SECTION 237200

AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 1 Specification with completely editable text; therefore, any portion of the text can be modified by the A/E preparing the Solicitation Package to suit the project.***

*For Design/Build projects, do not delete the Notes to Specifier in this Section so that they may be available to Design/Build entity when preparing the Construction Documents.*

*For the Design/Build entity, this specification is intended as a guide for the Architect/Engineer preparing the Construction Documents.*

*The MPF specifications may also be used for Design/Bid/Build projects. In either case, it is the responsibility of the design professional to edit the Specifications Sections as appropriate for the project.*

*Text shown in brackets must be modified as needed for project specific requirements.* *See the “Using the USPS Guide Specifications” document in Folder C for more information.*

*The last date that USPS revised this standard specification section occurs in two places, at the end of this section and in the Table of Contents. If the date in this section matches the date in the Table of Contents, then you are using the latest version. Do not delete or revise the “last revised” date at the end of the section during the development of the Project Manual.*

*The footer in this section should be edited to replace the text, “USPS MPF SPECIFICATION” with the project name, and the blank date in the center should be replaced with the submission date, for interim design reviews, or the issue date of the completed Project Manual.*

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1. GENERAL
	1. SUMMARY
		1. Section Includes:
			1. Heat wheels.
			2. Heat-pipe heat exchangers.
			3. Fixed-plate sensible heat exchangers.
			4. Fixed-plate total heat exchangers.
			5. Packaged energy recovery units.
	2. PERFORMANCE REQUIREMENTS
		1. Seismic Performance: Air-to-air energy recovery equipment shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
	3. SUBMITTALS
		1. Product Data: For each type of product indicated. Include rated capacities, furnished specialties, and accessories.
		2. 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.

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**NOTE TO SPECIFIER**

Retain subparagraph below for facilities located in seismic zones.

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* + 1. Seismic Qualification Certificates: For air-to-air energy recovery equipment, accessories, and components, from manufacturer.
		2. Operation and maintenance data.
	1. QUALITY ASSURANCE
		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. AHRI Compliance: Capacity ratings for air-to-air energy recovery equipment shall comply with AHRI 1060-2013, "Performance Rating of Air-to-Air Exchangers for Energy Recovery Ventilation Equipment."
		3. ASHRAE Compliance:
1. ASHRAE Standard 15-2016 for safety codes for mechanical refrigeration.
2. ASHRAE Standard 34-2016 for safety classifications of refrigerants based on toxicity and flammability data.
3. ASHRAE Standard 147-2013 for refrigerant leaks, recovery, and handling and storage requirements
	* 1. UL Compliance: Packaged heat recovery ventilators shall comply with requirements in UL 1812, "Ducted Heat Recovery Ventilators"; or UL 1815, "Nonducted Heat Recovery Ventilators."
		2. Comply with U.S. EPA Final Rule 21 (40 CFR Part 82 – 81 FR 86778) for acceptability status of substitute refrigerants.
		3. Comply with any state, fire marshal, building code or other local authority prohibitions or regulations related to flammable refrigerants.
	1. WARRANTY
		1. 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 Fixed-Plate Total Heat Exchangers: 10 years.
4. PRODUCTS
	1. HEAT WHEELS
		1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
			1. Advanced Thermal Technologies.
			2. Airxchange.
			3. Dais Analytic.
			4. Loren Cook Company.
			5. SEMCO Incorporated.
			6. Trane Technologies.
		2. Casing:
			1. Steel with standard factory-painted finish.
			2. 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 differential pressure.
			3. Casing seals on periphery of rotor and on duct divider and purge section.
			4. Support vertical rotors on grease-lubricated ball bearings having extended grease fittings or permanently lubricated bearings. Support horizontal rotors on tapered roller bearing.

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**NOTE TO SPECIFIER**

Retain one of first two paragraphs below.

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* + 1. Rotor: Aluminum segmented wheel strengthened with radial spokes, with nontoxic, noncorrosive, silica-gel desiccant coating.
			1. Maximum Solid Size for Media to Pass: 800 micrometer.
		2. Rotor: Polymer segmented wheel strengthened with radial spokes impregnated with nonmigrating, water-selective, molecular-sieve desiccant coating.
			1. Maximum Solid Size for Media to Pass: 800 micrometer.
		3. Drive: Fractional horsepower motor and gear reducer, with speed changed by variable frequency controller and self-adjusting multilink belt around outside of rotor.
			1. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section [\_\_\_\_\_\_\_].
			2. 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.
			3. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
		4. Controls:
			1. Starting relay, factory mounted and wired, and manual motor starter for field wiring.
			2. Variable frequency controller, factory mounted and wired, permitting input of field connected 4-20 mA or 1-10-V control signal.
			3. Pilot-Light Indicator: Display rotor rotation and speed.
			4. Speed Settings: Adjustable settings for maximum and minimum rotor speed limits.
		5. Extended-Surface, Disposable Panel Filters:
			1. Comply with NFPA 90A.
			2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
			3. Provide 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. Factory-fabricated, dry, extended-surface type.
			5. Merv (ASHRAE 52.2): 7.
			6. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
			7. Media-Grid Frame: Nonflammable cardboard.
			8. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.
	1. HEAT-PIPE HEAT EXCHANGERS
		1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
			1. Applied Air; a company of Mestek Technology Inc.
			2. Des Champs Technologies.
			3. Engineered Air.
			4. Gaylord Industries, Inc.
			5. Heat Pipe Technology, Inc.
		2. Casing: Galvanized-steel flanged casing, with airtight partition between airstreams.
		3. Refrigerant: ASHRAE 15, Class 1.
			1. Comply with ASHRE 15-2016 and ASHRE 34-2016 safety standards
			2. Comply with U.S. EPA’s Significant New Alternatives Policy (SNAP) program for acceptable substitute refrigerants. New generation equipment utilizing lower Global Warming Potential (GWP) hydrofluoroolefin (HFO) refrigerants and blends should be considered.
			3. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
		4. Tubes: 5/8-inch or 1-inch diameter, [aluminum] [copper].
		5. Fins: [Aluminum] [Copper]
			1. Fin Spacing: No more than 12 fins per inch.
			2. Fin and Tube Joint: Mechanical bond or silver brazed.
	2. FIXED-PLATE SENSIBLE HEAT EXCHANGERS
		1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
			1. American Energy Exchange, Inc.
			2. Dais Analytic
			3. Des Champs Technologies.
			4. Exothermics; a brand of Eclipse, Inc.
			5. Nutech Brands Inc.
			6. RenewAire LLC.
			7. United Air Specialists, Inc.; a CLARCOR company.
		2. Casing: Enameled steel, with galvanized-steel liner with duct collars.
		3. Casing Insulation: 1/2-inch- thick, foil-faced glass fiber.
		4. Plates: Evenly spaced and sealed and arranged for counter airflow.
			1. Plate Material: [Embossed aluminum] [Stainless steel] [Polypropylene copolymer (high-density plastic)].
		5. Extended-Surface, Disposable Panel Filters:
			1. Comply with NFPA 90A.
			2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
			3. Provide 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. Factory-fabricated, dry, extended-surface type.
			5. Thickness: 2 inches.
			6. Merv (ASHRAE 52.2): 7.
			7. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
			8. Media-Grid Frame: Nonflammable cardboard.
			9. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.
	3. FIXED-PLATE TOTAL HEAT EXCHANGERS
		1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
			1. Mitsubishi Electric Sales Canada Inc.
			2. RenewAire LLC.
		2. Casing: Galvanized steel.
		3. Plates: Evenly spaced and sealed and arranged for counter airflow.
			1. Plate Material: Chemically treated paper with selective hydroscopicity and moisture permeability, and gas barrier properties.
		4. Bypass Plenum: Within casing, with gasketed face-and-bypass dampers having operating rods extended outside casing.
		5. Extended-Surface, Disposable Panel Filters:
			1. Comply with NFPA 90A.
			2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
			3. Provide 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. Factory-fabricated, dry, extended-surface type.
			5. Thickness: 1 inch or 2 inches
			6. Merv (ASHRAE 52.2): 7.
			7. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
			8. Media-Grid Frame: [Nonflammable cardboard] [Galvanized steel] [Fire-retardant, 3/4-inch particleboard with gaskets].
			9. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.
	4. PACKAGED ENERGY RECOVERY UNITS
		1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
			1. Advanced Thermal Technologies.
			2. American Energy Exchange, Inc.
			3. Applied Air; a company of Mestek Technology Inc.
			4. Carnes.
			5. Des Champs Technologies.
			6. Engineered Air.
			7. Fairchild Industrial Products Company.
			8. Gaylord Industries, Inc.
			9. Greenheck Fan Corporation.
			10. Loren Cook Company.
			11. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
			12. Mitsubishi Electric Sales Canada Inc.
			13. RenewAire LLC.
			14. SEMCO Incorporated.
			15. Trane; American Standard Inc.
			16. Venmar CES Inc.
			17. Wing, L. J.; Mestek Technology Inc.
		2. 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. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2007
			2. Inlet: Weatherproof hood, with damper for exhaust and supply.
				1. Exhaust: Gravity backdraft damper.
				2. Supply: Spring-return, two-position, motor-operated damper.
		3. Heat Recovery Device: Heat wheel, heat-pipe heat exchanger, or fixed-plate heat exchanger.
			1. Plate Material: Chemically treated paper with selective hydroscopicity and moisture permeability, and gas barrier properties.
		4. Supply and Exhaust Fans: Centrifugal fans with spring isolators and flexible duct connections.
			1. Motor and Drive: Drive type indicated on Drawings.
			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 minimum 1-inch static deflection.
		5. Extended-Surface, Disposable Panel Filters:
			1. Comply with NFPA 90A.
			2. Provide minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
			3. Provide 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. Factory-fabricated, dry, extended-surface type.
			5. Thickness: 1 inch or 2 inches
			6. Merv (ASHRAE 52.2): 7.
			7. Media: Fibrous material formed into deep-V-shaped pleats and held by self-supporting wire grid.
			8. Media-Grid Frame: [Nonflammable cardboard] [Galvanized steel] [Fire-retardant, 3/4-inch particleboard with gaskets].
			9. Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.
1. EXECUTION
	1. INSTALLATION

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**NOTE TO SPECIFIER**

Retain first paragraph below for heat wheels.

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* + 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.
			1. Install access doors in both supply and exhaust ducts, both upstream and downstream, for access to wheel surfaces, drive motor, and seals.
			2. Install removable panels or access doors between supply and exhaust ducts on building side for bypass during startup.
			3. Access doors and panels are specified in Division 23 Section "Air Duct Accessories."

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**NOTE TO SPECIFIER**

Retain first paragraph below for heat pipe heat exchangers.

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B. Install heat-pipe heat exchangers so supply and exhaust airstreams flow in opposite directions. Install flexible connectors on ducts to enable tilt control; make connections airtight and with slack to compensate for full tilt.

* + - 1. Install heat exchanger with clearance space for heat-pipe coil removal.
			2. Install duct access doors in both supply and exhaust ducts, both upstream and downstream, for access to both sides of heat-pipe coil. Access doors and panels are specified in Division 23 Section "Air Duct Accessories."
			3. Install tilt-control components, including electronic controller, electric actuator and linkage, thermostats, and sensors.

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**NOTE TO SPECIFIER**

Retain first paragraph below for fixed-plate heat exchangers.

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* + 1. Install fixed-plate heat exchangers so supply and exhaust airstreams flow in opposite directions.
			1. Install duct access doors in both supply and exhaust ducts, both upstream and downstream, for access to heat exchanger. Access doors and panels are specified in Division 23 Section "Air Duct Accessories."
		2. Install floor-mounted units on 4-inch-high concrete base[ designed to withstand, without damage to equipment, seismic force required by code].

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**NOTE TO SPECIFIER**

Retain first paragraph below if curbs are provided by air-to-air energy recovery equipment manufacturer.

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* + 1. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." ARI Guideline B. Install air-to-air energy recovery equipment on curbs and coordinate roof penetrations and flashing with roof construction specified in Division 07 Section "Roof Accessories." Secure air-to-air energy recovery equipment to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

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**NOTE TO SPECIFIER**

Retain first paragraph below for equipment supported on a concrete base on grade without vibration isolation devices.

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* + 1. Equipment Mounting: Install air-to-air energy recovery equipment on concrete bases. Comply with requirements for concrete bases specified in Division 03.
			1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
			2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
			3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

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**NOTE TO SPECIFIER**

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

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* + 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 Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
		2. Install units with clearances for service and maintenance.
		3. Install new filters at completion of equipment installation and before testing, adjusting, and balancing.
		4. Pipe drains from units and drain pans to nearest floor drain; use ASTM D 1785, Schedule 40 PVC pipe and solvent-welded fittings, same size as condensate drain connection.
	1. CONNECTIONS
		1. Comply with requirements for piping specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
		2. Comply with requirements for ductwork specified in Division 23 Section [\_\_\_\_\_].
		3. Install piping adjacent to machine to allow service and maintenance.

END OF SECTION

USPS MPF Specification Last Revised: 10/1/2022