

SECTION 237200 - AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 STIPULATIONS

- A. The specifications sections “General Conditions of the Construction Contract”, “Special Conditions”, and “Division 1 – General Requirements” form a part of this Section by this reference thereto and shall have the same force and effect as if printed herewith in full.

1.2 RELATED DOCUMENTS

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

1.3 SUMMARY

- A. Section Includes:
 - 1. Packaged energy recovery units.
 - a. ERV-1,2,3.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, furnished specialties, and accessories.
- B. Shop Drawings: For air-to-air energy recovery equipment. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ARI Compliance:

1. Capacity ratings for air-to-air energy recovery equipment shall comply with ARI 1060, "Performance Rating of Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment."
2. Capacity ratings for air coils shall comply with ARI 410, "Forced-Circulation Air-Cooling and Air-Heating Coils."

C. NRCA Compliance: Roof curbs for roof-mounted equipment shall be constructed according to recommendations of NRCA.

D. UL Compliance:

1. Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Non-ducted Heat Recovery Ventilators."
2. Electric coils shall comply with requirements in UL 1995, "Heating and Cooling Equipment."

1.6 COORDINATION

- A. Coordinate layout and installation of air-to-air energy recovery equipment and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Packaged Energy Recovery Units: One year.
 2. Warranty Period for Energy Recovery Wheels: Five years.
 3. Warranty Period for Stainless Steel Heat Exchangers: Ten years.

PART 2 - PRODUCTS

2.1 PACKAGED ENERGY RECOVERY UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 1. Greenheck
 2. Advanced Thermal Technologies.

3. American Energy Exchange, Inc.
 4. Applied Air; Mestek Technology, Inc.
 5. Carnes.
 6. Des Champs Technologies.
 7. Engineered Air.
 8. Fairchild Industrial Products Company.
 9. Gaylord Industries, Inc.
 10. Loren Cook Company.
 11. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
 12. RenewAire LLC.
 13. SEMCO Incorporated.
 14. Trane; American Standard Companies, Inc.
 15. Venmar CES Inc.
 16. Wing, L. J.; Mestek Technology, Inc.
 17. Or Approved Equal.
- B. Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed and calked weathertight, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 1-inch thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
1. Inlet: Weatherproof hood, with damper for exhaust and supply.
 - a. Exhaust: Motor-operated low leakage damper.
 - b. Supply: Motor-operated low leakage damper.
- C. Heat Recovery Device: Heat-pipe heat exchanger.
- D. Supply and Exhaust Fans: Forward-curved, centrifugal fans with neoprene or spring isolators and insulated flexible duct connections.
1. Motor and Drive: Belt driven with adjustable sheaves, motor mounted on adjustable base.
 2. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 3. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 4. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 5. Spring isolators on each fan having 1-inch static deflection.
- E. Disposable Panel Filters:
1. Comply with NFPA 90A.
 2. Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
 3. Factory-fabricated, viscous-coated, flat-panel type.
 4. Thickness: 2 inches.
 5. Minimum Merv: 8, according to ASHRAE 52.2.

6. Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
7. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.
8. Provide 1 set of extra filters for each unit.

F. Indirect-Fired Gas Furnace:

1. Description: Factory assembled, piped, and wired; complying with NFPA 54, "National Fuel Gas Code," and ANSI Z21.47, "Gas-Fired Central Furnaces."
 - a. AGA Approval: Furnace shall bear label of AGA.
2. Burners: Aluminized steel with stainless-steel inserts.
 - a. Ignition: Electronically controlled electric spark with flame sensor.
3. Heat-Exchanger Drain Pan: Stainless steel.
4. Power Vent: Integral, motorized centrifugal fan interlocked with gas valve.
5. Gas Control Valve: Electronic modulating.
6. Gas Train: Single-body, regulated, redundant, 24-V ac gas valve assembly containing pilot solenoid valve, pilot filter, pressure regulator, pilot shutoff, and manual shutoff.
7. Access: Fabricate section to allow removal and replacement of furnace and to allow in-place access for service.

G. Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.

1. Indoor Enclosure: NEMA 250, Type 12 enclosure contains relays, starters, and terminal strip.
2. Outdoor Enclosure: NEMA 250, Type 3R enclosure contains relays, starters, and terminal strip.
3. Include fused disconnect switches.

H. ROOF CURBS

1. Retain one of first two paragraphs and associated subparagraphs below. Retain first for curbs with vibration isolation and seismic or wind restraints; retain second for curbs provided by RTU manufacturer without vibration isolation and seismic or wind restraints.
2. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.
3. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 - a. Materials: ASTM C 1071, Type I or II.
 - b. Thickness: 2 inches.
4. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb. All work shall be performed by a contractor certified by the existing roof manufacturer so as to not void the roof warranty.

- a. Liner Adhesive: Comply with ASTM C 916, Type I.
 - b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
 - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
 - d. Liner Adhesive: Comply with ASTM C 916, Type I.
5. Curb Height: 12 inches, minimum.

I. Accessories:

- 1. Intake weather hood with 2-inch thick filters.
- 2. Exhaust weather hood with bird screen and integral backdraft damper.
- 3. Convenience Outlet: Factory mounted duplex, 120-V, ground-fault-interrupter outlet with minimum 15-A overcurrent protection. Include factory mounted transformer if required. Outlet shall be energized even if the unit main disconnect is open.
- 4. Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, galvanized steel dampers with compressible jamb seals and extruded-vinyl blade edge seals, in parallel-blade arrangement with steel operating rods rotating in stainless-steel sleeve bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 9 cfm/sq. ft. at 4-inch wg.
- 5. Duct flanges.
- 6. Rubber-in-shear isolators for ceiling-mounted units.
- 7. Hinged access doors with quarter-turn latches.
- 8. Unoccupied Recirculation Damper.

2.2 CAPACITIES AND CHARACTERISTICS

- A. See Energy Recovery Ventilator Schedule on Schedules & Details.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine casing insulation materials and filter media before air-to-air energy recovery equipment installation. Reject insulation materials and filter media that are wet, moisture damaged, or mold damaged.
- C. Examine roughing-in for electrical services to verify actual locations of connections before installation.

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

3.2 INSTALLATION

- A. Install gas-fired furnaces according to NFPA 54, "National Fuel Gas Code."
- B. Unit Support: Install unit level on new concrete pad by HVAC contractor. Coordinate wall penetrations and flashing with wall construction. Secure air-to-air energy recovery equipment to structural support with anchor bolts.
- C. Install units with clearances for service and maintenance.
- D. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
- E. Pipe drains from units and drain pans to adjacent grade; use ASTM B 88, Type L (ASTM B 88M, Type B), drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.

3.3 CONNECTIONS

- A. Connect piping to units mounted on vibration isolators with flexible connectors.
- B. Gas Piping: Comply with requirements in Division 22 Section "Facility Liquefied Petroleum Natural Gas Piping." Connect gas piping with properly sized regulator and flexible connector after shutoff valve and union (provided and installed by Plumbing contractor, see HVAC and Plumbing Drawings) and with sufficient clearance for burner removal and service. Make connection with AGA-approved flexible connectors.
- C. Comply with requirements for ductwork specified in Division 23 Section "Metal Ducts."
- D. Electrical Connections: Comply with applicable requirements in Division 26 Sections.
 - 1. Install electrical devices furnished with units but not factory mounted.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 2. Adjust seals and purge.
 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
 4. Set initial temperature and humidity set points.
 5. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- D. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.5 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237200