SECTION 237313

MODULAR INDOOR AIR-HANDLING UNITS

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**NOTE TO SPECIFIER**

*Use this Specification Section for Mail Processing Facilities.*

***This is a Type 2 Specification with primarily editable text; therefore, most of the text can be edited, but there is some required text which is noted within the Section with a “Note to Specifier.” Do not revise these paragraphs without an approved Deviation from USPS Headquarters, Facilities Program Management, through the USPS Project Manager.***

*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. This Section includes modular air-handling units with coils for indoor installations.
	2. SUBMITTALS
		1. Product Data: For each type of modular indoor air-handling unit indicated. Include the following:
			1. Certified fan-performance curves with system operating conditions indicated.
			2. Certified fan-sound power ratings.
			3. Certified coil-performance ratings with system operating conditions indicated.
			4. Motor ratings, electrical characteristics, and motor and fan accessories.
			5. Material gages and finishes.
				1. Shop Drawings:

Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include auxiliary motor slides and rails, and base weights.

Wiring Diagrams: Power, signal, and control wiring.

* 1. QUALITY ASSURANCE
		1. Source Limitations: Obtain modular indoor air-handling units through one source from a single manufacturer.
		2. Product Options: Drawings indicate size, profiles, and dimensional requirements of modular indoor air-handling units and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."
		3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
		4. NFPA Compliance: Modular indoor air-handling units and components shall be designed, fabricated, and installed in compliance with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems."
		5. ARI Certification: Modular indoor air-handling units and their components shall be factory tested according to ARI 430, "Central-Station Air-Handling Units," and shall be listed and labeled by ARI.
		6. Comply with NFPA 70.
	2. COORDINATION
		1. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into slab.
		2. Coordinate installation of roof curbs, equipment supports, and roof penetrations.
		3. Coordinate size and location of structural-steel support members.
	3. EXTRA MATERIALS
		1. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
			1. Filters: One (1) set for each modular indoor air-handling unit.
			2. Fan Belts: One (1) set for each modular indoor air-handling unit fan.
1. PRODUCTS

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**NOTE TO SPECIFIER**

\*\*Required: Do not modify manufacturers or product requirements listed below without an approved deviation.

Verify manufacturer information, product numbers, and availability at time of Project Manual preparation for Project.

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* 1. MANUFACTURERS
		1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
			1. Carrier Global Corporation.
			2. Nortek Air Solutions.
			3. Johnson Controls International.
			4. Daikin Applied Americas.
			5. Trane Technologies (includes American Standard brand as manufactured by Trane).
	2. MANUFACTURED UNITS
		1. Modular indoor air-handling units shall be factory assembled and consist of fans, motor and drive assembly, coils, damper, plenums, filters, condensate pans, control devices, and accessories.
	3. CABINET
		1. Cabinet: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
			1. Outside Casing: G90 galvanized steel, 16 gauge frames and 18 gauge panels. Provide with thermal breaks to prevent exterior condensation from occurring.
			2. Inside Casing: G90 Galvanized steel, 20 gauge.
			3. Floor Plate: Galvanized steel, 0.1382 inch thick.
			4. Cabinet Insulation: Comply with NFPA 90A.
				1. Thickness: 2 inch, 1.5 lb. density.
				2. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
				3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50, when tested according to ASTM C 411.
				4. Liner Adhesive: Comply with NFPA 90A and ASTM C 916.
				5. 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.
				6. Location and Application: Factory applied with adhesive or mechanical fasteners between inside and outside casings.
			5. Access Panels and Doors: Same materials and finishes as cabinet, complete with hinges, latches, handles, and gaskets. Inspection and access panels and doors shall be sized and located to allow periodic maintenance and inspections. Provide access panels and doors in the following locations:
				1. Fan Section: Inspection and access panels.
				2. Access Section: Doors.
				3. Coil Section: Inspection panel.
				4. Filter Section: Inspection and access panels to allow periodic removal and installation of filters.
			6. Condensate Drain Pans: Formed sections of stainless-steel sheet complying with requirements in ASHRAE 62. Fabricate pans to collect condensate from cooling coils (including coil piping connections and return bends) when units are operating at maximum catalogued face velocity across cooling coil.
				1. Drain Connections: Threaded.
		2. Fan-Section Construction: Belt-driven centrifugalfans consisting of housing, wheel, fan shaft, bearings, motor and disconnect switch, drive assembly, and support structure and equipped with formed-steel channel base for integral mounting of fan, motor, and casing panels. Mount fan with vibration isolation.
			1. Centrifugal Fan Housings: Formed- and reinforced-steel panels to make curved scroll housings with shaped cutoff, spun-metal inlet bell, and access doors or panels to allow entry to internal parts and components.
				1. Panel Bracing: Steel angle- or channel-iron member supports for mounting and supporting fan scroll, wheel, motor, and accessories.
				2. Performance Class: AMCA 99-2408, Class suitable for airflow and static pressure rating.
				3. Horizontal Flanged Split Housing: Bolted construction.
			2. Fan Assemblies: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower.
			3. Forward-Curved Fan Wheels: Galvanized-steel construction with inlet flange, backplate, and shallow blades with inlet and tip curved forward in direction of airflow and mechanically secured to flange and backplate; cast-steel hub swaged to backplate and fastened to shaft with set screws.
			4. Shafts: Statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
				1. Turned, ground, and polished hot-rolled steel with keyway. Ship with a protective coating of lubricating oil.
				2. Designed to operate at no more than 70 percent of first critical speed at top of fan's speed range.
			5. Grease-Lubricated Shaft Bearings: Self-aligning, pillow-block-type, ball or roller bearings with adapter mount and two-piece, cast-iron housing.
				1. Ball-Bearing Rating Life: AFBMA-ANSI, L50 of 200,000 hours.
				2. Roller-Bearing Rating Life: AFBMA-ANSI, L50 of 200,000 hours.
			6. Belt Drives: Factory mounted, with final alignment and belt adjustment made after installation and with 1.2 service factor based on fan motor.
				1. Pulleys: Cast iron or cast steel with split, tapered bushing; dynamically balanced at factory.
				2. 5-hp limit in first subparagraph below is standard with many manufacturers but is a designer's choice.
				3. Motor Pulleys: Adjustable pitch for use with 5-hp motors and smaller; fixed pitch for use with motors larger than 5 hp. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
				4. Belts: Oil resistant, nonsparking, and nonstatic; matched for multiple belt drives.
				5. Belt Guards: Fabricate to OSHA/SMACNA requirements; 0.1046-inch-thick, 3/4-inch diamond-mesh wire screen welded to steel angle frame or equivalent; prime coated.
				6. Motor Mount: Adjustable for belt tensioning.
			7. Vibration Control: Install fans on open-spring vibration isolators having a minimum of 1-inch static deflection and side snubbers.
			8. Fan-Section Source Quality Control:
				1. Sound Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Fans shall bear AMCA-certified sound ratings seal.
				2. Factory test fan performance for flow rate, pressure, power, air density, rotation speed, and efficiency. Establish ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."
		3. Motors: Refer to Division 23 Section "Motors" for general requirements.
			1. Torque Characteristics: Sufficient to accelerate driven loads satisfactorily.
			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.
			3. Temperature Rating: 50 deg C maximum temperature rise at 40 deg C ambient for continuous duty at full load (Class A Insulation).
			4. Service Factor: 1.15 for polyphase motors and 1.0 for inverter duty.
			5. Motor Construction: NEMA MG 1, general purpose, inverter duty, Design Bmounted on adjustable base.
			6. Motor Insulation: Insulation system shall exceed the NEMA MG-1 Part 31 Standard and shall be Class F minimum.
			7. Bearings: The following features are required:
				1. Ball or roller bearings with inner and outer shaft seals.
				2. Grease lubricated.
				3. Designed to resist thrust loading where belt or other drives produce lateral or axial thrust in motor.
			8. Overload Protection: Built-in, automatically resetting, thermal-overload protection.
			9. Noise Rating: Quiet.
			10. Efficiency: Energy-efficient motors shall have a minimum efficiency as scheduled according to IEEE 112, Test Method B. If efficiency is not specified, motors shall have a higher efficiency than "average standard industry motors" according to IEEE 112, Test Method B.
			11. Nameplate: Indicate ratings, characteristics, construction, special features, and full identification of manufacturer.
		4. Coil Sections: Common or individual, insulated, stainless-steel casings for cooling coils. Design and construct to facilitate removal and replacement of coil for maintenance and to ensure full airflow through coils.
		5. Water Coils: Continuous circuit coil fabricated according to ARI 410.
			1. Piping Connections: Threaded, on same end**.**
			2. Tubes: Copper.
			3. Fins: Aluminum with fin spacing of no more than 10 fpi.
			4. Fin and Tube Joint: Mechanical bond.
			5. Headers: Seamless copper tube with brazed joints, prime coated.
			6. Casings: Stainless-steel channel frame, heavy duty.
			7. Provide with vent and drain connections.
			8. Ratings: Design tested and rated according to ASHRAE 33 and ARI 410.
				1. Working-Pressure Ratings: 250 psig, 300 deg F.
			9. Source Quality Control: Test to 300 psig underwater.
		6. Filters: Comply with NFPA 90A.
			1. Filter Section: 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.
			2. Disposable Panel Filters: Factory-fabricated, viscous-coated, flat-panel-type, disposable air filters with holding frames.
				1. Media: Interlaced glass fibers sprayed with nonflammable adhesive.
				2. Frame: Galvanized steel with metal grid on outlet side, steel rod grid on inlet side, hinged, and with pull and retaining handles.
				3. 2” thick 30% efficient prefilters and 4” thick 65% final filters.
1. EXECUTION
	1. EXAMINATION
		1. Examine areas and conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
		2. Examine roughing-in of steam, hydronic, and condensate drainage piping systems and electrical services to verify actual locations of connections before installation.
		3. Proceed with installation only after unsatisfactory conditions have been corrected.
	2. INSTALLATION
		1. Install modular indoor air-handling units with the following vibration-control devices.
		2. Ground Floor, Floor-Mounted Units: Support on manufacturer provided base rails using neoprene pads between base rails and slab.
		3. Arrange installation of units to provide access space around modular indoor air-handling units for service and maintenance.
	3. CONNECTIONS
		1. Piping installation requirements are specified in other Division 22 and 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
		2. Install piping adjacent to machine to allow service and maintenance.
		3. Flexible connections in first paragraph below may not be necessary. Verify requirements with Project conditions.
		4. Connect piping to modular indoor air-handling units mounted on vibration isolators with flexible connectors.
		5. Connect condensate drain pans using NPS 1-1/4 (DN 32), Type M copper tubing. Extend to nearest floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
		6. Hot- and Chilled-Water Piping: Comply with applicable requirements in Division 23 Section "Hydronic Piping." Connect to supply and return coil tappings with shutoff or balancing valve and union or flange at each connection.
		7. Refrigerant Piping: Comply with applicable requirements in Division 23 Section "Refrigerant Piping." Connect to supply and return coil tappings with shutoff valve and union or flange at each connection.
		8. Coordinate duct installations and specialty arrangements with schematics on Drawings and with requirements specified in duct and duct accessory Specifications. If Drawings are explicit enough, these requirements may be reduced or omitted.
		9. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connections.
		10. Electrical: Comply with applicable requirements in Division 26 Sections for power wiring, switches, and motor controls.
		11. Ground equipment according to Division 26 Section "Grounding and Bonding."
		12. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
	4. FIELD QUALITY CONTROL
		1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including piping and electrical connections. Report results in writing.
			1. Leak Test: After installation, fill water and steam coils with water and test coils and connections for leaks. Repair leaks and retest until no leaks exist.
			2. Fan Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
			3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
	5. STARTUP SERVICE
		1. Engage a factory-authorized service representative to perform startup service.
		2. Final Checks before Startup: Perform the following:
			1. Verify that shipping, blocking, and bracing are removed.
			2. 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, starters, and disconnect switches.
			3. Perform cleaning and adjusting specified in this Section.
			4. Lubricate bearings, pulleys, belts, and other moving parts with factory-recommended lubricants.
			5. Set outside- and return-air mixing dampers to minimum outside-air setting.
			6. Comb coil fins for parallel orientation.
			7. Install clean filters.
			8. Verify that manual and automatic volume control and fire and smoke dampers in connected duct systems are in fully open position.
		3. Starting procedures for modular indoor air-handling units include the following:
			1. Energize motor; verify proper operation of motor, drive system, and fan wheel. Adjust fan to indicated rpm. Replace motor pulleys as required to achieve design conditions.
			2. Measure and record motor electrical values for voltage and amperage.
			3. Manually operate dampers from fully closed to fully open position and record fan performance.
		4. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for modular indoor air-handling system testing, adjusting, and balancing.
	6. CLEANING
		1. Clean modular indoor air-handling units internally, on completion of installation, according to manufacturer's written instructions. Clean fan interiors to remove foreign material and construction dirt and dust. Vacuum clean fan wheels, cabinets, and coils entering air face.
		2. After completing system installation and testing, adjusting, and balancing modular indoor air-handling and air-distribution systems, clean filter housings and install new filters.
	7. DEMONSTRATION
		1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain modular indoor air-handling units. Refer to Division 1 Section “Closeout Procedures."

END OF SECTION

USPS MPF Specification Last Revised: 10/1/2022