

**Invitation For Bid (IFB)**

**IFB No. 08012025**

**NCHP Chiller Replacement Primary Cooling Equipment**

**BID RELEASE DATE: August 01, 2025**

**BID DUE DATE: August 19, 2025\***

**BID DUE TIME: 2:30 PM CST\***

**BID OPENING EVENT: 2:30 PM CST**

**SUBMIT ALL BIDS VIA:** [**UA Formal Bid Submission**](https://forms.uark.edu/xfp/form/906)

**(NOTE: Take care to choose the CORRECT BID NUMBER from the dropdown menu.)**

**Signature Required For Response**

Respondent complies with all articles of the Standard Terms and Conditions documents as counterpart to this IFB document, and with all articles within the IFB document. If Respondent receives the University’s purchase order, Respondent agrees to furnish the items and/or services listed herein at the prices and/or under the conditions as indicated in the IFB.

|  |  |
| --- | --- |
| **Vendor Name:** |  |
| **Mailing Address:** |  |
| **City, State, Zip:** |  |
| **Telephone:** |  |
| **Email:** |  |

**Authorized Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Typed/Printed Name of Signor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Title: \_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\*Under no circumstances will late bids be accepted.**

**Bid opening event will be conducted at the date and time specified via Microsoft Teams. Notice of bid opening event will be posted on HogBid once the Teams meeting is set up.**

**INTERGOVERNMENTAL/COOPERATIVE USE OF COMPETITIVELY BID PROPOSALS AND CONTRACTS:**

In accordance with Arkansas Code Annotated § 19-11-249, any State public procurement unit, including any University of Arkansas System campus or unit, may participate in any contract resulting from this solicitation with a participating addendum signed by the contractor and approved by the chief procurement officer of the procurement agency issuing this solicitation.

**General Campus Background for University of Arkansas**

Founded in 1871 as a land-grant institution, the University of Arkansas, Fayetteville Arkansas (UofA), is the flagship campus of the University of Arkansas System. Our students represent all 50 states and more than 120 countries. The UofA comprises 10 colleges and schools offering an internationally competitive education for undergraduate and graduate students in more than 270 academic programs. The UofA contributes new knowledge, economic development, basic and applied research, and creative activity while also providing service to academic and professional disciplines. As of Fall 2023, student enrollment totaled approximately 32,140. The faculty count totaled 1,490 and the staff count totaled 3,350. The UofA is one of the nation’s top public research universities and the state’s foremost partner and resource for education and economic development. Its public service activities reach every county in Arkansas, throughout the nation, and around the world. The Carnegie Foundation classifies the UofA among only 3 percent (3%) of universities in America that have the highest level of research activity.

**1. INTRODUCTION / DESCRIPTION**Facilities Management, located on the University of Arkansas, Fayetteville (UAF) campus, is soliciting sealed bid proposals for a Contractor who shall coordinate, receive and install the equipment in the North Chiller Plant (NCHP).

**2. OVERVIEW / SCOPE OF WORK**

**Per attached specifications** See ATTACHMENT A for specifications of description.

**3. DISTRIBUTING ORGANIZATION**

This IFB is issued by the Office of Business Affairs at UA. The University Purchasing Official is the sole point of contact during this process. Only written communication is considered formal and can be supported throughout this process.

**Respondent Questions and Addenda:** Respondent questions concerning all matters of this IFB should be sent via email to:

Ed Beadles, Procurement Manager

Business Services

[ebeadles@uark.edu](mailto:ebeadles@uark.edu)

Questions received via email will be directly addressed via email, and compilation of *all* questions and answers (Q&A), as well as any revision, update and/or addenda specific to this IFB solicitation will be made available on HogBid, the UA bid solicitation website: <http://hogbid/>. During the time between the bid opening and contract award(s), with the exception of Bidder’s questions during this process, any contact concerning this IFB will be initiated by the issuing agency and not Bidder. Specifically, the persons named herein will initiate all contact, unless designated otherwise.

Bidders shall not rely on any other interpretations, changes, or corrections. It is Respondent's responsibility to thoroughly examine and read the entire IFB document and any Q&A or addenda to this IFB. Failure of Bidders to fully acquaint themselves with existing conditions or information provided will not be a basis for requesting extra compensation after the award of a Contract.

**4. INSTRUCTIONS TO BIDDERS/RESPONDENTS**

* Respondents must comply with all articles of the Standard Terms and Conditions documents posted on our Hogbid website as counterpart to the IFB document, and any associated appendices, as well as all articles within the IFB document. UA is not responsible for any misinterpretation or misunderstanding of these instructions on the part of the Respondents.
* Unless otherwise noted, Bids will be publicly opened in a virtual event at the specified date and time. All bids must be submitted per instructions found on the Formal Bid Solicitations Form at <https://forms.uark.edu/xfp/form/906>.
* **REQUIRED**

**Respondents must submit one SIGNED digital copy. If submitting a redacted copy, see Section 33 of this IFB document.**

* For a Bid to be considered, an official authorized to bind the respondent to a resultant contract must include signature in the blank provided on the IFB cover sheet. Failure to sign the bid as required will eliminate it from consideration.
* All official documents, including responses to this IFB, shall be included as part of any resultant Contract.
* The UA Procurement Official reserves the right to award a contract or reject a bid response for any or all line items of a bid received as a result of this IFB, if it is in the best interest of UA to do so. Bids may be rejected for one or more reasons not limited to the following:
  + Failure of the Respondent to submit the bid response as required in this IFB on or before the deadline established by UA.
  + Failure of the Respondent to respond to a requirement for oral/written clarification, presentation, or demonstration in the Proposal.
  + Failure to provide the bid security or performance security if required.
  + Failure to supply Respondent references if required.
  + Failure to sign an Official Bid Proposal Document.
  + Failure to complete the Official Bid Price Sheet.
  + Any wording by the Respondent in their Proposal or any response to this IFB, or in subsequent correspondence, which conflicts with or takes exception to a bid requirement in this IFB.
* If the Respondent submits standard terms and conditions with the bid, and if any section of those terms is in conflict with the laws of the State of Arkansas, the State laws shall govern. Standard terms and conditions submitted may need to be altered to adequately reflect all the conditions of this IFB, the Respondent’s Proposals and Arkansas State law.
* *According to Ark. Code Ann. § 4-27-1501 and OSP Rule R4:19-11-217,* A foreign corporation may not transact business in Arkansas until it obtains a certificate of authority from the Secretary of State.
* The University may make any decision or take any action that it, in its sole discretion, deems appropriate in order to comply with Act 1020 of 2021, the Transparency in Foreign Investment Act (Ark. Code Ann. § 6-60-1201 *et seq.*).

**5. AWARD RESPONSIBILITY**

The UA Procurement Official will be responsible for award and administration of any resulting contract(s). UA reserves the right to reject any or all bids, or any portion thereof, to re-advertise if deemed necessary, and to investigate any or all bids and request additional information as necessary in order to substantiate the professional, financial and/or technical qualifications of the respondent(s).

Contract(s) will be awarded to the respondent(s) whose proposal(s) adheres to the conditions set forth in the IFB, and in the sole judgment of UA, best meets the overall goals and financial objectives of UA. A resultant contract will not be assignable without prior written consent of both parties.

**6. BID EVALUATION**Award will be made on a per item an all or none basis, whichever is in the best interest of the University of Arkansas. All bids must meet or exceed minimum specifications and will be evaluated based solely on price and/or discount as specified on the Official Bid Price Sheet. The University of Arkansas reserves the right to withdraw the IFB and to not make a final award if it is in the best interests of the University to do so. Bids not meeting the requirements specified in this IFB or received after the bid opening date and time will be rejected and removed from further consideration.

**7. BEST AND FINAL OFFER**UA reserves the right to request an official “Best and Final Offer” (BAFO) from bid respondents if it deems such an approach is in the best interest of the institution.  In general, the “Best and Final Offer” will consist of an updated cost proposal in addition to an opportunity for the respondent to submit clarification response to specific questions or opportunities identified in subsequent discussions related to the original Proposal response submitted to UA. If the UA chooses to invoke a “Best and Final Offer” option, all responses will be re-evaluated by incorporating the information as requested in the official “Best and Final Offer” document, including costs and answers to specific questions presented in the document. The specific format for the official “Best and Final Offer” request will be determined during evaluation discussions.  The official request for a “Best and Final Offer” will be issued by the UA Procurement Department.

**8. CONTRACT TERM AND TERMINATION**

The term (“Term”) of any resulting Contract will begin upon date of Contract award.  If mutually agreed upon in writing by the Contractor and UA, the term shall be for an initial period of four (4) years, with option to renew at the end of the contract term for three (3) additional years, for a combined total of seven (7) years (or 84 months). The University of Arkansas may terminate this Agreement without cause, at any time during the Term (including any renewal periods), by giving the other party thirty (30) days advance written notice of termination. Additionally, in the event of non-appropriation of funds necessary to fulfill the terms and conditions of this Agreement during any period of the Term (including any renewal periods), the parties agree that this Agreement shall automatically terminate without notice.

**a)** If at any time the performance becomes unsatisfactory, UA will give thirty (30) days written notice to the contractor. If at the end of the thirty (30) day period the performance is still deemed unsatisfactory, the contract shall be cancelled by UA, Office of Business Affairs. Additionally, the contract may be terminated, without penalty, by UA without cause by giving thirty (30) days written notice of such termination to contractor.

**b)** Upon award, the agreement is subject to cancellation, without penalty, either in whole or in part, if funds necessary to fulfill the terms and conditions of this contract during any period of the Term (including any renewal periods) are not appropriated.

**c)** In no event shall such termination by UA as provided for under this section give rise to any liability on the part of UA, its trustees, officers, employees or agents including, but not limited to, claims related to compensation for anticipated profits, lost business opportunities, unabsorbed overhead, misrepresentation, or borrowing. UA’s sole obligation hereunder is to pay contractor for services ordered and received prior to the date of termination.

The terms, conditions, representations, and warranties contained in the contract shall survive the termination of the Contract.

**9.** **RESPONDENT’S RESPONSIBILITY TO READ IFB**

It is the respondent's responsibility to thoroughly examine and read the entire IFB document, including any and all appendices. Failure of respondents to fully acquaint themselves with existing conditions or the amount of goods or work involved will not be a basis for requesting extra compensation after the award of a contract. This engagement is separate from any other engagement bidder may be currently pursuing with the University of Arkansas. Interpretation of the University of Arkansas is final.

Bids not fully compliant with all sections of the IFB may be deemed non-responsive and may not be evaluated. However, UA reserves the right to waive any formality or irregularity in any bid if deemed to be in the best interest of UA. In addition, UA reserves the right to reject any or all bids.

If language in this IFB differs from other language in the UA Standard Terms and Conditions or other standard forms, the language in this IFB shall govern.

**10. INDICIA**

The respondents and the contractor acknowledge and agree that UA owns the rights to its name and its other names, symbols, designs, and colors, including without limitation, the trademarks, service marks, designs, team names, facilities images, uniforms, nicknames, abbreviations, city/state names in the appropriate context, slogans, logo graphics, mascots, seals, color schemes, trade dress, and other symbols associated with or referring to UA that are adopted and used or approved for use by UA (collectively the “Indicia”) and that each of the Indicia is valid. Neither any respondent nor contractor shall have any right to use any of the Indicia, derivative, or any similar mark as, or a part of, a trademark, service mark, trade name, fictitious name, domain name, company or corporate name, a commercial or business activity, or advertising or endorsements anywhere in the world without the express prior written consent of an authorized representative of UA. Any domain name, trademark or service mark registration obtained or applied for that contains the Indicia or any similar mark upon request shall be assigned or transferred to UA or its Board of Trustees without compensation.

**11. PRICING**

Pricing must be listed on the Official Bid Price Sheet in the format provided with this IFB and must include

shipping and handling charges. Upon bid award, all pricing and/or discounts must be firm for a period of two (2)

years. UA will not be obligated to pay any costs not identified on the Official Price Sheet. If pricing is dependent on

any assumptions that are not specifically stated on the Official Price Sheet, please list those assumptions

accordingly, on a separate sheet and show detailed pricing. Bidders must certify that any costs not identified by the

Bidder, but subsequently incurred in order to achieve successful product/operation/service, etc. will be borne by the

Bidder. Failure to do so may result in rejection of the bid.

**12. DISCOUNTS**

Please list percentage (%) discount (from list price) for each category listed on the Official Bid Price sheet where applicable.

**13. INTEREST/LATE FEES**

Pursuant to Ark. Code Ann. § 19-11-224, no interest or late fees shall accrue until amounts are 60 days past due. The interest rate shall be 6% per annum, consistent with Ark. Code Ann. § 4-57-101(d).

**14.** **PREPAYMENT**

Any provision of the Agreement requiring a deposit or prepayment is deleted. Any such prepayment amount stated in the Agreement shall instead be due upon delivery of a fully and correctly functioning product after University has tested such product.

**15. WARRANTY**

A. Equipment Manufacturer shall provide full parts and labor warranty from the date of Substantial Completion for the complete chiller and associated systems including variable speed drives, and associated auxiliaries, including refrigerant, oil and start-up services from the completion of systems commissioning and project acceptance, which is anticipated to occur in December of 2026. Start-up services and labor warranty shall be performed by factory employed service technicians. Manufacturer shall agree to replace any and all chiller related components that are provided on the project at no cost to the Owner during the warranty period. Warranty period details are as follows: 1. Ten (10) years for electric motor only. Five (5) years for all other parts. B. All written warranty claims by the Owner shall be responded to by the manufacturer within 24 hours including a site visit and diagnosis. Prior to leaving the site, a repair schedule shall be mutually established between the Owner and the manufacturer. If the manufacturer fails to meet the repair schedule, the Owner reserves the right to make the necessary repairs. The cost for the Owner to make the repairs shall be invoiced to the manufacturer by the Owner. Through submittal of a bid on this project, the manufacturer is obligated to reimburse the Owner for such repairs (Net 30 days). C. Manufacturer to price warranty based on assumption the project’s Substantial Completion will be 6 months after delivery of the chiller. In addition, manufacturer shall provide a unit price per month to delay the start of the warranty to align with the project’s Substantial Completion if construction is prolonged.

**16. SHIPMENT**

All products to be delivered to the University shall be shipped FOB Point of Destination. Risk of loss for product(s) shall pass to the University upon delivery of the product(s) to University.

**17.** **RETURNS**

The University will not be responsible for any fees, including but not limited to cancellation fees, or the

return of any defective or otherwise nonconforming item.

**18. RESERVATION/COMMITMENT**

This IFB does not commit UA to award a contract, to pay costs incurred in the preparation of a bid to this request, or to procure or contract for services or supplies. UA reserves the right to accept or reject (in its entirety), any bid received as a result of this IFB, if it is in the best interest of UA to do so. In responding to this IFB, respondents recognize that UA may make an award to a primary Bidder; however, UA makes no commitment to purchase any minimum or maximum quantity of dollar volume of products from the selected supplier. UA reserves the right to purchase like and similar products/services from other agencies as necessary to meet operation requirements.

**19.** **FUNDING OUT CLAUSE**

If, in the sole discretion of UA, funds are not allocated to continue any resultant Contract, or any activities related herewith, in any future period, then UA will not be obligated to pay any further charges for services, beyond the end of the then current period. Contractor will be notified of such non-allocation at the earliest possible time. No penalty shall accrue in the event this section is exercised. This section shall not be construed so as to permit UA to terminate any Contract awarded in order to acquire similar service from a third party.

**20.**  **CONTRACT INFORMATION**

Bidders should note the following regarding the State’s contracting authority and amend any documents accordingly. Failure to conform to these standards may result in rejection of bid:

A. The State of Arkansas may not contract with another party to perform any of the following:

1. Pay any penalties or charges for late payment or any penalties or charges which in fact are penalties for any reason.

2. Indemnify or defend that party for liability or damages. Under Arkansas law UA may not enter into a covenant or agreement to hold a party harmless or to indemnify a party from prospective damages.

3. Pay all sums that become due under a contract upon default.

4. Pay damages, legal expenses, attorneys’ fees or other costs or expenses of any party.

5. Conduct litigation in a place other than the State of Arkansas.

6. Agree to be subject to or bound by governing law, jurisdiction, or venue of any state, country or province other than the State of Arkansas.

7. Agree to any provision of a contract that violates the laws or constitution of the State of Arkansas.

B. A party wishing to contract with UA should:

1. Remove any language from its contract which grants to it any remedies other than:

* The right to possession.
* The right to accrued payment.
* The right to expenses of de-installation.

2. Include in its contract that the laws of the State of Arkansas govern the contract and that the State of Arkansas is the exclusive jurisdiction and venue for any and all claims, disputes, actions or suits between the parties or related to the Contract.

3. Include in its Contract that the UA is an instrumentality of the State of Arkansas entitled to sovereign immunity from suit and that all claims, demands, suits, or actions for loss, expense, damage, liability or other relief, either at law or in equity, against UA or its trustees, officers, employees, volunteers, students, agents or designated representatives acting within the official scope of their position, must be brought before the Claims Commission of the State of Arkansas.

4. Include in its Contract all other terms and conditions stated in this IFB.

5. Acknowledge in its contract that contracts become effective when awarded by UA Purchasing Official.

**21. CONTRACT ITEMS/ADDITIONS**

The University of Arkansas, on behalf of Facilities Management, reserves the right to add items to this contract throughout the term of the contract. Changes must be submitted in writing and approved by both parties.

22. SPECIAL OFFERS/PROMOTIONS

The University of Arkansas reserves the right to take advantage of special offers, promotions and educational discounts for which the University of Arkansas is eligible, should they become available. Should these promotions be less expensive than the normal percentage discount, the University must be given an opportunity to participate.

**23. AGREEMENT AUTHORITY**

The parties agree that they are and shall remain independent parties, and nothing contained in this agreement shall be deemed or interpreted to create any relationship other than that of independent parties. The parties agree that they shall perform all rights and obligations under this agreement as independent parties. No acts performed or representations made, whether written or oral, by either party shall bind the other party.

**24. GOVERNING LAW**

This IFB, any resulting Contract and all performance thereunder, transactions and subsequent amendments thereto between Respondent(s) or Contractor(s) and UA shall be governed and construed in all aspects in accordance with the laws of the State of Arkansas without regard to its choice of law principles (including without limitation any and all disputes, claims, counterclaims, causes of action, suits, rights, remedies, promises, obligations, demands, and/or defenses related thereto that may be asserted by either party). The parties agree that the State of Arkansas shall be the sole and exclusive venue and jurisdiction for any litigation or proceeding that may arise out of or in connection with this IFB or any Contract with UA. The parties waive any objection to the laying of jurisdiction and venue of any claim, action, suit or proceeding arising out of the Contract or any transaction contemplated hereby, in the State of Arkansas, and hereby further waive and agree not to plead or assert that any claim, action, suit or proceeding has been brought in an inconvenient forum. Nothing contained herein shall be deemed or construed as a waiver of any immunities to suit available to UA or its trustees, officials, employees and representatives. In no event shall UA or any of its current and former trustees, officials, representatives and employees (in their official or individual capacities) be liable to Respondent(s) or Contractor(s) for special, indirect, punitive, or consequential damages, attorneys’ fees or costs or any damages constituting lost profits or lost business opportunities.

25. DISPUTES

Contractor and UA agree that they will attempt to resolve any disputes in good faith. Contractor and UA agree that the State of Arkansas shall be the sole and exclusive jurisdiction and venue for any litigation or proceeding that may arise out of or in connection with any Contract. The Respondent acknowledges, understands and agrees that any claims, demands, suits, or actions for damages against UA may only be initiated and pursued in the Arkansas Claims Commission, if at all. Under no circumstances does UA agree to binding mediation or arbitration of any disputes or to the payment of attorney fees, court costs or litigation expenses.

26. DELIVERY

Manufacturer shall be able to produce, test and deliver the equipment (FOB) to a location dictated by the Contractor per the schedule described above. Contractor shall plan construction to allow for equipment to be installed in the NCHP within this delivery window. If Contractor is unable to install equipment upon arrival within this delivery window, it is the Contractor's responsibility to provide appropriate storage for equipment, local to the University, and provide transportation of equipment from storage site to job site.

27. PAYMENT INSTRUCTIONS

Contractor agrees that in the course of making payments UA is entitled to rely on information contained in written or electronic communications that UA reasonably believes have been transmitted or authorized by Contractor. Contractor shall hold UA harmless against any loss or damage related to or arising from UA’s reliance on such communications.

28. CONDITIONS OF CONTRACT

Contractor shall at all times observe and comply with federal and Arkansas State laws, local laws, ordinances, orders, and regulations existing at the time of or enacted subsequent to the execution of the Contract which in any manner affect the completion of work. Contractor shall indemnify and hold harmless UA and all its trustees, officers, employees, volunteers, students, and agents against any claim or liability arising from or based upon the violation of any such law, ordinance, regulation, order or decree by an employee, representative, or subcontractor of the Contractor.

To the extent Contractor shall have access to, store or receive student education records, Contractor agrees to abide by the limitations on use and re-disclosure of such **records** set forth in **the Family Educational Rights and Privacy Act** (FERPA), 20 U.S.C. § 1232g, and 34 CFR Part 99. Contractor agrees to hold student record information in strict confidence andshall not use or disclose such information except as authorized in writing by UA or as required by law. Contractor agrees not to use the information for any purpose other than the purpose for which the disclosure was made. Upon termination, Contractor shall return all student education record information or provide evidence that it was destroyed within thirty (30) days.

When procuring a technology product or when soliciting the development of such a product, the State of Arkansas is required to comply with the provisions of Arkansas Code Annotated § 25‐26‐201 et seq., as amended by Act 308 of 2013, which expresses the policy of the State to provide individuals who are blind or visually impaired with access to information technology purchased in whole or in part with state funds. Contractor expressly acknowledges and agrees that state funds may not be expended in connection with the purchase of information technology unless that system meets the statutory requirements found in 36 C.F.R. § 1194.21, as it existed on January 1, 2019 (software applications and operating systems) and 36 C.F.R. § 1194.22, as it existed on January 1, 2019 (web‐based intranet and internet information and applications), in accordance with the State of Arkansas technology policy standards relating to accessibility by persons with visual impairments.

**ACCORDINGLY, CONTRACTOR SHALL EXPRESSLY REPRESENT AND WARRANT** to the State of Arkansas through the procurement process by submission of a Voluntary Product Accessibility Template (“VPAT”) or similar documentation to demonstrate compliance with 36 C.F.R. § 1194.21, as it existed on January 1, 2019 (software applications and operating systems) and 36 C.F.R. § 1194.22, as it existed on January 1, 2019 (web‐based intranet and internet information and applications) that the technology provided to the State for purchase is capable, either by virtue of features included within the technology, or because it is readily adaptable by use with other technology, of:

‐ Providing, to the extent required by Arkansas Code Annotated § 25‐26‐201 et seq., as amended by Act 308 of 2013, equivalent access for effective use by both visual and non‐visual means;

‐ Presenting information, including prompts used for interactive communications, in formats intended for non‐visual use;

‐ After being made accessible, integrating into networks for obtaining, retrieving, and disseminating information used by individuals who are not blind or visually impaired;

‐ Providing effective, interactive control and use of the technology, including without limitation the operating system, software applications, and format of the data presented is readily achievable by nonvisual means;

‐ Being compatible with information technology used by other individuals with whom the blind or visually impaired individuals interact;

‐ Integrating into networks used to share communications among employees, program participants, and the public; and

‐ Providing the capability of equivalent access by nonvisual means to telecommunications or other interconnected network services used by persons who are not blind or visually impaired.

If the information technology product or system being offered does not completely meet these standards, the Respondent must provide an explanation within the VPAT detailing the deviation from these standards.

State agencies cannot claim a product as a whole is not reasonably available because no product in the marketplace meets all the standards. If products are reasonably available that meet some but not all of the standards, the agency must procure the product that best meets the standards or provide written documentation supporting selection of a different product, including any required reasonable accommodations.

For purposes of this section, the phrase “equivalent access” means a substantially similar ability to communicate with, or make use of, the technology, either directly, by features incorporated within the technology, or by other reasonable means such as assistive devices or services which would constitute reasonable accommodations under the Americans with Disabilities Act or similar state and federal laws. Examples of methods by which equivalent access may be provided include, but are not limited to, keyboard alternatives to mouse commands or other means of navigating graphical displays, and customizable display appearance. As provided in Arkansas Code Annotated § 25-26-201 et seq., as amended by Act 308 of 2013, if equivalent access is not reasonably available, then individuals who are blind or visually impaired **shall** be provided a reasonable accommodation as defined in 42 U.S.C. § 12111(9), as it existed on January 1, 2019.

If the information manipulated or presented by the product is inherently visual in nature, so that its meaning cannot be conveyed non-visually, these specifications do not prohibit the purchase or use of an information technology product that does not meet these standards.

29. TIME IS OF THE ESSENCE

Respondent and UA agree that time is of the essence in all respects concerning this IFB and any Contract and performance therein.

30. PERMITS/LICENSES AND COMPLIANCE

Contractor covenants and agrees that it shall, at its sole expense, procure and keep in effect all necessary permits and licenses required for its performance of obligations under this IFB, and shall post or display in a prominent place such permits and/or notices as required by law. Contractor is responsible for compliance with all applicable laws and regulations, including but not limited to, OSHA requirements as well as any Fair Labor Standards Act requirements pertaining to compensation of Contractors employees or subcontractor (if any) working on the project; further, upon request, Contractor shall provide copies of all such permits or licenses to UA.

31. INDEMNIFICATION AND INSURANCE

The successful Respondent or Contractor shall indemnify, defend, and hold harmless University, its trustees, officers, directors, employees, agents and volunteers from and against any and all losses, costs, expenses, damages, and liabilities resulting from or relating to: (a) any breach by Contractor or Contractor’s members, officers, employees, subcontractors, vendors, and agents of any representation, warranty, or other provision of this IFB, any resulting Contract or any document delivered by Contractor in connection with the products and services contemplated by this IFB; (b) any damage to property or bodily injury, including, but not limited to illness, paralyzation, dismemberment and death, arising from or relating to any products or services provided by the Contractor or uses of the UA campus by Contractor, its officers, employees, agents, volunteers, customers, subcontractors or guests under this IFB or any resulting Contract, or any other activities conducted on the UA campus (whether such activity is authorized or unauthorized by UA); (c) any use of or damage to UA property and any defect in any building and improvement thereon, including, but not limited to, any damage to any parking lots arising from or relating to any permitted uses under this IFB or any resulting Contract; (d) any act or omission of Contractor or any of its officers, agents, employees, invitees, or subcontractor’s employees and invitees; and (e) any violation by Contractor of any applicable NCAA or SEC rules or regulations or state, federal or local laws.

The obligation to indemnify UA shall include, but shall not be limited to, the obligation to pay any and all losses, costs, expenses, attorneys' fees, damages, and liabilities incurred, as well as any attorneys’ fees and court costs (including, but not limited to, any appellate or appellate-related proceedings). At no cost or expense to UA, UA’s in-house counsel may participate in any proceedings. The indemnification obligations under this IFB or any resulting Contract shall survive the expiration or termination of such IFB or resulting Contract.

The successful Respondent or Contractor shall purchase and maintain at Contractor’s expense, the following minimum insurance coverage for the period of any Contract. Certificates evidencing the effective dates and amounts of such insurance must be provided to UA:

* Workers Compensation: As required by the State of Arkansas. Additionally, the Contractor shall maintain Employer's Liability Insurance with a policy limit of not less than $100,000 each accident, $500,000 disease, and $100,000 disease each employee.
* Comprehensive General Liability, with no less than $1,000,000 each occurrence/$2,000,000 aggregate for bodily injury, products liability, contractual liability, and property damage liability.
* Comprehensive Automobile Liability, with no less than combined coverage for bodily injury and property damage of $1,000,000 each occurrence.

Policies shall be issued by an insurance company authorized to do business in the State of Arkansas and shall provide that policy may not be canceled except upon thirty (30) days prior written notice to UA. Any policy shall cover any vehicle being used in the management, operation, or delivery deriving from Contractor’s operations on UA’s campus. Contractor shall also be responsible for payment of workers’ compensation insurance for all Contractor’s employees as required by the State of Arkansas.

Contractor shall furnish UA with a certificate(s) of insurance effecting coverage required herein. Failure to file certificates or acceptance by UA of certificates which do not indicate the specific required coverages shall in no way relieve the Contractor from any liability under the Contract, nor shall the insurance requirements be construed to conflict with the obligations of Contractor concerning indemnification. Any failure to comply with reporting provisions of the policies shall not affect coverage provided to UA, its trustees, officials, employees, agents or volunteers. Proof of Insurance must be included in bid Proposal.

Contractor shall, at their sole expense, procure and keep in effect all necessary permits and licenses required for its performance under the Contract, and shall post or display in a prominent place such permits and/or notices as are required by law.

32. SOVEREIGN IMMUNITY

Notwithstanding any terms or conditions to the contrary, nothing within the Contractor’s proposal shall constitute a waiver of any immunities to suit legally available to the University, it officers, agents and employees, including, but not limited to the Sovereign Immunity of the State of Arkansas.

**33. REQUIRED IF SUBMITTING ADDITIONAL REDACTED COPY**

Proprietary information submitted in response to this IFB will be processed in accordance with applicable State of Arkansas procurement law. Documents pertaining to the IFB become the property of UA and shall be open to public inspection **after** a notice of intent to award is formally announced.

It is the responsibility of the respondent to identify all proprietary information included in their bid and to submit in the proper receptacle at <https://forms.uark.edu/xfp/form/906>. The respondent shall submit one (1) separate digital copy of the bid from which any proprietary information has been removed, i.e., a redacted copy (marked “REDACTED COPY”).  **NOTE: There are SEPARATE repositories – the redacted copy is to be submitted in the repository titled “Upload redacted/proprietary bid documents”.** The redacted copy should reflect the same pagination as the original, show the empty space from which information was redacted. Except for the redacted information, the redacted copy must be identical to the original copy submitted for the bid response to be considered.  The Respondent is responsible for ensuring the redacted copy is protected against restoration of redacted data.  The redacted copy may be open to public inspection under the Freedom of Information Act (“FOIA”) without further notice to the Respondent **after** a notice of intent to award is formally announced. If during a subsequent review process the University determines that specific information redacted by the respondent is subject to disclosure under FOIA, the Respondent will be contacted prior to release of the information.

**34. WEB SITE ACCESSIBILITY**

Respondent represents that web-based services substantially comply with the accessibility guidelines of Section 508 of the Rehabilitation Act of 1973 and with Web Content Accessibility Guidelines (“WCAG”) Version 2.0 Level AA, and agrees to promptly respond to and resolve any accessibility complaints received from UA.

**35. PROHIBITION AGAINST BOYCOTTING ISRAEL**

In accordance with Ark. Code Ann. § 25-1-503, Respondent hereby certifies to UA that Respondent: (a) is not currently engaged in a boycott of Israel; and (b) agrees for the duration of any Contract not to engage in any boycott of Israel. A breach of this certification will be considered a material breach of contract. In the event that Respondent breaches this certification, UA may immediately terminate any Contract without penalty or further obligation and exercise any rights and remedies available to it by law or in equity.

**36. CAMPUS RESTRICTIONS**

Contractor shall not permit tobacco, electronic cigarettes, alcohol, or illegal drugs to be used by any of its officers, agents, representatives, employees, subcontractors, licensees, partner organizations, guests or invitees while on the campus of UA. Respondents further agrees that it will not permit any of its officers, directors, agents, employees, contractors, subcontractors, licensees, partner organizations, guests or invitees to bring any explosives, firearms or other weapons onto the campus of UA, except to the extent expressly permitted by UA policies and the Arkansas enhanced concealed carry laws. Respondent shall not allow any of its officers, directors, agents, employees, contractors, subcontractors, licensees, partner organizations, guests or invitees that are registered sex offenders to enter the campus of the University. Respondent agrees that it will not permit any of its officers, directors, agents, employees, contractors, subcontractors, licensees, partner organizations, guests or invitees who have been convicted of a felony involving force, violence, or possession or use of illegal drugs to work on this campus. Respondent will fully comply with all applicable UA policies, and federal, state and local laws, ordinances, and regulations.

**37. PERFORMANCE STANDARDS**

Contractor acknowledges that the use of performance-based standards on any resultant Contract by UA are required pursuant to Arkansas Code Annotated § 19-11-267. Contractor shall provide prompt, responsive, courteous and high-quality products, services and customer service in the performance of its obligations under this IFB and any resulting Contract with UA. Contractor shall warrant that the equipment placed on the UA campus shall be of good quality, safe and suitable for their intended use by customers and properly installed. Contractor acknowledges that all products and services provided to UA or tailgate customers on the UA campus are to be of high quality and rendered in a timely and professional manner.  Contractor represents and warrants that it will provide all products and services related to any resulting Contract in a manner consistent with industry standards. In addition, Contractor shall respond to all production, service, maintenance and customer service and support requests by in a polite and timely manner. Further, Contractor recognizes that failure to perform hereunder may cause UA financial or reputational harm or damages or require it to acquire replacement services on short notice.  Therefore, any failure to provide the agreed upon products or services to UA or customers at the quality, times or in the manner specified, or for the duration required hereunder shall constitute a breach of any Contract between Contractor and UA subject to termination.

38. BACKGROUND CHECKS

Contractor shall be responsible to obtain and to pay for background checks (including, but not limited to, checks for registered sex offenders) for *all* individuals performing any services related to this IFB on the UA campus, whether on a paid or volunteer basis, in a manner requested by UA and consistent with procedures established by UA for its background checks. No person may perform any duties or services for Contractor on the UA campus under any circumstances whatsoever until a satisfactory background check has been completed for each individual and copies furnished to UA.

**39. NO ASSIGNMENT AND SUBLICENSING**

Respondents may not assign or sublicense any resulting Contract without the prior written consent of an authorized representative of UA as provided by UA’s Board of Trustee Policy.

**40. PCI DSS COMPLIANCE**

Any third-party service provider utilized by the Contactor that engages in electronic commerce on behalf of the UA or other services contemplated under this IFB or any resulting Contract with UA, shall protect all card holder data (“CHD”) and sensitive authentication data (“SAD”) in accordance with the Payment Card Industry Data Security Standard (“PCI DSS”), if applicable, or using secure standard financial industry practices, if PCI DSS standards are not applicable. UA reserves the right at any time to request either proof of PCI DSS compliance or a certification (from a recognized third-party security auditing firm) verifying that the Contactor (and/or any third party service provider utilized by the Contactor) uses secure standard financial industry practices in its financial transactions, and maintains ongoing compliance under PCI DSS standards and/or secure financial industry practices as they change over time. The Contactor will comply with all laws, rules and regulations relating to the access, transfer, storage, processing, collection, use, protection and breach of all CHD and SAD. The Contactor shall not share with the University or grant the University access to any CHD or SAD accessed, transferred, stored, processed, collected, used or transacted by the Contactor or any third party provider utilized by the Contactor related to the purchase, sale, resale, offer to resell, return, credit, or reserving the rights to any services contemplated under the IFB or any resulting Contract with UA. The Contactor further acknowledges that neither it nor any third-party service provider utilized by the Contactor shall be granted access to UA’s system in connection with any financial transaction under the Contract, and will not access, transfer, store, process, collect, use or otherwise transmit CHD or SAD using UA’s systems. The Contactor will provide their Attestation of PCI Compliance and network scans to UA on an annual basis. The Contactor will give immediate notice to UA of any actual or suspected unauthorized disclosure of, access to or other breach of the CHD or SAD. The Contactor will indemnify UA for any third-party claim brought against UA arising from a breach by the Contactor of the representations or obligations of this section. This section and its indemnity will survive the termination of this IFB and any resulting Contract between Contractor and UA.

**41.** **Restriction of Boycott of Energy, Fossil Fuel, Firearms, and Ammunitions Industries**

In accordance with Ark. Code Ann. § 25-1-1002, Respondent hereby certifies to UA that Respondent: (a) is not currently engaged in a boycott of the energy, fossil fuel, firearms and ammunition industries; and (b) agrees for the duration of any Contract not to engage in any boycott of the energy, fossil fuel, firearms or ammunition industries. The preceding does not apply to: (i) a financial services provider as defined at Ark. Code Ann. § 25-1-1001(8)(A), (ii) an agreement with a total potential value of less than $75,000, or (iii) a contract under which the Contractor’s price for the goods or services is at least 20% less than the lowest certifying business.

**42. Certification of Non-Scrutinized Company**

The Respondent certifies that the government of the People’s Republic of China (“PRC”) does not wholly own the Respondent or hold a majority interest in the Respondent. Respondent further certifies that the PRC does not own or hold a majority interest in a for-profit parent company, subsidiary or affiliate of Respondent, or in a subcontractor to be employed by Respondent.

43. MINIMUM SPECIFICATIONS

SEE ATTACHMENT A (for specifications of description):

**OFFICIAL BID PRICE SHEET**

**BID NAME: NCHP Chiller Replacement Primary Cooling Equipment**

**BID NUMBER: 08012025**

**BID DUE DATE/TIME: August 19, 2025 2:30 PM CST**

**BIDDER INFORMATION CONTACT: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ PHONE/EMAIL:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Reference Section 11-Pricing** for further instruction, and the corresponding Bid Price Sheet provided below. Please complete the Price Sheet as provided and submit within your proposal. If pricing is dependent on any assumptions that are not specifically stated on the Official Price Sheet, please list those assumptions accordingly on a separate spreadsheet and show detailed pricing. Any additional pricing lists should remain attached to the Official Price Sheet for purposes of accurate evaluation. **Pricing must be valid for ninety (90) days following the bid due date and time.**

UA will not be obligated to pay any costs not identified accordingly. The Respondent must certify that any costs not identified by the Respondent, but subsequently incurred in order to achieve successful operation of the commodity/service, will be borne by the Respondent. Failure to do so may result in rejection of the bid.

**NOTE:** Bids must be submitted on this official bid form to be considered. Vendors must use this Official Bid Price Sheet when submitting bids in response to this IFB. Provide pricing and/or discount where applicable next to the item listed below, per minimum specifications as listed within this bid document. Pricing must include shipping and handling charges.

**NOTE: Shipping must be FOB Destination Fayetteville, AR.**

**Specify Delivery Time: \_\_\_\_\_\_\_\_\_\_ Days after receipt of order.**

**Bid the following according to minimum specifications or functional equivalent:**

BASE BID: Provide one electric centrifugal chiller as specified herein. Clarify tonnage and lead time within bid. Cost is not inclusive of additional line items within this section.

Dollars ($ )

Tons Weeks

Cost per year for five (5) year regular service and preventative maintenance contract for the chiller and related VSD/AFD.

Year 1:

Dollars ($ )

Year 2:

Dollars ($ )

Year 3:

Dollars ($ )

Year 4:

Dollars ($ )

Year 5:

Dollars ($ )

Cost for full parts and labor warranty described herein for the chiller and related VSD/AFD.

Dollars ($ )

Cost per month to delay the start of the full parts and labor warranty described herein for the chiller and related VSD/AFD to align with the project’s Substantial Completion date.

Dollars ($ per month) Cost for recommended complete spare parts package (exclusive of VSD/AFD spare parts).

Dollars ($ )

Cost for recommended VSD/AFD spare parts package.

Dollars ($ )

Cost for complete factory performance testing of the chiller and related VSD/AFD.

Dollars ($ )

Cost for factory Eddy Current testing.

Dollars ($ )

Cost to perform temporary modifications to the existing building opening for installation of the chiller, inclusive of restoration to match existing conditions. If not applicable, note accordingly.

Dollars ($ )

If additional hours are needed during initial installation, startup, and commissioning, supplier agrees to provide the services of a fully qualified technician for $ per hour.

Supplier agrees to provide the services of a fully qualified technician at a Not-To-Exceed rate for the first year of $ per hour and will be increased each year thereafter by not more than the annual percentage amount of % during the term of the warranty and service contract.

# ALTERNATE BID ITEMS

**Alternate Bid No. 1 for Fixed Capacity Machine:** Provide one electric centrifugal chiller as specified herein with a 2,500 Ton capacity. Clarify lead time within bid. Cost is not inclusive of additional line items within this section.

Dollars ($ )

Weeks

Cost per year for five (5) year regular service and preventative maintenance contract for the chiller and related VSD/AFD.

Year 1:

Dollars ($ )

Year 2:

Dollars ($ )

Year 3:

Dollars ($ )

Year 4:

Dollars ($ )

Year 5:

Dollars ($ )

Cost for full parts and labor warranty described herein for the chiller and related VSD/AFD.

Dollars ($ )

Cost per month to delay the start of the full parts and labor warranty described herein for the chiller and related VSD/AFD to align with the project’s Substantial Completion date.

Dollars ($ per month) Cost for recommended complete spare parts package (exclusive of VSD/AFD spare parts).

Dollars ($ )

Cost for recommended VSD/AFD spare parts package.

Dollars ($ )

Cost for complete factory performance testing of the chiller and related VSD/AFD.

Dollars ($ )

Cost for factory Eddy Current testing.

Dollars ($ )

Cost to perform temporary modifications to the existing building opening for installation of the chiller, inclusive of restoration to match existing conditions. If not applicable, note accordingly.

Dollars ($ )

If additional hours are needed during initial installation, startup, and commissioning, supplier agrees to provide the services of a fully qualified technician for $ per hour.

Supplier agrees to provide the services of a fully qualified technician at a Not-To-Exceed rate for the first year of $ per hour and will be increased each year thereafter by not more than the annual percentage amount of % during the term of the warranty and service contract.

Confirmation of addendum received and used in computing bid: Addendum No. 1

Addendum No. 2

Addendum No. 3

# SECTION 23 6000 PRIMARY COOLING EQUIPMENT

Attachment A

**PART 1 - GENERAL**

* 1. REFERENCE
     1. The Work under this section is subject to requirements of the Contract Documents including the GENERAL CONDITIONS, SUPPLEMENTAL GENERAL CONDITIONS, and

sections under Division 01 - GENERAL REQUIREMENTS.

* 1. DESCRIPTION
     1. The primary cooling equipment specified herein will be solicited for and bid by the Owner. Based on a comparative analysis prepared the Engineer, the Owner will assign the procurement of the preferred equipment to the Contractor who shall coordinate, receive and install the equipment in the North Chiller Plant (NCHP).
     2. Base Bid:
        1. Provide a 480V, electric packaged, factory assembled, centrifugal chiller complete with compressor, motor, unit mounted variable speed drive (VSD)/adjustable frequency drive (AFD), evaporator, condenser, microprocessor controls, graphics and all required ancillary equipment.
        2. The chiller can be configured as a single duplex compressor unit or two simplex compressor units that are interconnected with piping in an “end to end” series counterflow (SCF) arrangement with field installed piping and integrated controls such that the two units operate as one unit, as would a duplex unit. The chiller will be connected to the existing condenser water system at the NCHP and campus chilled water loop. Both the condenser water and chilled water systems in the NCHP are capable of variable primary flow.
        3. Total cooling capacity shall be the maximum that complies with the following:
           1. Fits within the existing, allotted space: Based on space limitations within the existing NCHP, the out-to-out dimension of the chiller support feet cannot exceed 33’-6” and the overall unit length cannot exceed 39’-6”, both of which include space for a 12” long flanged spool piece of piping between the flanged nozzle connections of the upstream and downstream chiller.
           2. Max Full Load Amps (FLA) 1260A, Max OCPD 1600A
     3. For SCF chiller arrangements, there will be an Upstream and Downstream unit, defined based on higher or lower average saturation temperatures in the evaporator and condenser. The Upstream unit will have chilled water return (CHR) entering the evaporator and intermediate chilled water (CHI) leaving the evaporator. The Downstream unit will have intermediate chilled water (CHI) entering the evaporator and chilled water supply (CHS) leaving the evaporator. The Downstream unit will have cooling tower water supply (CWS) entering the condenser and intermediate condenser water (CWI) leaving the condenser. The Upstream unit will have intermediate condenser water (CWI) entering the condenser and cooling tower water return (CWR) leaving the condenser. The CHI temperature for any given operating point shall be determined as the most optimal value by the chiller manufacturer to reduce the overall kW/ton of the SCF system. Each chiller

shall be capable of starting and stopping with full flow through both the evaporator and

condenser when the chiller is offline. Full flow through both the evaporator and condenser for extended periods of time while the chiller is offline shall not impact starting the chiller.

* + 1. Alternate Bid Items:

1. Alternate No. 1: Provide the equivalent of a 2,500 ton, 480V, electric packaged, factory assembled, centrifugal chiller instead of the maximum capacity provided with the base bid, complete with compressor, motor, unit mounted variable speed drive (VSD)/adjustable frequency drive (AFD), evaporator, condenser, microprocessor controls, graphics and all required ancillary equipment. The chiller can be configured as a single duplex compressor unit or two simplex compressor units that are interconnected with piping in an “end to end” series counterflow (SCF) arrangement with field installed piping and integrated controls such that the two units operate as one unit or similarly to a duplex unit. The chiller will be connected to the existing condenser water system at the NCHP and campus chilled water loop. Both the condenser water and chilled water systems in the NCHP are capable of variable primary flow.

* + 1. Schedule: The University prefers substantial completion of the project is no later than December 2026. The following details acceptable chiller delivery dates.
       1. Preferred Delivery – February 2026
       2. Target Delivery – June 2026
       3. Latest Delivery – May 2027
    2. Manufacturer shall be able to produce, test and deliver the equipment (FOB) to a location dictated by the Contractor per the schedule described above. Contractor shall plan construction to allow for equipment to be installed in the NCHP within this delivery window. If Contractor is unable to install equipment upon arrival within this delivery window, it is the Contractor's responsibility to provide appropriate storage for equipment, local to the University, and provide transportation of equipment from storage site to job site.
    3. Manufacturer shall be responsible for arranging/coordinating delivery of equipment and all other related activities with the Contractor. This includes directing the delivery truck to the jobsite, coordinating the date and time of delivery, supervising unloading of the equipment at the jobsite and all start-up, system commissioning support and equipment training services. Manufacturer is responsible for equipment until unloading of equipment at the jobsite by the Contractor.
    4. Contractor shall expedite the installation of the equipment as though they had purchased the equipment directly. This shall include, but not be limited to, secure registration and installation permits required by the State and local authorities and complete these requirements before system is placed in operation, receiving equipment at jobsite, unloading equipment, rigging and setting equipment in place, making mechanical and electrical connections, installing, testing and starting, equipment in accordance with manufacturer's recommendations, and maintaining equipment until such time as project is accepted by Owner. Perform all work and provide materials and connections for the equipment in accordance with contract documents, shop drawings and manufacturer's installation instructions.
    5. After completion of equipment installation, Contractor shall collect and assemble equipment shop drawings, operating/maintenance instructions and part lists into project operation/maintenance manuals.
  1. BID SUBMITTALS
     1. The following shall be provided with the chiller bids:

1. Complete all chiller bid summary data sheets located at the end of this section and submit for both the base bid largest capacity and alternate 2,500 Ton capacity with other bid documentation to allow for evaluation and selection of the preferred equipment by the Owner. Voluntary alternates will be accepted and considered for evaluation.
2. Cover letter with compliance table listing each specification section and indicating compliance “C”, deviation for alternate “D”, or exception with explanation “E”. Any deviation or exception shall be accompanied with detailed explanation of how design intent is being upheld for evaluation by the Owner and Engineer.
3. Detailed drawings of the proposed chiller shall be provided including a top view, right side view, left side view and front view. The drawings shall indicate the dimensions of the unit, locations of all connections (chilled water, tower water, electrical, controls, refrigerant relief, purge, etc.) and service clearances. The drawings shall also indicate the type and size of each piping connection.
4. Detailed drawings of the proposed unit mounted variable speed drive (VSD) or Adjustable Frequency drive (AFD) shall be provided including a top view, right side view, left side view and front view. The drawings shall indicate the dimensions of the unit, locations of all connections (electrical, controls, etc.) and service clearances. The drawings shall also indicate the type and size of each connection.
5. Detailed electrical wiring diagram that indicates all required field wiring for power, control and communication.
6. Detailed description of controls interface requirements (physical and communication) between the chiller mounted control system and the plant control system.
7. Product data including:
   1. Type of motor (open or hermetic)
   2. Number of compressors and stages
   3. Type of refrigerant
   4. Refrigerant charge (lbs.)
   5. Number and type of bearings
8. References: a complete list of references shall be provided with each Proposal. The list shall include a minimum of three (3) references where equipment of similar manufacturer type, capacity and refrigerant has been installed. The list shall indicate the name of the facility where the equipment has been installed, location (city and state) of the equipment, installation date, equipment capacity (tons), contact name and contact telephone number of each reference. In addition, the Owner may contact up to two (2) other Institutional Peers for their experiences with similar equipment.
9. Spare Parts: Provide chiller manufacturer’s recommended complete spare parts list and address of local supplier stocking location. Provide separate costs for the recommended chiller and VSD/AFD recommended spare parts. Spare parts shall be labeled with name and part number.
10. Scheduled Maintenance Requirements: A complete list of the recommended scheduled maintenance requirements for the chiller shall be provided with each Proposal. The list shall identify each recommended service item and its recommended frequency (monthly, quarterly, etc.). The list shall, at a minimum, include the scheduled maintenance items identified and indicate which items are included in the manufacturer’s regular service and preventative maintenance contract.
11. Warranty: Provide details of the full parts and labor warranty in compliance with the specification requirements.
12. Other information to verify compliance with the Request for Bids.
13. Award will be based on various criteria outlined within the bid package front-end documents.
    1. SUBMITTALS
       1. Shop Drawings: Detail chiller and auxiliary equipment assemblies and indicate plans, elevations, sections, component details, attachments, and other construction elements. Include the followings:
14. General
    1. Manufacturer's name and model number
    2. Identification as referenced in the documents
    3. Type of chiller - principle of operation
    4. Installation and operating manuals.
    5. Manufacturers signed report/log of the installation and start-up.
15. Performance
    1. Refrigerant Type
    2. Capacity (Tons)
    3. Compressor and product data in table form indicating impeller speed (RPM), number of bearings, type of bearings, high speed impeller shaft RPM, number of stages, number of sets of inlet guide vanes, amount of refrigerant charge (lb), and amount of oil required (gal).
    4. Compressor performance curves, compressor surge map
    5. Chilled-Water Temperatures-EWT in Deg. F
    6. Chilled-Water Flow in GPM
    7. Evaporator Pressure Drop in feet
    8. Evaporator Fouling Factor
    9. Condenser Water Temperatures-EWT in Deg F, -LWT in Deg F
    10. Condenser Water Flow in GPM (L/s)
    11. Condenser Pressure Drop in feet
    12. Condenser Fouling Factor
    13. Certified performance data with and without “zero tolerance” requirements specified herein.
    14. Sound ratings
    15. Heat rejection to space (Btu/hr)
16. Physical and Dimensional
    1. Materials of construction
    2. General arrangement drawings in .pdf and 3D CAD/Revit files.
    3. Assembled unit dimensions
    4. Weight loadings, distribution and structural supports
    5. Required clearances for maintenance and operation, including working clearances for mechanical controls and electrical equipment
    6. Size and location of field connections and piping installation requirements.
    7. Auxiliary equipment descriptions
17. Electrical and Controls
    1. Compressor (kW), Full Load Amps, Locked Rotor Amps
    2. Motor data
    3. Unit mounted VSD/AFD Data
    4. Complete interlocking and line diagrams of all electrical wiring required between machine control panel, starters, VSD/AFD, temperature control devices and the chiller plant’s control system.
    5. Wiring and interlocking diagram shall include all components of system such as chillers, cooling towers, system pumps, automatic valves, flow switches.
    6. Differentiate between manufacturer-installed and field-installed wiring.
    7. Controls description
    8. P&ID’s (chilled water, condenser water, and refrigerant)
    9. Object list for each chiller.
       1. Complete description of the proposed chiller maintenance training program including dates and locations. Include a complete listing of all documentation that will be provided during training program. This may include installation manuals, operation full maintenance and overhaul manuals, service manuals and bulletins, troubleshooting guides, etc.
       2. Factory Test Reports: Perform and interpret test results for compliance with specifications requirements.
    10. CHILLER QUALITY ASSURANCE
        1. Manufacturer’s Qualifications: The Chiller Manufacturer shall provide Industrial chillers that are the manufacturer’s standard product.
        2. Service Representatives: The chiller service representative shall be a factory trained and certified agent of the chiller manufacturer.
        3. Single source responsibility: Provide a source with responsibility and accountability to answer and resolve problems regarding compatibility, installation, performance and service. All chiller components, which includes VSD/AFD shall be supplied and serviced by chiller manufacturers local branch organization.
        4. Comply with referenced code and standards. Provide listings/approval stamp, label or other markings on equipment made to specified codes or standards.
        5. Codes and Standards: Products shall be designed, tested, rated, and installed in compliance with the latest edition of the following standards, as applicable.
18. ANSI/ASHRAE STANDARD 15 - Safety Code for Mechanical Refrigeration.
19. ANSI/ASHRAE 90.1 Energy-Efficient Design of New Nonresidential & High-Rise Residential Buildings.
20. ASME Boiler and Pressure Vessel Code/Section VIII, Division 1.
21. AHRI Standard 550 / Centrifugal or Rotary Water Chilling Packages.
22. ASME B31.5 Code for Pressure Piping – Refrigerant Piping.
23. ABMA – Anti-Friction Bearing Manufacturer’s Association.
24. HEI - Heat Exchange Institute
    * 1. Ratings and Certifications: Products shall be rated and certified in accordance with the following:
25. Conform to AHRI Standard 550/590 for rating and testing of centrifugal chillers.
26. Conform to UL 465 for construction of centrifugal chillers and provide UL/CUL label.
27. Conforms to ASME Boiler and Pressure Vessel Code/Section VIII, Division 1.
28. Conform to ANSI/ASHRAE Standard 15 (latest edition) for construction and operation of centrifugal chillers, safety code for Mechanical Refrigeration.
29. Secure registration and installation permits as required by the State and local authorities and complete these requirements before system is placed in operation.
    1. COORDINATION
       1. Intent of specifications is to provide for equipment that meets all functional and applicable code requirements. This includes but is not limited to all electrical, controls (including the Owner’s plant control system), piping, drains, vents and mounting. This manufacturer shall be responsible for coordinating all such requirements of units provided under this specification with the Contractor and the Owner. Any additional installation or redesign costs associated with the installation of the equipment provided that is different than that illustrated on the drawings shall be the responsibility of the equipment manufacturer.
    2. OPERATION AND MAINTENANCE DATA
       1. Manufacturer shall provide for services of factory trained service engineer to supervise and approve installation; start-up, test and adjust unit for proper operation; and instruct Owner's representative in operation and maintenance of machine. This shall include submitting start-up and test log showing all initial settings and readings; signed by manufacturer's service representative.
       2. Before acceptance by Owner, chiller manufacturer shall approve, in writing, the complete installation, including piping and wiring connections, and proper functioning of all operational and safety controls.
       3. Provide a complete set of as built drawings with each O&M manual. Manuals shall provide descriptions of maintenance on all system components including:
30. Periodic preventive maintenance
31. Troubleshooting guides
32. Repair parts lists.
33. Reed critical vibration data
    1. Motor independent
    2. Motor mounted on the chiller
    3. TRAINING
       1. The chiller manufacturer shall provide both initial chiller operations training and formalized comprehensive chiller operations and maintenance training,
       2. Initial Chiller Operations Training: The chiller manufacturer shall provide initial start-up and basic chiller operator training at the time of final chiller commissioning and placing

the machine in service. This training is to allow the University to safely and properly operate the chiller until the formalized comprehensive training can be scheduled. The chiller manufacturer shall allow 8 hours on-site for the initial chiller operations training.

* + 1. Formalized Comprehensive Chiller Operations and Maintenance Training: The chiller manufacturer shall provide full operating, service and maintenance training programs for the Owner's maintenance personnel. All costs associated with Owner Training shall be included in the base proposal, including travel and per diem expenses for the manufacturer’s Training Instructor. Training shall occur at the Owner’s facility. Training will be scheduled separately at a time determined by the Owner. The Owner will provide a minimum of (4) weeks’ notice to the Manufacturer to allow for adequate scheduling of training personnel. The Owner Training show NOT be assumed to occur at the time of chiller commissioning and start-up.

1. Two separate courses shall be provided, one for equipment fundamentals, one for the chiller VSD/AFD.
2. The fundamentals course shall include:
   1. start-up, check-out and routine maintenance
   2. refrigeration cycle
   3. lubrication cycle
   4. Compressor Surge and Stall causes and solutions
   5. Compressor lift and refrigerant flow characteristics relative to capacity and load
   6. electrical control sequence and trouble shooting.
3. The fundamentals course shall include a minimum of 8 hours of general training plus six (6) technical sessions (bi-monthly) not less than 4 hours in length or more than 8 hours in length. These sessions shall cover the most appropriate operation and maintenance issues for the given season and provide technicians an opportunity to ask and discuss issues from their experiences in operating and maintaining the chiller.
4. The fundamentals course shall be conducted at the Owner’s facility for up to six (6) of the Owner's maintenance personnel. Instruction time periods shall be approved by the Owner and conducted during normal working hours of 8:00 AM to 4:30 PM Monday through Friday. Instruction shall be a combination of classroom instruction and hands-on training.
5. The chiller variable frequency drive course shall include a minimum of 8 hours of training time. The chiller variable frequency drive manufacturers shall provide training for the complete operation and maintenance of the variable frequency drive and protection/control modules. This includes, but is not limited to, how to use the equipment for troubleshooting, real time and historic features, terminology definitions, adjustments and settings, etc.
6. The chiller and variable frequency drive course shall be conducted at the Owner’s facility for up to six (6) of the Owner's maintenance personnel. Instruction time periods shall be approved by the Owner and conducted during normal working hours of 8:00 AM to 4:30 PM Monday thru Friday. Instruction shall be a combination of classroom instruction and hands-on training.
7. A complete syllabus and O&M Manuals shall be submitted and approved by Owner a minimum of 4 weeks prior to training.
8. At the end of each training course, the manufacturer shall provide to the Owner complete service manuals and bulletins that would be equal to the manuals that would be provided to the manufacturer’s own service technicians. The manufacturer

shall include the Owner on their update mailing list to make available for purchase by the Owner, all updates to the service manuals and new service bulletins that are issued after the completion of the training program.

1. Owner may video tape training sessions for their use in future training of their operations and maintenance staff. Chiller manufacturer shall have the right to review the recording before release to verify that it contains no proprietary or confidential information.
   1. WARRANTY
      1. Equipment Manufacturer shall provide full parts and labor warranty from the date of Substantial Completion for the complete chiller and associated systems including variable speed drives, and associated auxiliaries, including refrigerant, oil and start-up services from the completion of systems commissioning and project acceptance, which is anticipated to occur in December of 2026. Start-up services and labor warranty shall be performed by factory employed service technicians. Manufacturer shall agree to replace any and all chiller related components that are provided on the project at no cost to the Owner during the warranty period. Warranty period details are as follows:

1. Ten (10) years for electric motor only. Five (5) years for all other parts.

* + 1. All written warranty claims by the Owner shall be responded to by the manufacturer within 24 hours including a site visit and diagnosis. Prior to leaving the site, a repair schedule shall be mutually established between the Owner and the manufacturer. If the manufacturer fails to meet the repair schedule, the Owner reserves the right to make the necessary repairs. The cost for the Owner to make the repairs shall be invoiced to the manufacturer by the Owner. Through submittal of a bid on this project, the manufacturer is obligated to reimburse the Owner for such repairs (Net 30 days).
    2. Manufacturer to price warranty based on assumption the project’s Substantial Completion will be 6 months after delivery of the chiller. In addition, manufacturer shall provide a unit price per month to delay the start of the warranty to align with the project’s Substantial Completion if construction is prolonged.
  1. MAINTENANCE SERVICE CONTRACT
     1. Equipment manufacturer shall provide five (5) years of recommended regular service and preventative maintenance for the chiller and related VSD/AFD from the date of Substantial Completion.
     2. Provide factory authorized service technician’s charge out rates and service terms and conditions.
     3. A complete list of the recommended scheduled maintenance requirements for the chiller shall be provided with each Proposal. The list shall identify each recommended service item and its recommended frequency (monthly, quarterly, etc.). The list shall, at a minimum, include the scheduled maintenance items identified and indicate which items are included in the manufacturer’s regular service and preventative maintenance contract.
     4. The Owner shall have the right to terminate the service contract at any point and only be liable for compensating the manufacturer thru the end of the year during which the contract was terminated in alignment with the bid cost.
  2. SPARE PARTS
     1. Provide chiller and VSD/AFD manufacturer’s recommended complete spare parts kit and address of local supplier stocking location. Spare parts shall be labeled with name and part number. Spare parts shall be stored on-site.
     2. Three (3) spare sets of sacrificial magnesium anodes.
     3. One (1) quart of finish paint shall be provided with each chiller.
     4. Turnover any chiller control panel or VSD/AFD enclosure keys to the Owner.

# PART 2 - PRODUCTS

* 1. ELECTRIC CENTRIFUGAL CHILLERS
     1. General:
        1. Chiller shall be designed, selected, and constructed to use refrigerant R-513A, R- 514A or R-1233zd(E) and meet the capacity requirements specified herein. Low pressure units shall also be provided with a unit mounted high efficiency purge unit. All chillers shall be provided with a full charge of oil and refrigerant. Chiller shall consist of, but not limited to, a complete system with simplex or duplex compressors, motors, evaporator, condenser, lubrication system, integral sub-cooler or flash economizer, capacity controller, control panel, unit mounted VSD/AFD, and other items as specified herein or required.
        2. All conduit that is integral to the chiller shall be neat in appearance. Chiller wiring shall be neat and routed without tension and allow for ease of relocation to facilitate maintenance and repair.
     2. Refrigerant Availability:
        1. The manufacturer is to maintain a stock of the refrigerant for the life of the chiller or 25 years from the date of chiller acceptance whichever is greater in capacities sufficient to replace the full chiller refrigerant charge, to be supplied to the Owner at the manufacturers cost if a leak occurs after the warranty period and at no cost during the full warranty period.
     3. Performance:
        1. Chiller shall meet the performance scheduled on the attached Bid Summary Data Sheet.
        2. Evaporator shall be designed to allow for the flow rate to be reduced to the rate of 1 gpm per ton without entering laminar flow to allow for variable chilled water flow and facilitate chilled water pump energy savings. The chiller shall be able to operate in a stable fashion at this condition for at least 8 hours continuously independent of condenser water flow rate or condenser water temperature relief.
        3. Condenser shall be designed to allow for the flow rate to be reduced to 1.5 gpm per ton without entering laminar flow to allow for variable condenser water flow and facilitate condenser water pump energy savings. The chiller shall be able to operate in a stable fashion at this condition for at least 8 hours continuously independent of chiller water flow rate or condenser water temperature relief.
        4. Minimum entering condenser water temperature shall be 12°F above leaving chilled water temperature. Chiller shall be able to operate in these conditions for at least 8

hours continuously to provide condenser water relief and allow compressor energy savings. Chiller shall be able to vary the condenser water temperature to the minimum condition independently of condenser water flow rate and chilled water flow rate.

* + 1. Acceptable Manufacturers
       1. Provide chiller manufactured by one of the following:
          1. Carrier
          2. Trane
          3. York – Johnson Controls
          4. Daikin
    2. Compressor Assembly:
       1. Single, semi-hermetic drive type, two stage centrifugal compressor OR Single primary, open drive type, single stage centrifugal compressor and secondary open drive type centrifugal economizer compressor] with high strength, aluminum-alloy impellers statically and dynamically balanced and run-tested at factory. Run test at factory to be done at minimum 25% over-speed condition.
       2. Airfoil shaped cast manganese bronze pre-rotation guide vanes (PRV) shall be precisely positioned by solid vane linkages connected to an externally mounted electric PRV actuator.
       3. Provide a proximity sensor to measure the distance (mils) between the thrust bearing and the compressor shaft. Wire sensor to the chiller control panel.
       4. Balance and align motor-compressor assembly to a maximum vibration amplitude of 1 mil as measured at the shaft. Alignment report and balance test results shall be submitted to the Engineer.
       5. Compressor motor to be protected against drawing more than rated full load amperes.
       6. Compressor shall have a cast-iron casing. Compressor castings shall be designed for minimum 180 psig working pressure and hydrostatically pressure tested at 270 psig.
       7. Provide an oil lubricated, helical gear, speed increaser between the motor and compressor with a maximum gear ratio of 3:1.
    3. Motors:
       1. Shall be premium efficiency, semi-hermetic or hermetically sealed, non-reversing squirrel cage, induction suitable for the voltage shown on the equipment performance schedule and operation with the unit mounted variable speed drive. Full load operation of the motor shall not exceed nameplate rating. The motor shall be provided with a NEMA D-flange configuration for open motors. Bolted cast iron adapter shall be provided to allow the motor to be rigidly coupled to the compressor, providing factory alignment of motor and compressor shafts, and to allow access to the motor for repair without removing refrigerant charge from the chiller.
       2. Chillers utilizing open motors shall be provided with an oil reclaim container. Shaft seal shall be double face bellows type or floating carbon ring, oil film type. Maximum refrigerant leakage rate of the shaft seals shall be less than 5 fluid ounces of refrigerant per 1000 hours of chiller operation.
       3. Chillers utilizing semi-hermetic motors shall be cooled by liquid refrigerant in intimate contact with motor interior components, including windings and rotor. Access for motor service on semi-hermetic units shall be provided for normal servicing with only minor compressor disassembly and no disassembly of the main refrigerant piping.
       4. General:
          1. Motor shall meet the following requirements:

Service factor - 1.04 (minimum)

Locked rotor torque - 60 percent of full load torque

Pull-up torque - 60 percent of full load torque

Breakdown torque - 175 percent of full load torque

Hot locked-rotor damage time - 125 percent of calculated acceleration time.

Minimum efficiency – 96%

* + - * 1. Motor shall operate successfully at rated load, with rated frequency and +10% of rated voltage.
        2. Motor shall operate successfully at rated load, with rated voltage and + 5% of rated frequency.
        3. Motor shall operate successfully at rated load with +10% combined variation of voltage and frequency, frequency variation not to exceed +5%.
      1. Enclosure:
         1. Motor enclosure shall be open drip-proof guarded type or hermetically sealed of cast iron frame and bracket construction with welded steel top cover if required. 360° concentric rabbet fits shall be utilized without dowels for bracket to frame alignment. Provide any lifting lugs required to be able to disassemble motor with a 5x safety margin.
         2. Provide acoustical motor enclosure as required to meet the noise criteria specified herein this section.
         3. Provide oversized conduit box and appropriate termination kit to allow for connection of feeder cables of the size shown on the “E” series drawings with ground to motor leads.
      2. Stator:
         1. Laminations shall be high permeability, low loss silicone steel with C5 core plate.
         2. Magnet wire shall be insulated enamel film over rectangular copper wire.
         3. Insulation shall be rated Class F and utilize Class H components in copper form wound rectangular wire coils with a dacron glass overlay for a “heavy film” glassed wire.
         4. Stator winding slot material shall be Nomex type or Thermoplastic Mica based insulation.
         5. Stator coils shall individually receive surge comparison testing per IEEE 522 after insulation and prior to insertion of coils into each stator. In addition, surge testing is required prior to final connection of each coil after all are inserted, and on the final fully connected stator, before VPI processing.
         6. Sealed wound stators shall be provided in conformance to NEMA MG1-20.18.
         7. Stator processing shall utilize 100% solids epoxy resin with a minimum of two VPI/baking cycles. During the resin oven cure cycle, each stator shall be slowly rotated horizontally to insure even, thorough resin distribution. Stators shall not be processed while in the motor frame.
         8. Every complete, finished wound stator shall receive and pass the water submersion test per NEMA MG1-20.49.1. A certified report shall be provided for each submersion test.
         9. Complete wound stator and core shall be fitted tightly to the motor frame, and

radially pinned to the frame with removable pins so that the stator core may be removed if necessary.

* + - 1. Rotor/Shaft:
         1. Rotors shall be copper bars with no square corners with brazed C-channel end-ring design that fully captures the rotor bars. If aluminum is stated as an exception, provide extruded rotor bar only (no cast bars) with same brazed C Channel end-ring assembly.
         2. Rotor laminations shall be manufactured and tested the same as described for stator laminations.
         3. Rotors shall be keyed to the motor shaft and utilize an interference fit to the shaft.
         4. Shafts shall be designed to carry 4x rated torque.
         5. The rotor/shaft assembly shall be dynamically balanced.
         6. Shaft material shall be AISI 4140 low alloy steel.
      2. Motor Bearings
         1. Conventional or Magnetic bearings are acceptable.
         2. Conventional

Provide grease filled anti-friction bearings. Insulated bearings shall be provided for VSD/AFD driven equipment.

Provide an internally mounted AEGIS Ring for shaft grounding.

* + - * 1. Magnetic

Levitated shaft shall be actively controlled and monitored by an X-, Y-, and Z-axis digital position sensor.

The compressor shall be capable of coming to a controlled, safe stop in the event of a power failure by utilizing integral backup power to the magnetic bearing control system.

* + - 1. Accessories:
         1. Winding Temperature Sensors:

Provide winding temperature sensing devices and wire to the chiller control module for safety interlocks.

Six elements, two in each phase, are to be embedded in the calculated hottest portion of the stator winding. All leads are to be brought out to terminals in auxiliary terminal box. Each lead and each terminal shall be clearly and individually identified. All elements shall be grounded in terminal box.

Sensors are to be resistance thermometer (RTD) elements, platinum wire, 100 ohms, at 0°C, 3 lead type with stainless steel armor shielding for use with General Electric "IRT" or Westinghouse "CT" or "DT3" thermal relays.

Motor Manufacturer is to recommend trip setting for thermal relays.

Provide drawings showing the location and number of each sensing element in the stator winding.

* + - * 1. Bearing Temperature Sensors:

Provide a minimum of one bearing temperature sensor for each bearing and wire to the chiller control module for safety interlocks.

Sensors shall be installed in bottom half of bearing, preferably within 10 to 20 degrees of the operating load point, and drilled so that the sensor is separated from babbitt by 30+5 mils of metal backing. Sensor leads shall be adequately protected against oil and mechanical damage and exit the bearing housing through an oil-tight fitting. Weatherproof terminal head with

moisture-resistant terminals shall be provided outside the bearing housing. Sensor sheath or raceway shall not bypass the bearing insulation. Guides shall be provided so that the sensor may be removed and reinstalled without disassembling the bearing housing or disturbing the wiring system. Means shall be provided for spring loading the sensor tip against the bearing backing.

RTDs shall be platinum wire, 100 ohms, at 0°C, tip sensitive-probe type, three wire, with stainless steel armor shielding.

* + - * 1. Vibration Monitoring:

Provide Allen Bradley 1442/1443 series accelerometers and proximity probes for all bearings. Radial bearings require both x and y measurements. Shafts require an end z measurement at both ends. Thrust bearings require an independent vibration measurement. Eddy current proximity type probes shall be used for fluid filled bearings, sleeve bearings, thrust bearings, and end shaft measurements. Accelerometers shall be used for roller bearings. The sensor shall have the capability to capture the dynamic wave form.

Vibration sensors shall attach to bearings utilizing a mechanical connection (threaded connection, compression fitting, or stud). Sensors glued to equipment are not allowed.

Sensors shall have an IP66 or NEMA 4 rating as a minimum.

Select sensor range to match manufactures’ published vibration ranges. Sensor shall be selected to operate in a wet environment at a temperature of 130F or 125% of expected operating temperature (whichever is higher).

Provide and install shielded low noise cable. Extension cables and signal conditioning to be terminated in housings supplied and installed by Manufacturer and mounted on the machinery skid.

* + - * 1. Accessory Terminal Boxes:

Box(es) shall be provided for leads from vibration-sensing elements, stator- temperature devices and bearing-temperature devices.

Box(es) shall be weatherproofed and gasketed with bolt on removable covers in front. Box(es) shall be outside motor enclosure or accessible by removing a gasketed subpanel on enclosure.

Box(es) shall be suitable for conduit entry through top or bottom.

Terminal points shall be furnished in the box(es) for all wiring. Terminal points shall be clearly identified per NEMA standard notation.

Permanent nameplates shall be provided on all terminal boxes.

* + - * 1. Noise Level:

Motor noise level shall not exceed 85 dBA measured at three feet from motor enclosure surface in any direction.

Motor manufacturer shall correct motor noise levels exceeding the level specified above at no expense to the Owner.

Noise tests are to be conducted in accordance with IEEE Standard No. 85.

Noise tests are to be performed at the factory. Noise tests are not required to be part of the Owner Witnessed Factory testing.

* + - * 1. Testing:

Routine testing shall meet or exceed NEMA minimum standards.

A dynamic three phase locked rotor test shall be performed as part of the routine test. Motor manufacturer shall provide High Pot Insulation resistance test report.

All vibration testing, routine and other, shall be performed on neoprene isolators between chiller and a rigid base.

Efficiency date shall be in accordance with IEEE Standard 112 Method F as defined by NEMA MG1-12.53a and 1-12.53b.

* + 1. Compressor and Motor Lubrication System:
       1. Force-feed lubrication shall be provided to all oil lubricated bearings, gears, and rotating surfaces by a positive displacement oil pump prior to startup, continuously during operation, and during coast-down even during power failure shutdown. An interlock shall be provided to prevent motor starting unless oil pressure is established. System to include oil pump assembly, factory mounted oil pump starter, motor controls, cooler, heater, relief valve, pressure regulator, and filter for delivering thermostatically controlled clean oil at proper temperature. An oil reservoir, separate from the compressor, shall contain a submersible oil pump and immersion type oil heater, thermostatically controlled to remove refrigerant from the oil. Oil shall be filtered by a replaceable cartridge oil filter equipped with service valves. Filter shall be serviceable without machine disassembly or pump down. Refrigerant cooled oil coolers shall be completely factory mounted and piped, including service valves for the oil circuit. Use chilled water source for cooler if required.
       2. Bearing oil temperatures shall be monitored and safeties shall be provided to the bearings.
    2. Evaporator and Condenser Vessels:
       1. Heat exchangers shall be shell and tube type, designed in accordance with ANSI/ASHRAE 15 Safety Standard for Mechanical Refrigeration and ASME Pressure Vessels Code, and shall be appropriately stamped where required by ASME Code.
          1. Machines not required to be stamped by ASME shall include welder’s certificates during the shop drawing phase of all workers who will be involved in the manufacture of the machine, along with welding procedures and materials certification.
       2. Pressure Testing:
          1. The refrigerant side shall be hydro tested in accordance with the ASME Code. The refrigerant side of low-pressure machines may be air tested in lieu of hydro tested in accordance with the ASME Code.
          2. Design water side for 150 psig working pressure and perform hydrostatic pressure test at 225 psig.
       3. Waterside pressure drop shall be determined by manufacturer. Note pressure drop will be utilized for Life Cycle Cost Analysis by Engineer to assist the Owner with selecting a chiller from the bid results.
       4. Water side heads shall be removable to allow direct access to all tubes.
       5. Heat exchangers shall include water side taps for vent and drain connections as required. Suitable tappings shall be provided in water boxes and nozzles for all required control sensors, gauges and thermometers. Provide plugged or capped valves in all drain and vent locations.
       6. Evaporator and condenser shells to be fabricated from carbon steel. Tube sheets to

be carbon steel, drilled and reamed to accommodate the tubes, and welded to the end of each shell. Intermediate tube supports to be fabricated of carbon steel plates with a minimum thickness of 3/8” and maximum spacing of 4'-0", welded to the vessel shell, and fully self-supported.

* + - 1. Each tube shall be roller expanded into the tube sheets providing a leak-proof seal. Tubes to be individually cleanable and replaceable with tube ends rolled into annular grooves/holes in tube sheets.
         1. Condenser tubes to be seamless copper tubing with minimum tube wall thickness of 0.035" at the root of any fins.
         2. Evaporator tubes to be seamless copper tubing with minimum tube wall thickness of 0.028" at the root of any fins.
      2. Evaporator shall be of such design to prevent liquid refrigerant from entering compressor. A suction baffle or aluminum mesh eliminators shall be installed along the entire length of the evaporator to prevent liquid refrigerant carry over into the compressor. Oil eductors, capable of returning oil to the oil sump, shall be provided on all evaporators.
      3. Provide two (2) 2” sight glasses with isolation valves on chiller vessels to view refrigerant levels.
      4. For duplex compressor machines, provide marine water boxes on both ends of each tube bundle for chilled water and condenser water piping connections to allow for access to tubes without the removal of connected piping.
      5. For simplex compressor machines that will be connected in an “end to end” series counterflow arrangement, provide marine water boxes on the outboard ends of each tube bundle and standard end plates with piping connection nozzles on the inboard ends for interconnecting the two units with a short section of piping.
      6. All water boxes and standard end plates shall be provided with hinges to allow for access to tubes. Hinges shall be capable of carrying the full weight of the end plate without the use additional supports or lifting devices. Provide removable taper pins to align the head to the mating flange.
      7. All evaporator and condenser piping connections 2-1/2” and larger shall be provided with Class 150, ASTM A181 or A105 Grade 1, hot forged flanged type connections. Connections 2” and smaller shall be threaded FNPT. Configuration/location of the main evaporator and condenser water connections will be determined in the final design.
      8. Wetted surfaces of the condenser and evaporator water boxes and tube sheets to be epoxy coated in the factory.
         1. Surface preparation to be performed in accordance to coating documentation.
         2. Corrosion resistant materials shall be used where a coating is ineffective in protecting the substrate such as on the removable water box baffles, baffle channels, and threaded couplings.
         3. Water boxes shall be designed and constructed to facilitate protective coating performance, considerations such as no sharp edges or internal seams included.
         4. Epoxy coating to consist of a two-component product designed to handle a variety of chemical environments and temperatures. Coating shall be rated for industrial service and cured to a hard, glossy finish to enhance fluid flow in high performance heat exchangers. Coating to be Belzona R-Metal and S-Metal, Enecon CeramAlloy or approved equal.
         5. Upon completion of ceramic application and cork removal, Manufacturer shall

completely brush all condenser water tubes to remove any remaining debris.

* + - * 1. The assembled water boxes shall be hydro leak tested after coating is applied.
        2. The coating shall be warranted by the Chiller Manufacturer for no less than the same warranty period as the chiller.
      1. Provide sacrificial magnesium anodes on each end of the condenser bundles. Anodes shall be replaceable from the outside without removal of the end plate. The quantity of anodes is based on the size and volume of the chiller and shall be determined by the chiller manufacturer. All hardware associated with the mounting/attachment of the sacrificial anodes shall be stainless steel. Provide drain and vent holes on the water box with stainless steel couplets for added corrosion resistance.
    1. Refrigerant Flow Control:
       1. Refrigerant flow to the evaporator shall be controlled by either a variable or fixed orifice. The variable orifice control shall automatically adjust to maintain proper refrigerant level in the condenser and evaporator. This shall be controlled by

monitoring refrigerant liquid level in the condenser assuring optimal subcooler performance.

* + - * 1. Provide each unit with fully automatic capacity control system, complete with variable speed drive and inlet guide vanes, capable of fully modulating performance down to 10% of full load without surge at all ARI condenser inlet temperatures.
        2. Capacity control system to permit stable operation of machine at any point within 10% to 100% capacity range.
        3. Provide feed forward adaptive control to anticipate and compensate for load changes.
    1. Accessories:
       1. Purge System (required for low pressure chillers only): Provide factory mounted air, water, or refrigerant cooled; with operating controls, piping, elapsed time meter, and refrigerant service valves to isolate the purge unit from the chilling unit. Purge shall be capable of operating independently of compressor motor.
          1. The purge shall operate independently of the chiller and can be operated while the chilled water circulation pump is shut down. An external water-cooling source shall not be required.
          2. The chiller pressure control system shall be fully automatic and control the pressure in the chillers to 0 PSIG ± 0.1 PSI during the off cycle. It shall be capable of pressurizing the chillers to 10 PSIG for leak testing. Control module shall be solid state with an electric resistance heater applied to the chiller’s evaporator under the evaporator insulation. The system shall have safety logic to prevent raising chillers pressure to a level that presents a risk of release of part or all the chillers refrigerant charge to the atmosphere. No other purge will be considered.
          3. Any excess purge requirement will enable an alarm indication light at the chiller unit control panel, a contact closure at the purge shall be provided for remote alarm annunciation, and a diagnostic (with date and time of occurrence) shall be stored in the chiller unit control panel’s diagnostic summary.
          4. 5. The unit indication shall include:

Purge operating mode (ON, OFF, AUTO, AUTO ADAPTIVE)

Purge operating status (ON, OFF, AUTO, AUTO ADAPTIVE)

Elapsed time meter for total pump-out time and total run time (monitors amount of leak rate)

Indication of mode and status as an integral part of the chiller control panel unit mounted Operator Interface Clear Language Display

Purge suction temperature

Purge liquid temperature

Purge pump-out rate (minutes/24 hours)

Time to next purge (minutes)

30 day purge pump-out average (minutes/day)

Last 5 purge cycles pump-out average run time, interval from shutdown to 3 hours after shutdown (minutes/day)

* + - * 1. At standard room operating conditions and with a condensing refrigerant temperature > 80 F, the purge shall be rated for no more than 0.1 lb of refrigerant per 1 lb. non-condensables. If the purge uses refrigerant absorption media, the media’s design capacity must not exceed 3 years for typical chiller operation. The purge efficiency must not deteriorate over time.
        2. Purge unit shall be powered by the unit.
      1. Safety Relief Devices
         1. Provide redundant and re-seatable safety devices on the refrigerant side of both high- and low-pressure units in accordance with ANSI B9.1 safety code ASME B31.5 and the latest version of ASHRAE Std. 15. Safety devices shall be provided on both the evaporator and condenser consisting of stainless-steel rupture discs in series with spring loaded re-seatable ASME approved relief valves (to minimize refrigerant loss). Select the pressure setpoint of the rupture disk to fail at 10% less than the vessel pressure limit or the maximum per code, whichever is more stringent.
         2. Provide a refrigerant compatible pressure sensing device capable of connecting to the BAS between the rupture disk and the relief valve to detect rupture disk failure. In addition, provide valved and capped test port inline between rupture disc and relief valve to detect rupture disc failure.
         3. Multiple relief devices shall be brought to a common vent connection. Discharge piping complete with gaskets, unions and flexible connectors per Drawings shall be provided by the Contractor. All materials and piping connection details to be used by Contractor must be approved by chiller manufacture to ensure compatibility with refrigerant and to ensure a strain free connection in all directions to the safety relief devices.
      2. Vibration Isolation: Manufacturer to furnish properly sized 3/4" thick (min.) neoprene pads similar to Mason Super W, 50 durometer to Contractor to install below chiller support feet.
    1. Painting:
       1. All exposed surfaces and insulation shall be primed and painted with an alkyd- modified, vinyl enamel or acrylic, machinery primer and paint system using the manufacturer’s standard colors.
       2. All damage to finish paint shall be prepared and repainted prior to acceptance.
       3. The chiller manufacturer shall provide industry standard Pantone paint color code to allow the Owner to procure matching touch up paint if needed.
       4. One (1) quart of finish paint shall be provided with each chiller.
    2. Protection for Transportation:
       1. Chiller shall be shrink wrapped for delivery to the project site prior to leaving the factory. Provide desiccant material in the electrical panel and/or cabinets to minimize moisture intrusion during shipping and storage.
    3. Insulation:
       1. All chiller insulation shall be provided by the installing Contractor including but not limited to the evaporator, water boxes, suction piping, compressor end bell and all other surfaces that will be below 65°F when the unit is in operation.
    4. Instrumentation and Controls:
       1. General: The chiller shall be controlled by a stand-alone microprocessor-based control center. The chiller shall be provided with an independent direct digital control system that includes a control panel capable of chiller operation, monitoring, alarming and remote interface to a third-party supervisory plant control system/Building Automation System (Metasys FX by Johnson Controls).
       2. Control Panel: 10" minimum color display mounted on control panel door or on articulated arm. Color display shall show all system parameters in the English language with numeric data in English units. The chiller control panel shall provide control of chiller operation and monitoring of chiller sensors, actuators, relays, and switches.
          1. A numbered terminal strip shall be provided for all required field interlock wiring.
          2. Controls cabinet power that feeds the main controls processor and display system shall be fed from an external 120V uninterruptible power source (UPS) circuit that provides both uninterruptible power and power conditioning for the main controls processor and HMI systems. The intent of the UPS is to allow the main controls processor and HMI display to be protected from unplanned power loss, through any short-term power outages that take the chiller package offline. The UPS shall be provided by the Contractor, not the chiller manufacturer.

Controls shall be in a separate compartment from any higher voltages and be electrically isolated from any line voltage exceeding 120V. The control cabinet door shall not be interlocked to the machine safety circuits and be accessible when the machine is in operation as there should only be 120 V line voltage in the compartment. Provide a direct means of isolating / disconnecting the incoming low voltage into the control cabinet, without needing to access the high voltage section.

* + - * 1. Digital programming of essential setpoints through a tactile-feel keypad shall include:

leaving chilled water temperature

percent current limit

pull-down demand limiting

* + - * 1. Safeties: All cycling and safety shutdowns shall be enunciated through the alphanumeric display and consist of day, time, cause of shutdown, and type of restart required. Safety shutdowns shall include:

high oil reservoir temperature

high condenser pressure

low oil pressure

compressor thrust bearing oil temperature (if applicable)

compressor thrust bearing position (if applicable)

high oil pressure

high compressor discharge temperature

low evaporator pressure

motor over current

over voltage

under voltage

high motor winding temperature

high bearing temperature

motor controller fault

sensor malfunction

* + - * 1. Cycling Shutdowns:

low water temperature

low oil temperature

evaporator/condenser water flow

loss of power

anti-recycle

* + - * 1. System operating information shall include:

entering and leaving chilled water temperatures

entering and leaving condenser water temperatures

evaporator and condenser refrigerant pressures

differential oil pressure

percent motor current, amp draw, and Kw

speed if controlled by adjustable frequency drive

evaporator and condenser saturation temperatures

compressor discharge temperature

oil reservoir temperature

compressor thrust bearing position and oil temperature (if applicable)

operating hours

number of compressor starts

Refrigerant level

* + - * 1. Chiller control center shall monitor all vibration signals with an Allen Bradley 1444 monitoring system, displaying those levels in a vibration monitoring screen through the control center screen.
        2. Security: Security access shall be provided to prevent unauthorized change of set points, to allow local or remote control of chiller, and to allow manual operation of the pre-rotation vanes and oil pump. The operating program shall be stored in non-volatile memory (EPROM) to eliminate chiller failure due to AC power failure or battery discharge. Programmed set points shall be retained in lithium battery-backed RTC memory for a minimum of 5 years.
        3. Power failure restart: After a power failure and restoration of normal power,

chilled water flow and condenser water flow, chiller must be capable of starting and reaching 100% load within 12 minutes or less without experiencing surge or stall.

* + 1. Chiller Control System Interface:
       1. The main chiller control panel shall communicate using the Read (Initiate) and Write (Execute) Services as defined in Clauses 15.5 and 15.8, respectively, of ASHRAE Standard 135, to communicate BACnet MS/TP objects to the existing chiller plant control system/Building Automation System. No third-party device (translator) should be used to interface to the needed control points for proper operation.
       2. The chiller control panel shall be capable of communicating all available information from the chiller mounted control panel including all available operational, safety and informational control points and these points will be mapped to the Building Automation System. Manufacturer shall supply the BACnet object list to the Owner for each chiller for what is accessible to the BACnet internetwork. Coordinate with the Owner to supply the specific points and control to include on the Building Automation System.
       3. As a minimum, the chillers and chiller VSD/AFD shall be capable of communicating the following input and output signals with the plant control system for each chiller and chiller VSD/AFD:
          1. Leaving Chilled Water Temperature Setpoint, analog, 4 Byte Float – R/W.
          2. Motor Current Limit Setpoint, analog, 4 Byte Float – R/W
          3. Remote Start/stop, digital, Bit Offset – R/W
          4. VSD/AFD Fixed Cmd, digital, Bit Offset – R/W
          5. Leaving Chilled Water Temperature, analog, 4 Byte Float - R
          6. Entering Chilled Water Temperature, analog, Byte Float – R
          7. Chilled Water Flow Switch Status, digital, Bit Offset - R
          8. Evaporator Pressure, analog, 4 Byte Float - R
          9. Condenser Pressure, analog, 4 Byte Float - R
          10. Oil Pressure Differential, analog, 4 Byte Float - R
          11. Entering Condenser Water Temperature, analog, 4 Byte Float - R
          12. Leaving Condenser Water Temperature, analog, 4 Byte Float - R
          13. Motor Current Percent FLA, analog, 4 Byte Float – R
          14. Compressor Motor Status, digital, Offset - R
          15. Remote/Local Actual Current Setpoint, analog, 4 Byte Float - R
          16. Evaporator Saturation Temperature, analog, 4 Byte Float - R
          17. Condenser Saturation Temperature, analog, 4 Byte Float - R
          18. Discharge Temperature, analog, 4 Byte Float - R
          19. Oil Sump Temperature, analog, 4 Byte Float - R
          20. Refrigerant Level, analog, 4 Byte Float – R
          21. Refrigerant Level Setpoint, analog, 4 Byte Float - R
          22. Accumulated Operating Hours, analog, 4 Byte Float - R
          23. Accumulated System Starts, analog, 4 Byte Float - R
          24. Low Oil Transducer Pressure, analog, 4 Byte Float - R
          25. High Oil Transducer Pressure, analog, 4 Byte Float - R
          26. Anti-Recycle Time Left, analog, 4 Byte Float - R
          27. Operating Mode (Local, Remote, Service), analog, 4 Byte Float - R
          28. Operation Code, analog, 4 Byte Float - R
          29. Safety Shutdown Code, analog, 4 Byte Float - R
          30. Cycling Shutdown Code, analog, 4 Byte Float - R
          31. Thrust Bearing Proximity Sensor Actual Position, analog, 4 Byte Float - R
          32. Thrust Bearing Proximity Sensor Reference Position, analog, 4 Byte Float - R
          33. Drain Line Thermocouple Temperature, analog, 4 Byte Float – R
          34. Pre-Rotation Vane Position, analog, 4 Byte Float – R

ii. VSD/AFD Output Voltage, analog, 4 Byte Float – R

1. VSD/AFD Phase A Current, analog, 4 Byte Float – R
2. VSD/AFD Phase B Current, analog, 4 Byte Float – R
3. VSD/AFD Phase C Current, analog, 4 Byte Float – R mm.VSD/AFD Input Power, analog, 4 Byte Float – R
4. VSD/AFD Total kW hours, analog, Float – R
5. VSD/AFD Bus Voltage, analog, 4 Byte Float – R
6. VSD/AFD Inverter Link Current, analog, 4 Byte Float – R
7. VSD/AFD Output Frequency, analog, 4 Byte Float – R
8. VSD/AFD Enclosure Internal Temperature
9. (2) Motor Bearing Temperatures, analog, 4 Byte Float – R
10. (6) Motor Winding Temperatures, analog, 4 Byte Float – R
11. Motor Bearing Vibration Sensors, analog, 4 Byte Float – R

vv. Communication Fault, digital, input

* + 1. Integration With Building Automation System (BAS)
       1. The chiller’s microprocessor-based control system or chiller control panel shall be capable of communicating the following hard-wired input and output signals for each compressor with the plant control system:
          1. Chilled Water Flow Proven – DO
          2. Condenser Water Flow Proven – DO
          3. Chiller Alarm - DI
          4. Chiller Ready - DI
          5. Chiller Running Status – DI
          6. Chiller Fault - DI
          7. Chiller Remote Start/Stop Command - DO
          8. Chilled Water Temperature Setpoint – AO
          9. Running Load Amps - AI
       2. If the control system provided with the chiller cannot communicate any of the above hard-wired control points with the plant control system, an auxiliary lockable, NEMA 1 rated enclosure shall be provided for the communication of these points. The auxiliary control panel shall be factory installed, wired and tested including all required terminal strips, instruments, temperature indicators, relays, signal conditioner/loop isolators, switches and gauges. Any relays and signal conditioners/loop isolators required in the auxiliary control panel shall conform to the following:
          1. Command/Control Relay:

Manufacturer: IDEC type RH2B-U, Potter Brumfield type K-10P-11D15-24, or approved equal as manufactured by Square D or Allen Bradley.

Provide miniature 8 blade pilot relays with DPDT silver cadmium oxide contacts rated at 15A, 30VDC or 120VAC. Coil shall be 24VDC with a maximum current burden of 50 milliamps. Rectangular base socket mount with blade type plug-in terminals and a polycarbonate dust cover. Dimensions are nominally 1.4"H x 1.1"D x 0.83"W. All relays provided under this specification shall have the same socket mounting configuration so that the Owner may stock one type of relay for spares.

Provide shunt diode equal to 1N4005 across the coil or as shown on drawings.

Provide DIN rail mountable (Snap type) mounting sockets IDEC SH2B-05 or approved equal.

* + - * 1. Field Indication Relay:

Manufacturer: IDEC type RY22S-U or approved equal.

Provide miniature 8 blade pilot relays with DPDT silver-palladium or gold overlay on silver, bifurcated twin crossbar contacts. Rectangular base socket mount with blade type plug-in terminals, 120VAC/60 Hz coil, and a polycarbonate dust cover. Dimensions are nominally 1.4"(H) x 1.1"(D) x 0.55"(W). All relays provided for field indication shall have the same socket mounting configuration so that the Owner may stock one type of relay for spares.

Provide DIN rail mountable (Snap type) mounting sockets IDEC SY2S-05 or approved equal.

* + - * 1. Signal Conditioners/Loop Isolator:

Manufacturer and type: Action Instruments, Rochester Instruments, Moore Industries.

Provide DC input field configurable signal isolator as required. Isolator shall be surface mounted and require 120 VAC 60 Hz power.

Unless otherwise indicated, mount control and adjusting switches, temperature indicators, and other indicating or manually operated devices, on front face of panel with black phenolic engraved nameplates and label all terminal strips to indicate proper wire landing points for associated control devices.

* + - * 1. Control Cabling and Raceways:

Control cables shall be minimum 14 gauge stranded, rated for 600V.

All exposed control cables between integral chiller control devices and the chiller control panel shall be run in liquid tight flexible metal conduit (No open unprotected wiring). Flexible conduit shall be limited to this application and shall not be used in lieu of metal conduit for other applications. All conduit must be neat in appearance. Chiller wiring and liquid tight flexible metal conduit shall be neat and routed without tension or stress and include slack in the wiring harness to allow for ease of relocation to facilitate maintenance and repair.

All control cables between the chiller and the chiller starter / VSD/AFD shall be run in IMC conduit.

* + 1. Interlocking and Control Sequence:
       1. Unit manufacturer shall carefully coordinate unit controls with automatic control sequence requirements and provide all necessary auxiliary contacts and integral wiring required to meet these functions.
       2. Chilled water pumps and condenser water pumps shall be in operation and flow proven before refrigeration machine automatic control sequence is initiated.
       3. Provide condenser and evaporator proof of flow switches required for chiller start-up and operation. Flow switches shall be thermal dispersion type. Switches shall be either mounted on chiller or remote in system piping and interconnected with the chiller control panel as required by manufacturer.
    2. Factory Test:
       1. All factory controls shall be tested for functionality.
       2. Refer to Part 3 of this specification for performance test.
    3. Sound Power Levels:
       1. Sound data shall be measured according to AHRI Standard 575.
       2. Sound pressure for the unit shall not exceed the following specified levels, and be less than 85 dBA, measured a 1 meter (3.28 feet). If chiller noise generation exceeds these levels, the chiller manufacturer shall provide acoustical devices with the chiller to reduce the noise generation to the level specified.
  1. UNIT MOUNTED VARIABLE FREQUENCY DRIVE (VFD)
     1. GENERAL
        1. Provide a VFD system to control each chiller. All equipment and devices shall be provided for a complete and operational system in an integrated package, factory tested with the chiller and motor. The VFDs shall be provided by the chiller manufacturer as a coordinated system.
        2. VFD shall have internal 5% line reactor as well as harmonic filter (with optional drop- out contractor at low load) and shall meet IEEE-519 requirements with the PCC measured at the input terminals.
        3. The VFD shall have a 480V single- point power connection input cabinet that includes CTs, PTs, line reactor, harmonic filter, and step-down transformers to accommodate all auxiliary 480V, 120V, and LV loads at the VFD and at the chiller.
        4. The VFD control logic shall be specifically designed to interface with the chiller controls. The VFD control shall adapt to the operating ranges and specific characteristics of the chiller, and chiller efficiency is optimized by coordinating compressor motor speed and compressor inlet guide vane position. Chilled water control and VFD control shall work together to maintain the chilled water set point, improve efficiency and avoid surge.
     2. QUALITY ASSURANCE
        1. Provide equipment in full accordance with the latest applicable rules, regulations and reference standards, including but not limited to:
           1. NEMA Listed - ISC-6, ISC-7
           2. ANSI - Instrument Transformers C57.13
           3. CSA - Industrial Control Equipment C22.2 No 14
           4. IEEE 1100 AND IEEE 519 – 1992
           5. NFPA 70, National Electric Code - latest edition
           6. System registered to ISO 9001
        2. All fully assembled controls shall be combined-tested for performance and functionality at the manufacturer's factory with fully loaded VFD rated induction motors. The combined test data shall then be analyzed to insure adherence to quality assurance specifications.
     3. VFD SUBMITTAL
        1. Shop drawings for each VFD system including, but not limited to, the following:
           1. Complete technical description of the VFD system
           2. Manufacturer's name
           3. Identification of all system components.
           4. 3-Wire system wiring and block diagram showing all system components.
           5. LV controls wiring schematic, terminations, DI/DO/AI/AO points, interface requirements with BAS system
           6. Electrical ratings (Amps).
           7. Thermal ratings (Btus).
           8. Cabling entry/exit and size requirements.
           9. Physical installation requirements for access and ventilation.
           10. Type of enclosure, front elevation and plan view, equipment weight, conduit access locations.
           11. Operating and monitoring devices with specified features clearly indicated
           12. Start-up operation, maintenance, spare parts, and field tests
           13. Manufacturer's installation instructions
           14. Other appropriate data
           15. Warranty
        2. After quality assurance tests are complete, submit written certification that drive and components have passed factory quality assurance tests.
        3. Submit letter guaranteeing conformance with IEEE-519 standards as indicated in this specification.
        4. Submit product and performance data on electrical noise attenuation device if required to meet electrical noise criteria specified. Isolation transformer is not an acceptable electrical noise attenuation device.
     4. ELECTRICAL NOISE CRITERIA
        1. Voltage and current distortion generated by VFD and attenuation devices measured at input and output of VFD assembly and as installed in place, shall not exceed the following criteria as referenced by IEEE Standard 519:
           1. Total harmonic distortion (THD) shall not exceed 5 % RMS of fundamental input voltage at full load with maximum 3% RMS on any single harmonic.
           2. Total harmonic current demand distortion (TDD) shall not exceed 5% in amplitude of fundamental input current.
     5. DESIGN AND FABRICATION
        1. Voltage:
           1. The VFD shall accept single-point connection from nominal plant power of 480

volts.

* + - * 1. The supply input voltage tolerance shall be + - 10% of nominal line voltage.
      1. Current:
         1. The VFD has a "normal duty" rating of 100% continuous current with a short time duty rating of 110% overload for one minute, once every 10 minutes or continuous operation at 104%.
      2. Frequency:
         1. The drive system shall provide controlled speed over the range from 38 to 60 Hz.
      3. Power Factor:
         1. The VFD shall be capable of maintaining a minimum displacement power factor of 0.99 at all loads.
      4. Efficiency:
         1. VFD efficiency shall be a minimum of 97%.
      5. Environmental Ratings:
         1. Storage ambient temperature range - 40F (-40C) to 158F (70C)
         2. Operating ambient temperature range 32F(0C) to 104F (40C)
         3. The relative humidity range is 0% to 95% non-condensing
         4. Operating elevation: up to 3,300 ft (1000m) without derating.
      6. Audible Noise:
         1. The maximum audible noise from the VFD shall comply with OSHA Standard 3074, Hearing Conservation, which limits noise level to 85 dBA.
      7. Motor Compatibility:
         1. The VFD shall be capable of operating the chiller motor over the speed range specified. The VFD drive shall provide near sinusoidal voltage and current waveforms to the motor at all speeds and loads. VFD induced torque pulsations to the output shaft of the chiller shall be less than 1% to minimize the possibility of exciting a resonance.
         2. The motor insulation system shall not be compromised thermally or due to dv/dt stress. Dv/dt at the motor terminals (line-to-line) shall be limited to 10 volts per microsecond or less. Vendor is required to provide any auxiliary equipment, active or passive filters, load reactors, etc. necessary to limit voltage spikes to 10 volts per microsecond or less.
         3. The VFD shall be designed for a maximum availability of 99.9%. The VFD shall be designed for a mean time between failure (MTBF) of 100,000 hours. The VFD shall be designed for a minimum life expectancy of 20 years, based on 5000 hrs

of operation per year. The VFD shall have a control power monitoring system that monitors all power supply voltages and signals Power switch device diagnostics shall detect and protect against device short, over and under gate voltage, loss of gating, loss of diagnostic feedback, heat sink temperature feedback as well as overload monitoring and protection. Failed power switch components shall be replaceable without the removal of the entire power module. Special tools or force measuring transducers shall not be required.

* + - 1. Control Logic:
         1. The VFD shall be capable of operating with the output short circuited at full current. The drive system shall provide controlled speed over the range from 38 to 60 hz. Speed accuracy within this range, expressed as a percent of top speed,

shall be within 0.5% of base speed without encoder or pulse tachometer feedback (0.1% with encoder or pulse tachometer feedback). The VFD shall have a " normal duty " rating of 100% continuous current with a short-time duty rating of 110% overload for one minute, once every 10 minutes (suitable for variable torque loads).

* + - 1. Auto Tuning:
         1. The VFD, in conjunction with the chiller controller shall have an auto tuning function which includes optimizing the chillers system energy efficiency.
      2. Starting Mode:
         1. The VFD shall offer two starting modes. The S-curve profile shall consist of both non-linear and linear portions. The Ramp mode shall be programmable with four ramp speed break points.
      3. Auto-Restart Capability with the Chiller:
         1. The VFD in conjunction with the chiller controller shall be capable of automatically restarting in the event of a momentary power loss, or a clearing of a VFD auto- restart trip.
      4. Protective Features:
         1. Fault information shall be accessible through the VFD human interface. The VFD shall have comprehensive protective diagnostics for line side, VFD system, and load side.

Kirk key for interlocking the system which prevents unsafe access to doors.

Output line-to-line and line-to-ground short circuit protection shall be provided.

Input protection shall be provided via surge arrestors.

* + - 1. Enclosure:
         1. VFD enclosure shall be NEMA 1G (IP21). Door latches shall be heavy-duty 1/4 turn type units which are operated with an Allen wrench. The VFD shall be designed for front access to allow for installation with no rear access. Equipment that requires rear access shall not be accepted.
         2. The VFD shall be designed for top or bottom entry line power (via optional top hat) and back load power exit directly to the motor. The power cable connections are bolted type. Lugs shall be provided. Use copper conductors only for terminal connections.
      2. Cooling System:
         1. The VFD system shall have a dedicated, integral refrigerant or chilled water- based cooling system provided by the chiller manufacturer. All cooling system refrigerant or chilled water piping shall be provided by the unit manufacturer. No additional power or other utilities shall be necessary for the cooling system. The VFD shall include sensors and detection to monitor proper operation of the cooling system. If there is a cooling system failure, the system must generate an alarm indication of the exact failure.
      3. Structural Finish:
         1. All VFD exterior metal parts shall be painted with hybrid epoxy powder paint. “Top hat” raceway provided by the Contractor for cable transition from conduit into the VFD shall be painted to match the VFD for consistency. Chiller supplier shall provide the specific Pantone color code for matching color.
      4. Power Bus:
         1. All power bus bars, when part of the standard design and other current carrying

parts shall be high-conductivity, low loss copper with nickel or tin plating for corrosion resistance. Power bus bar joints shall be nickel or tin plated.

* + - 1. Disconnects:
         1. The VFD shall include a main disconnect device. Disconnect device shall be a molded case thermal magnetic circuit breaker rated 65KAIC with shunt trip option, with an interlocked and pad lockable handle mechanism.
         2. When multiple doors are supplied, all doors shall be electrically interlocked with the disconnect device. The interlocks shall include provisions to manually override for test and repair.
      2. Protection and Metering Equipment:
         1. Item specified: Schweitzer Engineering Laboratories (SEL) 710-5 Motor Protection Relay
         2. Provide a microprocessor-based motor protective relay for protection, control and monitoring of each motor.
         3. Relay(s) shall monitor remote resistance temperature detection (RTD) modules for measurement of motor windings and bearing temperatures using an SEL 2600 RTD Module, which communicates to the SEL 710-5 MPR. Chiller shall be furnished complete with interconnecting wiring for these points from motor to protective relay control panels.
         4. Provide relay protection and metering capabilities. Relay(s) shall provide the following protective functions:

Undervoltage

Lock rotor current (overcurrent)

Instantaneous overcurrent

Undercurrent

Phase loss

Phase unbalance

Phase reversal

Unbalance/ negative sequence

Zero sequence ground fault with run and start time delay

Mechanical jam/stall

Thermal trip

Custom overload curve

Stator winding over-temperature (6 inputs)

Motor bearing over-temperature (2 inputs)

Relay(s) shall provide the following control functions:

Incomplete sequence delay

Anti-back spin timer

Relay(s) shall provide a digital display of the following measured parameters:

Three phase average current

Individual phase currents

% of full load current

Individual winding temperatures

Individual bearing temperatures

Individual bearing vibration sensors

Phase to phase voltage

Number of starts

Provide metering to indicate the following:

Motor current as percent of full load amperes

Run time (hours)

Total KWH/incoming

Instantaneous KW complete with 4-20 ma output

Instantaneous motor KW complete with 4-20 ma output

Current transformers used for overload protection shall be of linear response through six times full load motor current and shall have adequate burden capacity for devices they supply. Linear response shall be per ANSI accuracy classification.

All control, protection and metering equipment shall be mounted in separate isolated low voltage compartment.

* + - * 1. Chiller Power Metering:
      1. Chiller Motor Protective Relay Settings and Coordination:
         1. Chiller Manufacturer is responsible for providing all motor protective relay settings, and performing all fault current, coordination and arc flash analyses for the chiller and its electrical subsystems.
         2. Upon final system commissioning, the Chiller Manufacturer is responsible for turning over both hard copy and electronic protective relay setting files, and any required system software to allow the Owner to maintain and alter protective device programming as necessary in the future, should the need arise.
      2. Operator Interface
         1. The VFD shall have a user-friendly operator interface integrated into the chiller control panel. Refer to Paragraph 2.2O for communication protocol requirements. The following values shall be indicated locally and remotely:

Output speed in hertz and rpm

Input line Volts, Amps, Hz, KW, KVA, PF

Output line Volts, Amps, Hz, KW, KVA, PF

Average current in % RLA

Internal VFD temperature and cooling unit controls.

All relay and other protective settings. They shall be adjustable from the control panel.

Fault and alarm summary.

* + - 1. Communications:
         1. The VFD shall be provided with communication protocol capability to allow for direct control and full comprehensive communications, including diagnostics, with the chiller controller and the plant control system. Refer to Paragraph 2.2O for communication protocol requirements.
      2. Spare parts:
         1. Provide manufacturer’s recommended complete spare parts list and address of local supplier stocking location. Provide a separate cost that is not included in

the overall chiller spare parts cost. Spare parts shall be labeled with name and part number.

# PART 3 - EXECUTION

* 1. MANUFACTURER’S PRIMARY RESPONSIBILITIES
     1. GENERAL
        1. Provide shop drawings and submittal data.
        2. Meet performance criteria as described herein.
        3. Chiller shall be fully assembled and tested at the factory prior to shipment and be fully charged ready for installation upon arrival at the site. If necessary, the initial refrigerant and oil charges shall be removed for shipment and shipped separately in containers and cylinders for field installation. If oil and refrigerant are shipped separately, the Chiller Manufacturer is responsible to cover all costs associated with storing oil and refrigerant through the stated date for Installation shown in the schedule, as applicable. Shipping for just-in-time installation is preferred.
        4. Delivery Coordination, Unloading and Installation:
           1. Manufacturer shall be responsible for delivering the equipment to the site, including coordinating exact delivery date.
           2. The Manufacturer shall off-load equipment and is responsible to set the equipment in-place in the plant. The bearing points for the equipment will rest on raised pedestals, approximately 12 inches above the existing floor elevation.
           3. The chillers must pass through a 13’-4” wide by 14’-0” high door opening into the ground level of the plant. Minimum clearance of the access drive leading to the door opening is 20’-0”. Prior to bid, a manufacturer’s representative shall visit site to verify if the existing door opening and all other existing conditions are adequate to install and set in-place the chiller with appropriate dollies or rigging equipment. If the proposed chiller will not clear the existing opening into the building, the chiller Manufacturer is responsible to make temporary modifications as necessary to the opening as required to install the chiller. Cost for provisions shall be included in the cost of furnishing the equipment.
           4. Modifications shall be pre-approved by the Owner, and the opening will be restored to as-current architectural and aesthetic condition or better following installation.
           5. Disassembly/reassembly of the chiller for installation shall not be permitted.
        5. It is the responsibility of the Chiller Manufacturer to provide all protective device settings necessary to fully configure and set up the motor protective relays. Furthermore, the Chiller Manufacturer shall provide a protective relay field technician to be on site during start up to confirm all settings and assist with relay configuration.
        6. Coordinate electrical (including coordination of all protective device settings) and controls requirements with the University and the installing Contractor(s).
        7. A factory-trained service representative of the manufacturer shall supervise the field- assembly (if any), final installation, pressure testing, checkout, start-up, adjusting and balancing of the chiller. Prepare manufacturer’s written report/log of the installation and start-up signed by the service representative and the Owner. The Manufacturer’s representative shall supervise leak testing, evacuation, dehydration, and charging of oil and refrigerant. If the chiller is found to have lost its shipping pressure prior to the time of installation and assembly, then the machine shall be

leak tested, and shall be evacuated a minimum of 24 hours. Other special provisions for unit testing and setups as recommended by the equipment manufacturer in operations and maintenance manuals shall also be followed. Manufacturer shall include a minimum of 40 hours of service representative time on-site (not including travel) for the contract and include all support costs including travel and per diem charges. If the unit furnished is composed of two separate machines close coupled and working as a duplex machine, then the minimum service representative time on site shall be 80 hours. Provide the service representative charge out rates as a part of the bid. If necessary, additional hours, per diem and trip charges will be paid per the provided rates, terms and conditions. However, the University will not be responsible for the cost of multiple deployments if the time on site falls within the initial time on site allocation noted above and included in the base cost of the contract.

* + - 1. In a series counterflow arrangement, chiller manufacturer shall be responsible for integrating all controls as necessary such that the two units operate as one unit or similarly to a duplex unit. This includes, but is not limited to, power and controls raceways and cabling connections that may be required between chillers.
      2. Chiller manufacturer’s factory-trained service representative shall prepare manufacturer’s written report/log of the installation and start-up signed by the service representative and the Owner.
      3. Before acceptance by Owner/Engineer, Manufacturer shall approve, in writing, the entire installation, including piping and wiring connections, and proper functioning of all operational and safety controls, including protective relays on power equipment, is complete and ready for formal commissioning.
      4. Provide Owner training per requirements within this specification. Note that chiller operations training shall consist of two activities. The chiller manufacturer shall provide initial start-up and basic chiller operator training at the time of final chiller commissioning and placing the machine in service to allow the University to safely and properly operate the new machine. Then scheduled at a time later, the chiller manufacturer shall provide formal in-depth classroom and hands on training as stated elsewhere in the specification.
      5. Provide O&M documentation in both hard copy and electronic formats.
      6. Provide spare parts package that has been pre-approved by Owner at time of chiller testing.
      7. Furnish touch up paint.
      8. Furnish and install neoprene pads for vibration isolation.
    1. FACTORY PERFORMANCE TEST
       1. Manufacturer shall conduct factory performance test for the selected chiller or SCF pair of chillers in accordance with the latest edition of AHRI 550/590, except as modified below, to verify full load design capacity and part load capacity points indicated on Chiller Bid Summary Data Sheet included at the end of this section. Notify Owner and Engineer six weeks in advance of test so that Owner and Engineer may plan to witness test at their own expense.
       2. If any retesting is required due to chiller failure or retest to meet efficiencies, the two Owner's representatives and the Engineer shall witness the retest. Chiller manufacturer shall be responsible to reimburse the cost to the Owner and the Engineer for the transportation and accommodations to witness the retest.
       3. Factory performance test shall be in accordance with AHRI 550/590 test procedures, except as modified below, to verify design capacity and part load capacity points indicated on the Bid Summary Data Sheet included.
          1. Conduct test at an approved AHRI certified test facility of the Manufacturer.

Owner/Designer may elect to contact AHRI for verification of performance and test conditions.

* + - * 1. Instrumentation used for testing must be calibrated within six (6) months of the test date and traceable to the National Bureau of Standards. All documentation verifying NBS traceability shall be submitted to Engineer for approval a minimum of 2 weeks prior to chiller test.
        2. Test chiller with water temperature and adjustment cooler/condenser per standard AHRI 550/590 to simulate specified fouling versus no fouling during test. Verification of this procedure will require inside surface area and number of tubes per vessel. This information is to be submitted with proposal for formula verification of fouling per AHRI 550/590.

A downward temperature adjustment per AHRI 550/590 shall be made to the design leaving evaporator water temperature to adjust from the design fouling to the clean tube condition.

An upward temperature adjustment per AHRI 550/590 shall be made to the design entering condenser water temperature to adjust from the design fouling to the clean tube condition.

There shall be no exceptions to conducting the performance test with clean tubes and with temperature adjustments in (1) and (2). The manufacturer shall clean tubes, if necessary, prior to test to obtain a test fouling factor of 0.0000.

* + - * 1. All proposals for chiller performance must include an AHRI approved selection method for the specified refrigerants. Verification of data and version of computer program selection or catalog shall be available through the Engineering Division of AHRI.
      1. Modifications to AHRI Standard shall be as follows:
         1. Chiller tonnage shall be equal to or greater than specified value when producing water at project required conditions (no tolerance allowed).
         2. Chiller energy consumption (kW) shall not exceed value submitted on the Chiller Bid Summary Data Sheet or energy consumption penalty will be imposed (no tolerance allowed).
         3. All design conditions, part load performance data and full load performance data is to be evaluated with 480 volt, three phase, 60 hertz power supplied to chiller VFD.
         4. The performance test shall be a three-point test per chiller or chiller pair (SCF). Points to be tested will be selected at time of test.

One test point will be at full load and full lift conditions.

The other two points will be part load points selected by Owner from the Chiller Bid Summary Data Sheet submitted with the bid.

* + - 1. During the test, all machinery performance data including, but not limited to, oil pressures, gas pressures, and component temperatures shall be recorded at fifteen

(15) minute intervals and compared to standard conditions supplied by the manufacturer. If at any time during the test, the recorded machinery performance data is in excess of the standard conditions, the test will be considered not valid and the test shall be restarted for an additional period.

* + - 1. Defective work or material shall be replaced or repaired, as necessary, and inspection and test repeated. Repairs shall be made with new materials. Tests for various items of equipment shall be as specified in their respective specification sections. Defective

work includes the following:

* + - * 1. Compressor VFD kW input in no case shall exceed that indicated in these specifications for full load conditions (no AHRI tolerance allowed). Capacity must meet or exceed tonnage indicated on the Chiller Bid Summary Data Sheet. In other words, there is zero tolerance allowed on both efficiency and capacity.

If chiller assembly fails to meet full load capacity, the Manufacturer will be allowed to adjust and retest the machine. If the Manufacturer cannot successfully pass the full load test, the Owner can either reject the machine or accept the machine as is and assess a penalty charge as described herein.

* + - * 1. If an unacceptable performance test is determined by the Designer or Owner, additional subsequent test(s) may be required at the discretion of the Owner. The complete cost of the additional test(s) requested or caused by equipment operation condition exceeding standard conditions or not meeting the overall operating efficiency, shall be borne by the Manufacturer.
        2. Penalties for not meeting performance data as shown on the Chiller Bid Summary Data Sheet shall be as follows:

If a chiller fails to meet full load capacity, the Owner, at their sole discretion, may elect not to accept delivery until chiller is modified at Manufacturer's expense to meet design capacity or to assess performance penalty charges. If Manufacturer elects to modify the chiller, a retest of the chiller will be required at Manufacturer’s Expense. If the University elects to assess performance penalty charges, the cost shall be $5,000 per ton (pro-rated per fraction of a ton rounded to the nearest one-thousand dollar) that chiller capacity falls short of the contracted full load capacity.

If a chiller fails to meet any of part load performance data supplied by Manufacturer with the bid, Owner may elect not to accept delivery until chiller is modified at Manufacturer's expense to meet all points of design and part load performance data or to assess a performance penalty charge equal to twenty-five (25) years operating cost differential. This differential is to be determined by using 5-point part load data included in bid form and data obtained from performance test, subtracting bid data annual operating cost from test data annual operating cost, and multiplying by annual load, average electricity cost, and 25-year present value factor noted below.

All bids will be analyzed on a 25-year present value basis using the run hours noted below:

All chillers will be offline 3% of the year

Zero annual load increase

Average electricity cost of $0.08/kWh

25-year Present Value Factor for Industrial Electricity of 19.46 from NISTIR Table Ba-3

* + - 1. A certified test report of all data shall be submitted to the Owner and Designer prior to shipment. The factory certified test report shall be signed by an officer of the manufacturer’s company. Preprinted certification will not be acceptable; certification shall be in the original.

After completion of Factory Performance Tests, the chillers shall be flushed with clean water, drained, and dried in preparation for shipment to prevent any surface corrosion on normally wetted surfaces.

* + 1. BASELINE EDDY CURRENT TEST
       1. Upon completion of the Factory Performance Test, provide baseline eddy current test at factory for 100% of evaporator and condenser tubes.
       2. Utilize computer-based eddy current test instrument manufactured by Highline Automation, or equal, with frequency range of 40Hz to 2 MHz.
       3. Test instrument shall record the inspection data for playback and analysis at a later time.
       4. The vertical and horizontal deflections produced by the inspection probe of both channels are recorded.
       5. The test instrument used shall generate a tube sheet map and tube list for the purpose of tracking the tubes being tested and reduce the possibility of human error.
       6. The test instrument shall automatically mark defective tubes on the tube sheet map, generate data sheets with defect description and location, and summarize the inspection results.
       7. The test probes used shall be capable of operating at the various frequencies necessary to perform the specific test. The probes used shall have a minimum fill factor of not less than .80, as calculated using the formula η =(D/d)². Probes shall be constructed to perform without failure or frequency drift for the entire inspection period.
       8. Probe speed shall not exceed 60 feet per minute.
       9. The test instrument used shall be capable of recording both the Vertical and Horizontal outputs of the detection circuits to enhance signal interpretation and review. A sampling of these recorded images shall be printed as strip charts and included in the final written report.
       10. Test instrument calibration shall be checked at the beginning, at the end, every two hours of continuous operation, or when improper operation is suspected. When the test instrument is found to be improperly calibrated or malfunctioning, all tubes shall be re-inspected since last known good calibration.
       11. Submit written report including vessel information sheet containing the unit model and serial number, tube specifications, test end, tube sheet layouts, data summary sheets, detailed data sheets, and printouts of graphics.
    2. FIELD TESTING
       1. Pressure Test: Manufacturer shall conduct a standing pressure test on the refrigerant circuit for a period of 12 hours using nitrogen with exceeding test pressure recommended by the manufacturer in operations and maintenance manuals. Conduct a standing vacuum test on the vessel equal to 1 mm Hg absolute for a 24-hour period. Machine shipped pre-charged need not comply with this requirement unless the factory pre-charge or holding charge is lost during shipment or prior to start-up, in which case, the Manufacturer shall test as indicated. Perform all tests and start-up in such a manner as not to introduce moisture into the machine.
    3. COMMISSIONING
       1. Upon issuance of the written acceptance of the installation of the chiller and its support subsystems by the chiller manufacturer’s factory trained service representative as required in this Specification, PART 3.1 - A.7 above, the chiller and associated equipment will be commissioned. The chiller manufacturer will be responsible for providing a factory trained technician on site for a minimum of 40 hours of project commissioning. This time shall be in addition to any other start-up, training, etc. and shall include all associated costs, travel and per diem expenses. Scheduling

of commissioning will be by the Chiller Plant Contractor and is assumed to occur at straight time charge out rates. Any additional costs or premium time expenses caused by delays in the commissioning process due to the Contractor shall be the Contractor’s responsibility.

* 1. CONTRACTOR’S PRIMARY RESPONSIBILITIES
     1. GENERAL
        1. Provide concrete housekeeping pads with sizes per the manufacturer’s shop drawings.
        2. Extend condenser water and chilled water piping to the chillers.
        3. Coordinate and extend refrigerant relief piping from the chillers to the exterior per the Drawings and the manufacturer’s installation manual. If there are discrepancies between the Drawings and the manufacturer’s recommendations / requirements, the manufacturer’s recommendations shall govern.
        4. Extend electrical service to the chiller including feeders to the chillers.
        5. Install control devices, raceway systems and/or wiring between the chiller and the control system.
        6. Insulate the associated piping systems.
        7. Touch up the paint on the chillers and paint associated connecting piping systems.
        8. Insulate all cold surfaces at 65°F or less when chiller is operating to prevent condensation. This includes, but is not limited to, the evaporator shell, end sheets, cover plates, suction elbow, vent and drain connections, auxiliary piping, etc. Water box insulation shall be field installed by the Contractor after piping connections are made and shall be removable. Ambient temperatures in the chiller plant will reach over 105°F. Refer to Specification Section 23 0700.
        9. Provide refrigerant monitoring system.
        10. Provide system identification.
        11. Coordinate schedule for training, field testing and commissioning duties with chiller manufacturer, including all other items to provide a fully operational system.
        12. Participate in commissioning process.

# END OF SECTION

**PROJECTED ANNUAL LOAD SUMMARY**

|  |  |  |
| --- | --- | --- |
| **Design Data** | | |
| Load % | Hours Per Year | Ent. Cond. Wtr. Temp (°F) |
| 100 | 500 | 84.0 |
| 100 | 2,500 | 75.0 |
| 100 | 2,500 | 65.0 |
| 75 | 1,500 | 65.0 |
| 50 | 1,500 | 55.0 |

## BASE BID CHILLER BID SUMMARY DATA SHEET CHILLER PROVIDED WITH VSD / AFD - 100% Design Data

Manufacturer shall insert performance data for proposed chiller in the Bid Value column below.

|  |  |  |
| --- | --- | --- |
|  | **Specified Value** | **Bid Value** |
| **General** |  |  |
| Manufacturer & Model No. | --- |  |
| Refrigerant | R-513A, R-514A or R-1233zd(E) |  |
| Capacity (Tons) | TBD BY MANUFACTURER |  |
| **Evaporator Data** |  |  |
| Flow (GPM) | TBD BY MANUFACTURER |  |
| Entering Water Temperature | 54˚F |  |
| Leaving Water Temperature | 40˚F |  |
| Fouling Factor | 0.00010 |  |
| Pressure Drop (Feet) | TBD BY MANUFACTURER |  |
| Number of Passes | 1 |  |
| **Condenser Data** |  |  |
| Flow (GPM) | TBD BY MANUFACTURER |  |
| Entering Water Temperature | 84.0˚F |  |
| Leaving Water Temperature | 94.0˚F |  |
| Fouling Factor | 0.00025 |  |
| Pressure Drop (Feet) | TBD BY MANUFACTURER |  |
| Number of Passes | 1 |  |
| **Electrical Data** |  |  |
| KW (max) | TBD BY MANUFACTURER |  |
| FLA (max) | 1260A |  |
| Voltage | 480 |  |
| Phase | 3 |  |

## Chiller Flow Rates:

Indicate the minimum and maximum flow rates for the provided chillers: Minimum Evaporator Flow Rate GPM

Maximum Evaporator Flow Rate GPM

Minimum Condenser Flow Rate GPM

Maximum Condenser Flow Rate GPM

## Bid Performance Values

Manufacturer shall populate the table below with kW/Ton (zero tolerance on kW and tonnage) values for each operating condition while producing 40˚F chilled water. Data provided will be utilized by Engineer for life cycle analysis and factory chiller performance test verification.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Percent Load** | **84˚F ECWT** | **75˚F ECWT** | **65˚F ECWT** | **55˚F ECWT** |
| 100 |  |  |  |  |
| 90 |  |  |  |  |
| 80 |  |  |  |  |
| 70 |  |  |  |  |
| 60 |  |  |  |  |
| 50 |  |  |  |  |
| 40 |  |  |  |  |
| 30 |  |  |  |  |
| 20 |  |  |  |  |
| Min. = % |  |  |  |  |

## Acoustical Performance:

Indicate SPL under design conditions noted above for the chiller with VSD/AFD without noise abatement measures below:

|  |  |
| --- | --- |
| Frequency | Chiller with  VSD/AFD Bid Values |
| 63 HZ |  |
| 125 HZ |  |
| 250 HZ |  |
| 500 HZ |  |
| 1000 HZ |  |
| 2000 HZ |  |
| 4000 HZ |  |
| 8000 HZ |  |
| Overall dB(A) |  |

## ALTERNATE NO. 1 – 2,500 T CHILLER BID SUMMARY DATA SHEET CHILLER PROVIDED WITH VSD / AFD - 100% Design Data

Manufacturer shall insert performance data for proposed chiller in the Bid Value column below.

|  |  |  |
| --- | --- | --- |
|  | **Specified Value** | **Bid Value** |
| **General** |  |  |
| Manufacturer & Model No. | --- |  |
| Refrigerant | R-513A, R-514A or R-1233zd(E) |  |
| Capacity (Tons) | 2,500 |  |
| **Evaporator Data** |  |  |
| Flow (GPM) | 4,285 |  |
| Entering Water Temperature | 54˚F |  |
| Leaving Water Temperature | 40˚F |  |
| Fouling Factor | 0.00010 |  |
| Pressure Drop (Feet) | TBD BY MANUFACTURER |  |
| Number of Passes | 1 |  |
| **Condenser Data** |  |  |
| Flow (GPM) | 7,500 |  |
| Entering Water Temperature | 84.0˚F |  |
| Leaving Water Temperature | 94.0˚F |  |
| Fouling Factor | 0.00025 |  |
| Pressure Drop (Feet) | TBD BY MANUFACTURER |  |
| Number of Passes | 1 |  |
| **Electrical Data** |  |  |
| KW (max) | TBD BY MANUFACTURER |  |
| FLA (max) | 1260A |  |
| Voltage | 480 |  |
| Phase | 3 |  |

## Chiller Flow Rates:

Indicate the minimum and maximum flow rates for the provided chillers: Minimum Evaporator Flow Rate GPM

Maximum Evaporator Flow Rate GPM

Minimum Condenser Flow Rate GPM

Maximum Condenser Flow Rate GPM

## Bid Performance Values

Manufacturer shall populate the table below with kW/Ton (zero tolerance on kW and tonnage) values for each operating condition while producing 40˚F chilled water. Data provided will be utilized by Engineer for life cycle analysis and factory chiller performance test verification.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Percent Load** | **84˚F ECWT** | **75˚F ECWT** | **65˚F ECWT** | **55˚F ECWT** |
| 100 |  |  |  |  |
| 90 |  |  |  |  |
| 80 |  |  |  |  |
| 70 |  |  |  |  |
| 60 |  |  |  |  |
| 50 |  |  |  |  |
| 40 |  |  |  |  |
| 30 |  |  |  |  |
| 20 |  |  |  |  |
| Min. = % |  |  |  |  |

## Acoustical Performance:

Indicate SPL under design conditions noted above for the chiller with VSD/AFD without noise abatement measures below:

|  |  |
| --- | --- |
| Frequency | Chiller with VSD/AFD Bid  Values |
| 63 HZ |  |
| 125 HZ |  |
| 250 HZ |  |
| 500 HZ |  |
| 1000 HZ |  |
| 2000 HZ |  |
| 4000 HZ |  |
| 8000 HZ |  |
| Overall dB(A) |  |