

## **SECTION 23 74 33**

### **FACTORY FABRICATED PACKAGED HEATING AND COOLING MAKE-UP AIR UNITS SPECIFICATIONS**

**TAG: Industrial Heater**

#### **PART 1 - GENERAL**

##### **1.1 SUMMARY**

- A. This section includes heating units capable of supplying up to 80/20 recirculated outdoor air.
- B. This section includes heating units capable of supplying up to 100 percent outdoor air.
- C. Unit(s) may have a Variable Air Volume Control System capable of adjusting the CFM of the make-up air unit down to 50% of the design CFM.

##### **1.2 SUBMITTALS**

- A. The manufacturer assumes no liability for the use or results of use of this document. This specification is to be reviewed by the engineer to confirm requirements of the project and building codes are met.
- B. As the manufacturer continues product development, it reserves the right to change design and specifications without notice.

##### **1.3 QUALITY ASSURANCE**

- A. ETL-Listed to the American National Standard/CSA Standard for Gas Unit Heaters And Gas-Fired Duct Furnaces ANSI Z83.4, CSA 3.7., and Z83.18.
- B. The Safety Control Board is ETL-Listed to standards UL 60730-2-9, UL 60730-1; CSA E60730-1, and CSA E60730-2-9.

##### **1.4 WARRANTY**

- A. All units are provided with the following 2-year standard warranty.
- B. This warranty shall not apply if:
  - 1. The equipment is not installed by a qualified installer per the manufacturer's installation instructions shipped with the product.
  - 2. The equipment is not installed in accordance with Federal, State, and Local codes and regulations.
  - 3. The equipment is misused, neglected, or not maintained per the manufacturer's maintenance instructions.
  - 4. The equipment is not operated within its published capacity.
  - 5. The invoice is not paid within the terms of the sales agreement.
- C. The manufacturer shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 2-year warranty period, upon examination by the manufacturer, such part will be repaired or replaced by the manufacturer at no charge. The buyer shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without manufacturer's

prior authorization, and all returned equipment shall be shipped by the buyer, freight prepaid to a destination determined by the manufacturer.

## **PART 2 - PRODUCTS**

### **2.1 GENERAL ASSEMBLY**

- A. Unit(s) shall be assembled, tested, and shipped from the factory for indoor or outdoor mounting consisting of the following specifications, deliver all capacities scheduled, and conform to design indicated herein. Alternate layouts or dimensional changes will not be accepted.

### **2.2 CABINET**

- A. Size 10-15" blower(s) - Shall be constructed of minimum 20-gauge G-90 galvanized steel.
- B. Size 18 and up blower(s) - Shall be constructed of minimum 18-gauge G-90 galvanized steel.
- C. All metal shall be CNC bent for precise assembly.
  - 1. The wall panels and roof panels shall be fabricated by forming double standing, self-locking seams that require no additional support.
  - 2. The floor shall be constructed of 16-gauge G-90 galvanized steel.
  - 3. The base and floor support channels shall be constructed of 12-gauge G-90 galvanized steel.
  - 4. The floor and wall panels shall be sealed airtight with a silicone caulk.
  - 5. All casing panels shall be attached with sheet metal screws which can be removed for field service of large components.
  - 6. The unit base shall be suitable for curb or flat mount. Casing construction should be suitable for Outdoor or Indoor Installation.
- D. An observation port shall be located on the exterior of the unit for observation of the main flame and pilot flame. All controls, gas valves, modulating controls and electrical components shall be mounted within the control vestibule. The control vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and should not be exposed to the main air stream.
- E. The vestibule full size hinged access doors shall have a minimum of two (2) latches. Vestibule doors provide easy access to controls and gas train components. Blower door shall provide easy access to blower, motor and drives and also include a minimum of two (2) latches. All doors shall include 20-gauge G-90 galvanized steel liners for added rigidity and positive seal. All access doors shall have a continuous aluminum hinge with stainless steel pin.
- F. Latches shall be a heavy duty lift and turn type latch that is flush to the casing surface. Latches shall have a sealing gasket to prevent water leakage.
- G. 80/20 unit(s) - Proportioning dampers shall be installed to provide a mixture of outside air and bypass air. These dampers shall be installed parallel to the direct fired burner to provide the ideal mixing of heated air, bypass air and outside air. At no time will the bypass air be allowed to pass through the burner. Dampers shall be of G-90 galvanized steel mounted on friction-free bearings.
- H. VAV unit(s) - Balancing dampers shall be installed in the burner profile to maintain a

constant velocity across the burner. Dampers shall be type G-90 galvanized steel mounted on friction-free bearings.

### **2.3 AIRFLOW CONFIGURATIONS**

- A. Unit shall be configurable for up (vertical) discharge through unit.
- B. Unit shall be configurable for down (vertical) discharge through unit.
- C. Unit shall be configurable for side (horizontal) discharge through the cabinet.
- D. 100 percent outdoor air unit intake's airflow configuration shall be through use of a fresh/outdoor damper. 80/20 percent outdoor air unit intake airflow configuration shall be through use of a fresh/outdoor damper and return air damper.
  - 1. Damper: Shall exceed AMCA Class 1A standard for low leakage.
  - 2. Optional insulated and thermally broken. Damper insulation R-value = 2.16.
  - 3. Actuator: A direct-drive damper actuator shall be used with spring return to ensure that the outdoor air section opens when not powered.

### **2.4 SUPPLY AIR BLOWER AND MOTOR**

- A. Blower Motor: Shall be a premium efficiency motor available as:
  - 1. Open Drip Proof (ODP) motor driven by a Variable Frequency Drive.
  - 2. Totally Enclosed Fan Cooled (TEFC) motor driven by a Variable Frequency Drive.
- B. Fans to be selected at or near efficiency peak. Check fan curves provided with job.
- C. Blower and motor assembly shall be dynamically balanced. Wheels balanced as per AMCA 204-96; Balance Quality and Vibration Levels for fans.
- D. Twin blower assemblies shall be coupled together using Sure-Flex Elastomeric Couplings. Couplings shall be designed for 4-Way (torsional, angular, parallel, and axial) flexing action shaft movement. Single blower shafts for twin blower assemblies will not be acceptable.
- E. External Static: The sum of duct loss plus accessory static (example: filter, hood and damper). All blowers shall be tested and set at rated speed after being installed in the factory assembled unit.
- F. Motor shall have an adjustable drive or fixed drive, and will have a 1.15 service factor. Blower motor shall have an adjustable mount, made of heavy gauge steel.

### **2.5 VARIABLE AIR VOLUME**

- A. VFD Manual - Blower will communicate with VFD. VFD will run at user defined static speed set through HMI.
- B. VFD 0-10V - External 0-10V signal will be applied to MUA board for speed reference.
- C. VFD Pressure - Differential pressure sensor located on MUA board. Blower will operate on differential setpoint option.

### **2.6 SHAFTS AND BEARINGS**

- A. Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings designed for and individually tested, specifically for use in air handling applications.

## **2.7 HEATING SYSTEM**

- A. The gas burner shall use natural gas at a minimum/maximum inlet-supply pressure to the unit of 7 -14" w.c., 14 w.c. -1lb, 1-5lbs, 5-10lbs, 10lbs or greater.
- B. The gas burner shall use liquid-propane gas at a minimum/maximum inlet-supply pressure to the unit of 7 -14" w.c., 14 w.c. -1lb, 1-5lbs, 5-10lbs, 10lbs or greater.
- C. Burner design shall be capable of using natural gas. Burner ignition shall be of the direct-spark design with remote flame sensing at the pilot assembly to detect the presence of flame in the burner.
- D. Burner design shall be capable of using LP type gas. Burner ignition shall be of the direct-spark design with remote flame sensing at the pilot assembly to detect the presence of flame in the burner.
- E. Direct-sparking sequence shall last through the complete duration of the trial for ignition period for guaranteed light-off. Each burner ignition module shall have LED indicators for troubleshooting and a set of exposed prongs for testing flame indication signal.
- F. Each furnace shall have:
  - 1. The burner shall have stainless steel combustion baffles attached to a ductile aluminum gas-supply section with no moving parts to wear out or fail. The burner shall be capable of 92% combustion efficiency with a maximum turndown ratio of up to 30 to 1.
  - 2. Manifold and Input gas pressure gauges.
  - 3. A manual reset high temperature limit switch located on control board.
  - 4. High gas-pressure switches to disable heating if gas pressure is too high.
  - 5. Low gas-pressure switch to disable heating if gas pressure is too low.
  - 6. Proof-of-closure switch to energize the main-burner circuit only if the motorized gas valve is in a closed position.

## **2.8 FILTERS**

- A. Provide filters as part of unit. All filters shall be furnished and installed to meet the performance requirements set forth in the schedule and as specified under another section of this work.
- B. The filters shall be (2") thick, aluminum mesh, aluminum mesh, or pleated throw away. Aluminum-mesh filters shall have aluminum frames with media to be layers of slit and expanded aluminum, varying in pattern to obtain maximum depth loading. Washable 2" filters shall be enclosed in two-piece, die-cut frame with diagonal supports. Frame shall be constructed of heavy-duty beverage board. Filter media is supported on the air leaving side by a metal grid.
- C. All filters shall be installed on tracks for easy removal from the unit.
- D. Shall be either insulated or non-insulated constructed of G-90 galvanized steel with filters supported by internal slides and with removable access panels.
- E. Unit shall have an optional adjustable pressure differential sensor for the filter bank to alert in the event of a clogged filter.

## **2.9 ELECTRICAL**

- A. All controls shall be pre-wired and housed in an insulated electrical cabinet within the unit to protect against risk of condensation.
- B. Unit(s) shall be provided with single point electrical connection.
- C. Unit(s) shall be provided with a door safety switch that de-energizes the supply fan when the door is opened.
- D. Unit(s) shall be provided with a factory mounted averaging intake air temperature sensor to allow for accurate intake temperature reading regardless of how the OA/RA dampers are positioned.
- E. The electrical cabinet shall be outfitted with the following:
  - 1. LED electrical cabinet service light with automatic activation upon door switch.
  - 2. Color wiring schematics laminated and secured to the interior wall of the cabinet doors.
  - 3. Factory mounted disconnect with bottom knockouts.
  - 4. A LED backlit, LCD Human-Machine Interface (HMI) shall be mounted within the unit's control cabinet to allow for all setpoints configuration and refrigeration system monitoring at the unit.
  - 5. Up to 4 additional space mounted HMIs available. Additional HMIs shall allow for full programming capabilities and are outfitted with integral temperature and humidity sensors. Additional HMIs shall be capable of being individually averaged for space temperature/humidity readings. All HMIs shall be wired using standard CAT5/6 cables.

## 2.10 CONTROLS

- A. Unit shall be outfitted with a control board to allow for full control of the entire unit.
- B. Provide onboard air flow switch located on MUA control board to sense air flow.
- C. All unit controls shall be compatible with BACnet and LonWorks based building management systems.
- D. Unit(s) shall be outfitted with CASLink cloud based monitoring, which monitors every point of operation. Provides configurable automated fault alert e-mails, and remote control capabilities.
- E. Integrated cellular module to provide remote connection to monitoring services to view both real time and historical unit operation. Data shall be stored utilizing a cloud computing service for a minimum of 3 years. Data sample rate shall be a maximum of 60 seconds.
- F. Temperature Control System:
  - 1. **Discharge Temp Control (Heating)** - Unit modulates the burner flame to accurately maintain the desired discharge temperature set point and compensate for fluctuations in entering air temperature, air volume and % of OA using heating PID controls.
  - 2. **Space Temp Control (Heating)** - Unit modulates the burner flame to accurately maintain the desired space temperature set point and compensate for fluctuations in entering air temperature, air volume and % of OA using heating PID controls. Minimum and maximum discharge set points can be set to limit the temperature

entering the space. An optional additional HMI or room thermostat can be used to determine the space temperature. If no temperature sensor is available in the space, the unit will use an internal return temperature sensor.

G. Activation Controls:

1. **Activate Based on Intake (Heating)** - Unit will activate heating when the intake temperature drops below the desired set point.
2. **Activate Based on Space (Heating)** - Unit will activate heating when the space temperature drops below the desired set point.
3. **Activate Based on Both (Heating)** - Unit will activate heating when the space AND intake temperature drop below the desired set point.
4. **Activate Based on Either (Heating)** - Unit will activate heating when the space OR intake temperature drops below the desired set point.
5. **Activate Based on Stat (Heating)** - Unit will activate heating when the space thermostat sends a 24V signal to W and G on the main control board. Unit will modulate to maintain a constant discharge heat set point.

## 2.11 CURBS

- A. Curbs must be field assembled. Shipped separately.
- B. Curb formed of 12-gauge steel. Sizing varies by selection.
- C. Curb shall be fully insulated with 2" field installed thermal insulation (optional).
- D. Curb shall be factory outfitted with duct support hangers (optional).

## 2.12 VARIABLE FREQUENCY DRIVES

- A. Provide Variable Frequency Drive to control speed on all direct drive supply fans.
- B. All VFDs shall provide the following inherent protections:
  1. Phase protection.
  2. Brownout protection.
  3. Overload/Overheat protection.
  4. Soft starts to protect bearings/hardware.
  5. Low & High voltage & over-torque protections.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine all areas and conditions under which packaged units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

### 3.2 INSTALLATION

- A. Install units in accordance with manufacturer's instructions, drawings, written specifications, manufacturer's installation manual and all applicable building codes.

### **3.3 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties. Install piping to allow service and maintenance.
- B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts.
- C. Electrical connections conform to applicable requirements in Division 26 Sections.

### **3.4 SYSTEM START-UP**

- A. System start-up is performed by a factory-trained Service Technician.