

SECTION 237339 - INDOOR, DIRECT GAS-FIRED 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 direct-fired H&V units.

1.3 ACTION SUBMITTALS

- A. Product Data: Include rated capacities, furnished specialties, and accessories.
 - 1. Complete fan performance curves for Supply Air, with system operating conditions indicated, as tested on an AMCA Certified Chamber.
 - 2. Sound performance data for Supply Air, as tested on an AMCA Certified chamber.
 - 3. Motor ratings, electrical characteristics and motor and fan accessories.
 - 4. Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
 - 5. Estimated gross weight of each installed unit.
 - 6. Installation, Operating and Maintenance manual (IOM) for each model.
 - 7. Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Startup service reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For direct-fired H&V units to include in emergency, operation, and maintenance manuals.

1.6 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: One sets for each unit.
 - 2. Fan Belts: One sets for each unit.

1.7 QUALITY ASSURANCE

- A. 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.
- B. Source Limitations: Obtain Packaged Make-Up Air Unit with Integral Heating with all appurtenant components or accessories from a single manufacturer.
- C. Product Options: Drawings must indicate size, profiles and dimensional requirements of Make-Up Air Units and are to be based on the specific system indicated. Refer to Division 1.
- D. Certifications: Entire unit shall be ETL Certified per ANSI Z83.4 or ANSI Z83.18 and bear an ETL mark.

1.8 COORDINATION

- A. Coordinate sequencing of construction of associated plumbing, HVAC, and electrical supply.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck (basis of design)
 - 2. Captive-Air Systems, Inc.
 - 3. Reznor-Thomas & Betts Corporation
 - 4. Trane Company.
 - 5. Weather-Rite, Inc.
 - 6. Modine

2.2 MANUFACTURED UNITS

- A. Units with Integral Heating shall be fully assembled at the the factory and consist of an insulated metal cabinet, supply air blower assembly, electrical control unit with all specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

2.3 CABINET

- A. Materials: Formed, double wall insulated metal cabinet fabricated to permit access to internal components for maintenance. Underside of unit shall have formed metal panels covering base panel insulation.
 - 1. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653.
 - 2. Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
- B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.

1. Thickness: 1 inch
 2. Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
 3. Location and application: Floor of each unit shall be insulated with 1 inch thick rigid fiberglass insulation, covered on one surface with integral aluminum foil. Full interior coverage of entire cabinet to include walls and roof of unit shall be semi-rigid type and installed between inner and outer shells of all cabinet exterior components when double walls are specified.
- C. Access panels: Unit shall be equipped with insulated hinged access panels to provide easy access to all major components. Access panels shall be fabricated of 18 gauge galvanized G90 steel. Removable access panels shall incorporate a formed drip edge.
- D. Supply Air blower assembly: Blower assembly consists of an electric motor and a belt driven, double width, and double inlet forward curve blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on spring isolation devices.
- E. Unit shall have 2" thick MERV 8 disposable pleated filters located in the outdoor air intake and shall be accessible from the exterior of the unit.
- F. Control center / connections: unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.
- G. Direct Gas-Fired Furnace:
1. Shall be factory assembled, piped and wired direct gas-fired system of 92% efficiency with a draw through design and field adjustable burner baffles with a direct spark ignition system.
 2. Shall have a cast aluminum burner manifold and stainless steel mixing plates. No air from the inside space shall be allowed to pass across the burner at any time. Flame rectification shall be provided by a flame rod. A flame safeguard display shall be included. Burner control shall have a digital coded fault indicator capable of storing the last five faults.
 3. Shall be equipped for operation on natural gas with a maximum rated inlet gas pressure of 1/2 psi. Gas pressure regulator shall be provided.
 4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
 5. Shall have temperature control provided by an electronic 25:1 turndown-ratio modulating discharge air sensor. Direct digital controller with integral discharge temperature limit using an external 2 - 10 VDC or 4 - 20 mA signal.
 6. Shall include the following safety controls:
 - a. Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.
 - b. Dual safety shutoff valves shall be provided that do not exceed 120 VAC control signals.
 - c. High and low Gas Pressure Switch: Main gas valve closes if high or low pressure switch faults.
 - d. A gas vent line shall be included that vents gas from between the safety shutoff valves.
 - e. Visual indication: Clear visual signal demonstrating the position of the main gas safety shutoff valves.
 - f. Other controls as required by Maine Fuel Gas Code.
- H. Motorized dampers / Intake Air: Motorized damper of insulated low leakage type shall be factory installed.
- I. Motorized Recirculating Air Damper designed to permit 80% recirculation of exhaust air shall be factory installed. Damper shall be controlled by external 2-10 vdc or 4-20mA signal

2.4 BLOWER

- A. Blower section construction, Supply Air: Belt drive motor and blower shall be assembled onto a minimum 14 gauge galvanized steel platform and must have helical coil spring vibration devices.
- B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
- C. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.
- D. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.
- E. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating."

2.5 MOTORS

- A. General: Blower motors shall be "NEMA Premium". Compliance with EPCAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined cast-type, keyed and fully secured to the fan wheel and motor shafts. Electric motors of ten horsepower or less shall be supplied with an adjustable drive pulley.

2.6 UNIT CONTROLS

- A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors or it can be operated as a heating and cooling system controlled by a Building Automation System (BAS).
- B. External Control:
 - 1. Controller shall allow a 4-20mA signal from the BAS to control the modulation of the burner. Provide field adjustable max/min settings to prevent over/under firing of the burner.
 - 2. Controller shall allow a 4-20mA signal from the BAS to control the modulating OA/RA dampers.
- C. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status, operating settings and alarm conditions. DDC controller shall have a built-in keypad to permit operator to access read-out screens and change settings without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons.
 - 1. Operating protocol: The DDC shall be factory-programmed for LonWorks, BACnet MSTP, or BACnet IP. Coordinate with BAS contractor.
- D. Variable Frequency Drive (VFD) unit shall have factory installed variable frequency drives for modulation (to be used for soft start, also for balancing) of the blower motors. The VFDs shall be factory-programmed for unit-specific requirements and shall not require additional field programming to operate.

- E. Sensors to be provided with the unit
 - 1. Heating Inlet Air Sensor
 - 2. Cooling Inlet Air Sensor
 - 3. Dirty Filter Sensor
 - 4. Fire Stat Type III
 - 5. Smoke Detector

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 equipment supports for suitable conditions where rooftop replacement-air 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. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.
- C. Provide metal support in accordance with Section 230500. The support shall elevate the unit to allow the bottom return to route below the MUA unit.
- D. Install controls and equipment shipped by manufacturer for field installation with direct-fired H&V 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 "Facility Fuel-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 "Ductwork." Drawings indicate the general arrangement of ducts. Connect supply and return ducts to direct-fired H&V units with flexible duct connectors.
- C. Ground equipment according to Division 26 requirements.
- D. Connect wiring according to Division 26 requirements.

3.4 STARTUP SERVICE

- A. Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.
- B. Engage a factory authorized service representative to perform startup service. 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. Clean entire unit, comb coil fins as necessary, and install clean filters.
 6. Purge gas line.
 7. Measure and record electrical values for voltage and amperage.
 8. Inspect and adjust vibration isolators.
 9. Verify bearing lubrication.
 10. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 11. Adjust fan belts to proper alignment and tension.
 12. Start unit according to manufacturer's written instructions.
 13. Complete startup sheets and attach copy with Contractor's startup report.
 14. Inspect and record performance of interlocks and protective devices; verify sequences.
 15. Operate unit for run-in period recommended by manufacturer.
 16. 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.
 17. Calibrate thermostats.
 18. Adjust and inspect high-temperature limits.
 19. Inspect dampers, if any, for proper stroke and interlock with return-air dampers.
 20. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.
 21. Inspect controls for correct sequencing of heating, mixing dampers, and normal and emergency shutdown.
 22. After startup and performance testing, change filters, verify bearing lubrication, and adjust belt tension.
- C. Remove and replace malfunctioning components that do not pass tests and inspections and retest as specified above.
- D. Prepare written report of the results of startup services.

3.5 ADJUSTING

- A. Adjust initial temperature set points.
- B. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

- C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

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

END OF SECTION 237339