

How to use this manual

This manual is composed of sections for common and unique information. For example, a “common” section would be Uncrating, because all units are uncrated the same way. A “unique” section would be BURNERS, because only the Direct-Fired units have burners.

Purpose

This handbook provides the installing contractor with all necessary information to:

1. Define the scope of his work.
2. Accurately estimate the cost of his work.
3. Assure proper, timely and trouble-free unit installation.
4. Assure satisfactory unit performance after installation.
5. Assure overall customer satisfaction by elimination installation delays and unexpected costs.

For answers to any questions regarding unit installation and operation, contact your local YORK office.

For more detailed information and specifications on the particular unit you are installing, refer to the unit submittal drawings.

Pre-Installation Check List

Working Guidelines

The contractor is advised to become thoroughly familiar with the operation, installation, maintenance and service requirements of the YORK *ParaFlow*[™] chiller. Careful study of the factory submittal drawings and this manual is recommended. YORK representatives are available to answer any questions and to coordinate delivery of the unit and its accessories.

YORK should be advised by the contractor of the scheduled start-up time so that qualified personnel can be made available on that date. We require a minimum of four weeks advance notice to schedule a start-up and to have the Lithium Bromide solution delivered to the job site. The exact start-up date must be noted on the checklist (see pages 26 and 27 for this checklist) and confirmed **two weeks in advance** and must be returned to the YORK office completed and signed. If you don't have a checklist, you may copy these pages and return that form to YORK.

YORK will cooperate with the contractor and provide all possible assistance before and during the installation of the unit.

Advance Preparation

1. Perform a first-hand job site inspection.
2. Obtain all preliminary information on clearances, access to services, etc.
3. Check factory submittals and drawings.
4. Verify weight, fuel and electrical requirements, gas pressure, foundation dimensions, etc.

Site Selection

When selecting a site for installation of a YORK *ParaFlow*[™] Chiller/Heater, consider the following:

1. The *ParaFlow*[™] Chiller/Heater operating weight should be considered when choosing the unit location.

2. In selecting a site, consider structural support, access for service and tube pull area on either end of the main shell. (Tube pull space is approximately equal to the length of the main shell.) Follow standard engineering practice in designing the piping system and other services. **Adequate support must be provided for system piping so that no weight is placed on the unit's water boxes and connecting nozzles.**

3. The *ParaFlow*[™] unit makes very little noise or vibration, and vibration-eliminating mounts are generally not required. Mounts or pads **should** be used, however, when the unit is installed in an area where even mild noise would be a problem, such as on a floor near a conference room, sleeping area or on a roof. Where there are very strict noise and sound requirements, seek the advice of an acoustical consultant.

4. Check the type of fuel to be used when selecting the installation site. Gas allows more flexibility in site selection than does oil. Standard oil units require gas supply for pilot ignition. A means of metering gas flow must be provided.

5. A minimum of 42 inches of service space is recommended along each side of the unit. Tube pull space equivalent to 1 unit length must be provided on one end of the main shell or the other. The end opposite the tube pull end should be allowed 60 inches of service clearance. Additional space must be provided to clean tubes. See Factory Submittal for this information. If there are flammable materials near the unit, leave at least 20 inches of space above the unit and at least 40 inches above the first-stage generator.

6. *ParaFlow*[™] chillers are not suitable for outdoor installation. They must NOT be stored in temperatures below 35°F. The machine room must be enclosed, well lighted and properly ventilated to keep its temperature no higher than 104° and no

lower than 35°F. Relative humidity in the machine room must never reach the saturation point. Condensation of moisture may cause corrosion and damage to electrical components.

7. Local utility codes vary with location. Be sure to check and comply with them when installing the unit.

Foundation

When laying the foundation concrete, finish the surface smoothly so that the main shell of the *ParaFlow*[™] chiller unit will be level with the first-stage generator. The foundation should be able to support the full weight of the unit; this will assure that the main shell and the first-stage generator will remain level.

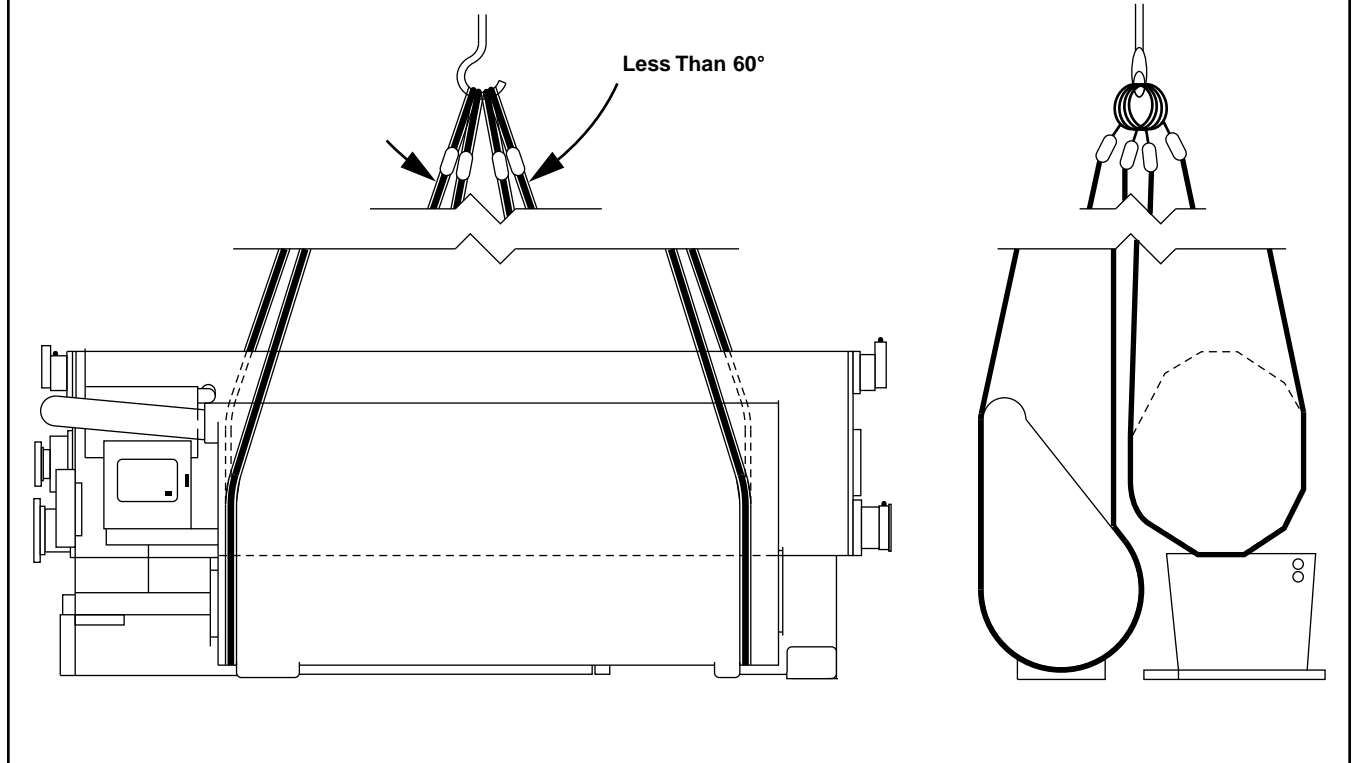
Refer to factory drawings for additional details and dimensions.

Rigging Instructions For "G" and "S" Series Machines (Direct-Fired And Steam)

Absorption

For lifting units, sling vertically. Use extreme care so as not to sling against, or on any projecting brackets, pipes, fittings, etc.

Figure 1 - 16G - 18G Direct-Fired Machines

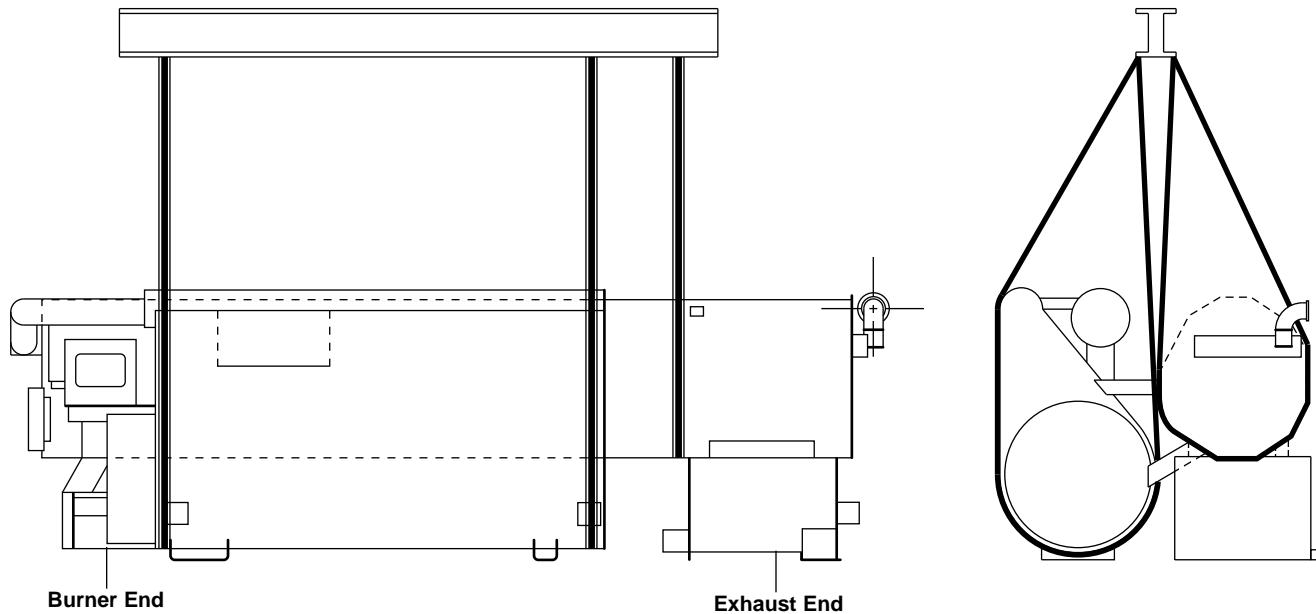


Rigging Instructions For "G" and "S" Series Machines (Direct-Fired And Steam)

Absorption

For lifting units, sling vertically. Use extreme care so as not to sling against, or on any projecting brackets, pipes, fittings, etc.

Figure 2 - 19G - 19GL Direct-Fired Machines



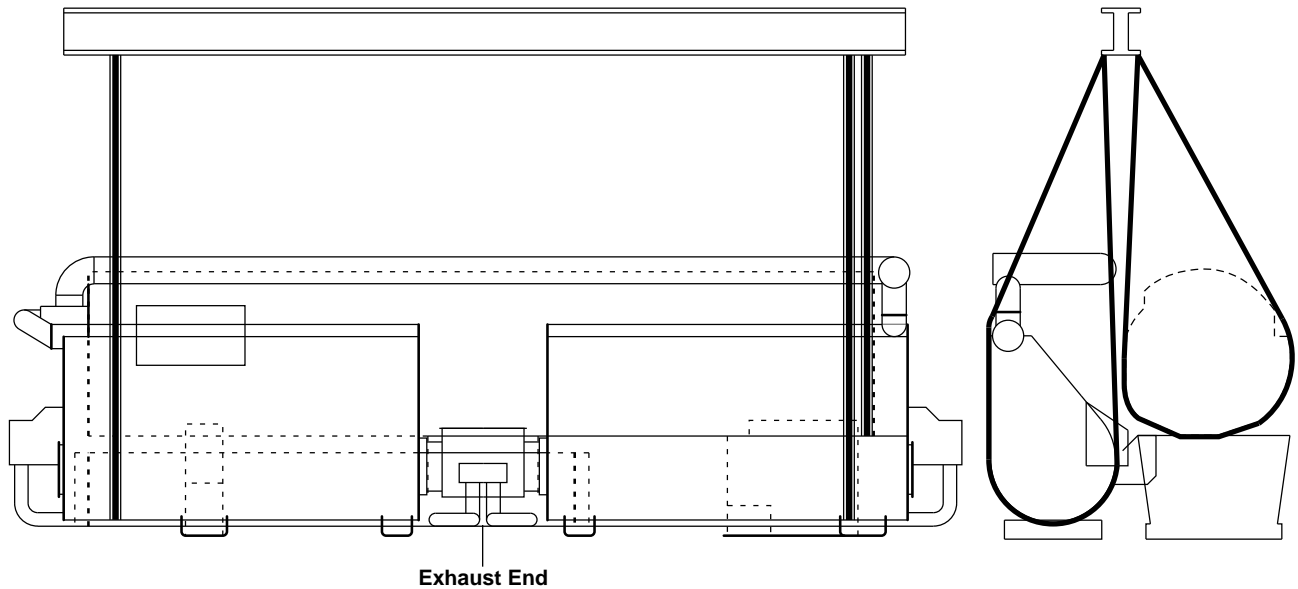
Note: Four slings are to be used on these machines; two for the generator, two for the main shell. When viewed from the side (as above) the slings on the burner end will be in the same plane. The slings for the exhaust end will be staggered.

Rigging Instructions For "G" and "S" Series Machines (Direct-Fired And Steam)

Absorption

For lifting units, sling vertically. Use extreme care so as not to sling against, or on any projecting brackets, pipes, fittings, etc.

Figure 3 - 20G Direct-Fired Machines



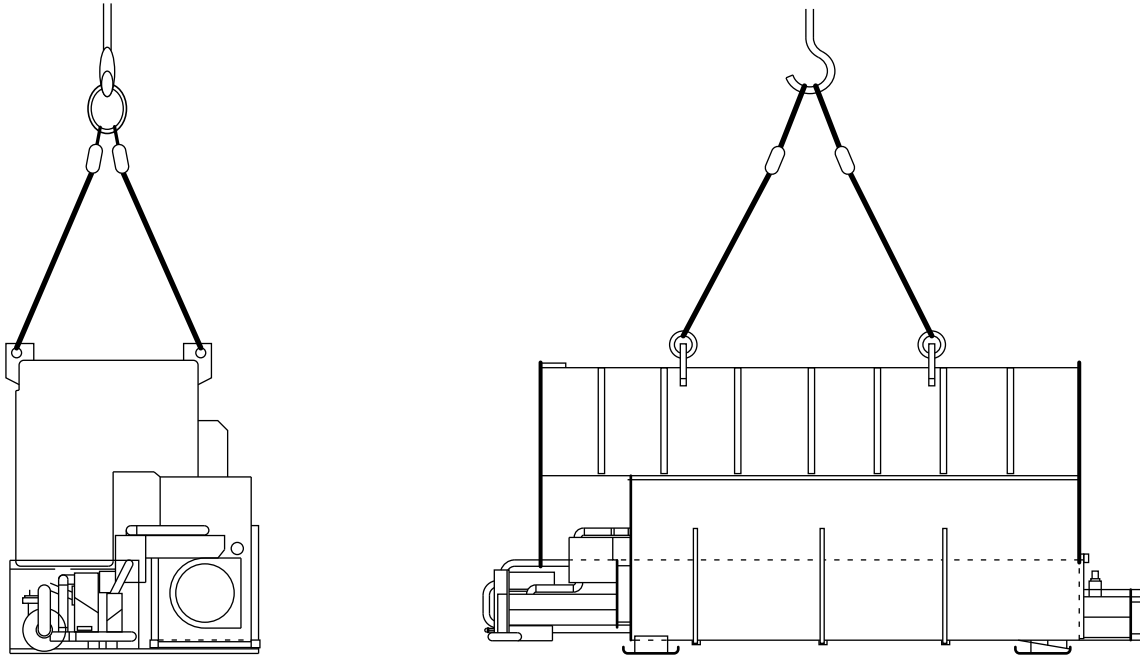
Note: Four slings are to be used on these machines; one on each generator and one on each end of the main shell. When viewed from the exhaust side of the machine, the slings on the left side will be in the same plane while the slings on the right side will be staggered.

Rigging Instructions For "G" and "S" Series Machines (Direct-Fired And Steam)

Absorption

For lifting units, sling vertically. Use extreme care so as not to sling against, or on any projecting brackets, pipes, fittings, etc.

Figure 4 - 12SC - 14SC Direct-Fired Machines



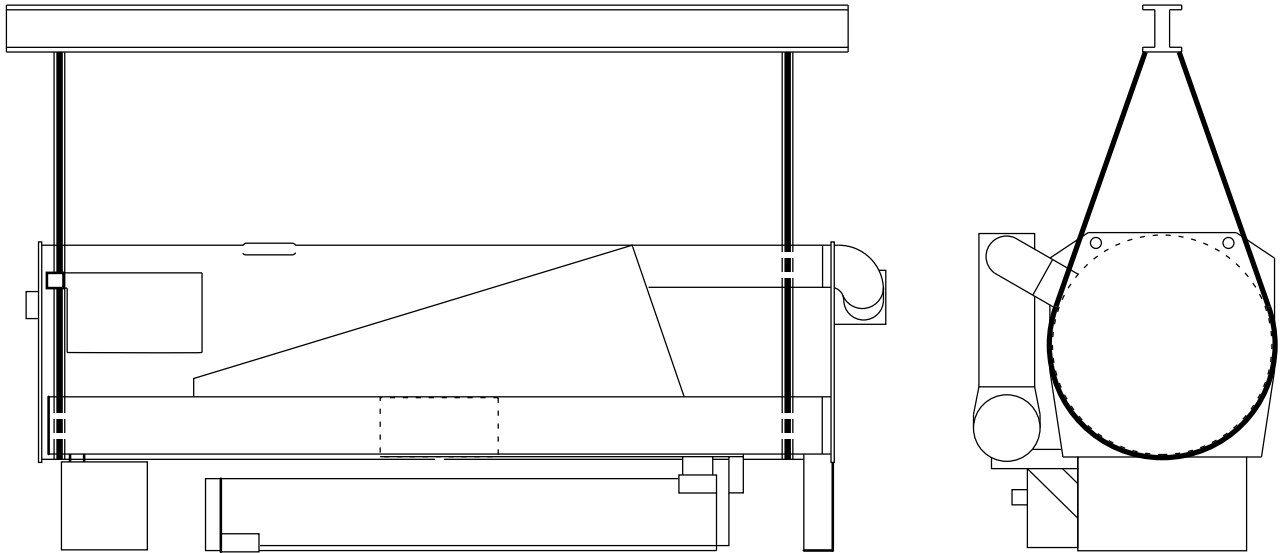
Note: Four slings are to be used on these machines; one on each generator and one on each end of the main shell. When viewed from the exhaust side of the machine, the slings on the left side will be in the same plane while the slings on the right side will be staggered.

Rigging Instructions For "G" and "S" Series Machines (Direct-Fired And Steam)

Absorption

For lifting units, sling vertically. Use extreme care so as not to sling against, or on any projecting brackets, pipes, fittings, etc.

Figure 5 - 19G - 22G Steam-Fired Machines



Note: Four slings are to be used on these machines; one on each generator and one on each end of the main shell. When viewed from the exhaust side of the machine, the slings on the left side will be in the same plane while the slings on the right side will be staggered.

Leveling The Unit

Foundation

When laying the foundation concrete, finish the surface smoothly so that the main shell of the Chiller/Heater will be level with the first-stage generator.

The foundation should be able to support the full operating weight of the unit; this will assure that the main shell and the first-stage generator will remain level.

Leveling

The York *ParaFlow*™ Chiller/Heater will operate properly and produce maximum output only if it is installed level. Therefore, it is important that the unit be

leveled when installed in place, and checked again (and adjusted, if necessary) after the piping, solution, refrigerant and system water have been installed.

“G” units are provided with leveling lines or stickers on the tube sheets. USE THESE LINES AS REFERENCE POINTS WHEN LEVELING THE UNIT. DO NOT use bottom of tube sheets.

“S” units are built on a skid and require that the foundation be level within 1 inch in 1000. “S” units have leveling stickers on the end sheets.

To check the levelness of a unit: Use a transparent or semitransparent vinyl hose filled with water. As shown in the dia-

gram, check the levels of points A-B, A-C, and A-D. Secure one end of hose to corner A with tape. Move other end of hose until water level is on the water level at corner A and the level mark at corner A is the distance the unit is out of level. The unit should be leveled to within 1 inch in 1000 both lengthwise and side-wise (see Figure 6 below). Use jacks at jacking points on unit legs to raise and lower unit during leveling.

Anchoring: To secure the unit, attach the legs to the foundation with anchor bolts after leveling the unit. Since there is little vibration, anchor bolts may not be needed in most locations. However, in areas known to experience earth tremors, bolting down the unit is recommended. (See Figure 6 below)

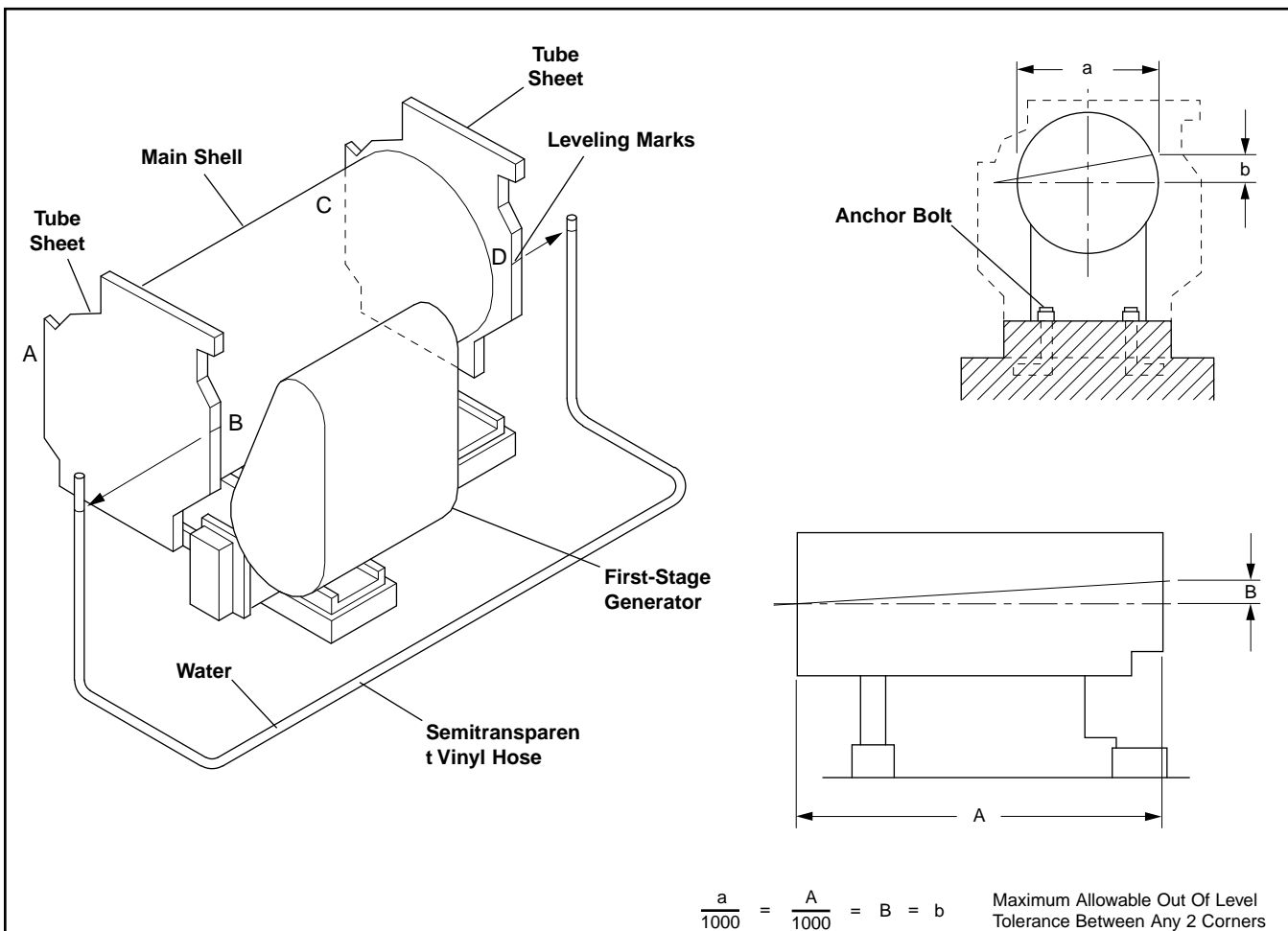
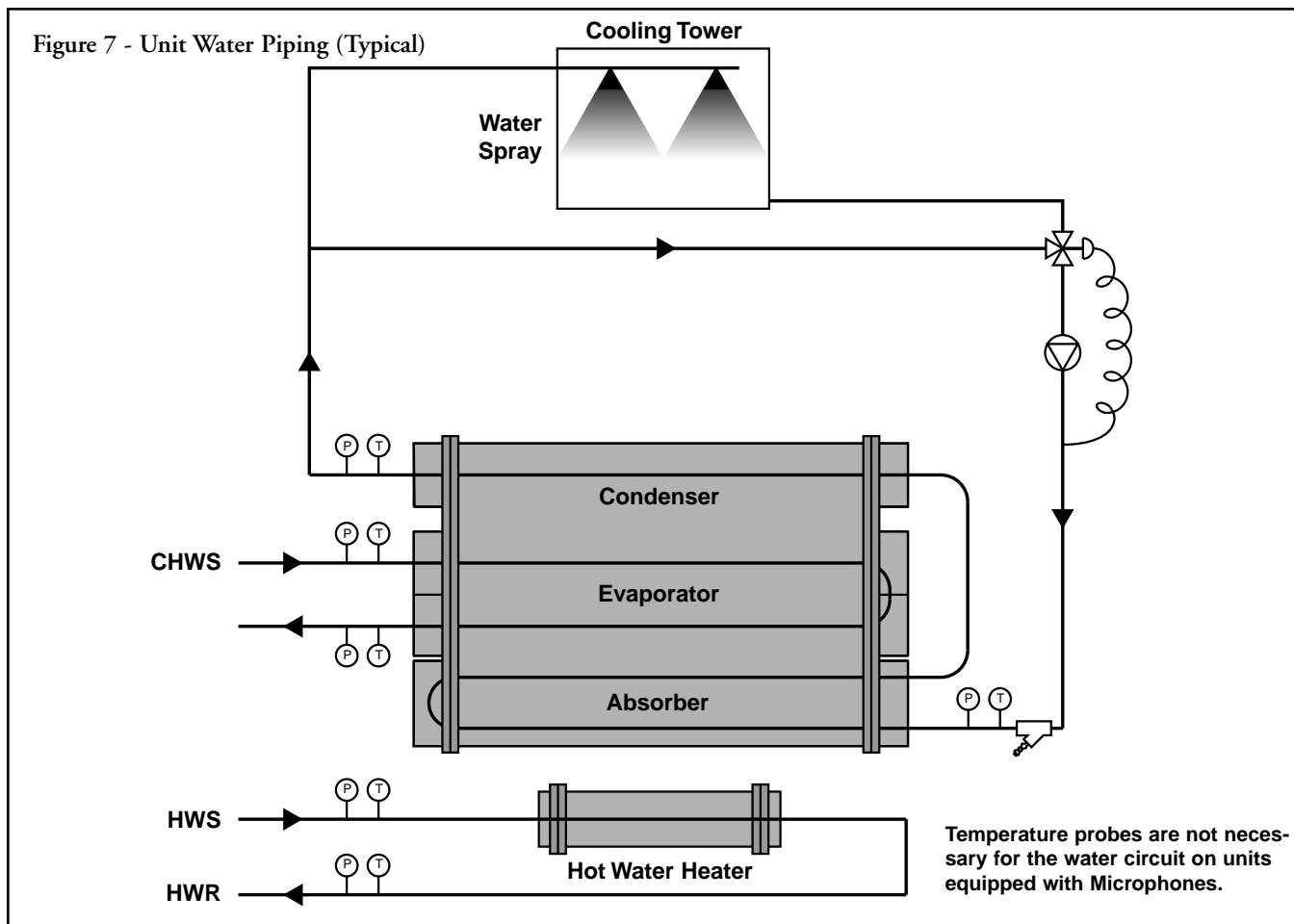


Figure 6 - Leveling The Unit

Typical Water Piping Schematic All Units-Models 12SC to 22G



Water Piping And Hook-Up

All Models

Make all necessary connections to the building water systems: chilled, hot and condenser water. ensure that all piping is adequately supported and that no strain is placed on unit nozzles and connection flanges and adequate tube cleaning space is available.

Provide adequate temperature and pressure wells or taps on all supply and return piping. Provide a means to regulate the water flow. Final pipe fabrication should not be done until the unit is properly leveled.

The inlet temperature of tower water to the absorber section of the unit must be maintained at all times between 68°F and

the design temperature (typically 85°F) water temperature must be no greater than 0.5°F/min. A three way mixing valve with accompanying temperature controller as indicated in **Figure 7** is recommended to control tower water temperature.

Water Treatment

The YORK *ParaFlow*™ Chiller/Heater is designed for maximum efficiency and long life. However, as with any piece of equipment of comparable size and complexity, it can only deliver its design output and efficiency if it is properly operated and maintained.

One of the most important elements of proper maintenance is the cleanliness and treatment of system water, both in the chilled (hot) water circuit and more

importantly, in the condenser or cooling water circuit.

It is very important that the owner (operator) of this equipment engage the services of a reputable water treatment specialist for both the initial charging of the system and its continuous monitoring and treatment.

Improperly treated or maintained water can result in decreased efficiency, high operating costs and premature failure of this equipment.

It is equally important that the owner (operator) of this equipment perform tube cleaning and inspection at the frequencies recommended by the water treatment specialist and York's service organization.

Rupture Disk Piping Installation All Units (Common)

The *ParaFlow*™ Chiller/Heater will normally arrive with a factory installed rupture disk(s). The rupture disk is a carbon graphite plate that will rupture should the unit's internal pressure exceed 7.0 psig. This will protect the unit should there ever be a tube rupture or the extremely unlikely case of abnormally high refrigerant vapor pressure inside the unit. The disk is housed between two

steel flanges. The outer flange has a SCH80 CPVC pipe stub. Cut the cap off of the pipe stub using a hacksaw. Take care to stay as close to the cap as possible. Glue the CPVC coupling to stub, insuring that coupling covers the hole left from removing the plug.

1. Prepare CPVC coupling and pipe support assemblies. Vent piping must be CPVC or fiberglass unless prohibited by local codes. **USE OF OTHER MATERIALS REQUIRE YORK INTERNATIONAL APPROVAL.**

2. To make vent piping lighter and less costly, pipe size may be reduced to 3 inches on 4 inch disks, and 4 inches on 6 inch disks.

3. Vent piping to be terminated 10 inches to 12 inches above suitable drain.

4. Some large tonnage units may have more than one rupture disk. Refer to factory submittal for more detailed rupture layout disk.

Typical Rupture-Disk Vent Piping:

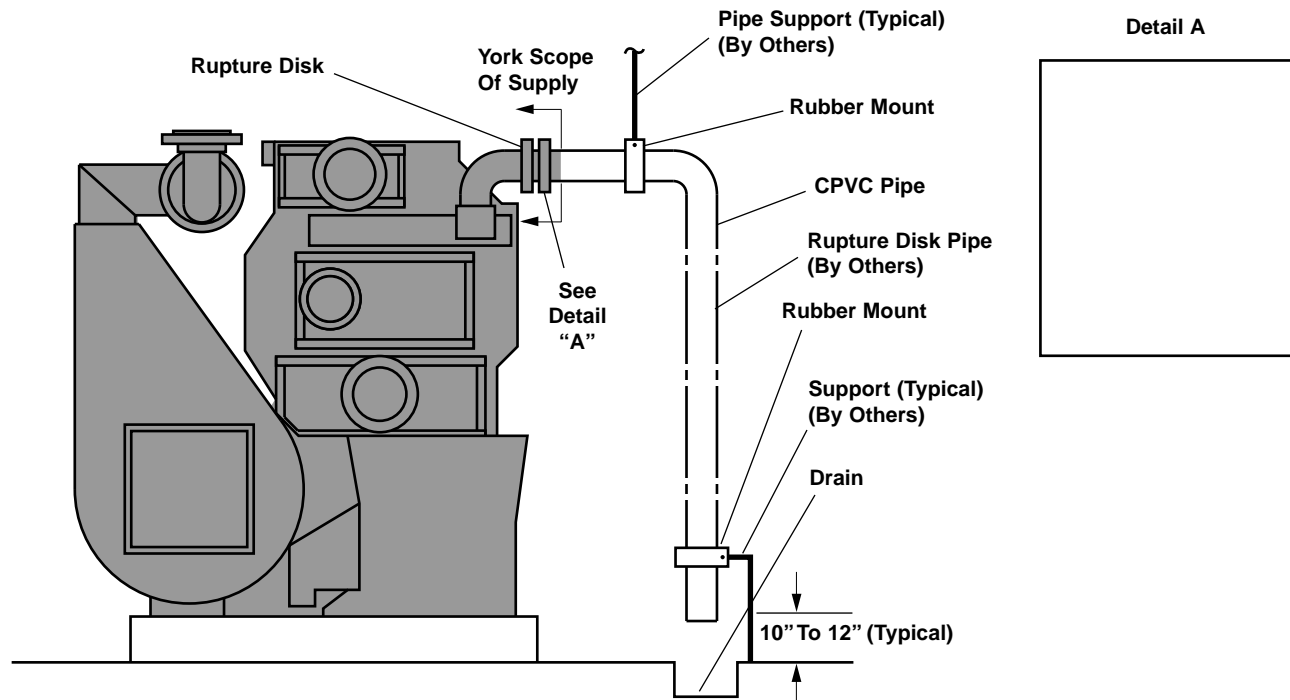
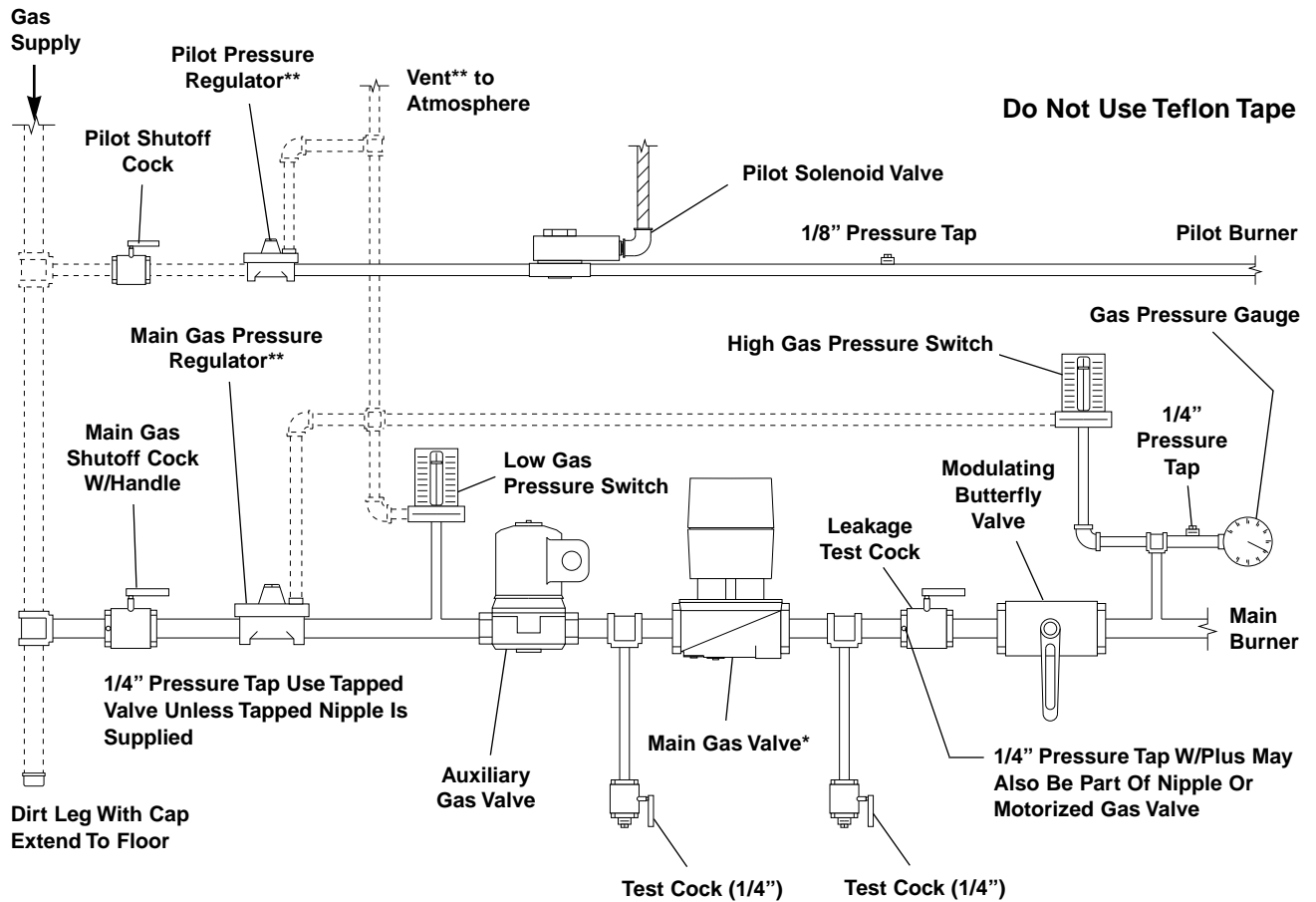


Figure 8 - Rupture Disk Location

Piping Schematics Direct-Fired Units - All Models (Gas Only) (Unique)

Standard U.L. Gas Train



Gas Train To Be Prepiped

- Factory Piped
- - - - - Field Piped

Caution: All Field Piping Must Be Mounted In The Proper Location And In Proper Direction Of Gas Flow.

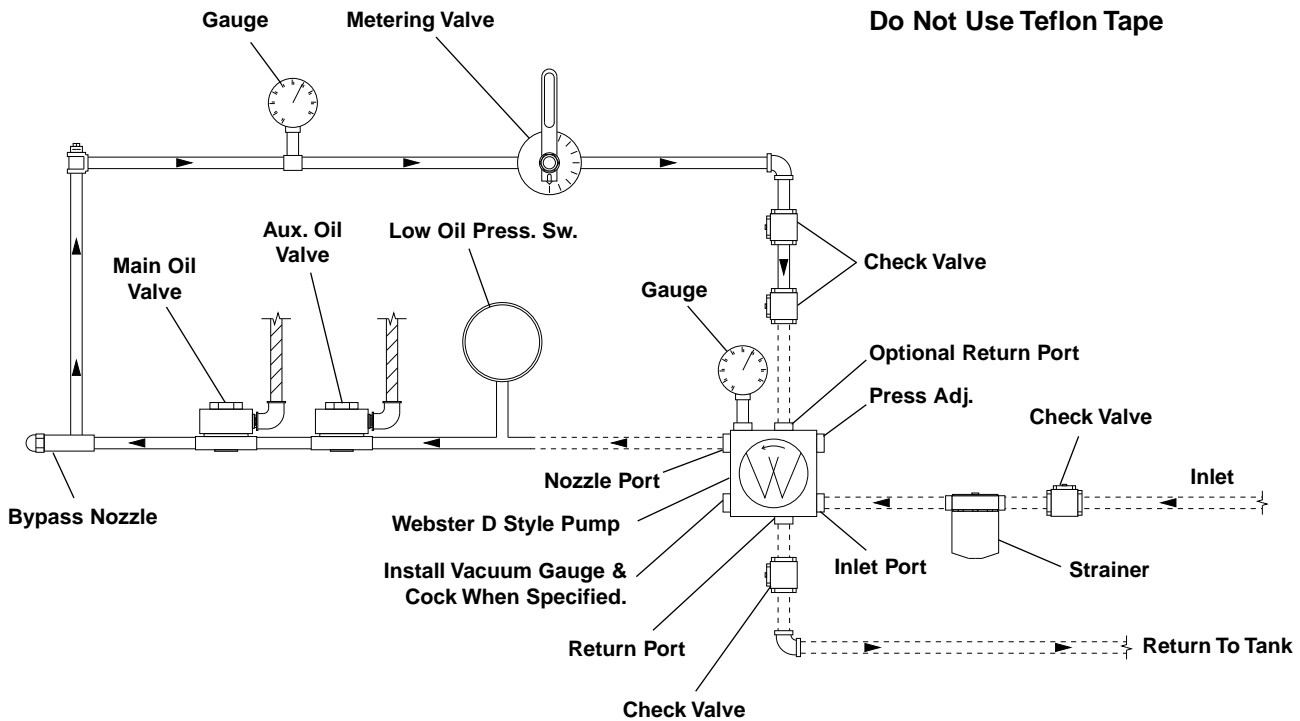
Note: This Drawing Depicts York International 'S' Standard Scope Of Supply, Project Specific Burner Submittal Will Be Supplied Under Separate Cover.

*(Proof Of Closure Req'd. Above 5,000,000 BTU'S

** Common Vent Line Size	Regulators
3/4"	RV-53 thru RV-91
1"	RV110, 2100
1 - 1/4"	RV131, 210 E-J

Piping Schematics Direct-Fired Units - All Models (Oil Only) (Unique)

Standard U.L. Oil Piping



Do Not Use Teflon Tape

——— Factory Piped

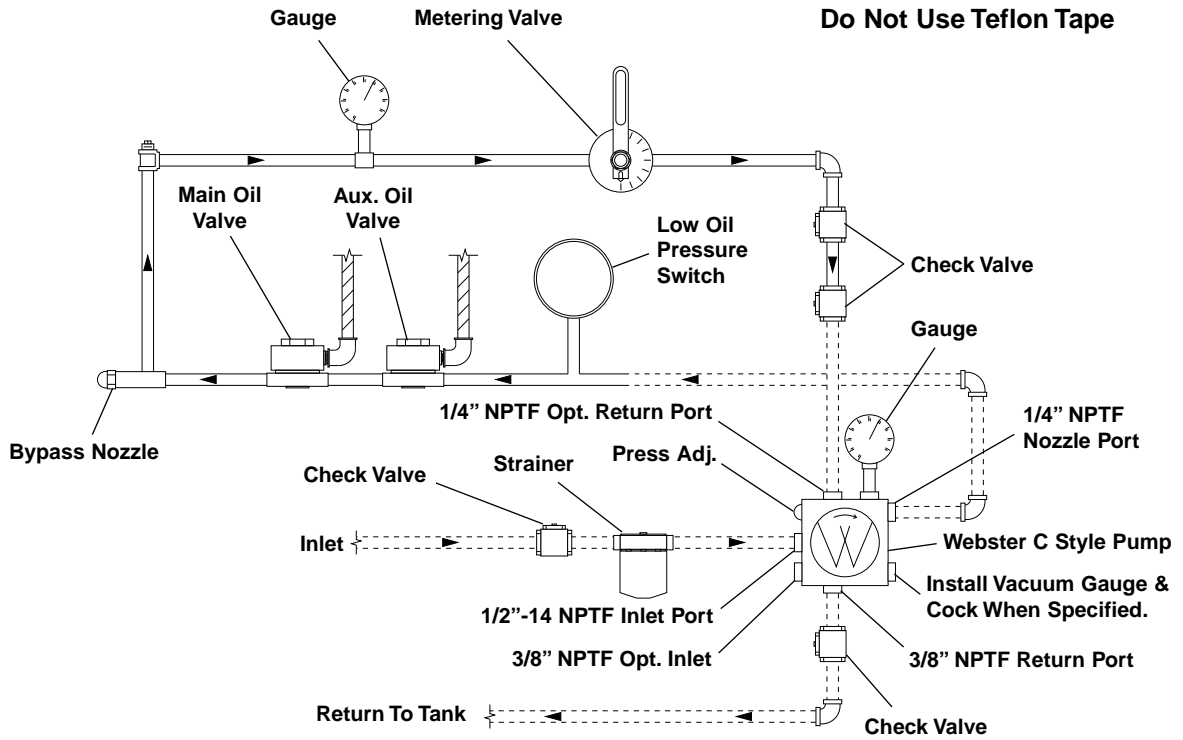
- - - - - Field Piped

Caution: All Field Piping Must Be Mounted In The Proper Location And In Proper Direction Of Gas Flow.

Note: This Drawing Depicts York International 'S' Standard Scope Of Supply, Project Specific Burner Submittal Will Be Supplied Under Separate Cover.

Piping Schematics Direct-Fired Units - All Models (Oil Only) (Unique)

Standard U.L. Oil Piping



———— Factory Piped

----- Field Piped

Caution: All Field Piping Must Be Mounted In The Proper Location And In Proper Direction Of Gas Flow.

Note: This Drawing Depicts York International 'S' Standard Scope Of Supply, Project Specific Burner Submittal Will Be Supplied Under Separate Cover.

Insulation Information (Common Information) Models -11S to -22GL

1. Before installing insulation, the unit should be placed in its permanent position, leveled, checked to make sure it is air-tight, and commissioned. Insulation should be scheduled last. YORK will not be responsible for costs incurred to remove insulation to leak check unit if insulation was installed before commissioning.

2. To mount insulating materials, use bonding agents, iron wires, and bands. Do not use tapping screws or rivets. **No weld pins, or any fastening means which requires penetration of unit wall are permitted.**

3. Insulation on outer equipment and flange sections should be mounted so that it can be removed easily.

a) Water boxes will have to be opened from time to time to clean the tubes. Therefore, design the insulation covering of water boxes to be removable. The same holds true for all flanges.

4. The drawings on pages 14 thru 18, show the areas to be insulated and the recommended insulating materials and procedures. Follow the drawings and observe the following instructions:

a) Do not cover moving parts (such as valve handles) with insulation.

b) Insulation thickness should be 2 inches on the hot surfaces and 1 inch on all other parts (see table).

c) Use 2 inch thick, 3 lb. density fiberglass insulation for the hot surfaces: first-stage generator, second-stage generator and hot water heat exchanger (if used).

d) Use 1 inch thick, 2 lb. density fiberglass or phenolic foam insulation on cold surfaces: evaporator and evaporator headers.

e) Do not cover sight glasses with insulation.

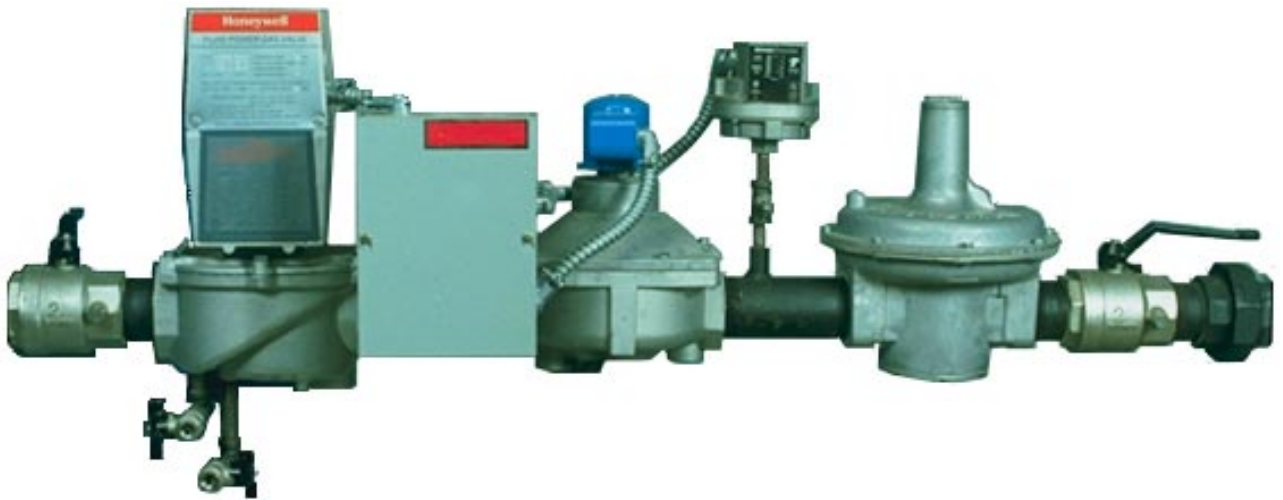
f) Do not cover thermowells.

g) Insulate auxiliary and instrument piping by wrapping glass wool around it. Do not cover pipe connections, since they must be accessible for pressure and vacuum tests.

h) Do not cover pump motors with insulation.

Refer to Insulation Diagrams at the back of this manual, pages XX - XX.

Typical U.L. Gas-Control Trains



Heat Input

UL Gas Control Train Systems Direct-Fired Units - All Models (Unique)

General

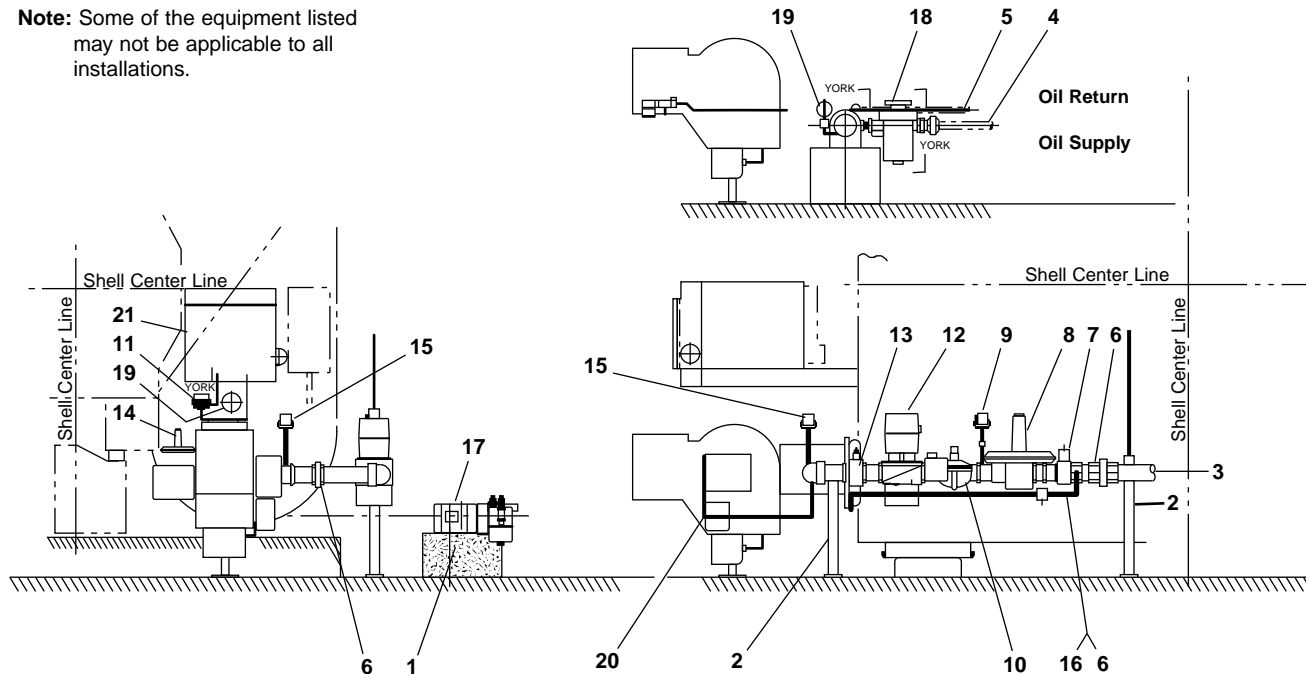
Standard Gas-Control Trains - Gas systems which meet or exceed current Underwriter's Laboratories (UL) requirements are furnished as standard with Power Flame forced draft gas burners.

Variations - Requirements vary by range of Btu/Hr. input while the configuration of the gas train will vary by the method used to control the burner fuel-air ratio.

Heat Input

Typical Burner Assembly Direct-Fired Units - G Models (Unique)

Note: Some of the equipment listed may not be applicable to all installations.



ITEM NAME	ITEM NAME
01 Base (for Oil Pump Unit)	12 Main Gas Shutoff Valve
02 Support (for Oil Pump)	13 Manual Leaktest Shutoff Valve
03 Gas Supply Piping	14 Gas Pressure Gauge
04 Oil Supply Piping	15 High Gas Pressure Switch
05 Oil Return Piping	16 Manual Pilot Gas Shutoff Valve
06 Union	17 Oil Pump Unit
07 Main Gas Shutoff Cock	18 Oil Filter
08 Main Gas Pressure Regulator	19 Oil Compound Gauge
09 Low Gas Pressure Switch	20 Burner Unit
10 Auxiliary Gas Valve	21 Burner Control Panel
11 Pilot Regulator	

Notes:

1. Items 1-5 in Table 1 are not supplied.
2. Burner parts 6-21 listed in Table 1 are supplied. The following 4 units are shipped loose.
 - a) Burner Unit 20, 14, 27, 28
 - b) Oil Pump Unit 23, 25, 26 (Dual Fuel Installation)
 - c) Gas Train Unit 10-18 (Preassembled)
 - d) Pilot Gas Train 21-22
3. Contractor will connect electric wiring (between burner panel and electrical parts) shipped loose. Upon operation, field wiring between oil pump motor and panel should be done by others.
4. Automatic fuel change over switch (MRA) is optional. Mounting and wiring are not provided by YORK.

Direct-Fired Combustion Air And Draft Control Requirements (Unique)

Air Supply

As with any gas or No. 2 oil-fired appliance, adequate combustion air supply must be provided for proper and complete combustion to take place. As a general rule, 12 scf of air are required for every 1000 BTU of fuel burned, assuming combustion with 20% excess air.

In addition to direct combustion air, outside air is also needed for ventilation and as make up to any machine room air which is induced up the chimney through a barometric draft regulator.

Air supply openings of adequate size must be provided to the machine room in accordance with local codes and standards. The specific location and size should be sufficient to allow an unobstructed flow of fresh air to the burner. Under no circumstances should the static pressure in the mechanical room become negative (below atmospheric pressure).

The *ParaFlow*TM Direct-Fired Chiller-Heater is equipped with a forced draft burner capable of firing on a variety of fuels, including natural gas and/or No. 2 oil and/or propane. As such, the unit will require a properly designed chimney system to control draft and discharge flue gases from the unit to the atmosphere.

The combustion system for the *ParaFlow*TM Chiller-Heater is engineered to produce a positive gauge pressure of 0.05 to 0.15 in. water at the outlet of the First Stage Generator (the unit is a positive forced draft appliance). As such, **the chimney must be designed to maintain a negative available draft of between 0.05 and 0.15 in. water at the outlet of the First Stage Generator.** The exhaust temperature at the outlet of the First Stage Generator is 400°F±50°F.

For the sake of discussion, it is necessary to define the following terms:

Draft - Negative gauge pressure measured relative to atmospheric pressure.

Note: Negative draft is positive gauge pressure and vice versa.

Available Draft, (Da) - The draft required at the outlet exhaust flange of the *ParaFlow*TM First Stage Generator.

Theoretical Draft, (Dt) - The natural draft or "chimney effect" produced by the difference in densities of hot exhaust gas relative to cooler ambient air.

Pressure Drop, (dP) - Fictional losses in the chimney which act against theoretical draft.

The theoretical draft needed to overcome chimney frictional losses is described as follows:

$$Dt = dP + Da \quad \text{Eq. 1}$$

In the case of a *ParaFlow*TM Chiller-Heater, Da is negative, resulting in Equation 1 becoming:

$$Dt = dP - Da \quad \text{Eq. 2}$$

Proper chimney design balances the theoretical draft (Dt) against the pressure drop (dP) of the chimney system in order to provide the required available pressure (Da) at the outlet of the unit. It is not the intent of this section to address the fine details of proper chimney design - this must be addressed on an application specific basis by an experienced designer knowledgeable in chimney systems, draft control and local code requirements. This section is prepared only to identify certain considerations which may bear upon final chimney system configuration and to provide a brief description of two commonly employed methods of draft control.

Theoretical draft is a function of mean chimney gas temperature (always a temperature lower than unit outlet temperature), ambient temperature, ambient barometric pressure and chimney height. It should be noted that this value can vary

significantly from summer ambient conditions (when Dt is smallest) to winter ambient conditions (when Dt is greatest). Because *ParaFlow*TM Chiller-Heaters are typically required to operate at "high fire" throughout the summer months, **it is important to design the chimney system for summer ambient design conditions to avoid undersizing.**

Proper chimney system design will provide the required Da under all operating conditions. Because the difference in winter and summer ambient conditions can result in Dt variations of 50% and greater, **some method of draft control is usually required** in order to maintain Da between +0.05 and +0.15 in. water gauge pressure.

Figure 8 depicts a simple yet effective means of controlling draft. With this system, a barometric draft regulator is used in series with a manual backdraft damper. This is usually the minimum requirement. YORK will not be responsible for costs associated with retrofitting dampers to improperly designed chimneys. With maximum economy employed in the chimney design, Dt would exactly equal dP - Da (eq. 2) during summer design ambient conditions with the barometric regulator closed. In reality, some degree of conservatism should exist in the design, causing the barometric draft regulator to be open slightly even during summer design conditions. As ambient temperatures drop, Dt would increase, if not for the barometric draft regulator. With the regulator in place, mechanical room air is introduced into the chimney system as in response to the increased draft, thus stabilizing the gauge pressure just upstream of the barometric regulator. Most barometric regulators can maintain -0.06 in. water gauge pressure when properly sized for a particular application.

With the gauge pressure thus stabilized just upstream of the barometric regulator, the manual backdraft damper can be adjusted to a fixed position which will provide the proper resistance or pressure drop to yield the required +0.05 to +0.15 in. water gauge pressure at the outlet

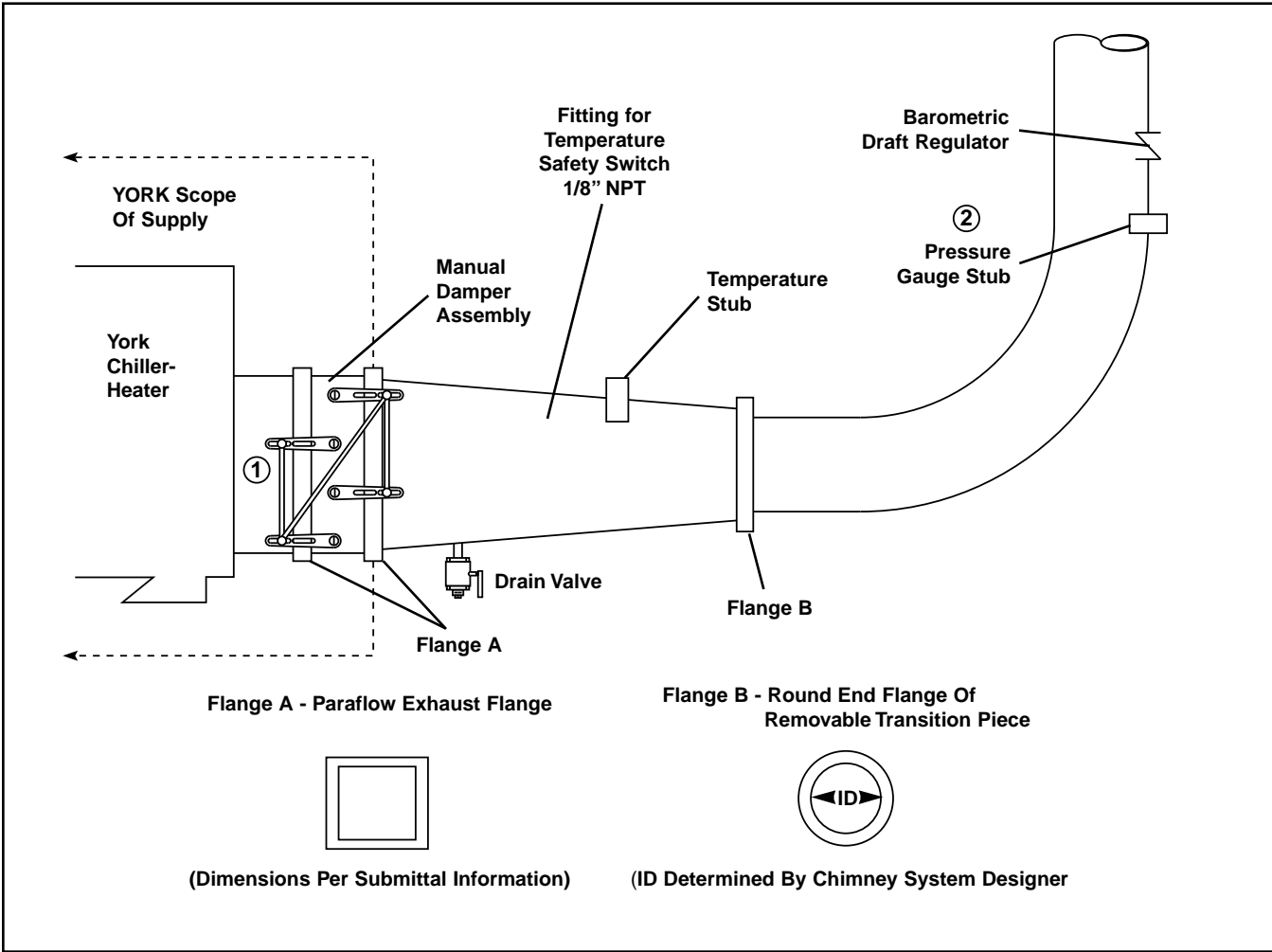
exhaust flange of the *ParaFlow*[™] Chiller-Heater.

Figure 9 depicts a sequential draft control system which incorporates a motorized damper whose position is automatically adjusted as a function of available draft at the outlet of the *ParaFlow*[™] unit. Sequential draft control is available as an option for all *ParaFlow*[™] Chiller-Heaters.

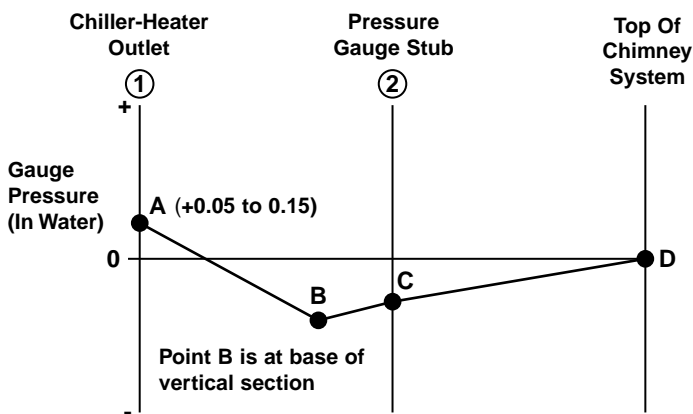
When multiple *ParaFlow*[™] Chiller-Heaters are to be ducted into a common breeching or chimney system, it is recommended that separate draft control systems be provided for each unit. In addition, when dual generator *ParaFlow*[™] Models are applied (i.e., Models YPC-DF-20G, 21G, 22G), separate draft control systems should be provided for **each** generator.

Chimney design and draft control are topics best handled by experienced engineers. YORK strongly recommends that the installer engage in the services of a competent engineer to design the chimney and provide the type of draft control best suited for each application.

Barometric Control



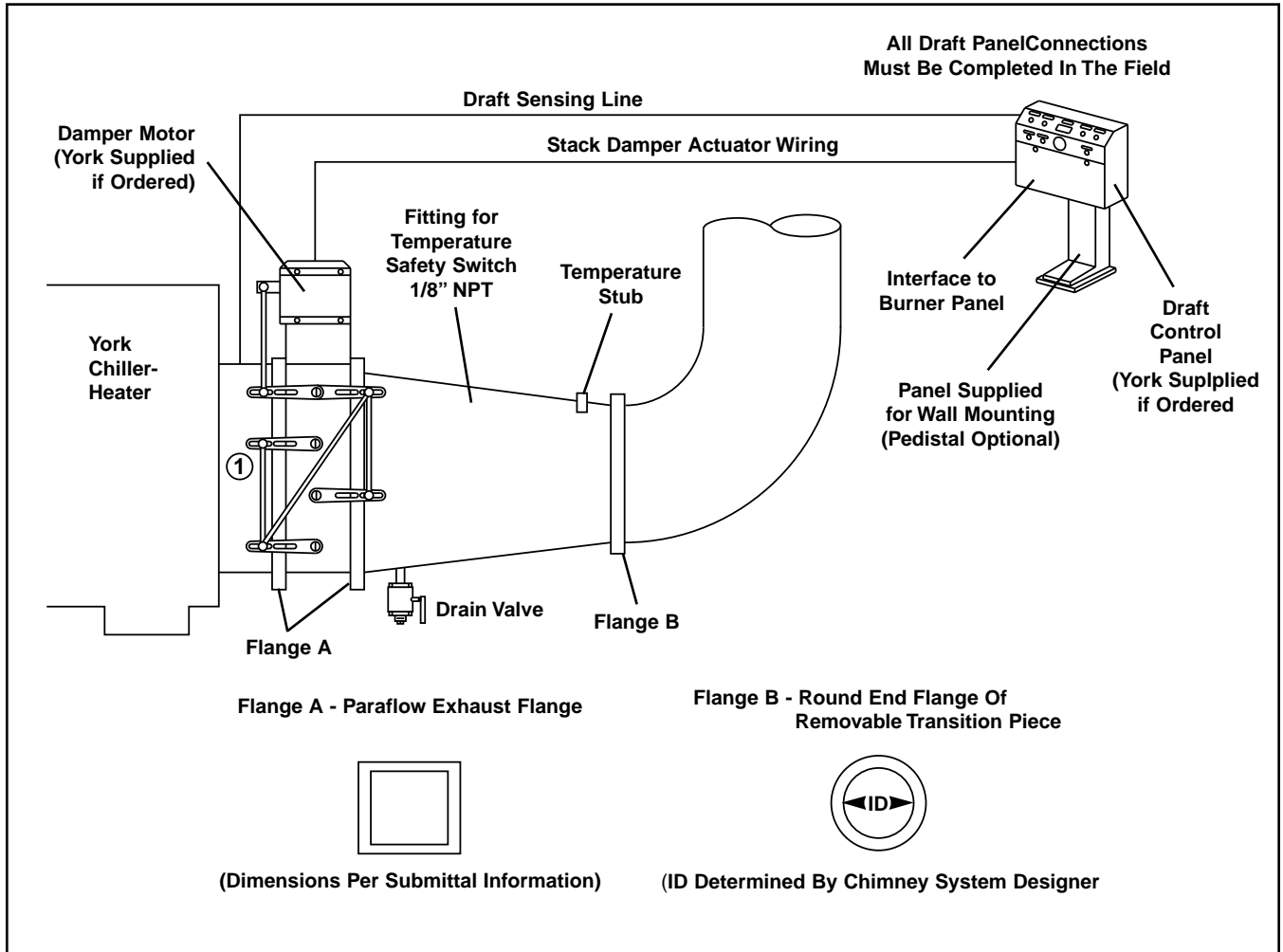
Gauge Pressure Profile - Chimney System With Barometric Control



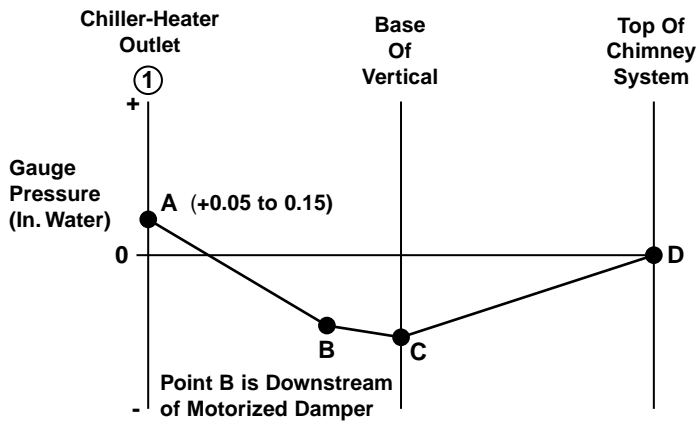
Notes:

- dP between A and B due to transition piece and properly positioned manual backdraft damper. Damper adjusted to maintain +0.05 to =0.15 in. water at A.
- Maximum draft (minimum gauge pressure) occurs at base of vertical section of chimney (B). Barometric regulator will maintain steady gauge pressure at C. Maximum gauge pressure attainable with a barometric draft regulator is typically -0.06 in. water.

Sequential Draft Control



Gauge Pressure Profile - Chimney System With Sequential Draft Control



Notes:

1. dP between A and B due to transition piece and motorized damper. Damper automatically controls to maintain +0.05 to =0.15 in. water at A. The actual dP is variable and depends on the momentary gauge pressure C.
2. Maximum draft (minimum gauge pressure) occurs at base of vertical section of chimney (C). With sequential draft control, this valve is allowed to drift with prevailing ambient conditions. Motorized damper controls to maintain steady gauge pressure at A.

Heat Input Typical Steam Piping Schematic (Unique)

General - The *Paraflow*TM unit is nominally rated for dry steam with minimal superheat, and a pressure of 115 psig (at the steam valve). The inlet steam must not have a temperature higher than 363°F and can not have a saturation pressure higher than 128 psig. The condensate leaves the drain cooler at approximately 14.3 psig at 180°F.

Pressure - Since a lower steam saturation pressure corresponds to a lower temperature in the generator, a *Paraflow*TM chiller's available capacity varies with the steam pressure at the steam valve.

Piping - The steam piping must follow the diagram found in Figure 10. Beginning at the steam supply, the automatic shut off valve (by others) must be fail-safe and designed to protect the unit in case of a power failure. Both steam supply and condensate drain pipes must be properly sized and pitched to prevent hammering. A steam separator should be installed after the automatic shut-off valve to ensure the unit receives only dry steam. A steam trap below the separator will allow draining of only condensate. Beyond the separator, a #50 mesh strainer removes foreign matter from the steam. A regulator is only necessary if the steam supply pressure to the unit will exceed 128 psig. The pressure relief valve should be set to open at 128 psig. The

factory installed steam control valve must be no further than 200 inches from the first-stage generator steam inlet flange in order to minimize the pressure drop from the valve exit to the generator inlet.

Dimension H₁ is a minimum of 15 inches to prevent condensate back-flow from the generator into the steam piping. Dimension H₂ is a maximum of 32.8 feet to prevent excessive backpressure to the drain cooler. During factory testing, the unit is calibrated to provide design condensate flow to a condensate system operating at 15.0 psig (as measured immediately downstream of the Drain Solenoid Valve). To duplicate this condition in the field, an adjustable

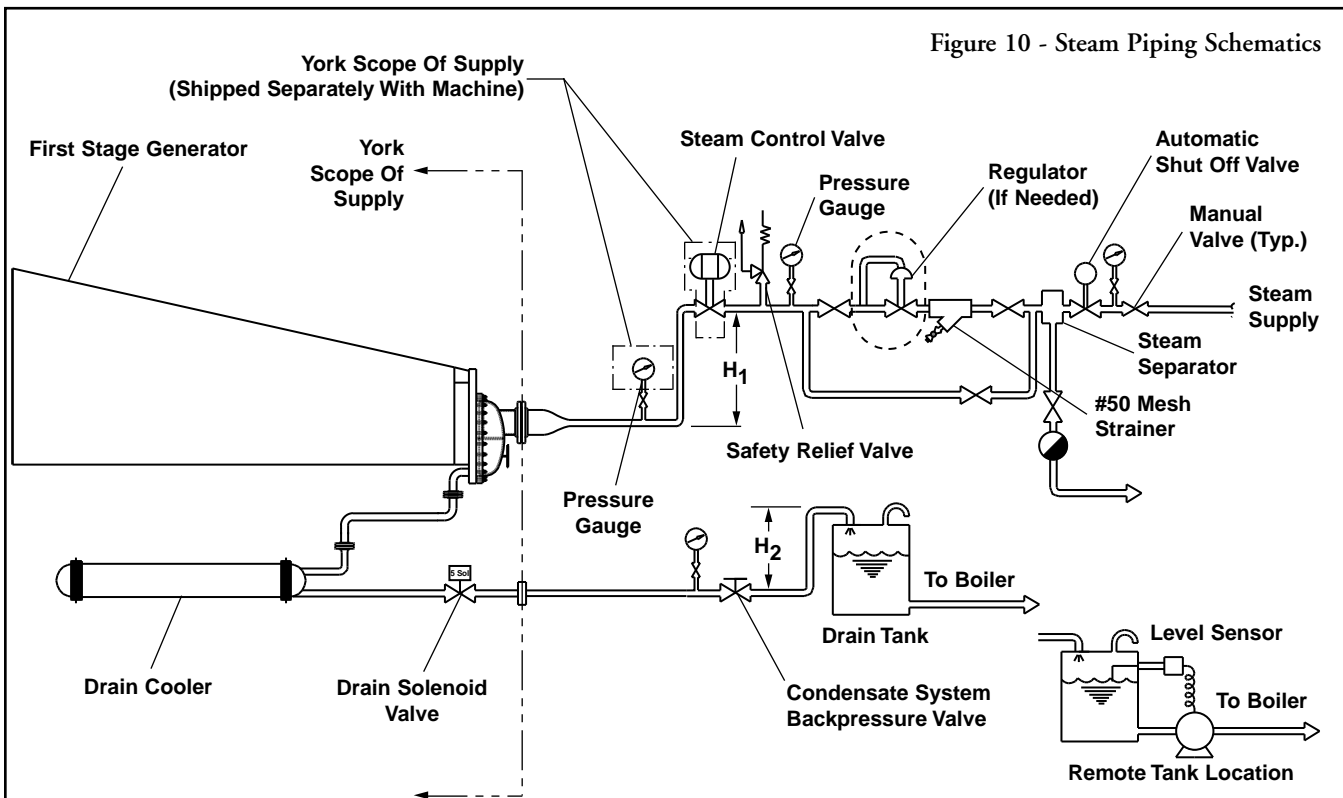


Figure 10 - Steam Piping Schematics

Notes:

1. H₁ = 15 inches minimum to prevent condensate backflow.
2. H₂ = 32.8 feet maximum to prevent excessive back pressure.
3. Condensate leaves drain cooler at approximately 14.3 psig., 180°F.
4. Maximum inlet steam pressure 128 psig. Maximum inlet steam temperature 363°F.
5. Automatic shutoff valve to be failsafe type.
6. Both the steam supply and condensate drain pipes must be properly sized and pitched to prevent hammering.
7. Steam control valve to be installed within 200 inches of the first stage generator steam inlet flange.

Condensate System Backpressure Valve (by others) must be installed such that:

$$\Delta P_{H2} + \Delta P_{Piping} + \Delta P_{Valve} = 15.0 \text{ psig}$$

Where:

ΔP_{H2} = Pressure drop due to height, H_2

ΔP_{Piping} = Pressure drop due to condensate piping, elbows, bends, etc.

ΔP_{Valve} = Pressure drop due to Condensate System Backpressure Valve

The drain cooler installed on the unit effectively eliminates the need for an additional condensate cooler or a steam trap. The drain solenoid valve is a factory installed device to insure zero steam flow through unit during shutdown.

All steam piping should be adequately supported and braced independent of the *Paraflow*[™] chiller. The support system must account for the expansion and contraction of steam piping, avoiding the imposition of strain on chiller components.

Control Valve Sizing - Control valves are sized for each job based upon the available steam pressure, required steam pressure at the unit, and the full load required steam flow. During the unit performance test, factory technicians establish the minimum load steam valve position (20%) and set the limit switch accordingly, eliminating possible problems at start up.

Controls (Where Applicable)

Lead-Lag Controls

When two units are installed to provide either half or part of the load, “lead-lag” controls can be provided to simplify field installation and control.

The diagram below indicates how the controls operate and how the units are connected. In this configuration, the units are connected in parallel, and each unit contains the additional components shown in the diagram.

When operation is initiated, the first unit will go on line and will provide up to 90% of its rated capacity. The unit will cycle off and on between 0 and 30% of its rated capacity and will modulate between

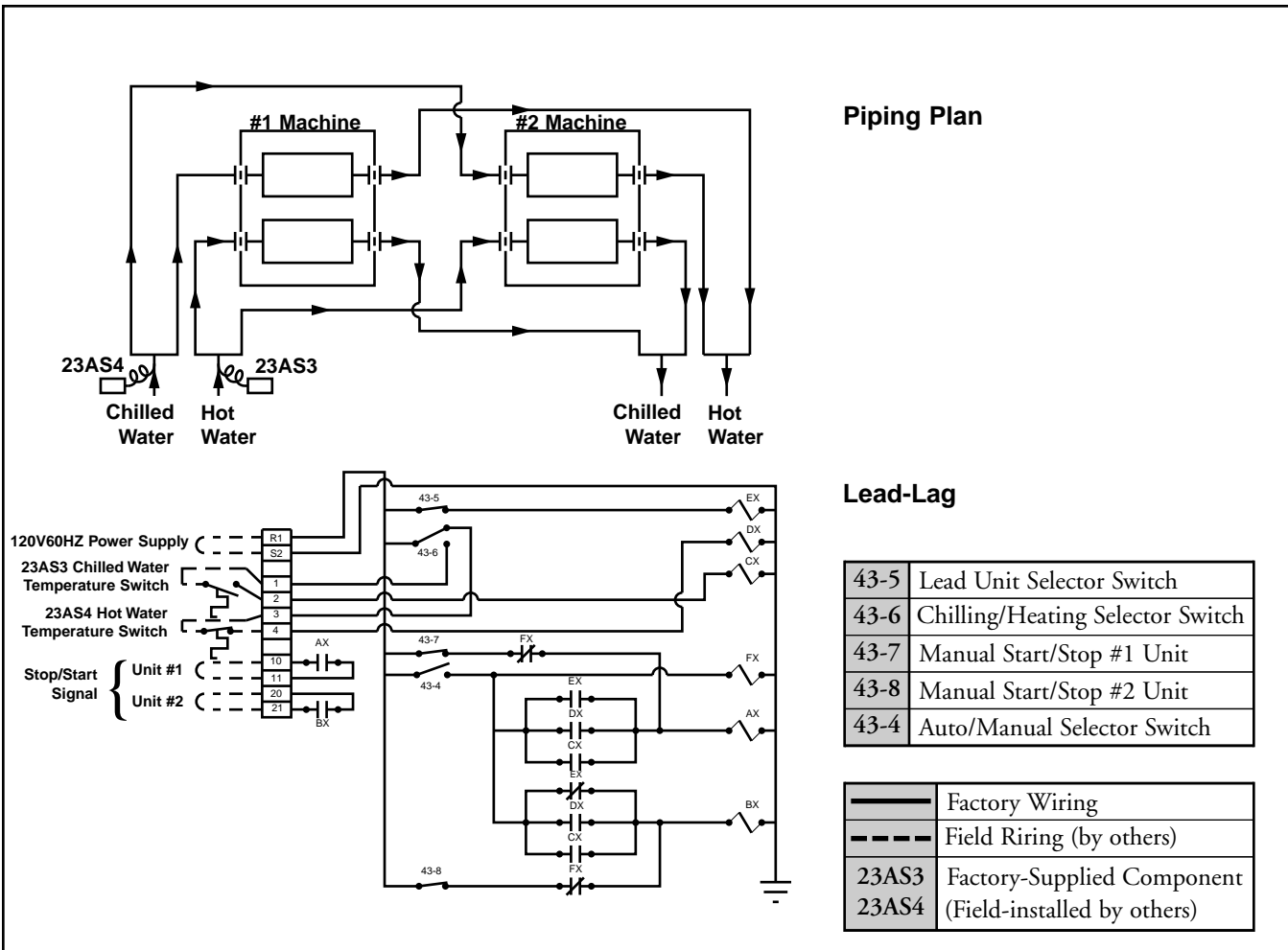
30% and 90%. When the load exceeds this 90% capacity, the second unit will go on line and load will be shared by the two units equally (approximately 45% rated output per unit). Both units will continue to operate as long as the load is between 45% and 100% of total. Please note that even though we assume here both units are equal, they need not be.

When the load decreases, the second unit will drop out when the total load becomes approximately 45%, and the first unit will automatically increase its output to maintain the load.

The unit will modulate as the load decreases to 30% of the unit rated capacity and will then cycle off and on as the load decreases to zero, at which point the unit will finally shut down.

Each unit can be transferred from “lead” to “lag” and back again as often as desired by operating the selector switch.

The same sequence and limitations will occur when the units are operating in the heating mode.



Piping Plan

Lead-Lag

43-5	Lead Unit Selector Switch
43-6	Chilling/Heating Selector Switch
43-7	Manual Start/Stop #1 Unit
43-8	Manual Start/Stop #2 Unit
43-4	Auto/Manual Selector Switch

	Factory Wiring
	Field Wiring (by others)
	Factory-Supplied Component
	(Field-installed by others)

Simultaneous Operation (Where Applicable)

Direct-Fired and Heat Recovery (Unique)

YORK *ParaFlow*[™] Chiller/Heaters equipped with a hot water heat exchanger can provide both chilled water and hot water simultaneously. An understanding of the simultaneous operation feature and its limitations is required to assure proper application.

Simultaneous operation can take place only if there is a basic demand for chilled water. The operation of the unit during simultaneous operation is initiated and controlled by the chilling load, and it is essentially the same as the normal chilling operation. The only difference is that during Simultaneous Operation some of the vapor generated in the first-stage generator is utilized to make hot water. To

control the hot water temperature, a motorized mixing valve and two temperature controllers must be supplied and installed in the hot water circuit by the installer as shown in the accompanying sketch. One controller senses the leaving hot water temperature and positions the mixing valve to maintain that temperature. The other controller acts as a limit switch and will abort simultaneous operation by placing the mixing valve in the full by-pass position and stopping the hot water circulating pump if the leaving chilled water temperature rises to a pre-set level (usually 50°F), indicating that too much energy is being used to make hot water and the chiller cannot meet the chilling demand.

Since the unit operation is controlled by the chilling load, the amount of available heating capacity as well as the hot water temperature will vary as the chilling load varies. The graph shows the relationship

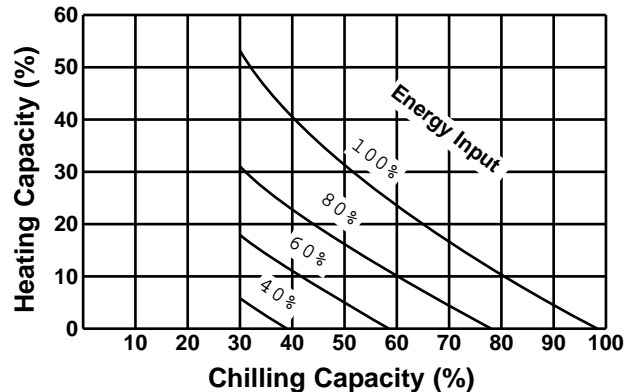
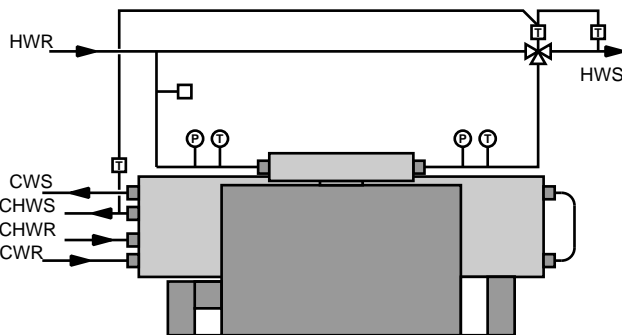
between chilling capacity and heating capacity at varying energy input rates.

For example, at 100% energy input rate (top curve), the unit will produce 100% chilling and no heating or, 80% chilling and 10% heating or, 50% chilling and 32% heating, etc. At 70% of the rated chilling capacity and no heating, or 50% chilling and approximately 13% heating, etc.

WARNING
SAFETY
WARNING

When the YORK ParaFlow[™] Chiller/Heater is in the heating mode, the mixing valve must be in the open position to allow full flow through the hot water heat exchanger. The hot water controller will then modulate the burner to meet load variations and the unit will operate in the normal manner.

Suggested Piping Schematic For Simultaneous Operation
(All Piping And Controls By Others)



Gas Piping Design

Prior to designing/installing gas piping systems, all national, local and other applicable codes should be reviewed to ensure total compliance.

Gas piping should be sized to provide required pressure at the burner train inlet manual shut off cock, when operating at the maximum desired fuel input.

All gas piping should be appropriately pressure tested to ensure leak free operation. It is mandatory that a drip leg be installed in the gas supply system just ahead of the manual main shutoff cock as shown in **Figure B3 pg. 11**

When testing with pressures higher than the maximum pressure ratings on the gas train components, be sure to isolate these components and test their piping for gas leaks with correct pressures only. On

some burners, the maximum main gas train and/or pilot gas train components pressure is 1/2 PSIG (14" W.C.).

Refer to **tables below** for information relating to the sizing of gas supply piping. These charts are based on the general flow characteristics of commercially produced black wrought iron pipe. If in doubt regarding flow capabilities of a chosen line size, the next largest size is recommended.

Capacity of pipe - Natural Gas (CFH)
With Pressure Drop of 0.3" W.C. and Specific Gravity of 0.60.

Length (ft.)	Pipe Size - Inches (IPS)						
	1	1 1/4	1 1/2	2	2 1/2	3	4
10	520	1050	1600	3050	4800	8500	17500
20	350	730	1100	2100	3300	5900	12000
30	285	590	890	1650	2700	4700	9700
40	245	500	760	1450	2300	4100	8300
50	215	440	670	1270	2000	3600	7400
60	195	400	610	1150	1850	3250	6800
70	180	370	560	1050	1700	3000	6200
80	170	350	530	990	1600	2800	5800
90	160	320	490	930	1500	2600	5400
100	150	305	460	870	1400	2500	5100
125	130	275	410	780	1250	2200	4500
150	120	250	380	710	1130	2000	4100
175	110	225	350	650	1050	1850	3800
200	100	210	320	610	980	1700	3500

Correction Factors
To be used for other specific gravities and pressure drops.

Specific Gravity Other Than .60		Pressure Drop Other Than .3	
Specific Gravity	Multiplier	Pressure Drop	Multiplier
0.50	1.10	0.1	0.577
0.60	1.00	0.2	0.815
0.70	0.926	0.3	1.00
0.80	0.867	0.4	1.16
0.90	0.817	0.6	1.42
1.00	0.775	0.8	1.64
Propane - Air		1.0	1.83
1.10	0.74	2.0	2.58
Propane		3.0	3.16
1.55	0.622	4.0	3.65
Butane		6.0	4.47
2.00	0.547	8.0	5.15

Equivalent Length of Fittings in Feet

Pipe Size (IPS) SCH. 40	1	1 1/4	1 1/2	2	2 1/2	3	4
Std. Tee through Side	5.5	7.5	9.0	12.0	14.0	17.0	22.0
Std. 90 Elbow	2.7	3.7	4.3	5.5	6.5	8.0	12.0
Std. 45 Elbow	1.2	1.6	2.0	2.5	3.0	3.7	5.0
Plug Cock	3.0	4.0	5.5	7.5	9.0	12.0	16.0

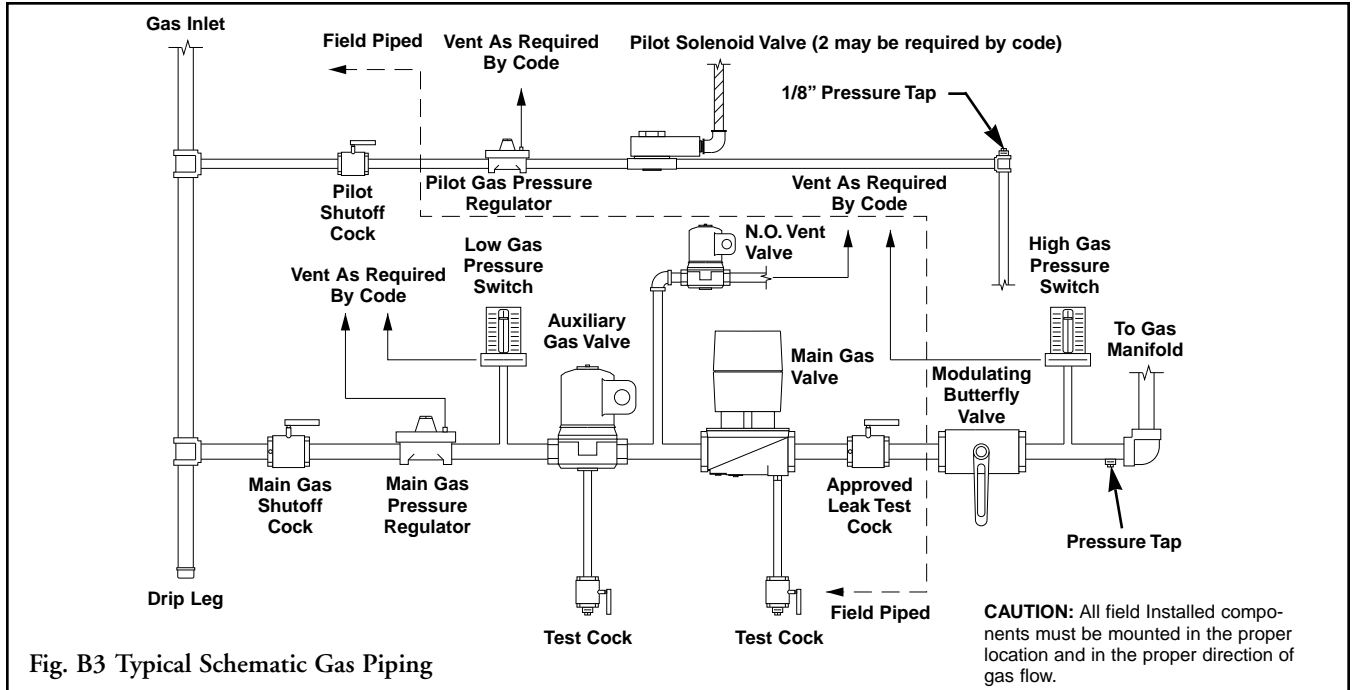


Fig. B3 Typical Schematic Gas Piping

Oil Piping Design

ParaFlow™ Units are designed for use with #2 fuel oil only.

Prior to designing/installing oil piping systems, all national, local and other applicable codes should be reviewed to ensure total compliance.

A two pipe (separate suction and return line) system must always be used. The oil pumps are preset at the factory for use

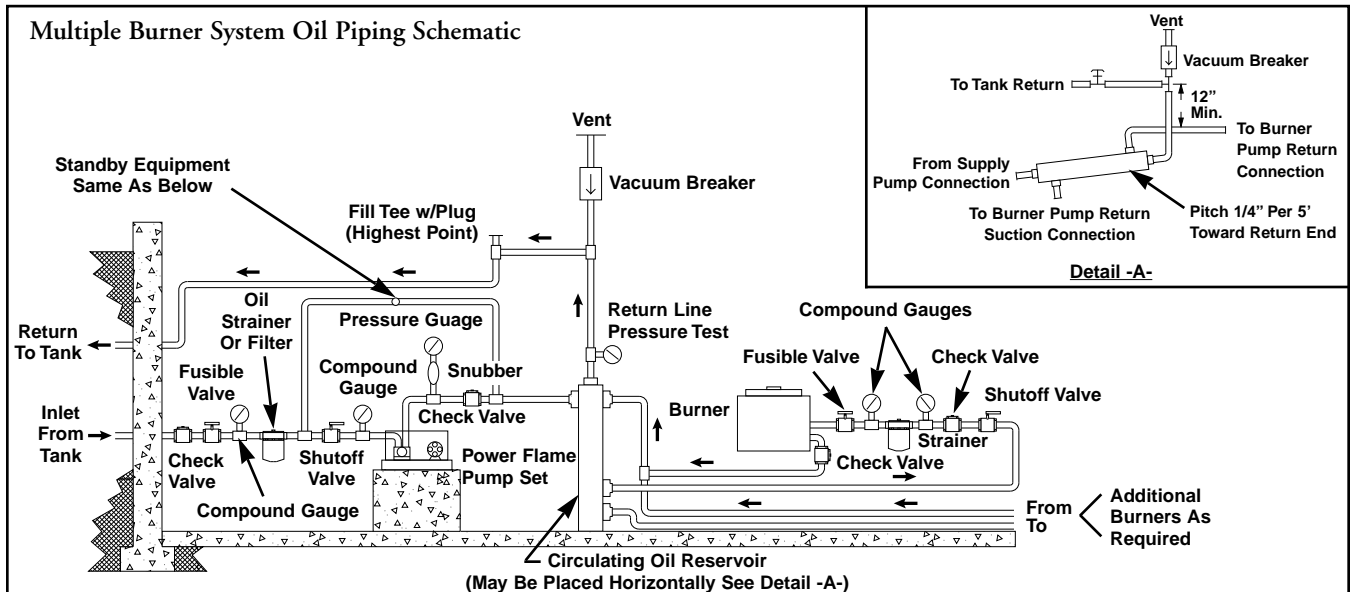
only with a two pipe system. The pump warranty will be voided if a one pipe system is installed.

Do not use Teflon Tape. The pump warranty will be voided if it is used.

Rigid pipe connected to the pump may cause excessive vibration. It is recommended that the connection to the pump be of copper tubing, complete with a vibration dampening loop, on both the suction and return lines.

Do not install manual valves in the return line between the pump and the tank unless required by a specific code. If a manual valve is required, an automatic relief valve must be installed across the manual valve to ensure that oil will bypass directly back to the tank in the event that the manual valve is inadvertently left in the closed position.

Copper tubing with flare fittings or iron pipe is to be used on all installations.



INSTALLATION

Installation

Use the proper size and type of suction line oil filters (refer to table BT2 below).

Utilize fusible link and/or overhead anti-siphon valves as applicable.

Oil Tanks

If the oil storage system has been used with fuel heavier than #2 fuel oil, the entire system should be thoroughly cleaned and flushed before filling the

tank with the new #2 fuel oil for the first time.

If iron pipe oil lines are used on underground tanks, swing joints utilizing nipples and elbows must be used and joined together, making certain the piping connections are tightened as the tank settles. Keep swing joints in the suction and return lines as close to the tank as possible.

Under ground tanks should be pitched away from the suction end of the tank to prevent sediment from accumulating at the suction line entrance. Install the suction line a minimum of 3" from the bottom of the tank.

Before starting up the system, all appropriate air and oil leak tests should be performed. Make certain that the tank atmospheric vent line is unobstructed.

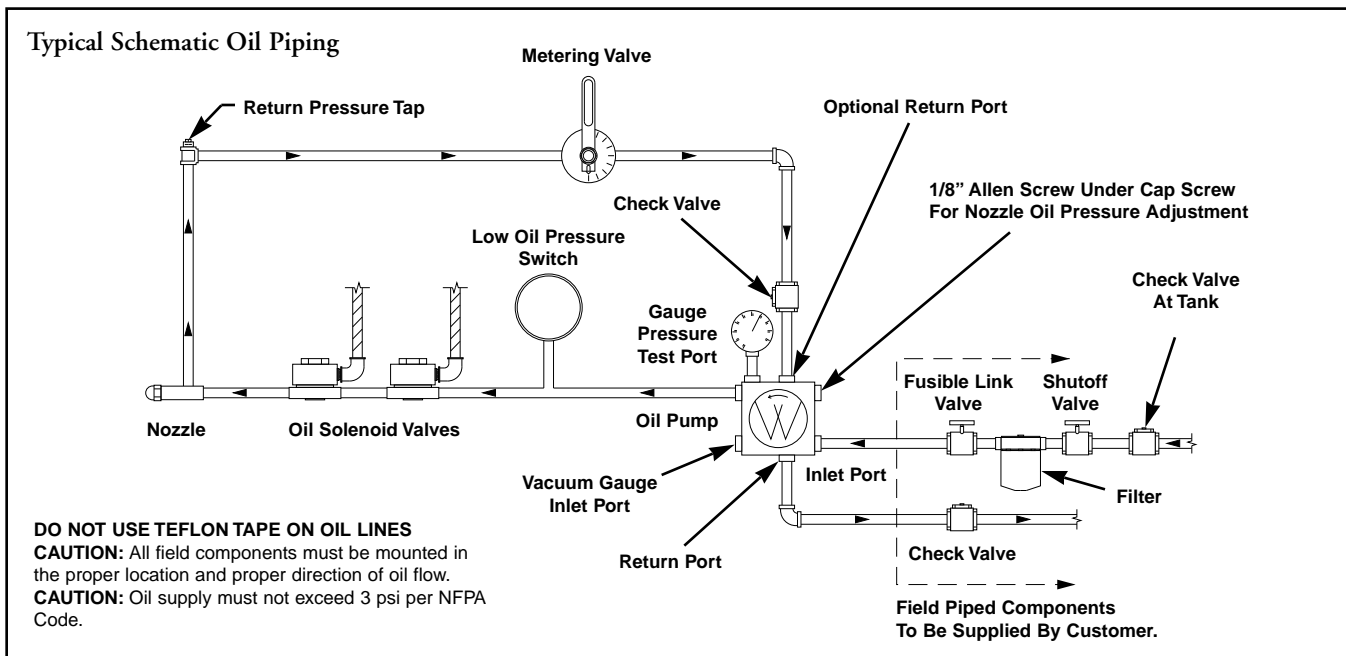


Table BT2

York Mod # YPC-DF-	Suction Capacity (GPH)	Power Flame Oil Filter Model	Alternate Oil Filter
12SC/13S	40	70101-100	73410 (Fulflo FB-6)
13SC/14S	105	70101-100	73410 (Fulflo FB-6)
14SC/15S	105	70101-100	73420 (Fulflo FRB-10)
15SL	135	70101-100	73420 (Fulflo FRB-10)
16S	135	70101-100	73420 (Fulflo FRB-10)
16SL	135	70101-100	73420 (Fulflo FRB-10)
17S	135	70101-100	73420 (Fulflo FRB-10)
18S	135	70101-100	73420 (Fulflo FRB-10)
19S	250	70101-100	731290 (#72 1 Hayward w/ 100 mesh basket)
16G	135	70101-100	73420 (Fulflo FRB-10)
16GL	135	70101-100	73420 (Fulflo FRB-10)
17G	135	70101-100	73420 (Fulflo FRB-10)
18G	250	70101-100	731290 (#72 1 Hayward w/ 100 mesh basket)
19G	250	70101-100	731290 (#72 1 Hayward w/ 100 mesh basket)
19GL	250	70101-100	731290 (#72 1 Hayward w/ 100 mesh basket)
20G	2@135	70101-100	73420 (Fulflo FRB-10)
21G	250	70101-100	731290 (#72 1 Hayward w/ 100 mesh basket)
22G	250	70101-100	731290 (#72 1 Hayward w/ 100 mesh basket)

Oil Line Sizing

It is very important to properly size the oil suction line and oil filter, to provide fuel flow to the burner without exceeding 10" suction pressure (vacuum) at the oil pump suction port.

The method to properly size copper tubing is outlined below. Consult the burner manufacturers service department for sizing assistance regarding iron pipe.

1. Check oil pump "GPH Suction Capacity" shown in table BT2 on the previous page.
2. Measure total tube length (horizontal and vertical) from the end of the line in the tank to the connection at the oil pump.

3. Choose the appropriate graph below, based on the tubing size. Read up from the horizontal axis "total feet of copper tubing" to "Suction capacity in GPH."

4. Read to the left until the vertical axis is reached. This is the vacuum required to draw oil through the length of tube selected.

5. If the installation has lift (vertical distance the fuel unit is above the top of the tank), add 1" of vacuum for every 1 foot of lift.

6. Add the two values obtained in steps 4 and 5.

7. If the total obtained in step 6 is over 10" vacuum, move to the next chart to the right (increase tubing size) and re-calculate the total inches of vacuum.

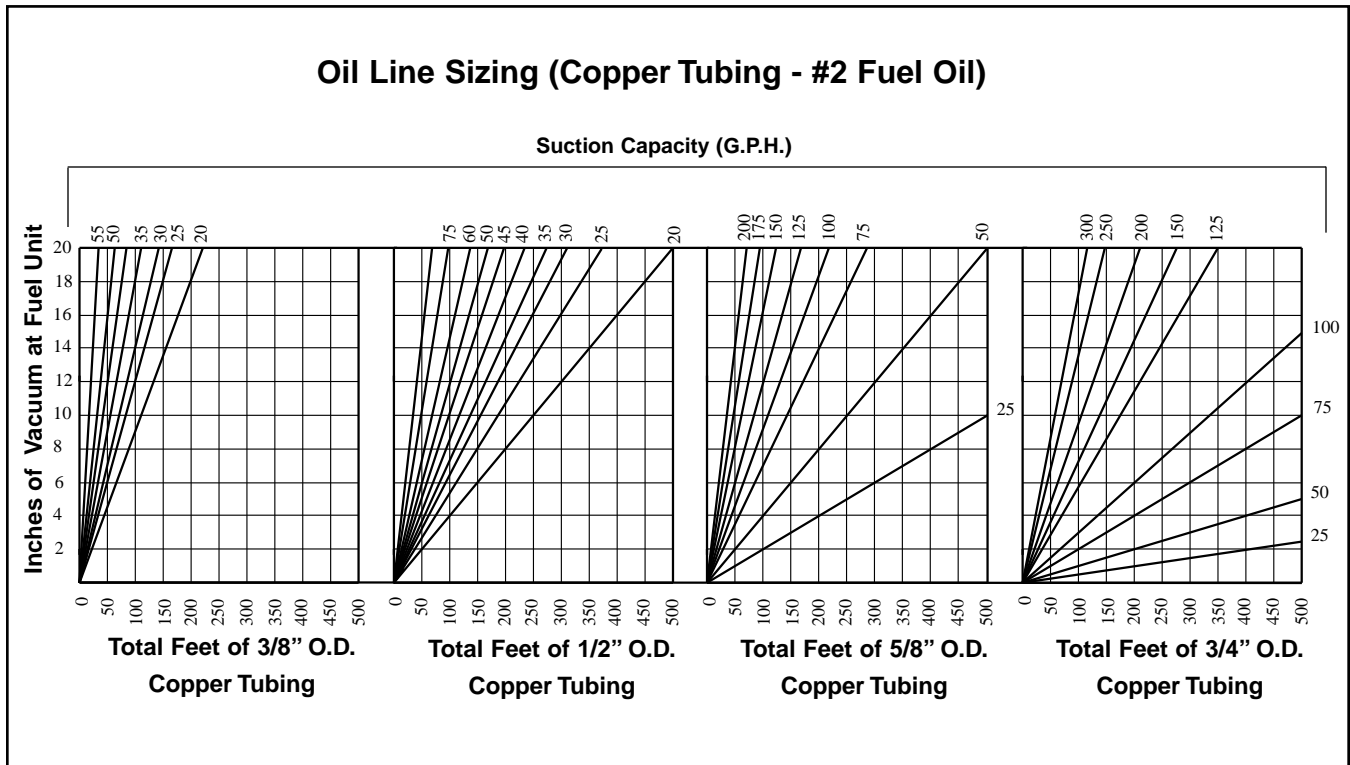
8. These instructions do not allow for any added restrictions, such as the line filter, elbows, sharp bends, check valves, etc. Suction line vacuum values will vary from one manufacturer to another. A good rule of thumb to determine total vacuum for suction line sizing is to add 10% to the vacuum obtained in step 6.

NOTICE

SAFETY

WARNING

It is always safe to size the return line from the pump to the tank at the same size as the selected suction line.



Draft Theory

Draft control serves two important functions for *Paraflow*™ Direct Fired Units:

1. It removes the combustion products from the living or work space.
2. Minimizes excess draft which pulls useful heat out of the unit and lowers its efficiency.

Draft depends on two important factors:

1. The temperature difference between the flue gas and the outside air.
2. The height of the chimney.

Temperature Difference

Chimney draft is the force created by the difference in temperature between the flue gases and the outside ambient air. The magnitude of this temperature difference is directly proportional to the draft created. Temperature difference causes draft because gases such as air occupy different volumes at different temperatures.

For example: one cubic foot of air weighs .0834 pounds at a temperature of 0°F.

This same cubic foot of air at 450°F weighs only .0422 lbs.. The amount of mass per specific volume is referred to as density. Density decreases as temperature increases and lighter (lower density) air rises while heavier more dense air sinks.

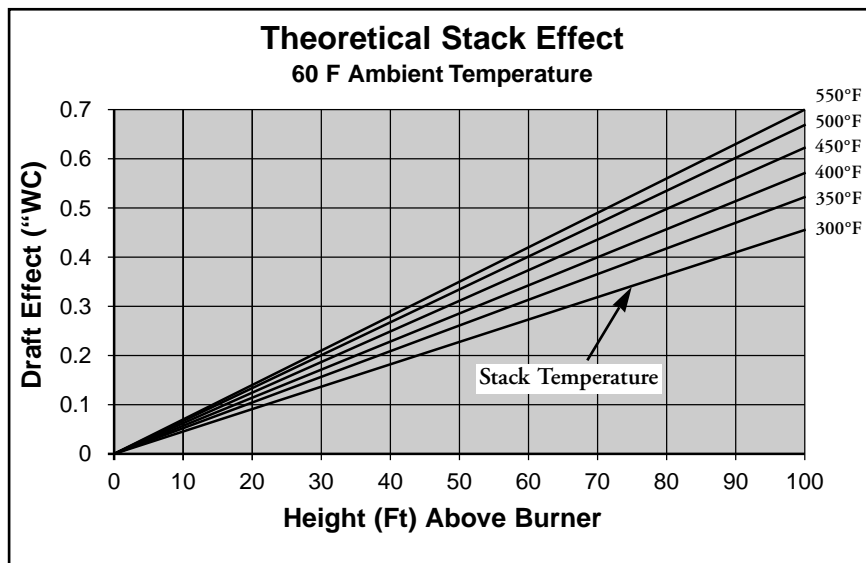
This is the same phenomenon that leads to air stratification in buildings. The temperature in a room at the thermostat may be 70° F, but the temperature near the ceiling may be 80° F.

Heated combustion gases being less dense than the cooler outside air rise and flow out of the top of the chimney and create a partial vacuum. This causes a negative pressure at the chimney inlet that pulls in more gas for venting. This pulling force is referred to as chimney draft.

Because *Paraflow*™ units are capable of operating in both the heating and cooling modes, the outdoor air temperatures will change significantly from the summer (cooling season) to the winter (heating season). These wide temperature swings must be accounted for during burner start-up. The larger the temperature difference the greater the draft. Therefore, when the unit is operating during the colder months more draft will be produced. It is essential that the chimney system be designed using summer ambient conditions so as to avoid under sizing the draft system.

Chimney Height

Chimney height is another major factor influencing the intensity of the draft. Higher chimneys, produce more draft. The graph below shows the relationship between Stack Height, Temperature and Draft



Chimney Design Theory

The following is a discussion of the basic terms and approach used in chimney design. It is not the intent of this section to address the fine details of proper chimney design. Because of the large number of variables, this must be addressed on an application specific basis by an experienced designer knowledgeable in chimney systems, draft control, and local code requirements.

Theoretical Draft (Dt)

The definition of Theoretical Draft is the natural draft or “Chimney Effect” produced by difference in densities of hot exhaust gas relative to cooler ambient air.

Available Draft (Da)

The Available Draft is the draft required at the outlet exhaust flange of the High Temperature Generator.

Pressure Drop (dP)

Frictional losses in the chimney system which act against theoretical draft. The chimney draft needed to overcome chimney frictional losses is described as follows:

$$Dt = dP + Da$$

Proper chimney design balances the theoretical draft (Dt) against the pressure drop (dP) of the chimney system in order to provide the required available pressure (Da) at the outlet of the chiller-heater.

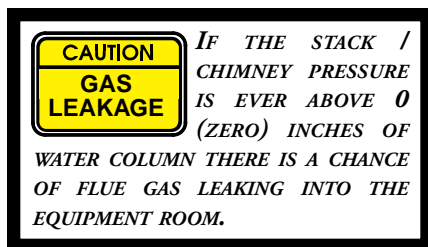
Proper chimney design must provide the required (Da) under all operating conditions. Because the difference between summer and winter ambi-

ent conditions can result in D_t variations of 50% and greater, some method of draft control is usually required in order to maintain D_a .

Chimney Application

The York direct-fired chiller/heater is equipped with a forced draft burner capable of firing on a variety of fuels, including natural gas and/or No. 2 oil and/or propane. As such, the unit will require a properly designed chimney system to control draft and discharge flue gases from the unit to the atmosphere.

The combustion chamber of the chiller-heater is engineered to produce a positive gauge pressure of 0.05 to 0.15 in. of water at the outlet of the first stage generator with an exhaust temperature of 400°F +/- 50°F. As such the chimney design must provide a method for maintaining the pressure at all ambient conditions. Because York chiller-heaters operate at "high fire" throughout the summer months, it is important to design the chimney system for summer ambient design conditions to avoid under sizing. It is recommended that the chimney itself should be designed for a D_a of 0 (zero) in. of water column. This will prevent the chimney from becoming pressurized at any point along the flue gas path.



There are two commonly used ways to maintain the pressure at the outlet of the chiller-heater. Either manual or automatic/motorized draft control can be used. All York direct-fired chiller-heaters will come standard with a manual draft control damper. This damper can be modified for motorized operation either in the factory (if ordered) or in the field if site conditions require.

Manual Draft Control

Manual draft control is suitable for applications where each gas fired appliance will have its own dedicated chimney and draft control system. With this type of system, a (field supplied) barometric draft regulator is used in series with the factory supplied manual backdraft damper. With maximum economy employed in the chimney design, D_t would exactly equal $dP + D_a$ during the summer design ambient conditions with the barometric regulator closed. In reality, some degree of conservatism should exist in the design, causing the barometric regulator to be open slightly even during summer design conditions. As ambient temperatures drop, D_t would increase, if not for the barometric draft regulator. With the regulator in place, mechanical room air is introduced into the chimney system in response to the impressed draft, thus stabilizing the gauge pressure just upstream of the barometric regulator. Most barometric regulators can maintain -0.06 in. water column gauge pressure when properly sized for a particular application.

With the gauge pressure stabilized upstream of the barometric regulator, the factory supplied manual backdraft damper can be adjusted to a fixed position which will provide the pressure drop to yield the required positive pressure at the exhaust flange of the chiller-heater.

Motorized Draft Control

Motorized draft control is suitable for applications where multiple gas fired appliances will be ducted into one common chimney system. In this case each unit will require its own draft control system. (Motorized draft control may be used for one chiller-heater/one chimney applications as well if it is desired over manual control.) Sequential draft control systems, which incorporate a motorized damper whose position is automatically adjusted as a function of available draft at the outlet of the chiller, can be used as a means of draft control. The York supplied backdraft damper at the outlet of the chiller can be modified (in the factory if

ordered, or in the field) to mount the motor driver. The motor is controlled from a draft control panel which senses the pressure at the outlet of the chiller-heater. The draft control panel is available from York to ship with the chiller. The panel is wired to the burner panel and damper motor in the field, and the pressure is sensed through a small line field connected to the outlet of the chiller-heater.

Special Problems and Maintenance

Factors causing draft variations during normal operation include: wind and weather factors, inadequate chimney construction or system installation, location of installation or inadequate system maintenance.

Wind and Weather

Windy conditions will tend to increase the draft in the chimney as the wind helps to remove the combustion products leaving the chimney at a much faster rate. Down draft may occur causing a temporary positive pressure in the chimney system. The stack should be designed to prevent not only wind, but rain and snow from entering the stack. A flue cap should be installed.

Inadequate System Installation

If the diameters of the chimney system are too restrictive, the combustion products and flue gases may not be allowed to leave the system. On the other hand if the flue passages are too large, the chimney is never given a chance to completely warm due to the large surface area of the flue. This situation may cause poor draft and flue gas condensation which can corrode the chimney. To allow the chimney system to heat up faster, insulation should be installed on all exposed flue piping. Insulation is also a good safety measure (often required by code) as the breaching and flue pipes will heat to temperatures in excess of 400°F.

Location of installation

Consideration should be given to the location of the stack in comparison to building intake and exhaust vents, cooling towers, etc. The effect of wind patterns around a building can create surface pressures and eddy currents that could lead to draft problems or contamination of other systems.

Inadequate System Maintenance

Inadequate system maintenance may lead to burner sooting. If left unattended for long periods of time, the flue passages can become restricted reducing the draft. Flue gas should be sampled on a regular basis to check for proper fuel/air ratios.

For More Information

For information regarding chimney and breaching design procedures, refer to ASHRAE 1992 Systems and Equipment Handbook, Chapter 31 and the National Fuel gas code (NFPA 541992). For information regarding the effects of airflow around buildings refer to ASHRAE 1993 Fundamentals Handbook chapter 14.

Also, independent companies exist which design and supply stack materials. These companies have engineering programs to

design chimneys for specific application considerations. When contacting such a company expect to need certain information including: Fuel type and consumption, design ambient temp. (it is best to design for the hottest summer day), flue gas temp., expected height of stack, number of expected fittings (elbows, T's, etc.).

Combustion and Ventilation Air Requirements

NOTICE

Jurisdictional authority relating to combustion and ventilation air requirements vary widely. In order to make certain of compliance, the controlling authorities must be consulted.

Fresh air required to support combustion, as well as to provide adequate location ventilation, must be supplied.

All types of fuel require approximately 10 cu.ft.. of standard air (sea level at 60°F) per 1000 BTU/HR burner firing rate, for theoretically perfect combustion. In actual practice, a certain amount of excess air is required to ensure complete combustion, but this can vary significantly with specific job conditions. Additional air is also lost from the mechanical room

through barometric draft dampers if used.

Ventilation air should be brought in directly from the outside whenever possible.

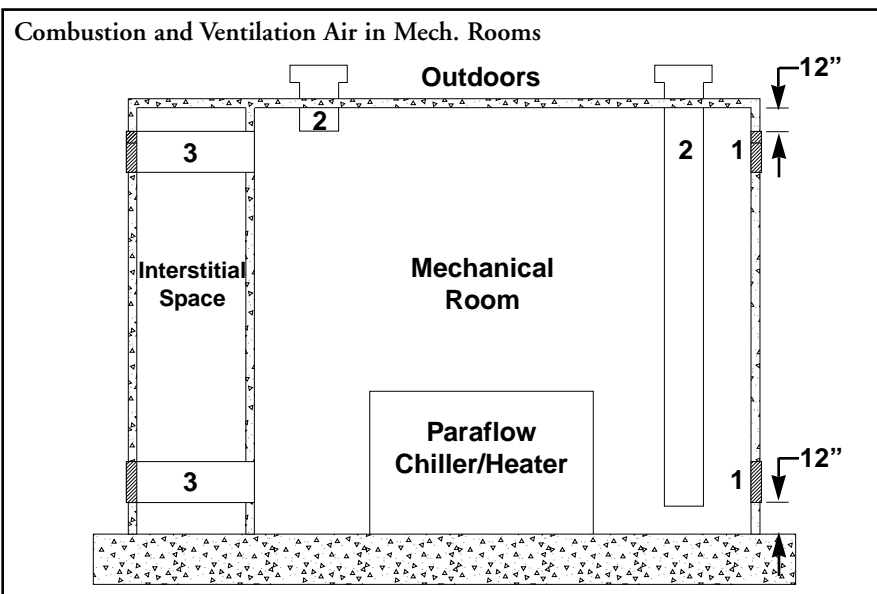
The following is standard field practice and should be used as a minimum.

All confined mechanical rooms and spaces shall be provided with two permanent openings. One commencing within 12 inches (30cm) of the ceiling and one commencing 12 inches (30cm) from the floor.

Refer to diagram below for different options.

1. If these openings **directly communicate with the outdoors** (on an outside wall), **each opening** must have a minimum free area of 1 square inch per 4,000 BTU/HR (5.5 cm² per kw) of the total input rating of all equipment in the enclosure.
2. If these openings **communicate with the outdoors through vertical ducts**, **each opening** must have a minimum free area of 1 square inch per 4,000 BTU/HR (5.5 cm² per kw) of the total input rating of all equipment in the enclosure.
3. If these openings **communicate with the outdoors through horizontal ducts**, **each opening** must have a minimum free area of 1 square inch per 2,000 BTU/HR (11 cm² per kw) of the total input rating of all equipment in the enclosure.

Note: If ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect.



Louvers and Grills

In calculating free area, consideration is to be given to the blocking effect of louvers, grills and screens protecting the openings. Do not use screens which have a mesh size smaller than 1/4" (6.3 mm).

If the free area through the design of louver or grill is known, use it to calculate the size opening required to provide the free area specified. If this value is not known, the following rules of thumb may be used.

Wood louvers will have 20-25% free area and metal louvers and grills will have 60-75% free area.

NOTICE

Fix louvers and grills in an open position or interlock them with the unit(s) so they open during operation. The latter is preferred so that the temperature in the mechanical room will not drop to a point which may facilitate crystallization in the event of a power failure. All dampers should be allowed to close during a power failure

To insure that a safe and satisfactory installation has been made, a pre-start inspection is necessary. This inspection must be performed by an individual who is thoroughly familiar with all aspects of chiller/burner installation and how it interfaces with overall plant operation.

The following is a recommended pre-start inspection check list.

General

The burner(s) should be checked for damaged and/or loose components as these conditions can occur during shipment, through improper handling, tampering, or improper care and storage at the job site.

Check For:

Damage to housing, combustion air inlet and all factory mounted components.

Tightness of fasteners, tube fittings, plugs, etc.

Tightness of electrical connections and terminals.

Tightness of adjustment mechanisms such as ball-joint swivel connectors and control arms.

Accumulation of oil, dust, dirt, water or other foreign matter on, in or near the burner.

Note: Repair and/or clean any deficiencies.

Have the following persons been informed of the start-up?

- Owner's Representative
- Mechanical Contractor's Representative
- Electrical Contractor's Representative
- Local Gas Utility Representative

Make sure that the installed Burner, Gas Train and other related components are those which were specified in the Burner As Built Specification Sheet

(Supplied by Burner Manufacturer)

Make a general inspection tour of the equipment room to ensure that the installation is complete (i.e. piping, controls, wiring, etc.).

Has the burner support stand been installed.

Determine that the voltage supply is correct to the motor starter line connections (L1,L2,L3) and control circuit line connections.

Check blower (and oil pump motor if applicable) rotation by momentarily making contact of the motor starters. Proper rotation is imprinted on the fan housing and (if supplied) the remote oil pump set assembly.

Have piping systems been properly purged of air and filled with water.

Are all system valves and pumps set for the proper operating mode.

Has the cooling tower been filled and put into operation.

Has sufficient load been connected to the unit so that it can fire continuously at full fire rating.

Have the Chilled Water, Condenser/Absorber and Hot Water (where applicable) Pumps been interfaced properly with the appropriate Micro-Panel Contacts (refer to Controls Section for details)

Remove Flame Safe Guard Control from its sub-base and tighten all connections.

Check fuses in main panel and burner control cabinet for continuity.

Have the boiler breeching connections to the stack been completed and are they open and unobstructed.

Has the draft control equipment been installed properly (i.e. Barometric Draft

Damper, Manual Back Draft Damper, etc.).

Is the High Stack Temperature (700°F) Sensing Device(s) installed properly.

Note: *ParaFlow*™ 20G direct fired units require one sensor for each burner (2 total)

Gas Firing

Are all gas train components installed, and have they been properly assembled (refer to Burner Manufacturer's As Built Specification Sheet).

Have properly sized vent lines been installed on all gas train components which require venting? This includes pressure regulators, normally open vent valves, diaphragm valves, low and high gas pressure switches, etc.

Have gas train piping and components been tested and proven gas tight ?

Purge both main and pilot gas lines.

Is the proper gas pressure available at the inlet to the controls which meets the requirements shown on the Burner As Built Specification Sheet, as provided by the Burner Manufacturer ?

Oil Firing

Is the oil tank installed and filled with #2 fuel oil.

Have oil supply and return lines been properly sized to meet the maximum pumping capacity of the pump.

Has the oil piping system been leak tested and purged of air.

Is the proper oil pressure available at the inlet to the controls.

Notes: