Reflected Heat Design Inc.

Model 10 Series
Gas Fired Low Intensity
Infrared Heater

Model 10-040 (-2, -3, - NG)

Model 10-060 (-2, -3, - NG)

Model 10-080 (-2,-3)

Model 10-100 (-2,-3)

Model 10-125 (-2,-3)

Model 10-150 (-2,-3)

Model 10-175 (-2,-3)

Model 10-205 (-2,-3)

Model 10-225 (-2,-3)

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.

This heater must be installed by and serviced by gas installation and service professionals only. Failure to comply could result in personal injury, asphyxiation, death, fire, and/or property damage.

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 serviceman with necessary information.

For Your Safety

If you smell gas:

- Do not try to light any appliance.
- Immediately call your gas supplier, but do not use any phone in your building, use a neighbor's phone.
- Do not use any electrical switch or appliance
- If you cannot reach your gas supplier, call the fire department.

Reflected Heat Design Inc.
418 Highway 8
Stoney Creek, On
L8G 1G2



Do not locate ANY gas-fired units in areas where chlorinated, halogenated, or acidic vapors are present in the atmosphere. These substances can cause premature heat exchanger failure due to corrosion which can cause property damage, serious injury or death.



As with all heating equipment, clearances to combustible materials are critical. Be sure all units have reflectors installed along the entire length of the tube, and that the reflectors are not mounted at an angle greater than 45° from the horizontal plane. U-tubes and Elbows may be installed without reflectors, refer to clearance to combustible label on the heater and information in this manual.

When heaters are installed in building areas where combustible materials are stored, care must be exercised to be sure that such materials always remain outside of the required clearances to combustibles. Signs must be posted in such areas to specify the maximum permissible stacking height beneath heaters to maintain the required clearances from the heater to the combustibles, and that such signs must either be posted adjacent to the heater thermostats or in the absence of such thermostats in a conspicuous location.



DO not expose this heater to a supply pressure greater than 14" W.C. (1/2 psi).

This may result in damage to the gas controls in the burner unit.



Thermal growth is a normal function of a low intensity tube heater. Ensure that a proper listed gas flexible connector is used and installed as per these installation instructions. The gas flex must be listed for use with an infrared heater.

FOR YOUR SAFETY

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

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1.0 Safety

1.1 SPECIAL PRECAUTIONS

Read and understand all safety information and warnings in this manual before installation, operation, and maintenance of the Infrared tube heater system.

The installation and maintenance instructions in this manual must be followed to provide safe, efficient, and trouble-free operation. In addition, read and understand all safety information and warnings in this manual before installation, operation and maintenance of this product. Failure to properly address these precaution areas could result in property damage or loss, personal injury, or death.

Safety Precaution Identification

1. **DANGER:** Potential exposure to a hazardous situation which, if not avoided, WILL result in death or serious injury.
2. **WARNING:** Potential exposure to a hazardous situation which, if not avoided, COULD result in death or serious injury.
3. **CAUTION:** Potential exposure to a hazardous situation which, if not avoided, MAY result in minor or moderate injury.
4. **IMPORTANT:** Potential creation of a hazardous situation which, if not avoided, MAY result in a safety concern.

Your Safety is Paramount!



This symbol is used throughout the manual to identify possible fire, electrical or burn hazards. Please pay special attention when reading and following the warnings in these sections. **This symbol applies to all the statements in this section.**

This heater must be installed by and serviced by gas installation and service professionals only. Failure to comply could result in personal injury, asphyxiation, death, fire, and/or property damage

This heater is designed for heating non-residential indoor spaces. Do not install in residential spaces.

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 must to be worn during installation, operation and service. Thin sheet metal parts, including the aluminum reflector portion of the heater and other metal components, have sharp edges.

For your protection, the use of work gloves is recommended. The use of gloves will also prevent the transfer of finger prints to the surface of the reflector.

Do not locate ANY gas-fired units in areas where chlorinated, halogenated, or acidic vapor are present in the atmosphere. These substances can cause premature heat exchanger failure due to corrosion which can cause property damage, serious injury or death.

To prevent risk of fire or improper unit operation, Turbulator sections must be properly selected from Table 2 based or Burner Rate and Installed Length, and the baffle sections must also be properly assembled and installed. Refer to Section 3 for proper Turbulator section installation.

To prevent tube sections from separating during unit operation, tube couplings must be centered over the joints of the adjoining tube sections and both clamps tightened to 25 to 30 ft. - lb. This will suffice for tube clamping however fastening the coupling on each tube with (2) self-tapping screws after the clamps have been secured will add extra security. Failure to properly secure the clamp may result in separation of tube sections which could fall and result in death or serious injury.

All supply gas piping must be pressure and leak tested prior to operation as per local codes. Use a soap solution or equivalent for testing, or other methods as allowed by the authority having jurisdiction. Gas pressure to heater controls must never exceed 14" W.C. (1/2 psi).

A certified flexible connector must be used. The flexible connector must be marked suitable for connecting to infrared heaters. Arrange the flexible gas connector in such a way that it will allow for the expansion of the low intensity infrared tubes during operation. SEE Figure 30

Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage. All wiring must be completed strictly in accordance with the wiring diagram supplied with the unit.

1.2 Manpower

It is strongly recommended that two persons install this appliance for maximum safety. Tube sections are 10ft long and can pose a danger when being handled by only one person. Ensure that any lifting equipment used for the installation of this equipment is properly certified and suited to the purpose.

1.3 Clearance to Combustibles

COMBUSTIBLE MATERIAL: As pertaining to materials adjacent to or in contact with heat producing appliances, vent connectors, gas vents, chimneys, steam and hot water pipes, and warm air ducts, shall mean materials made of or surfaced with wood, compressed paper, plant fibers, or other materials that are capable of being ignited and burned. Such material shall be considered combustible even though flame-proofed, fire- retardant treated, or plastered.



Do not store flammable items or explosive containers in the vicinity of the radiant heater as explosion or fire may occur.

Provide the following:
Adequate clearance around air openings into the combustion chamber, clearances from combustible material, provisions for accessibility and for combustion and ventilating air supply

The stated clearance to combustibles represents a surface temperature of 90°F (50°C) above room temperature. Building material with a low heat tolerance (such as plastics, vinyl siding, canvas, triply, etc.) may be subject to degradation at lower temperatures. It is the installer's responsibility to assure that adjacent material are not subject to degradation.

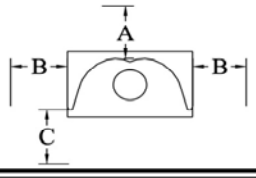
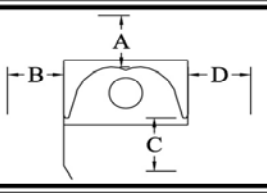
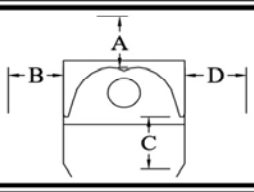
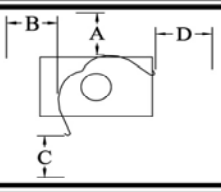
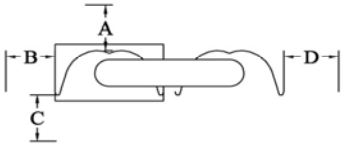
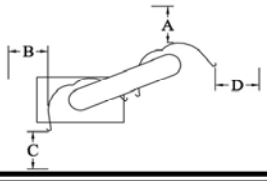
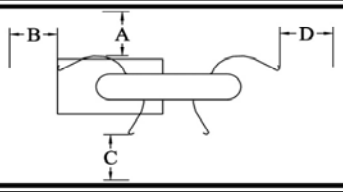
This heater should be installed so that the minimum clearances marked on the heater will be maintained from vehicles parked below the heater. When heaters are installed in building areas where combustible materials are stored, care must be exercised to be sure that such materials always remain outside of the required clearances to combustibles. Signs must be posted in such areas to specify the maximum permissible stacking height beneath heaters to maintain the required clearances from the heater to the combustibles, and that such signs must either be posted adjacent to the heater thermostats or in the absence of such thermostats in a conspicuous location.

It is good practice to leave a minimum of 18" around the burner for future service.

All elbows, u-tubes and un-reflected fittings shall maintain a clearance distance of 18" from the tube or tube fitting to combustible surfaces.

Table 1 lists the minimum clearance to combustible materials for all installation configurations. These stated clearances also apply to installation above T-bar ceilings and above decorative grills. This clearance must be adhered to for glass, painted surfaces and other materials in the vicinity of the decorative grill that maybe damaged by radiant or convective heat.

Table 1 (Dimensions in inches)

Reflector Orientation	Dimension	Model 10										
		40	40 LNG	60	60 LNG	80	100	125	150	175	205	225
	A	2	2	2	2	2	4	4	6	6	6	6
	B	17	4	24	6	26	30	32	35	40	43	45
	C	47	28	60	36	62	65	70	72	80	84	87
	D	17	4	24	6	26	30	32	35	40	43	45
	A	2	2	2	2	2	4	4	6	6	6	6
	B	4	2	4	4	4	4	4	4	6	6	6
	C	52	32	58	36	65	72	77	80	82	84	84
	D	35	6	38	8	44	46	50	53	55	58	58
	A	2	2	2	2	2	4	4	6	6	6	6
	B	9	2	15	4	18	19	21	24	27	30	32
	C	51	36	61	39	66	72	79	80	83	87	89
	D	9	2	15	4	18	19	21	24	27	30	32
	A	4	4	4	4	4	4	6	6	8	8	8
	B	4	4	4	4	4	4	4	4	4	4	4
	C	40	16	51	22	58	68	71	72	75	78	82
	D	40	16	47	22	51	60	64	65	68	72	78
	A	2	2	2	2	2	4	4	6	6	6	6
	B	17	4	24	6	28	31	33	37	40	46	48
	C	47	29	59	39	66	73	78	82	83	85	87
	D	17	4	24	6	28	31	33	37	40	46	48
	A	4	2	6	2	6	6	6	6	6	6	6
	B	4	4	4	4	4	4	4	4	4	4	4
	C	40	18	51	22	58	68	71	72	75	78	82
	D	33	8	39	22	44	48	52	57	62	67	72
	A	4	4	4	4	4	4	4	6	8	10	10
	B	40	16	47	22	51	60	64	65	68	72	78
	C	40	16	51	22	58	68	71	72	75	78	82
	D	16	8	16	22	18	19	24	24	27	30	33
Unvented	Above	12	12	12	12	18	18	18	18	18	24	24
	End	26	26	26	26	26	26	26	32	32	36	36
Vented	End	18	18	18	18	18	18	18	18	18	18	18

When installed with a lower shield (see Figure 29), clearances can be reduced 25% in all “C” dimensions

In all cases, clearance dimensions B,C, and D can be reduced 50% when 25 feet or more downstream of the burner

1.4 NATIONAL STANDARDS AND CODES

All installation details must comply with Codes and regulations currently prescribed for your area or as directed by the local authority having jurisdiction. If not sure, consult the authority having jurisdiction.

National Standards and Gas Codes
The installation must conform with local building codes, or in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US and CAN/CGA B149.1 installation Codes in Canada.
They shall be installed for the fuel listed on the burner rating plate. These heaters may be approved for vented/un-vented, and indoor/outdoor applications. Refer to the rating plate for listed use. Not for use in residential dwellings.

Aircraft Hangar Installation
These heaters are suitable for use in aircraft hangars when installed in accordance with the Standard for Aircraft Hangars, ANSI/NFPA 409 and the Canadian Natural Gas and Propane Installation Code, CSA B149.1

Public Garage/Parking Structures Installation
These heaters are suitable for use in parking or repair garages when installed in accordance with the Standard for Parking Structures, ANSI/NFPA 88A, or the Standard for Repair Garages, ANSI/NFPA 88B, Canadian Natural Gas and Propane Installation Code, CSA B149.1

Motor Fuel Dispensing Facilities
Specific models are suitable for use in Motor Fuel Dispensing Facilities and Repair Garages NFPA 30A (latest edition). Please consult factory.

Gas Supply Lines
Gas supply pipe sizing must be installed in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US, and CAN/CGA B149.1 and B149.2 Installation Codes in Canada.

Electrical
All heaters must be electrically grounded in accordance with the National Electric Code, ANSI/NFPA 70 in the US, and the Canadian Electric Code, CSA C22.1 in Canada, and comply with all local codes.

Venting
Refer to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US and CAN/CGA B149.1 installation Codes in Canada for proper vent sizing, location and installation of vents. Attention must be given to information on clearance requirements when penetrating combustible walls for venting purposes.

High Altitude
This appliance is approved for up to 4500 ft (1372 m). in Canada, In the USA this appliance is approved for up to 2000 ft. (610 m). Installation of this appliance at altitudes above 2 000 ft (610 m) shall be in accordance with local codes, or in the absence of local codes, the National Fuel Gas Code, ANSI Z223.1/NFPA 54

2.0 General Specifications

GAS PRESSURE AT MANIFOLD:

Single Stage

Natural Gas: 3.5" W.C.
LP Gas: 10.0" W.C.

Two Stage

Natural Gas: 2.4 / 3.5" W.C
LP Gas: 6.0 / 10.0" W.C.

PIPE CONNECTION:

1/2" NPT for all models

DIMENSIONS:

Vent Connection Size: 4" (10 cm)
Outside Air Connection Size: 4" (10 cm)

GAS INLET PRESSURE:

Natural Gas:

For 40, 60, 80, 100, 125, 150 - 4.5" W.C. Minimum
For 175, 205, 225 - 5.0" W.C. Minimum
14.0" W.C. Maximum

LP Gas:

11.0" W.C. Minimum
14.0" W.C. Maximum

ELECTRICAL RATING (ALL MODELS):

1.6 Amp 115VAC, 60HZ

ELECTRICAL CONNECTION

36” (1M) Power Cord, three prong plug

3.0 Burner Configurations

Table 2

Burner Model	**Burner Rate** Single Stage Btu/hr.	**Burner Rate** Two Stage Low/Hi Btu/hr.	**Minimum Length** Feet	**Maximum length** Feet	Baffle Sections See Table 3
10-40	**40,000**	**30,000/40,000**	**10**	**20**	2
10-60	**60,000**	**45,000/60,000**	**15**	**30**	2
10-80	**80,000**	**60,000/80,000**	**20**	**40**	4
10-100	**100,000**	**75,000/100,000**	**20**	**40**	4
10-125	**125,000**	**95,000/125,000**	**30**	**50**	4
10-150	**150,000**	**110,000/150,000**	**40**	**60**	3
10-175	**175,000**	**130,000/175,000**	**40**	**60**	3
10-205	**205,000**	**150,000/205/000**	**50**	**80**	2
10-225	**225,000**	**165,000/225,000**	**60**	**80**	-

Note. That baffles sections listed are for minimum lengths and maximum lengths, however for lengths other than minimum lengths baffles section may be removed. See section 3.2 for complete detailed baffle configurations.

For –NG Model burners refer to page 40 for minimum and maximum lengths and baffle requirements

3.1 System Components

Figure 1 and 2 illustrate the typical components supplied with the heater

Burner is supplied with a mounting gasket, installation instructions, and burner mounting hardware. The burner orientation is important. **The operator light must be on the bottom**.

Flanged Combustion Tube is aluminized heat treated and appears in a grey color. **IMPORTANT**, the weld Seem MUST be installed at the bottom when arranging the tube in the hanger. Also available in Stainless Steel

Tube is 16 gauge steel and is offered as Hot Rolled, Aluminized heat treated, or Stainless Steel.

Hanger is the heater hanging support; the heater is supplied with a quantity of 2 for the Flanged Tube and one for all additional tubes.

End Cap is an important part of the heat exchanger and must be installed. There are two required for a straight heater installation. They serve the function of minimizing convective heat loss.

Reflector Clip & Strap when installed as a unit provide additional support for the reflectors. They are supplied with screws to secure the reflector only in strategic locations. This will be discussed further in the installation instructions.

Reflector is a key component that most effects the performance of the heater. They are supplied in lengths of 122.5 inches and are installed in a stacked fashion in such a way that the thermal growth will not impose stress on them. This is discussed further in the installation instructions.

Baffle Section promotes heat exchange to the tube surface and must be installed in the correct position and location in the tube. See the installation details for baffle lengths and locations specific to each model. **WARNING:** Failure to properly assemble and locate baffles may result in failure that could cause fire, injury or death.

Coupling is made of an aluminized steel sleeve and two high strength band clamps. When properly torqued these couplings permanently fix the tube together. Couplings are also available in Stainless Steel.

Figure 1

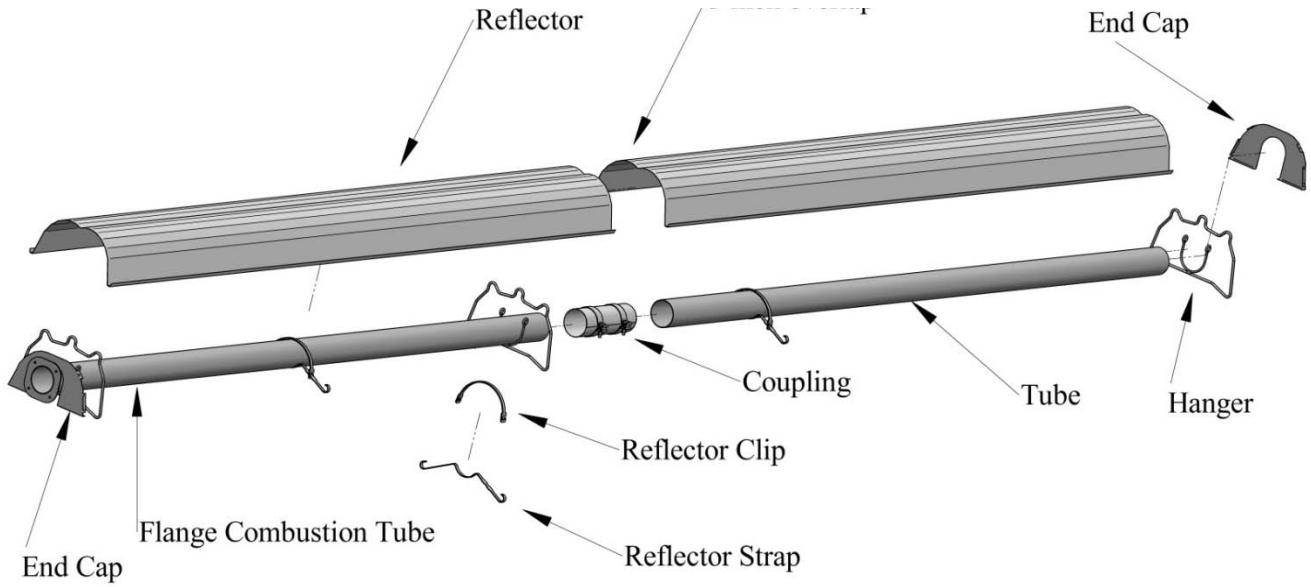
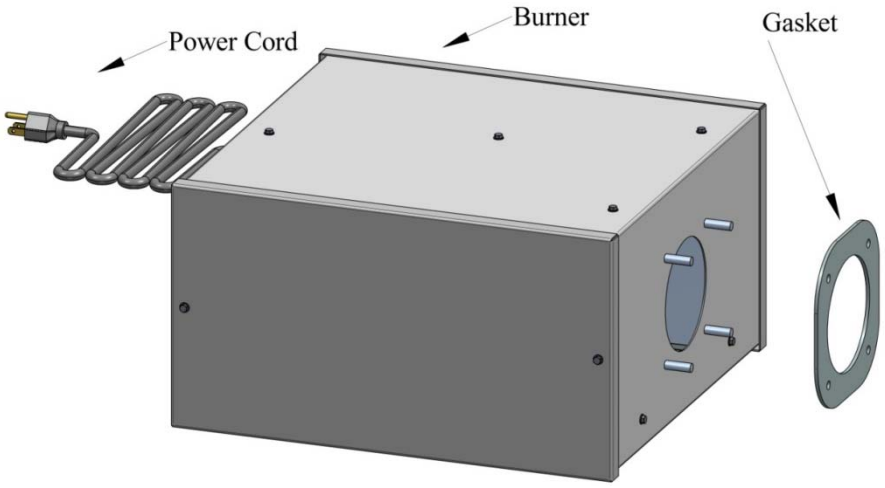
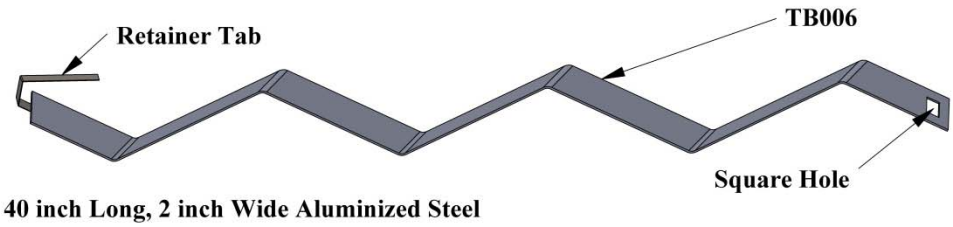


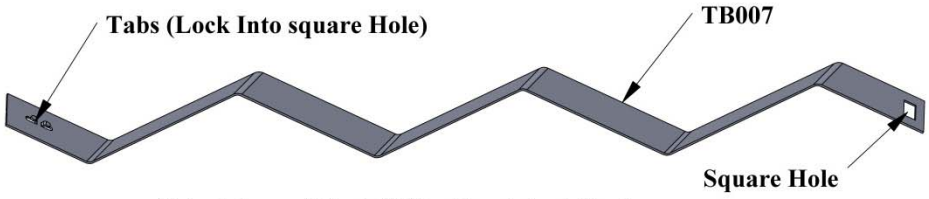
Figure 2



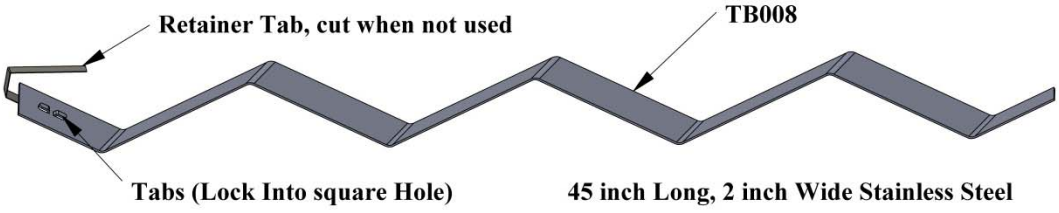
Baffle Sections **Figure 3**



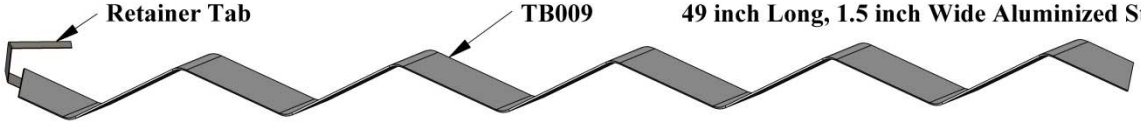
40 inch Long, 2 inch Wide Aluminized Steel



40 inch Long, 2 inch Wide Aluminized Steel



45 inch Long, 2 inch Wide Stainless Steel



49 inch Long, 1.5 inch Wide Aluminized Steel

3.2 Burner Configurations

Table 3

Baffle Length Table

Burner Model	Installed Length (Feet)	Baffle Qty. TB006	Baffle Qty. TB007	Baffle Qty. TB008	Baffle Qty. TB009	Figure
10-40	**10**	**1**	**-**	**1**	-	4
10-40	**20**	**1**	**-**	**1**	-	
10-60	**15**	**1**	**-**	**1**	-	5
10-60	**20**	**1**	**-**	**1**	-	
10-60	**30**	**1**	**-**	**1 (optional)**	-	
10-80	**20**	**1**	**2**	**1**	-	7
10-80	**30**	**1**	**2**			
10-80	**40**	**1**	**1(optional)**	**-**	-	
10-100	**20**	**1**	**2**	**1**	-	7
10-100	**30**	**1**	**2**	**1 (optional)**	-	
10-100	**40**	**1**	**1+1(optional)**	**-**	-	
10-125	**30**	**1**	**2**	**1**	-	8
10-125	**40**	**1**	**2**	**-**	-	
10-125	**50**	**1**	**1+1(optional)**	**-**	-	
10-150	**40**	**1**	**1**		1	9
10-150	**50**	**1**	**1**	**-**	-	
10-150	**60**	**1**	**1(optional)**	**-**	-	
10-175	**40**	**-**	**-**	**-**	3	10
10-175	**50**	**-**	**-**	**-**	2	
10-175	**60**	**-**	**-**	**-**	1	
10-205	**50**	**-**	**-**	**-**	2	11
10-205	**60**	**-**	**-**	**-**	1+1(optional)	
10-205	**70**	**-**	**-**	**-**	1(optional)	
10-205	**80**	**-**	**-**	**-**	-	
10-225	**60**	**-**	**-**	**-**	-	
10-225	**70**	**-**	**-**	**-**	-	
10-225	**80**	**-**	**-**	**-**	-	

1 (optional) means that this baffle may be installed as an option but is not required

1+1(optional) means that 1 of this baffle type must be installed and a second one is optional. The optional baffle is always the baffle closest to the burner**.**

It is good practice when the optional baffle is used to use minimum vent lengths to minimize nuisance condensation**.**

For –NG Model burners refer to page 43 for installed lengths and baffle requirements.

The figures below illustrate the baffle positions for the shortest length of each model that uses a baffle. The two inch wide baffles, TB006, TB007, and TB008 are always connected together with the tabs twisted into the square hole. These baffle assemblies are always installed at the end of the shortest heat exchanger length for each model as illustrated below. The baffle assemblies are held in place with the retainer tab at the end of the tube.

The baffle TB009 is installed in mid-sections as illustrate in Figure 10 & 11. These baffles are held in place with the retainer tab at the tube joint, See Figure 17. For figures 6, 7, and 8 the baffle TB008 may also be held in place with the Tab at the coupling joint.

Figure 4 (40,000 Btu/hr)

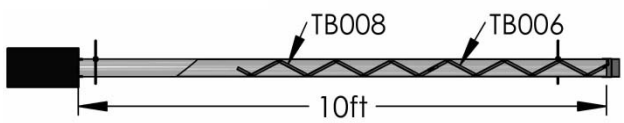


Figure 5 (60,000 Btu/hr)

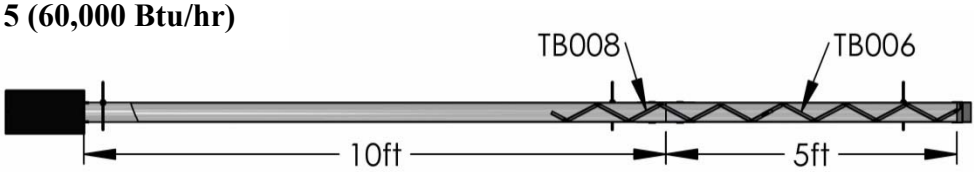


Figure 6 (80,000 Btu/hr)

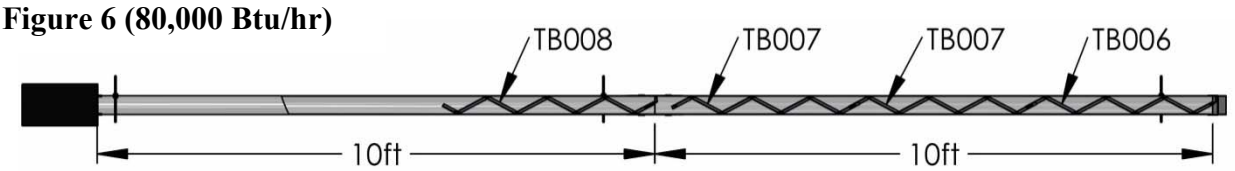


Figure 7 (100,000 Btu/hr)

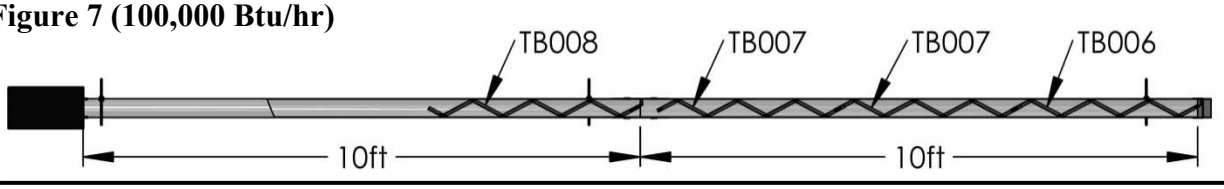


Figure 8 (125,000 Btu/hr)

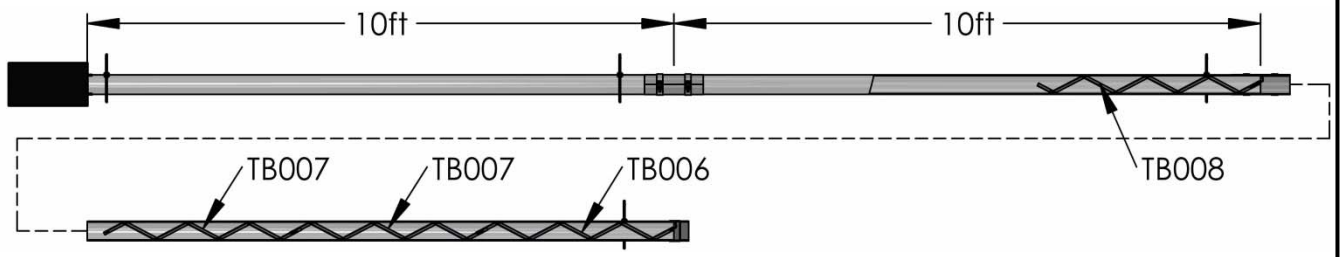


Figure 9 (150,000 Btu/hr)

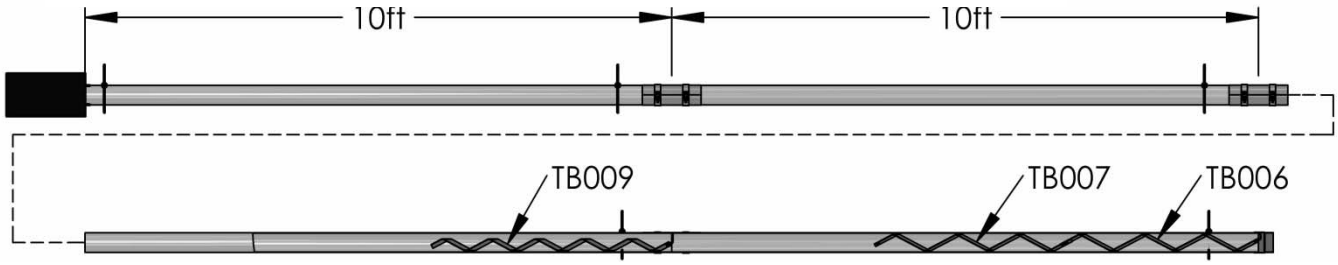


Figure 10 (175,000 Btu/hr)

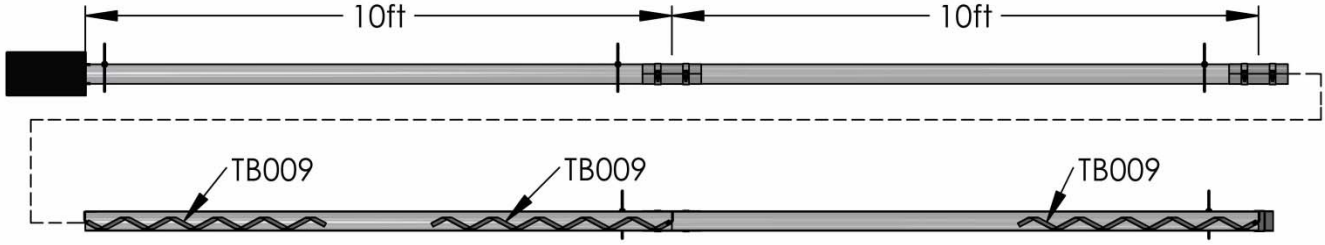
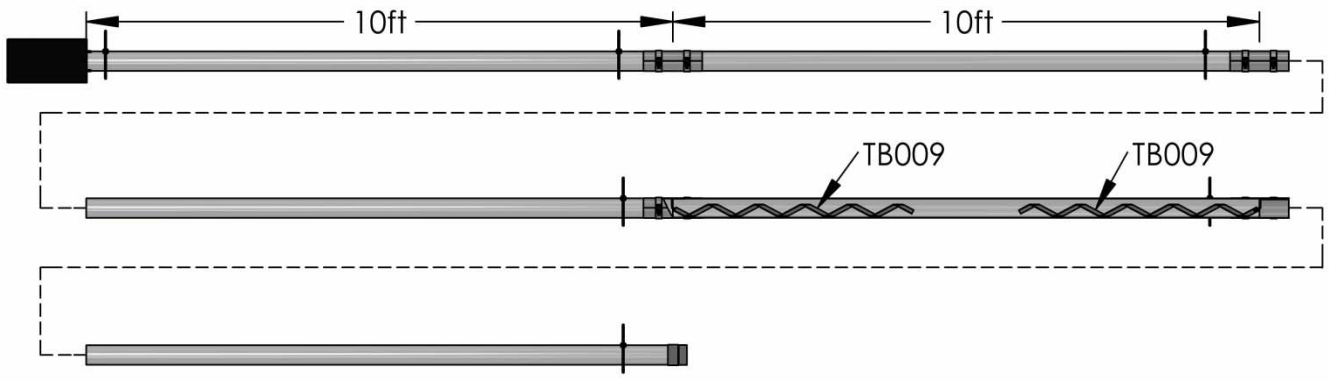


Figure 11 (205,000 Btu/hr)



4.0 Installation

The Planning of the installation is a very important step. The following should be considered before installation:

Location of overhead doors, cranes, service equipment, and any other item that would affect heater placement should be considered before installation.

Hanging points and chain length should be considered to accommodate the thermal expansion that takes place as tube temperature changes causing growth of the heater. A minimum chain length is required to allow hangers to move in a relatively stable horizontal plane. See Figure 12 for some acceptable support hanging methods.



When heaters are installed outdoors, or in areas requiring seismic restraints, it is the responsibility of the installer to ensure that proper restraints are in place. The installer must seek proper procedures and methods for restraint installation from local agencies. When installed outdoors every hanger must use a “J” bolt and the hangers may be used as restraint connection points. In all cases restrains must allow for thermal growth of the tube.

For outdoor installations the heater rating plate must indicate that it is approved for outdoors application and the hanger must have proper tethering to protect from wind movement. It is the responsibility of the contractor to ensure that tethering is sufficient for the installation.

Proper equipment selection and layout are key factors in achieving good performance; consult your local dealer for assistance.

4.1 Support Methods

The chains supporting the hangers must have a working load of minimum 150 Ibs. We recommend a closed loop welded chain minimum 3/16" in size. The best practice for connecting chain is a chain quick link. When "S" hooks are used the ends shall be closed. Turnbuckles shall have the ends closed. The ends in turnbuckles and "S" hooks are closed by using a large channel lock plier or equivalent tool, this prevents the heater from becoming accidently dislodged.

When threaded rod is used as a hanging support it must be minimum 3/8 inch diameter and the minimum length shall be 24 inches.

The recommended minimum chain length (X) is as follows:

Heat Exchanger length from 10ft. -40ft. X = 12 inches.

Heat Exchanger length from 41ft. -60ft. X = 18 inches.

Heat Exchanger length from 61ft. -80ft. X = 24 inches.

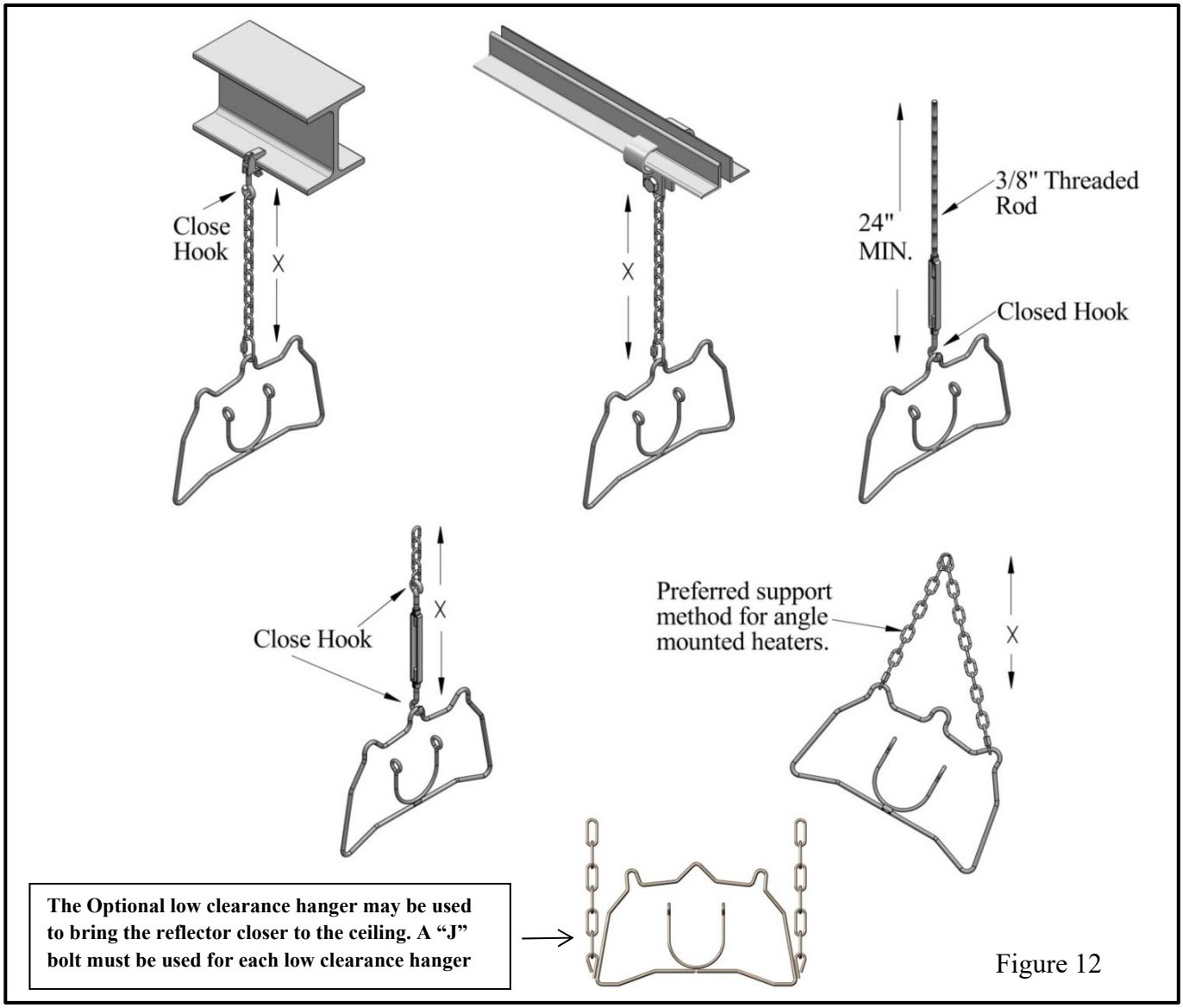


Figure 12

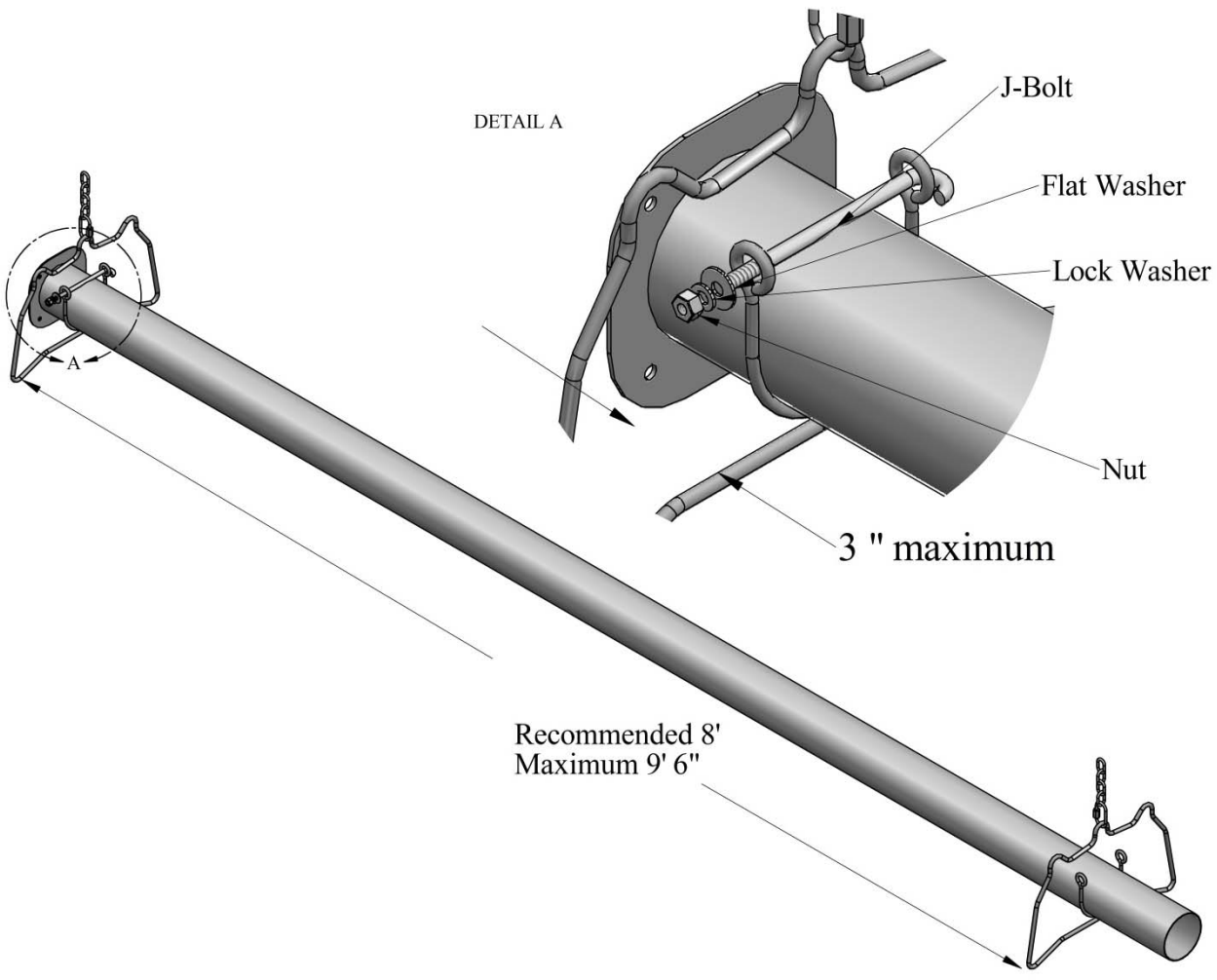
4.2 Installation Sequence

Installation sequence can be carried out in any logical order that meets the guidelines set out in this manual. Here we will describe one method of installation.

At this stage the desired heater location is known so we begin by hanging chain and hangers from the ceiling using a method that will support minimum 150 lbs. per chain, refer to the illustrations in figure 12.

Once the first two chain and hangers are supported the Flange tube can be placed in the hangers with the tube weld seem facing the bottom. The flange must be within 3 inches from the first hanger. See Figure 13. Tighten the J-bolt to prevent rotation of the tube and note the tube flange position at this time; it should be parallel with the floor so that when the burner is mounted it is level. Tubes may be sloped up to 1 inch per 10ft. of run.

Figure 13

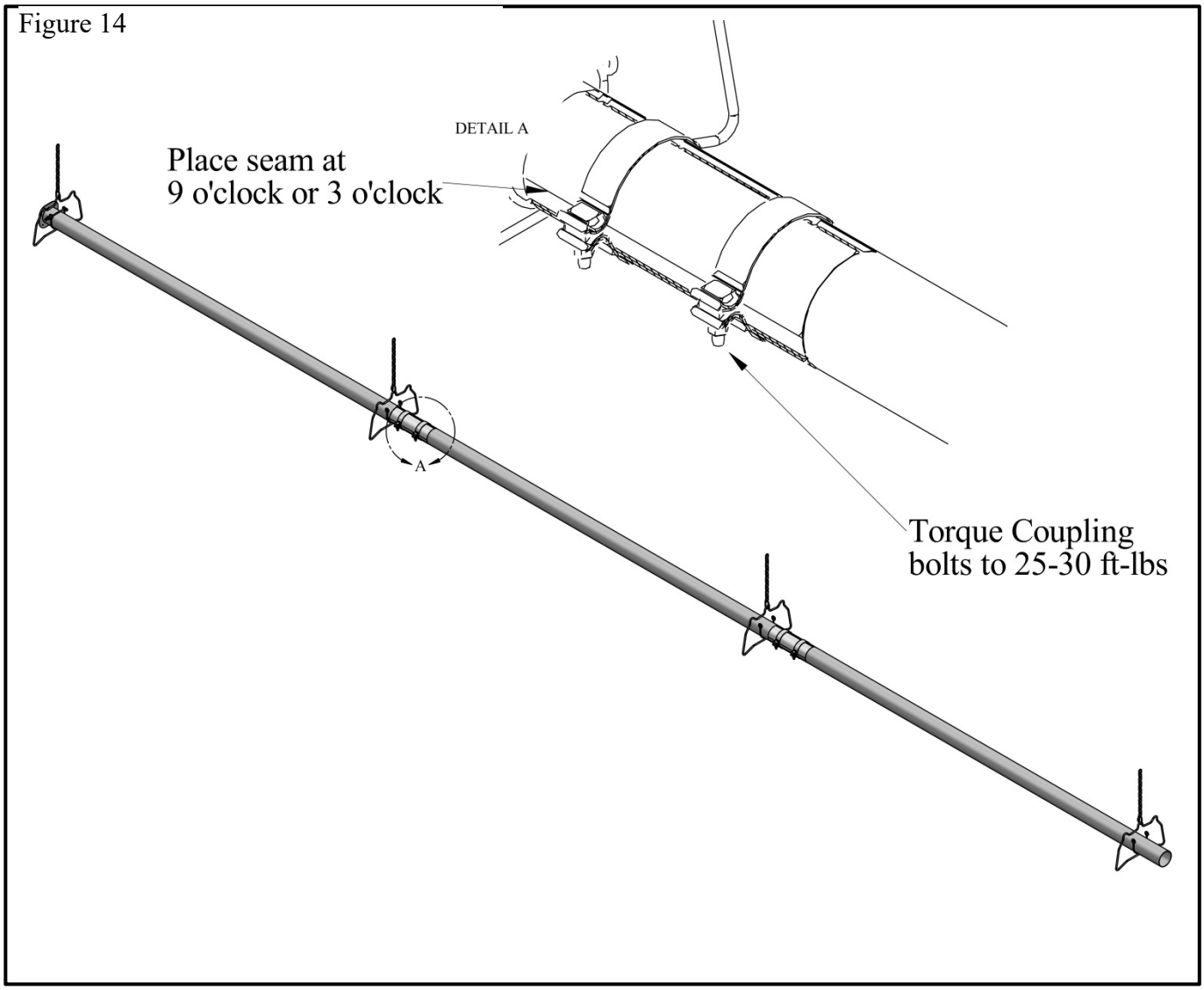


Continue installing the chain, hangers, and tube until you have completed the full length of the heat exchanger. Note that the couplings should be centered at the joints. The coupling is provided with a tab at the center to facilitate the centering of the coupling at the joint.

The coupling must also be installed with the seam at 3 o'clock or 9o'clock ± 1 hour. It is best if the coupling nuts are facing down for easy access. It is important to tighten the coupling clamps in an alternating fashion to take up the sheet metal evenly, once snug torque the clamps to 25 – 30 ft. Ibs.

All hangers other than the first hanger must be located within 24" of tube end or coupling. All chain or alternate hangers must be plumb. Use appropriate structural bridging materials (Unistrut, Dexion, perforated angle) as necessary to properly locate and support hanging points to comply with these guidelines.

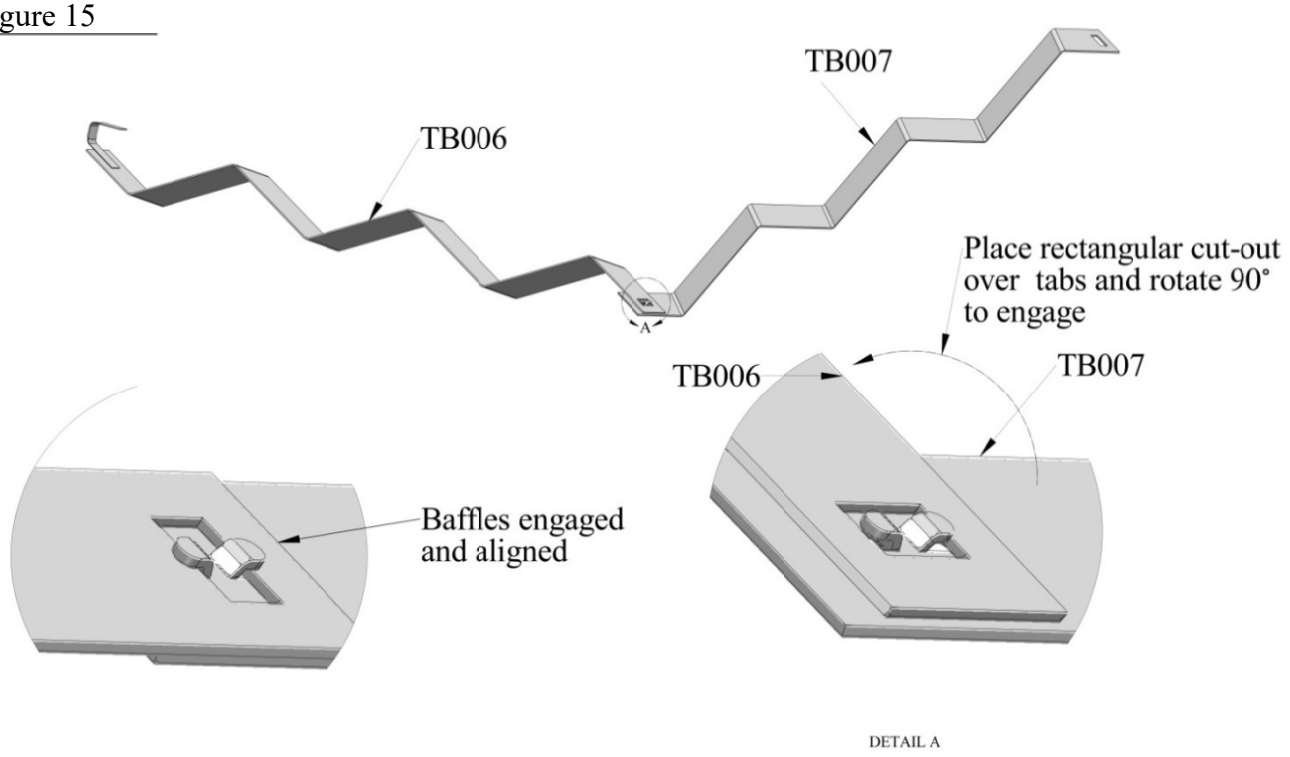
Figure 14



Baffle section are assembles as illustrated in figure 15. This can be done as the baffles are being placed in the tube. To assist the insertion of the baffle a left to right twisting motion while pushing the baffle in the tube works well. See figure 16.

Also intermediate baffles, when used in the heating system should be installed with the appropriate tubing section, and in the case of intermediate baffles, the coupling is used to keep the baffle retainer tab in place, See Figure 17.

Figure 15



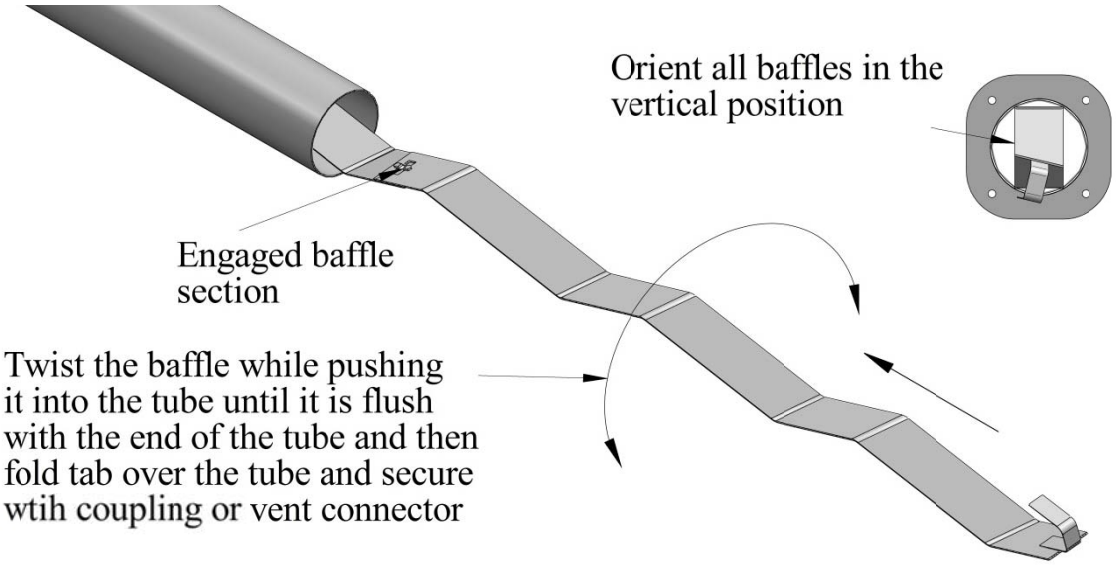
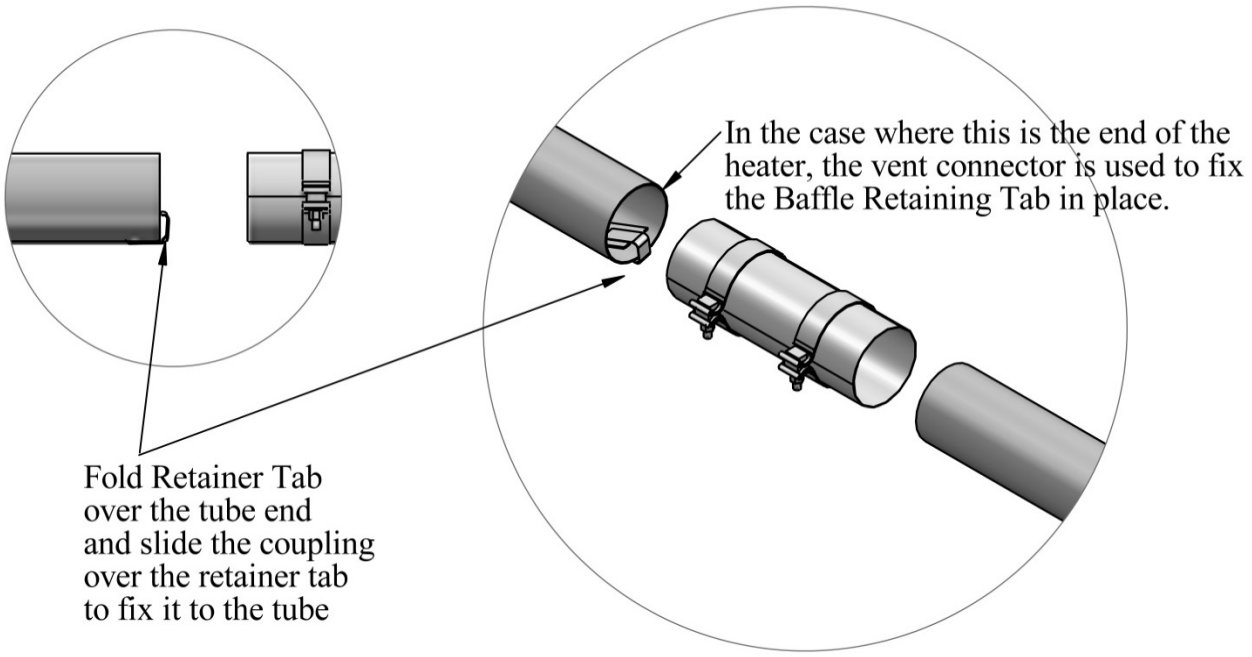


Figure 16

Figure 17



At this point we are ready to install reflectors. It is important to note that reflectors need to move with thermal expansion of the tube. Reflectors are fixed from movement at every other overlap only! Failure to follow this instruction will cause undesirable distortion of the reflector system. See Figure 18.

Install reflectors by sliding them into the hanging system. Once installed, reflector straps and clips are installed to hold the reflectors in place. See figures 20,21, and 22.

Figure 18

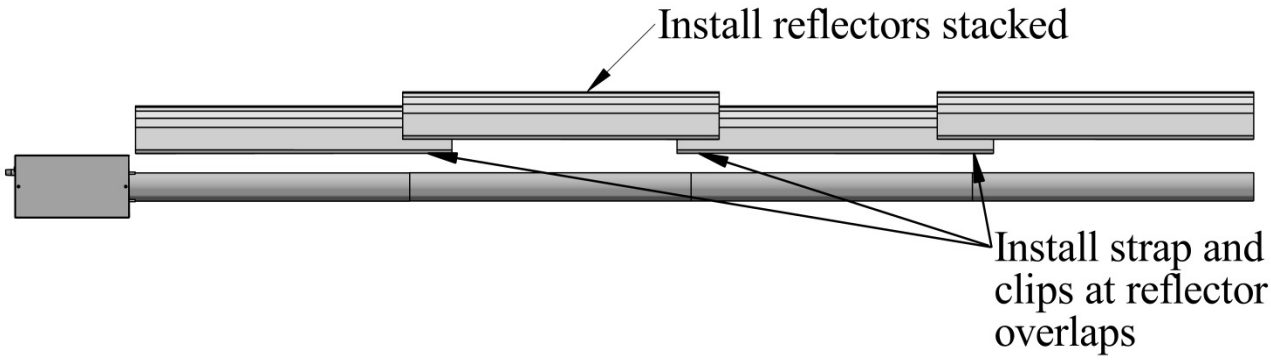


Figure 19

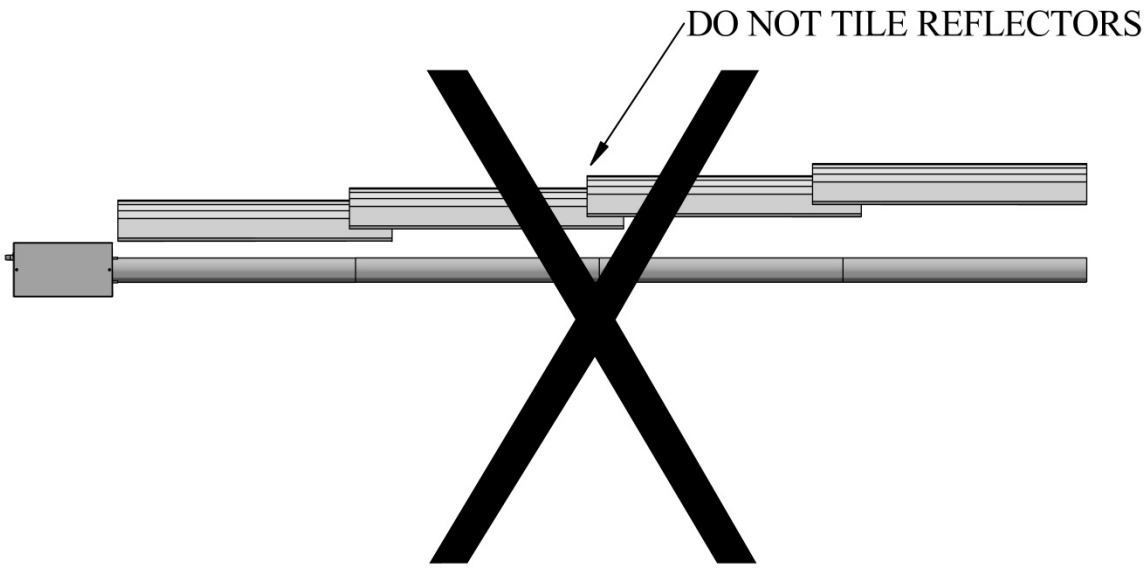
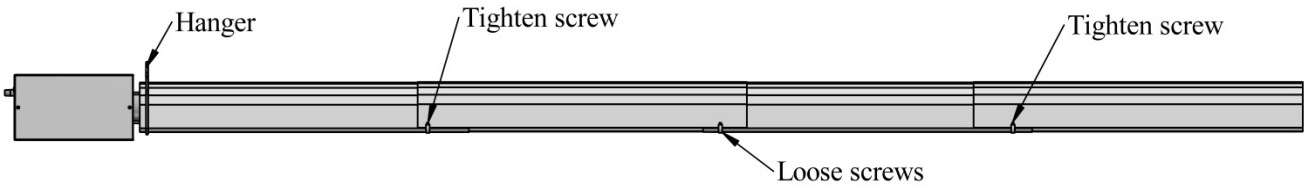


Figure 19 above illustrate reflectors that are improperly installed. Do not install reflectors in this manner.

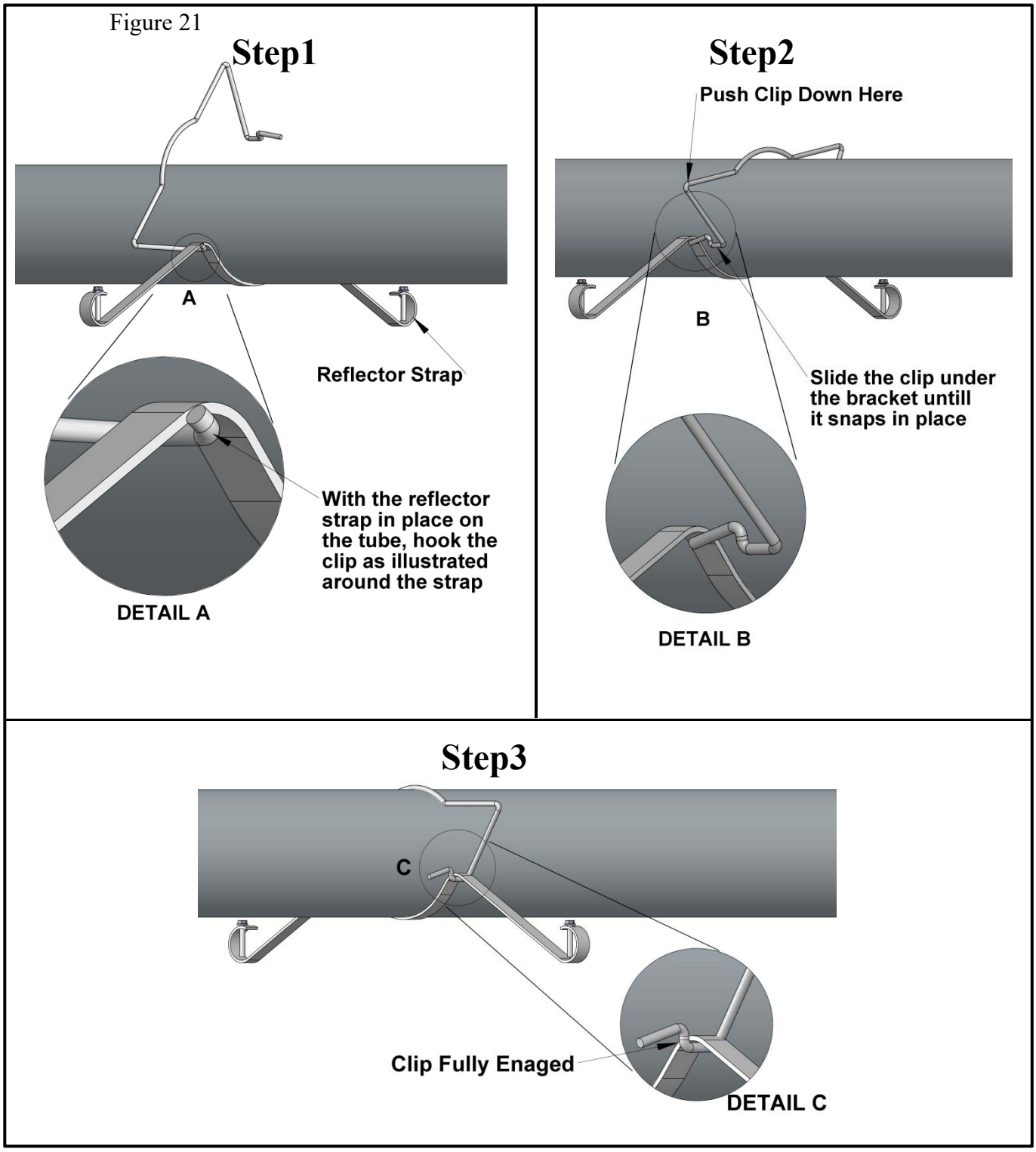
Reflector clips and straps are installed at every reflector overlap. Straps and clips may also installed midpoint of the reflector. The reflector straps are used to restrain the reflector from movement only at every other reflector overlap joint. See figure 20.

Figure 20



See Figure 21 for the sequence of installing the reflector strap and spring clip. These are installed after the reflectors are in place. The reflectors are not shown in the illustration in Figure 21 for simplicity.

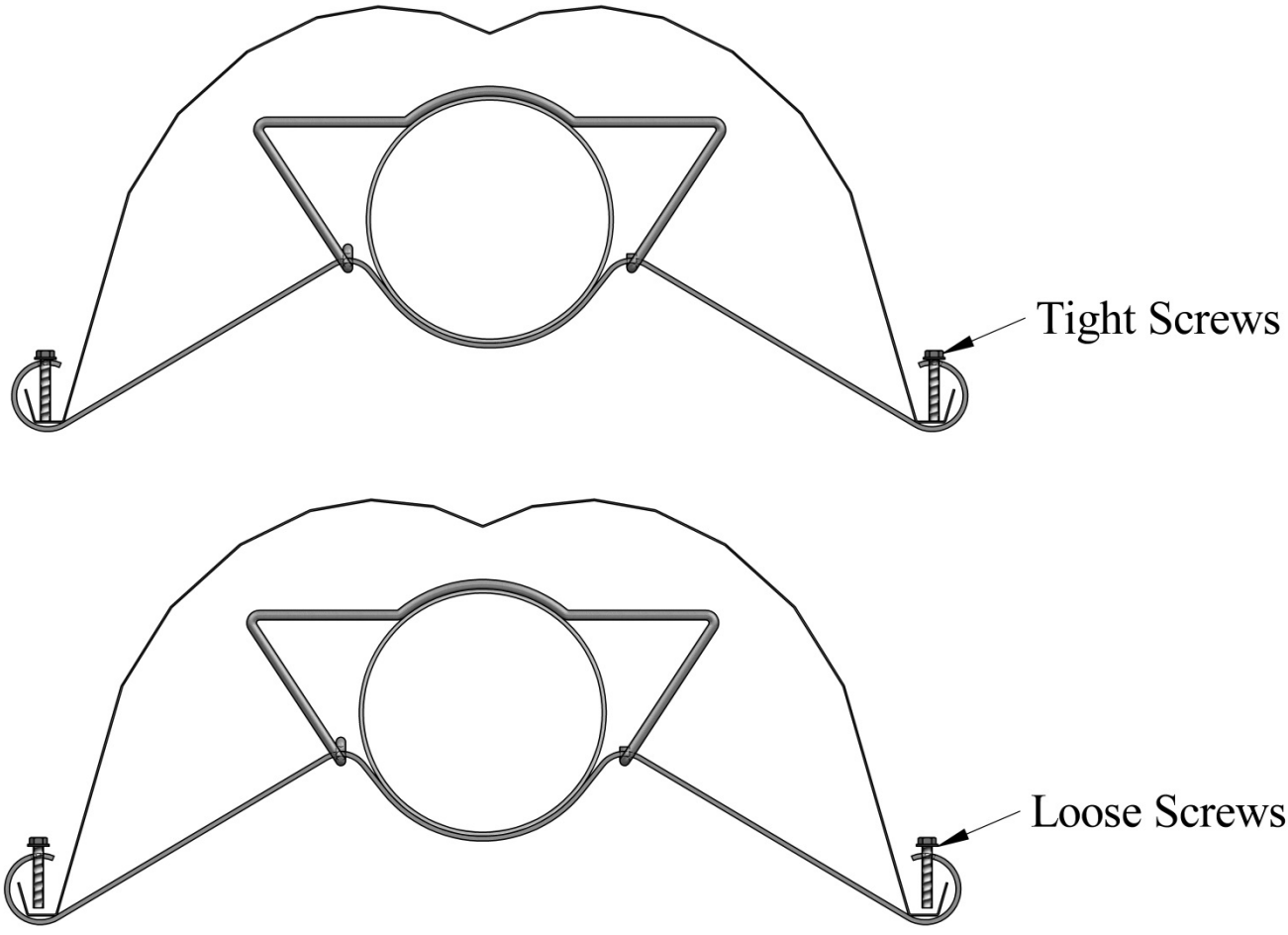
Figure 21



With each heating and cooling cycle substantial expansion and contraction occurs. The steel tube will expand more and faster than the aluminum reflector. As a result the reflectors must be free to slide relative to each other only at every other overlap. The reflectors shall be fixed at the remaining overlaps in such a way that the reflector stays in place.

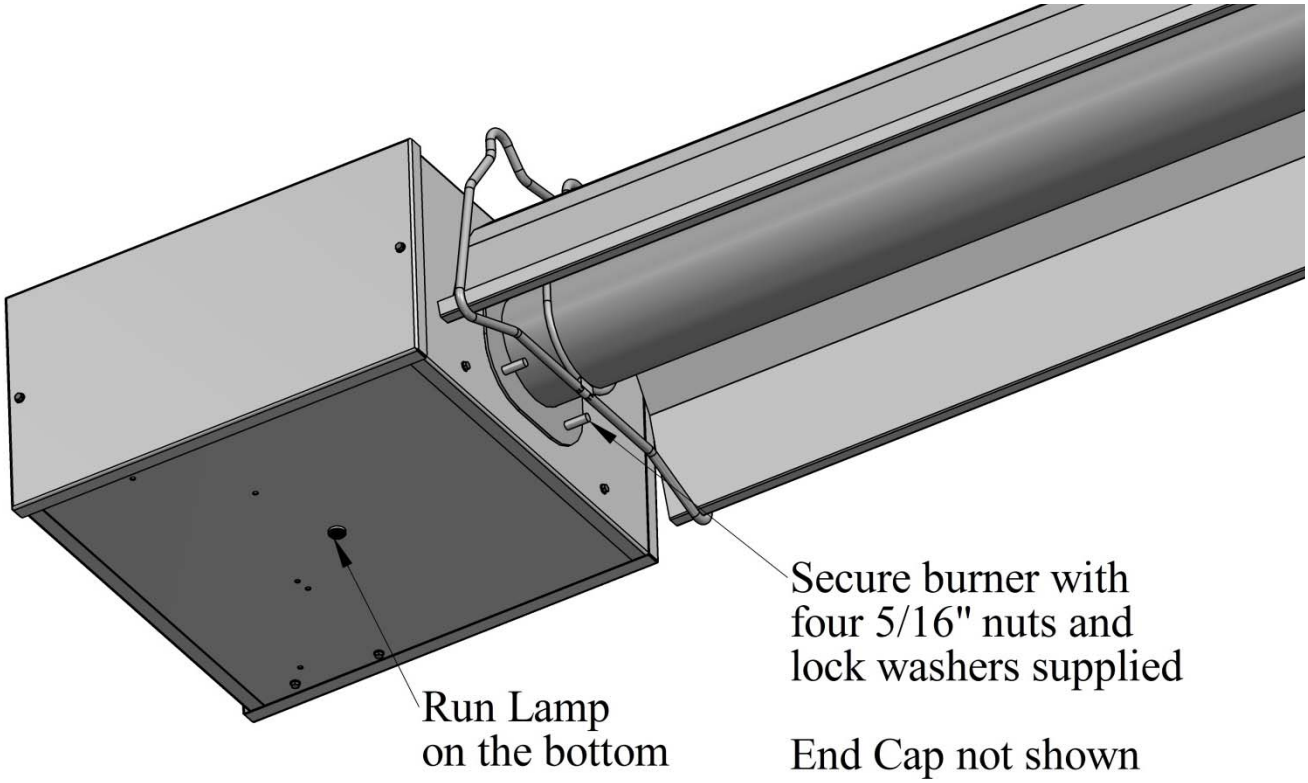
Figure 22 illustrates the screws in the reflector strap. The “tight” screws are snug down to pinch the reflector against the strap. The “loose” screws are left with the screws approximately 1/16” from making contact with the reflector; the intent is to allow reflectors to slide. In Figure 20 we illustrate a tight screw and a loose screw pattern that allows the system to thermally grow and contract.

Figure 22



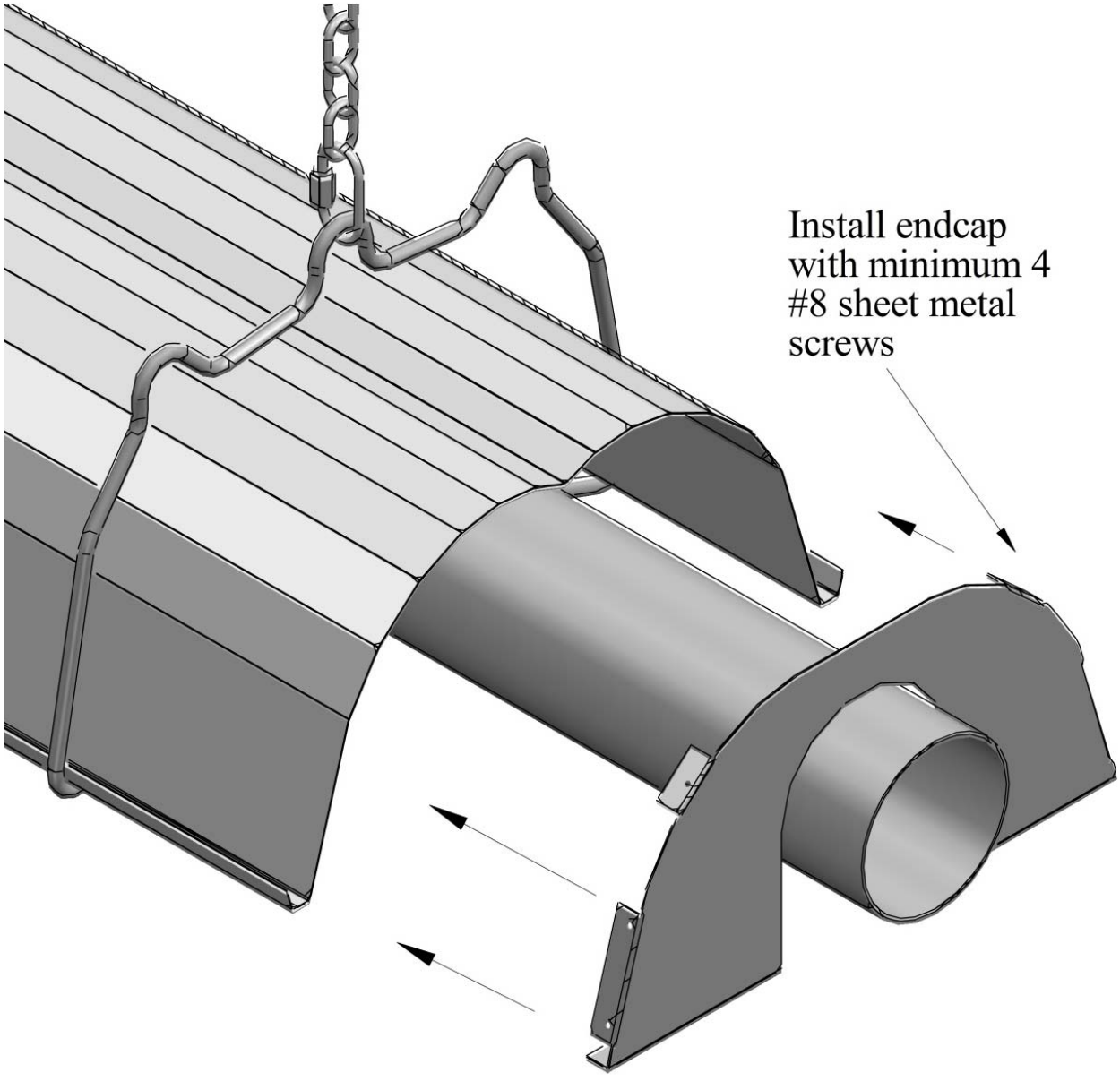
It may be desirable to mount the burner with the flanged tube on the ground and then hang it as an assembly before the reflector is installed. The burner is mounted using four 5/16 inch lock washers and nuts and may be installed at any time during the installation process. The burner run lamp must be in the bottom position. See Figure 23. Also ensure that the burner mount gasket is in place between the burner and the flange. RTV silicone can be used in the gaskets place but must not cause any obstrusion of flow in the burner. If silicone is used ensure a thin film is placed on the outer edge of the flange and inspect the burner passage for obstruction by removing the service covers for observation.

Figure 23



Reflector end caps must be installed at each end of all reflector runs. Where a U-bend or elbow is used end caps must be used at each end when the reflector run is split.

Figure 24



5.0 Accessories

5.1 Elbow Kits and U-Tube Kits

When installing U-bends or elbows, clearance to combustibles above is 18” for un-reflected portions of the fittings. If reflector kits are used then clearances per Table 1 apply. Minmum distance to Elbow or U-Tube is half the minimum straight length, See Table 3 for minimum installed length. **However Minimum distance to Elbow or U-Tube is never less than 10 ft.**

Figure 25

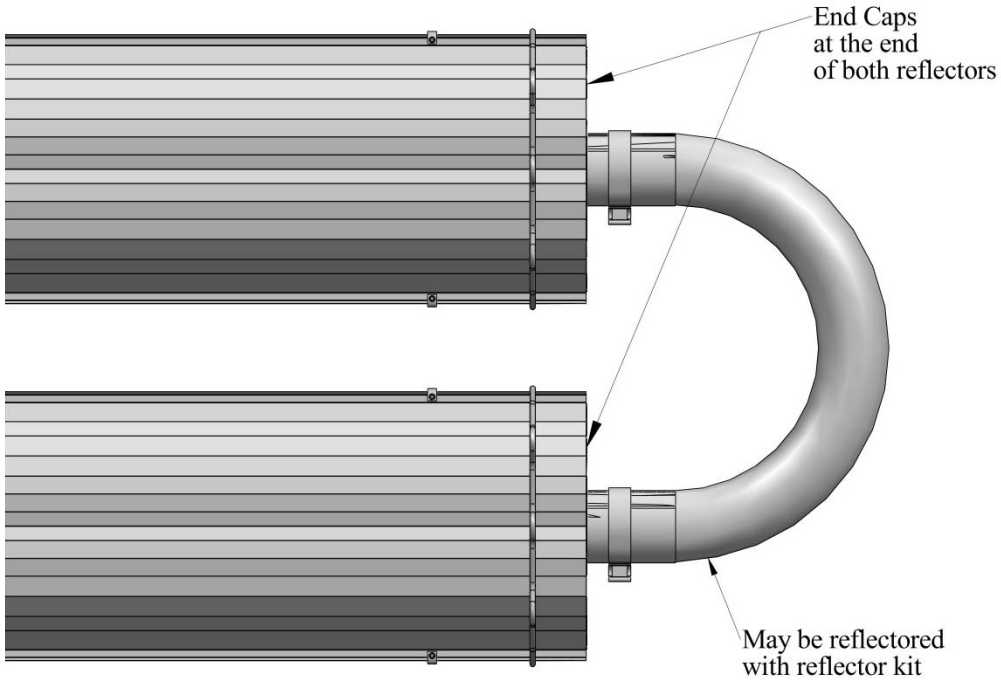
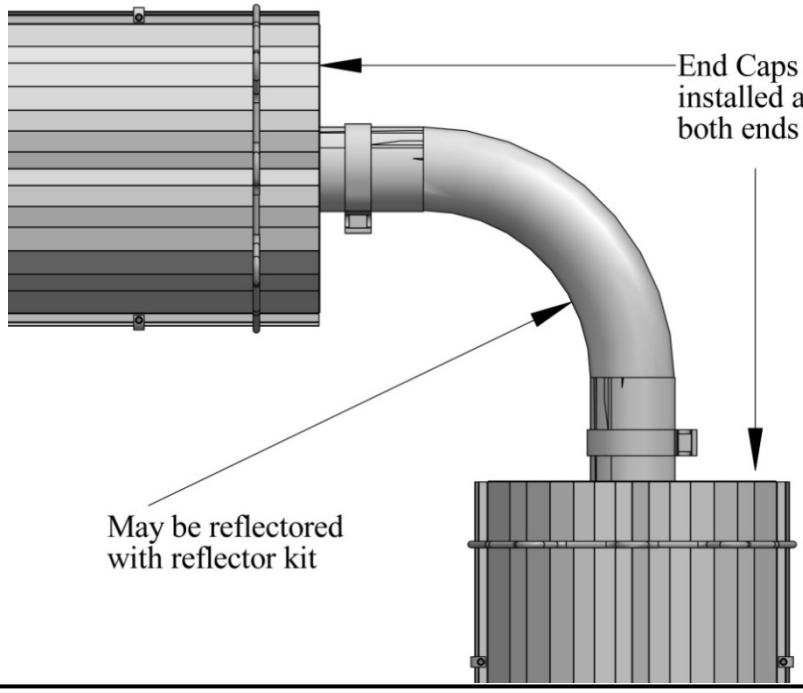


Figure 26



5.2 Side Shields

Figure 27

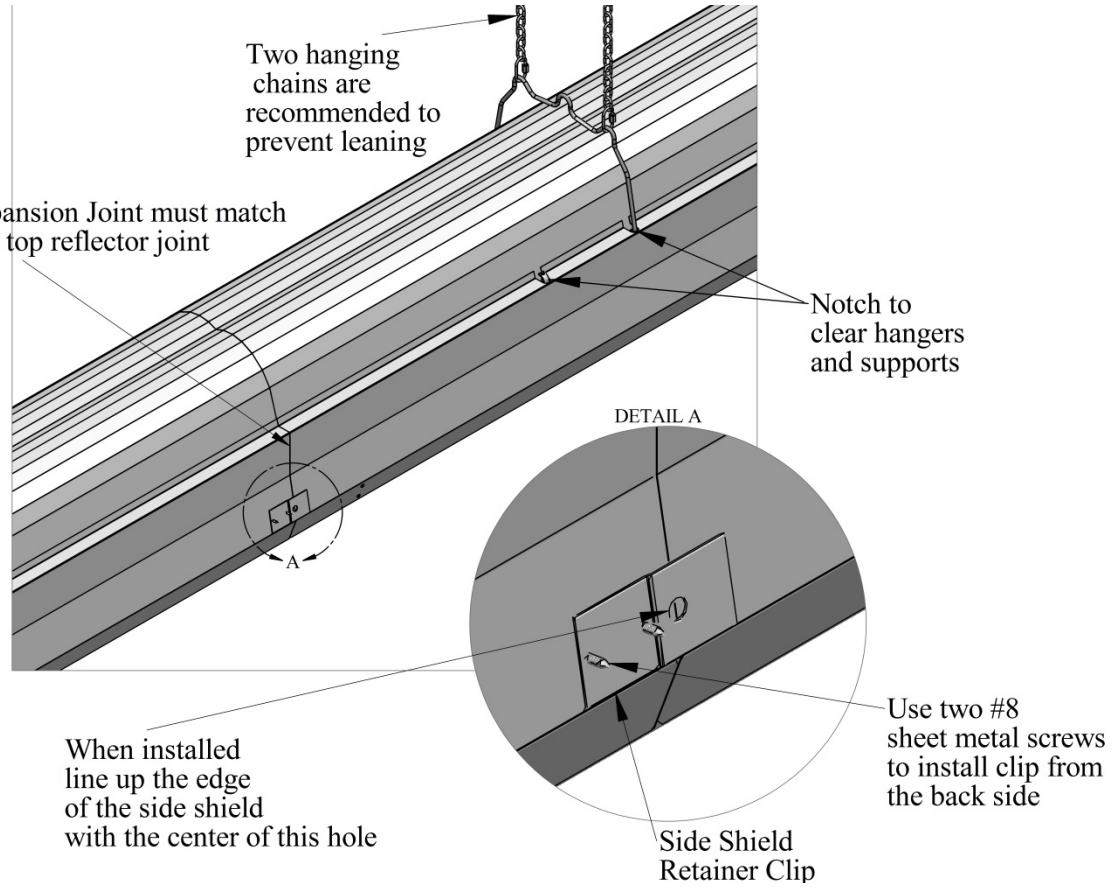
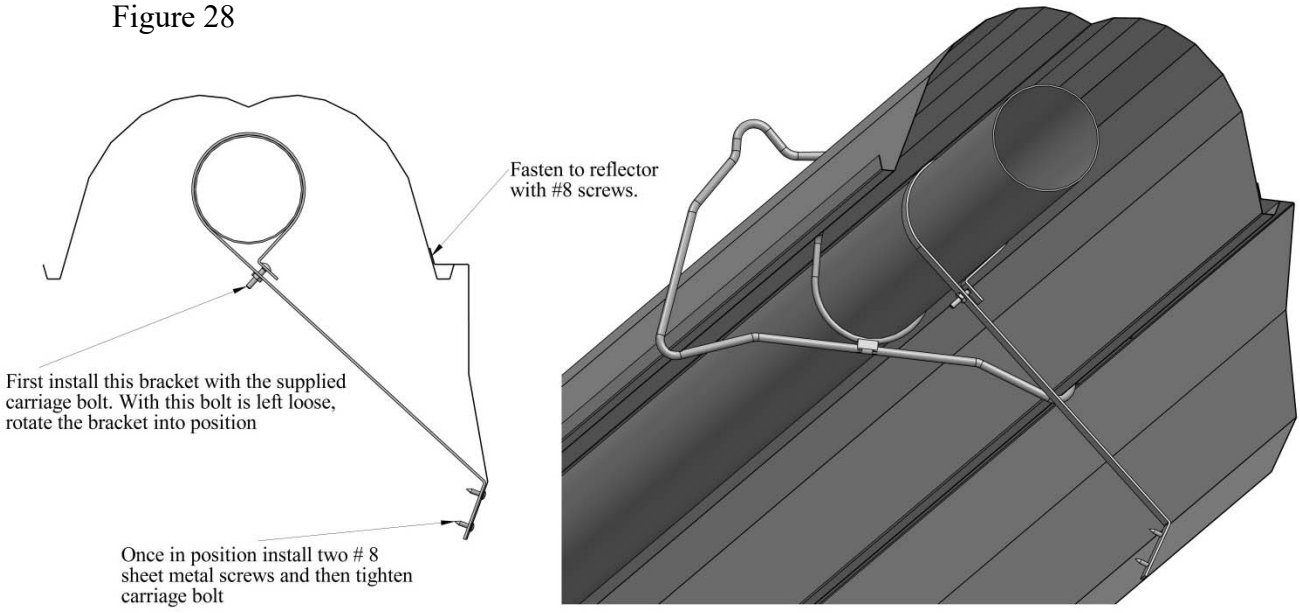


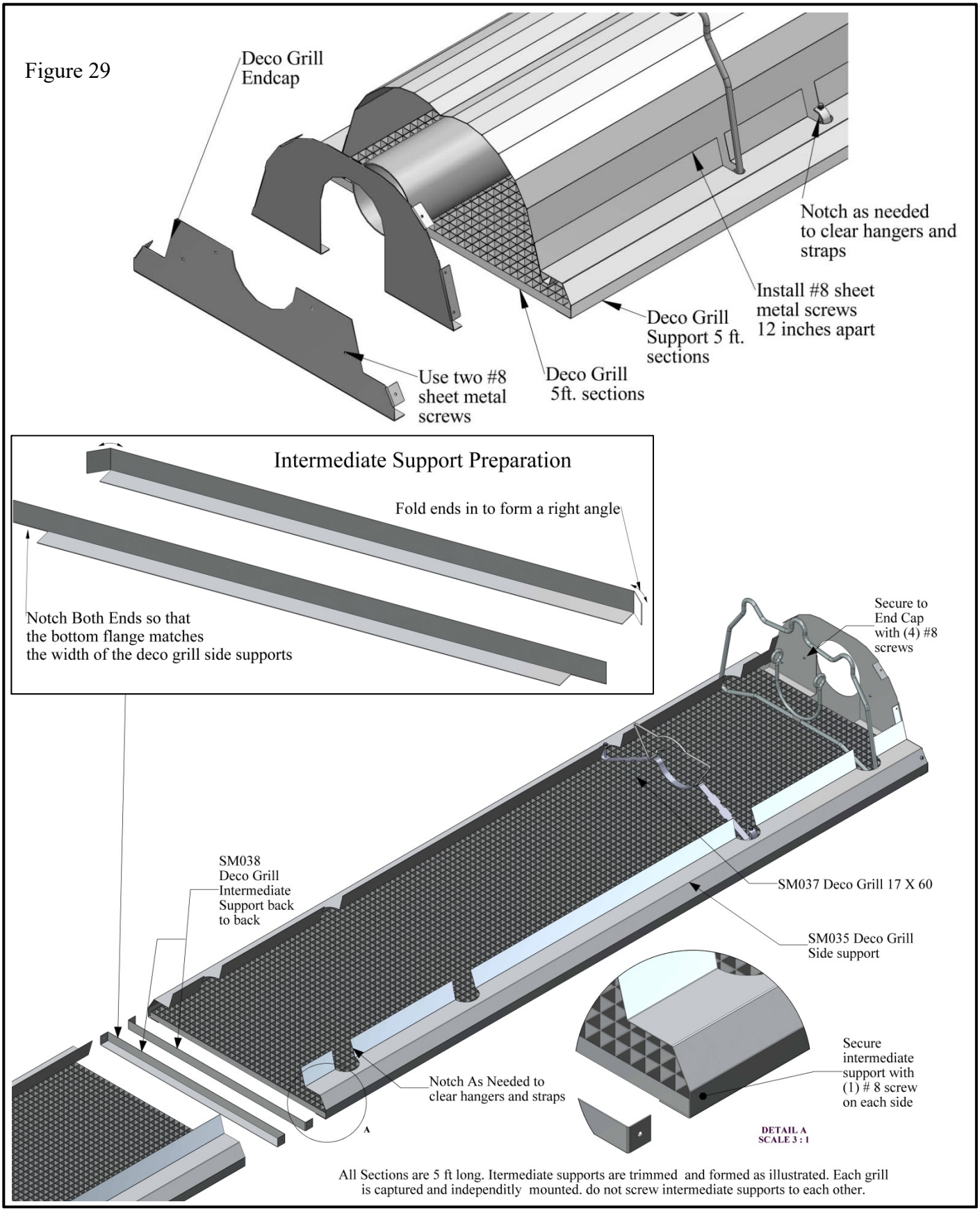
Figure 28



5.3 Deco Grill Kit

Deco grill kits are available for standalone, or drop ceiling applications. See Figure 29 below for installation detail.

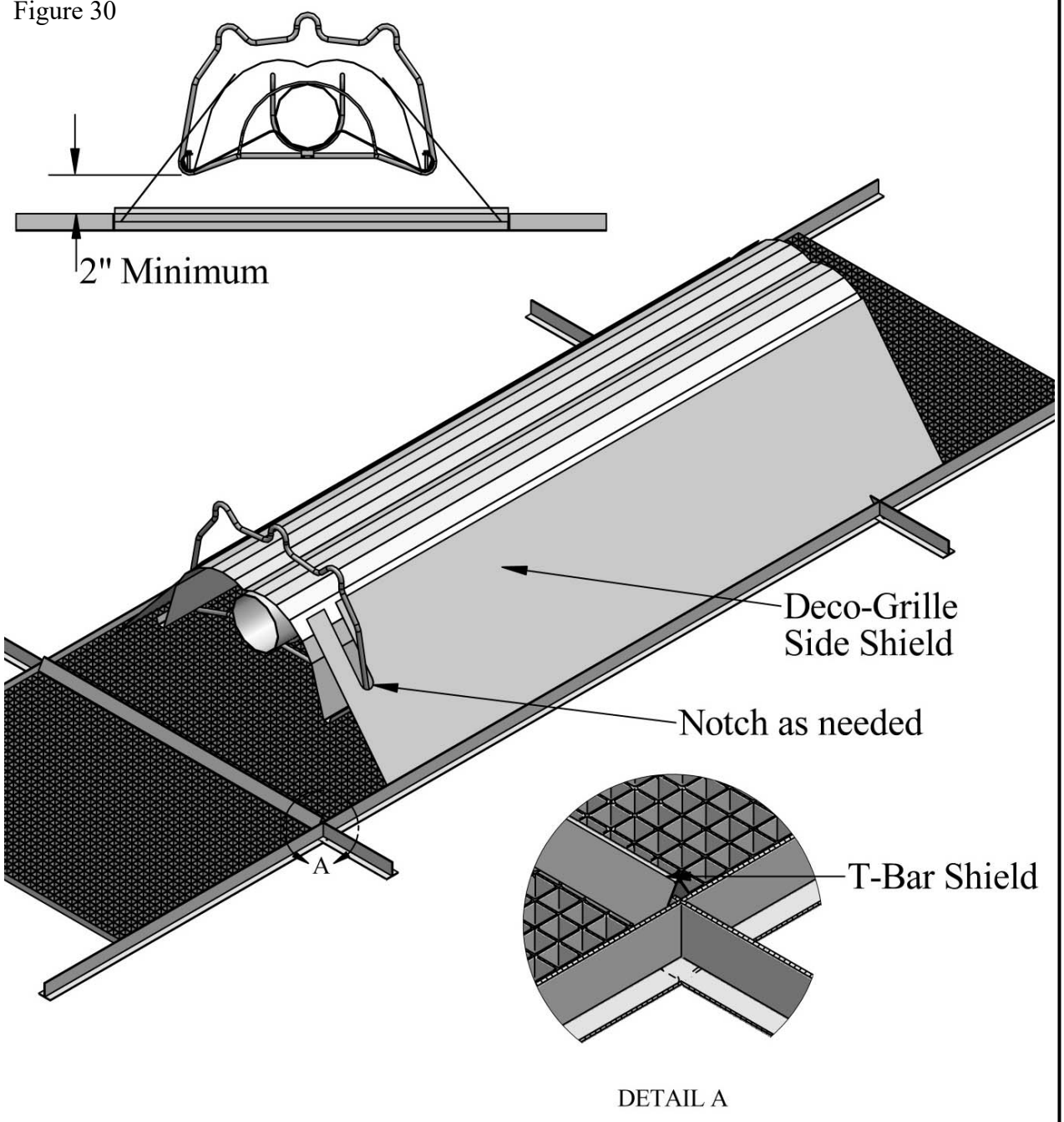
Figure 29



5.4 Drop Ceiling Installation

When installing the heater in a drop ceiling all clearance to combustible remain the same as outlined in Table 1. Adjacent ceiling tiles within clearance to combustibles must be made of non-combustible materials. Below Figure 30 illustrates typical installation in a drop ceiling.

Figure 30

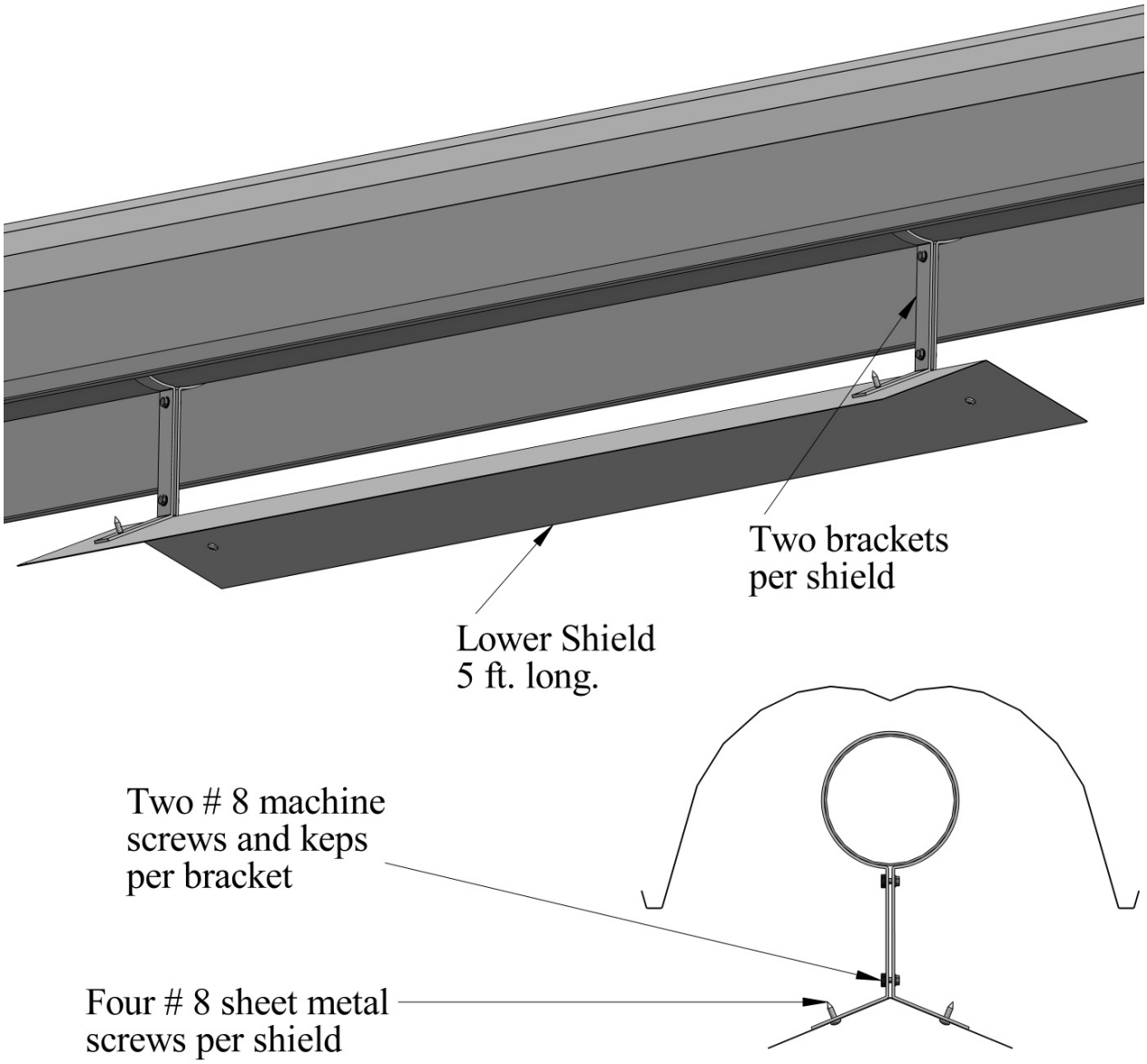


5.5 Lower Shield

Lower Shields are available in 5ft long sections. They are held in place with two lower shield brackets per shield. The shields are installed in a horizontal plane as illustrated in Figure 31. The two brackets must be between 3ft to 4.ft. apart and equally spaced from the end of the shield.

The lower shield reduces the below clearance distance (dimension C) in Table 1 by 25 %. When multiple shields are installed they must not overlap each other.

Figure 31



6.0 Gas Piping

Gas service to the building must be sufficient to supply gas to all gas fired appliances installed in the building. The gas pipe network sizing and load capabilities must be sized according to local codes. Refer to the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the US and CAN/CGA B149.1 Installation Codes in Canada.

All gas supply system pressure testing should be completed BEFORE appliances are connected to the piping system. The International Fuel Gas Code recommends that appliances or equipment should "be isolated from the piping by disconnecting them and capping the outlet(s)". Do not depend on gas appliance shut-off valves, which may fail to hold pressure during testing, and allow pressure to bleed through to connected appliances with possible control damage resulting.

Before connecting the burner to the gas pipe system verify that the supply piping has been properly pressure tested and that the operating pressure to the burner is not in excess of ½ psi. It is required to have a 1/8 inch pressure tap immediately upstream of the gas supply connection to the heater. We recommend that a gas shut off with a 1/8 inch NPT pressure tap be installed to facilitate measuring inlet gas pressure, or alternatively a tee with a 1/8 inch NPT leg. Arrange piping to ensure that collisions do not occur between the piping and the heater with heater movement. See figure 32 for the proper arrangement of the gas flex connector.

Gas flex sizes shall be sized for the capacity of the heater

Only listed gas flexible connector suitable for use with low intensity infrared tube haters must be used.

In the USA order:

PN CG017 for rates up to and including 125,000 Btu/hr

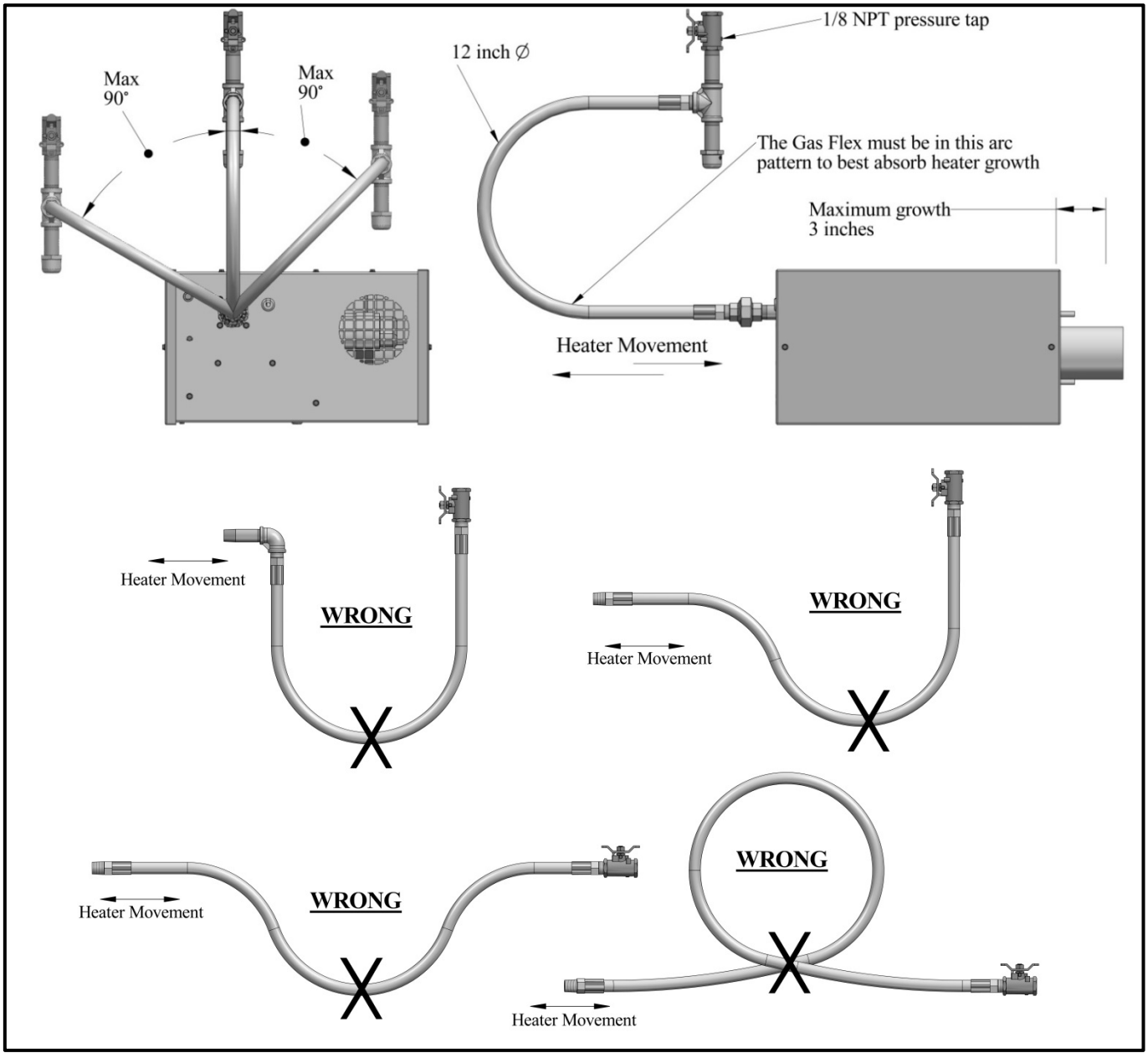
PN CG018 for rates 150,000 Btu/hr and above

In the Canada order:

PN CG019 for rates up to and including 125,000 Btu/hr

PN CG020 for rates 150,000 Btu/hr and above

Figure 32



7.0 Venting

7.1 General Venting Requirements

This heater must be vented in accordance with the instructions contained in this manual and must adhere to 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.

The Exhaust end of heater will accept a 4' (10 cm) **26 gauge** galvanized C vent pipe minimum using the vent connecter (PN SM048). To prevent leakage of nuisance condensation, install the vent connecter and venting material with minimum 3 corrosion resistant # 8 screws and seal

the joints using a high temperature silicone sealant rated at 600 °F (316 °C). Also, 26 gauge galvanized minimum spiral vent with all joints sealed may be used in the horizontal venting system. Any portion of vent pipe passing through a combustible wall must have an approved wall thimble part number SM039.
Vent pipe must be sloped downward away from the burner, up to 1 inch for every 20 feet of vent run. All joints and the inside seam of the "C-Vent" must be sealed with high temperature silicone sealant rated at 600 °F (316 °C).

The heaters are approved for un-vented applications. In the United States refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision, in Canada refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision for unvented application requirements. Unvented operation also requires compliance with the clearances to combustibles for the end of the heaters. Refer to Table 1.

For Horizontally vented heaters the vent must:

- The bottom of the vent or air intake terminal shall not be located less than 1ft. above adjacent roof levels.
- The vent shall not terminate less than 7ft. above grade when located adjacent to public walkways.
- Vent terminal must be installed at a height sufficient to prevent blockage by snow.
- Building materials must be protected from degradation by exiting flue gasses.
- Secure all joints with #8 x 1/2 sheet metal screws (3 minimum). Seal all joints with high temperature silicone sealant rated at 600 °F (316 °C).
- Vent terminal must be beyond any combustible overhang.
- For outdoor installation the heater must have the vent terminal installed.
- Use soap solution to test for leaks in the venting system once the installation is complete

United States Requirements
Vent must terminate at least 3ft. above any forced air inlet located within 10ft.
Vent must terminate at least 4ft. below, 4ft. horizontally from, or 1ft. above any door, operable window, or gravity air inlet into any building.
Canadian Requirements
The vent shall not terminate within 6ft. of a mechanical air supply inlet to any building.
The vent shall not terminate within 12 inches for inputs from up to and including 100 000 Btuh, and 3ft. for inputs exceeding 100,000 btu/hr; 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.

In the United States refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision, in Canada refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision for detailed vented application requirements.

7.2 Unvented Operation

The national codes supersede the guidelines below for un-vented heaters. In the United States refer to National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision, in Canada refer to Natural Gas and Propane Installation Code CSA B149.1 - latest revision for unvented application requirements.
When the National codes allow, sufficient ventilation must be provided in the amount of 4 cfm per 1000 Btu/h of firing rate minimum in the United States and 3 cfm per 1000 Btu/h of firing rate minimum in Canada.
Mechanical exhaust fans utilized to get the proper ventilation must be interlocked with the heater for your safety. This safety device may be in series with the thermostat (low voltage wiring), or the line voltage to the heater. It is the installer's responsibility to ensure proper interlock is in place.
The unvented heater must terminate with a vent terminal (PN TB010) discharging in the downward direction.

7.3 Horizontal Venting

The venting system for this appliance operates under a positive pressure when horizontally vented and requires a special venting system when installed as a Category III heater (positive pressure).

A listed category III venting system may be used or the special venting configurations listed in these installation instructions may be used.

For burner rates up to and including 60,000 Btu/hr; the maximum vent length allowed is 30ft. The maximum fresh air supply duct length allowed is 30ft. The total vent length, plus outside air duct length, cannot exceed 50ft. Any extensions to minimum heat exchanger lengths, is considered part of the vent length allowed and must be accounted for in the total vent length.
For burner rates 80,000 Btu/hr. and up, the maximum vent length allowed is 45ft. The maximum fresh air supply duct length allowed is 45ft. The total vent length, plus outside air duct length cannot exceed 60ft. Any extensions to minimum heat exchanger lengths, is considered part of the vent length allowed and must be accounted for in the total vent length.
In all cases vent length should be limited to less than 20ft. when possible. If using vent lengths greater than 20ft. then nuisance condensation may form in the vent pipe. Insulation and additional sealing measures may be required.
Heat exchanger beyond minimum lengths is considered as vent length. The vent lengths above includes two elbows in both the vent and fresh air duct (4 total). Subtract 10ft. for each additional elbow. Note elbows not used in the fresh air supply cannot be added to the vent section. The vent length limits above include only two elbows in each section maximum. If more elbows are used 10 ft. must be subtracted for each additional elbow.

Examples:
1 3 Elbows in the vent and no fresh air connection the maximum vent length is reduced 10ft. and the total combined length is reduced by 10ft.
2 1 elbow in the vent and 3 elbows in the fresh air duct, then the maximum fresh air duct length is reduced 10 ft. and the total combined length is reduced by 10ft.

3 If there are 3 elbows in the vent and 3 elbows in the fresh air duct, then the maximum vent length is reduced by 10 ft. and the maximum fresh air duct is reduced 10ft. and the maximum combined length is reduced 20ft.

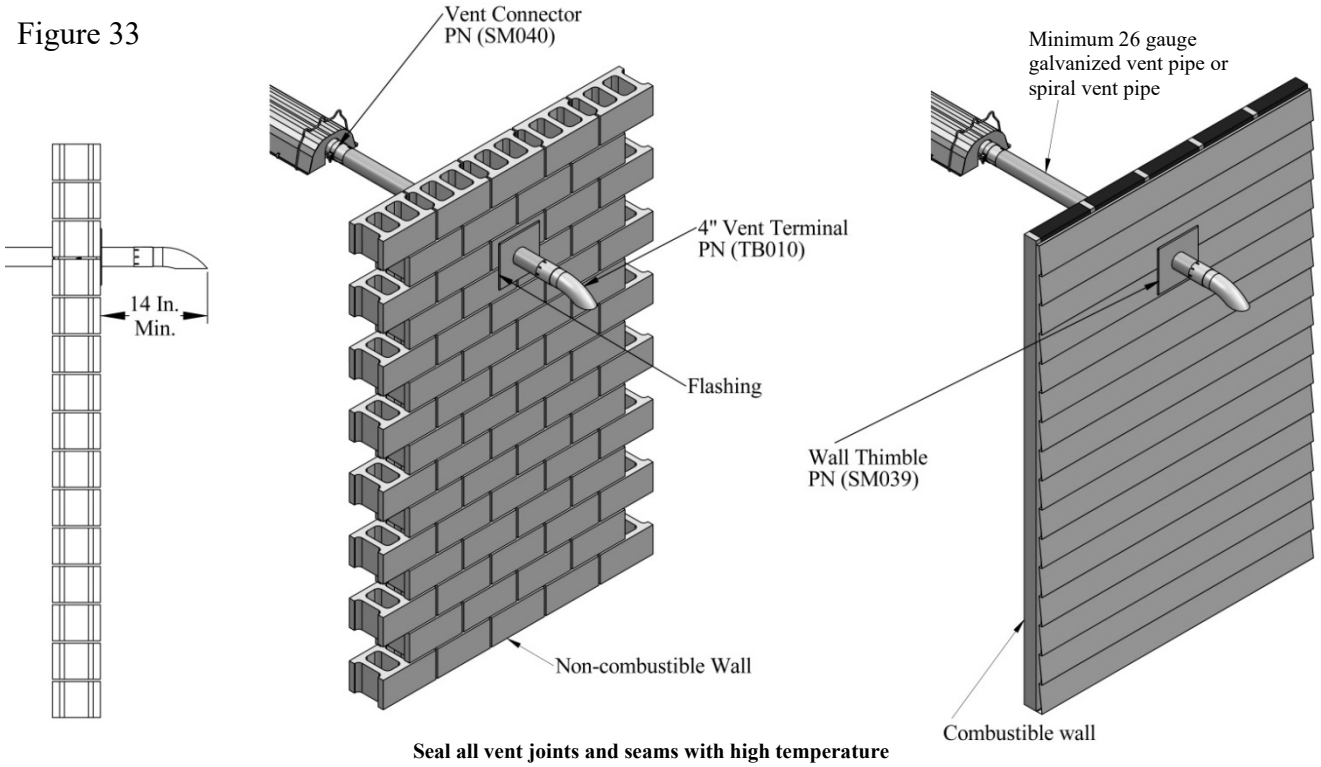
For horizontal venting refer to Figure 33 for visual guidance. Note that in all cases a vent terminal PN (TB010) or Tjernlund VH1-4 must be used for 4 inch terminations.
In all cases for combustible walls a wall thimble must be used. See Figures 33.

4 inch wall thimble PN (SM039)

For non-combustible walls a simple flashing is sufficient and is the responsibility of the contractor.

Note: When a concentric vent kit (PN SM057) is used on models 10-40 (-1,-2,-NG) or 10-60 (-1,-2,-NG) refer only to the supplemental venting instructions supplied with the concentric vent kit PN SM057.

Figure 33



Seal all vent joints and seams with high temperature silicone sealant rated at 600 °F (316 °C)

7.5 Vertical Venting

The vertical venting portion must be **B-vent and must be sized for a category 1, fan assisted appliances** based on the National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision in the United States, or based on Natural Gas and Propane Installation Code CSA B149.1 - latest revision in Canada. The vent connector is 4 inch and must be increased at the end of the heater for vertical venting determined to be greater than 4 inches. This increase must be done immediately at the vent connector. Horizontal vent connector length shall not exceed 25 ft.

7.5.1 Common Vertical Venting

The Common vertical venting portion must be **B-vent and must be sized for category 1, fan assisted appliances** based on the National Fuel Gas Code NFPA 54/ANSI Z223.1 - latest revision in the United States, or based on Natural Gas and Propane Installation Code CSA B149.1 - latest revision in Canada.
With the above conditions the heaters in this common vertical venting configuration may be controlled by individual thermostats. Note that the respective code will dictate the vertical offset of each heater vent connection.

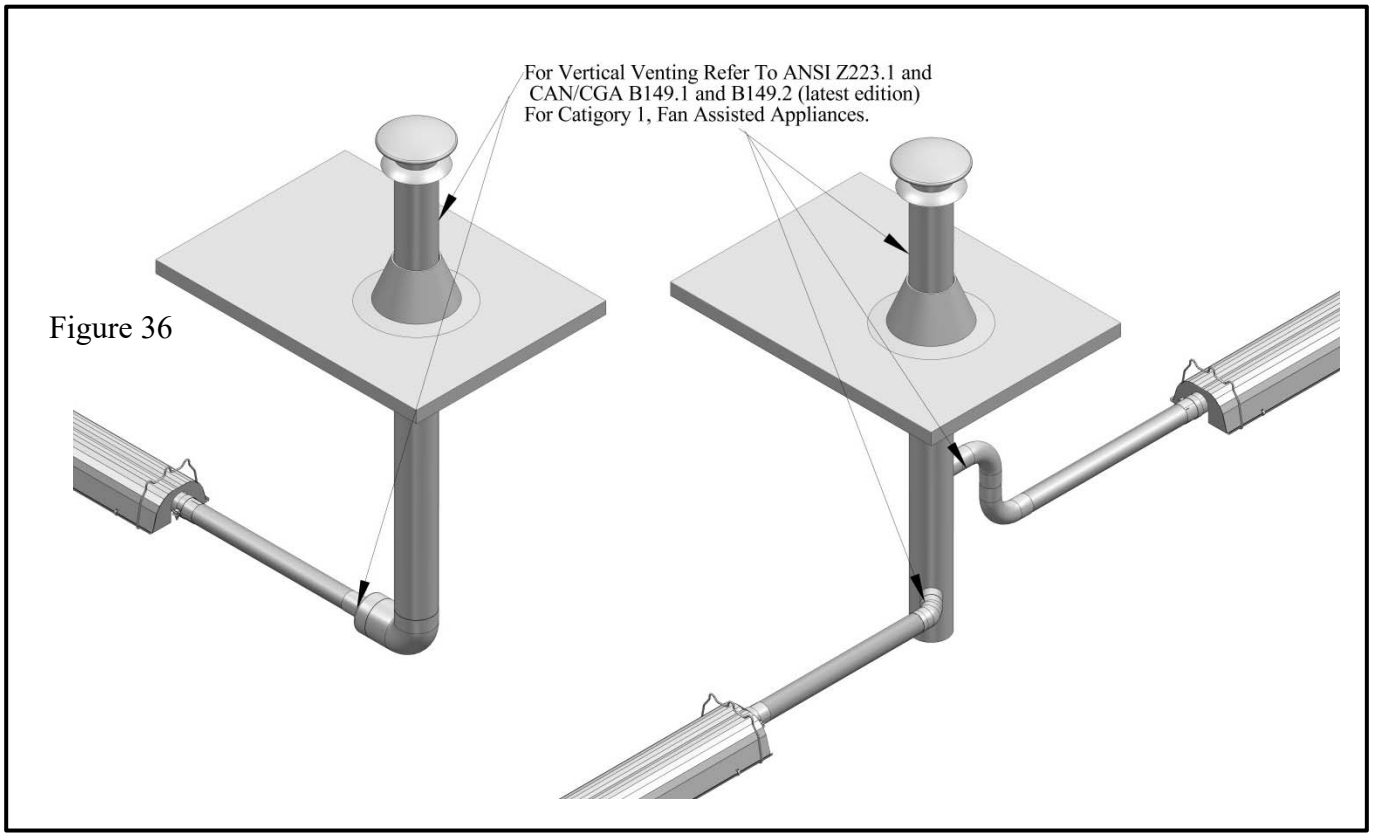


Figure 36

8.0 Fresh Air Supply Ducts

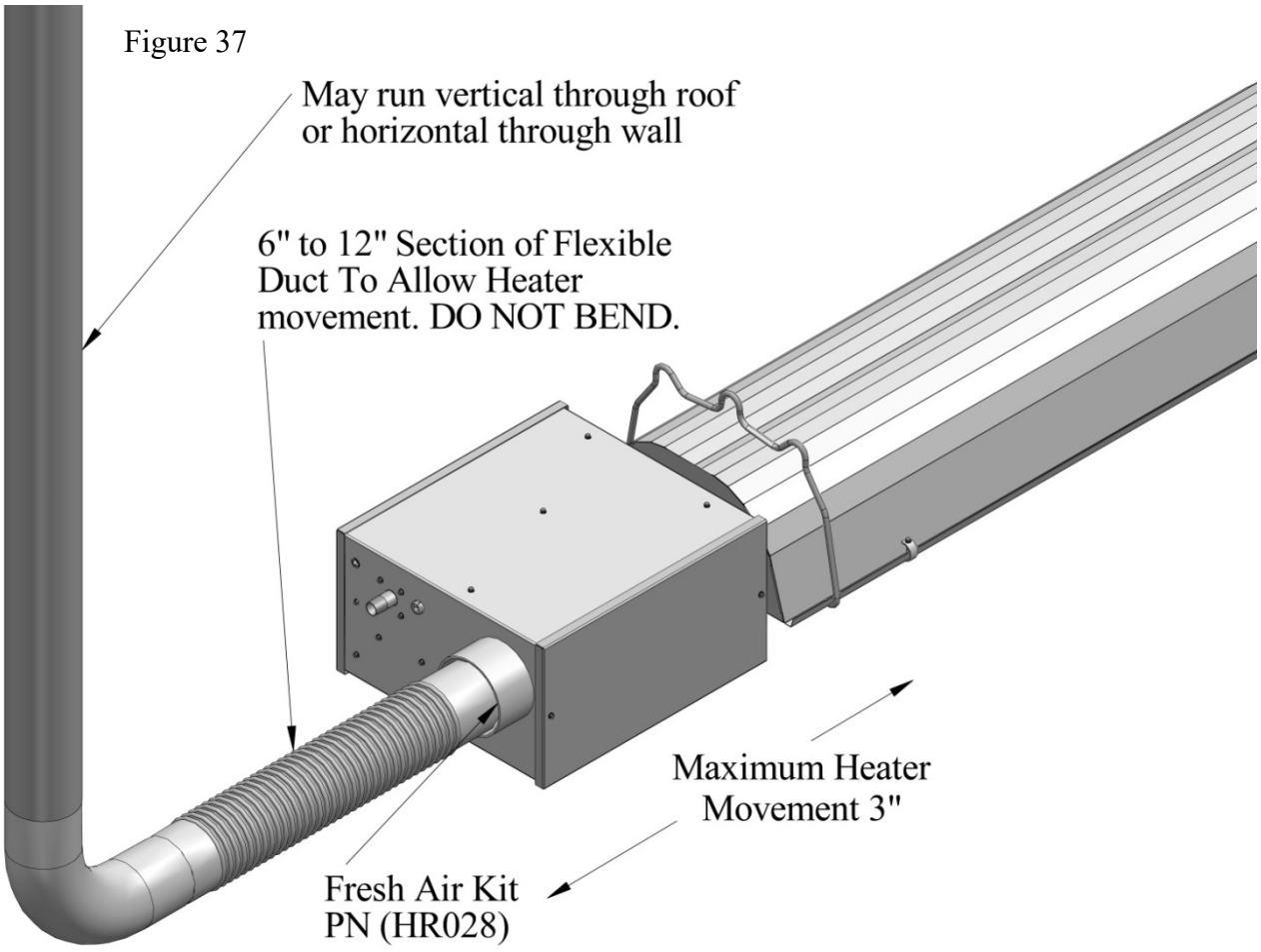
Fresh air supply is not mandatory in all cases but is recommended in dusty environments, where negative pressure or chemical contaminants are present, and in locations such as Brooders etc.

Note that with every heating and cooling cycle the heater will expand in length and return back to its' normal length. The fresh air duct must incorporate a piece of flexible ducting with a length between 8 to 12 inches to absorb this movement. Do not use flexible duct throughout the length and do not use flexible duct to produce bends as flow restrictions may affect the operation of the burner.

The outside fresh air terminal must be of the approved type such as a B-vent. The terminal, when penetrating the roof, and must be minimum 2 ft. (60 cm) above the surface of the roof. It must also meet local code requirement for fresh air intake terminations.

For horizontal fresh air inlet hood use our PN (HR029). Fresh air duct material may be adequately supported PVC or galvanized sheet metal duct.

Figure 37



9.0 Outdoor Installation

Heaters installed outdoors must be supported and secured such that wind and weather will not cause heater movement and/or stress to the gas flex connector. It is recommended that each hanger is secured to the tube with a “J” Bolt.

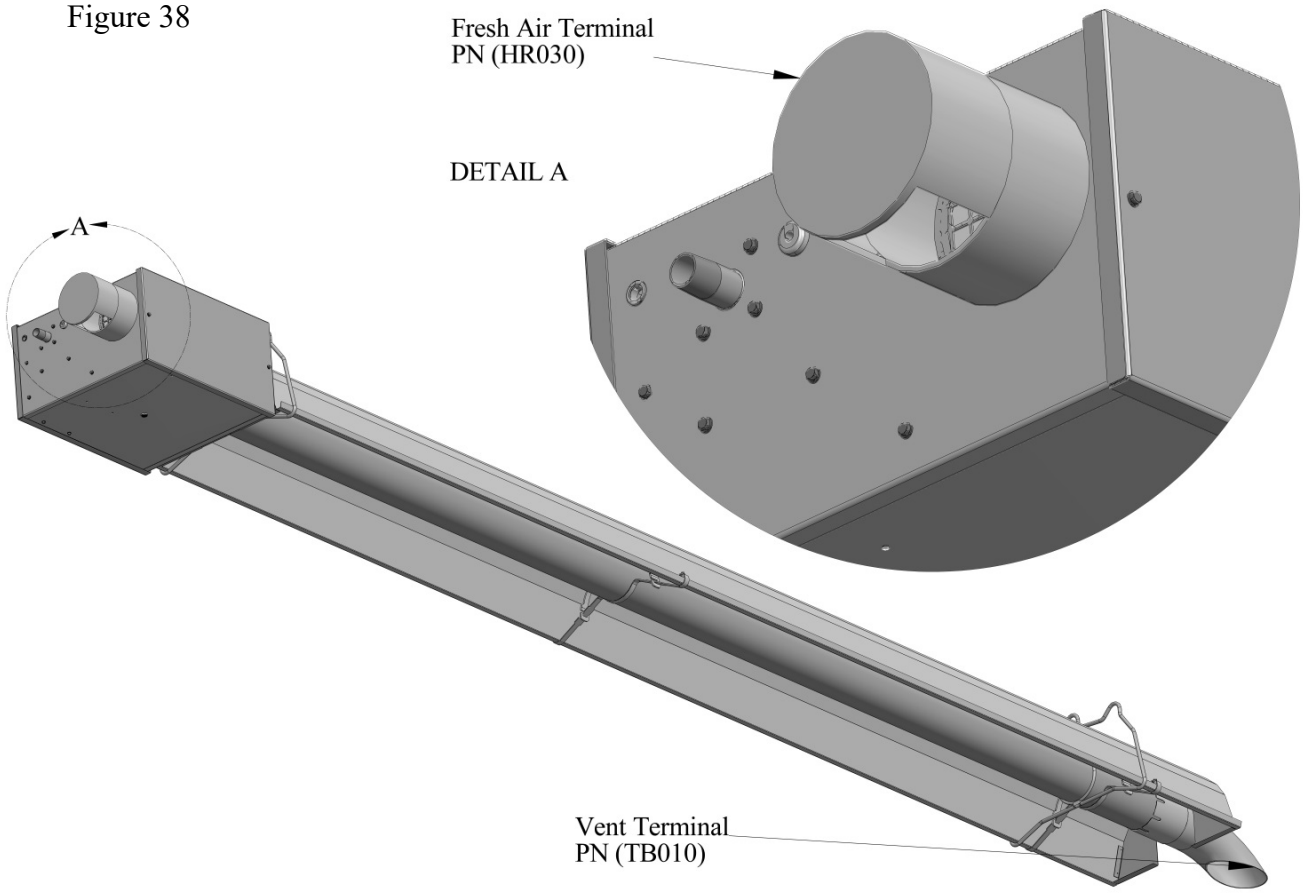
The heater rating plate must state that it is approved for outdoor use. The following accessories must be installed in an outdoor application:

- The fresh air inlet terminal for outdoor heater PN (HR030) must be installed with gasket
- The vent terminal PN (TB010) must be installed

All electrical connections must be suitable for outdoor applications. Check with local code requirements.

For outdoor applications the minimum heat exchanger lengths should be chosen. U-tube configuration with minimum heat exchanger lengths will yield the most even and effective heat output.

Figure 38



10.0 Motor Fuel Dispensing Facilities and Repair Garages

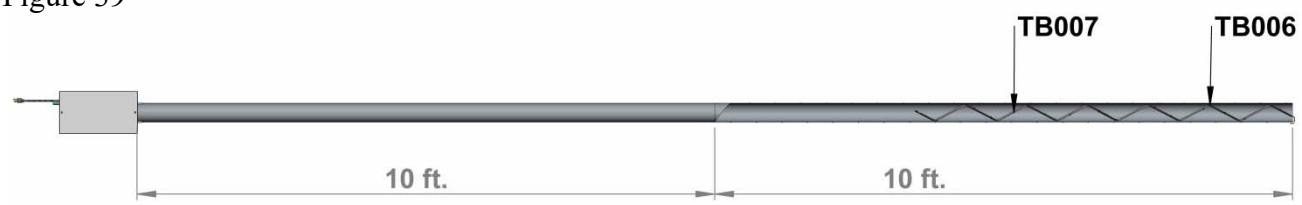
Model 10-60-NG and 10-40-NG both have a maximum surface temperature of 750°F (399°C) and meets the NFPA 30A Code for Motor Fuel Dispensing Facilities and Repair Garages. To meet NFPA 30A requirements, these heaters must be installed with a fresh air supply to the exterior of the building and must be vented.

The General specification is the same as model 10 heaters with the exception as follows:

Model 11-40-NG

- Burner input 40,000 Btu/hr.
- Minimum length 20 ft. maximum length 30 ft.
- Baffle sections are installed as follows in Figure 39 for a 20ft. long heater. When a 30ft. heater is used the baffle section moves to the end of the heat exchanger furthest from the burner.

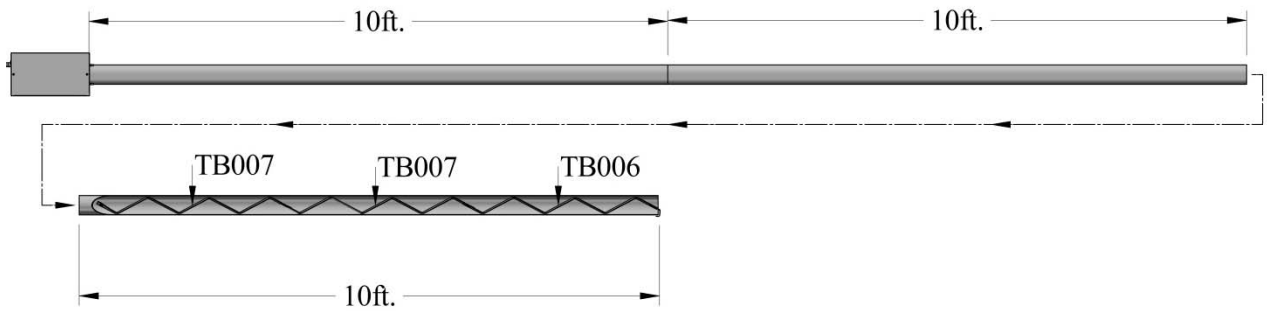
Figure 39



Model 11-60-NG

- Burner input 60,000 Btu/hr.
- Minimum length 30 ft. maximum length 40 ft.
- Baffle sections are installed as follows in Figure 40 for a 30ft. long heater. When a 40ft. heater is used the baffle section moves to the end of the heat exchanger furthest from the burner.

Figure 40



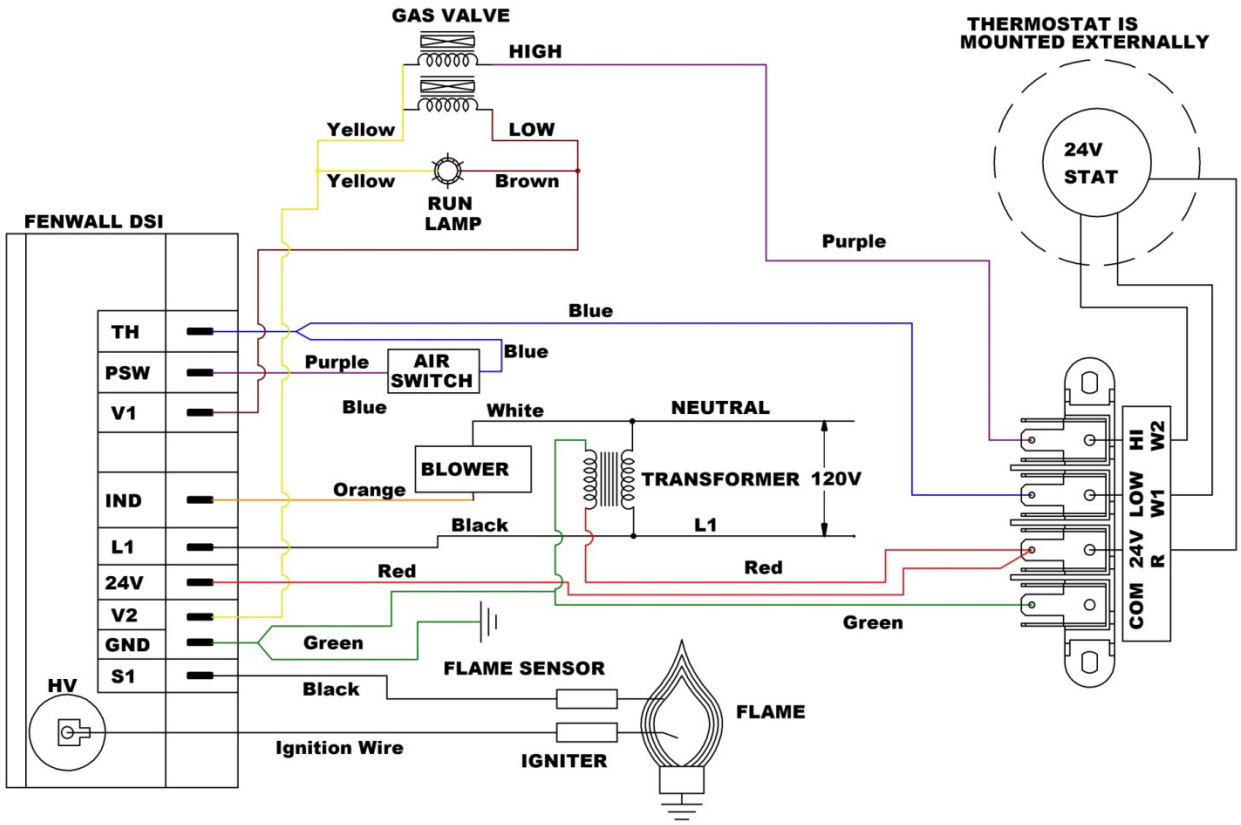
11.0 Electrical Wiring

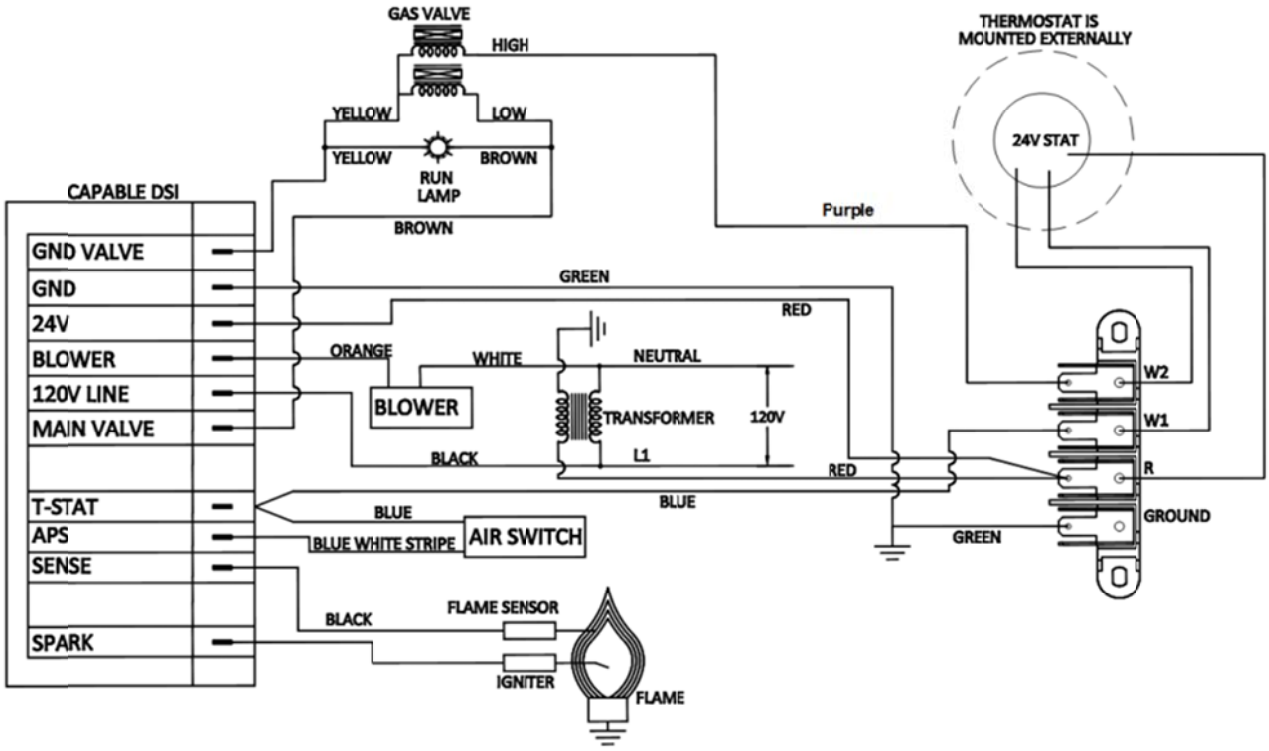
Heaters are supplied with a three prong power cord (type SJTW) and this power cord is plugged into a 115VAC outlet in the proximity of the heater. The outlet is supplied by the contractor and must be installed in accordance with the latest ANSI/NFPA 70 National Electrical code in the United States, and in accordance with the Canadian Electrical Code CSA C22.1 in Canada. The installation must comply with any local electrical requirements as well. Heater may be controlled with any appropriate switching device with voltage isolated contacts.

The heater may be controlled on the 115 VAC side or the 24VAC side of the transformer as per wiring diagram below. When controlled on the 115 VAC side the post purge feature is eliminated.

For outdoor installation we recommend cutting of the three prong plug and enter the cable into an outdoor rated electrical box with an appropriate outdoor rated strain relief suited for the cable. A disconnect switch must be furnished that meets code requirements.

If any wiring internal to the heater is replaced it must have a rating of at least 105°C and 600 VAC rating.





12.0 Sequence of Operation

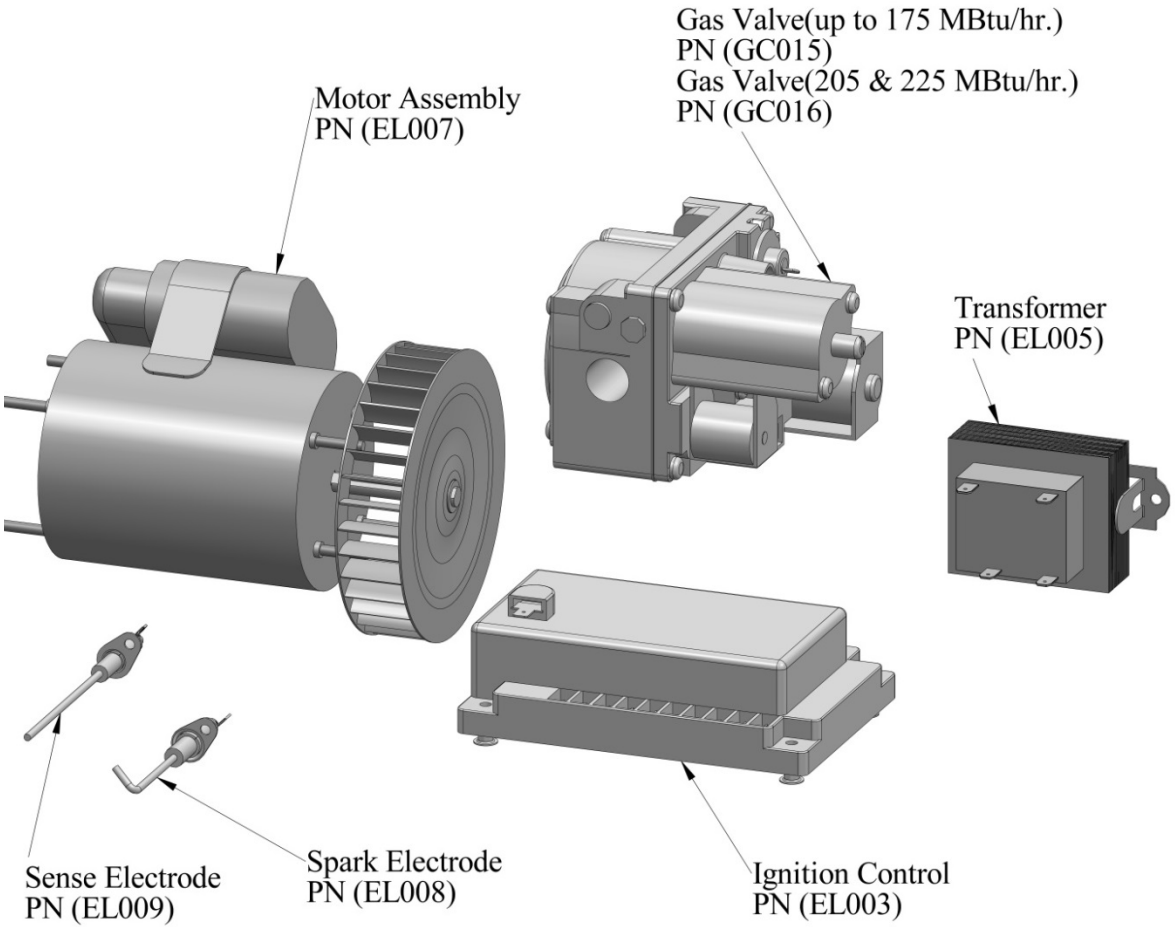
With the heater wired with a constant 115 VAC supply:

- On call for heat the thermostat closes the contacts and energizes the Ignition control
- The control performs some safety scans and with all normal the blower turns on
- When the blower produces enough air pressure the air switch engages and sends the signal to the control
- The control now initiates a pre-purge cycle where the blower will run for 30 seconds
- At the end of the pre-purge cycle the spark is energized and the gas valve is energized. This continues for up to 15 seconds or until the flame is detected.
- The flame is detected by a voltage being rectified through a flame sensor electrode.
- IF no flame is detected after the 15 second trial period the heater will go into an inter-purge period where the blower will run for 30 seconds and then begin the ignition cycle again. If no ignition is detected it will continue this cycle for three trials and then go into a soft lockout for one hour
- After one hour if the thermostat has not been reset the heater will initiate the trial for ignition again
- While in soft lockout the thermostat can be set back and then turned up to reset the control and begin the trial for ignition again. This would be helpful if for example you run out of propane fuel and on refill the heater cycle can be reset using the thermostat
- If all is normal then the heater will run until the thermostat signals the heater to turn off. In this circumstance the flame will shut down immediately and a post purge period of 30 seconds is initiated. After 30 seconds the blower shuts down and the control waits for the next signal from the thermostat.
- When controlling the heater on the line 115 VAC voltage side the sequence is the same but he post purge feature is not available.

13.0 Maintenance

Installation and repair should be done by a qualified gas service person. The heater should be inspected before use and at least annually by a qualified service person. More frequent cleaning may be required as necessary. It is imperative that the control compartment, air passageways, motor, blower Wheel, and burner of the heater be kept clean.
The vent and fresh air intake should be inspected for any evidence of nesting. If there are indications of nesting then you must contact a qualified gas service person to clean out and commission the heater.
The heater area should be kept clear and free from combustible materials, gasoline and other flammable vapors and liquids.
Be sure the flow of combustion and ventilation air is not obstructed. The tubing must be inspected for integrity, ensure that the tube is linear and has not been adversely affected from corrosion or abnormal operating conditions. Replace any reflector or tube that shows sign of deformation to avoid the possibility of future tube failure.
If the heater has unusual burner noises or is not producing much heat then the heater may have a spider nesting in the burner area. Disconnect power, shut off gas, and contact a qualified gas service person to clean out and commission the heater.
It is a good idea to remove the cover exposing the blower and inspect the blower wheel for dirt build up. To clean the blower wheel use a fine brush, vacuum, compressed air, or a combination of any of these methods. Care must be taken not to bend or displace balancing weights on the blower wheel.

14.0 Replacement Parts



Model 10 Series Warranty

- **The Manufacture warrants the this product is free of defects in material and workmanship for periods as outlined below:**

Components	3 Years	7 Years	10 Years
Burner	*		
Hot Rolled Heat exchanger		*	
Aluminized Heat exchanger			*
Burner Cup			*

- **The Manufacturer limits its' obligations to replacement or repair of defective parts FOB its factory at no charge.**

- **Failure that is caused by abuse, misuse, improper installation, by improper application, damage, or an act of God (such as a flood) is not covered in this warranty. Consequential and incidental damages are not recoverable under this warranty. Some states do not allow the exclusion or limitation of incidental or consequential damages, so this limitation or exclusion may not apply to you.**

- **This does not cover failure if the equipment is used in a corrosive environment, an environment with explosive chemicals, or in the vicinity of a combustible material.**

- **Damage incurred during a shipment must be filed with the carrier and is not covered under this warranty.**

- **Proof of purchase must be provided and you must be the original purchaser. This warranty is not transferable.**