Galaxy Burner Specification

BURNER AND FUEL TRAINS:

A. Burner Type: Preferred Galaxy ultra low NOx, high turndown combination natural gas and fuel oil, packaged, forced draft, modulating firing, variable speed forced draft fan. Design for ultra low NOx emissions. Burner and controls system shall be manufactured by the same company for single source responsibility.

1. Gas Burner: Ring type with multiple ports or spuds.
2. Oil Burner: Gun type, pressure atomized, bypass nozzle type.

B. Service:

1. Continuous operation at all firing rates on each fuel listed under Article, PROJECT CONDITIONS of Part 1. Design the entire burner and fuel train system for application to the specific boiler furnished and for service at the available fuel pressures.
2. Igniter (Pilot) Fuels: Normal fuel will be natural gas. Propane will be used if there is an interruption in natural gas service.
3. Main Fuels: After boilers are accepted for operation, choice of fuels will be based on cost and availability.

C. Performance:

1. Igniter (pilot) flame on natural gas and propane shall form close to the point of ignition and shall be stable. Ignite both the gas and oil burner with single igniter.
2. Main flame on gas and oil fuels shall ignite at lowest firing rate.
3. Main flame characteristics at all firing rates:
   a. Flame retained at the burner.
   b. Flame stable with no blowoff from the burner or flashback into the burner. No pulsations.
   c. No carryover of flame beyond the end of the first pass (furnace tube).
4. Operation:
   a. Minimum turndown 6:1 firing natural gas, 8:1 firing fuel oil.
   b. Operate at all loads on any one fuel without any manual changes to burners, fuel trains or fuel pressures, atomizing media trains or pressures.
   c. Performance at any load point shall be repeatable after increasing or decreasing the firing rate. Repeatability plus or minus five percent excess air, at 25 percent and higher boiler loading except excess air must remain within normal operating ranges.
   d. Oxygen trim control set at maximum position shall not blow out the fire at any load point. At minimum position, the combustion shall not go below stoichiometric.
   e. Noise and Vibration: Burners shall operate without pulsation.
5. Flue Gas Emissions Limits:
   a. Carbon Monoxide: Shall not exceed 100 PPM.
   b. Smoke: On natural gas and No. 2 oil, opacity shall not be visible and shall not exceed No. 1 on the Bacharach smoke scale.
   c. NOx: 9 ppm maximum, corrected to 3 percent oxygen, dry basis on natural gas; 120 ppm on No. 2 fuel oil. No FGR is permitted.
6. Fuel Changeover:
   a. Burner shall be able to change fuels without making adjustments to the burner head.
   b. Burner shall be able to change fuels (e.g. natural gas to #2 oil) within 5 minutes.
D. Construction:

1. Burner Access (Main Burner and Igniter): Arrange fuel valve and piping trains, controls and other devices so that they do not interfere with the removal and replacement of burner parts.
2. Arrangement of Fuel Valve and Piping Trains: All devices shall be accessible for maintenance or replacement without removal of other devices. Do not attach any piping or devices to boiler casings.
4. Combustion Air System
   a. Air flow rates controlled by forced draft fan inlet or outlet dampers, and a variable speed drive.
   b. Symmetrical, balanced distribution of combustion air into the burner.
   c. Forced Draft Fan: Direct drive fan, electric motor driven. Design for required excess air and for static pressure that is based on losses from fan inlet to stack or chimney outlet, including economizer (if provided), at jobsite altitude. Fan shall have no resonant frequencies at all operating speeds. Belt driven motors are not permissible.
   d. Motor: TEFC, non-overloading under all fan operating conditions, design for 40 deg. C ambient, premium efficiency type.
   e. Damper: Design to provide accurate control of excess air with minimum hysteresis. On variable speed systems, the damper shall control only at lower firing rates.
   f. Motor Starter Panel: Provide variable speed drive with bypass contactor mounted in NEMA 4 enclosure, readily accessible.
   g. Fan Housing must be removable.
   h. Air Inlet Box with fresh air damper is required for noise reduction.
   i. No air filters are permitted.
   f. No fiber metal mesh burner heads are permitted.
5. Provide viewport, with one clear, replaceable interchangeable glass. Locate to permit view of main and igniter flames.
6. Burner Throat: Refractory, shaped to promote proper combustion, arranged with provisions for expansion and contraction and rated by the refractory manufacturer for the maximum service conditions.
7. Service and Maintenance: All removable burner components must be able to be removed without entering the boiler.
8. Flame scanner(s): The flame scanner is to be externally mounted for ease of access, and should not be located inside the burner.
9. Oil Atomizer: The oil atomizer shall be capable of being withdrawn during gas firing in order to extend the service life of the nozzle.
10. Air Sleeve: The burner shall have an adjustable air sleeve capable of fine tuning flame geometry for furnace geometry and site specific conditions.
11. Gas Injectors: Must be spud type and removeable.
12. Gas Manifold: Burner gas manifold shall be of at least 11 gauge construction.
14. Electrical Conduit: Provide liquid-tight flexible metal conduit with sealing fittings for all power and control services to fuel trains and burners.
15. Factory Testing: Mount burner and controls on boiler at factory and fire-test at all load points.

E. Natural Gas Main Fuel Train:

1. Arrangement: Comply with typical arrangement in CSD-1, as modified by the following description: Starting at the entrance to the train, the devices are, in sequence: isolation valve, pressure gage, pressure regulator, valved connection to pilot burner fuel train, pressure gage, low pressure switch, two automatic safety shut off valves, valved leak
test, high pressure switch, fuel flow control valve, isolation valve, pressure gage, burner. Provide tee connection for vent between the automatic safety shut off valves. Vent line shall include automatic vent valve, lockable isolation valve, vent thru roof. High and low pressure switches shall be located to sense the constant pressure controlled by the burner pressure regulator and not the variable burner pressure.

2. Pressure Regulator:
   a. Single seated, diaphragm-operated, designed for natural gas service. Controlled pressure shall be sensed downstream of main valve. Valve may be self-operated or pilot-operated as necessary to comply with performance requirements.
   b. Service: Provide precisely controlled downstream pressure in fuel train, as required by burner and fuel trains furnished, with upstream pressure as shown or specified. Inlet and outlet emergency pressure rating shall be at least twice the lock-up pressure of the nearest upstream pressure regulator.
   c. Performance: Maximum outlet pressure droop 5 percent of the set pressure over the burner firing range. Maximum lock-up pressure 1.5 times regulated pressure. Speed of response to opening of automatic safety shut off valves shall be sufficient to allow set pressure of low pressure switch to be within 20% of the normal operating pressure with no nuisance burner trips.

3. Automatic Safety Shut-Off Valves:
   a. Type: Motorized-opening, spring closing, controlled by burner control system. Two valves required.
   b. Service: Provide open-shut control of fuel flow to burner. Valves shall shut bubble tight and be suitable for operation with upstream pressure of two times the highest pressure at entrance to boiler-mounted regulators.
   c. Performance: Timed opening of six seconds or less to safely and smoothly ignite main flame, and close within one second.
   d. Construction: Valves 2-1/2 inches and larger, flanged ends; valves 2 inches and below threaded ends; position indicator showing open and shut, visible from front or side of boiler. Aluminum seating surfaces not permitted. Closed position interlock switch on each valve. Valved leak test fittings before and after each valve.
   e. Approval: FM approved, UL listed for burner service.

4. Automatic Vent Valve:
   a. Type: Motorized or solenoid closing, spring opening, full port, controlled by burner control system.
   b. Service: Provide open-shut control of vent line that is connected between the two safety shut-off valves. Valves shall shut bubble-tight and be suitable for operation with upstream pressure of two times the highest pressure at entrance to boiler-mounted regulators. Valve shall be open whenever safety shut-off valves are closed.
   c. Approval: UL listed for burner service.

5. Pressure Switches: Switch settings must be within 20% of the controlled pressure.

6. Fuel Flow Control Valve:
   a. Type: Throttling, driven by servomotor controlled by combustion control system.
   b. Performance and Service: Control fuel flow in exact proportion to combustion airflow over the entire firing range of the burner. Static pressure rating shall exceed the lockup pressure of the boiler-mounted regulator.
   c. Jackshaft systems are not permitted. Must be independently controlled by a servo motor.

F. Fuel Oil Train:
   1. Arrangement: Comply with typical arrangement in CSD-1.
   2. Y-strainer with 100 mesh screen. Provide plugged drain.
   3. Pressure Regulator: Do not provide unless required by the burner furnished. Pressure control is provided by a back pressure control valve on the house fuel oil pump set.
   4. Automatic Safety Shut-Off Valves:
a. Type: Motorized-opening, spring closing, controlled by burner control system. Two valves required.
b. Service: Provide open-shut control of fuel flow to burner. Valves shall shut bubble-tight and be suitable for operation with upstream pressure exceeding upstream safety relief valve set pressure plus accumulation.
c. Performance: Timed opening of six seconds or less to safely and smoothly ignite oil burner, one-second closure.
d. Construction: Threaded ends, valve position indicator visible from front or side of boiler. Closed position interlock switch on each valve.
e. Approval: FM approved, UL listed for burner service.

5. Pressure Switches: switch settings must be within 20% of the controlled pressure.

6. Fuel Flow Control Valve:
   a. Type: Throttling, controlled by combustion control system. Driven by servomotor with 0.1 degree deadband for precise reliability
   b. Performance and Service: Control fuel flow in exact proportion to combustion airflow over the entire firing range of the burner. Static pressure rating shall exceed the lockup pressure of the boiler-mounted regulator.
   c. Valve must be the Preferred Voluvalve-DGB1241, characterized to provide linear flow control.

7. Boiler/Burner-Mounted Oil Pump and Relief Valve: Provide if necessary for burner operation.

G. Igniter (Pilot) Fuel Train, Burner and Ignition System:

1. Arrangement: Comply with typical arrangement in CSD-1.
2. Y-strainer with 100 mesh basket.
3. Pressure Regulators:
   a. Type: Single-seated, diaphragm-operated.
   b. Service: Provide controlled pressure in igniter train as required by igniter, with upstream pressures as shown or specified. Inlet and outlet emergency pressure rating shall be at least twice the lockup pressure of the nearest upstream pressure regulator. As an alternate to the outlet emergency pressure rating, provide internal relief valve vented to outside set at pressure that will avoid overpressure on regulator outlet that could damage the regulator.
   c. Performance: Lockup pressure shall not exceed 1.5 times the regulated pressure.
   d. Construction: Propane regulator must be designed for LP gas when applicable.
4. Automatic Safety Shut-Off and Vent Valves:
   a. Type: Solenoid-type, normally closed shut-off valves controlled by the burner control system.
   b. Approval: Safety shut-off valves UL listed, FM approved for burner service. Vent valves UL listed for burner service.
5. Igniter and Ignition System: Provide removable igniter, ignition electrodes, ignition transformer, high voltage cable. Provide shield at ignition area so that spark is not visible to flame scanner from any position on its mounting.