SECTION 236423

AIR-COOLED rOTARY WATER CHILLERS

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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: Packaged, air-cooled, electric-motor-driven, scroll or screw water chillers.
	2. SUBMITTALS
		1. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories.
		2. ARI sound power data
		3. Startup service reports.
		4. Operation and maintenance data.
		5. Warranty.
	3. QUALITY ASSURANCE
		1. AHRI Certification: Certify chiller according to AHRI 550/590 certification program.
		2. AHRI Rating: Rate water chiller performance according to requirements in AHRI 550/590, " Performance Rating of Water Chilling and Heat Pump Water-Heating Packages Using the Vapor Compression Cycle."
		3. ASHRAE Compliance:
2. ASHRAE Standard 15-2016 for safety codes for mechanical refrigeration.
3. ASHRAE Standard 34-2016 for safety classifications of refrigerants based on toxicity and flammability data.
4. ASHRAE Standard 147-2013 for refrigerant leaks, recovery, and handling and storage requirements
	* 1. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2007, Section 6 - "Heating, Ventilating, and Air-Conditioning."
		2. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.
		3. Comply with NFPA 70.
		4. Comply with requirements of UL and UL Canada, and include label by a qualified testing agency showing compliance.
		5. Comply with U.S. EPA Final Rule 21 (40 CFR Part 82 – 81 FR 86778) for acceptability status of substitute refrigerants.
	1. WARRANTY
		1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship within specified period.
			1. Compressor Warranty Period: Five years from date of Substantial Completion.
5. PRODUCTS
	1. PACKAGED AIR-COOLED WATER CHILLERS
		1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
			1. Carrier Global Corporation.
			2. Daikin Applied Americas.
			3. Trane Technologies (includes American Standard brand as manufactured by Trane).
			4. Johnson Controls International.
		2. Description: Factory-assembled and run-tested water chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories.
		3. Fabricate base, frame, and attachment to water chiller components strong enough to resist movement during a seismic event when water chiller base is anchored to field support structure.
		4. Complete sound power and sound pressure data shall be provided that indicates no peaks above 92 dB in the 1K to 8K octave bands for Sound Power, no peaks above 65 dB in the 1K to 8K octave bands for Sound Pressure, and A-weighted values at 100% load not exceeding 98 dBA for Sound Power and 71 dBA Sound Pressure
			1. Provide sound-reduction package consisting of the following as needed to meet the lowest radiated sound:
				1. Ultra low sound condenser fans.
				2. Compressor blankets with sound attenuating properties.
				3. Variable speed compressors.
				4. Hot gas silencers or sound enclosures to limit noise from refrigerant piping.
				5. RIS vibration isolators.
				6. Etc.
		5. Cabinet:
			1. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
			2. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.
			3. Casing: Galvanized steel.
			4. Finish: Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 1000-hour salt-spray test according to ASTM B 117.
			5. Security Package: Provide security grilles with fasteners for additional protection of compressors, evaporator, and condenser coils. Grilles shall be coated for corrosion resistance and shall be removable for service access.
		6. Compressors:
			1. Description: Positive-displacement direct drive with hermetically sealed casing.
			2. Each compressor provided with suction and discharge service valves, crankcase oil heater, and suction strainer.
			3. Operating Speed: Nominal 3600 rpm for 60-Hz applications.
			4. Capacity Control: On-off compressor cycling.
			5. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug, and initial oil charge.
			6. Vibration Isolation: Mount individual compressors on vibration isolators.
		7. Compressor Motors:
			1. Hermetically sealed and cooled by refrigerant suction gas.
			2. High-torque, two-pole induction type with inherent thermal-overload protection on each phase.
		8. Compressor Motor Controllers:
			1. Across the Line: NEMA ICS 2, Class A, full voltage, nonreversing.
		9. Refrigeration:
			1. Refrigerant R-410a or R-134a. Classified as Safety Group A1 according to ASHRAE 34.

a. Note: Effective January 1, 2024, the manufacture and sale of new positive displacement chillers (e.g., reciprocating, scroll, and screw/rotary) utilizing R-410a or R-134a will not be allowed. See Item 2.Comply with U.S. EPA’s Significant New Alternatives Policy (SNAP) program for acceptable substitute refrigerants. As the deadline for phase out approaches, new generation chiller equipment utilizing lower Global Warming Potential (GWP) hydrofluoroolefin (HFO) refrigerants (e.g., R-1234ze) and blends (e.g., R-513a and R-450a) should be considered.

b. Comply with current ASHRAE 15 guidance on the use of “mildly flammable” refrigerants such as R-1234ze that has an ASHRAE 34 rating of A2L.

* + - 1. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
			2. Refrigerant Circuit: Each circuit shall include a thermal-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
			3. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid-line to allow the isolation and storage of the refrigerant charge in the chiller condenser.
		1. Evaporator:
			1. Brazed-plate or shell-and-tube design, as indicated.
			2. Shell and Tube:
				1. Description: Direct-expansion, shell-and-tube design with fluid flowing through the shell and refrigerant flowing through the tubes within the shell.
				2. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code.
				3. Shell Material: Carbon steel.
				4. Shell Heads: Removable carbon-steel heads with multipass baffles designed to ensure positive oil return and located at each end of the tube bundle.
				5. Shell Nozzles: Fluid nozzles located along the side of the shell and terminated with mechanical-coupling end connections for connection to field piping.
				6. Tube Construction: Individually replaceable copper tubes with enhanced fin design, expanded into tube sheets.
			3. Brazed Plate:
				1. Direct-expansion, single-pass, brazed-plate design.
				2. Type 316 stainless-steel construction.
				3. Code Compliance: Tested and stamped according to ASME Boiler and Pressure Vessel Code.
				4. Fluid Nozzles: Terminate with mechanical-coupling end connections for connection to field piping.
			4. Heater: Factory-installed and -wired electric heater with integral controls designed to protect the evaporator to minus 20 deg F.
			5. Remote Mounting: Designed for remote field mounting where indicated. Provide kit for field installation.
		2. Air-Cooled Condenser:
			1. Plate-fin coil with integral subcooling on each circuit, rated at 450 psig.
				1. Construct coils of copper tubes mechanically bonded to aluminum fins.
				2. Coat coils with a baked epoxy heresite corrosion-resistant coating after fabrication. As an alternative, coat coils with ambient air temperature cured, inorganic film structures. Surface treatment shall not act as an insulating barrier to the substrate, which would inhibit or degrade heat transfer coefficients or increase energy consumption of the condenser.
				3. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.
			2. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades, arranged for vertical air discharge. Ultra low sound type.
			3. Fan Motors: Totally enclosed nonventilating (TENV) or totally enclosed air over (TEAO) enclosure, with permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.
			4. Fan Guards: Steel safety guards with corrosion-resistant coating.
		3. Electrical Power:
			1. Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to water chiller.
			2. House in a unit-mounted, NEMA 250,Type 3R enclosure with hinged access door with lock and key or padlock and key.
			3. Wiring shall be numbered and color-coded to match wiring diagram.
			4. Install factory wiring outside of an enclosure in a raceway.
			5. Field power interface shall be to nonfused disconnect switch.
			6. Provide branch power circuit to each motor and to controls with one of the following disconnecting means:
				1. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
				2. NEMA KS 1, heavy-duty, nonfusible switch.
				3. NEMA AB 1, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.
			7. Provide each motor with overcurrent protection.
			8. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.
			9. Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.
			10. Provide power factor correction capacitors to correct power factor to 0.90 at full load.
			11. Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.
				1. Power unit-mounted controls where indicated.
				2. Power unit-mounted, ground fault interrupt (GFI) duplex receptacle.
			12. Control Relays: Auxiliary and adjustable time-delay relays.
			13. Indicate the following for water chiller electrical power supply:
				1. Current, phase to phase, for all three phases.
				2. Voltage, phase to phase and phase to neutral for all three phases.
				3. Three-phase real power (kilowatts).
				4. Three-phase reactive power (kilovolt amperes reactive).
				5. Power factor.
				6. Running log of total power versus time (kilowatt hours).
				7. Fault log, with time and date of each.
		4. Controls:
			1. Stand-alone, microprocessor based.
			2. Enclosure: Share enclosure with electrical power devices or provide a separate enclosure of matching construction.
			3. Operator Interface: Keypad or pressure-sensitive touch screen. Multiple-character, backlit, liquid-crystal display or light-emitting diodes. Display the following:
				1. Date and time.
				2. Operating or alarm status.
				3. Operating hours.
				4. Outside-air temperature if required for chilled-water reset.
				5. Temperature and pressure of operating set points.
				6. Entering and leaving temperatures of chilled water.
				7. Refrigerant pressures in evaporator and condenser.
				8. Saturation temperature in evaporator and condenser.
				9. No cooling load condition.
				10. Elapsed time meter (compressor run status).
				11. Pump status.
				12. Antirecycling timer status.
				13. Percent of maximum motor amperage.
				14. Current-limit set point.
				15. Number of compressor starts.
			4. Control Functions:
				1. Manual or automatic startup and shutdown time schedule.
				2. Entering and leaving chilled-water temperatures, control set points, and motor load limit. Chilled-water leaving temperature shall be reset based on [return-water] [outside-air] [space] temperature.
				3. Current limit and demand limit.
				4. External water chiller emergency stop.
				5. Antirecycling timer.
				6. Automatic lead-lag switching.
			5. Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:
				1. Low evaporator pressure or high condenser pressure.
				2. Low chilled-water temperature.
				3. Refrigerant high pressure.
				4. High or low oil pressure.
				5. High oil temperature.
				6. Loss of chilled-water flow.
				7. Control device failure.
		5. Insulation:
			1. Material: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type I, for tubular materials and Type II, for sheet materials.
			2. Thickness: 3/4 inch and K=0.28.
			3. Factory-applied insulation over cold surfaces of water chiller components.
				1. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.
			4. Apply protective coating to exposed surfaces of insulation.
		6. Accessories:
			1. Factory-furnished, chilled-water flow switches for field installation.
			2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.
			3. Factory-furnished neoprene isolators for field installation.
		7. Capacities and Characteristics:
			1. As per Scheduled characteristics
	1. SOURCE QUALITY CONTROL
		1. Perform functional test of water chillers before shipping.
		2. Factory test and inspect evaporator according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.
		3. For water chillers located outdoors, rate sound power level according to ARI 370 procedure.
1. EXECUTION
	1. WATER CHILLER INSTALLATION
		1. Install water chillers on support structure indicated.
		2. Equipment Mounting: Install water chiller on concrete bases using elastomeric pads. Comply with requirements in Division 03 Section "Cast-in-Place Concrete"
			1. Minimum Deflection: 1/4 inch
		3. Maintain manufacturer's recommended clearances for service and maintenance.
		4. Charge water chiller with refrigerant if not factory charged and fill with oil if not factory installed.
		5. Install separate devices furnished by manufacturer and not factory installed.
	2. CONNECTIONS
		1. Comply with requirements in Division 23 Section "Hydronic Piping" Drawings indicate general arrangement of piping, fittings, and specialties.
		2. Install piping adjacent to chiller to allow service and maintenance.
		3. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve. Make connections to water chiller with a union, flange, or mechanical coupling.
		4. Connect each drain connection with a union and drain pipe and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection if required.
	3. STARTUP SERVICE
		1. Engage a factory-authorized service representative to perform startup service.
		2. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.
		3. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
			1. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
			2. Verify that pumps are installed and functional.
			3. Verify that thermometers and gages are installed.
			4. Operate water chiller for run-in period.
			5. Check bearing lubrication and oil levels.
			6. Verify proper motor rotation.
			7. Verify static deflection of vibration isolators, including deflection during water chiller startup and shutdown.
			8. Verify and record performance of chilled-water flow and low-temperature interlocks.
			9. Verify and record performance of water chiller protection devices.
			10. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.
		4. Prepare a written startup report that records results of tests and inspections.

END OF SECTION

USPS MPF Specification Last Revised: 10/1/2022