

**SECTION 23 64 00
PACKAGED WATER CHILLERS**

SPEC WRITER NOTES:

1. Use this section only for NCA projects.
2. Delete between //----// if not applicable to project. Also delete any other item or paragraph not applicable in the section and renumber the paragraphs.
3. Refer to latest VA Handbook H-18-8, "Seismic Design Requirements". Provide seismic restraints for refrigeration equipment:
 - a. In new buildings where moderate low, moderate high and very high seismicities are shown.
 - b. In existing buildings where moderate high and very high seismicities are shown.
4. The spec writer shall review the Physical Security Design Manual for VA Facilities to determine and include any Life Safety requirements called out.
5. For seismic restraints requirements, coordinate with Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT and Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.
6. Show input/output points for chillers on control drawings.
7. Make sure the noise level for outdoor units is in compliance with local ordinance.

DESIGNER NOTE: Coordinate work under this section with the following VA Standard detail:

1. 23 64 00-01.dwg Air Cooled Chiller - Piping Connections

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Scroll air-cooled chillers with complete accessories.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. //Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.//
- D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- E. Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT.
- F. Section 23 21 23, HYDRONIC PUMPS

- G. Section 23 21 13, HYDRONIC PIPING.
- H. Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC.
- I. Section 26 29 11, LOW-VOLTAGE MOTOR STARTERS.

1.3 DEFINITION

- A. BACnet: Building Automation Control Network Protocol, ASHRAE Standard 135.

1.4 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALITY ASSURANCE, in Section 23 05 11, COMMON WORK RESULTS FOR HVAC.
- B. Refer to PART 3 herein after and Section 01 00 00, GENERAL REQUIREMENTS for test performance.
- C. Comply with ARI requirements for testing and certification of the chillers.

SPEC WRITER NOTES: Verify the
compressor/motor warranty with the
manufacturers of the equipment being
specified and edit the following
accordingly.

- D. Refer to paragraph, WARRANTY, Section 01 00 00 GENERAL REQUIREMENTS
- E. Refer to OSHA 29 CFR 1910.95(a) and (b) for Occupational Noise Exposure Standard.
- F. Minimum performance efficiency per ASHRAE 90.1 and Federal Energy Management Program.

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. American Refrigeration Institute (ARI):
550/590-98 Standard for Water Chilling Packages Using the
Vapor Compression Cycle
- C. American Society of Heating, Refrigerating, and Air-Conditioning
Engineers (ASHRAE):
34-2007 Designation and Classification of Refrigerants
90.1-2007 Energy Standard for Buildings Except Low-Rise
Residential Buildings
- D. American Society of Mechanical Engineers (ASME):
2007 ASME Boiler and Pressure Vessel Code, Section
VIII, "Rules for Constructive Pressure Vessels"
- E. American Society of Testing Materials (ASTM):
C534/C534M-08 Preformed, Flexible Elastomeric Cellular Thermal
Insulation in Sheet and Tubular Form
C612-04e1 Mineral-fiber Block and Board Thermal Insulation

- F. National Electrical Manufacturing Association (NEMA):
NEMA 250-2008 Enclosures for Electrical Equipment (1000 Volts
Maximum)
- G. National Fire Protection Association (NFPA):
70-08 National Electrical Code
- H. Underwriters Laboratories, Inc. (UL):
UL 1995 Heating and Cooling Equipment

1.6 SUBMITTALS

- A. Submit in accordance with Specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

SPEC WRITER NOTES: There could be more than one type of chillers required for the project. Edit paragraph B and associated subparagraphs to suit project requirements in the chiller selection.

- B. Manufacturer's Literature and Data.
 - 1. Scroll water chillers, including motor starters, control panels, and vibration isolators, data shall include the following:
 - a. Rated capacity.
 - b. Pressure drop.
 - c. Efficiency at full load and part load without applying any tolerance indicated in the ARI 550/590-98 Standard.
 - d. Refrigerant
 - e. Condenser Fan performance.
 - f. Accessories.
 - g. Installation instructions.
 - h. Start up procedures.
 - i. Wiring diagrams, including factory installed and field installed wiring.
 - j. Noise data report. Manufacturer shall provide noise ratings. Noise warning labels shall be posted on equipment.

- C. Maintenance and operating manuals for each piece of equipment in accordance with Section 01 00 00, GENERAL REQUIREMENTS.

SPEC WRITER NOTES: Show seismic restraints for Refrigeration Equipment in accordance with Note No. 2 under SPEC WRITER NOTES (GENERAL). Delete the following paragraph if the chiller(s) is located outside the seismic zone.

- D. //Provide seismic restraints for refrigeration equipment to withstand seismic forces. //

PART 2 - PRODUCTS**2.1 ROTARY-SCREW, AND SCROLL WATER CHILLERS**

- A. General: Factory assembled and tested, rotary-screw, or scroll water chillers, complete with air-cooler condenser, compressors, motor, starters and controls mounted on a welded steel base. The chiller unit shall consist of two compressors minimum, but not more than eight, mounted on a single welded steel base. Where compressors are paralleled, not more than two shall be interconnected and not less than two independent refrigerant circuits shall be provided. Chiller shall be capable of operating with any of the refrigerants HFC-134a, HFC-407c, or HFC-410a.
- B. Applicable Standard: Chillers shall be rated and certified according to ARI 550/590, and shall be stamped in compliance with ARI certification.

SPEC WRITER NOTES: Verify with the manufacturers minimum range of capacity modulation available for the equipment specified.

- C. Compressor (Rotary-Screw Type): Positive-displacement oil injected type, direct drive, cast-iron casing, precision-machined for minimum clearance about periphery of rotors. Lubrication system shall provide oil at proper temperature to all moving parts. Capacity control shall be by means of single slide valve to modulate the capacity from 100 to 20// 25// 30// percent of full unit rated capacity without unstable compressor operation. The slide valve shall be hydraulically operated upon the actuation of temperature or pressure sensor. Minimum efficiency of 1.23 full load kw/ton and 0.98 Integrated Part Load Value kw/ton.
- D. Compressor (Scroll Type): Three dimensional, positive-displacement, hermetically sealed design, with suction and discharge valves, crankcase oil heater and suction strainer. Compressor shall be mounted on vibration isolators. Rotating parts shall be factory balanced. Lubrication system shall consist of reversible, positive displacement pump, strainer, oil level sight glass, and oil charging valve. Capacity control shall be by on-off compressor cycling of single and multiple compressors. Minimum efficiency of 1.23 full load kw/ton and 0.86 Integrated Part Load Value kw/ton.

SPEC WRITER NOTES: Verify with the manufacturers for availability of hot gas muffler for the equipment specified.

- E. Refrigerants Circuit: Each circuit shall include an expansion valve, refrigerant charging connections, compressor suction and discharge

- shutoff valves, replaceable-core filter drier, sight glass with moisture indicator, liquid-line solenoid valve and insulated suction line.
- F. Refrigerant and Oil: Sufficient volume of dehydrated refrigerant and lubricating oil shall be provided to permit maximum unit capacity operation before and during tests. Replace refrigerant charge lost during the warranty period, due to equipment failure, without cost to the Government.
- G. Condenser: Air-cooled condenser coils shall have aluminum fins mechanically bonded to copper tubing. Condenser shall have integral subcooling circuit. Direct drive vertical discharge condenser fans with permanently lubricated ball bearings and external thermal overload protection. //Include factory applied anti-corrosive treatment on the condenser fins, for corrosive environments.//
- H. Refrigerant Receiver: Provide a liquid receiver for chiller units when system refrigerant charge exceeds 80 percent of condenser refrigerant volume. Liquid receivers shall be horizontal-type, designed, fitted, and rated in conformance with ARI 495-1999(R2002). Receiver shall be constructed and tested in conformance with Section VIII D1 of the ASME Boiler and Pressure Vessel Code. Each receiver shall have a storage capacity not less than 20 percent in excess of that required for fully charged system. Each receiver shall be equipped with inlet, outlet drop pipes, drain plug, purging valve, and relief devices as required by ASHRAE Standard 15.
- I. Controls: Chiller shall be furnished with unit mounted, stand-alone, microprocessor-based controls in NEMA 4 enclosure, hinged and lockable, factory wired with a single point power connection and separate control circuit. The control panel shall provide chiller operation, including monitoring of sensors and actuators, and shall be furnished with light emitting diodes or liquid-crystal display keypad.

SPEC WRITER NOTES: Some display functions listed below are chiller specific. Verify with manufacturers all of the control functions as well as edit the following lists accordingly.

1. Following shall display as a minimum on the panel:
 - a. Water and air temperatures.
 - b. Refrigerant pressures and temperatures.
 - c. Flow switch status.
 - d. Thermal expansion valve position.
 - e. Compressor status and run time.
2. Control Functions:
 - a. Manual or automatic startup and shutdown time schedule.

- b. Entering and leaving chilled water temperature and control set points.
- 3. Safety Functions: Following conditions shall shut down the chiller and require manual reset to start:
 - a. Low evaporator refrigerant temperature and pressure.
 - b. High condenser refrigerant temperature.
 - c. Critical sensor or detection circuit faults.
 - d. High compressor discharge temperature.
 - e. Electrical distribution faults.
 - f. Emergency stop.
 - g. Loss of evaporator water flow.
- J. The chiller control panel shall provide leaving chilled water temperature reset based on // return water temperature // outdoor air temperature // 4-20 ma or 0-10 VDC signal from DDC//.
- K. // Provide contacts for remote start/stop from DDC//.
- L. //Pump package shall include two integral pumps with variable frequency drives, air separators with vents, expansion tank, drain valve and isolation valves.//
- M. Motor: Refer to Section 23 05 11, COMMON WORK RESULTS FOR HVAC. Compressor motor furnished with the chiller shall be in accordance with the chiller manufacturer and the electrical specification Section 23 05 12, GENERAL MOTOR REQUIREMENTS FOR HVAC. Starting torque of motors shall be suitable for driven machines.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, piping and electrical to verify actual locations and sizes before chiller installation and other conditions that might effect chiller performance, maintenance, and operation.
- B. Equipment locations shown on drawings are approximate. Determine exact locations before proceeding with installation.

3.2 EQUIPMENT INSTALLATION

- A. Install chiller on concrete base with isolation pads or vibration isolators.
 - 1. Vibration isolator types and installation requirements are specified in Section 23 05 41, NOISE AND VIBRATION CONTROL FOR HVAC PIPING AND EQUIPMENT
 - 2. Anchor chiller to concrete base according to manufacturer's written instructions // and for seismic restraint on vibration isolators//.
 - 3. Charge the chiller with refrigerant, if not factory charged.

4. Install accessories and any other equipment furnished loose by the manufacturer, including //remote starter, remote control panel, and// remote flow switches, according to the manufacturer written instructions and electrical requirements.
 5. Chillers shall be installed in a manner as to provide easy access for and removal of compressor and motors etc.
- B. Install thermometers and gages as recommended by the manufacturer and/or as shown on drawings.
- C. Piping Connections:
1. Make piping connections to the chiller for chilled water and other connections as necessary for proper operation and maintenance of the equipment.
 2. Make equipment connections with flanges and couplings for easy removal and replacement of equipment.

3.3 STARTUP AND TESTING

- A. Engage manufacturer's factory-trained representative to perform startup and testing service. Test procedure as per ARI 550/590 and manufacturer's instructions.
- B. Inspect, equipment installation, including field-assembled components, and piping and electrical connections.
- C. After complete installation startup checks, according to the manufacturer's written instructions, do the following to demonstrate to the RE/COTR that the equipment operates and performs as intended.
1. Check refrigerant charge is sufficient and chiller has been tested for refrigerant leak.
 2. Check bearing lubrication and oil levels.
 3. Verify proper motor rotation.
 4. Verify pumps associated with chillers are installed and operational.
 5. Verify thermometers and gages are installed.
 6. Operate chiller for run-in-period in accordance with the manufacturer's instruction and observe its performance.
 7. Check and record refrigerant pressure, water flow, water temperature, and power consumption of the chiller.
 8. Test and adjust all controls and safeties. Replace or correct all malfunctioning controls, safeties and equipment as soon as possible to avoid any delay in the use of the equipment.
 9. Prepare a written report outlining the results of tests and inspections, and submit it to the RE/COTR.

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