Direct Gas Fired [Make-Up Air / Displacement Ventilation / Space Heating] System

Note: Optional items and/or items requiring a choice, are shown between brackets and/or parentheses with selections separated by a forward slash, i.e.[a / b / c].

Part 1: GENERAL

1.1 Section Includes:

A. Direct Gas-Fired Heaters
B. Controls
C. Equipment Schedule

1.2 Related Sections:

A. Section 01655: Starting up mechanical systems
B. Section 15070: Pipe and pipe fittings
C. Section 15100: Valves
D. Section 15120: Piping specialties
E. Section 15400: Plumbing system
F. Section 15990: Testing, adjusting and balancing
G. Section 16050: Basic electrical materials and methods

1.3 References:

A. **American National Standards Institute (ANSI)**: Establishes requirements applicable to certifying direct gas-fired heaters.

B. **ETL Testing Laboratories**: Independent testing facility certifies standards conformance.

C. **American Conference of Governmental Hygienists (ACGIH)**: Establishes air quality standards.

D. **Environmental Protection Agency (EPA)**: Enforces outdoor air quality standards.

E. **Occupational Safety & Health Administration (OSHA)**: Enforces air quality standards and safety in the work place.

F. **National Electric Code (NEC)**: Establishes electrical standards.

G. **Underwriters Laboratory (UL)**: Independent testing facility certifies component

conformance to appropriate standards.

H. **National Fire Protection Agency (NFPA)**: Establishes fire prevention standards.

I. **Factory Mutual Insurance (FM)**: Certifies gas manifold to owners insurance carrier.

J. **Industrial Risk Insurance (IRI)**: Certifies gas manifold to owners insurance carrier.

K. **Sheet Metal & Air Conditioning Contractors National Association (SMACNA):** Covers standards for sheet metal fabrication and insulation.

1.4 Quality Assurance:

Manufacturer shall:

A. Provide direct gas-fired heater built in conformance to NFPA-54 and ETL listed and certified to the ANSI Z83.4b-2006/CSA 3.7b-2006 standard for 100% outside air models.

B. Provide direct gas-fired heating equipment that does not exceed contaminant threshold limits for safe environment, as established by the ACGIH or OSHA.

C. Furnish proof, satisfactory to the owner (or its representative), of having manufactured temperature modulating direct gas-fired space heating systems for a minimum of 10 years.

D. Make its facility available to owner or its representative for quality control audit without prior notification.

1.5 Submittals:

A. Manufacturer shall submit product data, including dimensions, duct & service connections, accessories, controls with schematics and sequence of operation, electrical nameplate data, wiring diagrams, fan curves and burner & filter data.

B. Manufacturer shall furnish rigging, assembly, and installation instructions.

C. Manufacturer shall furnish Operation & Maintenance Manuals, including descriptive literature, operation instructions, maintenance and repair data, and parts listings.

2.1 Acceptable Manufacturer's:

AbsolutAire, Inc. (Kalamazoo, MI) (800) 804-4000

2.2 Direct Gas-Fired Heaters:

Manufacturer shall:

A. Provide a direct gas-fired [Rooftop / Horizontal / Suspended] heater with 100% O.A. [constant volume / variable volume / 2-speed] capability.

B. Provide self-contained packaged heaters that shall include the casing, modulating burner, DWDI Forward Curve fan, fan motor and drives, and temperature controls.

   a. **Casing:** shall be a minimum 0.050 grade 5052 or 3003 aluminum [18 gauge aluminized / galvanized] sheet attached to a 1"x1" grade 6063 aluminum extruded tubular [cold rolled steel] structural framework. All exterior casing seams shall be 100% weather-tight. All interior and exterior surfaces will be cleaned of all oil and grease. [Option: painted exterior will consist of a high-quality catalyzed primer coat and a finish coat of machine enamel with rust inhibitors. Color selected by owner.]

   b. **Insulation:** all interior surfaces will be lined with 1 inch thick, 1-1/2 pound density foil-face fiberglass insulation. The insulation shall comply with UL standard 181 for erosion and NFPA 90A for fire resistance and will be held in place with adhesive.

   c. **Access door panels:** will be fully gasketed positive latching lift out type with rustproof handles and hardware. Foil face insulation will be adhered to the interior of the door panel(s).

C. **Filters:** provide disposable 1-1/2" dust-lok polyester media filters with wire reinforced internal frames (2" aluminum washable filters) accessible at the unit inlet hood (a side access v-bank filter section). [Provide a clogged filter warning (light / alarm / photohelic gauge) at the main (remote) control panel].

D. **Burner:** shall be a direct-fired type gas burner which shall be [Maxon Model NP1LE or NP2LE / Midco Model HMA2 / Eclipse Model Ah-MA] specifically designed to burn natural or propane gas below the maximum non-contaminating levels required by OSHA and the ACGIH. Burner shall have non-clogging, stainless steel baffles attached to a cast aluminum gas supply section with no moving parts. The burner shall be capable of a 30-to-1 turndown ratio and be designed for 100% thermal efficiency for the life of the equipment. The outdoor air velocity across the burner shall be constant and at an air velocity required for ANSI certification. The burner air velocity shall be constant at all times throughout the operation of the heater. No air from the indoor space shall be allowed to recirculate across the burner at any time. Service of and access to the burner igniter and flame rod shall be accomplished through an access door or panel.

E. **Burner Profile Adjustment System:** shall consist of a means to monitor and adjust the pressure differential across the burner profile while the fan is running. The burner profile will remain fixed while in service and use.

F. **Pilot:** the direct fired burner will consist of a direct spark ignition system, including an ignition module, spark igniter, and flame rod to verify burner low fire (pilot) ignition before allowing the main gas valve to fully open.

G. **Supply fan:** shall be a double-width, double-inlet, centrifugal design, belt driven for the required air capacity. The motor shall be 1750 rpm, standard NEMA frame, [Open Drip Proof (ODP) / Totally Enclosed Fan Cooled (TEFC) / EPACT compliant / Premium Efficient] mounted on an adjustable pivot base. The motor shall have a 1.15 service factor, suitable for continuous service at 120° F ambient temperature, and shall be wired for the specified voltage. The fan, motor, and drive shall be factory tested to ensure the specified air delivery (per ANSI standards) at the design total static pressure. The fan shaft shall be connected to the motor by a V-belt drive, capacity designed for 30% over the motor nameplate horsepower. The fan shaft shall be a turned, ground and polished solid shaft. A protective coating shall be applied to the shaft to minimize oxidation. Fan shall have ball bearings, and shall be designed for a minimum L10 life of 100,000.

H. **Vibration Isolators:** shall consist of a molded neoprene rubber isolation element. The isolators will be installed by the manufacturer for fan and motor isolation from the unit housing. The isolator design shall be deflection specific for the fan and motor load. Includes a flexible gasket connection between the fan housing discharge and the unit supply air opening.

I. **Controls:**

a. **Main control panel** shall be NEMA 3R and contain all standard electrical components, [non] fused disconnect switch, motor starter, 120-volt and/or 24-volt control transformers, control circuit fuses, color coded wires, and an ignition module to lockout the flame in abnormal conditions. The complete control and safety system as well as the burner and gas manifold shall be factory tested prior to shipment.

b. **Temperature Controls:** shall be a solid-state system located in the main control panel. It shall have a sensor located in the supply air stream which controls the supply air temperature (maximum and minimum) in response to heating requirements.

c. **Remote Control Panel:** shall be provided and includes a summer-off-winter (vent-off-heat) switch, a fan on indicator light, a burner on indicator light, a burner alarm light, and a means to reset the burner in the event of flame failure.

The unit serial number and customer tag number will be on the panel face. The following optional items are included which are specific to this application and specification:

i. Discharge temperature control dial
ii. Space temperature dial
iii. Unoccupied space temperature dial
iv. Mechanical [elec. programmable with battery back up] 7-day time clock
v. Low temperature alarm light (optional)
vi. Dirty filter light (optional)

d. **High Temperature Limit Switch:** turns the burner off when the discharge air temperature exceeds 130° F. This switch must then be manually reset at the heater.

e. **Gas manifold:** shall be sized for the rated BTU (MBH) capacity as scheduled on the drawings. The gas manifold will be constructed in conformance to ANSI Standards [and Factory Mutual (FM) / Industrial Risk Insurers (IRI) insurance requirements].

f. **Control & Power Wire Harness:** shall be provided to include a 12' long (minimum) pigtail in flexible metal conduit. The harnesses is pre-wired and attached at the unit by the manufacturer and clearly tagged and marked for field tie-in. Primary motor voltage wires and color coded control voltage wires shall be in separate conduits.

2.3 Accessories (select each optional accessory needed):

Manufacturer shall (provide the following accessories):

A. Low-Temperature Limit Switch: turns the fan motor off when cold air is being discharged from the heater. The minimum discharge temperature may be selected from 0°F to 70°F. An integral timer shall by-pass this switch for five (5) minutes on initial start-up.

B. High and Low Gas Pressure Switches: this option includes a high gas-pressure switch located on the burner end of the gas manifold and shall turn the burner off when the gas pressure is too high. The maximum gas-pressure range will be from 3" to 21" W.C. This is factory set at 1.5" W.C. above the high fire gas pressure. Also included with this option is a low gas-pressure switch located on the inlet end of the manifold. The low gas switch shall turn the burner off when the gas pressure is too low. The minimum gas pressure range will be from 3" to 21" W.C. This switch shall be factory set at 3.0" W.C.

C. Filter Inlet Hood: (reference paragraph 2.2b). This option includes a clam-shell style filter rack accessible from the inlet hood face. Filters are a disposable 1-1/2" polyester media filter with and internal galvanized frame [2" aluminum mesh washable filter]. The hood is knock down in (4) pieces for field assembly. [Provide a clogged filter warning (light / alarm / photohelic gauge) at the main (remote) control panel].

D. Inlet Hood with Bird Screen: manufactured using the same gauge and metal type as the base unit and ships knock-down for field assembly. Includes ½" x ½" galv. bird screen.

E. Side Access Filter Section: manufactured using the same gauge and metal type as the base unit and is field attached at the unit inlet (entering air) end. All interior surfaces will be lined with 1 inch thick, 1-1/2 pound density foil-face fiberglass insulation. The insulation shall comply with UL standard 181 for erosion and NFPA 90A for fire resistance and will be held in place with adhesive. Filters are a disposable 1-1/2" polyester media filter with and internal galvanized frame. [2" aluminum mesh washable filter]. [Provide a clogged filter warning (light / alarm / photohelic gauge) at the main (remote) control panel]. Filters are UL Class 2.

F. Variable Frequency Drive: variable volume 100% OA models includes an automatic building pressure control, a variable frequency drive (VFD) for supply fan speed control and a burner profile damper with a pressure differential switch to control and maintain the proper burner airflow across the burner profile. Includes a building pressure differential switch to signal the VFD to vary fan speed as needed in response to the building negative or positive conditions. This diaphragm [photohelic] switch is mounted in the heater main control panel. The pressure sensing range shall be 0.01 to 0.20" W.C. with a null span of 0.01 to 0.03 inches water column.

G. Roof Curb: provide a [full-perimeter curb / duct supply-air curb], 20" high [flat, pitched] curb, formed of heavy-gauge galvanized or aluminized steel. Installer shall shim the curb so that it is level. [Manufacturer to provide {1" foil face fiberglass} {1" therma-fiber} insulation on curb interior, glued and pinned as required.] [Manufacturer to provide 1" wood-nailer and cant strip.]

H. Motorized [Inlet / Discharge] Damper: a parallel blade [low leak] [spring return] damper is provided in a flange assembly shipped loose for field installation by others. Includes a 24-volt direct coupled actuator with a pre-wired cable.

I. Gravity [Inlet / Discharge] Damper: a parallel blade damper is provided in a flange assembly which is shipped loose for field installation by others. Damper blades are constructed of fabricated aluminum and have adjustable weights for balancing.

J. Vibration Isolators: shall consist of a steel housing and an isolation element, molded entirely of a colored oil-resistant neoprene stock for easy identification of capacity. The

hangers shall have a deflection of 1/4" or less and will be supplied by the heater manufacturer.

K. Discharge Diffuser: shall be provided and will include horizontal [and vertical] blades. The diffuser will be constructed such that it discharges supply air in 3 [4] directions and will be constructed of a minimum of 16-gauge aluminized steel. The directional blades will be 14 gauge aluminized steel and will be field adjustable and are able to be locked into place. [4-way discharge heads shall be provided with insulation (1"-1-1/2#) installed on the interior floor area for noise reduction].