

SECTION 23 64 23
MULTISTACK AIR-COOLED PACKAGED WATER CHILLER
MODEL (ASP- 015K, 020K, 030K, 060K) GUIDE SPECIFICATION

PART 1 GENERAL

1.01 SUMMARY

Section includes design, performance criteria, refrigerants, controls, and installation requirements for Multistack air cooled centrifugal chillers.

1.02 REFERENCES

Comply with the following codes and standards: (as adopted by each individual State)

ARI 550/590

ANSI/ASHRAE 15

ASME Section VIII

NEC

ETL

CSA

OSHA

1.03 SUBMITTALS

Submittals shall include the following:

A. Chiller dimensional drawings with elevation overview. Drawings to include required service clearances, location of all field installed piping and electrical connections.

B. A summary of all auxiliary utility requirements for normal system operation required. Auxiliary utility requirements include: electrical, water, and air. Summary of auxiliary equipment shall include quantity and quality of each specific auxiliary utility required.

C. Chiller Control documentation to include: Chiller control hardware layout, wiring diagrams depicting factory installed wiring, field installed wiring with points of connection, and points of connection for BAS control/interface points.

D. Sequence of operation depicting overview of control logic used.

E. Installation and Operating Manuals.

F. Manufacturer certified performance data at full load in addition to either IPLV or NPLV.

1.04 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with the codes and standards as defined in Section 1.02 titled REFERENCES

B. Chiller is required to be run tested for functionality at manufacturer's facility prior to shipment. Report available upon request.

1.05 DELIVERY and HANDLING

A. Chiller(s) shall be delivered to the job site completely assembled and charged with complete refrigerant charge.

B. Installing contractor to comply with the manufacturer's instructions for transporting, rigging, and assembly of chiller.

1.06 WARRANTY AND START-UP

A. Manufacturer shall provide full parts-only warranty coverage for entire chiller for a period of one year. All parts shall be warranted against defects in material and workmanship. Similar parts-only coverage shall be provided for the chillers compressors for a period of five years. The warranty period shall commence either on the equipment start-up date or six months after shipment, whichever is earlier.

B. Manufacturer shall provide the services of a Factory Authorized Service Engineer to provide complete start-up supervision. After start-up a Manufacturer's Representative shall provide a minimum of 8-hours of operator training to the owner's designated representative(s).

1.07 MAINTENANCE

A. Maintenance of the chiller shall be the sole responsibility of the owner.

PART 2 PRODUCTS

2.01 Operating Conditions

A. Provide outdoor packaged air-cooled liquid chiller with the capacity as scheduled on drawings at job site elevation listed in Section 15050.

B. Chiller shall be designed to operate using **R-454B Refrigerant**.

C. Chiller shall be designed for parallel evaporator water flow.

D. The liquid to be chilled will be water containing corrosion inhibitors and antifreeze solution as required.

E. Chiller shall be designed to operate using **460 / 230 / 208/ 575** volt, 3 phase, **(60 Hz) (50 Hz)** electrical power supply.

2.02 Outdoor Packaged Air-Cooled Chiller

A. Approved manufacturer is AIRSTACK.

B. System Description: Chiller shall incorporate Scroll type compressors and can consist of multiple (15, 20, 30, 60)-ton modules. Each refrigerant circuit shall consist of an individual compressor set, common single circuit evaporator, single circuited condenser, electronic expansion valve (thermal expansion valve not acceptable), liquid line solenoid valve, filter drier, fin and tube condenser, and control system. Each circuit shall be constructed to be independent of other circuits from a refrigeration and electrical stand-point. The multi-circuit chiller (requires multiple modules) must be able to produce chilled water even in the event of a failure of one or more refrigerant circuits. Circuits shall contain R-454B refrigerant.

B. General

1. Chiller Modules shall be ETL listed in accordance with UL Standard 1995, CSA certified per Standard C22.2#236.
2. Chiller modules shall be AHRI certified.
3. Modules shall ship wired and charged with refrigerant. All modules shall be factory run tested prior to shipment on an AHRI certified or 3rd party verified test stand.
4. Compressors, heat exchangers, condenser fans, piping and controls shall be mounted on a heavy gauge, powder coated steel frame. Electrical controls, contactors, and relays for each module shall be mounted within that module. Module shall be provided within a steel enclosure suitable for outdoor use. Exposed steel surfaces shall be provided with a powder coat paint finish.
5. **OPTIONAL: 15, 20 and 30 ton modules shall be IBC Certified per IBC 2012, AC156.** Proof of seismic certification shall be furnished upon request.

D. Chilled Water Mains: Each module shall include supply and return mains for chilled water. Cut grooved end connections are provided for interconnection to (six, four, eight)-inch standard (6.625", 4.5", 8.625") outside diameter) piping with grooved type couplings. Rolled grooved shall be unacceptable.

E. Evaporators: Each evaporator shall be a brazed plate heat exchanger constructed of 316 stainless steel; designed, tested, and stamped in accordance with UL 1995 code for 650 psig working pressure. The evaporator heat exchanger shall not be mounted above the compressor, to eliminate the effect of migration of refrigerant to the cold evaporator with consequent liquid slugging on start-up.

F. Compressor: Each module shall contain two hermetic scroll compressors in a tandem piping arrangement mounted to the module with rubber-in-shear isolators. Each system also includes high discharge pressure and low suction pressure safety cut-outs.

G. **Optional: additional VFDs NOT needed** if *ECM Fans* -
Condenser Fans: Each module shall contain dual condenser fans for each refrigerant circuit. These fans shall be multi-blade vane-axial type made of plastic composite material for quiet operation. Fans shall be direct drive at a maximum RPM of 1,150. Fan motors shall all be pressure controlled and suitable for outdoor use. Condenser fan variable frequency drives (VFD's) are standard on the (ASP30K) and (ASP60K).

OPTIONAL: (VFD's integral no additional needed – if *ECM Fans*) VFDs shall be provided on the (ASP15K) and the (ASP20K).

OPTIONAL: *ECM Fans* - VFD's integral in ECMs, **additional VFDs NOT needed**

Blades are aluminum construction owlet design 7-blade axial fan with integral EC motor (direct drives with external VFD driven motors are not acceptable). Efficiency exceeds criteria set out in the ErP 2015 directive. Individual fans are factory tested. Encapsulation required. Encapsulation is a process of filling a complete electronic assembly with a solid compound for resistance to shock and vibration, and for exclusion of moisture and corrosive agents. Sound pressure reductions at 30 feet, as compared to standard fan option, ranges from 3-6 dBA.

H. Central Control System

1. Scheduling of the various compressors shall be performed by a microprocessor based control system (Master Controller). A new lead compressor is selected every 24 hours to assure even distribution of compressor run time.

2. The Master Controller shall monitor and report the following on each refrigeration system:

- a. Discharge Pressure Fault
- b. Suction Pressure Fault
- c. Compressor Winding Temperature

- d. Suction Temperature
 - e. Evaporator Leaving Chilled Water Temp.
3. The Master Controller shall be powered by the chillers single point power connection and shall monitor and report the following system parameters:
 - a. Chilled Water Entering and Leaving Temperature
 - b. Discharge Refrigerant Temperature
 - c. Chilled Water Flow
 4. An out of tolerance indication from these controls or sensors shall cause a “fault” indication at the Master Controller and shutdown of that compressor with the transfer of load requirements to the next available compressor. In the case of a System Fault the entire chiller will be shut down. When a fault occurs, the Master Controller shall record conditions at the time of the fault and store the data for recall. This information shall be capable of being recalled through the keypad of the Master Controller and displayed on the Master Controller’s 2 line by 40 character back-lit LCD. A history of faults shall be maintained including date and time of day of each fault (up to the last 20 occurrences).
 5. Individual monitoring of leaving chilled water temperatures from each refrigeration system shall be programmed to protect against freeze-up.
 6. The control system shall monitor entering and leaving chilled water temperatures to determine system load and select the number of compressor circuits required to operate. Response times and set points shall be adjustable. The system shall provide for variable time between compressor sequencing and temperature sensing, so as to optimize the chiller performance to different existing building loads.
 7. **OPTIONAL: INTEROPERABILITY WEB PORTAL**
The Chiller shall be capable of interfacing to a building automation system. Interface shall be accomplished using an Interoperability Web Portal and shall be capable of communication over **BACnet, MS/TP; BACnet, IP; BACnet, TCP/IP; BACnet, Ethernet; Modbus. LON, LONWorks.**
 8. **OPTIONAL: FAIL TO RUN MODE (FRM)**
Chiller shall be capable of operation in the event that the Master Controller has lost communication. FRM provides

the ability to switch the chiller into manual mode automatically keeping the chiller online until a replacement Master Controller can be provided. Included is a power phase monitor and IFM flow switch per module.

- I. Chiller shall have external inputs and outputs to be compatible with the building management system to include Remote Start/Stop capability and Cooling Alarm output.
- J. Each refrigerant circuit shall include all refrigerant specialties to provide reliable operation down to 40°F Ambient.
- K. **OPTIONAL: LOW AMBIENT TO -20°F**
Chiller shall incorporate appropriate refrigerant specialties including a properly sized refrigerant receiver and flooded head pressure control valves for operation to -20°F. This option includes VFD driven condenser fan motors.
- L. **OPTIONAL SINGLE-POINT power (OPTIONAL: Hoffman Box / Dual POINT Power / OPTIONAL: DIRECT CONNECT TWO POINTS POWER CONNECTION at a 5,000 amp SCCR.** This will include pre-engineered wiring for field installation and connection to a factory mounted chiller junction box. Junction box shall include branch circuit protection for each module and provide a single point of connection to building power.
 - a. **OPTIONAL—SCCR greater than 5,000 amps- kA SCCR: Contact factory.** Depending on voltage and module size SCCR up to 85,000 may be available. Some higher SCCR will require fused protection as opposed to the standard isolation circuit breakers.
- M. **OPTIONAL: FREE COOLING MODULE**
Provide Free Cooling modules in quantity and capacity as indicated on drawings and schedules. Free Cooling Modules shall interconnect through the common chiller header system and require no additional water connections.

Free Cooling Modules shall include glycol cooling coils, temperature controlled fans and an automatic 3-way bypass valve to eliminate the need for mechanical cooling under low ambient conditions. Module shall be completely factory assembled and tested before shipment.

The unit control system shall provide automatic changeover between Mechanical Cooling, Pre-Cooling and Free-Cooling modes with the following field adjustable set points:

1. **Changeover Set point** (Ambient Air Temperature): Below this set point chiller will be in free cooling mode. If adequate cooling cannot be accomplished through free cooling coils, mechanical cooling will be staged up to meet building load requirements.
 2. **Leaving Glycol Temperature Set point**: This setting will provide two-stage thermostatic control of the unit fans to meet indicated setting for chiller leaving glycol temperature.
 3. **Leaving Glycol Low Temperature Lock-out**: At any time if the leaving glycol drops below this field adjustable setting, free cooling will be suspended and system glycol will be diverted around the glycol cooling coils. This will prevent over cooling of the chilled water system due to ambient wind blowing through the glycol coils under cold winter conditions.
- N. ***OPTIONAL: ISOLATION VALVES - CHILLED WATER***
Manual isolation valves shall be installed between the heat exchanger and water supply mains for heat exchanger isolation.
- O. ***OPTIONAL: VARIABLE FLOW OPERATION - CHILLED WATER***
Butterfly type isolation valves shall incorporate appropriate accessories and controls to allow the chiller to operate efficiently in a variable primary flow system. Motorized valve per module shall operate for variable flow.

Optional: NEMA 4X rated valves with easily visible position indicators and internal thermal motor overload protection. Valves shall be fast acting type with a maximum stroke time (full closed to full open) of 15 seconds.

Optional: COMPRESSOR WRAPS

Wrap is constructed of mass loaded barium with fiberglass inserts. Cover is silicone impregnated fiberglass. Wraps are to be accessible and removable.

- P. ***OPTIONAL: PUMP MODULE WITH MINI GLYCOL FEEDER AND EXPANSION TANK***
Provide a Pump Module of size and capacity indicated on the drawings and schedules. The Pump Module shall be interconnected through the common chiller header system and require no additional water connections. Pump Module will become an integral part of the chiller system.

Pump Module shall incorporate dual in-line centrifugal pumps in a Primary/Standby pumping arrangement. Pump starters and controls shall be provided to enable manual selection of lead pump.

In addition, in the event of a loss-of-flow failure of the chilled water system, the Pump Module controls shall disable the lead pump and automatically start the standby pump. Module shall be completely factory assembled and tested prior to shipment.

System shall include (6 gallon) mini glycol tank with molded-in level gauge, 5" fill/access opening and cover; pump suction hose with inlet strainer and check valve; pressure pump with fuse protection; low fluid level pump cut-out float switch; manual diverter valve for purging air and agitating contents of storage tank; pressure switch and two sets of SPST contacts, each individually adjustable from 8 psig to 18 psig cutout pressure; and liquid filled pressure gauge.

Feeder shall be compatible with glycol solutions of up to 50% concentration. Pump shall be capable of running dry without damage. The second set of contacts in the pressure switch shall be wired to a terminal strip for use as low pressure alarm contacts for remote alarm circuit supplied by others.

Expansion tank shall be welded steel with butyl rubber diaphragm and capable of a maximum operating temperature of 240° F and maximum working pressure of 100 psig. Tank shall be interconnected through the common chiller header system and require no additional water connections. Module shall be completely factory assembled and tested prior to shipment.

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Pump Module shall incorporate dual in-line centrifugal pumps in a Primary/Standby pumping arrangement. Pump starters and controls shall be provided to enable manual selection of lead pump. In addition, in the event of a loss-of-flow failure of the chilled water system, the Pump Module controls shall disable the

lead pump and automatically start the standby pump. Module shall be completely factory assembled and tested prior to shipment.

R. ***OPTIONAL: GLYCOL FEEDER MODULE***

Optional Glycol Feeder and Expansion Tank shall be incorporated into the chiller system through a modular arrangement and interconnect through the common chiller header system requiring no additional water connections.

System shall include a 48 gallon storage/mixing tank with lid and cover; pump suction hose with inlet strainer; pressure pump with thermal cut-out, and integral pressure switch; pre-charged accumulator tank with EPDM diaphragm, manual diverter valve for purging and agitating contents of storage tank, adjustable 5-55 psi pressure regulating valve with pressure gauge, fast fill lever, integral replaceable strainer, built in check valve, and built in shut-off valve. Glycol feeder system shall be compatible with glycol solutions of up to 50% concentration. Pump shall be capable of running dry without damage.

Expansion tank shall be welded steel with butyl rubber diaphragm and capable of a maximum operating temperature of 240° F and maximum working pressure of 100 psig. Tank shall be interconnected through the common chiller header system and require no additional water connections. Module shall be completely factory assembled and tested prior to shipment.

S. ***OPTIONAL: LIFTING FRAME***

Optional six (W6X15) inch I-beam painted steel frame will be provided with all modules mounted upon it. Typically, all water and wiring connections will be made between the modules at the factory. Depending on chiller length or customer requests, larger I-beams can be furnished.

T. ***OPTIONAL: LIFTING FRAME w/ HEADER PASSAGE and ISOLATION VALVES FOR TOTAL ACCESS DESIGN***

Optional six (W6X15) inch I-beam painted steel frame will be provided with a header passage down the center for highly critical applications. External piping paired with Isolation Valves per module provides the advantage of all modules being completely removable from the array for total access and serviceability. Chiller headers would not have to be drained for servicing one module or for adding on future modules.

U. ***OPTIONAL: IFM flow switch per module.*** Integral to each module and powered by the module for individual module proof of

flow and flow safety. Modules without independent IFM switches per module are not acceptable alternates.

2.03 SAFETIES, CONTROLS AND OPERATION

A. The chiller safety controls shall be provided (minimum) as follows:

1. Low evaporator refrigerant pressure
2. Loss of water flow through the evaporator
3. High condenser refrigerant pressure
4. High compressor motor temperature
5. Low suction gas temperature
6. Low leaving evaporator water temperature

B. Failure of chiller to start or chiller shutdown due to any of the above safety cutouts shall be annunciated by display of the appropriate diagnostic description at the unit control panel. This annunciation will be in plain English. Alphanumeric codes shall be unacceptable.

C. The chiller shall be furnished with a Master Controller as an integral portion of the chiller control circuitry to provide the following functions:

1. Provide automatic chiller shutdown during periods when the load level decreases below the normal operating requirements of the chiller. Upon an increase in load, the chiller shall automatically restart.
2. Provisions for connection to automatically enable the chiller from a remote energy management system.
3. The control panel shall provide alphanumeric display showing all system parameters in the English language with numeric data in English units.

D. Normal Chiller Operation

1. When chiller is enabled, the factory supplied Master Controller modulates the chiller capacity from minimum to maximum as required by building load.
2. The Chiller control system shall respond to Entering Water Temperature and will have an integral reset based on entering water temperature to provide for efficient operation at part-load conditions.

PART 3 INSTALLATION

3.01 PIPING SYSTEM FLUSHING PROCEDURE

- A. Prior to connecting the chiller to the building chilled water loop, the piping shall be flushed with a detergent and hot water (110-130° F) mixture to remove previously accumulated dirt and other organic residue. In old piping systems with heavy encrustation of inorganic materials consult a water treatment specialist for proper passivation and/or removal of these contaminants.
- B. During the flushing a 30 mesh (max.) Y-strainers (or acceptable equivalent) shall be in place in the system piping and examined periodically as necessary to remove collected residue. The use of on board chiller strainers shall not be acceptable. The flushing process shall take no less than 6 hours or until the strainers, when examined after each flushing, are clean. Old systems with heavy encrustation shall be flushed for a minimum of 24 hours and may take as long as 48 hours before the filters run clean. Detergent and acid concentrations shall be used in strict accordance with the respective chemical manufacturer's instructions. After flushing with the detergent and/or dilute acid concentrations the system loop shall be purged with clean water for at least one hour to ensure that all residual cleaning chemicals have been flushed out.
- C. Prior to supplying water to the chiller the Water Treatment Specification shall be consulted for requirements regarding the water quality during chiller operation. The appropriate chiller manufacturer's service literature shall be available to the operator and/or service contractor and consulted for guidelines concerning preventative maintenance and off-season shutdown procedures.

3.02 Water Treatment Requirements

- A. Supply water for the chilled water circuit shall be analyzed and treated by a professional water treatment specialist who is familiar with the operating conditions and materials of construction specified for the chiller's heat exchangers, headers and associated piping. Cycles of concentration shall be controlled such that recirculated water quality for modular chillers using 316 stainless steel brazed plate heat exchangers and carbon steel headers is maintained within the following parameters:

1. pH	Greater than 7 and less than 9
2. Total Dissolved Solids (TDS)	Less than 1000 ppm
3. Hardness as CaCO ₃	30 to 500 ppm
4. Alkalinity as Ca CO ₃	30 to 500 ppm
5. Chlorides	Less than 200 ppm
6. Sulfates	Less than 200 ppm

3.03 Warranty and Start-Up

- A. Manufacturer's Warranty: Manufacturer shall provide full parts-only warranty coverage for entire chiller for a period of one year. All parts shall be warranted against defects in material and workmanship. Similar parts-only coverage shall be provided for the chillers compressors for a period of five years. The warranty period shall commence either on the equipment start-up date or six months after shipment, whichever is earlier.

- B. Manufacturer shall provide the services of a Factory Authorized Service Engineer to provide complete start-up supervision. Factory Authorized Service Engineer shall also be responsible for assembly of the chillers cabinetry package and electrical bus bar system. After start-up a Manufacturer's Representative shall provide a minimum of 8-hours of operator training to the owner's designated representative(s).