



## UNIFLUX FIRED HEATER SPECIFICATION

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### **1.0 GENERAL DESCRIPTION**

The heater shall be a complete factory-assembled, forced draft, all convection unit including heat exchanger, burner equipment, blower, gas train, stack, piping connections, and steel supports. The heater shall be of complete factory assembled design, with minimum field bolt-up assembly required. Field welding shall not be necessary. Unit shall be a Uniflux type.

Coil surface shall be sufficient to provide heat transfer at rated efficiency. Efficiency shall increase for lower heat load conditions. Accessories shall include a fuel gas pressure regulator, fuel safety shutoff valves, mechanically linked fuel and air control valve with actuator and ultraviolet flame safety detection system.

The heater shall be designed to have two distinctive sections. A combustion chamber where the gas is burned and a heat exchanger portion where heat is transferred from the hot products of combustion to the process flow coil.

A heat exchanger principle is to be used that will assure uniform heat transfer flux rates throughout the heat exchanger portion of the heater. As a guard against high flux rates in one area and low flux rates in another, heat transfer shall be by convection. Radiant sections will not be acceptable. Convection heat transfer shall be by rapid circulation of hot inert flue gases around the process tubes caused by a high velocity flue gas jet. Recirculation of hot gases by mechanical devices with moving parts is not acceptable. The fuel/air ratio shall be controlled through-out the turndown range resulting in low oxygen levels at all firing rates. The net thermal efficiency of the heater shall increase as the firing rate decreases.

### **2.0 PROCESS COIL:**

- 2.1 The process coil shall be fabricated from standard pipe with wall thickness and material selection compatible with the design pressure, design temperature and corrosion allowance.
- 2.2 The process coil shall be designed, fabricated, tested and stamped in accordance with ASME Boiler and Pressure Vessel Code Section VIII, Division I. Minimum radiograph inspection shall be 100% of 100% of the pipe welds.
- 2.3 Tube supports: Process coils shall be adequately supported to prevent sagging and undue stress on the piping at any operating condition. The length of span between tube supports shall not exceed 35 pipe diameters. Pipe supports shall not transfer loads to the heater wall. Pipe support shall be from below only. Pipe supports shall not impede thermal expansion of process coils.

### **3.0 INSULATION:**

- 3.1 The insulation system shall be composed of a soft-walled, light weight insulating material. No firebrick or castable refractory shall be used.
- 3.2 The insulation system shall insure that residual heat storage is minimized. In the event that the heater is shutdown and flow is stopped, the heat contained in the insulation shall not be sufficient to over heat the fluid remaining in the heat transfer coil.
- 3.3 Insulation Installation: Insulation shall be three layers: Next to the heater casing, two layers of 2" thick, 8 #/cf mineral fiber followed by a 1" layer of 8 #/cf ceramic fiber insulation. Insulation shall be installed by impaling over 5/16" diameter 304 SS pins which shall be fillet welded to the heater shell on 11" centers. A 26 gauge type 430 stainless steel liner shall cover the entire heat exchanger portion to protect the fiber insulation from deterioration due to high velocity flue gas. Washers shall be fillet welded to the insulation anchor pins on top of the stainless steel liner to hold the entire assembly securely in place.



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### **4.0 BURNERS:**

- 4.1 Type: The burner shall be a gas fired high intensity, forced air type having a short flame length. Exit velocity of the burner shall be above 200 ft/s. Burners with a long, lazy flame are unacceptable.
- 4.2 Excess Air: Burner is to operate at a ten percent excess air at maximum firing rate.
- 4.3 Construction: The burner shall be of all metal construction, refractory materials are not to be used. The burner shall be of sealed construction.
- 4.4 Burners shall be capable of rapid transition from maximum fire to minimum fire to accommodate sudden process demand changes.
- 4.5 A separate pilot and main burner is unacceptable. The main burner shall utilize an integral pilot. No provision shall be made for manual ignition of the burner with torches, matches, etc. Ignition of pilot shall utilize an automatic, electronic spark igniter, controlled by the burner management system.
- 4.6 The burner shall have a turndown capability of 40:1.

### **5.0 BLOWER:**

- 5.1 Combustion air blower shall be a heavy duty type sized for (10%) ten percent excess volume over operation requirements at maximum capacity. The blower shall be direct drive arrangement 4 or arrangement 8.
- 5.2 Blower outlet pressure shall be sufficient to maintain a positive pressure throughout the combustion air line, burner, heater cabin, and stack. All portions of the heater shall be forced-draft. No natural- or induced-draft is acceptable.

### **6.0 SAFETY CONTROLS:**

Safety controls and installation shall be per NFPA 8501, latest edition, and shall include the following:

- 6.1 Internal spark ignition system.
- 6.2 Micro processor based preprogrammed burner control with continuously supervised ultraviolet flame sensing device which is designed to shut off fuel gas in the event of flame failure.
- 6.3 Electrical controls to pre-purge the combustion chamber and heat exchanger portion with eight air changes prior to any flame ignition attempt.
- 6.4 Combustion air pressure switch that is designed to shut off fuel gas in the event of blower failure.
- 6.5 High and low fuel gas pressure switches that are designed to shut off fuel gas in the event of fuel supply pressure malfunction.
- 6.6 Safety double block and bleed valves on the main fuel line and on the pilot gas line.
- 6.7 An indicating high stack temperature monitor to shut down unit.
- 6.8 A first-out annunciator shall be included for troubleshooting purposes.

### **7.0 MATERIAL OF CONSTRUCTION:**

All materials shall be new and of the highest quality.

- 7.1 Heater Shell: Carbon steel minimum shell thickness 1/4" with fiber insulation lining and stainless steel inner liner.
- 7.2 Process Coil: ASTM Certified pipe of material suitable for service.
- 7.3 Coil Supports: Type 304 stainless steel.



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7.4 Inlet and Outlet Connections: ANSI B16.1 flanges, SA-105.

7.5 Combustion Air and Fuel Gas Piping: A106-B.

7.6 Structural Steel: A-36.

7.7 Exhaust stack: A-53. If stack is readily accessible to personnel, it shall be externally insulated with jacketed ceramic fiber for personnel protection.

7.8 Inlet and Outlet Connections: ANSI B 16.1 flanges of material suitable for service.

7.9 Combustion Air and Gas Piping: Carbon Steel.

### **8.0 FABRICATION:**

8.1 Heater burner and shell be of fabricated welded steel construction of air tight design.

8.2 Stack shall be a stub stack and not be less than 4 ft. above top of heater. It shall be fabricated from carbon steel material.

8.3 Electrical: The control panel, electrical enclosures and conduit shall meet NFPA-70, NEC requirements for the operating environment of the heater. The electrical assembly and wiring shall be factory installed and shall be complete.

8.4 Piping: Fuel gas and air piping shall be completely shop assembled with control and safety valves.

### **9.0 TESTING:**

Testing shall include, but not be limited to:

9.1 Process coil: Hydrostatic test per ASME VIII at 1.5 times the design pressure.

9.2 Fuel gas Piping: Air test for integrity.

9.3 Combustion Controls: Functional test firing at low fire conditions and simulation of all safety devices.

### **10.0 FACTORY PAINTING:**

The heater shall be cleaned in accordance with SSPC-SP 10 and given one coat of an inorganic zinc primer (approximately 2 mils DFT) and one coat of an engineered siloxane (approximately 5 mils DFT). This provides a coating system which has substantial resistance to chalking due to exposure to sun light.

### **11.0 STRUCTURAL STEEL:**

The supporting structure on the heater shall be designed in accordance with the latest edition of AISC Manual for a 70 MPH wind (Minimum).

### **12.0 CONTROL PANEL:**

The control panel shall be free standing type with terminal strips for final connections between controls and heating unit. Panel shall meet NEMA construction standards. Control panel shall have exterior indicating lights and switches for local control.

### **13.0 OPERATING & MAINTENANCE MANUALS:**

Two sets of operating and maintenance shall be provided per heater. Manuals shall include detailed installation and start-up procedures. The manuals shall include an explanation of the controls system, an instrument settings guide, a recommended spare parts list, as well as heater specifications and other information.

### **14.0 GUARDS:**

Equipment shall be provided with guards when necessary to comply with OSHA requirements.



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**15.0 ENGINEERING DRAWINGS:**

Two sets of approval drawings shall be provided. Drawings shall include dimensional drawings, flow sheet with instrument bill of material, and electrical schematic diagrams. No fabrication of equipment shall be commenced until the approval drawings have been approved by the Owner's Engineers.

**16.0 WARRANTY:**

Company warrants title to the product(s) and, except as noted below with respect to items not of Company's manufacture, also warrants the product(s) on date of shipment to Purchaser, to be of the kind and quality described herein merchantable, and free of defects in workmanship and material.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS, AND CONSTITUTES THE ONLY WARRANTY OF COMPANY WITH RESPECT TO THE PRODUCTS(S).

If within one year from date of initial operation, but not more than eighteen months from date of shipment by Company of any item of product(s), Purchaser discovers that such item was not as warranted above and promptly notifies Company in writing thereof, Company shall remedy such nonconformance by, at Company's option, adjustment or repair or replacement of the item and any affected part of the product(s). Purchaser shall assume all responsibility and expense for removal, reinstallation, and freight in connection with the foregoing remedies. The same obligations and conditions shall extend to replacement parts furnished by Company hereunder. Company shall have the right of disposal of parts replaced by it.

ANY ITEM OF THE PRODUCT(S) WHICH IS NOT MANUFACTURED BY COMPANY (such as valves, instrumentation and electrical devices) IS NOT WARRANTED BY COMPANY, and shall be covered only by the express warranty, if any, of the manufacturer thereof.

THIS STATES PURCHASER'S EXCLUSIVE REMEDY AGAINST COMPANY AND ITS SUPPLIERS RELATING TO THE PRODUCT(S), WHETHER IN CONTRACT OR IN TORT OR UNDER ANY OTHER LEGAL THEORY, AND WHETHER ARISING OUT OF WARRANTIES, REPRESENTATIONS, INSTRUCTIONS, INSTALLATIONS OR DEFECTS FROM ANY CAUSE. Company and its supplier shall have no obligation as to any product which has been improperly stored or handled, or which has not been operated or maintained according to instructions in Company or supplier furnished manuals.