Section 23 55 33.16 – *Sample Specification for Sterling HU Gas Fired Unit Heaters*

**PART 1 – GENERAL**

* 1. RELATED DOCUMENTS
1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
	1. SUMMARY
2. This section includes gas-fired unit heaters
	1. INFORMATIONAL SUBMITTALS
3. Product Data: For each type of gas-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.
4. Shop Drawings: For gas-fired unit heaters.
	1. Detail equipment assemblies and indicate dimensions, weights, required clearances, components, and location and size of each field connection.
	2. Wiring Diagrams: Power and control wiring.
	3. MAINTENANCE MATERIAL SUBMITTALS
5. Operation and Maintenance Data: For gas-fired unit heaters to include, installation, operation, and maintenance manuals.
	1. QUALITY ASSURANCE
6. Equipment, Electrical Components, Devices, and Accessories: Listed and labeled as defined by Intertek’s ETL certification.
7. Comply with the following codes and standards where applicable:
8. ANSI Z83.8 -2009/CSA 2.6-2009 – American National Standard/CSA Standard for Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters and Gas-Fired Duct Furnaces.
9. ASHRAE/IESNA 90.1-2010 – Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 – “Heating, Ventilating, and Air-Conditioning”.
10. NFPA 70, National Electric Code for electrical components and installation.
11. NFPA 54, National Fuel Code for gas components and installation.
	1. WARRANTY
12. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components listed below of gas-fired unit heater that fails in materials or workmanship within the specified warranty period.
13. Warranty Period for Unit: Manufacturer’s standard, but not less than 1 years from the date of shipment. Warranty shall be non-prorated.
14. Warranty Period for Heat Exchangers: Manufacturer’s standard, but not less than 10 years from the date of shipment. Warranty shall be non-prorated.

**PART -2 – PRODUCTS**

1. MANUFACTURES
2. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
	1. Sterling HVAC Products
	2. (The) Trane Company
	3. Beacon Morris Heating Products
3. Manufacture must have a minimum of 5 year experience manufacturing Gas Fired Unit Heaters.
4. GENERAL
5. Furnish and install, where indicated or scheduled on plans, gas-fired unit heaters. Unit shall be factory assembled, piped and wired, and complying with ANSI Z83.8-2016/CSA 2.6.-2016. Unit shall be of power vented design. Gravity vented units shall not be acceptable.
6. CAPACITIES AND PERFORMANCE
7. All heaters are to have a minimum thermal efficiency of 94%. Unit performance shall be the sizes, capacities and configurations as scheduled on drawings.
8. UNIT CONSTRUCTION
9. Most cabinetry and trim pieces shall be fabricated of minimum 20-gauge 430 brushed stainless steel.
10. Unit shall be insulated with foil faced insulation. Insulation shall have a fire hazard classification of 25/50 Flame Spread/Smoke Developed Rating per ASTM E 84, UL 723 and CAN/UCL S102-M88.
11. All line voltage wiring shall be completely enclosed in flexible conduit.
12. HEAT EXCHANGER AND BURNER
13. Combustion tubes shall be constructed of 0.043” thickness 409 stainless steel. Heat exchanger tubes shall consist of 0.020” thickness 304 Stainless steel. Heat exchangers fins shall be constructed of 0.010” thick aluminum or brass. Fins shall have a fully drawn collar to ensure accurate spacing. Clamshell heat exchangers shall not be acceptable.
14. Burner shall be metal fiber mesh type constructed of stainless steel.
15. Flue collector shall be constructed of 321 stainless steel. Flue collector shall be constructed with condensate drain at the bottom of flue collector to prevent condensate pooling.
16. UNIT FAN
17. Unit fan shall be of the propeller type. Propeller blades shall be constructed of aluminum and hubbed to the fan shaft. Fan blade shall be locked into location via set screw.
18. Motor sizes shall be minimum sizes as indicated on schedule. If not indicated, motor size shall be large enough so driven load will not require motor to operate in service factor range above 1.0.
19. Units will be equipped with 115/1/60 volt open drip proof motors which include internal automatic reset thermal overload protection.
20. For voltages other than 115/1/60, a unit must be supplied with the corresponding field installed transformer to step the voltage down to 115/1/60.
21. All fans shall be provided with factory installed fan-blade guard, complying with OSHA specifications. Guard must be removable for maintenance.
22. Units shall be equipped with dual motors and fan blades for optimum air distribution for sizes except 100,000 BTU. Units with an input of 100,000 BTU’s shall be equipped with a single motor and fan blade for optimum air distribution.
23. CONTROLS
24. Unit will be provided with an electronic modulating gas control. Gas control shall be capable modulating the gas input from 100 to 33% of the rated input.
25. The following gas control shall be provided with the unit (Select one).
	1. Outdoor Air Reset Modulation – Unit will be enable for heating when a call for heating is received from the thermostat. The unit will modulate based on the outside air temperature. At the OA design temperature and below, the unit will run at 100% fire. When the temperature is above 65⁰F, the unit will run at low fire. When the outside air temperature is between the setpoint and 65⁰F, the unit will modulate to linear relationship between these two points. A W2 call will cause the unit to run at 100% input.
		1. (Optional) Outdoor Air Reset – (Global Enable) – The master unit will broadcast the outside air temperature and thermostat to all networked member units. Each member unit will then modulate based on its individual outside air design temperature.
		2. (Optional) Outdoor Air Reset (Individual Enable) - The master unit will broadcast the outside air temperature to all networked member units, however each unit will be enable by an individual thermostat. Each member unit will then modulate based on its individual outside air design temperature.
	2. Indoor Air Reset Modulation- Unit will be enable for heating when a call for heating is received from the thermostat. The unit will modulate based on recent demand duration and firing rate, averaging over time, optimizing the unit run time at the minimum firing input rate needed to meet the heating load.
		1. (Optional) Indoor Air Reset Modulation, Networked - The master unit will broadcast the thermostat and its calculated input to all networked member units.
	3. 2-10V/4-20mA Input Modulation – Unit will modulate based on 2-10 VDC or 4-20 mA input from the building automation system. A value of 10V/20mA will cause the unit to run at 100% fire and a value of 2V/4mA will cause the unit to run at minimum fire.
		1. (Optional) 2-10V/4-20mA Input Modulation, Networked - The master unit will broadcast the thermostat and its calculated input to all networked member units.
	4. Room Sensing Modulation – Unit will be enabled with the space temperature falls below the room temperature setpoint. The will modulate based on the temperature difference between the room temperature setpoint and measured space temperature.
		1. (Optional) Room Sensing Modulation, Networked - The master unit will broadcast the call for heat and its calculated input to all networked member units.
	5. 2-Stage Thermostat – Unit will be enable for heating via a 2-stage thermostat. When an input on W1 is received, the unit will run at minimum fire. If an input is received on W2, the unit will fire at 100%.
		1. (Optional) Thermostat Operation, Networked - The master unit will broadcast the thermostat to all networked member units.
	6. Modbus Control – Operation of the unit will be controlled by remote Modbus commands over a RS484 cable.
		1. (Optional) Modbus Control, Networked - The master unit will broadcast all calls and input requests to all networked member units.
26. Combustion Blower - A variable speed integral combustion blower for combustion air will be provided. Outside air for combustion will have individual air inlet located in the upper section of the burner compartment. Combustion blower will match the air volume to gas input to ensure a 1:1 ratio across the entire 3:1 turndown range. A blocked inlet air pressure switch will be installed and its normally closed contacts wired in series with the main gas valve.
27. Power Venting - A variable speed integral power vent fan for venting will be provided. Power venter will match the air volume to combustion blower to ensure proper airflow through the heat exchanger. A blocked vent air pressure switch will be installed and its normally open contacts wired in series with the main gas valve.
28. A direct spark ignition system with integrated control shall be provided. Flame rectification shall be independent of the spark igniter allowing true indication of complete ignition of the burner. Standing pilot shall not be acceptable. For size 200 and above units, the unit shall be equipped with (2) direct spark ignitors and flame sensors.
29. Integrated electronic control board shall be used to regulate the system sequence of operation, including an external LED indicators for ease of troubleshooting.
30. Control transforms - Heaters shall be equipped with a 120/24 volt transformer. The control transformer and pressure switches shall be factory mounted in a power venter compartment.
31. The following safeties shall be provided:
	1. High Limit Switch -Units shall be equipped with a low voltage automatic reset high temperature control, wired to de-energize the main gas valve and maintain fan operation until the high temperature control resets.
	2. Blocked Vent Air Pressure Switch – Units shall be equipped with an air pressure switch to confirm power venter operation and proper flue gas flow prior to beginning ignition sequence and during operation.
	3. Blocked Inlet Air Pressure Switch – Units shall be equipped with an air pressure switch to confirm combustion blower operation and proper combustion air flow prior to beginning ignition sequence and during operation.
	4. Manual Rollout Safety Switch – Unit shall be equipped with a manual rollout safety switch. If flame rollout is detected, unit shall de-energize the gas valve.
	5. Flame Sensor – shall monitor ignition and normal operation. If flame is not detected after 3 ignition periods, the control will de-energizes the gas valve and lockout the unit requiring manual reset.
	6. Condensate Float Switch – shall monitor the condensate level in the flue collector. If the condensate rises about the setpoint, the unit shall de-energize the gas valve and force unit to post-purge mode.
	7. Flue Temp Switch - shall monitor the flue gas temperature. If the flue gas temperature rises about 140°F, the unit shall de-energize the gas valve and force unit to post-purge mode.
	8. Auto-Reset Fuse – Control board shall be equipped with integral automatically reset fuses. If the current exceeds 1.8 amps, the fuse will open interrupting the flow of electric current to the control board. This will immediately turn the unit off. Once the current or voltage is reduced to acceptable levels, the temperature will decrease and the fuses shall automatically reset.
32. Thermostat terminal strip shall be integral to the control board located on the interior of the electrical control panel for ease of installation and wiring.
33. Line voltage wiring will terminate inside power venter section.
34. (Optional) Thermostat – Unit shall be provided with a ship loose thermostat for field install. Thermostats shall be mercury free.
	1. Single stage heating only thermostat shall be provided. Subbase shall include fan switching relay. Temperature range: 50-100°F. range. (Optional) Thermostat shall be standard round style. (Optional) Thermostat shall include tamper proof guard
	2. Two Stage Thermostat with subbase shall be provided. Thermostat shall include two stage heating and two stage cooling with system and fan switching and built in 10°F heating/cooling differential. Thermostat shall include fan switching relay. Temperature range: Heating 40-90°F., Cooling 50-99 °F.
35. Factory wiring shall permit the use of propeller fan for continuous air circulation when combined with thermostat with built in fan switch.
36. DISCHARGE LOUVERS:
	1. Louvers shall be individually adjustable and removable with horizontal blades for directing air flow.
37. ACCESSORIES
	1. (Optional) Unit shall be provided with high pressure regulator to reduce supply gas pressure. High pressure regulator will ship loose for field install.
	2. (Optional) Condensate Pump – Condensate pump shall be of vertical centrifugal pump design. Pump shall include a ½ gallon collection tank. The pump shall be controlled by a float/switch mechanism which turns the pump on when approximately 2-1/4" of water collects in the tank, and automatically switches off when the tank drains to approximately 1-1/4".Pump shall be certified for us with condensate up to 140°F. (Optional) Unit shall include a field installed Condensate Pump Shelf that shall mount directly to the bottom of the unit. Shelf shall be designed to support the weight of the Condensate Pump.
	3. (Optional) Condensate Neutralizer – Condensate Neutralizer will ship loose for field install. Condensate neutralizer shall be sized for corresponding MBH input of condensing unit heater. (Optional) Condensate Neutralizer shall be designed for inline mounting. (Optional) Condensate Neutralizer shall be designed for wall mounting.
	4. (Optional) Stratification Sensor – Unit shall be provided with a ship loose air stratification sensor. Sensor shall be field installed in control box knockout. If there is a call for heat and the air temperature near the unit is equal to or greater than 100°F the unit will enter stratification mode. The supply fan will continue to run to blow the hot air at the unit down into the space but the mechanical (gas) heat will turn off if currently enabled. The mechanical (gas) heat will then go through a post-purge. The supply fan will turn off if the call for heat ends. If the air temperature near the unit falls below 90°F and a call for heat is still present, the unit will go through a pre-purge then the mechanical (gas) heat will turn back on. During stratification mode, the orange LED will be a solid orange color indicating a call for heat and the unit is in stratification mode.
	5. (Optional) PVC Concentric Vent Kit shall be provided ship loose for field install. Kit shall include a concentric vent box to allow for combustion air and exhaust gas piping to exit the building via a single wall penetration. Kit shall also include:
		1. (1) Combustion Air Inlet Cap
		2. (1) Air Inlet Pipe
		3. (1) Vent Pipe
		4. (1) Intake/Vent Concentric “Y”
		5. (1) Installation Instructions on box

**PART 3 – EXECUTION**

1. EXAMINATION
2. Examine area to receive unit heater for compliance with requirements for installation clearances and other conditions affecting unit heater performance. Do not proceed with installation until unsatisfactory conditions have been corrected.
3. INSTALLATION
4. Install unit heater level and plumb, according to manufacturer’s written instructions and referenced standards.

1. Install gas fired unit heater according to NFPA 54, and applicable federal and local code.
2. Support suspended unit heater per manufactures instructions.
3. Install electrical devices furnished with unit heater, but not specified to be factory mounted.
4. CONNECTIONS
5. All gas piping should be sized in accordance with the latest edition of ANSI Standard Z223.1, National Fuel Gas Code; in Canada, according to CSA B149.

1. If supply gas pressure exceeds 14 inches W.C. a high pressure regulating valve must be installed in the line upstream from the main shut off valve.
2. Connect gas piping to unit heater gas train inlet with ground joint union (field provided). A manual shut off valve (field provided) should be field install immediately upstream of the gas supply connection to the unit heater.
3. Piping must be adequately supported to prevent strain on the gas manifold and controls.
4. To prevent the mixing of moisture with the gas, run the take-off piping from the top or side of the main gas line.
5. Provide a drip leg in the gas piping near the unit heater.
6. Make certain that all connections have been adequately doped and tightened.
7. Electrical: Comply with applicable requirements in Division 26 Sections.
8. All external wiring must conform to the latest edition of ANSI/NFPA No. 70, United States National Electrical Code, and applicable local codes; in Canada, to the Canadian Electrical Code, Part 1, CSA Standard C22.1
9. A disconnect switch (field provided) of suitable electrical rating should be located as close to the gas valve and controls as possible.
10. Each unit heater must be electrically grounded in accordance with the latest edition of ANSI/NFPA No. 70, United States National Electrical Code, and applicable local codes; in Canada, to the Canadian Electrical Code, Part 1, CSA Standard C22.1.
11. Thermostat must be mounted on a vertical, vibration free surface, free from air currents and in accordance with the furnished instruction.
12. Thermostat shall be mounted at a height of approximately 5 feet above the floor, in an area where it will be exposed to a free circulation of average temperature air.
13. Venting: All venting installations shall be in accordance with the latest edition of ANSI Z223.1, Part 7, Venting of Equipment of the National Fuel Gas Code or applicable provisions of local building codes.
14. Pipe exhaust venting per manufactures instructions.
15. Venting must be sloped ¼ inch per foot towards the unit to ensure proper condensate drainage.
16. CLEANING
17. Gas line should be purged prior to startup of unit heater.
18. Unit should be cleaned of all construction debris and any dust that may have accumulated on interior of unit, burner or any part of the heat exchanger.
19. All vent piping must be free of any blockage that may affect airflow.
20. FIELD QUALITY CONTROL
21. Manufacturer’s Field Service: Engage a factory authorized service representative to inspect the field assembled components and installation of unit heater, including piping and electrical connections. Report results in writing.
	* 1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
22. Manufacturer’s representative shall supply a factory authorized service technician to start up the unit heater.
23. COMMISSIONING
24. Engage a factory authorized service representative to provide startup service. Start up to be performed only after space is field verified to offer a substantial load.
25. Verify that installation is as indicated and specified.
26. Verify that electrical wiring installation complies with manufacturer’s submittal and installation instructions as well as any requirements in Division 26 Sections. Do not proceed with unit heater startup until wiring installation is acceptable to equipment Installer.
27. Complete manufacturer’s installation and startup checklist and verify the following:
28. Unit heater is installed level and incompliance with manufacture’s instruction.
29. Vent piping is sized correctly and installed without visible damage.
30. No damage is visible to unit heater cabinet, heat exchanger, or fan assembly. Fan should rotate freely.
31. Gas piping and electric wiring have been installed properly and inspected by the local authority having jurisdiction.
32. Supply gas pressure is within manufactures requirements.
33. Clearances have been provided and piping is correct per all applicable codes.
34. A field installed controls have been installed and operational.
35. Labels are clearly visible.
36. Unit heater, burner, and flue are clean and free of construction debris.
37. Perform the following tests for high fire rating for burners. Adjust unit heater combustion efficiency at given firing rate. Measure and record the following:
38. Supply voltage.
39. Motor amps.
40. Inlet gas pressure. If multiple units are connected to the same inlet gas line, measure inlet gas pressure when all valves on the line are full open.
41. Combustion analysis: Carbon Monoxide (PPM). Caron Dioxide (%) and O2 (%) at both high and low fire.
42. Measure and record temperature rise through each unit heater.
43. MAINTENANCE
44. For units used during the construction phase of the project, installing contractor shall be responsible for all maintenance associated with running the unit. Maintenance shall be performed per the manufacturer’s instructions at the manufacturer’s required intervals.
45. DEMONSTRATION
46. Engage a factory authorized service representative to train Owner’s maintenance personnel as

 specified below:

1. Operate unit heater, including accessories and controls, to demonstrate compliance with requirements.
2. Train Owner’s maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
3. Review data in the maintenance manuals. Refer to Division 1 Section “Contract Closeout.”
4. Review data in the maintenance manuals. Refer to Division 1 Section “Operation and Maintenance Data.”
5. Schedule training with Owner with at least 7 days advance notice.

END OF SECTION