SECTION 237213 - HEAT WHEEL AIR-TO-AIR ENERGY RECOVERY UNITS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

This Section may include provisions for LEED 2009, LEED v4, ASHRAE 189.1, IgCC, and Green Globes. Note that some sustainable design requirements are either mandatory or optional requirements that may be inserted in the Section Text using the hypertext links. Other requirements that are associated with sustainable design, and may be considered "best practice" or retained even if a sustainable design standard is not a project requirement, are discussed in the Evaluations.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section includes heat wheels.

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

* + - * 1. Related Requirements:

Section 237313.19 "Indoor, Custom Air-Handling Units" for custom housings used for air-to-air energy recovery units.

Section 237343.19 "Outdoor, Custom Air-Handling Units" for custom housings used for air-to-air energy recovery units.

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer's installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include rated capacities, operating characteristics, furnished specialties, and accessories.

* + - * 1. Sustainable Design Submittals:

"Product Data" subparagraph below applies to LEED 2009 NC, CI, CS, and LEED for Schools; LEED v4; IgCC; ASHRAE 189.1; and Green Globes.

Product data showing compliance with ASHRAE 62.1.

* + - * 1. Shop Drawings: For air-to-air energy recovery equipment.

Include plans, elevations, sections, details, and [**mounting**] [**attachment**] details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Include diagrams for power, signal, and control wiring.

Retain "Coordination Drawings" paragraph below for situations where limited space necessitates maximum utilization for efficient installation of different components or if coordination is required for installation of products and materials by separate installers. Coordinate paragraph with other Sections specifying products listed below. Preparation of coordination drawings requires the participation of each trade involved in installations within the limited space.

* + - * 1. Coordination Drawings: Floor plans, elevations, and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

Mechanical-room layout and relationships between components and adjacent structural and mechanical elements.

Support location, type, and weight.

Field measurements.

Retain "Seismic Qualification Data" paragraph below if required by seismic criteria applicable to Project. Coordinate with Section 230548 "Vibration and Seismic Controls for HVAC." See ASCE/SEI 7 for certification requirements for equipment and components.

* + - * 1. Seismic Qualification Data: Certificates, for air-to-air energy recovery equipment, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
			1. CLOSEOUT SUBMITTALS
				1. Operation and Maintenance Data: For air-to-air energy recovery equipment to include in maintenance manuals.
			2. MAINTENANCE MATERIAL SUBMITTALS
				1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Wheel Belts: [**One**] <**Insert number**> set(s) of belts for each heat wheel.

* + - 1. COORDINATION
				1. Coordinate sizes and locations of concrete bases with actual equipment provided.
			2. WARRANTY

When warranties are required, verify with Director’s Representative's counsel that special warranties stated in this article are not less than remedies available to Director’s Representative under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace components of air-to-air energy recovery equipment that fail in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods for units and components with manufacturers listed in Part 2 articles.

<**Insert components requiring extended warranty**>.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications.

* + - 1. PERFORMANCE REQUIREMENTS
				1. 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.
				2. NFPA Compliance: Comply with NFPA 90A for design, fabrication, and installation of unit components.

"ASHRAE Compliance" paragraph below may be required to comply with Project requirements or authorities having jurisdiction. Sustainable design may require compliance with requirements in ASHRAE 62.1, including requirements for controls, surfaces in contact with the airstream, particulate and gaseous filtration, humidification and dehumidification, drain pan construction and connection, finned-tube coil selection and cleaning, and equipment access. Verify, with manufacturers, the availability of units with components and features that comply with these requirements.

* + - * 1. ASHRAE Compliance:

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

Capacity ratings for air-to-air energy recovery equipment shall comply with ASHRAE 84, "Method of Testing Air-to-Air Heat/Energy Exchangers."

"ASHRAE/IES 90.1 Compliance" paragraph below may be required to comply with Project requirements or authorities having jurisdiction. Sustainable design may require minimum efficiency equal to requirements in ASHRAE/IES 90.1.

* + - * 1. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

Retain "Seismic Performance" paragraph below with "Seismic Qualification Data" paragraph in "Informational Submittals" Article for projects requiring seismic design. Delete paragraph if performance requirements are indicated on Drawings. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

* + - * 1. Seismic Performance: Air-to-air energy recovery equipment shall withstand the effects of earthquake motions determined according to [**ASCE/SEI 7**] <**Insert requirement**>.

Retain first subparagraph below to define the term "withstand" as it applies to this Project. Definition varies with type of building and occupancy and is critical to valid certification. Option is used for essential facilities where equipment must operate immediately after an earthquake.

The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified[**and the unit will be fully operational after the seismic event**]."

For life-safety components required to function after an earthquake (such as fire-sprinkler systems, components that contain hazardous content, and storage racks in structures open to the public), the Component Importance Factor is 1.5. For other components, the Component Importance Factor is 1.0 unless the structure is in Seismic Use Group III and component is necessary for continued operation of facility or failure of component could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: [**1.5**] [**1.0**].

See ASCE/SEI 7, Coefficients for Architectural Component Table and Seismic Coefficients for Mechanical and Electrical Components Table for requirements to be inserted in subparagraph below.

<**Insert requirements for Component Amplification Factor and Component Response Modification Factor**>.

* + - 1. CAPACITIES AND CHARACTERISTICS

If Project has more than one type or configuration of air-to-air energy recovery unit, delete this article and schedule air-to-air energy recovery units on Drawings.

* + - * 1. Exhaust Air:

Airflow: <**Insert value**> cfm.

Face Velocity: <**Insert value**> fpm.

Summer:

Entering-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Entering-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Winter:

Entering-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Entering-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Air Pressure Drop: <**Insert value**> inches wg.

* + - * 1. Supply Air:

Airflow: <**Insert value**> cfm.

Face Velocity: <**Insert value**> fpm.

Summer:

Entering-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Entering-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Winter:

Entering-Air Temperature, Dry Bulb: <**Insert value**> deg F.

Entering-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Leaving-Air Temperature, Dry Bulb: <**Insert value**>deg F.

Leaving-Air Temperature, Wet Bulb: <**Insert value**> deg F.

Air Pressure Drop: <**Insert value**> inches wg.

* + - * 1. Wheel Drive:

Motor Size: <**Insert horsepower**>.

Motor Electrical Characteristics:

Volts: [**120**] [**208**] [**230**] <**Insert value**> V.

Phase: [**Single**] [**Three**].

Hertz: 60 Hz.

* + - * 1. Effectiveness: <**Insert percentage**>.
			1. MANUFACTURERS

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=13329) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[AIRotor](http://www.specagent.com/Lookup?uid=123457139996).

[Airxchange Inc](http://www.specagent.com/Lookup?uid=123457139991).

[Desiccant Rotors International, Inc](http://www.specagent.com/Lookup?uid=123457139998).

[Heatex, Inc](http://www.specagent.com/Lookup?uid=123457140000).

[Klingenburg](http://www.specagent.com/Lookup?uid=123457139999).

[Novelaire Technologies](http://www.specagent.com/Lookup?uid=123457139997).

[SEMCO, LLC; part of FlaktGroup](http://www.specagent.com/Lookup?uid=123457139993).

Approved equivalent.

* + - * 1. Source Limitations: Obtain from single source from single manufacturer.
			1. HEAT WHEELS
				1. Casing:

Galvanized steel, stainless steel, or aluminum with standard factory finish.

Retain first subparagraph below to include purge.

Integral purge section limiting carryover of exhaust air to between [**0.05 percent at 1.6-inch wg and 0.20 percent at 4-inch wg**] <**Insert value**> differential pressure.

Casing seals on periphery of rotor and on duct divider and purge section.

Support vertical rotors on grease-lubricated ball bearings having extended grease fittings[**or permanently lubricated bearings**] with an [**L-10**] <**Insert bearing life**> [**400,000 hours**] <**Insert hours**>. Support horizontal rotors on tapered roller bearing.

Retain one of first two "Rotor" paragraphs below. Not all manufacturers offer each combination of materials and coatings. Consult manufacturers.

* + - * 1. Rotor: Aluminum or polymer segmented wheel strengthened with radial spokes[**, with nontoxic, noncorrosive, silica-gel desiccant coating**].
				2. Rotor: Aluminum, metallic, or polymer segmented wheel strengthened with radial spokes impregnated with nonmigrating, water-selective, 3-angstrom, molecular-sieve desiccant coating.
				3. Drive: Fractional horsepower motor and gear reducer[**, with speed changed by variable-frequency controller**] and self-adjusting multilink belt around outside of rotor.

Default motor characteristics are specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."

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.

Retain "Controls" paragraph below to require heat-wheel controls to be an integral part of air-to-air energy recovery equipment. Delete if heat-wheel controls are specified in Section 230923 "Direct-Digital Control System for HVAC."

* + - * 1. Controls:

Control options vary with manufacturer. Consult manufacturers.

Starting relay, factory mounted and wired, and manual motor starter for field wiring.

Retain one of three "Variable-Frequency Controller" subparagraphs below.

Variable-Frequency Controller: Factory mounted and wired, permitting input of field-connected 4- to 20-mA or 1- to 10-V control signal.

Variable-Frequency Controller with Exhaust-Air Sensor: Factory mounted and wired, with exhaust-air sensor to vary rotor speed and maintain exhaust temperature above freezing.

Variable-Frequency Controller with Exhaust- and Outdoor-Air Sensors: 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. Rotor speed shall increase to maximum when exhaust-air temperature is less than outdoor-air temperature.

Pilot-Light Indicator: Display rotor rotation and speed.

Speed Settings: Adjustable settings for maximum and minimum rotor speed limits.

<**Insert additional control features**>.

* + - 1. SOURCE QUALITY CONTROL
				1. AHRI 1060 Certification: Testing according to AHRI 1060 and listed and labeled by AHRI.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Examine roughing-in for electrical services to verify actual locations of connections before installation.
				3. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. INSTALLATION OF HEAT WHEELS
				1. Install heat wheels so supply and exhaust airstreams flow in opposite directions and rotation is away from exhaust side to purge section to supply side.

Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.

Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.

Access doors and panels are specified in Section 233300 "Air Duct Accessories."

* + - * 1. Install floor-mounted units on 4-inch- high concrete base[**designed to withstand, without damage to equipment, seismic force required by code**].
				2. Equipment Mounting:

Retain subparagraph below to require equipment to be installed on cast-in-place concrete equipment bases without vibration isolation devices.

Install air-to-air energy recovery equipment on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."

Retain first paragraph below for air-to-air energy recovery equipment requiring seismic restraints.

* + - * 1. Install seismic restraints according to manufacturers' written instructions.

Retain first paragraph below for suspended units. Retain option for projects in seismic areas.

* + - * 1. Suspended Units: Suspend[**and brace**] units from structural-steel support frame using threaded steel rods and spring hangers. Comply with requirements for vibration isolation devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
				2. Install units with clearances for service and maintenance.
				3. Comply with requirements for ductwork specified in Section 233113 "Metal Ducts."
			1. PIPING CONNECTIONS

Coordinate piping installations and specialty arrangements with Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

* + - * 1. Comply with requirements for piping specified in Section 232113 "Hydronic Piping" and Section 232116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.
				2. Where installing piping adjacent to unit, allow space for service and maintenance.
				3. Connect piping to units mounted on vibration isolators with flexible connectors.

Retain one of two "Condensate Drain Piping" paragraphs below.

* + - * 1. Condensate Drain Piping: Pipe drains from drain pans to nearest floor drain; use ASTM B88, Type L, drawn-temper copper water tubing with soldered joints, same size as condensate drain connection.
				2. Condensate Drain Piping: Pipe drains from drain pans to nearest floor drain; use ASTM D1785, Schedule 40 PVC pipe and solvent-welded fittings, same size as condensate drain connection.
				3. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
			1. ELECTRICAL CONNECTIONS
				1. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
				2. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				3. Install electrical devices furnished by manufacturer, but not factory mounted, according to NFPA 70 and NECA 1.
				4. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

Retain one of two subparagraphs below. First subparagraph cross-references Section 260553 "Identification for Electrical Systems" and should be retained for consistent electrical identification. Second subparagraph is an abbreviated version of the product specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

Nameplate shall be laminated acrylic or melamine plastic signs with a black background and engraved white letters at least 1/2 inch high.

* + - 1. CONTROL CONNECTIONS
				1. Install control and electrical power wiring to field-mounted control devices.
				2. Connect control wiring according to Section 260523 "Control-Voltage Electrical Power Cables."
			2. FIELD QUALITY CONTROL

Retain one of first three paragraphs below.

Retain "Testing Agency" paragraph below to require Contractor to hire an independent testing agency.

* + - * 1. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

Retain "Manufacturer's Field Service" paragraph below to require a Company

Field Advisor to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a Company Field Advisor per OGS Spec Section 014216 to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" paragraph below to require Contractor to perform tests and inspections and retain option to require Contractor to arrange for the assistance of a Company Service Advisor.

* + - * 1. Perform the following tests and inspections[**with the assistance of a Company Field Advisor per OGS Spec Section 014216**]:

Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

Adjust seals and purge.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Set initial temperature and humidity set points.

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

* + - * 1. Air-to-air energy recovery equipment will be considered defective if it does not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. STARTUP SERVICE
				1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to perform**] [**Perform**] startup service.

Complete installation and startup checks according to manufacturer's written instructions.

Verify that shipping, blocking, and bracing are removed.

Verify that unit is secure on mountings and supporting devices and that connections to piping, ducts, and electrical systems are complete. Verify that proper thermal-overload protection is installed in motors, controllers, and switches.

Verify proper motor rotation direction, wheel rotation, and smooth bearing operations. Reconnect motor drive system, align belts, and install belt guards.

Verify that bearings, pulleys, belts, and other moving parts are lubricated with factory-recommended lubricants.

* + - 1. ADJUSTING
				1. Comply with requirements for air-handling system testing, adjusting, and balancing in Section 230593 "Testing, Adjusting, and Balancing for HVAC."
			2. DEMONSTRATION
				1. [**Engage a Company Field Advisor per OGS Spec Section 014216 to train**] [**Train**] Facility’s maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units.

END OF SECTION 237213