Air-Cooled Chiller Replacement
Penguin & Puffin Habitat

Issued for Bidding and Construction
May 15, 2017
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INVITATION TO BIDDERS

PROJECT: Air-Cooled Chiller Replacement – Penguin & Puffin Habitat

SCOPE OF WORK
Intent of this project is to replace an existing air-cooled chiller with a similar new chiller installed in the existing chiller’s location, serving the existing penguin and puffin habitat, furnished and installed complete and turnkey. Demolition of the existing chiller and its complete removal from the site is a requirement of the scope of work. Ancillary base bid work includes disconnection and reconnection of the existing electrical feed to serve the new chiller, disconnection and reconnection of the existing chilled water piping to serve the new chiller, miscellaneous piping, fittings, couplings, and pipe insulation as required for a complete and operational system, all as per the attached specifications. (No Drawings provided for this project.) The new chiller shall be interconnected with the Saint Louis Zoo’s existing Siemens DDC energy management and control system.

An alternate bid requests additive pricing for a chilled water economizer accessory on this new chiller to provide compressor-free winter operation.

MANDATORY PRE-BID MEETING & SITE INSPECTION:
On June 1, 2017 at 11:00am in The Living World building on Government Drive in Forest Park, lower level. Please note that this meeting will start in the Living World’s lower rotunda, and we will be going to the site outside the Penguin & Puffin Habitat for a site visit in any weather rain or shine.

BID DATE:
Sealed bids marked with project name will be accepted on or before June 15, 2017 prior to 2:00pm, and opened publicly in the conference room of the Facility Management office immediately thereafter, located off of Wells Drive near the Distribution Building using Gate 5.

BID DOCUMENTS: Bid Documents and specifications will be available on May 15 at: https://www.stlzoo.org/about/contact/vendoropportunities/
If you have any questions, contact the individuals listed below. Patrick Williamson, Director of Purchasing and Distribution Williamson@stlzoo.org or Direct line 314-646-4631
REQUEST FOR BID

The Saint Louis Zoo is seeking competitive proposals from qualified Bidders as outlined on the Invitation to Bidders, this Request for Proposal, and the Scope of Work contained in these Bid Documents.

I. THE BIDDING PROCESS

A. Pre-Bid Meeting and Site Inspection/s

1. The Saint Louis Zoo will hold a Mandatory Pre-Bid Meeting for all interested Bidders on Thursday June 1, 2017 at 11:00am in The Living World building on the lower level. Bids will be accepted only from Contractors who have attended the Pre-Bid Meeting.

2. Bidders are directed to inspect the site and to investigate all conditions involved in executing a Contract, to carefully read the specifications, and to inform themselves fully of the conditions under which the Contract is to be performed. The Contractor will not be allowed additional compensation for items on which he has failed to inform himself prior to the bidding.

3. The submission of a bid will be construed by the Saint Louis Zoo to mean that the Bidder has made such examinations and investigations, and agrees to fulfill all the requirements of the Contract in full accordance with these specifications, and that he/she is entirely familiar with and thoroughly understands all such requirements.

B. Bid Form and Submittal of Proposal

1. Bids will be submitted on Bid Form provided by the Zoo. (Appendix A)

2. Quotations should be typewritten or in ink on Bid Form provided. Altered or erased prices will not be accepted.

3. Bids must be submitted to the Distribution Center on Wells Drive at Gate 5, on or before 2:00pm Thursday June 15, 2017 in a sealed envelope clearly marked “Air-Cooled Chiller Replacement – Penguin & Puffin Habitat”

4. No bid received after the specified time will be considered.

5. Any bid may be withdrawn prior to the specified time for opening bids or any authorized postponement thereof.

6. Bids having an acceptance time limit of less than 30 days may be rejected.
7. Faxed bids shall not be accepted. Bid proposal, in a sealed envelope, clearly marked “Air-Cooled Chiller Replacement / Penguin & Puffin Habitat” shall be delivered to the Saint Louis Zoo Distribution Center on Wells Drive (Gate # 5), or mailed to:

Patrick Williamson  
Director, Purchasing & Distribution  
Saint Louis Zoo  
One Government Drive  
St. Louis, MO 63110

C. Bid Proposal Components and Attachments

1. Cost/s

   a. A separate cost is required to provide 100% performance and payment bonds for the total cost of this project.

   b. The laws of the State of Missouri provide that the Saint Louis Zoo pay no state sales or use tax, or federal excise taxes, and these taxes should be excluded from your bid price. Documentation will be provided for Contractor’s use in making tax-exempt purchases for this project. (See Appendix B.)

   c. Bids will include cost of delivery to jobsite of all materials.

   d. Workers’ wages shall be paid in accordance to the Missouri Division of Labor Standards. (Appendix C)

2. Unit Prices (if requested)

   a. It is understood that the quantities stated in the Bid Documents are not guaranteed by the Zoo and are used solely for the purpose of comparing Bids and awarding the Contract, and may or may not represent the actual quantities encountered on the job. The Zoo reserves the right to reduce any or all quantities. The Zoo may also add additional components or copies of specified components for which Contractor agrees to do the work at the unit price stated in the Bid or subsequent cost breakdown.

   b. Bidders must quote unit prices and extensions on each item listed on Bid Form (if any). When an error appears in an extension, the unit price will govern.

   c. The Saint Louis Zoo reserves the right to make a contract award on a per item basis or a total package basis.
3. Time

a. The bid proposal should include an estimate of the total time needed to complete each portion of the job, as defined in the scope of work.

b. The successful Bidder shall submit a schedule that allows time for all major phases of design and production, including approvals by Zoo staff at key stages, prototyping, and any necessary modifications prior to installation.

4. Minority Participation List

Bidder shall execute and include with Bid Proposal the Minority Participation Attachment to Bid Form. (Appendix D)

5. Bid Bond – Not Required

D. Responsibilities of the Bidder for Accuracy of Bid Proposal

1. Bidders may not use omissions or errors in the Bid Documents or other Contract Documents to their advantage. The Owner reserves the right to issue new instructions correcting any such errors or omissions, which new instructions shall be treated as if originally included.

2. The Bid Documents contain the available information about the work and the conditions pertaining thereto. Information obtained from any officer, agent, or employee of the Saint Louis Zoo, or from any other person, will not relieve the Contractor’s responsibility to assume all risks and obligations pertaining to the work, and to fulfill the conditions of the Contract. Bidders are required to satisfy themselves as to the accuracy of the estimated quantities in the Bid Documents, and must thoroughly examine the site and review the Bid Documents, including Addenda, if any, before submitting a Bid.

3. No Bidder may assert after Bids have been opened that there was a misunderstanding concerning the Bid Documents, the conditions under which the work must be performed, or the quantities of work involved.

E. Direct questions about this Request for Bid to:

Patrick Williamson
Director, Purchasing & Distribution
Saint Louis Zoo
One Government Drive
St. Louis, MO 63110
williamson@stlzoo.org
II. SELECTION OF SUCCESSFUL BIDDER AND CONTRACT AWARD

A. The Saint Louis Zoo enjoys the support of the community through the Metropolitan Zoological Park & Museum District. For this reason, the Zoo makes every effort to return that support by contracting with qualified businesses within the District (comprised of St. Louis and St. Louis County) whenever possible.

B. The time specified for awarding a Contract and for commencing work may be extended or shortened by mutual agreement between the Zoo and the successful Bidder.

C. The Zoo reserves the right to waive any informalities or minor defects in the Bid or bidding procedures; to reject any or all Bids; to rebid the project at a later date if Bids are rejected; and to accept the Bid that, in the judgment of the Zoo, will serve the best interests of the Zoo, whether or not said Bid is the low Bid.

D. Before awarding any Contract, the Saint Louis Zoo reserves the right to require the successful Bidder to file proof of his ability to properly finance, manage, staff and execute the project. The Zoo reserves the right to reject any bid if the evidence submitted by, or other investigation of, the Bidder fails to satisfy the Zoo that the Bidder has the proper qualifications, experience, equipment, manpower, or financial and managerial capability to carry out the obligations of the agreement or to perform the work contemplated.

E. Before award of Contract successful Bidder may be required to furnish:

   1. Cost breakdown and unit prices
   2. Proposed schedule
   3. Information regarding material suppliers and Subcontractors upon request.
   4. Bonds and insurance certificates

III. INSURANCE REQUIREMENTS

A. Before a Contract is signed, the successful Bidder will be required to furnish certificates of insurance showing that adequate Public Liability and Property Damage Insurance is being carried to protect the Saint Louis Zoo, its employees and officials, the City of St. Louis and the County of St. Louis. All insurance must be kept in force for the life of this Contract.

B. The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor’s operations under the Contract and for which the Contractor may be legally liable whether such operations be by the
Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable.

1. Claims under workers’ compensation, disability benefit and other similar employee benefit acts, which are applicable to the work to be performed.

2. Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor’s employees.

3. Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor’s employees.

4. Claims for damages insured by usual personal injury liability coverage.

5. Claims for damages, other than to the work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom.

6. Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle.

7. Claims for bodily injury, property damage arising out of completed operations.

8. Claims involving contractual liability insurance applicable to all Contractor obligations.

C. The insurance required shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverage, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the work until date of final payment and termination of any coverage required to be maintained after final payment.

1. General Liability
   Bodily injury:
   $1,000,000 each occurrence
   $2,000,000 aggregate
   Property damage

2. Employer's Liability
   $500,000 each accident
   $500,000 disease, each employee
   $1,000,000 disease, policy limit
3. Contractual Liability (Hold Harmless Coverage)
   Bodily Injury:
   $1,000,000 each occurrence
   $2,000,000 aggregate
   Property damage

4. Umbrella Excess Liability
   $2,000,000 over primary insurance

5. Automobile Liability
   $1,000,000 combined single limit

6. Owner's Protective Liability Policy in the Owner's Name
   $1,000,000

D. The general liability and the umbrella insurance must be written on an occurrence form versus a claims-made form. Aggregates should apply per project.

E. Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates and the insurance policies required shall contain a provision that coverage afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior, written notice has been given to the Owner. If any of the foregoing insurance coverage is required to remain in force after final payment and are reasonably available, an additional certificate evidencing continuation of such coverage shall be submitted with the final Application for Payment. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness in accordance with the Contractor’s information and belief.

F. Insurance certificates shall also be provided for any supplier or Subcontractor storing materials for this project for which application for payment is made.

G. The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance. NOTE: OWNER’S INSURANCE COVERAGE HAS A $5,000 DEDUCTIBLE FOR THEFT AND VANDALISM.

H. THE SAINT LOUIS ZOO SHOULD BE ADDED TO CONTRACTOR’S INSURANCE POLICY AS AN ADDITIONAL INSURED; AND THIS POLICY SHOULD ACT AS THE PRIMARY INSURANCE POLICY AND BE SO STATED BY THE ENDORSEMENTS.
IV. PAYMENT APPLICATIONS

A. All applications for payment will be submitted on a form mutually agreed upon by Contractor and the Zoo.

B. Applications will be submitted on prearranged schedule to be mutually agreed upon by Contractor and the Zoo.

C. Contractor shall supply lien waivers for all labor and material covered by Contract for this project.

D. The Contractor shall be paid 90% of the Contract amount upon completion of the project. The final 10% of all Contract amount will be paid upon completion and acceptance of all punch-list items and the tendering of appropriate lien waivers, including those of all suppliers.

V. ARCHITECTURAL SEAL, PERMITS, CODE COMPLIANCE

A. Drawings and specifications for structures to be designed for this project by the Contractor (if any), which may be deemed “occupied by the public,” shall require the seal of an architect licensed to do business in the State of Missouri.

B. Contractor will be responsible to satisfy any and all federal, state, and municipal building codes and regulations for the scope of work outlined in the Bid Documents; and include in the Base Bid the cost of any applications and permits required for same.

C. All work shall be designed, fabricated, and installed in accordance with applicable ADA guidelines.

D. Contractor will meet any and all industry standards for the scope of work outlined in these Bid Documents.

VI. DRAWINGS, PHOTOS, AND CORRESPONDENCE

A. Contractor will provide the necessary architectural, engineering or shop drawings, samples and photographs necessary for approval by Zoo personnel.

B. The cost of all drawings, specifications, reproduction, samples, illustrations and photographs shall be included in Base Bid.

C. In order to expedite routine correspondence and conserve resources, Contractor should have the capability to send correspondence as well as photographs and design files via e-mail and accept documents transmitted from the Zoo in Microsoft Word.
D. Drawings and important correspondence shall also be furnished in “hard” copy as appropriate.

VII. CONTRACTOR’S RESPONSIBILITIES

A. All applicable laws, ordinances, and rules and regulations of all authorities having jurisdiction over the work shall apply to the Contract, and shall be observed by the Contractor.

B. The Contractor shall hold harmless the Saint Louis Zoo for the payment of any and all claims arising out of any infringement, alleged infringement, or use of any patent or patented device, article, system, arrangement, materials or process used by him/her in the executing of the Contract.

C. The Contractor shall be responsible for the work of all Subcontractors employed by him/her and shall keep all work under his/her control. He/she shall submit a complete list of all such Subcontractors to the Saint Louis Zoo prior to commencement of this work.

VIII. GUARANTEE

A. The Contractor shall furnish a written guarantee, stating that work performed by him/her will be free from defects of materials and workmanship for a period of (1) one full year following final acceptance and agreeing to repair or replace any such defective work, and all work damaged thereby, at no cost to the Saint Louis Zoo, during the period covered by this warranty.

B. Failure to supply the Zoo with a written warranty will in no way relieve the Contractor of this obligation.

IX. GENERAL ZOO REQUIREMENTS

A. Temporary Facilities

1. Utilities - Existing electrical power and water service to the construction area is available in the building for construction purposes without cost to the Contractor. A telephone will be available to the Contractor at the site.

2. Sanitary Facilities - Toilet facilities are available to the Contractor on the Zoo grounds.

B. Signs: No signs shall be erected without the Owner's approval of sign and location.
C. Jobsite Rules and Regulations

1. In the event of an emergency on Zoo grounds please call extension 2222. This is the fastest way to get the help you need. State your name, where you are calling from, describe the emergency and where it is happening, and if there are any injuries. If an animal is involved state what type, how many and where they were last seen. Stay on the line until you are told to hang up. After 5:00 pm, call 4669 or the night ranger cell number at 314-799-3273.

2. Awareness of and courtesy to all Zoo visitors at all times is a firm Zoo policy. All Contractors’ personnel must observe this policy.

3. Construction personnel must stay within the confines of designated work areas at all times.

4. Construction personnel are at no time permitted to interfere with or touch the animals or interfere with the keeper-related activities.

5. Construction personnel are at no time permitted to interfere with the public on the Zoo premises. No public display in any form or manner will be tolerated.

6. Construction personnel shall wear proper working attire at all times.

7. Construction personnel shall comply with OSHA rules while on the jobsite.

8. Normal work hours at the Zoo are 8:00 a.m. to 5:00 p.m. Monday through Friday. Access to work areas cannot be before 8:00 a.m. or after 5:00 p.m. unless previously arranged and only after approval of the owner’s representative.

9. In order to provide maximum safety to the Contractor’s personnel and to protect the animals, close coordination of activities with Zoo personnel is imperative.

10. Access to the site shall be as directed by Zoo’s Project Manager. Employees shall arrive in a crew truck or on foot. Access for employees’ personal vehicles will not be allowed on the grounds (see Parking).

11. All gates must be kept closed and locked at all times. Failure to leave a gate unlocked and unattended will result in a fine to the contractor of $500 per occurrence.

D. Parking and Access to Zoo Grounds
1. Contractor's personnel will be allowed to park on the South Parking Lot. If the entrance to the lot is manned, personnel should identify themselves and sign in.

2. Private vehicles are not allowed on the Zoo grounds. If it is necessary to bring private vehicles on the grounds to execute the work called for in these Bid Documents, prior arrangements must be made with the Project Manager. Parking will be allowed only at specified areas. Owners of vehicles must furnish proof of Public Liability and Property Damage Insurance before being allowed to bring their vehicles on the grounds. The maximum speed limit on the Zoo grounds is 5 mph and extreme caution must be used while driving on the grounds.

3. It is the Contractor’s responsibility to advise all on-site employees, subcontractors and material suppliers of these rules and regulations.

4. During the Zoo’s peak visitor’s season, no full size vehicles of any kind are allowed access to the public paths and roads. All deliveries of material and equipment must be made before 9:00 a.m. and after 5:00 p.m.

E. Material Delivery and Storage

1. All firms performing work on the Zoo grounds must schedule that work and delivery of materials with the Project Manager.

2. All deliveries must be scheduled in order to have vehicles off Zoo Grounds and pathways by 9:00 am.

3. Deliveries must be accompanied by a packing slip or invoice listing the Zoo Purchase Order Number, if any, and the project name, and exact contents and quantities of each item included in the shipment.

4. Only a minimum number of vehicles necessary to accomplish the work will be allowed on the jobsite. The 5 mph speed limit within the Zoo shall be strictly observed, and every possible consideration shall be given to the public.

5. Materials shall be protected from the elements and stored in strict accordance with the manufacturer’s written recommendations and in locations approved by the Owner. Materials, equipment and personnel for roofing operations shall be arranged on the roof so that a 20-pound-per-square-foot load shall not be exceeded.

F. Barricades, Chutes, and Enclosures

Furnish and install all barricades as required to protect the public and Zoo employees and workmen. Provide chutes and enclosures to contain debris and excessive dust.
G. Job Conditions

1. Contractor will conduct all operations in such a way as to prevent injury to buildings, structures, other facilities, landscaping, persons, and animals.

2. Contractor shall be responsible for all cleanup and removal from site for disposal of all debris, packaging, and leftover material. Jobsite is to be cleaned up on a daily basis during construction prior to the contractor leaving at the end of each day. If material is to be disposed of on the Zoo site, prior arrangements must be made with Zoo staff and disposal must follow Zoo regulations and procedures, including sorting and recycling all recyclable material.
APPENDIX A

SAINT LOUIS ZOO

STIPULATED SUM BID FORM

2016

Date: _____________________________

Proposal of _________________________________________________
Hereinafter called “Bidder,” [ ] a corporation organized and existing under the laws of the state of __________________________, [ ] a partnership, or [ ] an individual doing business as ________________________________.

TO: Patrick Williamson
Purchasing Director
Saint Louis Zoo Distribution Center
One Government Drive
St. Louis, MO 63110

The Bidder, in compliance with the Invitation for Bid for the project, and having carefully examined the Bid Documents, dated 05/10/2017, which documents are made a part hereof, as well as the site and all conditions surrounding and affecting the work, agrees to furnish all labor, materials, and supplies necessary to perform all the work in accordance with said documents and within the time and at the prices stated below.

BASE BID
Furnish all labor, tools, equipment, and material required to perform all work as defined in the Bid Documents, including but not limited to low-ambient chiller operation, for the sum of:

________________________________________________________________
_________________________________ Dollars ($_______________________).

ALTERNATE BID #1
Furnish all labor, tools, equipment, and material required to include a chilled water economizer for compressor-free winter operation in lieu of low-ambient chiller operation, as further defined in the Bid Documents, for the additive sum of:

________________________________________________________________
_________________________________ Dollars ($_______________________) which shall be in addition to the above-stated Base Bid sum.
II. PERFORMANCE BOND

A performance bond is required; please list as a lump sum

___________________________________ Dollars ($____________________)

III. TIME

A. The Bidder hereby agrees to commence work as stipulated in the contract documents, but no later than:

________________________________________________________________________

B. The Bidder hereby states that the time required to perform all work indicated in the Bid Documents and necessary to bring the project to substantial completion (as defined in the documents) shall be _______________ calendar days.

(Note: Bid Documents allow ___ calendar days from "Notice To Proceed" to "Substantial Completion.")

IV. UNIT PRICES

Bidder shall price project on a unit price basis as specified in the Bid Documents Scope of Work, at rates specified herein:

**not applicable**

V. SUBCONTRACTORS

A. The Bidder hereby indicates that the following Subcontractors and/or Suppliers shall be employed under contract with Bidder for this project (subject to Owner review and approval).

<table>
<thead>
<tr>
<th>Work to Be Performed</th>
<th>Name of Subcontractor</th>
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</table>
VI. BID DOCUMENTS

Bidder acknowledges review of the following documents:

A. Specifications

B. Drawings (not applicable)

C. Addendum No. ____________  Dated ______________________
   Addendum No. ____________  Dated ______________________

VII. MISCELLANEOUS BID REQUIREMENTS

A. The undersigned understands that this bid shall be good and may not be withdrawn for a period of sixty (60) calendar days after the scheduled closing time and date for receiving bids.

B. The undersigned understands that the Owner reserves the right to reject any or all bids or Subcontractors.

C. The undersigned further agrees to indemnify and hold harmless the Owner and Engineer from and against all losses, judgments of every nature and description made, brought, or recovered against the Owner by reason of any act or omission of the undersigned, his agents, Subcontractors, or employees in the execution of the work or in guarding the same.

D. The undersigned hereby declares that this Stipulated Sum Bid is based solely upon the materials and equipment described in the bidding documents (including Addenda), and that no substitutions are contemplated.

E. The Bidder declares that he/she has had an opportunity to examine the site of the work and he/she has examined the Bid Documents therefor, and that he/she has carefully prepared his/her Bid upon the basis thereof and that he/she has carefully examined and checked this Bid and the materials, equipment and labor required thereunder, the cost thereof, and his/her figures therefor, and hereby states that the amount or amounts set forth in this Bid is/are correct and that no mistake or error has occurred in this bid.

F. Upon receipt of written notice of the acceptance of this Bid, the Bidder will execute a formal Contract attached within fifteen (15) calendar days and deliver to the Owner a surety bond or bonds as required by the Bid Documents.

VIII. BID SECURITY

A bid security bond is not required on this project.
By signing the Bidder hereby states to perform all work indicated in the Bid Documents and necessary to bring the project to completion.

**IF A CORPORATION**

<table>
<thead>
<tr>
<th>Name of Corporation</th>
<th>Signature of Officer</th>
</tr>
</thead>
</table>

Incorporated under the laws of the State of ________________________

Licensed to do business in Missouri? (check one) [ ] Yes [ ] No

Address for Communications:

(Seal if bid is by a corporation.)

**IF A PARTNERSHIP**

<table>
<thead>
<tr>
<th>Name of Partnership</th>
</tr>
</thead>
</table>

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<tr>
<th>Signature of Authorized Partner</th>
</tr>
</thead>
</table>

State name and address of all partners:

**IF INDIVIDUAL**

<table>
<thead>
<tr>
<th>Name of Firm (if any)</th>
</tr>
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<table>
<thead>
<tr>
<th>Signature of Individual</th>
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</table>

<table>
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<tr>
<th>Name of Individual (Print)</th>
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**IF BIDDING AS A JOINT VENTURE** (List all parties.)

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</table>
Signature for the Saint Louis Zoo

Saint Louis Zoo ____________________________

Signature of Officer ____________________________

Name and Title (Print) ____________________________

Address for Communications:
1 Government Drive ____________________________

Saint Louis Mo. 63110 ____________________________
APPENDIX B

State of Missouri

EXEMPTION FROM MISSOURI SALES AND USE TAX ON PURCHASES

Issued to: Missouri Tax ID
ZOOLOGICAL PK SUBDIST OF METRO ZOOLOGICAL PK/MUSEUM
FOREST PARK
ST LOUIS MO 63110

Missouri Tax ID
Number: 12623491
Effective Date: 07/11/2002

Your application for sales tax exempt status has been approved
pursuant to section 144.630.1, RSMo. This letter is issued as
documentation of your exempt status.

Purchases by your Agency are not subject to sales or use tax
if within the conduct of your Agency’s exempt functions
and activities. When purchasing with this exemption, furnish
all sellers or vendors a copy of this letter. This exemption
may not be used by individuals for personal purchases.

A contractor may purchase and pay for construction materials
exempt from sales tax when fulfilling a contract with your Agency
if your Agency issues a preprint exemption certificate and the
contractor makes purchases in compliance with the provisions
of section 144.472, RSMo.

Sales by your Agency are subject to all applicable state and
local sales taxes. If you engage in the business of selling
tangible personal property or taxable services at retail, you
must obtain a Missouri Retail Sales Tax License and collect and
remit sales tax.

This is a continuing exemption subject to legislative changes
and review by the Director of Revenue. If your Agency ceases
to qualify as an exempt entity, this exemption will cease to be
valid. This exemption is nonassignable and nontransferable. It
is an exemption from sales and use tax only and is not an
exemption from real or personal property tax.

Any alteration to this exemption letter renders it invalid.

If you have any questions regarding the use of this letter, please
contact the Division of Taxation and Collection, P.O. Box 3300,
Jefferson City, MO 65105-3300, phone 573-751-2836.
APPENDIX C

Missouri
Division of Labor Standards
WAGE Hour SECTION

JEREMIAH W. (JAY) NIXON. Governor

Annual Wage Order No. 23
Section 096
ST. LOUIS CITY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards. P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
John E. Lindsey, Director
Division of Labor Standards

This Is A True And Accurate Copy Which Was Filed With The Secretary of State: March 10, 2016

Last Date Objections May Be Filed: April 11, 2016

Prepared by Missouri Department of Labor and Industrial Relations
<table>
<thead>
<tr>
<th>OCCUPATIONAL TITLE</th>
<th>** Date of Increase</th>
<th>otHRIC Hourly Rates</th>
<th>over-Time Schedule</th>
<th>Holiday Schedule</th>
<th>Total Fringe Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos Worker (H &amp; F) Insulator</td>
<td></td>
<td>$38.36</td>
<td>55</td>
<td>60</td>
<td>$21.41</td>
</tr>
<tr>
<td>Boilermaker</td>
<td></td>
<td>$32.76</td>
<td>126</td>
<td>7</td>
<td>$30.10</td>
</tr>
<tr>
<td>Bricklayer and Stone Mason</td>
<td>6/16</td>
<td>$32.50</td>
<td>72</td>
<td>5</td>
<td>$21.80</td>
</tr>
<tr>
<td>Carpenter</td>
<td>6/16</td>
<td>$36.98</td>
<td>77</td>
<td>41</td>
<td>$16.30</td>
</tr>
<tr>
<td>Cement Mason</td>
<td>6/16</td>
<td>$31.16</td>
<td>80</td>
<td>6</td>
<td>$17.95</td>
</tr>
<tr>
<td>Communication Technician</td>
<td></td>
<td>$31.35</td>
<td>44</td>
<td>47</td>
<td>$9.53 + 31.75%</td>
</tr>
<tr>
<td>Electrician (Inside Wireman)</td>
<td></td>
<td>$34.20</td>
<td>82</td>
<td>71</td>
<td>$10.78 + 39.2%</td>
</tr>
<tr>
<td>Electrician (Outside-Line Construction/Lineman)</td>
<td></td>
<td>$42.27</td>
<td>43</td>
<td>45</td>
<td>$5.25 + 36%</td>
</tr>
<tr>
<td>Lineman Operator</td>
<td></td>
<td>$36.45</td>
<td>43</td>
<td>45</td>
<td>$5.25 + 36%</td>
</tr>
<tr>
<td>Groundman</td>
<td></td>
<td>$28.13</td>
<td>43</td>
<td>45</td>
<td>$5.25 + 36%</td>
</tr>
<tr>
<td>Elevator Constructor</td>
<td>a</td>
<td>$46.04</td>
<td>26</td>
<td>54</td>
<td>$31.645</td>
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<tr>
<td>Glazier</td>
<td></td>
<td>$33.40</td>
<td>87</td>
<td>31</td>
<td>$23.55</td>
</tr>
<tr>
<td>Ironworker</td>
<td></td>
<td>$32.88</td>
<td>11</td>
<td>8</td>
<td>$23.825</td>
</tr>
<tr>
<td>Laborer (Building):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General</td>
<td></td>
<td>$31.12</td>
<td>97</td>
<td>26</td>
<td>$14.47</td>
</tr>
<tr>
<td>First Semi-Skilled</td>
<td></td>
<td>$30.76</td>
<td>114</td>
<td>27</td>
<td>$14.47</td>
</tr>
<tr>
<td>Second Semi-Skilled</td>
<td></td>
<td>$31.12</td>
<td>109</td>
<td>3</td>
<td>$14.47</td>
</tr>
<tr>
<td>Lather</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linoleum Layer and Cutter</td>
<td>6/16</td>
<td>$31.83</td>
<td>92</td>
<td>26</td>
<td>$16.00</td>
</tr>
<tr>
<td>Marble Mason</td>
<td>6/16</td>
<td>$31.83</td>
<td>76</td>
<td>51</td>
<td>$14.62</td>
</tr>
<tr>
<td>Marble Finisher</td>
<td>6/16</td>
<td>$26.42</td>
<td>76</td>
<td>51</td>
<td>$13.95</td>
</tr>
<tr>
<td>Millwright</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operator/Carpenter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group I</td>
<td>6/16</td>
<td>$32.41</td>
<td>3</td>
<td>66</td>
<td>$25.13</td>
</tr>
<tr>
<td>Group II</td>
<td>6/16</td>
<td>$32.41</td>
<td>3</td>
<td>66</td>
<td>$25.13</td>
</tr>
<tr>
<td>Group III</td>
<td>6/16</td>
<td>$30.51</td>
<td>3</td>
<td>66</td>
<td>$25.13</td>
</tr>
<tr>
<td>Group II1-A</td>
<td>6/16</td>
<td>$32.41</td>
<td>3</td>
<td>66</td>
<td>$25.13</td>
</tr>
<tr>
<td>Group IV</td>
<td>6/16</td>
<td>$27.05</td>
<td>3</td>
<td>66</td>
<td>$25.13</td>
</tr>
<tr>
<td>Group V</td>
<td>6/16</td>
<td>$27.05</td>
<td>3</td>
<td>66</td>
<td>$25.13</td>
</tr>
<tr>
<td>Painter</td>
<td></td>
<td>$31.65</td>
<td>104</td>
<td>12</td>
<td>$13.76</td>
</tr>
<tr>
<td>Pipe Fitter</td>
<td></td>
<td>$37.00</td>
<td>91</td>
<td>69</td>
<td>$26.68</td>
</tr>
<tr>
<td>Plasterer</td>
<td></td>
<td>$31.06</td>
<td>67</td>
<td>3</td>
<td>$17.53</td>
</tr>
<tr>
<td>Plumber</td>
<td></td>
<td>$37.00</td>
<td>91</td>
<td>69</td>
<td>$26.68</td>
</tr>
<tr>
<td>Roofer / Waterproofer</td>
<td></td>
<td>$31.35</td>
<td>13</td>
<td>73</td>
<td>$17.12</td>
</tr>
<tr>
<td>Sheet Metal Worker</td>
<td></td>
<td>$39.83</td>
<td>32</td>
<td>25</td>
<td>$21.72</td>
</tr>
<tr>
<td>Sprinkler Fitter - Fire Protection</td>
<td></td>
<td>$41.56</td>
<td>66</td>
<td>18</td>
<td>$22.02</td>
</tr>
<tr>
<td>Terrazzo Worker</td>
<td>6/16</td>
<td>$32.30</td>
<td>116</td>
<td>5</td>
<td>$13.79</td>
</tr>
<tr>
<td>Terrazzo Finisher</td>
<td>6/16</td>
<td>$30.35</td>
<td>116</td>
<td>5</td>
<td>$11.84</td>
</tr>
<tr>
<td>Tile Setter</td>
<td>6/16</td>
<td>$31.83</td>
<td>76</td>
<td>51</td>
<td>$14.62</td>
</tr>
<tr>
<td>Tile Finisher</td>
<td>6/16</td>
<td>$26.42</td>
<td>76</td>
<td>51</td>
<td>$13.95</td>
</tr>
<tr>
<td>Traffic Control Service Driver</td>
<td></td>
<td>$27.35</td>
<td>83</td>
<td>17</td>
<td>$9.045</td>
</tr>
<tr>
<td>Truck Driver-Teamster</td>
<td></td>
<td>$30.41</td>
<td>35</td>
<td>36</td>
<td>$10.82</td>
</tr>
</tbody>
</table>

Fringe Benefit Percentage is of the Basic Hourly Rate

**Annual Incremental Increase
|| OCCUPATIONAL TITLE | - Date of | ISaSC Hourly Rates | over-Time Schedule | Holiday Schedule | Total Fringe Benefits |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

• Welders receive rate prescribed for the occupational title performing operation to which welding is incidental.

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30.3040(2).

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30.3.040(3).

a - Vacation: Employees over 5 years - 8%, under 5 years - 6%
APPENDIX D

MINORITY & WOMAN OWNED BUSINESS PARTICIPATION ON SAINT LOUIS ZOO CONTRACTS

Revised 9/17/2013
MINORITY AND WOMAN OWNED BUSINESS PARTICIPATION ON SAINT LOUIS ZOO CONTRACTS

SECTION ONE: DEFINITIONS

For purposes of this policy, the following terms have the meanings indicated below:

1. Minority Business Enterprise (MBE): a sole proprietorship, partnership or corporation owned, operated and controlled by minority group members who have at least 51% ownership. The minority group member(s) must have day to day operational and managerial control and an interest in capital and earnings commensurate with his or her percentage of ownership.

2. Minority Group Member(s): persons legally residing in the United States who are African American, Asian-American, Native-American or Hispanic-American.

3. Women’s Business Enterprise (WBE): a sole proprietorship, partnership or corporation owned, operated and controlled by a woman or women who have at least 51% ownership. The woman or women must have day to day operational and managerial control and an interest in capital and earnings commensurate with her or their percentage of ownership.

4. Certification: The process by which the Saint Louis Zoo determines a person, firm or legal entity to be a bona fide Minority or Women’s Enterprise.

5. Contracting Agency: Any Agency or Department making a contract on behalf of the Saint Louis Zoo.

SECTION TWO: POLICY

1. It is the policy of the Saint Louis Zoo, a political subdivision of the State of Missouri, that minority and women-owned businesses, as defined in the following document, shall have the maximum opportunity to participate in the performance of contracts or sub-contracts financed by Zoo funds, in whole or in part. The Zoo or its assigned Contracting Agencies shall take all necessary and reasonable steps to ensure that said business have the maximum opportunity to compete for and perform under all Zoo contracts. The Zoo or its Contracting Agencies shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.
2. The method that the Saint Louis Zoo shall employ to implement this policy is the establishment of a goal of at least 25% Minority Business Enterprise participation and at least 5% Women’s Business Enterprise participation in contracts and purchases wherein Zoo funds are expended. This goal shall be pursued by the programs described below.

SECTION THREE: PROGRAM ADMINISTRATION

1. The Vice President of Internal Relations for the Saint Louis Zoo shall be charged with the overall responsibility for the administration and enforcement of the Zoo’s Minority and Women’s Business Enterprise participation policy. The Purchasing Department shall be charged with establishing procedures & implementation for all Contracting Agencies for the purpose of monitoring the Zoo’s overall performance with respect to Minority and Women’s Business Enterprise participation. The duties and responsibilities of the Purchasing Department shall include:

A. Developing and distributing a directory of certified MBE’s and WBE’s.

B. Reviewing on a regular basis, the progress of each Contracting Agency toward achieving the goals for the utilization of Minority and Women’s Business Enterprises and making an annual report in the first quarter of each year to the Commission, reporting that progress which has been made, together with recommendations as to such further remedial action that should be taken, if any.

C. Monitoring Contracting Agencies throughout the duration of contracts to ensure that all efforts are made to comply with the requirements of this policy.

D. Certifying that the requirements of this policy have been satisfied before contracts are signed or countersigned.

E. The advertisement for bids, if any, shall appear in the Saint Louis Post Dispatch and the Saint Louis American and/or City Journal Newspapers no later than 21 days before bids are due on specific contracting opportunities, except where the contracts are awarded on an emergency basis.

F. All contract solicitations shall include the MBE/WBE policy and any other materials required.
2. It shall be the responsibility of each bidder and proposer to adhere to procedures and provisions set forth in this policy.

A. Each bidder and proposer must complete an MBE and WBE Utilization Form and identify therein its commitment, if any, to utilize MBE’s and WBE’s. Any failure to complete and sign the MBE and WBE Utilization Form will result in the bid or proposal being declared nonresponsive. In the response to an invitation to bid or request for proposal, the bidder or proposer shall include the names of Minority and Women’s Business Enterprises to whom it intends to award subcontracts, if any, the dollar value of the subcontracts and the scope of work to be performed.

B. It is the bidder’s or proposer’s responsibilities to ensure that all M/WBE’s projected for use have been certified by the Saint Louis Airport Authority prior to bid opening.

C. Whenever additional contract supplements, extra work orders or change orders are made that individually, or in aggregate, increase the total dollar value of the original contract, the contractor shall make every effort to maintain the level of MBE and WBE participation as established in the original contracts.

D. The awardees of a contract must submit a copy of executed agreements with the MBE’s and WBE’s being utilized.

E. The prime contract bidder should break its subcontracts down into discrete items or packages that at least some of the M/WBE’s in the relevant area may find economically feasible to perform.

F. The prime contract bidder should not deny a subcontract to an otherwise qualified and competitive M/WBE’s solely because the latter cannot perform an entire package of related items, but the bidder may deny a request to repackage the work where doing so would jeopardize scheduling or increase that bidder’s cost of performing the original package by more than 5%.

G. The Zoo shall use at least part of any pre-bid meeting to encourage prime contractors and M/WBE’s to work together, providing an opportunity for all firms to identify themselves and for all M/WBE’s to identify the type(s) of work that they perform. The Zoo should also emphasize that it expects all firms to perform a commercially useful function.
H. The Contracting Agency shall make monthly reports to the Zoo concerning the agency’s progress in achieving the goals established in this policy.

3. Bonding and Insurance
   A. The prime contract bidder should be encouraged not to deny a subcontract to an otherwise qualified and competitive, and if necessary, certified M/WBE solely because the latter cannot provide a performance or payment bond for the work, unless the bidder’s bonding is contingent upon bonding for all subcontractors.

4. Written Policy
   A. Independent and apart from its interest in any one project, the prime contract bidder should have a written policy stating that it affirmatively supports subcontracting to M/WBE’s, and that bringing such firms into the mainstream of the construction industry is a priority for that firm. This policy shall be made available to the Zoo upon request.

5. Liaison with MBE/WBE’s
   A. Independent and apart from its interest in any one project, the prime contract bidder should assign a senior official the responsibility of serving as a liaison between the firm and the M/WBE’s in the relevant area.

6. Scope Letter
   A. At least five business days before the date on which bids are due, the M/WBE’s should also give the prime contract bidder a scope letter that defines the items that the M/WBE would like to perform.

SECTION FOUR: ZOO CONTRACTS

1. This section shall be applicable to all contracts let for Zoo contracts or improvements.
2. If a prime contractor’s bid does not indicate intent to utilize a minimum of 25% MBE participation and 5% WBE participation, the contractor shall request a waiver from the Contracting Agency who then must submit such request to the Zoo Purchasing Department.
3. The Zoo’s Purchasing Department will grant a waiver from meeting the 25% MBE and 5% WBE goals, or some portion of them, when documentation submitted by the bidder substantiates
that all available resources have been exhausted in locating and soliciting bids or proposals from minority and women contractors, suppliers and service providers.

4. MBE and WBE participation shall be counted in accordance with the following provisions:

A. A Contracting Agency may count MBE or WBE participation only expenditures to MBE’s and WBE’s that perform commercially useful functions in the execution of a contract. An MBE or WBE is considered to perform a commercially useful function when it is responsible for executing a distinct element of the work and carrying out its responsibilities by actually performing, managing and supervising the work involved. To determine whether a MBE or WBE is performing a commercially useful function, the Zoo will evaluate the amount of work subcontracted, industry practices and other relevant factors.

B. A Contracting Agency may count as a MBE or WBE participation the total dollar value of a contract with a MBE or WBE prime contractor less any amount that is subcontracted to non-MBE’s/WBE’s (including any persons or firms that are identified as MBE and/or WBE but are not so certified by the Saint Louis Airport Authority).

C. The total dollar value of a contract with an enterprise owned and controlled by minority women may be counted as either minority or women’s business participation, but not both. The Contracting Agency must choose which category of participation to which the dollar value is applied.

D. A Contracting Agency may count as MBE or WBE participation a portion of the total dollar value of a contract with a joint venture equal to the percentage of MBE or WBE participation in the joint venture. The joint venture must be certified by the Saint Louis Zoo and the MBE and WBE participation in the joint venture must be responsible for a clearly defined portion of the work to be performed, equal to a share in the ownership, control, management, responsibility, risks and profits of the joint venture.

E. A Contracting Agency may count toward a bidder’s MBE and WBE goals expenditures for material and supplies obtained from MBE/WBE suppliers and manufacturers, provided that the MBE/WBE assumes the actual and contractual responsibility for the provision of materials and supplies.
A Contracting Agency may count a bidder’s entire expenditure to a MBE/WBE manufacturer. Manufacturer is defined as an individual or entity that produces goods from raw materials or substantially alters them before resale.

The bidder may count twenty percent (20%) of its expenditures to MBE/WBE suppliers that are not manufactures.

A Contracting Agency may count as MBE and WBE participation the entire expenditure to an MBE or WBE supplier, when the supplier:

i. Assumes the actual and contractual responsibility for furnishing the supplies and materials; and

ii. Is recognized as a distributor by the industry involved in the contracted supplies and materials; and

iii. Owns or leases a warehouse, yard, building or whatever other facilities are viewed as customary or necessary by the industry; and

iv. Distributes, delivers and services products with their own staff and/or equipment.

A Contracting Agency may count as MBE and WBE participation only those firms that have been certified as MBE’s and WBE’s by the Saint Louis Airport Authority prior to bid opening. If a firm listed by a bidder in its bid documents has not been so certified as MBE or WBE, the amount of participation it represents will be deducted from the total MBE or WBE participation proposed by the bidder.

Joint ventures or mentor-protégé relationships between prime contractors and subcontractors with local MBE and WBE firms are encouraged.

Representatives of the Contracting Agency and/or Zoo or its designee shall make periodic visits to the project site to verify minority and women’s business enterprise participation and staffing.

SECTION FIVE: SERVICE CONTRACTS

It shall be the goal of each Contracting Agency where anticipated service contracts, including professional service contracts, for any year exceed the sum of $50,000 in the aggregate that 25% of the aggregate value of contracts awarded each fiscal year be let with MBE’s and that 5% of the aggregate value of contracts awarded each fiscal year be let with WBE’s.
2. All requests for services, including professional services, shall require proposers to make every good faith effort to utilize minority business enterprises and women’s business enterprises as subcontractors and suppliers whenever possible. Proposers shall be required to submit their projected utilization of minority and women’s business enterprises, if any, along with a description of the efforts made to utilize such businesses.

3. Each Contracting Agency shall make a report to the Director of Purchasing of the M/WBE participation in each professional service contract that it makes.

4. Joint ventures or mentor-protégé relationships between prime contractors and subcontractors with local M/WBE firms are encouraged.

5. Participation of M/WBE firms located within the ZMD Tax District is preferred.

SECTION SIX: SUPPLY CONTRACTS

1. The goal of the Zoo is that 25% of the value of all contracts let and purchases made by the Zoo shall be let or made with MBE’s and that 5% of the value of all contracts let and purchases made by the Zoo shall be made with WBE’s.

2. All contracts let by the Zoo for the purchase or lease of materials, equipment, supplies, commodities or services, the estimated cost of which exceeds $5000, shall be subject to this goal.

3. Joint ventures or mentor-protégé relationships between prime contractors and subcontractors with local M/WBE firms are encouraged.

4. Participation of M/WBE firms located within the ZMD Tax District is preferred.

At contract completion, the Contracting Agency shall obtain final documentation of MBE and WBE participation. The Contracting Agency must have complete and acceptable documentation as determined by the Zoo of amounts paid to all project MBE and WBE subcontractors on file before the final payment is made to the prime contractor.
SAINT LOUIS ZOO
MBE/WBE UTILIZATION STATEMENT

Policy
It is the policy of the Saint Louis Zoo, a sub district of the City and County of Saint Louis, that minority and women-owned businesses, as defined in the following document, shall have the maximum opportunity to participate in the performance of contracts or sub-contracts financed by Zoo funds, in whole or part. The Zoo or its assigned Contracting Agencies shall take all necessary and reasonable steps to ensure that said business have the maximum opportunity to compete for and perform under all Zoo contracts. The Zoo or its Contracting Agencies shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.

Obligation
The contractor agrees to ensure that minority and/or women-owned businesses have the maximum opportunity to participate in the performance of contracts or subcontracts financed in whole or in part with City funds. The contractor shall take all necessary and reasonable steps to ensure that said businesses have the maximum opportunity to compete for and perform under this contract. The contractor shall not discriminate on the basis of race, color, national origin or sex in the award and performance of contracts.

Project and Bid Identification
Complete the following information concerning the Project and Bid:

PROJECT NAME: ________________________________

LETTING NUMBER AND DATE: ____________________________

TOTAL BID: ________________________________
CONTRACT MBE/WBE GOAL: 25% MBE and 5% WBE Participation

DOLLAR AMOUNT OF PROPOSED MBE: $________________________

DOLLAR AMOUNT OF PROPOSED WBE: $________________________

Assurance

I, acting in my capacity as an officer of the undersigned bidder or bidders if a joint venture, hereby assure the Saint Louis Zoo that on this project my company will: (check one)

Meet or exceed contract award goals and will provide participation as follows:

________ Minority Business Participation _________ Percent

________ Women-Owned Business Participation _________ Percent

Fail to meet contract award goals but will demonstrate that good faith efforts were made to meet the goals and that my company will provide participation as follows:

________ Minority Business Participation _________ Percent

________ Women-Owned Business Participation _________ Percent

NAME OF COMPANY

__________________________________________

BY

__________________________________________ DATE: _______________________ TITLE

THE WILLFUL FALSIFICATION OF ANY OF THE ABOVE STATEMENTS MAY SUBJECT THE CONTRACTOR OR SUBCONTRACTOR TO CIVIL OR CRIMINAL PROSECUTION.
SECTION 23 6423 – PACKAGED AIR-COOLED CHILLER

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes packaged, air-cooled, electric-motor-driven, water chillers with the following features:

1. Compressor(s).
2. Air-cooled condenser.
4. Microprocessor-based controls.

1.2 SUBMITTALS

A. Product Data: Include refrigerant, rated capacities, operating characteristics, furnished specialties, and accessories. Include manufacturer’s computerized chiller selection data sheet, including as a minimum:

1. Performance at AHRI standard conditions and at conditions indicated.
2. Performance at AHRI standard unloading conditions.
3. Minimum evaporator flow rate and pressure drop.
4. Refrigerant capacity of water chiller.
5. Oil capacity of water chiller.
6. Fluid capacity of evaporator.
7. Characteristics of safety relief valves.
8. Minimum entering condenser-air temperature.
9. Evaporator entering and leaving water temperatures.
10. Evaporator fouling factor.
11. Evaporator number of passes.
12. Unit electrical voltage and frequency.
13. Unit amperage full load and locked rotor.
14. Unit maximum sound pressure in dBA.
15. Assembled weights (shipping, installed, and operating).
16. Performance at varying capacity with constant design entering condenser-air temperature.
   Repeat performance at varying capacity for different entering condenser-air temperatures from design to minimum in 10°F increments.
17. MSDS (Material Safety Data Sheet) for the Refrigerant.

B. Shop Drawings: Complete set of manufacturer’s prints of water chiller assemblies, control panels, sections and elevations, and unit isolation. Include the following:

1. Assembled unit dimensions.
2. Weight and load distribution.
3. Required clearances for maintenance and operation.
4. Size and location of piping and wiring connections.
5. Piping roughing-in requirements.
6. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
7. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.
C. Wiring Diagrams: Power, signal, and control wiring; clearly differentiate between factory-installed wiring and field-installed wiring.

D. Source quality-control test reports.

E. Startup service reports.

F. Operation and Maintenance Data for each chiller.

G. Warranties: Submit special warranties specified in this Section, signed by the manufacturer.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Firm experienced in manufacturing air-cooled packaged chillers similar to those indicated for this Project and that have a record of successful in-service performance.

1.4 REFERENCED STANDARDS


C. ASME Compliance: Comply with ASME *Boiler and Pressure Vessel Code*, Section VIII, “Pressure Vessels,” Division 1, “Basic Coverage” for constructing and testing cooler and condenser pressure vessels. Any pressure vessel whose refrigerant-side normal design operating pressure exceeds 15 psig shall include an ASME “U” stamp and nameplate certifying compliance as an unfired pressure vessel.

D. Comply with NFPA 70-2005 *National Electrical Code* pertaining to electrical power and control wiring.

E. Comply with UL 1995-95 (Rev. 98) *Heating and Cooling Equipment*.

F. UL Listing: Motor controller shall be listed by Underwriters Laboratories and classified as suitable for the installed use and environmental conditions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Protect chillers from damage by factory packing. Deliver chillers to the project site factory assembled in one piece, fully assembled and pre-wired, to the extent allowable by shipping limitations.

B. Ship water chillers from the factory fully charged with refrigerant and filled with oil.

C. Any damaged chiller will be rejected upon arrival.
1.6 COORDINATION

A. Coordinate size and location of concrete bases with actual equipment provided.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer’s Special Warranty: Written warranty, signed by manufacturer agreeing to repair or replace drive train, compressor, motor, and/or gear train assembly, including replacement of refrigerant; purge and all factory-installed purge system components; oil pump and lubrication system; factory-installed controls and unit control panel; and starter.

1. Warranty Period: Manufacturer’s standard, but not less than five years (5) after date of Substantial Completion. Warranty must include parts, labor, shipping and handling charges, and applicable taxes.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Lubrication Oil: Enough for one complete oil change per chiller.
2. Paint: One quart per chiller of matching finish paint for field touch-up and Owner’s future use.

PART 2 - PRODUCTS

2.1 PACKAGED AIR-COOLED WATER CHILLERS

A. Manufacturers: Subject to compliance with requirements, provide packaged air-cooled chillers by one of the following manufacturers:

1. Carrier Corporation, a United Technologies Company.
2. Daikin Applied Americas Inc.

B. Description: Factory-assembled and run-tested water chiller complete with base and frame, condenser casing, compressors, compressor motors and motor controllers, evaporator, condenser coils, condenser fans and motors, electrical power, controls, and accessories.

1. Either scroll compressors or rotary-screw compressors meeting these specifications will be acceptable at manufacturer’s option.
2. Reciprocating compressors are not acceptable.

C. Fabricate base, frame, and attachment to water chiller components strong enough to resist movement during a seismic event when water chiller base is anchored to field support structure.
D. Cabinet: Galvanized steel. Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 500-hour salt-spray test according to ASTM B117.

1. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
2. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.

E. Scroll Compressors: Positive-displacement direct-drive with hermetically sealed casing; each with suction and discharge service valves, crankcase oil heater, and suction strainer.

1. Operating Speed: Nominal 3600 rpm for 60-Hz applications.
2. Oil Lubrication System: Automatic pump with strainer, sight glass, filling connection, filter with magnetic plug, and initial oil charge.
3. Compressor Motors: Hermetically sealed and cooled by refrigerant suction gas; high-torque, two-pole induction type with inherent thermal-overload protection on each phase.

F. Rotary-Screw Compressors: Positive displacement, hermetically sealed, one- or two-rotor design, accessible for inspection and service. Casing shall be constructed of cast iron, precision machined for minimum clearance about periphery of rotors. Each compressor provided with suction and discharge shutoff valves, crankcase oil heater, and suction strainer.

1. Capacity Control: On-off compressor cycling and modulating slide-valve assembly or port unloaders combined with hot-gas bypass, if necessary, to achieve performance indicated. Maintain stable operation throughout range of operation.
2. Operating Range: From 100 to 15 percent of design capacity at constant-design entering condenser-air temperature and without hot gas bypass.
3. Oil Lubrication System: Consisting of pump if required, filtration, heater, cooler, factory-wired power connection, and controls; factory-installed and pressure-tested piping with isolation valves and accessories. Provide lubrication to bearings, gears, and other rotating surfaces at all operating, startup, shutdown, and standby conditions including power failure. Include thermostatically-controlled oil heater properly sized to remove refrigerant from oil. Oil shall be compatible with refrigerant and chiller components. Positive visual indication of oil level.
4. Vibration Control: Balance chiller compressors and drive assemblies to provide a precision balance that is free of noticeable vibration over the entire operating range. Over-speed test at 25 percent above design operating speed.
5. Compressor Motors: Hermetically sealed and cooled by refrigerant suction gas. High-torque, induction type motor with inherent thermal-overload protection on each phase.
6. Compressor Motor Controllers: Star-Delta, reduced-voltage, NEMA ICS 2, closed-transition; or solid state.

G. Refrigeration: R-134a, R-407C, or R-410A, classified as Safety Group A1 according to ASHRAE 34. Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures. Each circuit shall include a thermal-expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
H. Evaporator: Brazed-plate or shell-and-tube design at contractor’s option.
   1. Shell and Tube Evaporator: Direct-expansion, shell-and-tube design with fluid flowing through the shell and refrigerant flowing through the tubes within the shell. Shell shall be constructed of carbon steel, with removable carbon-steel heads and multi-pass baffles designed to ensure positive oil return and located at each end of the tube bundle. Tubes shall be individually replaceable, copper, with enhanced fin design, expanded into tube sheets.
   2. Brazed Plate Evaporator: Direct-expansion, single-pass, brazed-plate design of Type 316 stainless-steel construction. Include factory-installed and -wired electric heater with integral controls designed to protect the evaporator to -20°F.
   3. Nozzles: Fluid nozzles located along the side of the shell and terminated with mechanical-coupling end connections for connection to field piping.

I. Air-Cooled Condenser: Plate-fin coil with integral sub-cooling on each circuit, rated at 450 psig. Construct coils of copper tubes mechanically bonded to aluminum fins. Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.
   1. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades, arranged for vertical air discharge.
   2. Fan Motors: Totally enclosed non-ventilating (TENV) or totally enclosed air over (TEAO) enclosure, with permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.
   3. Fan Guards: Steel safety guards with corrosion-resistant coating.

J. Electrical Power: Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to water chiller. House in a unit-mounted, NEMA 250 Type 3R enclosure with hinged access door with lock and key or padlock and key.
   1. Wiring shall be numbered and color-coded to match wiring diagram. Install factory wiring outside of an enclosure in a raceway.
   2. Field power interface shall be to wire lugs.
   3. Provide branch power circuit to each motor and to controls with overcurrent protection and disconnecting means.
   4. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.
   6. Provide power factor correction capacitors to correct power factor to 0.95 at full load.
   7. Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity. Power unit-mounted controls where indicated.
   8. Convenience Receptacle: Unit-mounted ground fault interrupt (GFI) duplex receptacle, factory pre-wired.
K. Monitor and indicate the following for water chiller electrical power supply:

1. Current, phase to phase, for all three phases.
2. Voltage, phase to phase and phase to neutral for all three phases.
3. Three-phase real power (kilowatts).
4. Three-phase reactive power (kilovolt amperes reactive).
5. Power factor.
6. Running log of total power versus time (kilowatt hours).
7. Fault log, with time and date of each.

L. Controls: Stand-alone, microprocessor based. Share enclosure with electrical power devices or provide a separate enclosure of matching construction. Operator interface shall be via keypad or pressure-sensitive touch screen, with multiple-character, backlit, liquid-crystal display or light-emitting diodes. Display the following:

1. Date and time.
2. Operating or alarm status.
3. Operating hours.
4. Temperature and pressure of operating set points.
5. Entering and leaving temperatures of chilled water.
6. Refrigerant pressures in evaporator and condenser.
7. Saturation temperature in evaporator and condenser.
8. No cooling load condition.
9. Elapsed time meter (compressor run status).
10. Anti-recycling timer status.
13. Number of compressor starts.

M. Required Control Functions:

1. Manual or automatic startup and shutdown time schedule.
2. Entering and leaving chilled-water temperatures, control set points, and motor load limit. Chilled-water leaving temperature shall be reset based on instruction from EMCS.
3. Current limit and demand limit.
4. External water chiller emergency stop.
5. Anti-recycling timer.
6. Automatic lead-lag switching.

N. Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:

1. Low evaporator pressure or high condenser pressure.
2. Low chilled-water temperature.
3. Refrigerant high pressure.
4. High or low oil pressure.
5. High oil temperature.
7. Control device failure.
O. Interface with EMCS System for HVAC: Factory-installed hardware and software to enable existing EMCS system for HVAC to monitor, control, and display water chiller status and alarms via communication interface shall enable HVAC operator to remotely control and monitor the water chiller from an operator workstation. Control features and monitoring points displayed locally at water chiller control panel shall be available through EMCS system for HVAC.

P. Insulation: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C534, Type I, for tubular materials and Type II, for sheet materials.
   1. Thickness: 1½-inches applied in two layers with staggered joints.
   2. Factory-applied insulation over cold surfaces of water chiller components.
   3. Adhesive: As recommended by insulation manufacturer and applied to 100 percent of insulation contact surface. Seal seams and joints.
   4. Apply protective coating to exposed surfaces of insulation.

Q. Required Accessories:
   1. Factory-furnished, chilled-water flow switches for field installation.
   2. Individual compressor suction and discharge pressure gages with shutoff valves for each refrigeration circuit.
   3. Factory-installed neoprene vibration isolators for resilient mounting of compressors and condenser fans to unit frame.
   4. Chiller Enclosure: Furnish and ship loose for field installation, manufacturer’s heavy-gage wire-mesh screen, grille, or louvered skirt to protect machine from entry by unauthorized personnel. Such screen or skirt shall mount directly to the machine and completely enclose or protect all exposed parts, including but not limited to fans, compressors, piping, controls, and accessories; but shall be removable for service access.

R. Capacities and Characteristics: As Scheduled on the Drawings.

2.2 WATERSIDE ECONOMIZER (ADDITIVE ALTERNATE)

A. General: The unit shall be factory-equipped with an integrated waterside economizer package, factory-installed, pre-piped, and pre-wired. The chilled water return to the chiller shall have a 3-way diverting valve that can divert the return water to the economizer coils. Unit shall produce partial cooling when the ambient temperature is lower than the building return water temperature. The water from the economizer coils shall return back to the system return line downstream of the 3-way valve and upstream from the evaporator so additional cooling by the refrigeration system can be achieved if needed. The flow switch on the discharge of the evaporator shall be factory wired into the chiller controls as a safety interlock.

B. Economizer coils: Copper headers with vents and drains; and copper solder end connections.
   1. Casing: Same as cabinet casing.
   2. Tubes: Copper complying with ASTM B75, ½-inch O.D. with 0.016-inch minimum wall; or 5/8-inch O.D. with 0.020-inch minimum wall.
   3. Fins: Aluminum of minimum thickness 0.006-inch. Spacing shall not exceed 12 per inch.
   4. Fin and Tube Joint: Mechanical bond created via thermal expansion.
   5. Fans: Economizer coil shall share same cooling airstream and fans as refrigeration condenser coil.
6. Location: Economizer coil shall be in series with, but sufficiently distant from, refrigeration condenser coil so as to allow access for cleaning of both coils; or alternatively, economizer coil shall be contiguous with refrigeration condenser coil, sharing same set of aluminum fins. Economizer coil shall be placed first in the order seen by the airflow, before the refrigeration condenser coil.

C. The following control monitoring points shall be factory-installed and prewired.

1. Building Return Water Temperature.
2. Economizer Leaving Water Temperature.
3. Evaporator Leaving Water Temperature.
5. Flow status through economizer coils.

D. Mode of Operation:

1. Outdoor temperature above return chilled water temperature: Diverting valve shall bypass economizer, and unit shall function in vapor-compression refrigeration cooling mode.
2. Outdoor temperature below return chilled water temperature: Diverting valve shall open to allow water to pass through the economizer coils first, and then the evaporator for additional vapor-compression refrigeration cooling if necessary to meet setpoint.
3. See Drawings for detailed Sequence of Operation.

E. Safety Cycle: All standard unit safety circuits are in effect. Any time flow is not proven, the economizer will not be allowed to operate. Any fan or circuit running status indicators have precedent over economizer operation.

2.3 SOURCE QUALITY CONTROL

A. Perform functional test of water chillers before shipping.

B. Factory test and inspect evaporator according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.

C. For water chillers located outdoors, rate sound power level according to AHRI 370 procedure.

PART 3 - EXECUTION

3.1 SELECTIVE DEMOLITION

A. Disconnect, demolish, and remove existing air-cooled chiller, and as required for installation of new work shown. Disconnect power to electrically-powered equipment prior to demolition.

B. Remove chiller in its entirety. Haul all demolished material from the Project site. Handle and dispose of in accordance with National, State, and Local regulations.

C. Prior to demolition, refrigerant shall be evacuated and captured in full compliance with the Clean Air Act; using only technicians with the proper refrigerant license as according to law, stored in approved containers, and shipped to a licensed refrigerant recycling facility all as required by the United States Environmental Protection Agency.
D. Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

E. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

F. Repair cut surfaces to match adjacent installations.

G. Repair any pipe insulation, whether new or existing, that are removed or scraped away in order to make a mechanical installation, so as to maintain an equivalent insulation as existed without said mechanical installation.

3.2 EXAMINATION

A. Before water chiller installation, examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting water chiller performance, maintenance, and operations. Final chiller locations indicated on Drawings are approximate, unless dimensioned. Determine exact locations before roughing-in for piping and electrical connections.

B. Locate chiller in general position indicated in relation to other work. Position chiller with sufficient clearance for normal service and maintenance, including clearance for cleaning and replacement of tubes, and clearance for motor replacement.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 AIR-COOLED CHILLER INSTALLATION

A. Except as otherwise indicated, install chiller work including components and controls required for chiller operation in accordance with chiller manufacturer’s instructions, and with recognized industry practices, to ensure that chiller equipment complies with requirements and serves intended purposes.

B. Install and anchor chillers plumb and level.

C. Install chillers on existing concrete base. Anchor chiller mounting frame to concrete base. Place and secure anchorage devices. Install anchor bolts to elevations required for proper attachment to supported equipment. Coordinate size and orientation of chiller pad with actual dimensions of chiller furnished; concrete pad shall be 4-inches larger than chiller base on all sides.

D. Vibration Isolation: Rubber pads with a minimum deflection of 0.10 inch.

E. Maintain manufacturer’s recommended clearances for service and maintenance.

F. Charge chiller with refrigerant, if not factory charged, in the quantity recommended by chiller manufacturer. Pressure-test chiller refrigerant system for leakage in manner recommended by manufacturer. Bleed-out non-condensable gases charged with refrigerant.

G. Fill unit with oil as directed by manufacturer, if not factory installed.

H. Install separate devices and auxiliary piping furnished by manufacturer but shipped loose.
3.4 FIELD CONNECTIONS

A. Use flanged or grooved connections at chillers and re-connect existing chilled water piping supply and return to new chiller. Install to allow service and maintenance.

B. Evaporator Connections: Connect inlet and outlet to evaporator with existing piping. Installing contractor shall shut off isolation valves and disconnect existing chilled water piping from existing chiller to be demolished, and re-connect existing chilled water piping to new chiller, as required for a fully-functioning machine.

1. Recognizing that new chiller’s piping connections might not match exactly with existing in size, location, or orientation, the installing contractor shall be responsible for furnishing and installing additional piping and fittings as necessary to make final connections in a complete, functioning, and workmanlike manner; all as part of Base Bid.

2. Steel Pipe: ASTM A53, black steel with plain ends; Type E (electric-resistance welded), Grade B, Schedule 40.

3. Wrought-Steel Fittings: ASTM A234, wall thickness to match adjoining pipe. All elbows shall be long-radius type.

4. Grooved Mechanical-Joint Fittings: ASTM A536, Grade 65-45-12 ductile iron; ASTM A47, Grade 32510 malleable iron; ASTM A53, Type F, E, or S, Grade B fabricated steel; or ASTM A106, Grade B steel fittings with grooves or shoulders constructed to accept grooved-end couplings; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings. All elbows shall be long-radius type.

5. Grooved Mechanical-Joint Couplings: Ductile- or malleable-iron housing and gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings. Gasket shall be Grade “E” EPDM compound, rated for water use at not less than 230°F; UL Classified according to ANSI/NSF 61.

6. Pipe Insulation: 2-inch ASTM C534, Type I flexible elastomeric with ASTM B209 stucco embossed aluminum jacket, 0.024-inch thick.

C. Connect each drain connection with a ball valve, hose-end thread connection, and threaded screw-on pipe cap, full size of connection.

D. Field-pipe the refrigerant pressure relief device outlet to discharge to the atmosphere at a location not less than 15 feet above the adjoining ground level and not less than 20 feet from any window, ventilation opening, or exit in any building. Use ASTM B88 Type L drawn-temper copper piping, unless another material is required by the manufacturer’s installation manual; sized to match or exceed outlet size of pressure relief device.

E. Installing contractor shall disconnect existing power wiring from existing chiller to be demolished, and re-connect existing power wiring to new chiller, as required and in accordance with NFPA 70 National Electrical Code.

1. Install controls and control wiring as required, in accordance with manufacturer’s written instructions.

2. Install and interlock flow switches with chiller controls in accordance with manufacturer’s instructions.

3. Connect wiring and ground equipment.

4. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A and UL 486B.
F. Installing contractor shall disconnect existing temperature controls from existing chiller and connect new chiller to the Saint Louis Zoo’s Siemens DDC energy management and control system.

3.5 CLEANING AND TOUCH-UP

A. Clean units using materials and methods recommended by manufacturer.

B. Clean finishes to remove dust and dirt. Touch up scratches on unfinished surfaces to restore corrosion resistance. Touch up scratches on finished surfaces to restore finish.

C. Repair or reinsulate any factory-insulated surfaces that were damaged during shipping, handling, or installation.

3.6 MANUFACTURER’S FIELD STARTUP SERVICES

A. Startup Services: Provide factory-trained service representative, in the employ of the chiller manufacturer, to start chillers and to demonstrate and train Owner’s maintenance personnel as specified below:

1. Test and adjust chiller controls and safeties. Lubricate rotating parts. Verify that motor amperage conforms to manufacturer’s data.
2. Verify proper motor rotation.
3. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.
4. Include leak testing and refrigerant charging in scope of supervision by manufacturer’s representative.
5. Include lubrication, including filling of reservoirs, and confirming that lubricant is of quantity and type recommended by manufacturer, in scope of supervision by manufacturer’s representative.

B. Complete installation and startup checks according to manufacturer’s written instructions and check for the following items:

1. No physical damage to unit.
2. Unit is level.
3. Chiller vibration isolation and flexible pipe connections are installed.
4. Service clearances have been maintained.
5. Chilled-water pipes have been connected to correct ports.
6. Labels and safety instructions are clearly visible.
7. Oil levels are as recommended by manufacturer.
8. Shipping skids, blocks, and straps are removed.
9. Refrigerant pressure relief is vented as specified herein.
10. Thermometers and pressure gages are installed.
11. Controls and safety interlocks are installed and connected.
12. Pumps are installed, connected, and operational.

C. Start chiller and verify performance. Demonstrate operation to Owner. Operate chiller for run-in period as recommended by manufacturer. After suitable run-in period, check the following:

1. Check and record performance of chiller protection devices.
2. Check and record performance of chilled-water flow and low-temperature interlocks.
3. Check static deflection of vibration isolators, including deflection during chiller startup and shutdown.
4. Check refrigerant charge.
5. Check bearing lubrication and oil levels.
7. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

D. Prepare a written startup report that records results of tests and inspections.

3.7 COMPLETION AND CLOSEOUT

A. Manufacturer’s Training Service: Train Owner’s maintenance personnel on procedures and schedules for startup, shutdown, troubleshooting, servicing, and preventive maintenance. Provide a minimum of 8 hours of actual training time, excluding startup service, divided into classroom-style and hands-on style instruction as appropriate.

1. Review data in operating and maintenance manuals.
2. Schedule training with the Owner through the Architect with at least 7 days’ notice.
3. Digitally-record the training sessions.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

C. Do not place chiller in sustained operation prior to initial balancing of mechanical systems affected by chiller operation.

D. Cooperate with other trades and installers of other work during testing, adjusting, balancing and start-up of mechanical systems.

PART 4 - EQUIPMENT SCHEDULES

4.1 AIR-COOLED CHILLER SCHEDULE

A. Capacity: 132 tons minimum.

B. Low Ambient Operation (Base Bid): Chiller designed for operation to 0°F.

C. Low Ambient Operation (Alternate Bid #1): Chiller designed for compressor-free cold-weather economizer operation as further specified in this Section.

D. Evaporator:

1. Fluid Type: 25% propylene glycol.
2. Design Fluid Flow Rate: 508 gpm.
3. Entering-Fluid Temperature: 40°F.
4. Leaving-Fluid Temperature: 33°F.
5. Fluid Pressure Drop: 25 feet head maximum.
6. Fouling Factor: 0.0001 sf*h°F/Btu.
E. Condenser Entering-Air Temperature: 95°F.

F. Number of Refrigeration Circuits: Not fewer than two.


H. Chiller Power Input: Not more than 196 kilowatts full-load, all-inclusive, single-point.

I. Overcurrent Protection Device: 450 Amperes existing. If new chiller furnished has a published maximum allowable overcurrent protection rating less than this, installing contractor shall replace the existing overcurrent protective device with new devices matching the furnished maximum allowable overcurrent protection rating, as part of base bid.


K. Physical Size: Maximum width 110-inches; maximum length 242-inches. Equipment larger than this will not fit on the existing concrete foundation.
Location Detail

Chiller 20.1 shall be replaced under this project / Chiller 20.2 is existing to remain undisturbed.

END OF SECTION 23 6423