

SECTION ____ : THERMAL FLUID HEATER
RECOMMENDED SPECIFICATIONS FOR PARKER THERMAL FLUID HEATER
GAS, OIL OR COMBINATION GAS/OIL FIRED OR PREMIX LOW NO_x

PART I: GENERAL

1.01 PROCUREMENT SPECIFICATION FOR BOILER

1.02 DIVISION 16: ELECTRICAL

1.03 REFERENCES

- A. ANSI Z21.13: Gas-Fired Low-Pressure Steam and Hot Water Boilers
- B. ASME SEC I: Boiler & Pressure Vessel Codes, Rules for Construction of Power Boilers
- C. ASME SEC IV: Boiler and Pressure Vessel Codes, Rules for Construction of Heating Boilers
- D. ASME SEC VIII: Boilers and Pressure Vessel Codes, Rules for Construction of Pressure Vessels
- E. CSA: Directory of Certified Appliances and Accessories
- F. Intertek Testing Laboratories (ETL)
- G. NFPA 54 (AGA Z223.1): National Fuel Gas Code
- H. NFPA 58: Storage and Handling of Liquefied Petroleum Gases
- I. NFPA 70: National Electrical Code
- J. UL 795: Gas and Oil Equipment Directory
- K. Title VIII: California Code of Regulations
- L. Underwriters' Laboratories, Inc. (UL) Listed Products, UL Standard 795, for Commercial Industrial Gas Heating Equipment

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum twenty years experience.

1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for internal wiring of factory wired equipment.
- B. Units: ETL or UL Certified Control Panels.
- C. Gas Train shall comply with UL Standard 795 & ASME CSD-1. FM Approved, or IRI Approved Gas Trains are an option.
- D. Conform to ASME Section I for boiler construction.
- E. Comply with local Air Quality Management District requirements. Local jurisdiction is _____.
- F. Units under 2MM BTU input shall be re certified to SCAQMD Rule 1146.2

1.06 DELIVERY, STORAGE, RIGGING, MOVING, AND PROTECTION

- A. Transport, handle, store, and protect products to point of delivery and receiving (by contractor).
- B. Coordinate shipping dates and off-loading requirements with installing contractor prior to shipment.
- C. Protect boilers and accessories before, during, and after installation from damage to casing (or any other related components) by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.07 WARRANTY

- A. Manufacturer's Warranty: Provide non-prorated warranty for not less than 25-years against damage caused by thermal shock at all normal operating conditions.
- B. Provide a 5-year prorated warranty from the date of start-up or 15-mos. from ship date against defects in workmanship and materials on the pressure vessel.
- C. Provide a minimum 1-year Parts Warranty from date of start-up, or 15-months from ship date.

207 Specifications**Page 2.****PART 2: EQUIPMENT****2.01 BOILERS****A. MANUFACTURER**

1. Parker Boiler Co., Model _____ Thermal Fluid Heater.

B. MANUFACTURED UNITS

1. The boiler shall be flexible bent steel, water tube design. The heater shall be fired with _____ fuel(s) , _____ BTUH input rating, _____ BTUH output rating, and shall be furnished complete and assembled, factory fired and tested with controls and trim, mounted and wired. Minimum heating surface of ____-square feet.
2. Electrical Characteristics as shown on drawings.

C. CODES & STANDARDS

1. The heater shall be manufactured in accordance with the ASME Section I Code, and registered with The National Board of Boiler and Pressure Vessel Inspectors, for a minimum pressure of 125 PSI MAWP. ASME Section I Relief valve to be furnished for _____ PSI pressure and operating controls for 650°F maximum temperature. Furnished with "S" Stamp Section I.

All controls trim shall be in compliance with UL Standards. Power Gas, Oil and Combination Gas/Oil Boilers are furnished with a UL Listed Burner.

D. CONSTRUCTION

1. The boiler shall be of the bent water tube design with carbon steel tubes 1-5/16" O.D. steel and minimum wall thickness 0.12" (11 GA) double welded to top and bottom headers with high tensile weld metal. Ends of headers to have accessible inspection openings. Headers to be Schedule 80 with Class 300 Flanges. Tubing shall be staggered to provide a minimum 8-pass self-baffled heating surface with internal flow baffles for correct velocity to prevent film temperature of thermal fluid from being exceeded and carbonization from being formed. The tubes shall be of the bent design to permit free expansion and contraction. The boiler shall be mounted on a steel frame and enclosed in a heavy steel cabinet with controls mounted.
2. The cabinet shall consist of an inner and outer liner of minimum 16-gauge steel insulated with a high-temperature thermal fiber insulation minimum 3" thick. A minimum of one (1) flanged inspection door shall be provided on the cabinet for accessibility to the burners and tubes. The cabinet shall be finished in an attractive baked enamel heat resistant finish for long-life protection.
3. The boiler shall be furnished complete with controls and trim to provide safe, efficient operation. standard trim items furnished with the boiler shall include electronic flame safety with electric ignition, draft hood or barometric damper, safety relief valve, temperature gage (piped away) and pressure gauge, operating and modulating temperature control with LCD Display with 2°F differential, manual reset high-limit temperature control with stainless steel probe and manual reset low level cutoff terminal for float control mounted in system. The boiler shall be furnished with an enclosed ETL Listed boiler control panel with hinged door, boiler controls and main burner switch, and fuse for over-current protection. The Parker-Lite Sequence Indicator System with indicating lights shall be provided. Primary electrical shall be 115 Volts.

2.02 CONTROLS & TRIM (Choose one (1) burner type ONLY):**A. ALL BOILERS**

1. All controls and trim shall be in compliance with UL Standard 795. The gas manifold shall include dual electric gas valves, gas pressure regulator, a main shut off valve and a leak test cock above 400,000 BTU. On boilers over 2.5 million BTUH provide primary motorized gas valve in addition to standard type and high and low manual reset gas pressure switches.

B. ATMOSPHERIC BOILERS

The burner shall be multiple cast iron atmospheric up-shot, self-aspiring burners with fixed orifice requiring no air adjustment. Type of firing shall be on-off, two-stage or modulating. Burner shall be for standard natural gas, 950 to 1150 BTU content and rated at 4" W.C. pressure at burner. Standard trim items furnished with the boiler shall include electronic flame safety with electric ignition, draft hood or barometric damper with flue gas spill switch.

C. POWER, GAS FIRED BOILERS

The boiler shall be equipped with a gas burner, which is listed by Underwriters' Laboratories and displays the listing label. All controls and trim shall be in compliance with UL Standard 795. The burner shall be suitable for use with natural gas. The burner shall be complete with electronic flame safeguard, air pressure switch, blower motor and controls with modulating or two-stage firing over 700,000 BTUH. A gas pilot of the premix type with electric ignition shall provide reliable ignition. Gas Train components shall be similar to atmospheric natural gas.

D. OIL FIRED BOILERS

The boiler shall be equipped with an oil burner, which is listed by Underwriters' Laboratories and displays the listing label. All controls and trim shall be in compliance with UL Standard 296. The burner shall be the high pressure atomizing type approved for operation with A.S.T.M. D396 Commercial No. 2 Oil, and shall be complete with electronic flame safeguard with direct electric spark ignition or with gas pilot. Furnished with modulating or two-stage firing over 500,000 BTUH, two (2) main oil valves, oil pump, nozzles, blower motor and starter, air pressure switch control for automatic firing, provided as standard.

E. COMBINATION GAS/OIL FIRED BOILERS

The boiler shall be equipped with a combination gas/oil burner, which is listed by Underwriters' Laboratories and displays the listing label. All controls and trim shall be in compliance with UL Standards 296 and 795. The burner shall be suitable for use with either natural gas or oil, meeting standards of A.S.T.M. D396, Commercial No. 2 Oil. Fuel change-over shall be accomplished by a fuel selector switch. The burner shall be complete with electronic flame safeguard, oil pump with separate motor, nozzles, blower motor, oil pump, starter, and air pressure switch control for modulating or two-stage firing. A gas pilot of the premix type or direct spark pilot with electric ignition shall provide reliable ignition of both the gas and oil flame. Gas and oil train components shall be as stated in 5A and 5C.

F. LOW NO_x BURNERS FOR _____ PPM NO_x (Specify If Required & Verify w/ Local APCD)

The boiler shall incorporate a fan assisted combustion system with a burner bed of multiple Metal Fiber Burners. These burners shall be linked to a single fan through a gas air premix manifold. The premix burners shall provide a high degree of NO_x level repeatability once system is adjusted. No filters shall be required.

The burners shall be capable of generating Low NO_x without generating significant CO emissions. NO_x emissions are guaranteed less than _____ PPM at 3% O₂ with CO emissions guaranteed less than _____ PPM @ 3% O₂.

The burners shall consist of a Metal Fiber hot face made from a iron chromium alloy. The Metal Fiber shall be backed by a layer of stainless steel. The Metal Fiber Burners shall provide a high degree of resistance to mechanical and thermal shock, fast cool down and corrosion resistance. Maximum pressure drop through burner at normal firing rates shall be 1.25" W.C.

On boilers equipped with modulation or two stage firing and units over 970,000 BTUH, a blower mixer, which distributes a ratio-controlled gas/air mixture to the burners shall be utilized. Blower construction shall be non-sparking with totally enclosed motor. The gas air ratio shall be controlled through the throttling range by a characterizable fuel valve supplied as part of the blower mixer.

On boilers 970,000 BTUH input and below which are on/off fired provide single inlet blower. Housing shall be die cast aluminum with forward curve wheel. Gas shall be injected downstream of the blower. Air proving switch, blower starter and heat roll out switch shall be provided. Programming flame safeguard with interrupted pilot shall be provided.

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Designer Note: Delete items below which are not applicable for your project and/or add additional special trim as desired (consult factory).

G. FACTORY TRIM OPTIONS

1. California Code Trim
2. All-Limit Alarm 4" Bell
3. All-Limit Alarm Terminals (dry contacts)
4. Anchor Clips, 4 mounted and drilled
5. Remote start-stop relay (24 VAC in from EMCS)
6. IRI Gas Train (meets & exceeds FM Trim)
7. Weather protective cover/ outdoor trim for installation on non-combustible base
8. Non-combustible base shield
9. LPG firing
10. Draft Hood or Barometric Damper (specify Vertical or Horizontal Mounting Position when using barometric damper)

NOTE:

Additional required equipment for an operable hot oil system is required. See Sections _____ for pumps(s), expansion tank, vertical distribution tank, and other accessories.

2.03 PERFORMANCE

Performance rating shall be in accordance with UL Testing and Rating Standard.

2.04 VENTING

Boilers equipped with draft hoods or barometric damper. Units with barometric damper require UL Listed Chimney. Venting materials by installing contractor.

PART 3: THERMAL FLUID HEATER ACCESSORIES**3.01 EXPANSION TANK:**

The Expansion Tank shall be a Parker Model TLTEH-XX_____, Horizontal. Tank capacity shall be _____-gallons, _____" diameter by _____" overall length. This size shall be based on the percentage of thermal fluid expansion, which is based on the system volume, multiplied by 4, or a minimum allowance of 4% expansion volume so that the tank is 1/4 full at 70°F and 3/4 full at maximum system temperature. Tank shall be horizontal and built to ASME Code "U" Stamped and registered with the National Board of Pressure Vessel Inspectors. Minimum ASME working pressure is 125 PSI @ 650°F.

Tank shall be furnished complete with water gauge glass, low liquid level, and necessary openings for system connection, vent, pressurization, gauge, inspection, and drain.

The exterior of the tank shall be finished with an attractive enamel heat resistant finish. The internal surface is not lined. Tank pressurization with nitrogen may be required.

OPTIONS:

- A. Two (2) Saddles

3.02 CENTRAL DISTRIBUTION TANK

The Central Vertical Distribution Tank shall be parker Model TLTDV-XX_____. Tank capacity shall be _____-gallons, _____" diameter by _____"overall height. It shall be vertical and built to the ASME Code "U" Stamped and registered with the National Board of Pressure Vessel Inspectors. Minimum ASME working pressure 125 PSI @ 650°F.

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Central Distribution Tank (Cont'd)

Tank shall be furnished complete with legs, internal baffle fittings and necessary openings for system connection, air elimination, inspection, heater connection and drain.

System connection line size shall be _____" diameter. System connections shall be flanged CL150 or flanged CL300, and shall have 1" threaded air opening.

The exterior of the tank shall be furnished with an attractive enamel heat resistant finish. The internal surface is not lined.

3.03 SYSTEM ARRANGEMENT/SPECIFICATION

All system piping over 1" should be welded. When flanges are required, a high grade Flexatalic high temperature spiral wound gasket must be used. No petroleum type pipe dope should be used. All long circulating lines should be protected with expansion joints to prevent damage due to expansion.

3.04 FLUIDS

The fluid to be used must be selected from a wide variety of specifications. Fire resistance, cold flow and freeze points, high operating temperatures, viscosity at varying temperatures, life expectancy, vapor pressure characteristics, and of course, fluid costs are among the deciding factors in fluid selection.

There are a number of fluids available and all of them have been successfully used in Parker Thermal Liquid Heaters. They include: Mobiltherm (Mobile Oil Co.), Thermia (Shell Oil Co.), Therminol (Monsanto), Sylthem (Dow Chemical), Paratherm (Paratherm Corp.), Multitherm (Multitherm Corp.), Humblethem (Humble Oil Co.), Ucon (Union Carbide), Caluria (Exxon), and Calflow. Final fluid selection should be made in consultation with experienced personnel to determine the best fluid for the application.

3.05 PUMPS

Pump selection in GPM is based on the desired temperature rise through the heater and the system head pressure. Pump selection in a thermal liquid system is based on a velocity flow across the tube surface and the total system head. Some fluids reduce viscosity by 100 times from 50 centistokes at 100°F to .5 centistokes at 600°F. Velocity flow should not be less than 8-feet per second, which with 1" pipe as boiler tubing, represents approximately 20 GPM per tube. Due to the change in viscosity with change in temperature, pump motor horsepower must be selected by considering the cold point and hot point of the system. Parker can assist in selection and provide air cooled or water cooled pumps.

RA PRODUCT DESCRIPTION

The Dean Pump Series RA2000 and RA3000 pumps were specifically designed for very high temperature heat transfer oil applications. Other types of pumps that will operate at these high temperatures are typically designed to require water cooled bearings and elaborate seal flush plans with water cooled features. The RA Series pumps, on the other hand, are air cooled pumps designed to require no water cooling for the bearings and no water cooling for the mechanical seal. Cooling fins, integrally cast in between the casing and seal areas, protect the seal and bearing end of the pumps from the heat generated in the casing due to the high process fluid temperatures. Cooling is achieved by passing air from a shaft driven fan over the cooling fins of the pump's bearing housing.

The pumps are manufactured in ductile iron construction only. The RA3000 has a centerline supported casing, closed impellers, and Class 300# RF flanges. The RA3000 is manufactured in ten (10) sizes, with flows to 1,400 GPM (320 m³/h), heads to 425 feet (129.5m), working pressures to 350 psig (2413 kPa), and operating temperatures between -20 °F (-28 °C) and +650 °F (343 °C). The RA2000 is designed for smaller applications and is furnished in a foot mounted configuration with Class 150#FF flanges. The RA2000 is manufactured in three (3) sizes, with flows to 220 GPM (50.0 m³/h), heads to 280 feet (85.3m), working pressures to 250 psig (1724 kPa), and operating temperatures between

-20^o F (-28^o C) and +650^o F (343^o C).

The air cooled design of the RA Series pumps requires the use of a specially designed coupling guard which is designed to funnel air directly through the shaft mounted fan and across the pump's bearing housing. As such, these pumps should be installed such that free air movement and good ventilation are present. The maximum ambient air temperature is 40^o C (104^o F) for the RA2000, and 48^o C (118^o F) for the RA3000.

The mechanical seal* used is a John Crane Type 21 seal, code XF5010581 (304). The RA Series product is designed for automatic seal setting and will not accept other types of mechanical seals. The pump is furnished with a casing drain as standard. All other NPT drillings and options are extra and can be priced from the R400/R4000 section of the price book. Review all special requirements with the Dean applications engineering staff.

Applications of the RA Series pumps are limited to traditional transfer oils and are not suitable for water or glycol based heat transfer liquids. Applications on solvent based fluids and to old systems which contain dirt or debris may not be successful. For water or glycol based fluid applications, please refer to the RWA Series pumps.

*This seal is **silicon carbide vs. carbon** and is rated for 125 psig (862 kPa) at the seal. It replaces the niresist vs. carbon seal previously used, which was rated for 75 psig (517 kPa).

3.07 **SYSTEM VALVES**

Each pump suction shall be provided with line-size full lug-pattern butterfly valves to serve as isolation valves. Each pump discharge shall be provided with a steel gate valve rated for 125 PSI @ 650°F. Other isolation valves shall be provided as indicated on the P & ID.

3.08 **FLANGES – FITTINGS**

ASTM A-181 1/16" raised face 300 lb. rating up to 4" pipe diameter; 150 lb. rating greater than 4" pipe diameter.

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3.11 NITROGEN SYSTEM

A Steel tank shall be provided, mounted and piped to expansion tank as a manual nitrogen blanket system to create system cold start pressure. Components to be removable for shipment.

PART 4: EXECUTION

4.01 MANUFACTURER'S OR MANUFACTURER'S REP FIELD SERVICES

- A. The manufacturer or manufacturer's rep shall provide factory-trained technicians to properly start-up the equipment for maximum performance. Boiler shall be started and tested throughout entire firing range. Systems shall be tested in the presence of the designated owner's representative to demonstrate the system operation. Provide start-up report to the owner.
- B. Instruct operating personnel in operation and maintenance of units.