

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

PART 1 - GENERAL**1.1 DESCRIPTION**

This Section specifies rotary air-to-air heat exchanger and run-around heat exchangers.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS: Requirements for pre-test of equipment.
- C. 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.
- D. Section 23 21 23, HYDRONIC PUMPS and Section 23 22 23, STEAM CONDENSATE PUMPS: Requirements for pumping equipment.
- E. Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION: Requirements for piping insulation.
- F. Section 23 21 13, HYDRONIC PIPING and Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING: Requirements for piping for expansion tanks.
- G. Section 23 82 16, AIR COILS: Requirements for run-around system coils.
- H. Section 23 31 00, HVAC DUCTS AND CASINGS: Requirements for sheet metal ducts and fittings.
- I. Section 23 40 00, HVAC AIR CLEANING DEVICES: Requirements for filters used before heat recovery coils.
- J. Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC: Requirements for controls and instrumentation.
- K. Section 23 05 93, TESTING, ADJUSTING AND BALANCING FOR HVAC: Requirements for testing, adjusting and balancing of HVAC system.

1.3 QUALITY ASSURANCE

- A. Refer to paragraph, GUARANTEE in specification Section 00 72 00, GENERAL CONDITIONS.
- B. Refer to specification Section 01 00 00, GENERAL REQUIREMENTS for performance tests and instructions to VA personnel.
- C. Refer to paragraph QUALITY ASSURANCE in specification Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.
- D. 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.
- E. 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
 - 3. Plate Heat Exchanger
 - 4. Run-Around Energy Recovery System
- 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

2.2 ROTARY AIR-TO-AIR HEAT EXCHANGER:

- A. Exchanger Rotor or Wheel: Aluminum transfer media with a flame spread rating of not more than 25 and smoke developed rating of not more than 50 and independently tested in accordance with ASTM standard E-84. Rotor media shall be independently tested in accordance with ASHRAE Standard . It shall allow laminar flow (but not radial) at usual velocities and prevent leakage, bypassing and cross contamination by cross flow within wheel. Size the transfer media to allow passage of //300//500//800//1200// micrometers particles without fouling or clogging. When latent heat transfer is required, treat media with non-degrading silica-gel desiccant coating 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 ARI Standard 1060.
- B. Rotor: Polymer segmented wheel strengthened with radial spokes impregnated with non-migrating, water-selected, molecular-sieve desiccant coating.
1. Maximum Solid Size for media to pass://500//800//1200//micrometers.//
- 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.
1. Motors for constant speed wheel 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. 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- and outdoor-air sensors, automatic changeover thermostat and set-point adjuster, to vary rotor speed and maintain//exhaust temperature above freezing and air differential temperature above set point. When exhaust-air temperature is less than outdoor-air temperature rotor shall be a maximum speed.
 - //1. Pilot-Light Indicator: Display rotor rotation and speed Speed Settings: Adjustable settings for maximum and minimum rotor speed limits.//
- H. Filters Extended-Surface Disposable Panel Filters: Comply with NFPA 90A.
 - 1. Minimum Arrestance: According to ASHRAE 52.1
 - 2. Minimum Efficiency Reporting Value (MERV): According to ASHRAE 52.2.
 - 3. 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.
 - 4. Flat-Panel Type: Factory-fabricated, viscous-coated, 50 mm (2 inches).
 - 6. Initial Resistance: 0.25 inches wg.
 - 7. Recommended Final Resistance: 0.5 inches wg.
 - 8. Arrestance (According to ASHRAE 52.1): 80
 - 9. MERV (According to ASHRAE 52.2): 8
 - 10. Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
 - 11. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.

2.4 RUN-AROUND ENERGY RECOVERY SYSTEM (RAERS)

- A. System shall be field fabricated, as shown, containing coils, piping and 30 percent glycol, pumps, insulation, and accessories.
- B. Automatic Temperature Controls and Sequence of Operations: As shown on drawings.
- C. Components shall comply with requirements in the following specification sections:
 - 1. Pumps: Section 23 21 23, HYDRONIC PUMPS and Section 23 22 23, STEAM CONDENSATE PUMPS
 - 2. Insulation: Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION
 - 3. Pipes, Fittings, and Specialties: Section 23 21 13, HYDRONIC PIPING and Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING
 - 4. Coils: Section 23 82 16, AIR COILS
 - 5. Controls: Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

2.5 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. Rotary Air-to-Air Exchanger: Adjust seals and purge as recommended by the manufacturer. Verify correct installation of controls.
- C. Seal ductwork tightly to avoid air leakage.
- D. 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.

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