open ended S hooks and turnbuckles to avoid unhooking chain with inadvertent contact.**
- Locate hanging chain at predetermined suspension points in the structure. **It is required that the first 2 hangers** be about 8' to 9' apart. Thereafter, 10' apart on average is acceptable for the remainder of the heat exchanger. At no time should hangers be more than 12' apart, (Figure 6).

# Installation

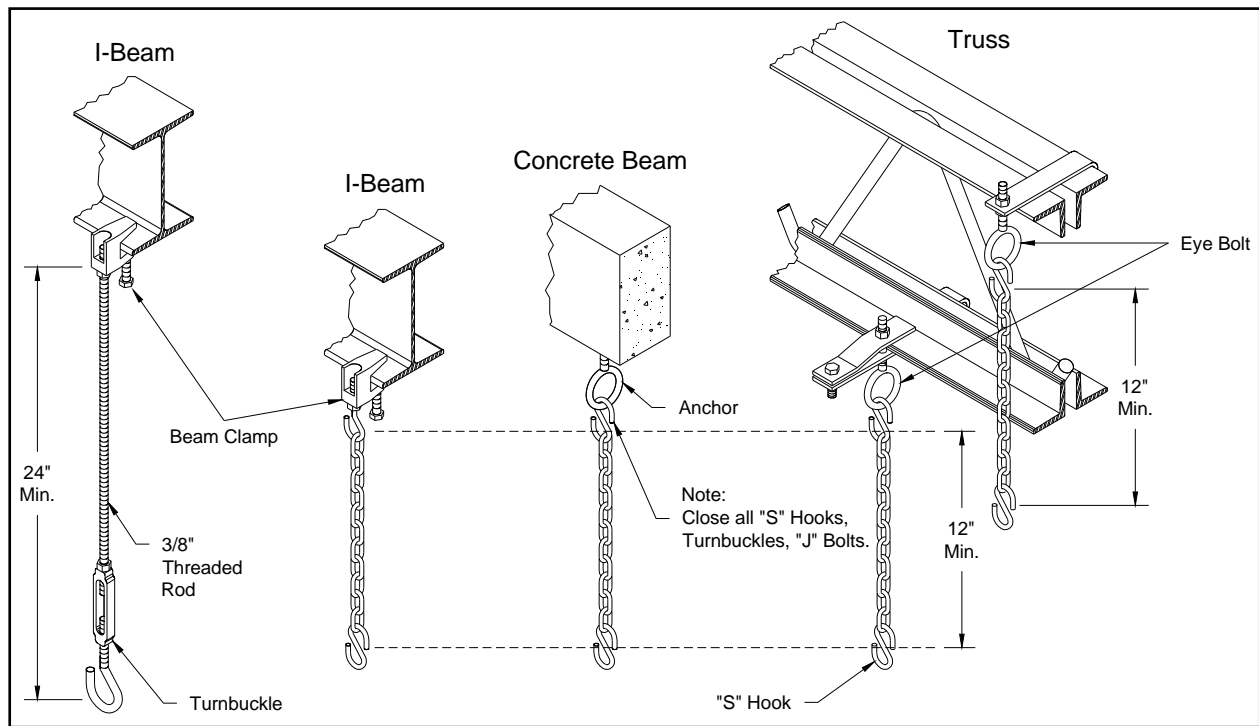


Figure 5: Suspension Mechanism

- Install the tube and reflector support hanger on the chain with “S-hooks” (Figure 5 & Figure 6).

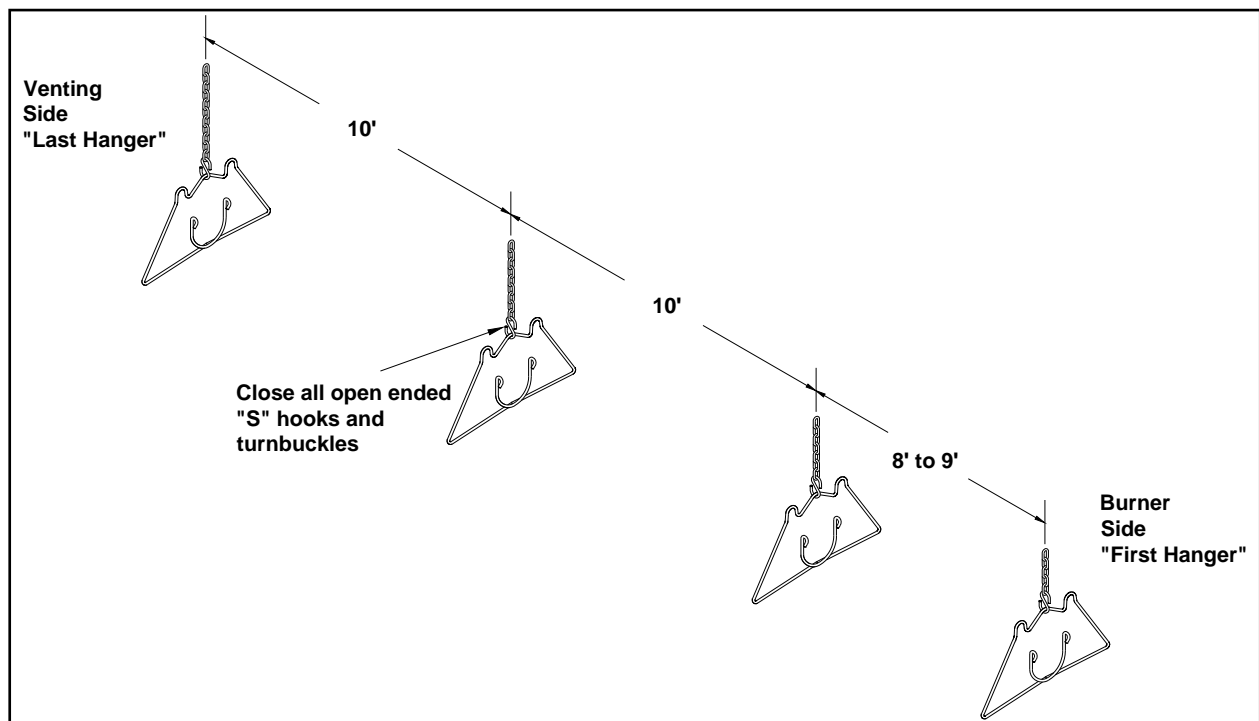


Figure 6: Hanging Points

- Place the first (*flanged, aluminized*) tube in the first two hangers (Figure 7). Be sure the flange is toward the intended burner location. The other end of the tube should have the first coupling already loosely fitted.

## TUBE INSTALLATION

- Always use all the hangers supplied. As a rule the combustion tube (first tube) utilizes 2 hangers and thereafter 1 hanger per 10' section. **It is required that the first hanging point be 2" to 8" from the burner mounting flange, and tube weld seam must face down**, refer to Figure 7 for more details.

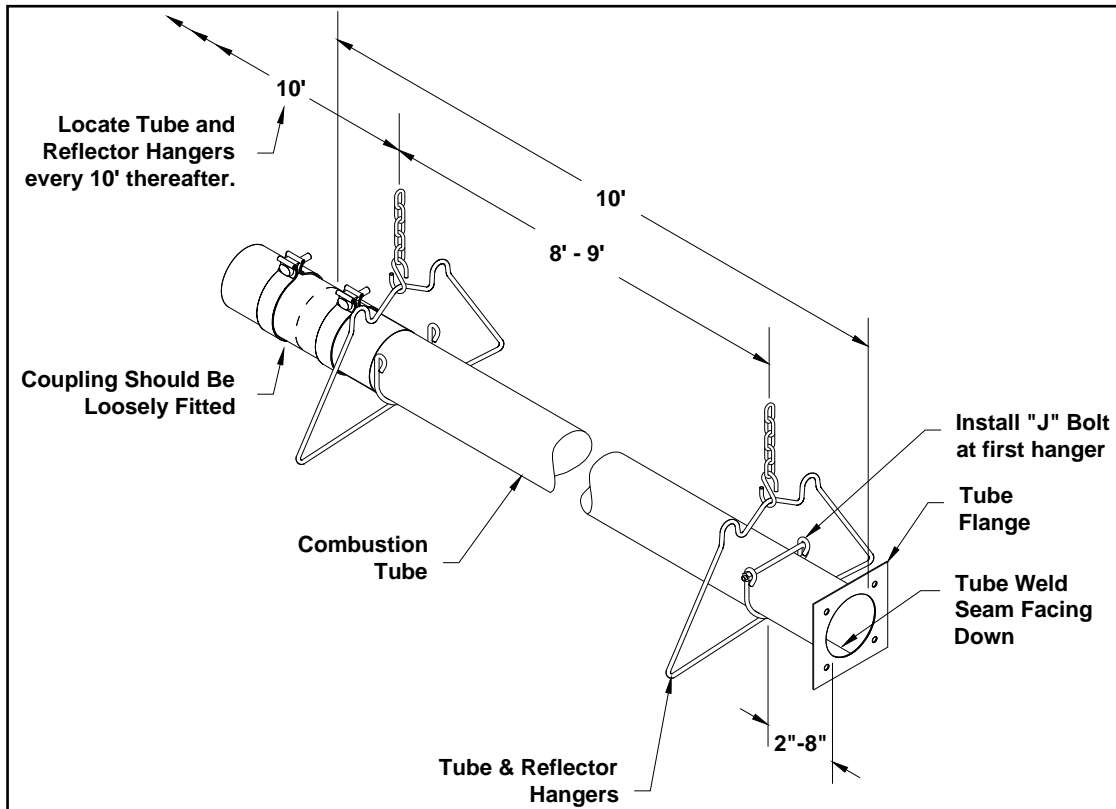


Figure 7: Installation of First section of Flanged Tube

- For all remaining tubes, fit the end of the tube with a coupling (Figure 8), (the coupling should be loose).

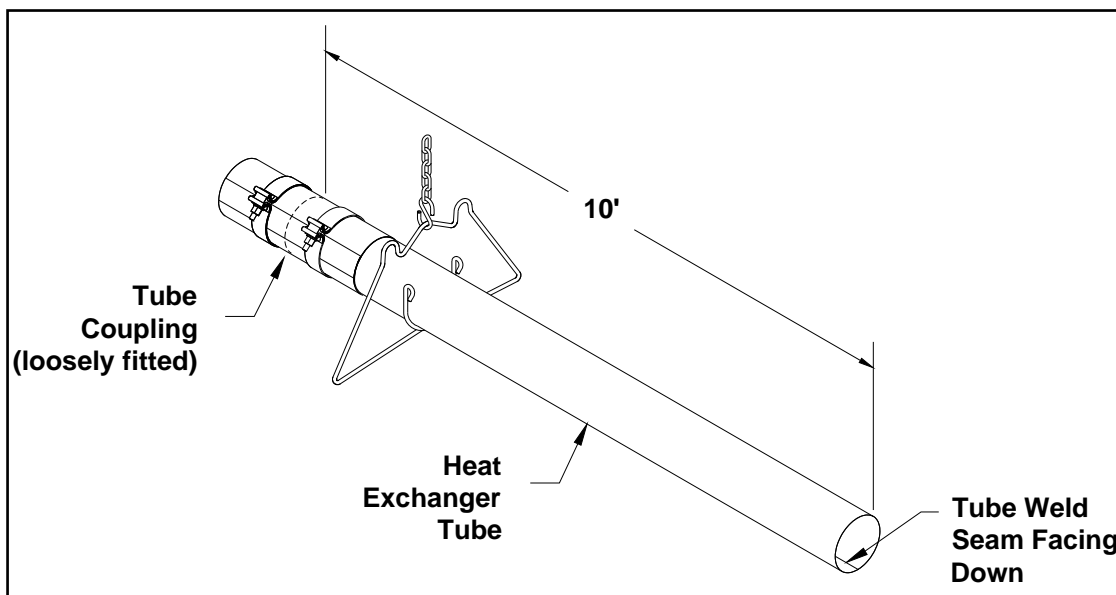


Figure 8: Installation of Heat Exchanger Tube and Coupling

## Installation

- Tighten the cradle loops of the first hanger with the “J-Bolt” found in the burner box, to snugly hold the combustion tube from rotating (Figure 9).

**Note:** For all coupling joints, ensure that the tube joint is in the center of the coupling length, and that the overlap joint of the coupling is above the centerline of the tube. Also ensure that the weld seam on ALL tubes is facing down.

**Note:** *In order to obtain smoothly sealed coupling liners, tighten each of the coupling bands progressively and alternately. Tightening one band completely before the other may result in an undesirable wrinkle in the liner (Figure 9). Be sure not to over torque the coupling. (Torque coupling to 15-25 ft-lbs).*

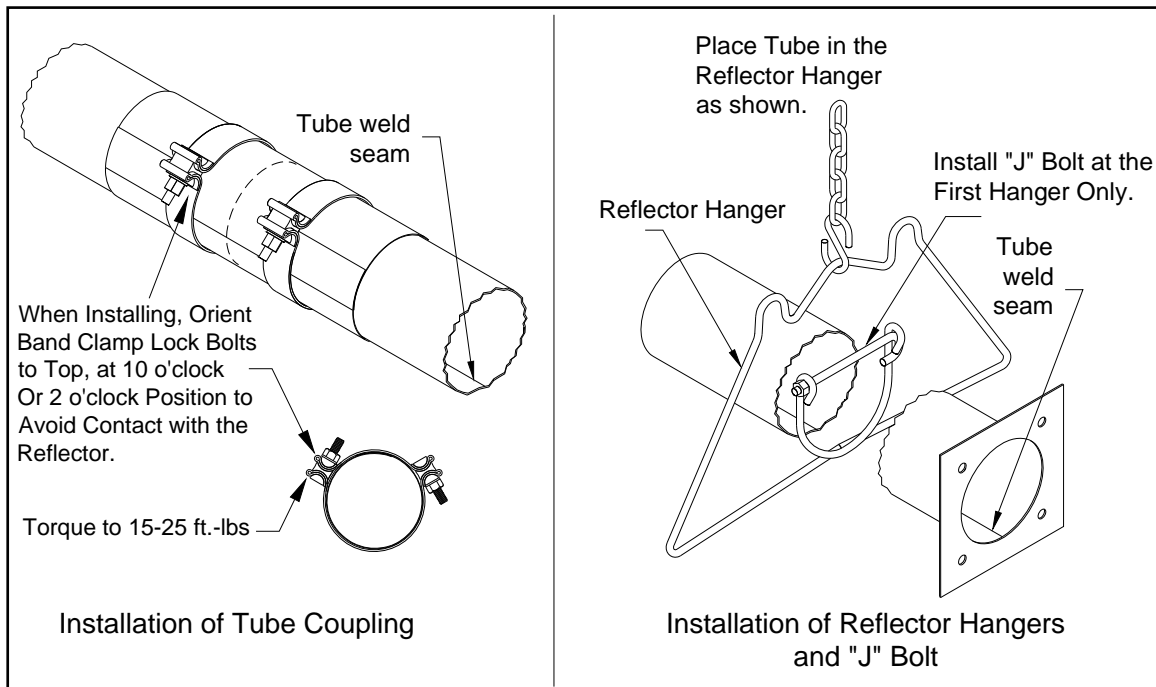


Figure 9: “J” Bolt and Coupling Installations

- Continue placing tubes, couplings and reflectors to complete the heater assembly. Ensure heat exchanger sections line up straight. Couplings should be tightened as heat exchanger is placed, since it is more difficult to do so once the reflector is in position.

## HEATER AND BAFFLE INSTALLATION

- Locate the burner gasket provided, bolt the burner in place on the tube flange with provided hardware. **Burner must never be installed in a tilted position.** The sense electrode of the burner cup should be in the 12 o'clock position (Figure 10).

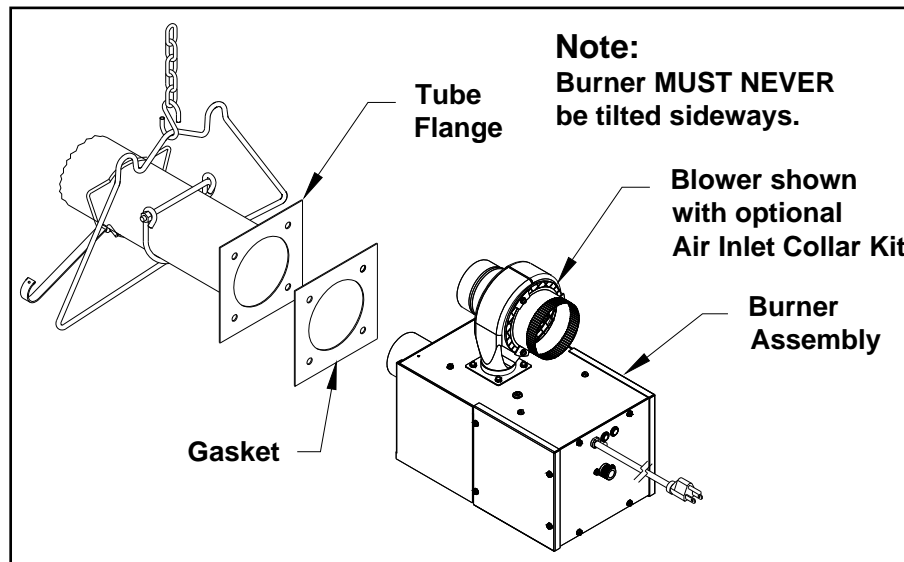


Figure 10: Burner Gasket Installation

- If required for your heater model (refer to Table 1), install the baffle at the end of the heat exchanger. The small tab on the baffle is folded over the end of the tube and clamped in place by the vent connector and vent system, (Figure 11).

*Note: Baffles are always placed at the end of the last heat exchanger tube length, with the exception of the special configuration ITH-205 with a 50' tube length, (Figure 3) for more details.*

*Note: Baffles are either one or two sections (each section is 6' in length). Multiple sections are simply clipped together. Where stainless and aluminized sections are supplied, always place the stainless steel section closest to the burner. The easiest installation method is to pull the baffle through the tube using a long wire.*

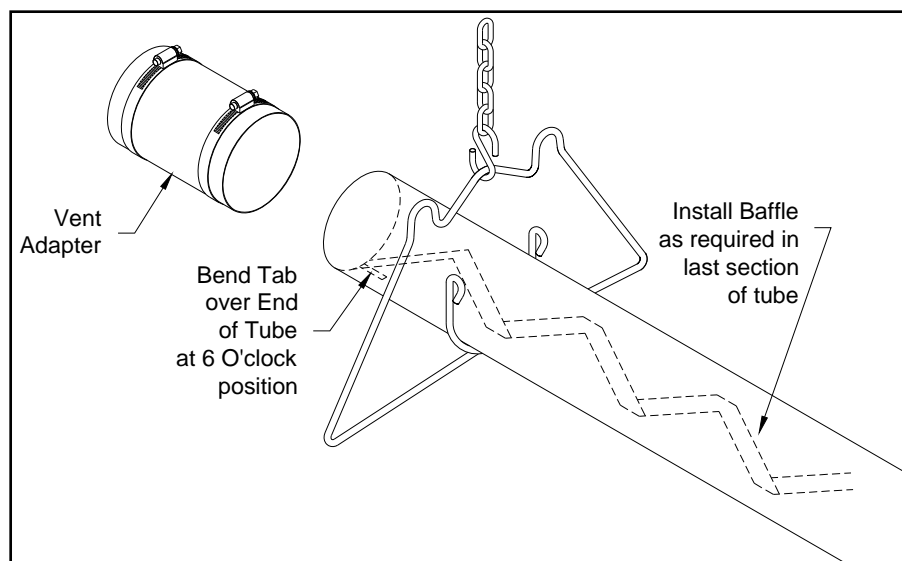


Figure 11: Baffle Installation

# Installation

- A general overall view of the tubes and reflector hangers are shown in Figure 12 below

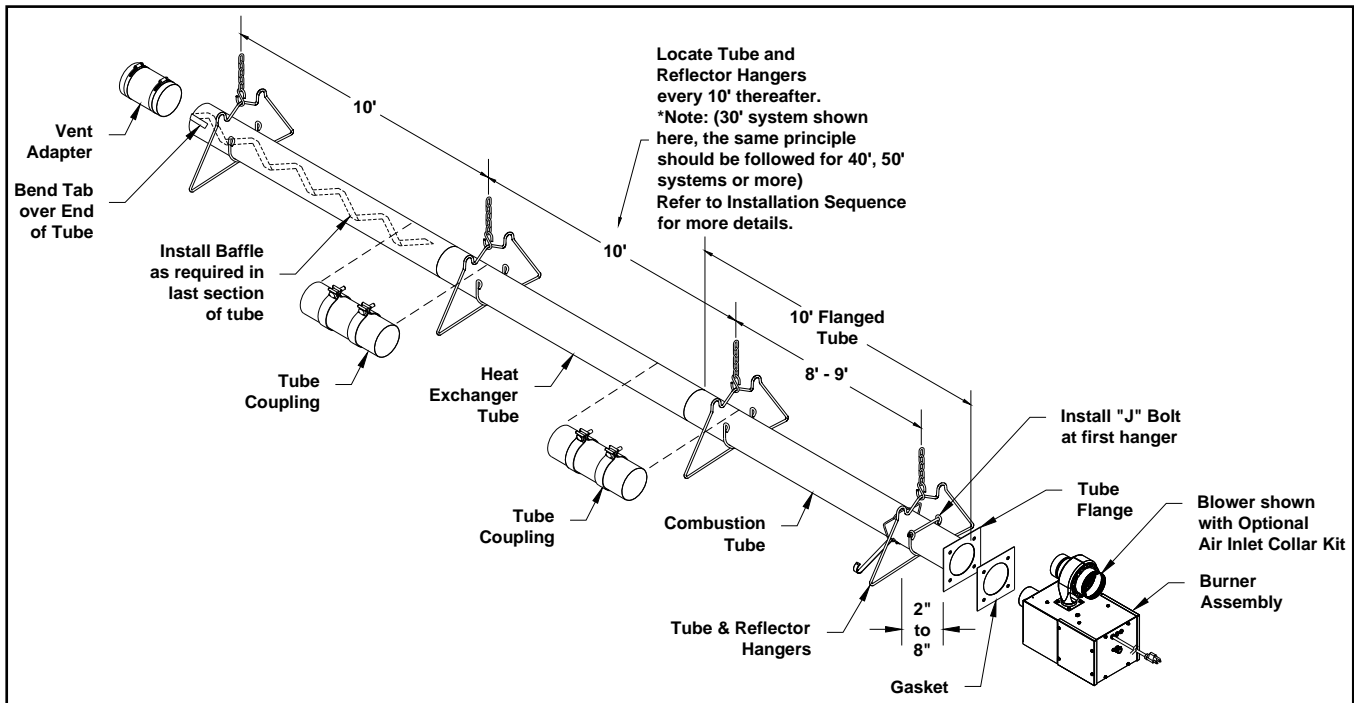


Figure 12: Overall view of Tubes and Reflector Hangers



## REFLECTOR INSTALLATION

- Slide a reflector section into place within the support hanger. (Figure 13).

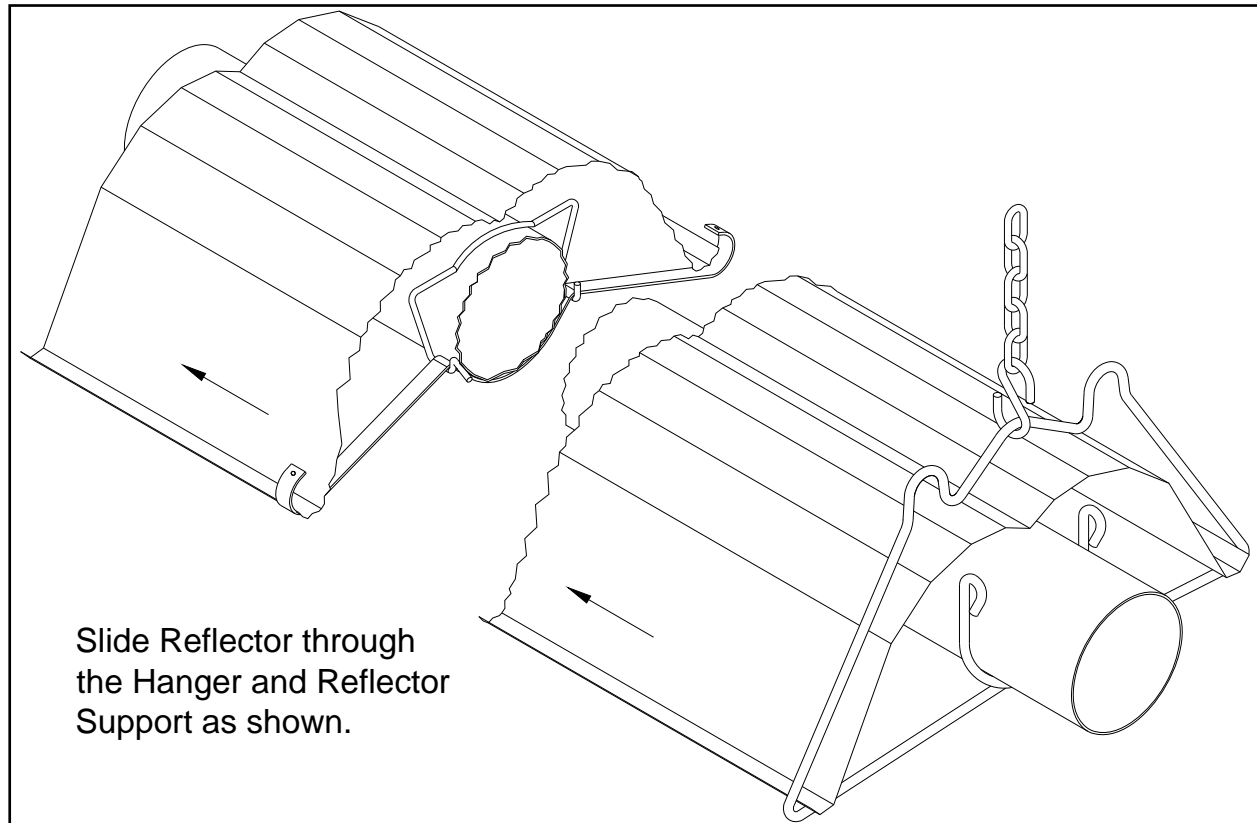


Figure 13: Reflector Installation

- Install reflector support brackets, one at each reflector overlap position, and one in the middle of each 10' reflector length. Figure 14 shows the installation of the reflector support bracket.

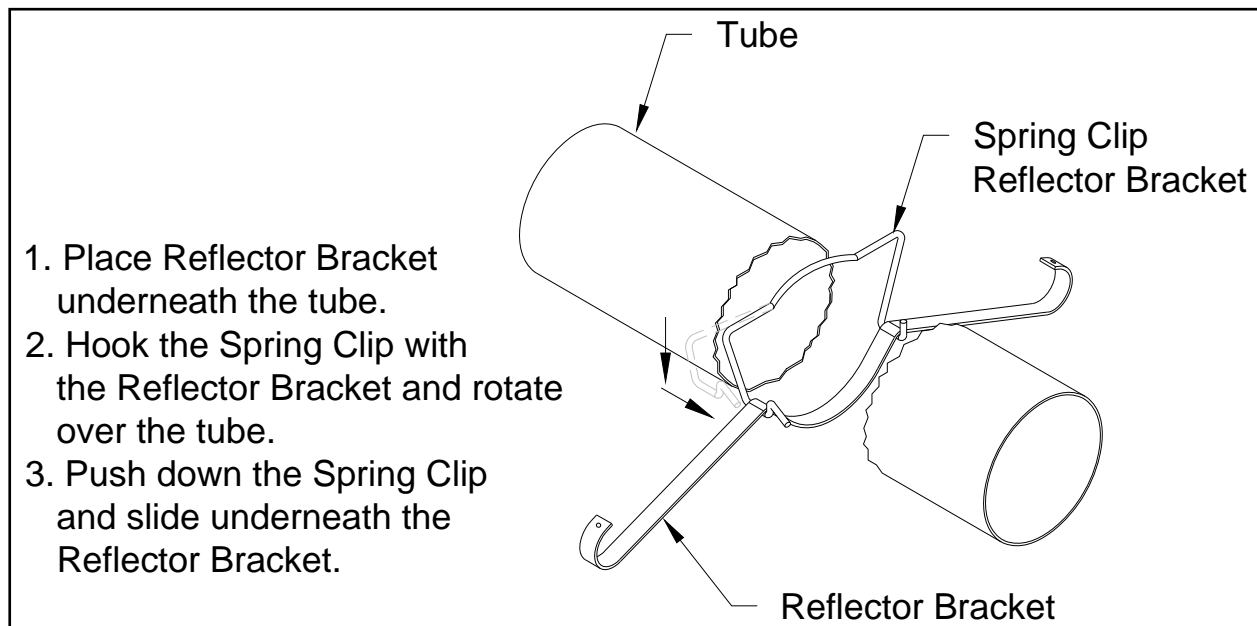


Figure 14: Reflector Support Bracket Installation

# Installation

*Note: Reflectors should overlap adjacent reflectors 4" to 6". Be sure not to tile reflector sections; that is, reflector sections must be either above both adjacent reflector sections, or below both adjacent reflector sections. (Figure 15).*

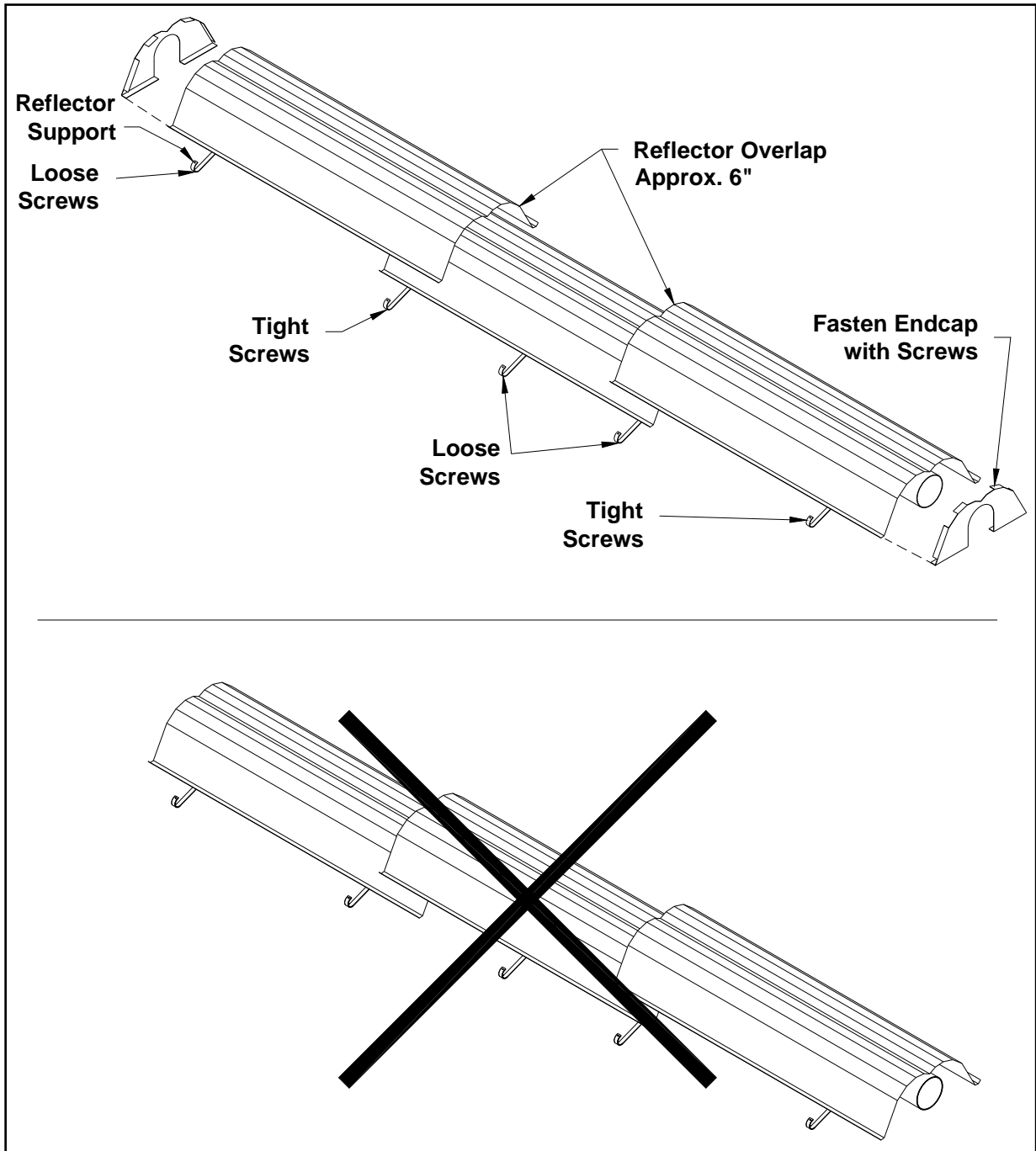


Figure 15: Reflector Overlap Illustration

- Secure every second reflector overlap together with a minimum of 2 - #8 x 3/8" long screws (not supplied), and secure reflector to the reflector bracket at this point by tightening down #8 x 1/4" screws supplied with reflector brackets (Figure 16). The remaining reflector overlap joints and reflector brackets are left loose to accommodate system movement.

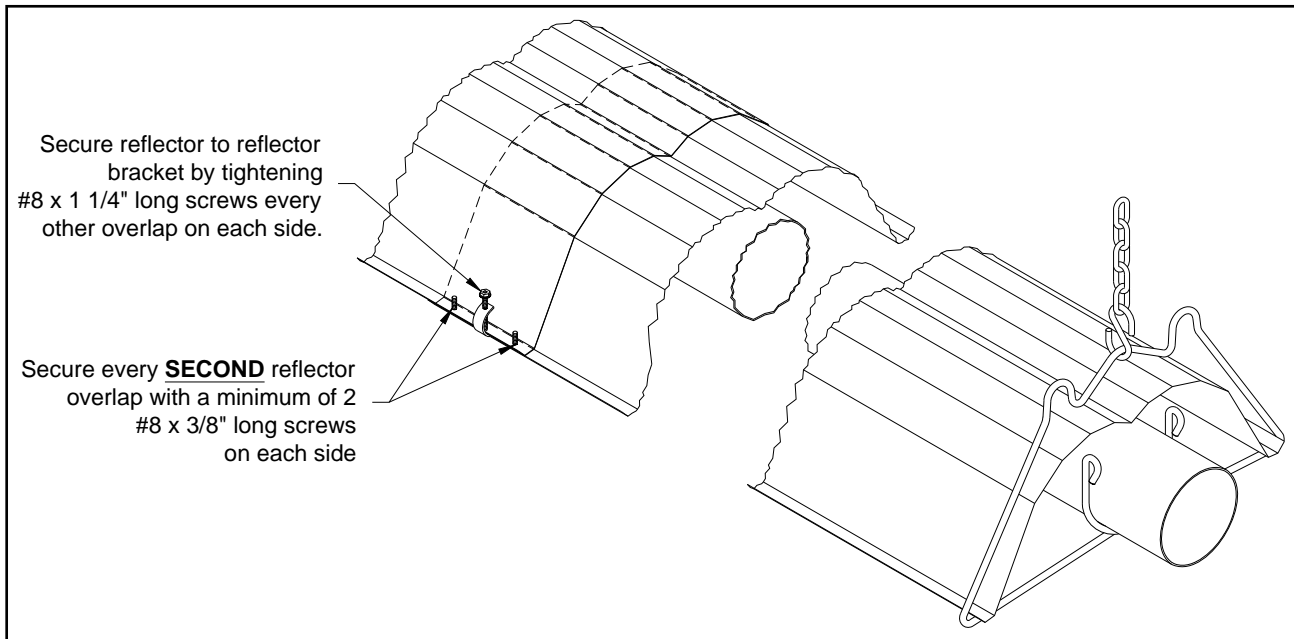


Figure 16: Reflector Supports Installation and Reflector Overlap

- Install End Cap as shown in Figure 4 and Figure 17.

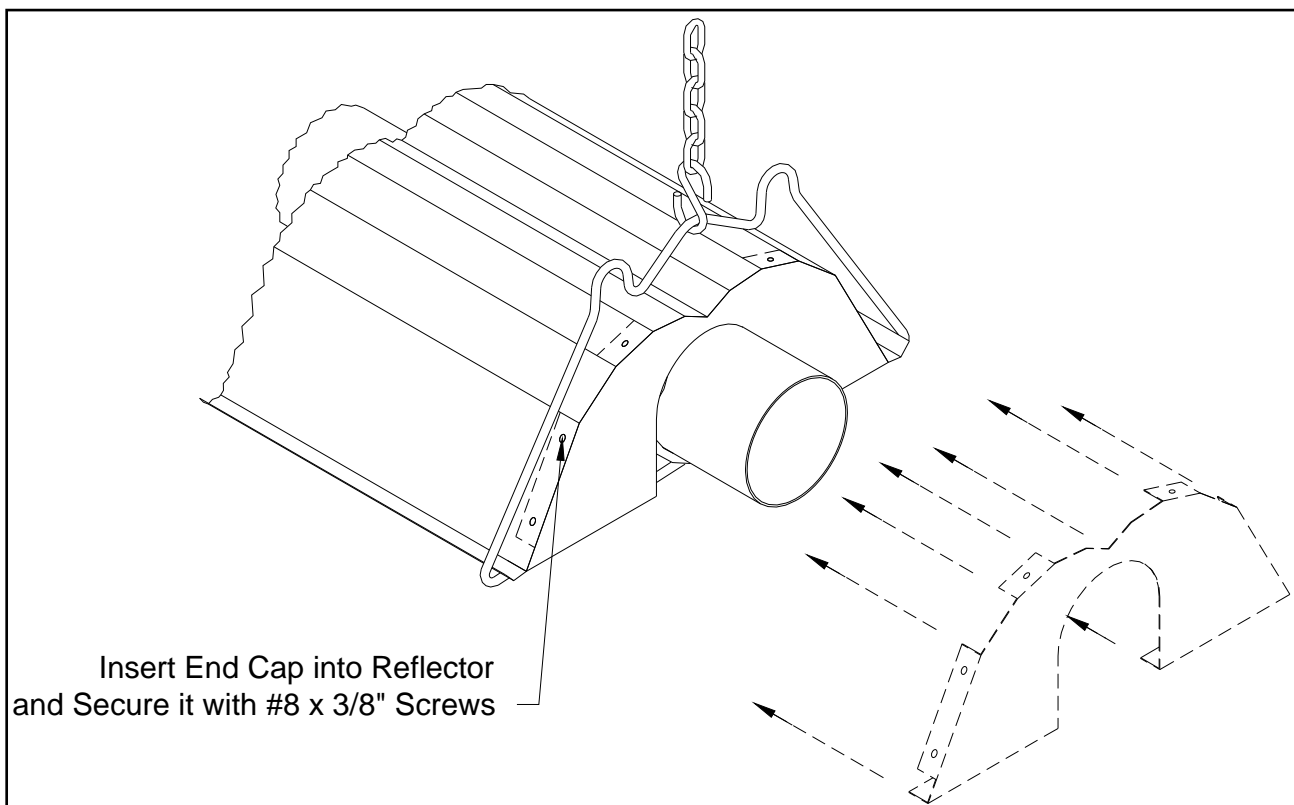


Figure 17: Reflector End Cap Installation

# Installation

## ELBOW AND “U-TUBE” INSTALLATION

- If required by the heater layout, install 90° elbows or U-tube where indicated. Refer to Figure 18 for details.

*Note: Elbows or U-tubes are typically installed without reflectors. To reduce the above clearance to combustibles distance use mitered reflectors (Figure 19) and refer to Clearance to Combustibles information.*

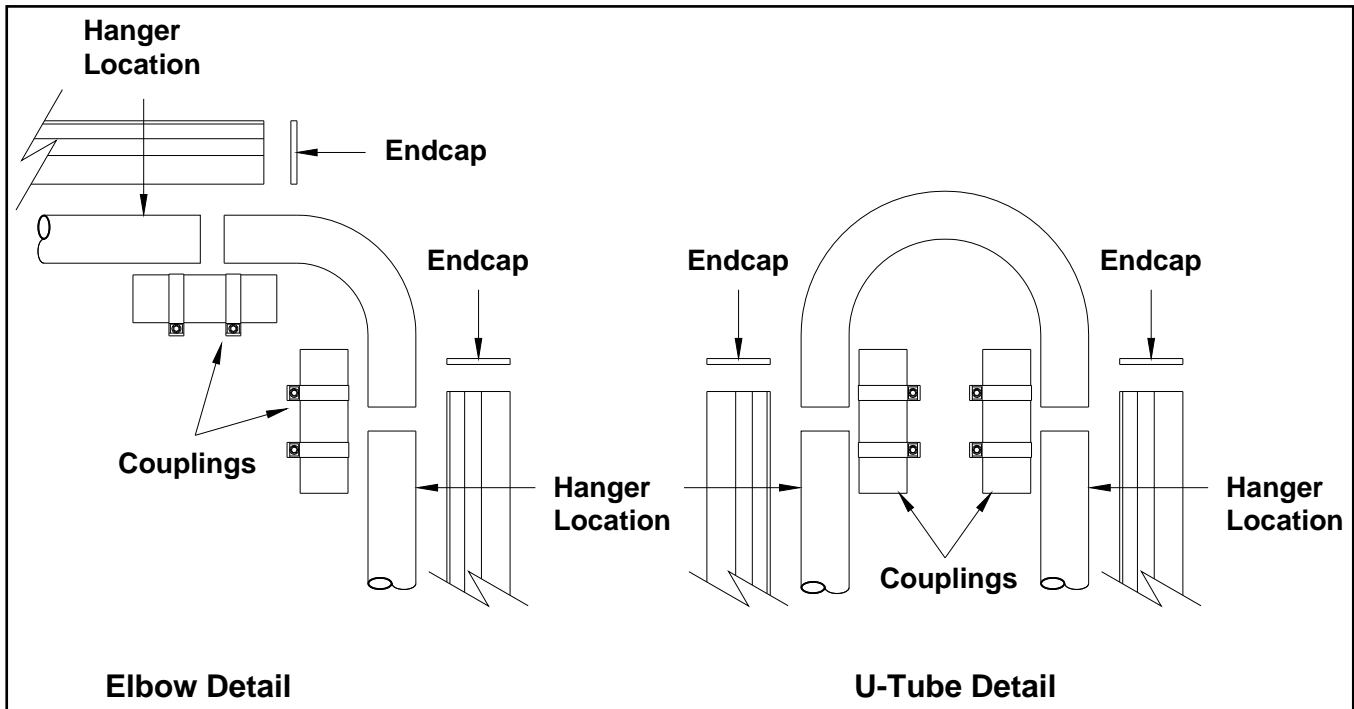


Figure 18: 90° Elbow and U-Tube Assembly Detail

- Elbows or U Tubes must be located not less than 10' from the burner in ITH-100 and smaller models, not less than 15' from the burner in ITH-125 to ITH-150, and not less than 20' from the burner in ITH-175 and larger models.

**MITERED REFLECTOR INSTALLATION**

- If used, install the Mitered Reflector as shown below (Figure 19).

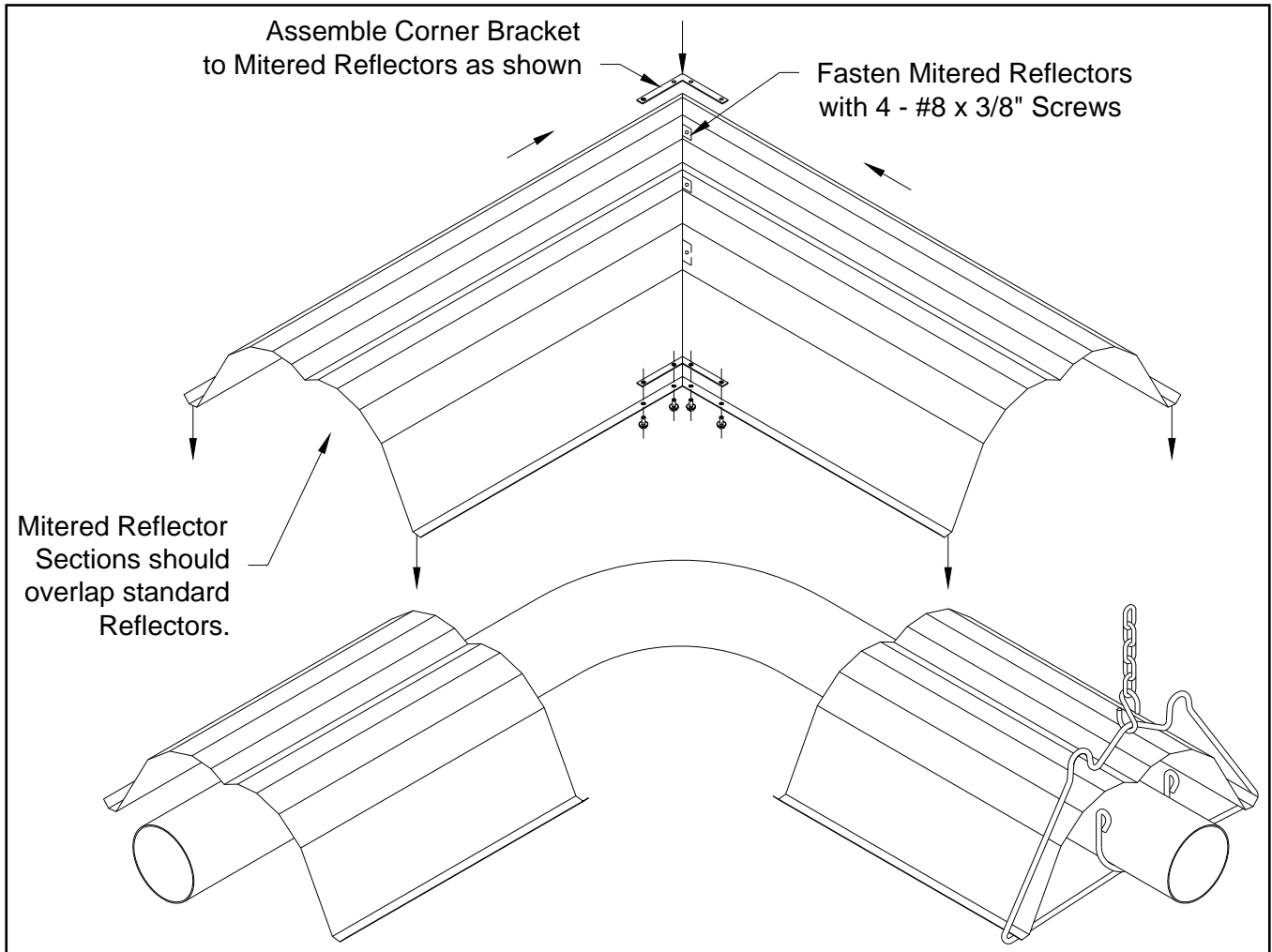


Figure 19: Mitered Reflector Installation

# Installation

## SIDE REFLECTORS & BOTTOM SHIELDS

- If used, install side shields (reflectors) and/or bottom shield as required. (Figure 20 and Figure 21).
- Side shields are 124" long. Fasten one side shield per reflector with #8 x 3/8" screws. Use three side shield brackets per side shield. Space about 48" apart. (Figure 20).

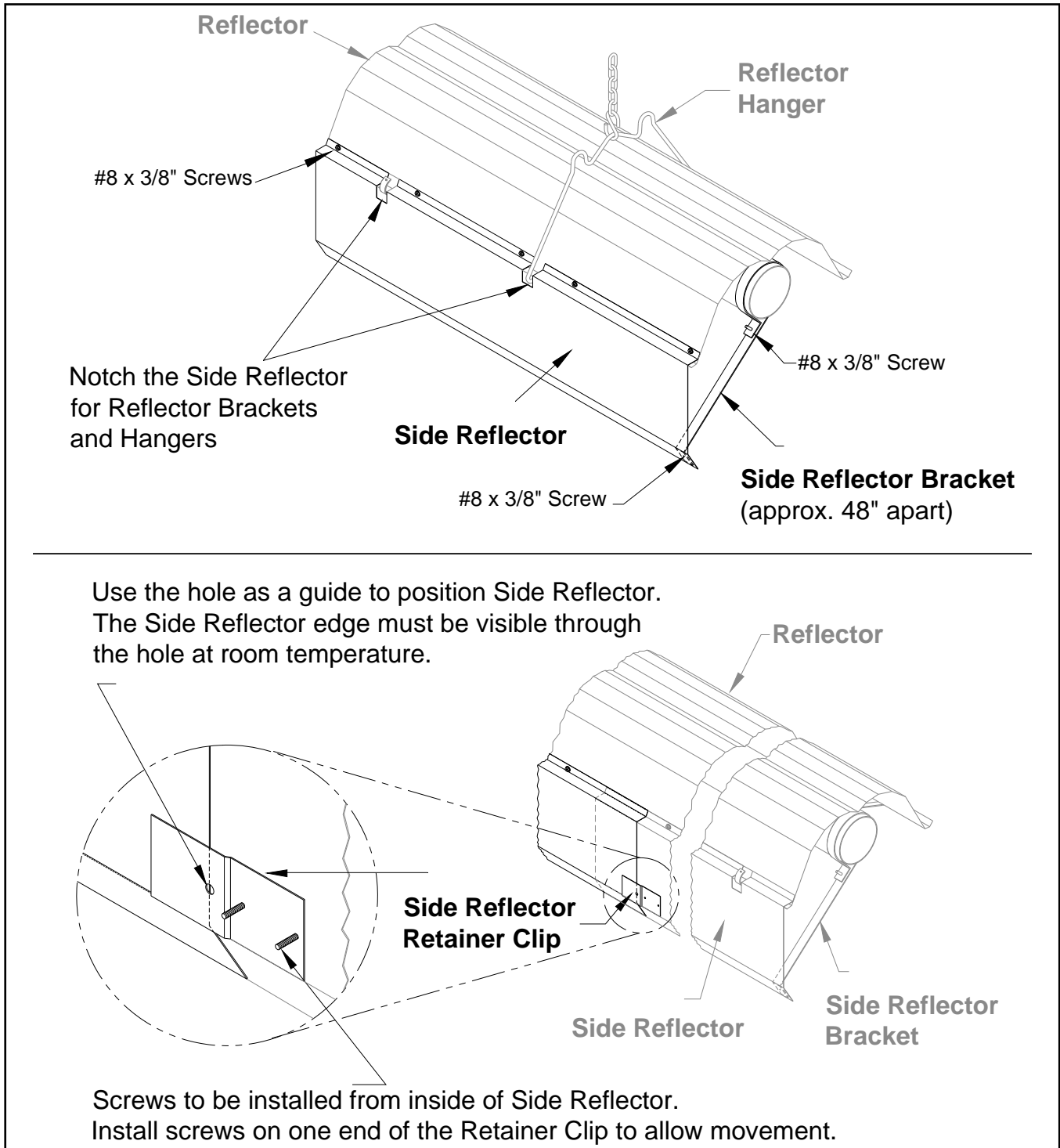


Figure 20: Side Shield Overlap

**BOTTOM SHIELD REFLECTOR INSTALLATION**

- Bottom shields need not overlap. Each 5' section is held with two support brackets (Figure 21).

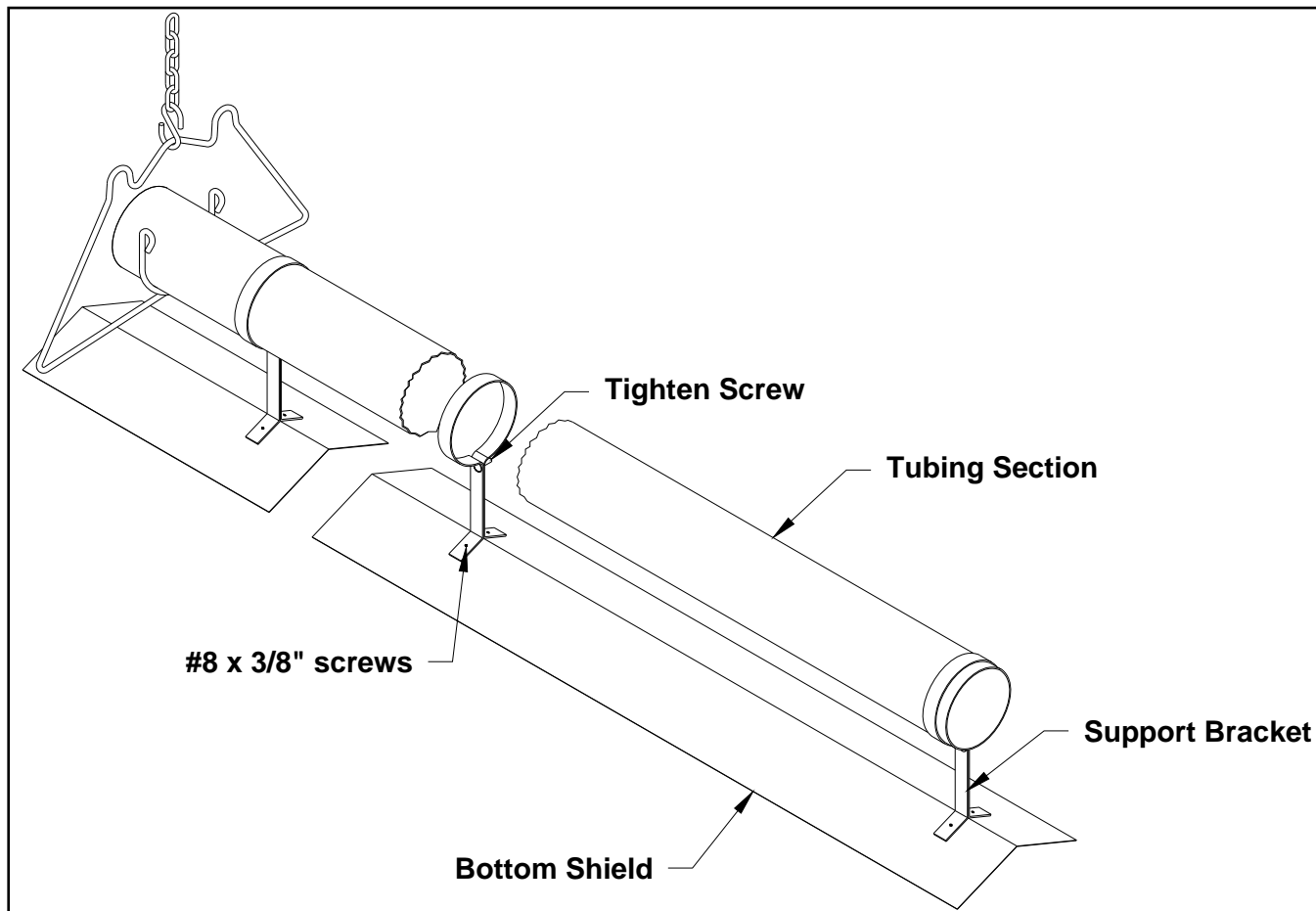


Figure 21: Bottom Shield Installation

# Installation

## DECO-GRILLE (OPTIONAL)

Series ITH heaters are approved for the addition of Deco-Grille either directly to the heater reflector or as part of a T-Bar installation where the heater is above the ceiling structure. (Figure 22 and Figure 23).

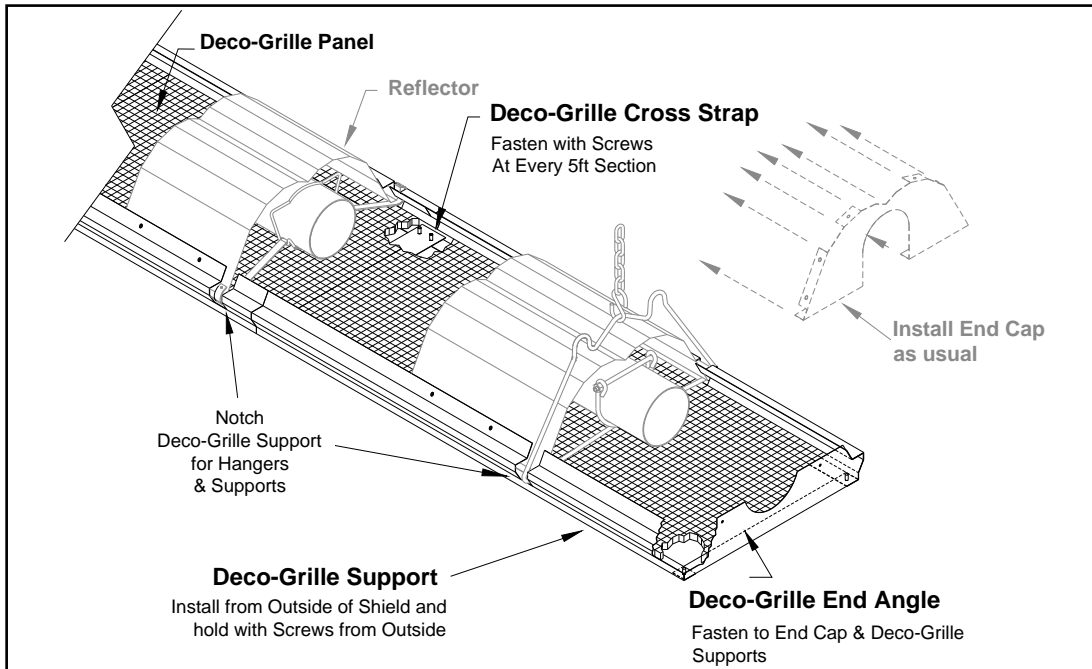


Figure 22: Deco-Grille and Heater Installation

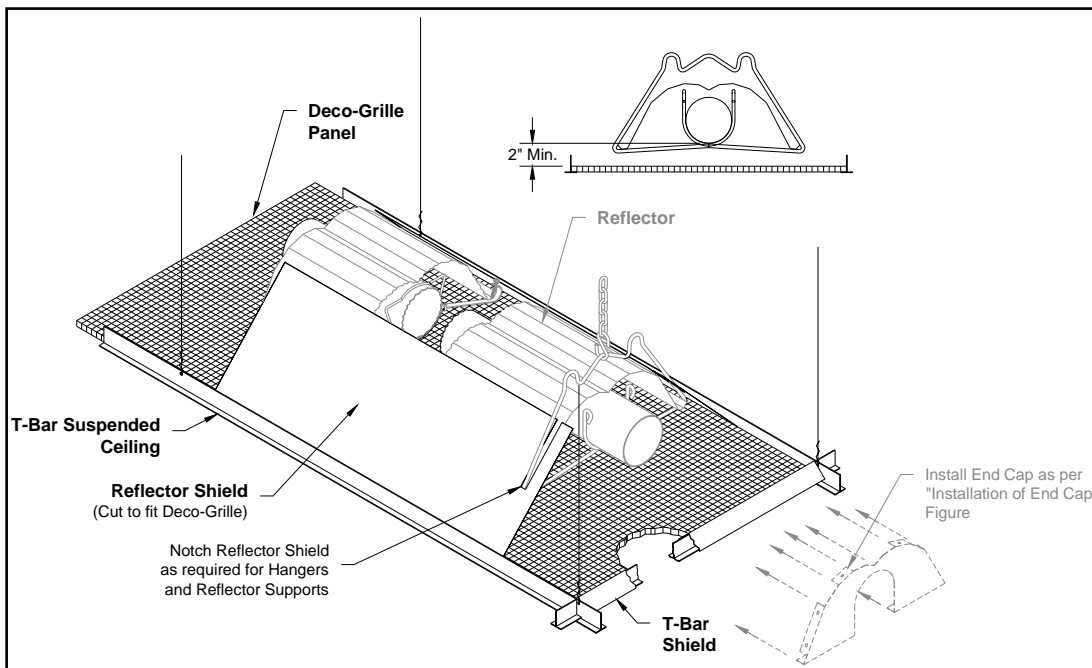


Figure 23: Deco Grille with Suspended Ceiling Installation



## General Requirements

- Refer to the *National Fuel Gas Code*, ANSI Z223.1 (NFPA 54), as well as all local requirements for general venting guidance.
- Series ITH Infrared Heaters may be installed vented or unvented.
- Series ITH Infrared Heaters may be vented horizontally or vertically using conventional venting materials.
- If heater is to be vented horizontally, the vent from building must:
  - Be not less than seven feet above grade when located adjacent to public walkways.
  - Terminate at least three feet above any forced air inlet located within ten feet.
  - Terminate at least four feet below, four feet horizontally from or one foot above any door, window, or gravity inlet into any building.
  - Be located at least one foot from any opening through which vent gases could enter a building.
  - Be beyond any combustible overhang.
  - Be installed at a height sufficient to prevent blockage by snow.
- Optional outside air supply may be directed to the heater horizontally or vertically.

### IMPORTANT

- Maximum total vent length allowed for any model heater is 30'.
- Maximum total fresh air inlet duct length allowed for any model heater is 30'.
- Total of vent length plus outside air supply duct length cannot exceed 50' for any heater with minimum heat exchanger length.
- If condensation in the vent pipe or outside air supply duct is a problem, shorten or adequately insulate the section

**Note:** The above stated requirements assume a maximum of 2 elbows in the total combination of vent and air supply duct. Subtract 5' of allowable length for each elbow if 3 or more elbows are used.

## Unvented Operation

- Requirements for combustion air supply and dilution air vary by jurisdiction, building type and specific installation details. **See local codes for guidance.** In general, where heaters are installed without direct outside combustion air, fresh air ventilation must be provided to the building space. **Verify applicable codes.**
- Optional outside air supply is not recommended for unvented heaters due to possible pressure imbalances in the building space.
- Ensure that minimum combustible clearances are maintained for unvented heaters. Refer to Table 2 for required clearance dimensions.

# Venting / Combustion Air Ducting

## Vented Operation

In all cases, be sure vent pipes and outside air supply ducts are sealed with approved sealant, such as high temperature RTV silicone. Double wall venting (B vent) may not require sealant.

### Horizontal Venting

- When venting through combustible walls, use approved vent terminal Tjernlund VH1-4, or Cambridge Engineering supplied deflector vent terminal with an approved insulating thimble.
  - When venting through non-combustible walls, use supplied deflector vent terminal.
- Recommended extension of the terminal past the outside wall surface is 18" minimum.

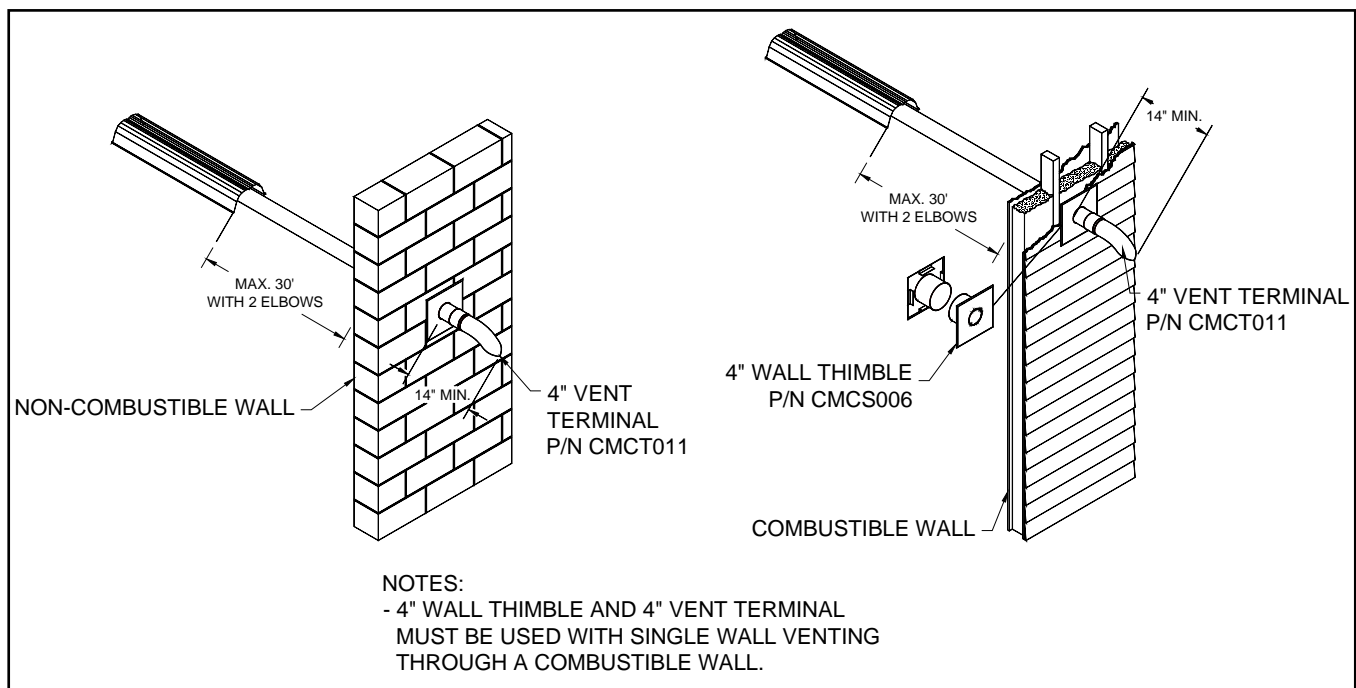


Figure 24: Horizontal Venting

### Vertical Venting

- Minimum vent pipe size is 4" for an individual heater. Additional vent pipe sizes, as required to accommodate multiple heaters venting through a common roof vent, are defined in the appropriate gas installation code. (Refer to common venting section below).
- Use of an approved thimble to pass through combustible roof materials is required.
- Use of an approved vent cap is required.
- Check local codes for vertical vent size for fan-assisted appliances.

### Common Vertical Venting

- Common vent sizing information is defined in the appropriate gas installation code (Refer to ANSI Z223.1 for sizes and installation information).
- For vertical venting refer to ANSI Z223.1 Fan Assisted Category 1 Appliances.
- Connection locations to the common vent should be offset to avoid pressure interferences between heaters, refer to ANSI Z223.1 Fan Assisted Category 1 Appliances.

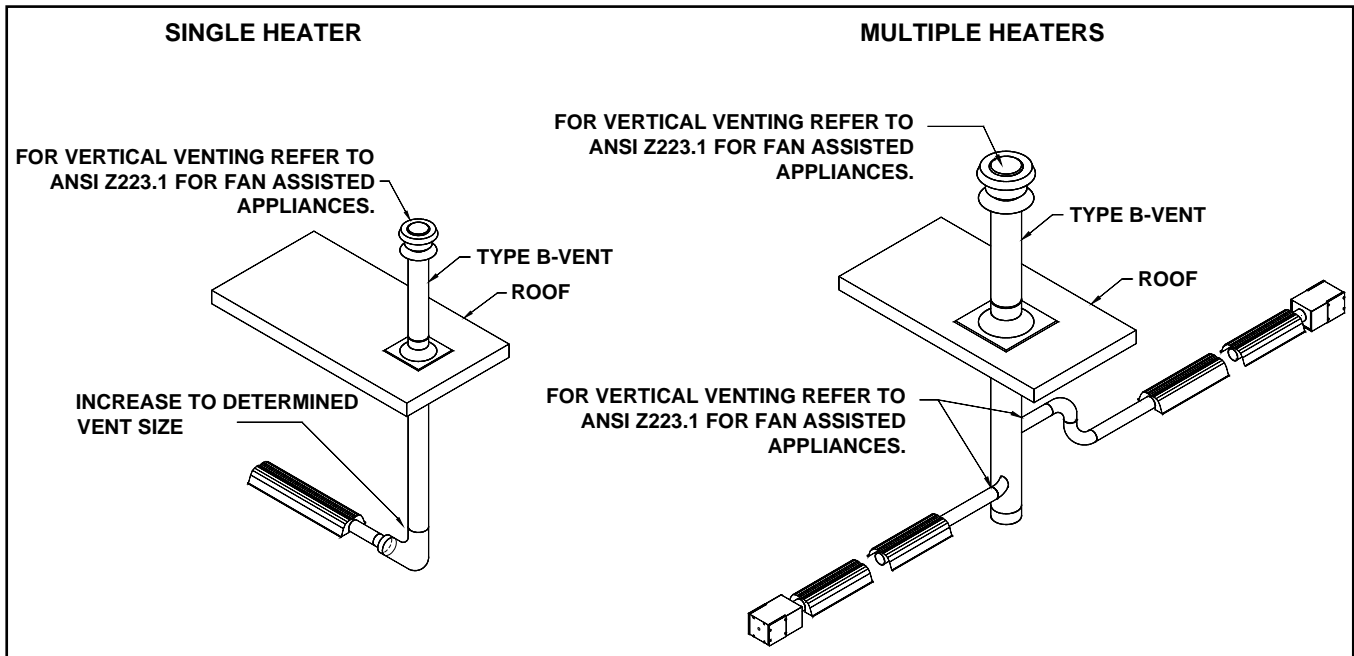


Figure 25: Common Vertical Venting

## Common Horizontal Venting

- All heaters connected to a common horizontal vent must operate at the same time. Connect the electrical circuit to the same thermostat to ensure simultaneous operation.
- Fresh air supply **CANNOT** supply other burner systems.
- Refer to Figure 26 for detailed Common Horizontal Venting guidelines.

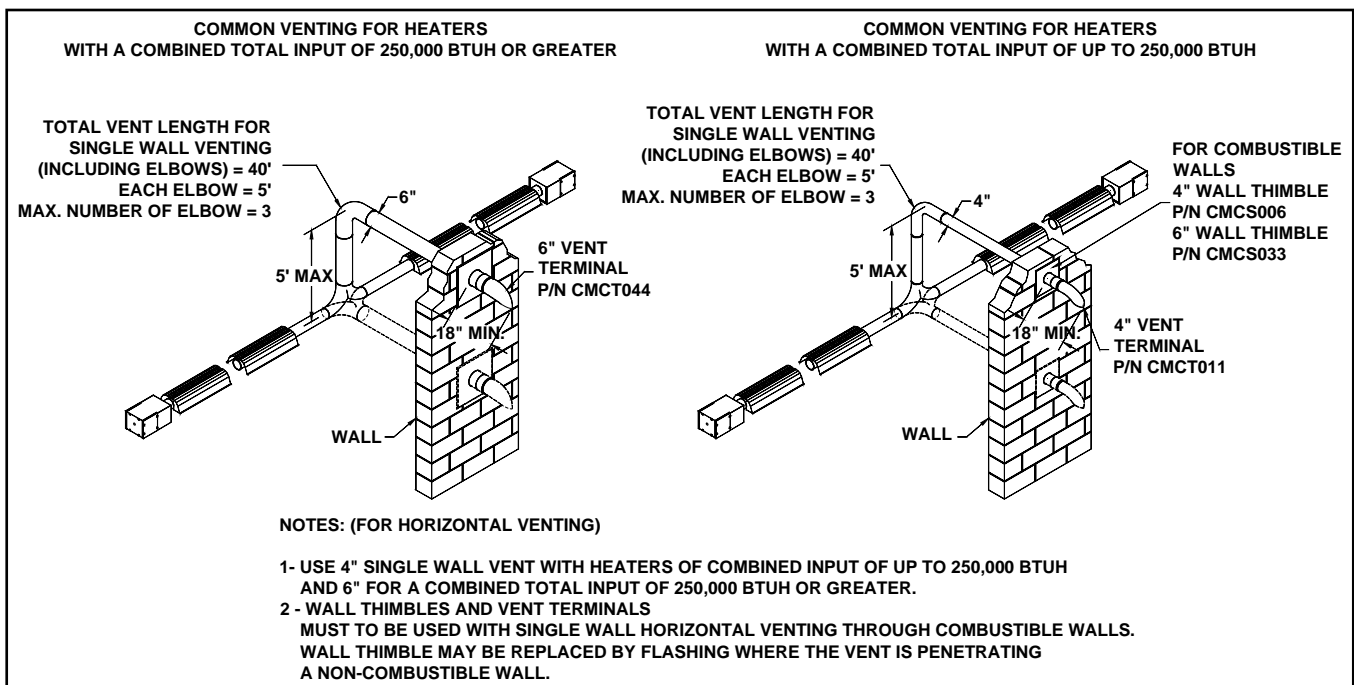


Figure 26: Common Horizontal Venting

## Venting / Combustion Air Ducting

### Combustion Air Supply (Optional)

- An outside combustion air supply is strongly recommended if the building space encloses a negative pressure due to exhaust, or if the building contains materials which would expose the heater to halogenated hydrocarbon atmospheres. Use CMVS022 Air Inlet Collar Kit.
- The outside air terminal must be of an approved type, and should be located at an elevation equal to or below the vent terminal elevation to prevent back-venting of flue gases into the burner compartment.
- Install single wall pipe or PVC pipe and fittings with a 12" linear section of flexible duct to allow movement of the heater. Do not use flexible duct throughout the entire length of fresh air duct. This may cause nuisance air switch tripping.

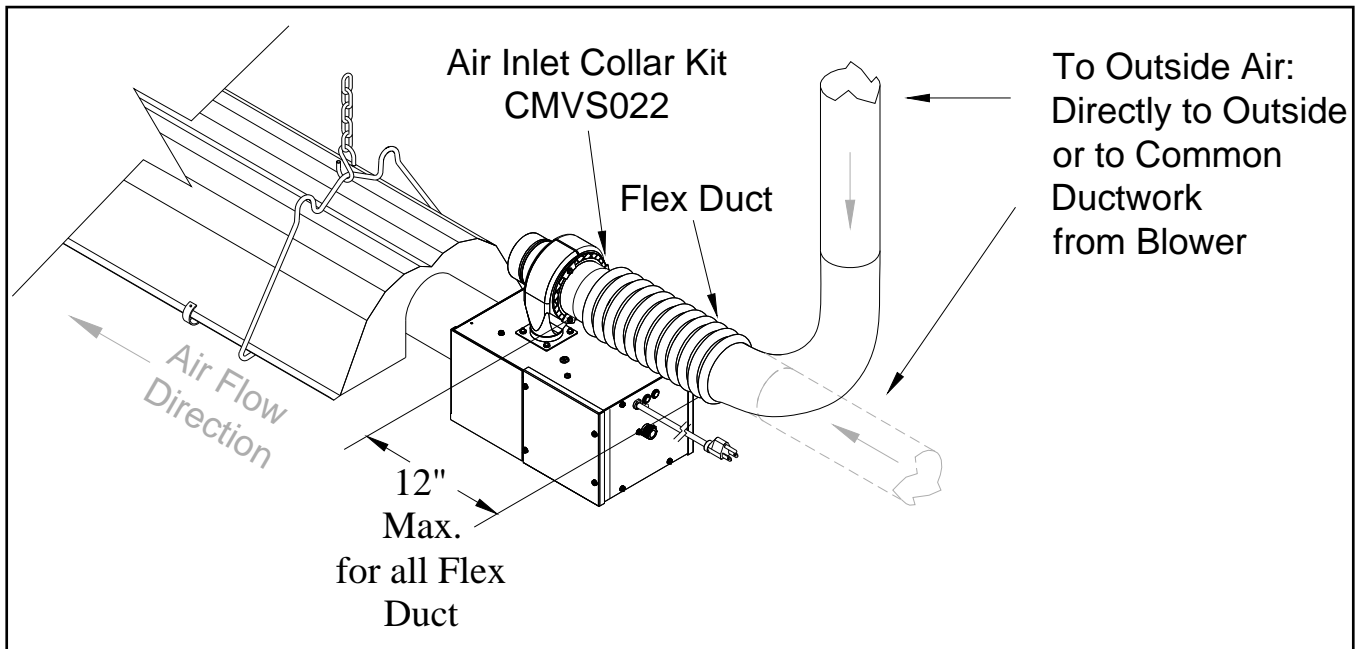


Figure 27: Installation of Outside Air as supply for Combustion

## General Requirements

- The gas meter and service must be large enough to supply gas to the connected building gas load including the heating equipment and any other gas fired equipment. Additionally, the gas distribution piping must be designed according to local and national ordinances. Generally (low pressure) systems designed with a maximum ½" W.C. total pressure drop meet this requirement.
- Gas supply pipe sizing must be in accordance with the *National Fuel Gas Code*, ANSI Z223.1 (NFPA 54).
- Before connecting burners to the gas supply system, verify that high pressure testing of the system has been completed. Failure to do so may expose the burner components to damaging high pressure, requiring replacement of key components.

Flexible gas connectors of approved type must be installed as shown in Figure 28, in one plane, and without sharp bends, kinks or twists. A smooth loop of approximately 12" in diameter is best. Failure to install the gas connection in the approved manner will result in a hazardous and potentially deadly situation due to the movement of the heat exchanger and burner in the normal course of operation.

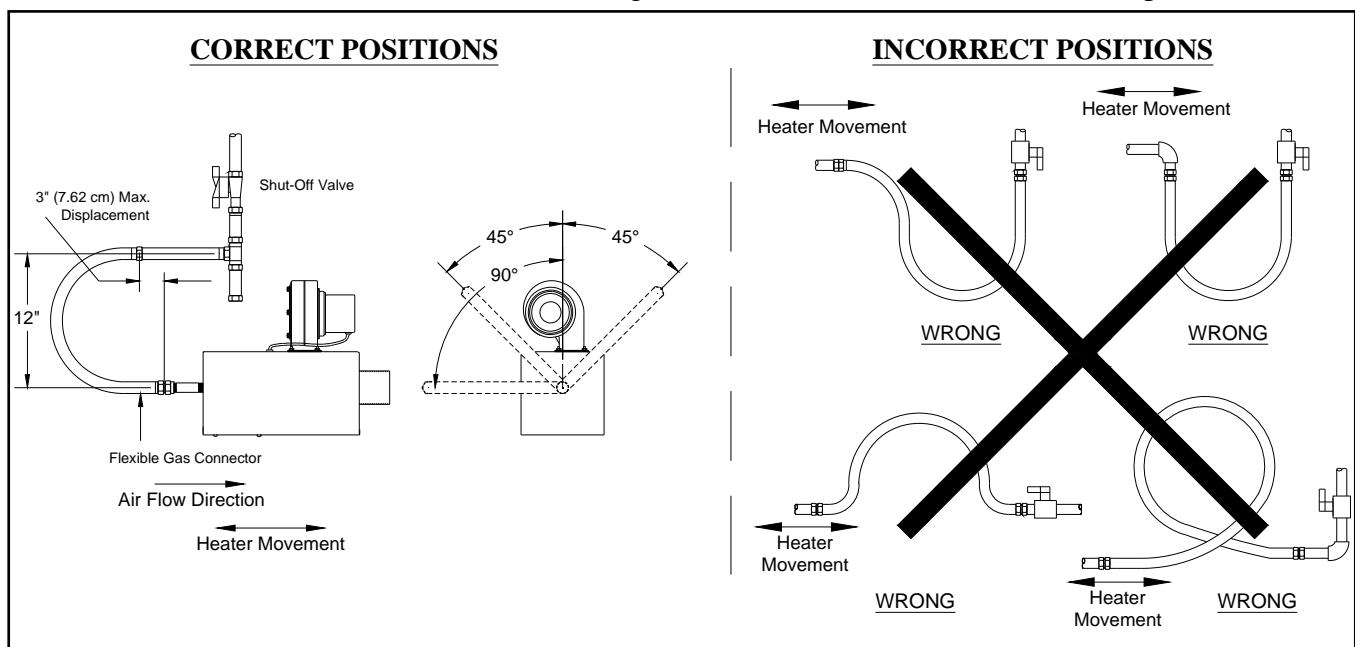


Figure 28: Flexible Gas Connections

# Electrical Wiring

## General Requirements

Heaters are normally controlled by line voltage (120V) or low voltage (24V) thermostats. Line voltage thermostats are wired directly while low voltage thermostats use a relay. In all cases, heaters must be grounded in accordance with the *National Electric Code*, ANSI/NFPA 70, and must comply with all local requirements. Heaters may also be controlled with a manual line switch or timer switch in place of the thermostat. Refer to Figure 29 for guidance on electrical wiring of heaters.

If any of the original wire as supplied with the heater must be replaced, it must be replaced with wiring having a rating of at least 105°C temperature service and 600 volts capability.

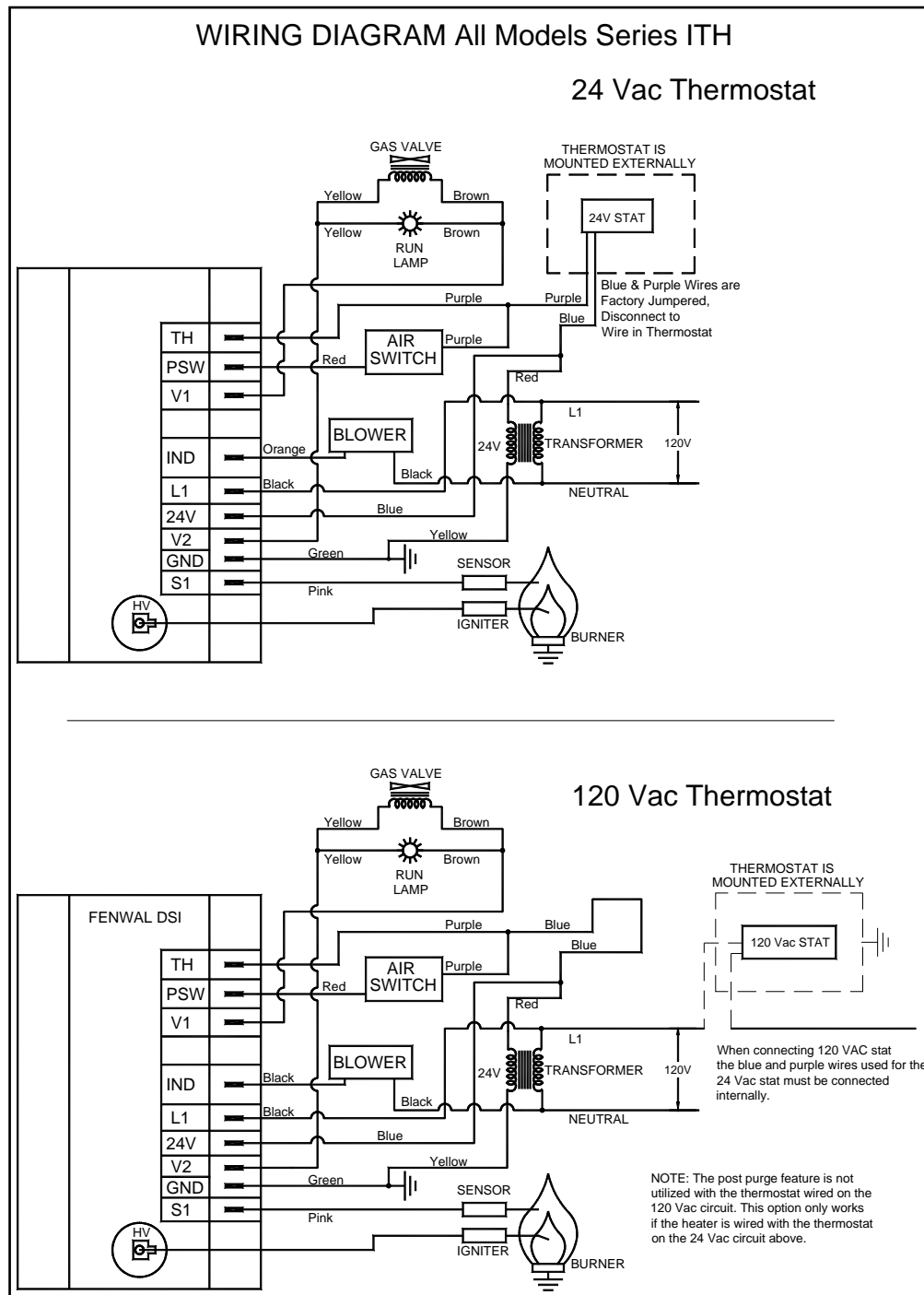


Figure 29: Wiring Diagram

## Starting Sequence of Operation

- Turn the thermostat up. When the thermostat calls for heat, the blower motor will energize.
- When the motor approaches nominal running RPM, the air-proving switch closes and activates the ignition module.
- The ignition module, after a pre-purge period of approximately 30 seconds, energizes the igniter. Additionally, the gas valve is energized for this ignition trial period of 15 seconds.
- If a flame is detected, the ignition sensing rod "reads" a rectification signal and the gas valve remains open. The sparking stops when the flame signal is established.
- If no flame is detected, the gas valve closes and a 30 sec inter-purge period begins. After the inter-purge, the module repeats the trial for ignition period. If flame is still not established, a third and final inter-purge followed by a final ignition trial cycle begins. After three trials, the module will lockout for a period of approximately 1 hour or until reset. (*Reset is accomplished by removing power from the module for at least 5 seconds.*) After this 1-hour period, the module re-attempts the full ignition sequence.
- When using a 24V thermostat and the heat requirement has been met and the thermostat opens, the burner shuts off but the fan continues to run for approximately 30 seconds. This is referred to as a post purge. This allows the products of combustion to be removed from the heat exchanger to avoid nuisance condensation and increase heat exchanger life.
- When using a line voltage thermostat and the heat requirement has been met and the thermostat opens, the burner and fan shut off with no post purge.

## Maintenance

For best performance, the following minimal maintenance procedures should be performed before each heating season:

- Before performing any services or maintenance, shut off gas and electrical supply to heater.
- Check condition of forced air blower scroll and motor. Dirt and dust may be blown or vacuumed from the blower.
- Check condition of burner. Remove any foreign objects or debris from inside the burner box or burner cup.
- Inspect the igniter. Replace igniter if there is excessive wear or erosion, breakage or other defects.
- Be sure the burner observation window is clean and free of cracks or holes. Clean or replace as necessary.
- Check the flue pipe for soot or dirt and reattach to the heater after cleaning as necessary.
- The reflector sections may be cleaned by wiping with a damp cloth.
- A service agency qualified to adjust and repair infrared heaters should be engaged for service other than routine maintenance.
- Be sure vent terminal and fresh air inlet are free from obstructions. If either pipe is restricted, the safety air switch will not operate properly, and the heater could fail to operate.
- Check the inside of the heat exchanger tube visually with a flashlight. If carbon or scale are present, scrape or otherwise remove deposits (a wire brush works well).

## Troubleshooting

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### Blower Motor Fails to Run

- Is the thermostat calling for heat? Is there 115V at the burner receptacle?
- Check blower side door for seal. Repair as necessary.
- Check blower for obstructions. Replace blower if necessary.

### No Gas Supply

- Check to see if manual supply valve to heater is ON.
- Check to see if gas valve knob on heater gas control is ON.
- Supply gas pressure can be checked at 1/8" NPT pressure tap in gas supply system.
- Is combination gas control opening? No manifold pressure indicates valve is closed. Gas pressure downstream of gas control can be measured by connecting a manometer to pressure tap on control. If the valve is closed, either the gas valve or the ignition module is faulty.

### Burner Does Not Light

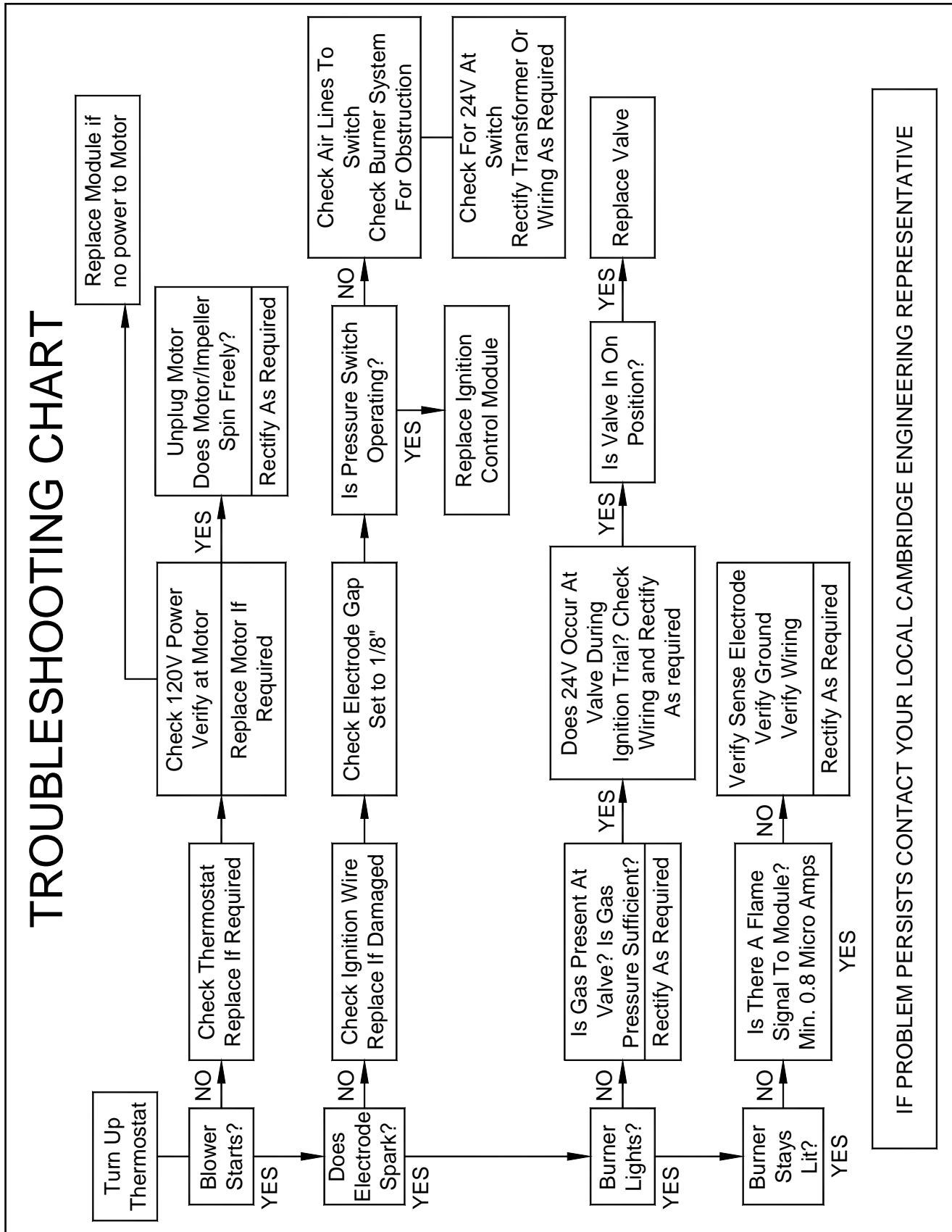
- Is spark visible through site glass during ignition trial? If no, further electrical checks by a qualified service person are required.
- Check to see if gas lines were properly purged of air.
- Check inlet and outlet gas pressure during ignition period.
- Check for proper orifice and air plate.

### Burner Does Not Stay Lit

- Check ground wire continuity.
- Check insulation on the igniter leads.
- Measure flame signal current; it should be between 2 to 6 micro amps dc. Minimum 0.8 micro amps.
- Clean flame rod if necessary.
- Replace module if necessary.



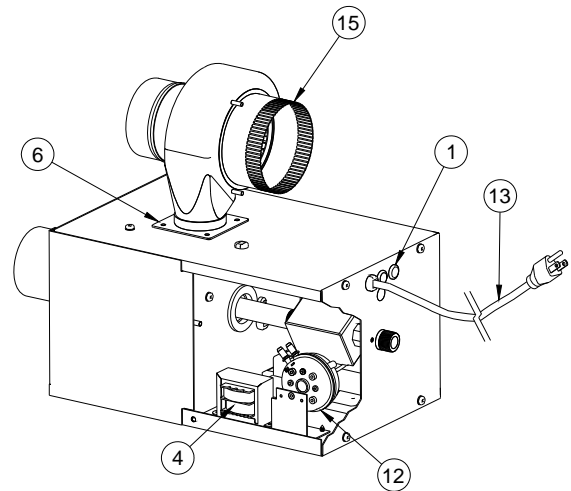
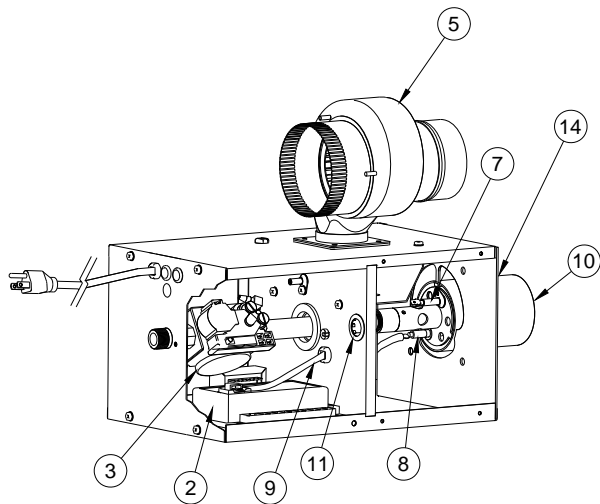
Troubleshooting Chart



# Replacement Parts

ITEM #	PART #	DESCRIPTION
①	CMCE057	INDICATOR LIGHT
②	CMCE015C	IGNITION MODULE
③	CMCG142	HONEYWELL VALVE TRAIN REPLACEMENT KIT - NAT.
	CMCG143	HONEYWELL VALVE TRAIN REPLACEMENT KIT - LPG.
④	CMCE058	TRANSFORMER
⑤	CMCE004	BLOWER MOTOR - 40,000 TO 175,000 BTU
	CMCE013	BLOWER MOTOR - 205,000 TO 220,000 BTU
⑥	CMCH007	BLOWER GASKET
⑦	CMCE003	FLAME SENSOR ELECTRODE
⑧	CMCE002	SPARK ELECTRODE
⑨	CMCE006	IGNITION WIRE

ITEM #	PART #	DESCRIPTION
⑩	CMUG001	BURNER CUP
	CMUG007	BURNER CUP ASSEMBLY (C/W ELECTRODES)
⑪	CMCH011	SIGHT GLASS ASSEMBLY
⑫	CMCE020	AIR SWITCH - MODELS - 40,000 & 60,000 BTU
	CMCE021	AIR SWITCH - MODELS - 80,000 & 100,000 BTU
	CMCE024	AIR SWITCH - MODELS - 125,000 & 150,000 & 205,000 BTU
	CMCE023	AIR SWITCH - MODELS - 220,000 BTU
	CMCE022	AIR SWITCH - MODELS - 175,000 BTU
⑬	CMCE010	POWER CORD
⑭	CMCH001	BURNER GASKET
⑮	CMVS022	AIR INLET COLLAR KIT (OPTIONAL)



## ITH-SERIES INFRARED HEATERS WARRANTY

The Manufacturer warrants to the original owner that the Product will be free of defects in material and workmanship. For the ITH-Series, warranty for all components is limited to twenty-four (24) months from the date of shipment. The hot rolled heat exchanger shall be warranted for an additional three (3) years for units which are proven to the satisfaction of the manufacturer to be inoperative due to defects in material or workmanship.

Buyer's sole and exclusive remedy for any nonconformity with this warranty shall be, at Manufacturer's option, repair or replacement of nonconforming parts, provided that Buyer shall return to Manufacturer, shipping prepaid, said non-conforming part(s) bearing a durable tag indicating the Serial Number of the Product from which the part was taken. In addition, Manufacturer may opt not to repair or replace nonconforming Product or part(s), but instead may refund to Buyer the price thereof, in lieu of repair or replacement. In no event shall Manufacturer be liable for more than a refund of the purchase price or replacement value of the Product or part(s), whichever is less. This warranty does not cover any shipping, installation or other labor costs incurred in the repair or replacement of the product. No materials will be accepted for return without authorization.

This Warranty does not apply and shall be void as to any Products that, in the judgment of the Manufacturer, are misused or misapplied, that are installed, operated or maintained not in conformity with Manufacturer's design, specifications, instructions, or Technical Manual, or are installed, operated or maintained in violation of any applicable national or local codes or industry standards.

Manufacturer does not warrant Products, if they are abused, improperly operated or maintained, subjected to abnormal wear and tear, damaged due to improper gas or electric service, damaged in transit, or that have been repaired or modified by others without Manufacturer's written authorization. This warranty will not apply to damage to the Product when used in corrosive atmospheres and in particular atmospheres containing halogenated hydrocarbons. No person is authorized to assume for the Manufacturer any other warranty, obligation or liability.

Buyer shall have no right to enforce this Warranty unless it has complied with all of its obligations under the contract for purchase/lease of the Products, including without limitation, being current on all payment terms.

THIS LIMITED WARRANTY IS MANUFACTURER'S ONLY WARRANTY WITH RESPECT TO THE PRODUCTS, AND IT IS IN LIEU OF AND SUPERSEDES ANY AND ALL OTHER WARRANTIES OF ANY KIND WHATSOEVER, WHETHER WRITTEN, ORAL OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES AFFORDED BUYER BY THIS WARRANTY ARE THE ONLY REMEDIES AFFORDED BUYER FOR ANY NONCONFORMITY WITH THIS WARRANTY OR FOR ANY DEFECT IN PRODUCTS, SERVICES, OR REPRESENTATIONS PROVIDED BY MANUFACTURER IN CONNECTION WITH SUCH PRODUCTS. IN NO EVENT SHALL MANUFACTURER BEAR ANY LIABILITY FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND WHATSOEVER, INCLUDING WITHOUT LIMITATION PERSONAL INJURY (INCLUDING DEATH), PROPERTY DAMAGE, LOST PROFITS OR OTHER ECONOMIC LOSS.

Buyer acknowledges that the foregoing warranty, limitations, and exclusions are a reasonable allocation of commercial risks by and among sophisticated business entities and are not subject to dispute as to their commercial reasonableness, fairness or ability to satisfy the essential purposes of the parties' transaction.

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