



Performance Ratings

Product Type: YVAA - Air-Cooled Chiller

Unit Tags: CH-1

Project Name: **YVAA-400TR**

Unit Tag: **CH-1**

Qty.: **1**

Model: **YVAA0213**

Full Load - Design

PIN

YVAA0213AD	F46BAVSXXX	SAXLXXX60	44X0SXXS20	7X1SXDA2BT	XFXX1XXXXX	XXXEXX		
...5...10	...5...20	...5...30	...5...40	...5...50	...5...60	...5...70	...5...80	...5...90

Unit

Model No.	YVAA0213
Number of Compressors	2
Compressor Type	VSD Screw - Semi Hermetic
Number of Compressor Circuits	2
Capacity Control	10% - 100%
Refrigerant	R-134a

Performance Data

Net Cooling Capacity [tons.R]	210.0
Total Power Input [kW]	239.3
EER [Btu/W.h]	10.53
IPLV.IP [Btu/W.h]	16.21
A-Weighted Sound Power [dB(A)]	102.0

Electrical Data

Nominal Voltage / Voltage Limits	460/3/60.0 / 414V - 508V
Compressor kW (each circuit)	109.4 / 109.8
Compressor RLA (each circuit) [A]	146.8 / 146.8
Fan QTY (each circuit)	6 / 6
Fan FLA (each circuit) [A]	3.3 / 3.3
Min. Circuit Ampacity [A]	373.7
Max. Fuse / CB Rating [A]	500.0
Unit Short Circuit Withstand [kA]	30 kA
Wires Per Phase	2
Wire Range (Lug Size)	#2 - 600 kcmil
Displacement Power Factor	0.95
Control kVA	2.000



Performance Impacting Options

End User Application	Comfort Cooling
Compressor Style	Standard Part Load Efficiency
Condenser Coil	Post-Coated Microchannel Coils (Environment Guard Basic)
Fan	Low Sound Fixed Speed Fans
Sound Attenuation	Standard Factory Sound Kit (Level 0 Reduction)

Weight & Dimensional Data

Shipping Weight [lbs]	13190
Operating Weight [lbs]	13632
Refrigerant Charge [lbs]	176 / 176
Length [in]	291.2
Width [in]	88.3
Height [in]	94.6

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Heat Exchanger Performance

Evaporator		Condenser (Air Cooled)	
Heat Exchanger Type	Hybrid Falling Film	Ambient Air Temperature* [°F]	95.0
Entering Fluid Temperature* [°F]	54.00	Altitude* [ft]	0.00
Leaving Fluid Temperature* [°F]	44.00	Condensing Temperature [°F]	121.51 / 121.72
Flow Rate [USGPM]	502.6	Number of Fans (Circuit 1 / Circuit 2)	6 / 6
Fouling Factor* [h ft ² F/Btu]	0.000100	Total Air Flow [cfm]	150000
Fluid Type*	Water	Total Fan Power [kW]	20.13
Passes*	2		
Pressure Drop [ft H ₂ O]	18.7		
Fluid Volume [USGAL]	48.1		
Evaporating Temperature [°F]	37.86		
Minimum Flow Rate [USGPM]	200.0		
Maximum Flow Rate [USGPM]	790.0		

* Designates user specified input

Certified in accordance with the AHRI Air-Cooled Water-Chilling Packages Using Vapor Compression Cycle Certification Program, which is based on AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI). Certified units may be found in the AHRI Directory at www.ahridirectory.org. Auxiliary components included in total kW - Oil heaters, Chiller controls. Auxiliary power is already included in the compressor and fan power



Part Load Performance (Based on Standard AHRI Unloading)

Percent Load	Ambient [°F]	Capacity [tons.R]	Power Input [kW]	Unit Efficiency [Btu/W.h]
100.0	95.0	210.0	239.3	10.53
75.0	80.0	157.5	133.5	14.16
50.0	65.0	105.0	72.13	17.47
25.0	55.0	52.50	32.88	19.16

Project Name: YVAA-400TR

Unit Tag: CH-1

Qty.: 1

Model: YVAA0213

Sound Power Levels (In Accordance with AHRI 370)

Percent Load	Ambient [°F]	Octave Band Center Frequency [Hz]								LWA
		63	125	250	500	1000	2000	4000	8000	
100.0	95.0	97.0	97.0	98.0	101.0	97.0	92.0	87.0	84.0	102.0
75.0	80.0	97.0	98.0	98.0	97.0	94.0	88.0	84.0	80.0	99.0
50.0	65.0	95.0	95.0	96.0	96.0	92.0	87.0	83.0	78.0	97.0
25.0	55.0	92.0	93.0	93.0	93.0	89.0	84.0	80.0	75.0	94.0

Note: Unit is equipped with Low Sound Fixed Speed Fans.

Measurement of sound pressure used to obtain the sound power data presented is based on AHRI-370.

Air-cooled chillers are rated in terms of sound power not sound pressure. Johnson Controls provides estimates of sound pressure, but this is not the rating metric.

For an air-cooled chiller, sound pressure calculated from sound power varies depending on how the chiller is assumed to behave, i.e. the radiation model. In other words, determining sound pressure from sound power requires making assumptions that result in different answers at a given distance from the chiller. The environment also influences sound pressure in the field installation. Sound pressure estimation radiation models pertaining to air-cooled chillers include the 'traditional' hemispherical model, parallelepiped model and equivalent hemispherical model.

Regarding sound power, Johnson Controls references tolerance limits based on ASHRAE guidelines. These are +/- 6dB in the 63Hz octave band, +/- 4dB in all other octave bands and +/- 3dB for the overall dBA.

Tolerance limits are based on uncertainties associated with:

1. Measurement Test Procedure
2. Repeatability
3. Production / Manufacturing Variability

Standard deviation associated with air-cooled chiller sound data is a measure of spread i.e. it indicates the range of probability of sound levels. Note that for operating conditions other than AHRI's Standard Rating Condition, higher levels of uncertainty can be expected.

Lead times for factory performance testing depend on test laboratory availability. Please confirm with Johnson Controls Customer Service.

Performance at AHRI Conditions

Evaporator		Condenser	
EFT [°F]	54.00	Ambient Temp. [°F]	95.0
LFT [°F]	44.00	Altitude [ft]	0.00
Flow Rate [USGPM]	502.6	Performance	
Pressure Drop [ft H ₂ O]	18.7	EER [Btu/W.h]	10.53
Fluid Type	Water	IPLV.IP [Btu/W.h]	16.21
Fouling Factor [h ft ² F/Btu]	0.000100	Net Cooling Capacity [tons.R]	210.0
Fluid Volume [USGAL]	48.1		

Note: Unit rated at design condition capacity.

Part Load Performance (Based on AHRI 550/590 - 2023 (IP))

Percent Load	Ambient [°F]	Capacity [tons.R]	Power Input [kW]	Unit Efficiency [Btu/W.h]
100.0	95.0	210.0	239.3	10.53
75.0	80.0	157.5	133.5	14.16
50.0	65.0	105.0	72.13	17.47
25.0	55.0	52.50	32.88	19.16



Performance Report

Performance Specification

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Project Name: **YVAA-400TR**

Unit Tag: **CH-1**

Qty.: **1**

Model: **YVAA0213**

Notes:

Country of Origin: Mexico

Min DSD (Factory Purpose/Use Only): 80.0 psig

Displacement Power Factor refers to compressor only. Unit Power Factor depends on fan option selected. Calculated value is available by request.

Use Copper Conductors only

Minimum and maximum evaporator flow information are for full load ratings with Water.

Evaporator Passes: 2, Condenser Type: T, Fan Type: F

Compliant with ASHRAE 90.1 - 2010, 2013, 2016, 2019, 2022.

The product image shown is for illustrative purposes only and is not representative of selected options.

Unit Drawings

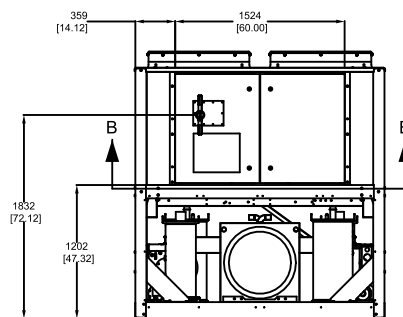
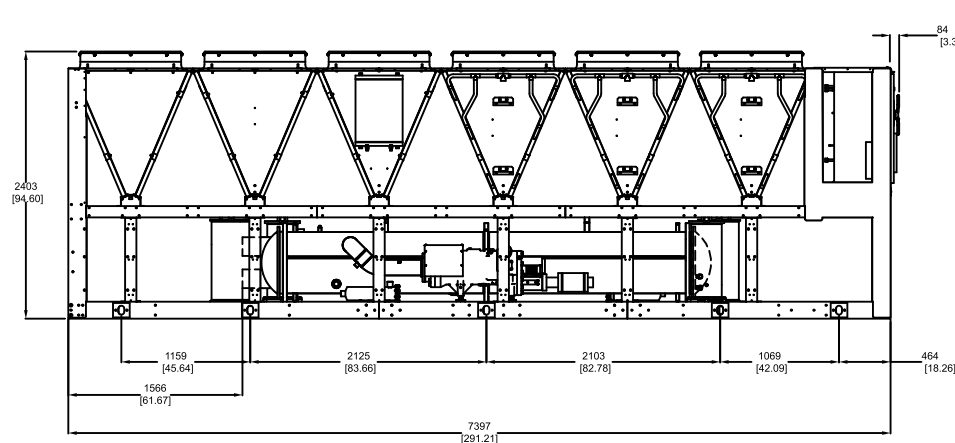
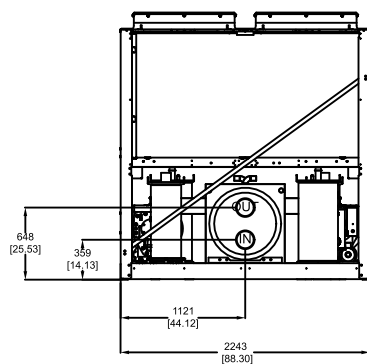
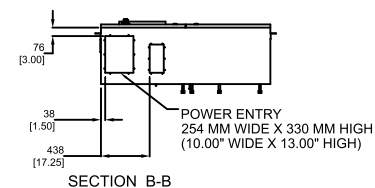
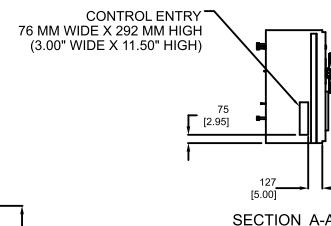
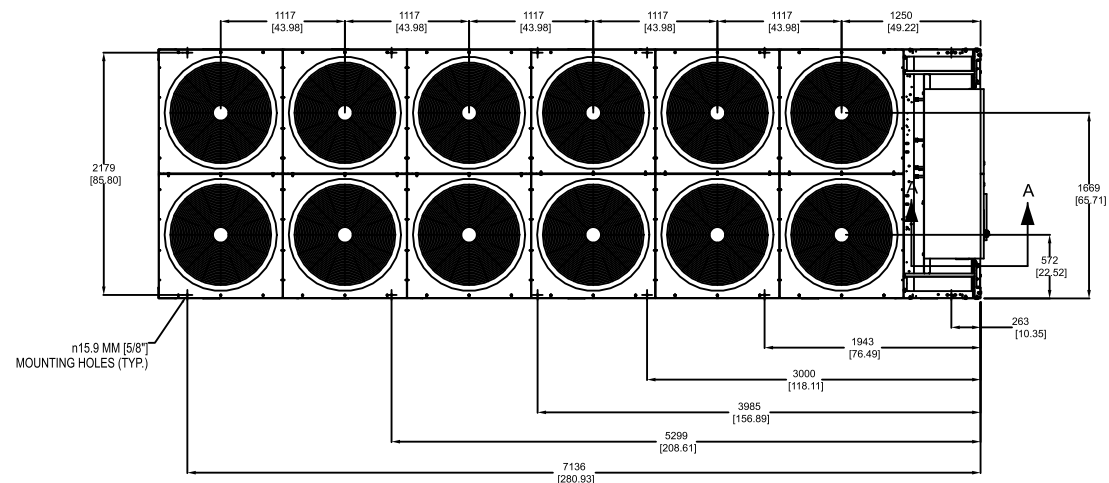
Product Type: YVAA - Air-Cooled Chiller

Unit Tags: CH-1

1. PLACEMENT ON A LEVEL SURFACE
FREE OF OBSTRUCTIONS (INCLUDING
SNOW, FOR WINTER OPERATION) OR
AIR RECIRCULATION ENSURES RATED
PERFORMANCE, RELIABLE OPERATION
AND EASE OF MAINTENANCE. SITE
RESTRICTIONS MAY COMPROMISE
MINIMUM CLEARANCES INDICATED
BELOW, RESULTING IN UNPREDICTABLE
AIR FLOW PATTERNS AND POSSIBLE
DIMINISHED PERFORMANCE. YORK'S UNIT
CONTROLS WILL OPTIMIZE OPERATION
WITHOUT NUISANCE HIGH PRESSURE
SAFETY CUTOUT; HOWEVER, THE SYSTEM
DESIGNER MUST CONSIDER POTENTIAL
PERFORMANCE DEGRADATION. ACCESS TO
THE UNIT CONTROL CENTER ASSUMES
THE UNIT IS NO HIGHER THAN ON
SPRING ISOLATORS. RECOMMENDED
MINIMUM CLEARANCES: SIDE TO WALL - 6';
REAR TO WALL - 6'; CONTROL PANEL
TO WALL - 4'; TOP - NO
OBSTRUCTIONS ALLOWED; DISTANCE
BETWEEN ADJACENT UNITS - 10';
NO MORE THAN ONE ADJACENT WALL
MAY BE HIGHER THAN THE UNIT.
2. WEIGHT AND CENTER OF GRAVITY -
REFER TO AVM REPORT.
3. WATER CONNECTIONS ARE GROOVED
FOR VACUICUL CONNECTION.
4. DIMENSIONS IN mm [INCHES].

EVAPORATOR INLET LEFT END 2 PASS 6 DIA. (150Psig DWP)
EVAPORATOR OUTLET LEFT END 2 PASS 6 DIA. (150Psig DWP)

Victaulic Grooved Nozzles (per ANSI / AWWA C-606)



YORK YVAA Air Cooled Screw Chiller
MODEL: YVAA 0213
NOT FOR CONSTRUCTION

Sold To:	
Cust Purch Order#:	6
Contract#:	
UNIT TAG:	CH-1





YVAA Air-Cooled VSD Screw Chiller

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AVM Report

Project Name: YVAA-400TR

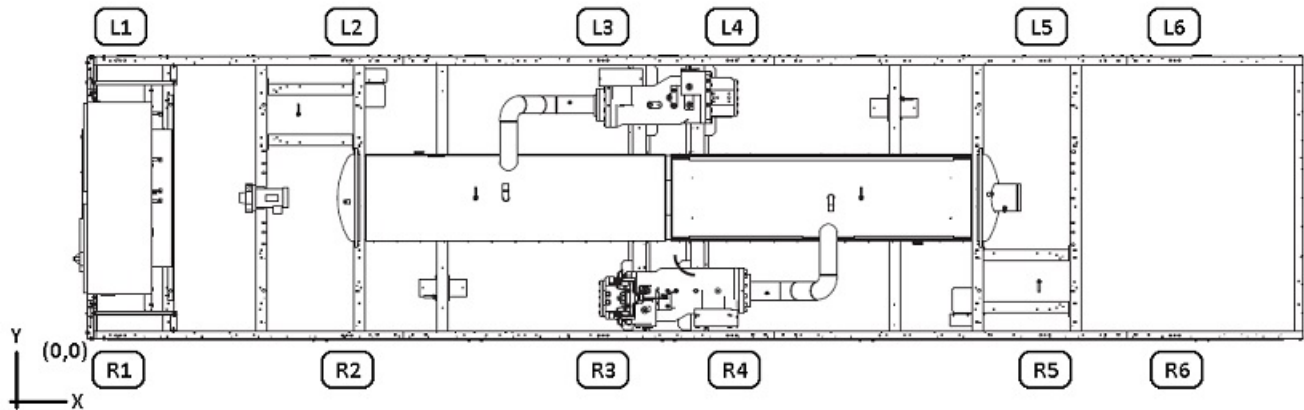
Unit Tag: CH-1

Qty.: 1

Model: YVAA0213

PIN

YVAA0213AD	F46BAVSXXX	SAXLXXXX60	44XOSXXS20	7X1SXDA2BT	XFXX1XXXXX	XXXEXX		
....5...10	5...20	5...30	5...40	5...50	5...60	5...70	5...80	5...90



AVM Data

LOCATION	X Distance [in]	Y Distance [in]	JCI PART NUMBER	SAP NUMBER	COLOUR	Operating Weights [lb]
R1	10.4	1.2	029-25334-004	433670	Gray	973
R2	76.5	1.2	029-25334-005	433871	White	1029
R3	118.1	1.2	029-25334-006	433872	Gray/Red	1397
R4	156.9	1.2	029-25334-006	433872	Gray/Red	1537
R5	208.6	1.2	029-25334-006	433872	Gray/Red	1340
R6	280.9	1.2	029-25334-003	433669	Dk.Green	536
L1	10.4	87.0	029-25334-004	433670	Gray	972
L2	76.5	87.0	029-25334-004	433670	Gray	1000
L3	118.1	87.0	029-25334-006	433872	Gray/Red	1403
L4	156.9	87.0	029-25334-006	433872	Gray/Red	1544
L5	208.6	87.0	029-25334-006	433872	Gray/Red	1357
L6	280.9	87.0	029-25334-003	433669	Dk.Green	543

Weight Data

Total Weight [lb]		Centre of Gravity [in]	
Shipping Weight [lb]	13190	Xg [in]	140.6
Operating Weights [lb]	13631	Yg [in]	45.6

Unit Specifications Text

Product Type: YVAA - Air-Cooled Chiller

Unit Tags: CH-1

Air Cooled Screw Liquid Chiller - YORK YVAA R-134a 50Hz & 60Hz

I. GENERAL

a. GENERAL REQUIREMENTS

- i. The requirements of this Section shall conform to the general provisions of the Contract, including General and Supplementary Conditions, Conditions of the Contract, and Contract Drawings.

b. SCOPE

- i. Provide Microprocessor controlled, twin-screw compressor, air-cooled, liquid chillers of the scheduled capacities as shown and indicated on the Drawings, including but not limited to:
 - 1. Chiller package
 - 2. Charge of refrigerant and oil
 - 3. Electrical power and control connections
 - 4. Chilled liquid connections
 - 5. Manufacturer start-up

c. QUALITY ASSURANCE

- i. Products shall be Designed, Tested, Rated and Certified in accordance with, and Installed in compliance with applicable sections of the following Standards and Codes:
 - 1. AHRI 550/590 – Water Chilling Packages Using the Vapor Compression Cycle
 - 2. AHRI 370 – Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
 - 3. ANSI/ASHRAE 15 – Safety Code for Mechanical Refrigeration
 - 4. ANSI/ASHRAE 34 – Number Designation and Safety Classification of Refrigerants
 - 5. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
 - 6. ANSI/NFPA 70 – National Electrical Code (N.E.C.)
 - 7. ASME Boiler and Pressure Vessel Code, Section VIII, Division 1
 - 8. OSHA – Occupational Safety and Health Act
 - 9. Manufactured in facility registered to ISO 9001
 - 10. Conform to Intertek Testing Services for construction of chillers and provide ETL/cETL Listed Mark
 - ii. Factory Run Test: Chiller shall be pressure-tested, evacuated and fully charged with refrigerant and oil, and shall be factory operational run tested with water flowing through the vessel.
 - iii. Chiller manufacturer shall have a factory trained and supported service organization.
 - iv. Warranty: Manufacturer shall Warrant all equipment and material of its manufacture against defects in workmanship and material for a period of eighteen (18) months from date of shipment or twelve (12) months from date of start-up, whichever occurs first.
- ### d. DELIVERY AND HANDLING
- i. Unit shall be delivered to job site fully assembled with all interconnecting refrigerant piping and internal wiring ready for field installation and charged with refrigerant and oil by the Manufacturer.
 - ii. Provide protective covering over vulnerable components for unit protection during shipment. Fit nozzles and open ends with plastic enclosures.
 - iii. Unit shall be stored and handled per Manufacturer's instructions.

II. PRODUCTS

a. MANUFACTURERS

- i. The design shown on the Drawings is based on YORK model YVAA chiller manufactured by Johnson Controls / YORK. Alternate equipment will be acceptable if the manufacturer's equipment meets the scheduled performance and complies with these specifications. If equipment manufactured by a manufacturer other than that scheduled is utilized, then the Mechanical Contractor shall be responsible for coordinating with the General Contractor and all affected Subcontractors to insure proper provisions for installation of the furnished unit. This coordination shall include, but not be limited to, the following:
 1. Structural supports for units.
 2. Piping size and connection/header locations.
 3. Electrical power requirements and wire/conduit and overcurrent protection sizes.
 4. Chiller physical size on plant layout.
 5. Site noise considerations.
- ii. The Mechanical Contractor shall be responsible for all costs incurred by the General Contractor, Subcontractors, and Consultants to modify the building provisions to accept the furnished alternate equipment.
- iii. The equipment manufacturer must specialize in the design and manufacture of the products specified and shall have a minimum of five (5) years of experience in supplying variable speed driven compressor technology on the type of equipment and refrigerant specified.

b. GENERAL

- i. Description: Furnish, Install, and Commission factory assembled, charged, and operational run tested air-cooled screw compressor chiller as specified herein and shown on the Drawings. Chiller shall include, but is not limited to: a complete system with multiple independent refrigerant circuits, semi hermetic twin screw compressors, shell and tube hybrid falling film type evaporator, air-cooled condenser, R-134a refrigerant, lubrication system, interconnecting wiring, safety and operating controls including capacity controller, control center, motor starting components, and special features as specified herein or required for safe, automatic operation.
- ii. Operating Characteristics:
 1. Provide low and high ambient temperature control options as required to ensure unit is capable of starting and operating from 0°F to 125°F (-23°C to 52°C) ambient temperature.
 2. Provide capacity control system capable of reducing unit capacity to 10% of full load for 2 compressor units. Compressor shall start in unloaded condition. Hot gas bypass shall not be acceptable to meet specified minimum load.
- iii. Cabinet: Unit panels, structural elements, control boxes and heavy gauge structural base shall be constructed of painted galvanized steel. All exposed sheet steel shall be coated with baked on powder paint to meet 500-hour salt spray test in accordance with the ASTM B117 standard.
- iv. Shipping: Unit shall ship in one piece and shall require installer to provide only a single evaporator inlet and outlet pipe connection. If providing chiller model that ships in multiple pieces, bid shall include all the material and field labor costs for factory authorized personnel to install a trim kit to connect the pieces as well as all interconnecting piping and wiring.

c. COMPRESSORS

- i. Compressors: Shall be direct drive, semi hermetic, rotary twin-screw type, including: muffler, temperature actuated 'off-cycle' heater, rain-tight terminal box, discharge shut-off service valve, suction shut-off service valve for each compressor and precision machined cast iron housing. Design working pressure of entire compressor, suction to discharge, shall be 350 psig (24 barg) or higher. Compressor shall be U.L. Recognized.
- ii. Compressor Motors: Refrigerant suction-gas cooled accessible hermetic compressor motor, full suction gas flow through 0.006" (0.1524 mm) maximum mesh screen, with inherent internal thermal overload protection and external current overload on all three phases.
- iii. Balancing Requirements: All rotating parts shall be statically and dynamically balanced.
- iv. Lubrication System: External oil separators with no moving parts, 450 psig (31 barg) design working pressure, and ETL listing shall be provided on the chiller. Refrigerant system differential pressure shall provide oil flow through service replaceable, 0.5 micron, full flow, cartridge type oil filter internal to compressor. Filter bypass, less restrictive media, or oil pump not acceptable.
- v. Capacity Control: Compressors shall start at minimum load. Provide Microprocessor control to command compressor capacity to balance compressor capacity with cooling load.

d. REFRIGERANT CIRCUIT COMPONENTS

- i. Refrigerant: R-134a. Classified as Safety Group A1 according to ASHRAE 34.

- ii. Equipment supplied shall comply with LEED Energy & Atmosphere Credit 4, Enhanced Refrigerant Management.
 - iii. Each independent refrigerant circuit shall incorporate all components necessary for the designed operation including: liquid line shut-off valve with charging port, low side pressure relief device, removable core filter-drier and sight glass with moisture indicator.
 - iv. Chiller manufacturer shall provide an independent circuit for each compressor to provide maximum redundancy during chiller operation. If equipment does not have independent circuits per compressor, manufacturer shall provide owner one spare compressor of each unique size.
 - v. Discharge lines shall be provided with manual compressor shut-off service valves.
- e. HEAT EXCHANGERS
- i. Evaporator:
 - 1. Evaporator shall be shell and tube, hybrid falling film type with 2 pass arrangement to optimize efficiency and refrigerant charge. Tubes shall be high-efficiency, internally and externally enhanced type copper tubes with 0.035" (0.89 mm) minimum wall thickness at all intermediate tube supports to provide maximum tube wall thickness at the support area. Each tube shall be roller expanded into the tube sheets providing a leak proof seal, and be individually replaceable. Independent refrigerant circuits shall be provided per compressor.
 - 2. Constructed, tested, and stamped in accordance with applicable sections of ASME pressure vessel code for minimum 235 psig (16 barg) refrigerant side design working pressure and 150 psig (10 barg) liquid side design working pressure.
 - 3. Water boxes shall be removable to permit tube cleaning and replacement. Water boxes shall include liquid nozzle connections suitable for ANSI/AWWA C-606 couplings, welding, or flanges.
 - 4. Provide vent and drain fittings.
 - 5. Provide thermostatically controlled shell heaters to assist in preventing freeze damage.
 - 6. Connection location: Chilled liquid inlet and outlet nozzle connections are located at rear (opposite control panel) end of unit.
 - ii. Air-cooled Condenser:
 - 1. Low Sound Fans: Shall provide vertical air discharge from extended orifices. Fans shall be composed of corrosion resistant aluminum hub and glass-fiber-reinforced polypropylene composite blades molded into a low-noise airfoil section. Fan impeller shall be dynamically balanced for vibration-free operation. Fan guards of heavy gauge, PVC (polyvinyl chloride) coated or galvanized steel.
 - 2. Fan Motors: High efficiency, direct drive, 3-phase, insulation class "F" , current protected, Totally Enclosed Air-Over (TEAO), with double sealed, permanently-lubricated ball bearings. Open Drip Proof (ODP) fan motors will not be acceptable.
- f. INSULATION
- i. Material: Closed-cell, flexible, UV protected, thermal insulation complying with ASTM C 534 Type 2 (Sheet) for preformed flexible elastomeric cellular thermal insulation in sheet and tubular form.
 - ii. Thickness: 3/4 (19mm).
 - iii. Thermal conductivity: 0.26 (BTU/HR-Ft²-°F/in) maximum at 75°F mean temperature.
 - iv. Factory-applied insulation over cold surfaces of liquid chiller components including evaporator shell, water boxes, and suction line. Liquid nozzles shall be insulated by Contractor after pipe installation.
 - v. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface including all seams and joints.
- g. ACOUSTICAL DATA
- i. Provide acoustical sound power or sound pressure level data in decibels (dB) at the scheduled eight (8) octave band center frequencies. A-weighted sound data alone is not acceptable.
 - ii. Provide all sound power or sound pressure level data at 100%, 75%, 50%, and 25% load.
 - iii. Supplied equipment shall not exceed scheduled sound power or sound pressure level data at any load point. The mechanical Contractor shall be responsible for any additional costs associated with equipment deviation.
 - iv. Acoustical performance ratings shall be in accordance with AHRI Standard 370.

h. POWER AND ELECTRICAL REQUIREMENTS

i. Power/Control Panel:

1. Factory installed and wired NEMA 3R, powder painted steel cabinets with tool lockable, hinged, latched, and gasket sealed outer doors equipped with wind struts for safer servicing. Provide main power connection(s), compressor starters and fan motor contactors, current overloads, and factory wiring.
2. Panel shall include control display access door.

ii. Single Point Power:

1. Provide single point power connection to chiller, shall be 3 phase of scheduled voltage.
2. Terminal Block connections shall be provided at the point of incoming single point connection for field connection and interconnecting wiring to the compressors. Separate external protection must be supplied, by others, in the incoming power wiring, which must comply with local codes.

iii. Control Transformer: Power panel shall be supplied with a factory mounted and wired control transformer that will supply all unit control voltage from the main unit power supply. Transformer shall utilize scheduled line voltage on the primary side and provide 115V/1Ø on secondary.

iv. Short Circuit Withstand Rating of the chiller electrical enclosure shall be (380, 400, & 460V: 30,000 Amps). Rating shall be published in accordance with UL508.

v. Motor Starters: Motor starters shall be Variable Frequency Drive type with zero electrical inrush current. Wye-Delta, Solid State, and Across the Line type starters will not be acceptable.

vi. Motor Starters: Motor starters shall be zero electrical inrush current (Variable Frequency Drives) or reduced inrush type (Closed transition Wye-Delta or Solid State) for minimum electrical inrush. Open transition Wye-Delta and Across the Line type starters will not be acceptable.

vii. Motor Starters: Motor starters shall be Variable Frequency Drive type with zero electrical inrush current. Wye-Delta, Solid State, and Across the Line type starters will not be acceptable.

viii. Power Factor:

1. Provide equipment with power factor correction capacitors as required to maintain a displacement power factor of 95% at all load conditions.
2. The installing contractor is responsible for additional cost to furnish and install power factor correction capacitors if they are not factory mounted and wired.

ix. All exposed power wiring shall be routed through liquid-tight, UV-stabilized, non-metallic conduit.

x. Supplied equipment shall not exceed scheduled Minimum Circuit Ampacity (MCA.) The mechanical Contractor shall be responsible for any additional costs associated with equipment deviation.

i. CONTROLS

i. General:

1. Provide automatic control of chiller and waterside economizer operation including compressor start/stop and load/unload, anti-recycle timers, condenser fans, evaporator pump, evaporator heater, waterside economizer bypass valve, unit alarm contacts and run signal contacts.
2. Provide dry contacts for chilled fluid pump control and evaporator shell heaters to assist in preventing freeze damage due to migration of refrigerant at ambient temperatures below 32°C (0°C).
3. Chiller shall automatically reset to normal chiller operation after power failure.
4. Unit operating software shall be stored in non-volatile memory. Field programmed set points shall be retained in lithium battery backed regulated time clock (RTC) memory for minimum 5 years.
5. Alarm contacts shall be provided to remote alert for any unit or system safety fault.

ii. Display and Keypad:

1. Provide minimum 80 character liquid crystal display that is both viewable in direct sunlight and has LED backlighting for nighttime viewing. Provide one keypad and display panel per chiller.

2. Display and keypad shall be accessible through display access door without opening main control/electrical cabinet doors.
 3. Display shall provide a minimum of unit setpoints, status, electrical data, temperature data, pressures, safety lockouts and diagnostics without the use of a coded display.
 4. Descriptions in English (or available language options), numeric data in English (or Metric) units.
 5. Sealed keypad shall include unit On/Off switch.
- iii. Programmable Setpoints (within Manufacturer limits): Display language, chilled liquid cooling mode, local/remote control mode, display units mode, system lead/lag control mode, remote temperature reset, remote current limit, remote sound limit, low ambient temperature cutout enable/disable, leaving chilled liquid setpoint and range, maximum remote temperature reset.
 - iv. Display Data: Chilled liquid leaving and entering temperatures; outside ambient air temperature; lead system; evaporator pump status; active remote control; compressor suction, discharge, and oil pressures per refrigerant circuit; compressor discharge, motor, and oil temperatures per refrigerant circuit; saturation temperatures per refrigerant circuit; compressor speed; condenser fan status; condenser subcooling temperature; condenser drain valve percentage open; compressor capacity in percentage of Full Load Amps; compressor number of starts; run time; operating hours; evaporator heater status; history data for last ten shutdown faults; history data for last 20 normal (non-fault) shutdowns.
 - v. Predictive Control Points: Unit controls shall avoid safety shutdown when operating outside design conditions by optimizing the chiller controls and cooling load output to stay online and avoid safety limits being reached. The system shall monitor the following parameters and maintain the maximum cooling output possible without shutdown of the equipment: motor current, suction pressure, discharge pressure, starter internal ambient temperature, and starter baseplate temperature.
 - vi. System Safeties: Shall cause individual compressor systems to perform auto-reset shut down if: high discharge pressure or temperature, low suction pressure, low motor current, high/low differential oil pressure, low discharge superheat, high motor temperature, system control voltage.
 - vii. Unit Safeties: Shall be automatic reset and cause compressors to shut down if: high or low ambient temperature, low leaving chilled liquid temperature, under voltage, flow switch operation. Contractor shall provide flow switch and wiring per chiller manufacturer requirements.
 - viii. Manufacturer shall provide any controls not listed above, necessary for automatic chiller operation. Mechanical Contractor shall provide field control wiring necessary to interface sensors to the chiller control system.
- j. ACCESSORIES AND OPTIONS
- i. Some accessories and options supersede standard product features. All options are factory-mounted unless otherwise noted.
 - ii. CONTROLS OPTIONS:
 1. Building Automation System Interface: Chiller to accept BACnet MS/TP, N2 and Modbus protocol from BAS (by others). BACnet to be BACnet Testing Laboratories (BTL) listed and support BACnet Automatic Discovery to eliminate field commissioning of chiller controls.
 - iii. GENERAL OPTIONS:
 1. Differential Pressure Switch: 3-45 psig (0.2-3 barg) range with 1/4" NPTE pressure connections. (Field Mounted by Contractor).
 2. Vibration Isolation (All Options Field Mounted by Contractor):
 - a. Provide 1" Deflection Spring Isolators: Level adjustable, spring and cage type isolators for mounting under the unit base rails.

III. EXECUTION

a. INSTALLATION

- i. General: Rig and Install in full accordance with Manufacturer' s requirements, Project drawings, and Contract documents.
- ii. Location: Locate chiller as indicated on drawings, including cleaning and service maintenance clearance per Manufacturer instructions. Adjust and level chiller on support structure.
- iii. Components: Installing Contractor shall provide and install all auxiliary devices and accessories for fully operational chiller.
- iv. Electrical: Coordinate electrical requirements and connections for all power feeds with Electrical Contractor.
- v. Controls: Coordinate all control requirements and connections with Controls Contractor.

- vi. Finish: Installing Contractor shall paint damaged and abraded factory finish with touch-up paint matching factory finish.