



Embassy of the United States of America

Manila, Philippines

July 27, 2012

To: Prospective Offerors

Subject: Request for Proposals number **SRP380-12-R-0002**

Enclosed is a Request for Proposals (RFP) for **Purchase of One Unit Centrifugal Water Chiller**. If you would like to submit a proposal, follow the instructions in Section 3 of the solicitation, complete the required portions of the attached document, and submit it to the address shown on the Standard Form 1449 (SF-1449) that follows this letter.

The U.S. Government (USG) intends to award a contract to the responsible company submitting an acceptable proposal at the lowest price. We intend to award a contract based on initial proposals, without holding discussions, although we may hold discussions with companies in the competitive range if there is a need to do so.

Proposals are due by **August 28, 2012, 4:00pm**. No proposal will be accepted after this time.

Request for access clearance must be submitted through fax no. (632) 3012964 or (632) 3012962 or through email address OcampoJL@state.gov at least two working days in advance prior to the submission of your proposal. Request should include the name of your company's representative, date/time of submission, vehicle type/color/plate number and name of driver if any. Access to USG facilities will not be permitted without prior access clearance.

Submit any questions you may have concerning the solicitation document in writing to the Contracting Officer via above fax numbers or email address on or before August 8, 2012.

Sincerely,


NENITA V. WHITAKER
Contracting Officer

Enclosure: RFP No. SRP380-12-R-0002, 39 pages


Review Clearance: CSMecabalo
Drafter: JLOcampo

SOLICITATION/CONTRACT/ORDER FOR COMMERCIAL ITEMS OFFEROR TO COMPLETE BLOCKS 12, 17, 23, 24, & 30				1. REQUISITION NUMBER PR1905753	PAGE 1 OF 39	
2. CONTRACT NO.	3. AWARD/EFFECTIVE DATE (mm-dd-yyyy)	4. ORDER NUMBER	5. SOLICITATION NUMBER RFP NO. SRP380-12-R-0002	6. SOLICITATION ISSUE DATE (mm-dd-yyyy) 07-27-2012		
7. FOR SOLICITATION INFORMATION CALL:	a. NAME MS. JANE OCAMPO / MS. BELLE MECABALO		b. TELEPHONE NUMBER (No collect calls) (632) 3012713 / (632) 8320826	8. OFFER DUE DATE/ LOCAL TIME 08-28-2012 / 4:00PM		
9. ISSUED BY CONTRACTING & PROCUREMENT GENERAL SERVICES OFFICE, U.S. EMBASSY MANILA SEAFRONT COMPOUND ROXAS BOULEVARD, PASAY CITY PHILIPPINES 1300		CODE	10. THIS ACQUISITION IS <input checked="" type="checkbox"/> UNRESTRICTED OR <input type="checkbox"/> SET ASIDE: % FOR <input type="checkbox"/> SMALL BUSINESS <input type="checkbox"/> EMERGING SMALL BUSINESS <input type="checkbox"/> HUBZONE SMALL BUSINESS <input type="checkbox"/> SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS <input type="checkbox"/> 8(A)			
11. DELIVERY FOR FOB DESTINATION UNLESS BLOCK IS MARKED <input checked="" type="checkbox"/> SEE SCHEDULE	12. DISCOUNT TERMS	13a. THIS CONTRACT IS A RATED ORDER UNDER DPAS (15 CFR 700) <input type="checkbox"/>		13b. RATING		
15. DELIVERY TO U.S. EMBASSY MANILA CHANCERY COMPOUND 1201 ROXAS BOULEVARD MANILA, PHILIPPINES 1000		CODE	16. ADMINISTERED BY FACILITIES MANAGEMENT UNIT U.S. EMBASSY MANILA SEAFRONT COMPOUND, ROXAS BOULEVARD PASAY CITY, PHILIPPINES 1300			
17a. CONTRACTOR/OFFEROR	CODE	FACILITY CODE	18a. PAYMENT WILL BE MADE BY FINANCIAL MANAGEMENT CENTER U.S. EMBASSY MANILA CHANCERY COMPOUND 1201 ROXAS BOULEVARD MANILA, PHILIPPINES 1000		CODE	
TELEPHONE NO.				NVW: <u>MW</u> CSM: <u>Am</u>		
<input type="checkbox"/> 17b. CHECK IF REMITTANCE IS DIFFERENT AND PUT SUCH ADDRESS IN OFFER			18b. SUBMIT INVOICES TO ADDRESS SHOWN IN BLOCK 18a UNLESS BLOCK BELOW IS CHECKED <input type="checkbox"/> SEE ADDENDUM			
19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES		21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT
01	CENTRIFUGAL WATER CHILLER <i>(Use Reverse and/or Attach Additional Sheets as Necessary)</i>		1	UNIT		
25. ACCOUNTING AND APPROPRIATION DATA				26. TOTAL AWARD AMOUNT (For Govt. Use Only)		
<input checked="" type="checkbox"/> 27a. SOLICITATION INCORPORATES BY REFERENCE FAR 52.212-1, 52.212-4. FAR 52.212-3 AND 52.212-5 ARE ATTACHED. ADDENDA			<input checked="" type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED			
<input type="checkbox"/> 27b. CONTRACT/PURCHASE ORDER INCORPORATES BY REFERENCE FAR 52.212-4. FAR 52.212-5 IS ATTACHED. ADDENDA			<input type="checkbox"/> ARE <input type="checkbox"/> ARE NOT ATTACHED			
<input type="checkbox"/> 28. CONTRACTOR IS REQUIRED TO SIGN THIS DOCUMENT AND RETURN _____ COPIES TO ISSUING OFFICE. CONTRACTOR AGREES TO FURNISH AND DELIVER ALL ITEMS SET FORTH OR OTHERWISE IDENTIFIED ABOVE AND ON ANY ADDITIONAL SHEETS SUBJECT TO THE TERMS AND CONDITIONS SPECIFIED HEREIN.			<input type="checkbox"/> 29. AWARD OF CONTRACT: REF. _____ OFFER DATED _____ (mm-dd-yyyy). YOUR OFFER ON SOLICITATION (BLOCK 5), INCLUDING ANY ADDITIONS OR CHANGES WHICH ARE SET FORTH HEREIN, AS ACCEPTED AS TO ITEMS:			
30a. SIGNATURE OF OFFEROR/CONTRACTOR			31a. UNITED STATES OF AMERICA (SIGNATURE OF CONTRACTING OFFICER)			
30b. NAME AND TITLE OF SIGNER (Type or print)		30c. DATE SIGNED (mm-dd-yyyy)	31b. NAME OF CONTRACTING OFFICER (Type or Print)		31c. DATE SIGNED (mm-dd-yyyy)	

19. ITEM NO.	20. SCHEDULE OF SUPPLIES/SERVICES	21. QUANTITY	22. UNIT	23. UNIT PRICE	24. AMOUNT

32a. QUANTITY IN COLUMN 21 HAS BEEN

RECEIVED INSPECTED ACCEPTED, AND CONFORMS TO THE CONTRACT, EXCEPT AS NOTED: _____

32b. SIGNATURE OF AUTHORIZED GOVERNMENT REPRESENTATIVE	32c. DATE (mm-dd-yyyy)	32d. PRINT NAME AND TITLE OF AUTHORIZED GOVERNMENT REPRESENTATIVE
--------------------------------------------------------	---------------------------	-------------------------------------------------------------------

32e. MAILING ADDRESS OF AUTHORIZED GOVERNMENT REPRESENTATIVE	32f. TELEPHONE NUMBER OF AUTHORIZED GOVERNMENT REPRESENTATIVE
	32g. E-MAIL OF AUTHORIZED GOVERNMENT REPRESENTATIVE

33. SHIP NUMBER <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL	34. VOUCHER NUMBER	35. AMOUNT VERIFIED CORRECT FOR	36. PAYMENT <input type="checkbox"/> COMPLETE <input type="checkbox"/> PARTIAL <input type="checkbox"/> FINAL	37. CHECK NUMBER
------------------------------------------------------------------------------------	--------------------	---------------------------------	------------------------------------------------------------------------------------------------------------------	------------------

38. S/R ACCOUNT NUMBER	39. S/R VOUCHER NUMBER	40. PAID BY
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41a. I CERTIFY THIS ACCOUNT IS CORRECT AND PROPER FOR PAYMENT		42a. RECEIVED BY (<i>Print</i>)	
41b. SIGNATURE AND TITLE OF CERTIFYING OFFICER	41c. DATE (mm-dd-yyyy)	42b. RECEIVED AT (<i>Location</i>)	
		42c. DATE REC'D (mm-dd-yyyy)	42d. TOTAL CONTAINERS

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- Attachment 1 to Description/Specifications/Work Statement, Equipment Schedule and Technical Specifications of the Centrifugal Water Chiller

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- Contract Clauses
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- Offeror Representations and Certifications
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SECTION 1 - THE SCHEDULE

CONTINUATION TO SF-1449
RFP NUMBER SRP380-12-R-0002
PRICES, BLOCK 23

I. Scope of Services

- A. The contractor shall deliver One Unit Centrifugal Water Chiller to the U.S. Embassy Manila.
- B. This is a firm-fixed price type of contract.
- C. The price listed below shall include all labor, materials, overhead, profit, and transportation necessary to deliver the required items to the American Embassy located in Manila, Philippines.
- D. All prices are in Philippine Peso.

II. Pricing

<u>Line Item</u>	<u>Description</u>	<u>Unit Price</u>	<u>Quantity</u>	<u>Total Price</u>
01	Centrifugal Water Chiller	₱ _____	1	₱ _____

Value Added Tax (VAT) shall not be included in the firm-fixed prices as it is not applicable to this contract.

The U.S. Government is exempt from payment of taxes as a qualifying entity under Section 3(b)(3) of Revenue Regulations No. 6-97 dated January 2, 1997. In accordance with this regulation, all sales made by the contractors or suppliers to the U.S. Government are subject to zero percent (0%) rate and are, therefore, not subject to the value added tax.

CONTINUATION TO SF-1449
RFP NUMBER SRP380-12-R-0002
SCHEDULE OF SUPPLIES/SERVICES, BLOCK 20
DESCRIPTION/SPECIFICATIONS/WORK STATEMENT

- I. Refer to Attachment 1 for the Equipment Schedule and Technical Specifications of the Centrifugal Water Chiller.
- II. Delivery Location and Time
- A. The contractor shall deliver all ordered items to the U.S. Embassy Manila. The address is:
- U.S. Embassy Manila
Chancery Compound
1201 Roxas Boulevard
Manila, Philippines 1000
- B. The contractor shall deliver all items not later than *[to be completed upon award]* days after date of contract award.
- C. Any contractor personnel involved with the delivery of the items shall comply with standard U.S. Embassy regulations for receiving supplies. The Contracting Officer's Representative (COR) will be responsible for instructing contractor personnel at the time deliveries are made. The contractor shall provide the Bill of Lading to the Embassy prior to the shipment of the chiller to the U.S. Embassy Manila.
- D. If delivery will be to the U.S. Embassy, delivery shall be made between the hours of 7:30am and 4:30pm, Monday to Friday, excluding holidays listed under DOSAR 652.237-72 Observance of Legal Holidays and Administrative Leave (Apr 2004).

**ATTACHMENT 1 -
EQUIPMENT SCHEDULE AND TECHNICAL SPECIFICATIONS
OF THE CENTRIFUGAL WATER CHILLER**

US EMBASSY MAIN CHILLER ADDITION

Roxas Boulevard, Philippines

DOCUMENTS INCLUDED

1. EQUIPMENT SCHEDULE
2. TECHNICAL SPECIFICATION SECTION 15625 - Centrifugal Water Chillers

US EMBASSY MAIN CHILLER ADDITION

Roxas Boulevard, Philippines

Equipment Schedule

1. Packaged Water Cooled Chiller

S/No.	Items	Specification	Supplier Proposal
1	Designation	CH -03	
2	Location	Chiller Plantroom	
3	Type	Water Cooled, Centrifugal	
4	Brand / Model	Trane, York, Carrier, McQuay, or Approved Equal	
5	Quantity	1	
6	Capacity, kw (TR)	1231 (350)	
7	Primary Efficiency	a. Best Efficiency b. Second Best Efficiency	
8	NPLV	a. Best Efficiency b. Second Best Efficiency	
9	Design Working Pressure, PSIG	150	
10	Evaporator Data: Water flow Rate. (L/s) / (GPM) Ent. Water Pump (deg °C / deg °F) Lvg. Water Pump (deg °C / deg °F) Max Pressure Drop (kPa / feet) Fouling Factor(HR-FT ² -DEG °F/BTU) Circuit No. of Pass	44.4 / 700 12.22 / 54 5.6 / 42 60 / 20 0.0001 3	
11	Condenser Data: Water flow Rate. (L/s) / (GPM) Ent. Water Pump (deg °C / deg °F) Lvg. Water Pump (deg °C / deg °F) Max Pressure Drop (kPa / feet) Fouling Factor(HR-FT ² -DEG °F/BTU) Circuit No. of	66.24 / 1050 29.44 / 85 35 / 95 39 / 13 0.00025 2	
12	Motor Data: Max. Input Rating, Kw Max. Speed, rpm Volts/Phase/Hertz Starter Type	210 - 460/3/60 Soft Starter	
13	Vibrator Isolator	Shall be provided with seismic restraints capable of resisting a horizontal force of 100% of the weight of the equipment.	
14	Remarks	Shall Operate @ 50% minimum capacity at all operating conditions without surging. (quaranteed)	

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**SECTION 15625
CENTRIFUGAL WATER CHILLERS****PART 1 – GENERAL****1.1 DESCRIPTION**

A. The following sections describe the requirement for the chillers and the following system components to be provided by the chiller manufacturer:

1. RESERVED
2. Automatic Condenser Tube Cleaning System
3. Factory Witness Testing

1.2 DEFINITIONS

- A. Engineering Control Center (ECC): The centralized control point for the intelligent control network. The ECC comprises of personal computer and connected devices to form a single workstation.
- B. Ethernet: A trademark for a system for exchanging messages between computers on a local area network using coaxial, fiber optic, or twisted-pair cables.
- C. SCBA: Self-contained breathing apparatus.

1.3 QUALITY

- A. RESERVED
- B. Refer to PART 3 herein after for test performance.
- C. Comply with ARI requirements for testing and certification of the chillers.
- D. RESERVED
- E. Refer to OSHA 29 CFR 1910.95(a) and (b) for Occupational Noise Exposure Standard.
- F. Refer to 42 degrees CFR -Public Health, Part 84, "Approval of Respiratory Protective Devices," Subpart H –"Self- Contained Breathing apparatus," 1998.

1.4 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the test by the basic designation only.

- A. AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings
- B. AFBMA 11 – Load Ratings and Fatigue Life for Roller Bearings
- C. American Refrigeration Institute (ARI):
- 210 - Unitary Air Conditioning and Air Source heat Pump equipment

- 550/590 - Standard for Water Chilling Packages Using the Vapor Compression Cycle
- D. American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE):
- E. American Society of Mechanical Engineers (ASME):
- ASME SEC 8 - Boilers and Pressure Vessels Codes, "Rules for Construction of Pressure Vessels"
- F. American Society of Testing Materials (ASTM):
- C 534 - Closed Cell, Flexible Elastomeric Insulation
- G. Occupational Safety and Health Administration (OSHA)
- OSHA 29CFR 1910 - Guidelines for Noise Enforcement, Appendix A.

1.5 SUBMITTALS

- A. Manufacturer's Literature and Data
1. Centrifugal water chillers, including motor starters, control panels, and vibration isolators, and condenser 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/Standard.
 - d. Refrigerant, including its properties such as but not limited to Ozone Depleting Potential (ODP), Atmospheric Life, etc.
 - e. Fan performance (Air-Cooled Chillers only.)
 - 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 and preventive measures needed to avoid noise exposure injuries per OSHA requirements. Noise warning labels shall be posted on equipment.
 - k. Self-contained breathing apparatus (SCBA).
 - l. Refrigerant vapor detectors and monitors.
 - m. Refrigerant Leakage Rate.
- B. Maintenance and operating manuals for each piece of equipment.
- C. Run test report for all chillers.

- D. Product Certificate: Signed by chiller manufacturer certifying that chillers furnished comply with ARI requirements. The test report shall include calibrated curves, calibration records, and data sheets for the instrumentation used in factory tests.
- E. Seismic Certificate: Submit certificate that the chiller(s), accessories, and components will withstand the seismic forces ($Z= 0.4$) and that the unit will be fully operational after the seismic event at the project site.

1.6 FACTORY WITNESS, WARRANTY/CERTIFICATIONS:

- A. The supplier shall certify and show proof that all components of the equipment they offer are brand new.
- B. The equipment shall be warranted by the supplier for a period of one (1) year from the date of acceptance.
- C. The supply of chiller shall include factory witness test together with the Customer's representative prior to the shipment of chiller to the site. The intent of the factory witness test is to validate that the proposed chiller shall be capable of delivering the required capacities at various percent load conditions from maximum to minimum evaporator flow rates at stable operating condition without surging and at the designed KW /ton efficiency as indicated in the schedule of equipment or per submitted chiller data from the manufacturer based on the design operating parameters.
- D. The owner's representative(s) will have the option to reject the manufactured chillers outright during the actual witness test if it fails to meet the specifications based on -1% to +5% tolerance on rated capacity and greater than 1% short of rated kw/ton.

PART 2 – PRODUCTS

2.1 WATER CHILLERS

- A. General: Chiller shall be centrifugal type, factory-assembled and-tested, complete with evaporator, condenser, optional marine water boxes for condenser and standard water boxes for condenser and evaporator, compressor, motor, starter, oil heater and cooler, economizer or intercooler, refrigerant piping, instrumentation and control piping, operating and safety controls mounted on the chiller, and other auxiliaries necessary for safe and proper operation of the unit. Chiller operation shall be fully automatic. Provide the capacity as shown on the drawings. Part load and/or full load efficiency ratings of the chiller shall not be less than those shown on the drawings. Chiller shall be suitable for continuous operation in the extremes of climate experienced in Manila.
- B. Applicable Standard: Chillers shall be rated and certified in accordance with ARI Standard 550/590. Chillers with ARI certification program shall be ARI stamped.
- C. Hermetic or open: Chillers shall be open or hermetically sealed, using HFC-134a.
- D. Compressor (Centrifugal Type): single or multistage, having statically and dynamically balanced impeller, either direct or gear driven. Impeller shaft shall be heat-treated carbon steel of sufficient rigidity to prevent whip or vibration at operating speed. Shaft main bearings shall be of journal type with bronze or Babbitt line steel cartridge, aluminum alloy one-piece insert type, or rolling element type with an AFBMA L 10 life of a minimum of 200, 000 hours. Rolling element bearings shall be rated in accordance with AFBMA 9 or AFBMA 11 as applicable. Casing shall be cast iron or steel plate with split sections gasketed and bolted together.

An open type compressor shall be acceptable provided a 5 year warranty shall be provided on the shaft seal integrity and performance on the chiller including the supply of additional refrigerant and oil in case of leak problem due to shaft seal failure.

- E. Provide a factory installed lubrication system to a compressor to deliver oil under pressure to bearings and transmission. The system shall include the following:
- Oil pump with factory installed motor and OL protection.
 - Refrigerant cooled coil cooler
 - Oil pressure regulator
 - Oil filter and reservoir
 - Oil sump heater.

Lubrication System shall be forced-feed type and shall provide oil at proper temperature to all parts requiring lubrication. Make provision to insure lubrication of bearings prior to starting and of shaft seal both on stopping and starting, or bearings and shaft seal shall be submerged in oil. On units providing for forced-feed lubrication prior to starting, a differential oil pressure cutout interlocked with compressor starting equipment shall allow compressor to operate only when required oil pressure is provided to bearings.

- F. The compressor at 100% load shall have measured maximum sound level reading of 90dBA or as specified in the attached equipment schedule, bare without any attenuation, measured at one meter distance per ARI 575 (latest edition). Supplier shall submit computer chiller indicating the sound level of the chiller at 100%, 75%, 50% and 25% running load for approval. The sound level shall be a major criteria in the acceptance of chiller offer.
- G. Capacity control shall be by means of variable inlet guide vanes in the compressor suction to modulate the chiller capacity from 100 to 20 percent of full unit rated capacity without unstable compressor operation. The inlet guide vanes shall be electrically or pneumatically operated upon the actuation of temperature or pressure sensor. The chiller supplier shall ensure that the impeller size of the proposed chiller shall be able to deliver the required capacity and kw/ton efficiency not only at full load condition but more importantly at its minimum part load conditions without surging. The chiller manufacturer shall demonstrate to the Owner's representatives that the specified and/or published full and part load performance conditions are met during the actual factory witness testing.
- H. Condenser: Shell-and-tube type, constructed, tested, and stamped in accordance with applicable portions of Section VIII D1 of the ASME Boiler and Pressure Vessel Code, where applicable for working pressure produced by the refrigerant used and water system installed, but not less than 1035kPa (150psig). Shell shall be fabricated of carbon steel and shall have carbon steel tube sheets; drilled and reamed to accommodate the tubes. Tubes shall be nonferrous metal, externally enhanced, and internally enhanced except where automatic tube cleaning system is specified, the condenser tubes shall be smooth bore type, individually replaceable, and shall be expanded full diameter into tube sheets, providing a leak proof seal. Intermediate tube support sheets shall be provided as recommended by the manufacturer to minimize tube vibration, stress and wear. Tubes shall fit tightly in the supports to prevent chafing due to vibration or pulsation. Performance of condenser shall be based on a water velocity not less than 1m/s (3fps) nor more than 4 m/s (12fps), and a fouling factor of 0.044 m² degrees C/kw (0.00025hr. sq. ft. degrees F/Btu). Removable standard water box shall be constructed of steel. Design working pressure shall be 1035kPa (150psig); pressure tested at 150 percent of working pressure. Water nozzle connections shall be grooved mechanical-joint coupling. Provide additional price for optional marine water box (instead of standard water box).

- I. Evaporator: Shell-and-tube type, constructed and tested and stamped in accordance with Section VIII D1 of ASME Boiler and Pressure Vessel Code where applicable for working pressure produced by refrigerant used and water system installed, but not less than 1035kPa (150psig) waterside working pressure. Shell shall be fabricated of carbon steel and shall have carbon steel tube sheets; drilled and reamed to accommodate the tubes. Tubes shall be externally and internally enhanced individually replaceable and shall be expanded full diameter into tube sheets, providing a leak proof seal. Intermediate tube supports sheets shall be provided as recommended by the manufacturer to minimize tube vibration, stress, and wear. Performance shall be based on a water velocity not less than 1m/s (12fps), and fouling factor of 0.0176m² degrees C/kw (0.0001hr. sq. ft. degrees F/Btu). Removable marine water box shall be constructed of steel. Design working pressure shall be 1035kPa (150psig); pressure tested at 150percent of working pressure. Water nozzle connections shall be grooved mechanical-joint coupling.
- J. Insulation: Evaporator, suction piping, compressor, and all other parts subject to condensation shall be insulated with 25mm (1.0inch) minimum thickness of flexible-elastomeric thermal insulation, complying with ASTM C534.
- K. Economizer: Provide if required by manufacturer. Flash gas shall be piped from economizer to inlet of intermediate stage impeller wheel. In case of rotary compressor flash gas shall be piped from economizer to the intermediate compressor point. Provide a refrigerant flow control system (float valve or multiple orifice system) to automatically regulate flow of liquid refrigerant through economizer. If external-type economizer is used, such economizer shall be constructed and tested in accordance with Section 8 of ASME Boiler and Pressure Vessel Code for working pressures produced by refrigerant used, unless exempt by Section U-1 of the code.
- L. Motor Load Limiter: Provide a sensing and control system, which will limit maximum load current of compressor motor to a manually selectable percentage of 40 percent to 100 percent of full load current. System shall sense compressor motor current and limit it by modulating inlet guide vanes at the compressor, overriding other controls in their ability to increase loading, but not overriding their ability to reduce loading.
- M. Isolation Pads: Manufacturers standard.
- N. Spring Isolators with seismic restraints.
- O. Refrigerant and Oil: Provide sufficient volume of dehydrated refrigerant and lubricating oil to permit maximum unit capacity operation before and during tests. Refrigerant charge lost during the warranty period due to equipment failure shall be replaced without cost to the owner.
- P. The manufacturer shall certify that chiller components, such as seals, o-ring, motor windings, etc, are fully compatible with the specified refrigerants.
- Q. Chillers using refrigerant HFC-134a shall be supplied with single or multiple reseating type, spring-loaded relief valve.
- R. Chillers shall be equipped with service valves to facilitate refrigerant reclaim/removal required during maintenance.
- S. Microprocessor Controls
- The chiller shall be equipped with a factory installed and wired microprocessor intelligent control panel with individually replaceable component construction. Components shall include chiller visual control, chiller control module, and power supply, integrated starter module and temperature and pressure sensors. The control center shall include a 16-line x 40 character LCD, 4 function keys, and stop button and alarm light. The microprocessor shall be configured for both English and SI units.

The chiller control system shall have the ability to interface and communicate directly to a Building Management System without the use of additional field installed hardware or software. Chiller microprocessor control shall include the capability to be wired into a chiller plant manager control system.

1. The default standard display screen shall indicate the following:
 - a. Date and time of day.
 - b. 24-character primary system status message.
 - c. Chiller operating hours
 - d. Entering CHW temperature
 - e. Leaving CHW temperature
 - f. evaporator refrigerant temperature
 - g. entering CW temperature
 - h. leaving CW temperature
 - i. condenser refrigerant temperature
 - j. oil supply pressure
 - k. oil supply temperature
 - l. % Motor RLA
 - m. Evaporator pressure
 - n. Condenser pressure
 - o. Compressor discharge pressure
 - p. Motor winding temperature
 - q. Number of compressor starts
 - r. Control point settings
 - s. Compressor motor starter status, etc.
2. The microprocessor control of the chiller shall be equipped with proprietary "Microprocessor Control" such that it can take corrective actions when any of the control variables approaches a limit condition at which the protection function of previous control schemes would normally shutdown the chiller.
3. To keep the chiller on line making chilled water, the control shall automatically reduce the chiller capacity when any of the parameters outside their normal operating conditions shall occur:
 - a. High condenser pressure
 - b. High motor temperature
 - c. Low evaporator refrigerant temperature
 - d. High motor amperes.
4. The above corrective action shall include modulation of compressor inlet guide vanes or leaving water temperature. When a limit is approached and all the corrective action has been taken without fixing the problem, the chiller shall shut down as its last measure to prevent damage.
5. A microprocessor control panel that does not allow or provide intelligent corrective action and simply shut down the chiller when certain critical parameters are exceeded shall not be acceptable.
6. Safeties:

Unit shall automatically shut-down when any of the following conditions shall occur:

 - a. Motor over current
 - b. Over voltage/under voltage
 - c. Single cycle dropout
 - d. Bearing oil high temperature
 - e. Low evaporator refrigerant temperature

- f. High condenser pressure
- g. High compressor discharge temperature
- h. Low oil pressure
- i. Prolonged surge
- j. Loss of chilled water flow
- k. Loss of condenser water low
- l. Starter fault and power fault
- m. Sensor malfunction
- n. Extended compressor surge
- o. Communication loss

7. Diagnostics:

The control system shall execute a series of pre-start checks wherever a start command is received before a start-up is permitted. If any of the limits are exceeded, a text alert message shall be displayed informing the operator of the cause of the pre-start alert or fault. Included in the pre-start test are:

- a. Pump, chilled and cooling water flow
- b. Oil pump
- c. Guide vane actuator test

A self-diagnostic control test shall be an integral parts of the control system to allow a quick identification of malfunctioning components. Once the control test has been initiated. All pressure and temperature sensors shall be checked to ensure they are within the normal operating range.

- 8. Leaving chilled water temperature reset shall be based on return water temperature and out door temperature, 4-20MA or 0-10VDC signal from a building automation system.
- 9. Chillers shall be pre-wired to terminal strips for interlocked to other equipment.
- 10. Provide contacts for remote start/stop, alarm for abnormal operation or shut down, and for Engineering Control Center (ECC) interface.
- 11. Chiller control panel shall either reside on the "LonTalk FTT-10a network", and provide data using LonMark standard network variable types and configuration properties, or BACnet inter working using ARCNET or MS/TP physical data link layer protocol for communication with building automation control system.
- 12. Auxiliary hydronic system and the chiller(s) shall be electronically interlocked to provide time delay and starting sequence as indicated on control drawings.

T. Motor: Compressor motor furnished with the chiller shall be in accordance with the chiller manufacturer
Starting torque of the motor shall be suitable for the driven chiller machines.

U. Motor Starter: Provide a starter for each centrifugal chiller in NEMA-4 enclosure, designed for floor mounting. For floor mounted starter provide wiring from starter to chiller.

- 1. Starter shall include incoming line provision for the number and size cables shown on the drawings. Incoming line lugs shall be copper mechanical type.
- 2. Terminal connection pads shall be provided to which customers supply lugs can be attached.

3. Starters shall be coordinated with chiller package(s) making certain all terminals are properly marked according to the chiller manufacturer's wiring diagram.
4. Contactors shall be sized properly to the chillers for full load currents.
5. Ammeter(s) shall be provided, capable of displaying current to all three phases. Ammeter shall be calibrated so that in rush current can be indicated.
6. Chiller starter shall include an advanced motor protection system incorporating electronic three phase overloads and current transformers. This electronic motor protection system shall monitor and protect against the following conditions:
 - a. Three phase loss with under and over voltage protection.
 - b. Phase imbalance.
 - c. Phase reversal.
 - d. Motor over load.
 - e. Motor over load protection incorrectly set.
 - f. Momentary power loss protection with auto restart consisting of three phase current sensing device that monitor the status of the current.
 - g. Starter contactor fault protection.
 - h. Starter transition failure.
 - i. Distribution fault protection.
7. When a motor driven oil pump is furnished, provide a 120- volt control circuit, mounted within starter enclosure. When an oil pump starter is provided at the refrigeration machine, provide fused disconnect in start delta starter for oil pump.
8. 220Volt, single phase may be provided from a separate power source with a fused disconnect and a control transformer, if required, for control panel, oil heaters and oil pump.
9. The starter shall be equipped with pilot relays to initiate the start sequence of compressor. These relays shall be a self-monitoring safety circuit, which shall indicate improper operation (slow operation, welding of contacts, etc) and shall cause the chiller unit to be shut down and a fault trip indicator be displayed. The "starter circuit fault" indicator shall be located in the door of the enclosure and shall require manual reset.
10. A lockout transition safety circuit shall be provided to prevent damage from prolonged energization due to malfunction of the transistor contactor. Malfunction shall cause the chiller unit to shut down and the "starter circuit fault" indicator be displayed.
11. A permanent nameplate shall be provided and mounted on the starter panel. It shall identify the manufacturer, serial or model number identifying the date of manufacturing and component replacement parts, and all current and voltage rating, and as built wiring schematic showing all items provided.
12. Non-fused main power disconnect switch.

2.2 AUTOMATIC CONDENSER TUBE CLEANING SYSTEM

- A. Provide an automatic condenser tube cleaning system complete with brushes, baskets, diverter valve, accessories, and control panel, to clean condenser tubes by means of brushes, which travel through each tube when water flow is reversed at timed intervals. All brushes are to be held captive to each tube by the two baskets.
- B. Brushes shall be made of nylon bristles, with titanium wire and polypropylene tips. Baskets for catching and retaining brushes shall be polypropylene and shall be cemented and tested per manufacturer's recommendations. Baskets shall have removable end clips to allow removal of brushes without removal of basket from tube. Baskets are to be directly fastened to the tube end using special epoxy which when set allows the basket to withstand a 10lb pull test.
- C. 4- Way Diverter valve shall be of the plug type and shall allow for field adjustment of plug-to-seat clearance to minimize bypass. The diverter shall be manufactured in accordance with ASME Unfired Pressure Vessel Code Specification, Section VIII, rated for a minimum of 150percent of operating pressure at valve but not less than 900kPa (125psig), and have capability of operating with a system differential pressure of 240kPa (35psig). The valve shall reverse flow inside the condenser tubes while chiller is "on-line". Diverter valve shall be equipped with pneumatic actuator, and the diverter shall be sandblasted clean and finish coated prior to shipment.
- D. Actuator shall be a direct shaft-mounted, double acting, rack and pinion type pneumatic actuator, with solenoid and position indicator, which can operate with a nominal 80-100psig air supply.
- E. Solenoid air valve shall control the speed of the actuator cylinder, and provide adjustable control of the diverter valve for smooth operation of water flow from normal to reverse and back to normal position.
- F. Control Panel mounted in enclosure NEMA 4 shall include the following:
 - 1. 24-hour timer (adjustable) to initiated cleaning cycle.
 - 2. Cycle counter.
 - 3. "Power ON" indicator light.
 - 4. Manual override to start cleaning cycle.
 - 5. Diverter valve position indicator lights for "Normal" and "Reverse" flow.
 - 6. Diverter cycle failure lights.
 - 7. 4-Way solenoid valve with speed controls for actuator operation mounted at control panel or actuator.
 - 8. Flow switch by-pass.
 - 9. Chiller unloading control.
- G. Provide manufacturer's factory trained representative to supervise installation, start-up, and testing of system. Manufacturer of the Tube Cleaning System shall guarantee the system to provide a fouling factor of 0.00025 or better in the condenser tubes when the system is operated according to the manufacturer's instructions. Provide operation and installation manual.

- H. Acceptable Brands
1. WSA (water services of America, Inc.)
 2. Water Technology of Pensacola, Inc.)
 3. or Approved Equal

2.3 REFRIGERANT MONITORING AND SAFETY EQUIPMENT

- A. General: Provide refrigerant monitoring sensor/alarm system and safety equipment as specified here. Refrigerant sensor and alarm system shall comply with ASHRAE standard 15.
1. Self-contained breathing apparatus shall comply with 42 CFR 84.
- B. Refrigerant monitor shall continuously and display the specific gas (refrigerant used) concentration and shall be capable of indicating, alarming and shutting down refrigerant sensor(s), the following shall occur:
1. Active machinery (chiller) room ventilation.
 2. Active visual and audio alarm inside and outside of machinery room, with beacon light(s) and horn sounds equipment room and outside equipment room door(s). Shut down combustion process where combustion equipment is employed in the machinery room.
 3. Notify Engineering Control Center (ECC) of the alarm condition.
- C. Refrigerant monitor shall be capable of detecting concentration of 1 part per million (ppm) for low-level detection and for insuring the safety of operators. It shall be supplied factory-calibrated for the apparent refrigerant.
- D. Monitor design and construction shall be compatible with temperature, humidity, barometric pressure, and voltage fluctuations of the machinery room-operating environment.
- E. Self-Contained Breathing Apparatus (SCBA):
1. Orthopedically designed for shoulder mounting, portable, and compressed-air type, completely assembled with face-piece and harness carrier assembly.
 2. Face-piece to be constructed of durable material, complete with adjustable straps to hold face piece to head, close fitting nose piece to ensure no CO₂ build-up, and perspiration drain to avoid skin irritation and to prevent eyepiece, spectacle, and lens fogging.
 3. Air cylinder shall be fitted with quick refill assembly and air transfer.
 4. Minimum SCBA gear rating shall be 45minute in compliance with ASHRAE Standard 15.
 5. SCBA shall be housed in leak-proof, corrosion-resistant, tough plastic case for wall mounting. Minimum two (2) SCBA shall be provided.

PART 3 – EXECUTION

3.1 RESERVED

3.2 RESERVED

3.3 START-UP AND TESTING

- A. Engage manufacturer's factory-trained representative to perform startup and testing service.
- B. Inspect, equipment installation, including field-assembled components, and piping and electrical connections.

- C. After complete installation startup checks, according to the manufacturers written instructions, do the following to demonstrate to the Consultant that the equipment operate and perform 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. Verify automatic tube cleaning system is installed and functional.
 7. Verify purge system, if installed, is functional and relief piping is routed outdoor.
 8. Operate chiller for run-in-period in accordance with the manufacturer's instruction and observe its performance.
 9. Check and record refrigerant pressure, water flow, water temperature, and power consumption of the chiller.
 10. 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.
 11. Prepare a written report outlining the results of tests and inspections, and submit it to the Consultant.
- D. Engage manufacturer's certified factory trained representative to provide training for Owner's maintenance and operational personnel to adjust, operate and maintain equipment, including self-contained breathing apparatus.

3.4 WARRANTY AND FIRST YEAR PLANNED MAINTENANCE

- A. Provide manufacturer's warranty against defects in materials and workmanship for a period of 12months from date of acceptance.
- B. Include replacement of refrigerant and oil lost due to leaks during the warranty period.
- C. Include all labor cost for replacement and/or repair of defective equipment and materials.
- D. Include for any additional costs to provide a complete planned maintenance program during the warranty period including for the costs of all labor and materials necessary to maintain the refrigeration machines, starts and controls in first class working condition.

3.5 RESERVED

END OF SECTION