

SECTION 23 72 00
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 DESCRIPTION

This Section specifies air to air heat pipe heat exchangers and rotary air-to-air heat exchangers.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS: Requirements for pre-test of equipment.
- B. Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION: General mechanical requirements and items, which are common to more than one section of Division 23.
- C. Section 23 40 00, HVAC AIR CLEANING DEVICES: Requirements for filters used before heat recovery coils.
- D. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.
- E. Section 23 73 00, INDOOR CENTRAL-STATION AIR-HANDLING UNITS.
- F. Section 23 74 13, PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS.

1.3 QUALITY ASSURANCE

- A. Refer to specification Section 01 00 00, GENERAL REQUIREMENTS for performance tests and instructions to VA personnel.
- B. Refer to paragraph QUALITY ASSURANCE in specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- C. Performance Criteria: Heat recovery equipment shall be provided by a manufacturer who has been manufacturing such equipment and the equipment has a good track record for at least 5 years.
- D. Performance Test: In accordance with PART 3.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Heat Pipe Heat Exchanger
 - 2. Rotary Heat Exchanger
- C. Certificate: Submit, simultaneously with shop drawings, an evidence of satisfactory service of the equipment on three similar installations.
- D. Submit type, size, arrangement and performance details. Present application ratings in the form of tables, charts or curves.

- E. Provide installation, operating and maintenance instructions, in accordance with Article, INSTRUCTIONS, in Section 01 00 00, GENERAL REQUIREMENTS.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Air Conditioning and Refrigeration Institute (ARI)
ARI 1060-2005.....Performance Rating of Air-to-Air Heat Exchangers
for Energy Recovery Ventilation Heat Equipment
- C. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE):
15-07.....Safety Standard for Refrigeration Systems (ANSI)
52.1-92.....Gravimetric and Dust-Spot Procedures for Testing
Air-Cleaning Devices Used in General Ventilation
for Removing Particulate Matter
52.2-07.....Method of Testing General Ventilation Air-
Cleaning Devices for Removal Efficiency by
Particle Size
84-91.....Method of Testing Air-to-Air Heat Exchangers
- D. American Society for Testing and materials (ASTM)
D635-06.....Standard Test Method for Rate of Burning and/ or
Extent and Time of Burning of Plastics in a
Horizontal Position
E84-07.....Standard Test Method for Surface Burning
Characteristics of Building Materials
- E. Underwriters Laboratories, Inc (UL)
1812-95 (Rev. 2006).....Standard for Ducted Heat Recovery Ventilators
1815-01 (Rev. 2006).....Standard for Nonducted Heat Recovery Ventilators

PART 2 - PRODUCTS

2.1 AIR-TO-AIR HEAT PIPE HEAT EXCHANGERS

- A. Thermal recovery units shall be capable of operating at temperatures ranging from a minimum of -29 degrees C (-20 degrees F) to a maximum of 49 degrees C (120 degrees F). The heat transfer between air streams shall take place in a counterflow arrangement. The unit shall have no moving part and shall be one piece construction.
- B. Tube core shall be either 18-mm (5/8 inch) or 25-mm (1 inch) OD seamless copper tubing permanently expanded into the fins to form a firm, rigid and complete metal pressure contact between the tube and fin collar of

all operating conditions. Provide copper tubes and copper fins for corrosive air streams.

- C. Fin: Aluminum.
 - 1. Fin Spacing: 2.3 mm (0.091 inch)
 - 2. Fin and Tube Joint: Mechanical bond and silver brazed.
- D. Secondary surfaces shall be of continuous plate type aluminum fins, 0.18 mm (0.007 inch) thick, and of corrugated design to produce maximum heat transfer efficiencies.
- E. Basic capillary wick shall be an integral part of the inner wall of the tube and provide a completely wetted surface for maximum heat pipe capacity with minimum heat transfer resistance.
- F. Refrigerants used shall be approved by EPA.
- G. Exhaust and supply airstreams shall be separated from each other by a vertical partition, so that there will be no cross-contamination.
 - 1. Partition Material: Galvanized steel.
 - 2. Partition Material Thickness: 1.9 mm (14 gage).
- H. Casing shall be a minimum of 1.9 mm (14 gage) galvanized steel flanged casing, with airtight partition between airstreams.
- I. End covers shall be a minimum of 1.0 mm (20 gage) galvanized steel.
- J. Tilt-Control Mechanism (if required): For summer-winter operation with a electric actuator; and having control panels and sensing bulbs as shown on the drawings.
- K. Provide flexible connectors for each side of the unit. The flexible connector shall be fabricated in a manner that will allow the unit to tilt without binding.
- L. Control: Integral plenum containing heat-pipe coil and gasketed, face-and-bypass, opposed-blade dampers with rods extended outside casing for damper operator and linkage.
- M. Control: Pivot center of bottom of heat-pipe coil on shaft and bearings to tilt coil. Include tilt controls with electric actuator and linkage, thermostats, sensors, and polyester fabric with PVC-coated flexible connector for automatic supply temperature regulation, summer/winter changeover, and frost protection.

2.2 ROTARY AIR-TO-AIR HEAT EXCHANGER:

- A. Exchanger Rotor or Wheel: Corrugated synthetic fibrous transfer media with a flame spread rating of 25 and less and smoke developed rating of 50 and less, and independently tested in accordance with ASTM standard E-84. Rotor media shall be independently tested in accordance with ASHRAE Standard 84. It shall allow laminar flow (but not radial) when operating within published operating airflow ranges and prevent leakage,

bypassing and cross contamination by cross flow within wheel. Treat media with non-degrading desiccant that is bacteriostatic, non-corroding and non-toxic. No asbestos material will be allowed. Wheel shall not condense water directly or require a condensate drain for summer or winter operation. Performance rating shall be in accordance with AHRI Standard 1060.

- B. Rotor: Polymer segmented wheel strengthened with radial spokes impregnated with non-migrating, water-selected, 4A molecular-sieve desiccant coating.
- C. Casings shall be sealed on periphery of rotor as well as on duct divider and purge section. Seals shall be adjustable, of extended life materials and effective in limiting air leakage.
- D. Wheel shall be supported by ball or roller bearings and belt driven by a fractional horsepower, totally enclosed, NEMA Standard motor through a close coupled positively lubricated speed reducer, or gear/chain speed reduction. Refer to Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC and STEAM GENERATION EQUIPMENT.
 - 1. Motors for constant speed exchanger wheels shall be an AC motor.
 - 2. Variable-speed exchanger wheels shall have exchanger wheel speed and leaving-air temperature controlled by means of a variable-speed motor controller. The speed shall be controlled as noted in paragraph G below. Operation shall be from 115/1/60 and by a proportioning temperature controller which shall vary output voltage of a silicon controlled rectifier (SCR) to a rectified power motor which will change speed in proportion to changes of voltage to its armature. Automatic changeover for summer-winter operations shall be controlled by an adjustable thermostwitch. Set point of adjustable proportioning temperature controller and thermostwitch shall be indicated on visible scale. System shall be capable of speed reduction down to 5 percent of capacity while maintaining adequate torque at any point of operation to rotate wheel.
- E. An automatic, factory-fabricated, field-adjustable purge unit shall limit exhaust air carry-over to less than 1.0 percent of rated volume. Purge shall be effective when static pressure difference between supply and exhaust is 125 Pa (one-half, inch wg) or greater, and it shall have provision for restriction or adjustment to limit purge air volume to not over five percent of rated air flow when a static pressure difference up to 2.5 kPa (10 inch wg) exists.
- F. Unit shall be constructed of heavy gage steel to insure rigidity and stability. Casing side panels shall be removable to insure easy access

to internal parts and have integral flanges for flanged duct connection and lifting holes or lugs.

- G. Controls starting relay shall be factory mounted and wired, and include a manual motor starter for field wiring. Variable frequency controller shall be factory mounted and wired, with exhaust-air sensor to vary rotor speed and maintain exhaust temperature above freezing. When exhaust-air temperature is less than outdoor-air temperature, the rotor shall be at maximum speed.
- H. Filters: MERV 7, 2-inch throw-away type. Refer to Section 23 40 00 HVAC Air Cleaning Devices.

2.2 AIR FILTERS

Air Filters: MERV rating of 7, as indicated on the drawings. Comply with requirements in specification Section 23 40 00, HVAC AIR CLEANING DEVICES.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Follow the equipment manufacturer's instructions for handling and installation, and setting up of ductwork for makeup and exhaust air steamers for maximum efficiency.
- B. Install units with adequate spacing and access for cleaning and maintenance of heat recovery coils as well as filters.

3.2 FIELD QUALITY CONTROL

- A. Operational Test: Perform tests as per manufacturer's written instructions for proper and safe operation of the heat recovery system.
 1. 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.
- B. Replace damaged and malfunctioning controls and equipment.
- C. Set initial temperature and humidity set points. Set field-adjustable switches and circuit-breaker trip ranges as indicated.
- D. Prepare test and inspection reports to the Senior Resident Engineer in accordance with specification Section 01 00 00, GENERAL REQUIREMENTS.

3.3 INSTRUCTIONS

Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of heat recovery equipment.

3.4 DEMONSTRATION AND TRAINING

- A. Provide services of manufacturer's technical representative for four hours to instruct VA personnel in operation and maintenance of units.

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