SECTION 237339 - DIRECT GAS-FIRED INDUSTRIAL HEATING AND VENTILATING UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes vertical upright, direct-fired, heating and ventilating units, designed for mounting inside and outside the building (as scheduled).

1.3 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection. Prepare the following:

1. Mounting Details: For mounting and securing to concrete pad.
2. Wiring Diagrams: Power, signal, and control wiring.

C. Startup service reports. At time of shipment provide copies of factory start-up and testing reports for each unit.

D. Operation and Maintenance Data: For direct-fired heating and ventilating units to include in emergency, operation, and maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Filters: Two set(s) of both types of filters for each unit.

1.5 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of direct-fired heating and ventilating units and are based on the specific system indicated. Refer to Section 016000 "Product Requirements."

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with NFPA 70.

D. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

E. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

F. Unit must comply and be built in conformance with NFPA-54, ETL/UL design certified, and listed to ANSI Z83.18b-2008 standards

G. Burners shall be designed to not exceed the contaminant threshold limits as established by OSHA and ACGIH

H. Furnish proof of having manufactured temperature modulating direct gas-fired OA/RA space heating systems for a minimum of 10 years

I. Make the manufacturing facility available to the Owner/Engineer for a quality control audit without prior notification

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. BASIS OF DESIGN: AbsolutAire Industries Model AA4-Kalamazoo, MI

The following manufacturers are allowed to bid providing they exceed or meet all conditions as shown in the Specification, Plans, and Schedules:

1. Rapid Engineering-Grand Rapids, MI
2. Hastings Industries; Division of Eric, Inc
3. Reznor-Thomas & Betts Corporation; Mechanical Products Division

If the Contractor wishes to substitute equipment they shall be responsible for the cost of any and all changes that may affect other Trades

2.2 PACKAGED UNITS

A. Factory-assembled, pre-wired, self-contained unit consisting of cabinet, supply fan, controls, filters, and direct-fired gas furnace for installation inside or outside the building (as scheduled).

2.3 CABINET

A. Cabinet: 1” insulated 1-1/2# density fiberglass matt-faced insulation {Double-wall} 18 gauge galvanized or aluminized steel panels formed to ensure rigidity and supported by galvanized-steel channels or structural channel supports with lifting lugs. Cabinet shall be fully weatherized for outside installation.

1. Cabinet fabricated of 18 gauge aluminized steel.
2. {Interior liner shall be constructed of 22 gauge aluminum liner}
3. Rigid welded frame. (units that utilize zip screws in the manufacture of the units are not acceptable

B. Access Panels: Weather-resistant, easy access hinged access doors with Ventlok handles and lock open braces for complete access to furnace, fan motor assemblies, and filter section

C. Internal Insulation: Fibrous-glass duct lining, 1-inch thick, 1-1/2 pound density.

D. Finish: Heat-resistant, baked enamel. Two-coat finishing process. Special unit color to match metal building.

E. Discharge: Horizontal-pattern, galvanized-steel assembly with diffusers incorporating individually adjustable vanes.

2.4 SUPPLY-AIR FAN

A. Fan Type: Centrifugal, double-width, double- inlet forward-curved fan rated according to AMCA 210; statically and dynamically balanced, galvanized steel; mounted on solid-steel shaft with heavy-duty**,** self-aligning, grease-lubricated pillow block ball bearings.

B. Fan Bearings: Rated to a minimum of 100,000 hours (L-10 Life).

C. Motor: Open drip-proof single-speed motor.

D. Drive: V-belt drive with matching fan pulley and adjustable motor sheaves and belt assembly.

E. Mounting: Fan wheel, motor, and drives shall be mounted in fan casing with spring isolators.

2.5 OUTSIDE-AIR INTAKE

A. Outside-Air Intake: On side or bottom of unit (as indicated), with bird screen, and finish to match cabinet; and sized to supply maximum 100 percent outside air.

2.6 AIR FILTERS

A. Comply with NFPA 90A. Two separate sets of filters.

B. Cleanable Filters: 1-inch**-** thick, cleanable metal mesh. Provide filter face area for 300 FPM maximum.

C. Pleated Panel Filters: 2-inch- thick, extended surface, pleated-panel-type, with holding frames**,** with a minimum efficiency value of MERV 8 according to ASHRAE 52.2 and 90 percent average arrestance according to ASHRAE 52.1. Provide filter face area for 300 FPM maximum.

D. 1” x 3” 16 gauge wire metal screen shall be provided downstream of the filters to ensure that the filters will not enter the burner and fan section in the case of a collapsed filter

E. Both air streams (outside and return air) shall be filtered by both sets of filters

2.7 DAMPERS

A. Outside-Air and Return-Air Damper: Galvanized-steel, opposed-blade dampers with vinyl blade seals and stainless-steel jamb seals, having a maximum leakage of 5 cfm/sq. ft. of damper area, at differential pressure of 2-inch wg.

1. Dampers arranged to provide a minimum of 20 percent outside air / 80 percent return air and 100 percent outside air / 0 percent return air. Damper operation shall be fully modulating.

B. Damper Operator: Direct coupled, electronic with spring return as required by the control sequence.

2.8 DIRECT-FIRED GAS FURNACE

A. Description: Factory assembled, piped, and wired; and complying with ANSI Z83.4, "Direct Gas-Fired Make-Up Air Heaters"; ANSI Z83.18, "Direct Gas-Fired Industrial Air Heaters"; and NFPA 54, "National Fuel Gas Code."

B. Burners: Cast-iron burner with stainless-steel mixing plates.

1. Control Valve: Modulating with minimum turndown ratio of 30:1.
2. Fuel: Natural gas.
3. Pilot: the direct fired burner system shall include a direct spark ignition system that includes an ignition module, spark igniter, and a flame rod or UV scanner system to verify burner status before allowing the main gas valve to open.
4. No air from the indoor space shall be allowed to recirculate across the burner at any time. Service of the flame rod and burner igniter shall be accomplished thru an access door
5. Burner profile adjustment system shall provide a means to automatically adjust the pressure differential across the burner profile while the fan is operating.

C. Safety Controls:

1. Gas Manifold: Safety switches and controls to comply with ANSI standards.
2. Purge-Period Timer: Automatically delays burner ignition and bypasses low-limit control.
3. Airflow Proving Switch: Dual pressure switch senses correct airflow before energizing pilot and requires airflow to be maintained within minimum and maximum pressure settings across burner.
4. Manual-Reset, High-Limit Control Device: Stops burner and closes main gas valve if high-limit temperature is exceeded.
5. Gas Train: Redundant, automatic main gas valves, electric pilot valve, electronic-modulating temperature control valve, main and pilot gas regulators, main and pilot manual shutoff valves, main and pilot pressure taps, and high-low gas pressure switches.
6. Safety Lockout Switch: Locks out ignition sequence if burner fails to light after three tries. Controls are reset manually by turning the unit off and on.
7. Control Transformer: Integrally mounted 24-V ac.

2.9 CONTROLS

A. Factory-wired, fuse-protected control transformer, connection for power supply and field-wired unit to remote control panel.

B. Control Panel: Surface-mounted remote panel, with engraved plastic cover, and the following lights and switches:

1. Summer-Off-Winter switch.
2. Supply-fan operation indicating light.
3. Heating operation indicating light.
4. Damper position potentiometer.
5. Room thermostat.
6. Dirty-filter indicating light operated by unit-mounted differential pressure switch for both sets of filters
7. Safety-lockout indicating light.
8. Burner lockout Flame Reset Switch: Allows the flame relay to be reset at the remote panel via momentary push button switch if an unusual condition locks out the burner

C. Refer to Section 230900 "Automatic Control Systems for HVAC" for control equipment and Section 230990 "Automatic Control Sequences for HVAC" for control sequences of operation.

D. Control Devices:

1. Remote Thermostat: Adjustable room thermostat with temperature readout.
2. Mild Weather Thermostat: Adjustable thermostat (-15 °F to 90 °F) that will automatically turn off the burner when the outdoor air temperature rises above the stat set-point. The burner reignites if the temperature falls below set-point. The mild weather sensor shall be located in the outside air stream of the unit and factory set at 65 °F.

E. Outside-Air, and Return-Air Damper Control:

1. Outside-air damper shall open (to minimum) when supply fan starts, and close when fan stops.
2. Outside-air damper shall modulate from minimum to maximum (return-air dampers shall move in opposition) to provide economizer cooling to maintain space thermostat set-point temperature.

F. Temperature Control: Operates gas valve to maintain space temperature set-point.

1. Direct-fired burner gas valve modulates to maintain space temperature.

G. Packaged Unit Controls: Stand-alone control module for packaged unit controls. Coordinated controls and control sequence with Division 23 Sections “Automatic Control System for HVAC," and “Automatic Control Sequences for HVAC."

2.10 MOTORS

A. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.11 SERVICE PLATFORM

A. 36” wide work platform the full width of the unit
B. 42 “ railing, 4” high toe kick, and heavy duty galvanized chain access with spring clasps
C. Ladder shall be provided to access the platform. Rungs shall be constructed of ¾” corrugated steel on 12” center
   1. Paint OSHA yellow with walk-thru style top hand rails and OSHA climbing cage
   2. Final height shall be modified for the height of the landing pad
   3. Access system shall be certified to meet ANSI A14.3, OSHA 1910.27/ 1926.1053 standards

2.12 SUPPORT LEGS

A. 11 gauge aluminized steel to match unit color
B. The four(4) heavy duty structural legs shall be used to support the weight of the unit
C. Legs shall be ship loose field installed by the Mechanical Contractor

2.13 CAPACITIES AND CHARACTERISTICS. Refer to Drawings and Schedules.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation of direct-fired H&V units.

B. Examine roughing-in for piping, ducts, and electrical systems to verify actual locations of connections before equipment installation.

C. Examine concrete equipment supports for suitable conditions where units will be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install gas-fired units according to NFPA 54, "National Fuel Gas Code."

B. Install controls and equipment shipped by manufacturer for field installation with direct-fired heating and ventilating units.

3.3 CONNECTIONS

A. Piping Connections: Drawings indicate general arrangement of piping, fittings, and specialties. Install piping adjacent to machine to allow service and maintenance.

1. Gas Piping: Comply with requirements in Section 231123 "Natural-Gas Piping." Connect gas piping with shutoff valve and union and with sufficient clearance for burner removal and service. Provide AGA-approved flexible connectors.

B. Duct Connections: Duct installation requirements are specified in Section 233113 "Metal Ducts." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to direct-fired heating and ventilating units with flexible duct connectors. Flexible duct connectors are specified in Section 233300 "Air Duct Accessories."

C. Ground equipment according to Division 26 Sections.

D. Connect wiring according to Division 26 Sections.

E. STARTUP SERVICE

F. Engage a factory-authorized service representative to perform startup service.

G. Complete installation and startup checks according to manufacturer's written instructions and perform the following:

1. Inspect for visible damage to furnace combustion chamber.
2. Inspect casing insulation for integrity, moisture content, and adhesion.
3. Verify that clearances have been provided for servicing.
4. Verify that controls are connected and operable.
5. Verify that filters are installed.
6. Purge gas line.
7. Inspect and adjust vibration isolators.
8. Verify bearing lubrication.
9. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
10. Adjust fan belts to proper alignment and tension.
11. Start unit according to manufacturer's written instructions.
12. Complete startup sheets and attach copy with Contractor's startup report.
13. Inspect and record performance of interlocks and protective devices; verify sequences.
14. Operate unit for run-in period recommended by manufacturer.
15. Perform the following operations for both minimum and maximum firing and adjust burner for peak efficiency:

    a. Measure gas pressure on manifold.
    b. Measure combustion-air temperature at inlet to combustion chamber.
    c. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.

16. Calibrate thermostats.
17. Adjust and inspect high-temperature limits.
18. Inspect dampers, if any, for proper stroke and interlock with return-air dampers.

19. Inspect controls for correct sequencing of heating, mixing dampers, and normal and emergency shutdown.
20. Measure and record airflow. Plot fan volumes on fan curve.
21. Verify operation of remote panel, including pilot-operation and failure modes. Inspect the following:

    a. High-limit heat.
    b. Alarms.

22. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension.

H. Remove and replace malfunctioning components that do not pass tests and inspections and retest as specified above.

I. Prepare written report of the results of startup services.

3.4 ADJUSTING

A. Adjust initial temperature set points.

B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain direct-fired H&V units. Refer to Division 01 Sections for requirements.

END OF SECTION 237339