

Section 23 55 33.16 – *Sample Specification for Beacon Morris BXC Gas Fired Unit Heaters*

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This section includes gas-fired unit heaters

1.3 INFORMATIONAL SUBMITTALS

- A. Product Data: For each type of gas-fired unit heater indicated. Include rated capacities, operating characteristics, and accessories.
- B. 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.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Operation and Maintenance Data: For gas-fired unit heaters to include, installation, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Equipment, Electrical Components, Devices, and Accessories: Listed and labeled as defined by Intertek’s ETL certification.
- B. Comply with the following codes and standards where applicable:
 - 1. 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.
 - 2. ASHRAE/IESNA 90.1-2010 – Applicable requirements in ASHRAE/IESNA 90.1-2010, Section 6 – “Heating, Ventilating, and Air-Conditioning”.
 - 3. NFPA 70, National Electric Code for electrical components and installation.
 - 4. NFPA 54, National Fuel Code for gas components and installation.

1.6 WARRANTY

- A. 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.
 - 1. 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

2.1 MANUFACTURES

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 - 1. Beacon Morris Heating Products
 - 2. Sterling HVAC Products
 - 3. (The) Trane Company
- B. Manufacture must have a minimum of 5 year experience manufacturing the products specified in this section.

2.2 GENERAL

- A. 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 Z83.8-2009/CSA 2.6.-2009. Unit shall be of power vented design. Gravity vented units shall not be acceptable.

2.3 CAPACITIES AND PERFORMANCE

- A. All heaters are to have a minimum thermal efficiency of 83%. Unit performance shall be the sizes, capacities and configurations as scheduled on drawings.

2.4 UNIT CONSTRUCTION

- A. Most cabinetry and trim pieces shall be fabricated of 20-gauge material and painted with a baked gray enamel finish.
- B. 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.
- C. All line voltage wiring shall be completely enclosed in flexible conduit.
- D. Unit heater shall have a minimum of (4) built in hanger brackets for suspension of unit.
- E. Combustion chamber must be completely sealed to prevent infiltration of air from the space into the combustion burner.

2.5 HEAT EXCHANGER AND BURNER

- A. The heat exchanger shall consists of aluminized steel tubes not lighter than 20-gauge. Tubes shall be of a curved, non-welded serpentine design. (Optional) 409 Stainless steel tubes shall be provided in lieu of standard aluminized steel tubes. Clamshell heat exchangers and welded heat exchangers shall not be acceptable.
- B. Burner shall be constructed of aluminized steel. (Optional) Burners shall be constructed of 304L Stainless Steel. Burners shall be of the "in-shot" design.
- C. Flue Collector shall be constructed of aluminized steel. (Optional) Flue Collector shall be constructed of 409 Stainless Steel.

2.6 UNIT FAN

- A. Unit fan shall be of the centrifugal blower type. Blower shall double width, double inlet with forward curved blades.
- B. 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.
- C. Units will be equipped with 115/1/60 volt open drip proof motors which include internal automatic reset thermal overload protection. Motors Windings shall be rated Class B. (Option) Units will be equipped with 115/1/60 volt totally enclosed motors which include internal automatic reset thermal overload protection. (Option) Motor shall be rated premium efficiency as defined by NEMA Standards Publication MG-1-2006 and rated for inverter duty. Motor efficiency shall be tested in accordance with the current federally mandated Energy Policy Act (EPACT).
- D. Bearing shall be ball bearing type with concentric locking collar and shall be permanently lubricated. Bearing shall have a cylindrical cartridge interliner made of conductive rubber to minimize noise and vibration, as well as dissipate static electricity.
- E. 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.
- F. All blower(s) shall be belt driven and provided with manufactures standard belt guard.
- G. All blower(s) shall be statically and dynamically balanced by manufacture prior to shipment.
- H. Units with inputs greater than 250,000 BTU's shall be equipped with dual blowers for optimum air distribution.
- I. (Optional) Factory installed Magnetic Starter shall be provided.

2.7 CONTROLS

- A. The following gas control shall be provided with the unit.
 - 1. (Standard) Provided 24 volt, single stage, redundant gas control valve. Valve shall be fast opening type.
 - 2. (Option) Provide 24 volt, two-stage, redundant gas control valve. Valve shall be fast opening type.
 - 3. (Option) Unit shall be provided with electronic modulating gas valve. Gas valve shall be capable of modulating from 100% to 40% of full fire rate. An automatic valve in series with the modulating valve will be provided to cycle the unit. Automatic valve shall be of the fail closed type to prevent the flow of gas in the event of a power failure.
 - a. (Optional) Modulating gas valve shall be controlled via 4-20mA or 0-10VDC signal from the Building Automation System.
 - b. (Optional) Valve modulation shall be controlled via a room sensor to maintain room temperature. Unit shall be capable of maintaining a constant discharge temperature within $\pm 1^{\circ}\text{F}$.
 - c. (Optional) Valve modulation shall be controlled via a duct sensor to maintain a constant discharge temperature within $\pm 1^{\circ}\text{F}$.
 - d. (Optional) Valve modulation shall be controlled via a duct sensor to maintain a constant discharge temperature within $\pm 1^{\circ}\text{F}$. A room override stat will provided to override modulation and allow 100% fire when the room temperature drops below room set point.

- B. 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.
- C. Integrated electronic control board shall be used to regulate the system sequence of operation, including an onboard LED indicator for ease of troubleshooting.
- D. Control transforms - Heaters shall be equipped with a 120/24 volt transformer. The control transformer and pressure switch shall be factory mounted in a main control panel located on the side of the unit; this panel creates easy access and all wiring information will be indicated on the inside control panel door.
- E. 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. Air Pressure Switch – Units shall be equipped with an air pressure switch to confirm power venter operation prior to beginning ignition sequence and during normal operation.
 - 3. 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.
- F. Control Terminal strip shall be mounted on the exterior of the electrical control panel for ease of installation and wiring.
- G. (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. (Optional) Thermostat shall include tamper proof guard. (Optional) Thermostat supply voltage shall be 120 VAC.
 - 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.
 - 3. (Optional) One Stage Duct Thermostat shall be provided. Thermostat shall be single pole double throw switching. Temperature range: 55-175°F.
 - 4. (Optional) Two Stage Duct Thermostat shall be provided. Thermostat shall be single pole double throw switching. Temperature range: 55-175°F.
- H. Factory wiring shall permit the use of blower for continuous air circulation when combined with thermostat with built in fan switch. (Option) Factory wiring shall permit the use of blower for continuous air circulation when combined with 24 volt summer/winter switch.
- I. (Optional) Terminal Block shall be factory installed for ease of field wiring.

2.8 DISCHARGE LOUVERS:

- A. Louvers shall be individually adjustable and removable with horizontal blades for directing air flow. (Optional) Vertical louvers shall also be provided to allow for the 4 way air deflection.

2.9 ACCESSORIES

- A. (Optional) Unit shall be provided with high pressure regulator to reduce supply gas pressure. High pressure regulator will ship loose for field install.
- B. (Optional) Vent cap shall be provided with unit, shipped loose for field install.
- C. (Optional) Downturn nozzle shall be provided to direct the air.
 - 1. (Optional) Downturn nozzle shall be at 30 degree angle. Air can be adjusted up to 60 degrees by adjusting the horizontal louvers.
 - 2. (Optional) Downturn nozzle shall be at 60 degree angle. Air can be adjusted up to 90 degrees by adjusting the horizontal louvers.
 - 3. (Optional) Downturn nozzle shall be at 90 degree angle. Air can be adjusted up to 120 degrees by adjusting the horizontal louvers.
- D. (Option) Discharge Duct Flange Assembly shall be provided with the unit to allow for duct work connection.
- E. (Optional) Combustion Air Inlet 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. Flue Terminal Assembly
 - 2. Combustion Air Inlet for horizontal applications or Inlet Air Screen for vertical applications.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. 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.

3.2 INSTALLATION

- A. Install unit heater level and plumb, according to manufacturer's written instructions and referenced standards.
- B. Install gas fired unit heater according to NFPA 54, and applicable federal and local code.
- C. Support suspended unit heater per manufactures instructions.
- D. Install electrical devices furnished with unit heater, but not specified to be factory mounted.

3.3 CONNECTIONS

- A. 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.
- B. 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.

- C. 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.
 - 1. Piping must be adequately supported to prevent strain on the gas manifold and controls.
 - 2. To prevent the mixing of moisture with the gas, run the take-off piping from the top or side of the main gas line.
 - 3. Provide a drip leg in the gas piping near the unit heater.
 - 4. Make certain that all connections have been adequately doped and tightened.

- D. Electrical: Comply with applicable requirements in Division 26 Sections.
 - 1. 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
 - 2. A disconnect switch (field provided) of suitable electrical rating should be located as close to the gas valve and controls as possible.
 - 3. 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.

- E. Thermostat must be mounted on a vertical, vibration free surface, free from air currents and in accordance with the furnished instruction.
 - 1. 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.

- F. 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.
 - 1. Pipe exhaust venting per manufactures instructions.
 - 2. Venting must be sloped to prevent any condensate from draining into the unit heater.
 - 3. (Optional) Outside air shall be piped to the unit per the requirements of ANSI Z223.1, sections 1.3.4.2 and 1.3.4.3.
 - 4. Location of vent terminal must be in accordance with the National Fuel Gas Code ANSI Z223.1 in the US, Natural Gas Installation Code CAN/CanGa-149.2 in Canada. A single wall penetration shall be made to allow for combustion air to be vented in and exhaust gas to be vented out of the space.

3.4 CLEANING

- A. Gas line should be purged prior to startup of unit heater.

- B. 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.

- C. All vent piping must be free of any blockage that may affect airflow.

3.5 FIELD QUALITY CONTROL

- A. 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.

- B. Manufacturer's representative shall supply a factory authorized service technician to start up the unit heater.

3.6 COMMISSIONING

- A. 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.
- B. Verify that installation is as indicated and specified.
 - 1. 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.
- C. Complete manufacturer's installation and startup checklist and verify the following:
 - 1. Unit heater is installed level and in compliance with manufacturer's instruction.
 - 2. Vent piping is sized correctly and installed without visible damage.
 - 3. No damage is visible to unit heater cabinet, heat exchanger, or Blower assembly. Blower should rotate freely.
 - 4. Gas piping and electric wiring have been installed properly and inspected by the local authority having jurisdiction.
 - 5. Supply gas pressure is within manufacturer's requirements.
 - 6. Clearances have been provided and piping is correct per all applicable codes.
 - 7. A field installed controls have been installed and operational.
 - 8. Labels are clearly visible.
 - 9. Unit heater, burner, and flue are clean and free of construction debris.
 - 10. Confirm the belt is properly tightened prior to startup.
- D. Perform the following tests for high fire rating for burners. Adjust unit heater combustion efficiency at given firing rate. Measure and record the following:
 - 1. Supply voltage.
 - 2. Motor amps.
 - 3. 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.
 - 4. Gas pressure on manifold. Manifold pressure should be set to 3.5 inches W.C for natural gas and 10.0 inches of W.C. for propane gas.
 - 5. Cycle on high limit.
 - 6. Combustion analysis, Carbon Monoxide (PPM). Carbon Dioxide or O₂ (%)
- E. Measure and record temperature rise through each unit heater.

3.7 MAINTENANCE

- A. 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.

3.8 DEMONSTRATION

- A. 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