Power Flame Incorporated

SUGGESTED SPECIFICATION
FOR
VECTOR COMBINATION
GAS/LIGHT OIL BURNERS

THE POWER TO MANAGE ENERGY
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VECTOR SPECIFICATION

Each boiler shall be provided with a factory packaged combustion system complete with fuel trains, atomizing media train, fuel/air metering systems and integrally mounted control panels for both burner management and motor control, all as hereinafter specified.

The burner shall be of the Parallel Flow Low Excess Air design, capable of firing _____ CFH (1000 BTU per cubic foot) Natural Gas or _____ GPH #2 Fuel Oil against a positive combustion chamber pressure of _____" w.c.. The fully modulating control system, with low fire start, shall be capable of operating at 10:1 turndown for Natural Gas and 8:1 turndown for Oil with low excess air levels of 10% (2% O_2) at firing rates of 25 to 100% of full input rate. The system shall incorporate staged air design with a primary combustion zone to provide flame stability and internal recirculation. The secondary combustion zone shall consist of parallel, laminar flow, capable of imparting the required flame shape to fit the combustion chamber geometry. Registers or movable dampers shall not be used to provide these functions.

Each unit shall consist of the following basic components, factory mounted, wired and piped, to form an integrated combustion system.

1. Combustion Air Distribution and Flow Control System - Shall consist of the combustion air fan, housing and vortex type Variable Inlet Vane damper assembly located on the Inlet side of the fan. The fan shall be of the high static, backward inclined type and shall be directly coupled to a 3450 RPM, ____ HP, _____/_____/____ ODP Motor.

2. Gas Burner - Shall be of the Multi-Lance design, consisting of six (6) lances which draw from a gas manifold located within the burner front plate. Adjustable stainless steel, multi-port gas spuds shall be attached to each lance and shall terminate within the secondary air zone around the burner diffuser. Fuel staging shall be accomplished by adjusting the relative Vector orientation of the gas spuds to create fuel rich and fuel lean zones within the combustion envelope. Two observation ports shall be provided for tuning and visual flame monitoring.

3. The Oil Burner - Shall consist of a Y Jet type fuel atomizer which incorporate multi-mixing chambers to produce a finely atomized oil spray. Steam atomization shall be used as the atomizing medium and shall be supplied to the factory mounted atomizing train at 125 psig. Steam consumption shall be no greater than .04 pounds of steam per pound of oil. The oil assembly manifold block shall be designed to provide easily accessible connections. The complete oil drawer assembly and nozzle shall be capable of adjustment and removal, from the front of the burner, using a snap lock connection mounted within the Oil Assembly Manifold block. Fuel supply and atomizing steam line connections to the oil block shall be made using austenitic stainless steel flexible hose complete with integral sealing quick disconnect assemblies.

4. Gas Ignition System - Shall consist of an electrically initiated port metered raw gas pilot with segmented flame retention chambers. The gas ignition system shall be capable of main fuel ignition with pilot gas flow rates no greater than 120 MBH. The gas ignition system shall be provided with a flange mounted pilot positioning system capable of

variable insertion lengths and adjustable from the burner front. The gas pilot train, as hereinafter specified, shall terminate in an austenitic stainless steel flexible hose complete with integral sealing quick disconnect assemblies.

5. Main Gas and Gas Pilot Trains - Shall be in accordance with UL, FM and NFPA-85.01 and shall be sized to operate at full rate with ____ psig gas pressure, at the inlet to the pressure reducing regulator. The systems shall be factory mounted and wired integral to the burner assembly and shall consist of the following basic components:

Main Gas Train

1 Main Gas Safety Block Valve; _____ motorized valve with proof of closure switch.
1 Auxiliary Gas Safety Block Valve; _____ motorized valve.
1 Pressure Reducing Regulator; _____ regulator.
1 Fuel Metering Valve
2 Manual Gas Valve (cocks)
1 Gas Vent Valve; normally open with upstream manual, locking, block valve.
1 High Gas Pressure Switch; _____ to _____ psig.
1 Low Gas Pressure Switch; _____ to _____ psig.
1 Inlet Pressure Gauge; _____ to _____ psig with 2 1/2" dial.
1 Burner Pressure Gauge; _____ to _____ psig with 2 1/2"dial.
2 Gauge Cocks

Pilot Gas Train

2 Pilot Gas Safety Solenoid Valves
1 Pressure Regulator
1 Pilot Vent Valve; normally open
2 Manual Gas Valves (cocks)
1 Gas Y Strainer
1 Pilot Pressure Gauge; 2 1/2" dial
1 Gauge Cock
1 Stainless Steel Flexible Hose

6. Oil and Atomizing Trains - Shall be in accordance with UL, FM and NFPA-85.01 and shall be sized to operate at full rate with 175 psig oil pressure supplied by the remote mounted pump set, hereinafter specified. These systems shall be factory mounted and wired integral to the burner assembly and shall consist of the following basic components:

Oil Train

1 Primary Oil Safety Solenoid Valve; N.C.
1 Auxiliary Oil Safety Solenoid Valve; N.C.
1 Oil Pressure Regulating Valve

1 Oil Low Pressure Switch
1 Oil Metering Valve
1 Oil Strainer; Y Type
2 Manual Shutoff Valves
2 Oil Pressure Gauges; 2 1/2" dial, 0 to 300 psig
2 Gauge Cocks
1 Stainless Steel Flexible Hose

Steam Atomizing Train (with air start)

1 Steam Safety Solenoid Valve
1 Steam Regulator
1 Steam Trap
3 Steam Check Valves
3 Steam Manual Shutoff Valves
1 Low Pressure Switch
1 High Pressure Switch
2 Pressure Gauges; 2 1/2" dial 0 to 200 psig.
2 Gauge Cocks
1 Automatic, N.C., Purge Valve
1 Stainless Steel Flexible Hose

Remote Pump Set (No. 2 Fuel Oil)

1 Rotary gear pump; _____ _____GPH, set for 175 psig
1 Motor; _____HP, _____RPM, _____Volt, 3 phase, 60 Hz, 56C frame, ODP construction.
1 Direct drive pump/motor housing; machined cast aluminum
1 Suction line basket strainer
1 Pump mounting stand, steel construction

7. Future Low NOx - Each unit shall be capable of being field equipped with an Induced Flue Gas Recirculation (IFGR) air inlet assembly, complete with FGR diverter damper to ensure that FG is not admitted into the combustion air prior to ignition and light off. The system, when installed, shall produce clean, stable combustion at NOx levels below 30 ppm (corrected to 3% O_2), on Natural Gas and 65 ppm on #2 Fuel Oil that contains less than 0.2% Nitrogen by weight.

8. Burner Throat - Shall be specifically matched with the burner air sleeve and diffuser to produce an aerodynamically stabilized flame. This refractory throat composed of 60% Alumina 3000°F A.P. Green Kast-o-lite 30 plus shall be factory assembled on the burner head by the burner manufacturer.

9. Integrally Mounted Control Panels

- Burner Control System

9.1. The burner manufacturer shall provide an integral burner mounted control cabinet enclosure for the main burner control devices as well as a secondary control cabinet enclosure for the motor control devices and other related electrical items.

9.2. The Burner Management control enclosure and motor control enclosure shall be manufactured in accordance with National Electrical Manufacturer's Association (NEMA) standard Type 4, enclosures intended to provide a degree of protection against windblown dust and rain, splashing water and hose directed water, and undamaged by the formation of ice on the enclosure.

9.3. The Burner Management control enclosure shall include the following:

9.3.1. _____ flame safeguard with pre- and post-purge operation, timed trial for ignition, proven low fire start and open damper position inputs, proof of main fuel valve seal overtravel interlock position, _____ flame amplifier with 2-4 second nominal flame failure response time, keyboard display module with annunciation of burner status, progression of burner sequence, flame signal strength, fault annunciation, and ability to display the last six lockouts the system has experienced.

9.3.2. View window in enclosure door to allow the operator to view the display module in the _____flame safeguard without having to open the door.

9.3.3. Pilot lights and selector switches shall be NEMA 4 Oil tight construction, heavy-duty operators only; standard toggle switches and indicating lamps are not acceptable. The panel shall include the following indicating pilot lights:

Power On
Ignition On
Main Fuel
Flame Failure

and the following selector switches:
Burner On-Off
Alarm Silencing
Gas-Off-Oil
Manual-Automatic with burner positioning Potentiometer

9.3.4. Three pole double throw relays with sockets and mounting clips for alarm and signaling purposes.

9.3.5. A weatherproof alarm signaling horn, mounted in the side of the enclosure, 120 decibels at 3 feet minimum sound amplitude.

9.4. The Motor Control enclosure shall include the following:

9.4.1. Circuit breakers for all motor circuits wired through the panel.

9.4.2. Magnetic contactors with thermal overload elements for each motor circuit wired through the panel.

9.4.3. Control circuit stepdown transformer, minimum 750 VA capacity.

9.4.4. Fuse and fuse holders for the primary and secondary circuits of the control circuit stepdown transformer.

9.4.5. Flange type main power disconnect switch - to disconnect all electrical power from the burner system.

9.5. All factory wiring runs will be in liquid tite flexible conduit or rigid thinwall metallic conduit. All connectors shall be water tight.

9.6. All electric motors shall be of the open drip proof fan cooled construction.

9.7. The main control panel shall be constructed in accordance and labelled with the Underwriters Laboratories listing mark for Flame Safeguard Control Panels.

9.8. The motor control panel shall be constructed in accordance and labelled with the Underwriters Laboratories listing mark for Industrial Control Panels.

The complete factory packaged and functionally fire tested combustion system as specified herein shall be Vector Model _____, as manufactured by Power Flame, Inc.