Title of Bid: Justice Center Chiller Replacement

Dept.: Construction Management
Contact Person: Brian Cox
Ext.: 1890

Bid #: 21-023

Description (product/service, justification and use):

St. Charles County is seeking approval for needed improvements to the Criminal Justice Center cooling tower, chiller and circulation pump. The Criminal Justice Center has two chillers, one is 12 years old and the other is original to the building. This original chiller is over 32 years old and has a typical lifespan of 20 years. If the original cooling tower were to fail during warmer climates, this could make the temperatures rise to a point of making the living and working conditions unsafe. This bid replaces the original equipment to properly support this building.

Additionally, the Criminal Justice Center was not designed to have year-round cooling. This requires the maintenance department to winterize the cooling tower to prevent freezing. Once the cooling tower is winterized the system can not cool, which creates potentially hot conditions on warmer winter and spring days after the cooling tower has been shutdown. This new cooling tower is designed to run year-round so the building can maintain proper temperatures.

The installation of the new circulation pumps and controls will allow the system to operate more efficiently and could qualify for energy rebates from Ameren UE. These rebates will be applied for by the County as part of the this effort, but are not included in this total cost.

This project cost is under the approved budget $917,000.00 and included in the approved 2021 Construction Management budget.

Award to: Nooter Construction Company
Location: St. Louis

Price: $735,082.00
Contract term (if applicable):

Bid opening held on: 1/8/21
Opened by: Pam Luesse

Account number to be charged for purchase: 47260

If bid was not awarded to lowest bidder, please explain:

If paying for with grant funds, please indicate (1) grant name, (2) total grant amount, (3) what portion of purchase is being paid for by a grant, and (4) when grant period ends as applicable:
FORMAL BID – REQUEST FOR APPROVAL

Bid #: 21-023

Additional Bids Received

The following additional bids were received:

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Location</th>
<th>Price</th>
<th>Meets all specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Facility Service, Inc</td>
<td>Fenton</td>
<td>$773,502.00</td>
<td>Yes</td>
</tr>
<tr>
<td>Icon Mechanical</td>
<td>Granite City, IL</td>
<td>$791,058.45</td>
<td>Yes</td>
</tr>
<tr>
<td>Murphy Company</td>
<td>St. Louis</td>
<td>$839,876.00</td>
<td>No</td>
</tr>
<tr>
<td>Pipe and Duct System</td>
<td>Fenton</td>
<td>$851,188.00</td>
<td>Yes</td>
</tr>
</tbody>
</table>

For each vendor that doesn’t meet specifications, please explain why:

Vendor: 

Vendor: 

☐ Sole source justification memos from (1) dept. and (2) vendor attached.

Department Director/Elected Official must sign the request prior to routing to the Purchasing Manager.

[Signature]
Department Director/Elected Official Signature

1/29/2021
Date

[Signature]
Approval or Concurrence of Director of Finance

2/9/21
Date

BELOW ONLY TO BE COMPLETED FOR BIDS AT LEAST $15,000 AND LESS THAN $60,000. See instructions at the top of pg. 1.

Director of Administration Signature

Date
<table>
<thead>
<tr>
<th>Responder</th>
<th>Base Bid</th>
<th>Alternative 1</th>
<th>Alternative 2</th>
<th>Bond</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>Nooter Construction Company</td>
<td>$437,234.00</td>
<td>$183,899.00</td>
<td>$105,310.00</td>
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<td>Integrated Facility Service, Inc</td>
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<td>Icon Mechanical</td>
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<td>$133,811.00</td>
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<td>Murphy Company</td>
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<td>$166,045.00</td>
<td>$133,289.00</td>
<td>$7,100.00</td>
<td>$839,876.00</td>
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<tr>
<td>Pipe and Duct Systems</td>
<td>$530,000.00</td>
<td>$206,149.00</td>
<td>$102,439.00</td>
<td>$12,600.00</td>
<td>$851,188.00</td>
</tr>
</tbody>
</table>
CONTRACTOR'S AGREEMENT FOR
21-023 PROJECT

This agreement made as of the 25 day of January in the year 2021

Between the Owner: St. Charles County
                      201 North Second Street
                      St. Charles, MO 63301
                      636-949-7900

And the Contractor: Nooter Construction Company
                      Dan Stokes
                      1500 S. Second St
                      St. Louis, Mo
                      314-421-7745

Now therefore, CONTRACTOR and COUNTY, in consideration of mutual covenant herein set forth, agree as follows:

ARTICLE 1. CONTRACT PRICE

COUNTY shall pay CONTRACTOR in current funds, for completion of the Work designated in Article 2 in accordance with the Contract Documents, an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work multiplied by the quantity of that item as indicated in CONTRACTOR'S Bid, for the total amount of Seven Hundred Thirty-Five Thousand, Eighty-Two Dollars and Zero Cents ($735,082.00).

ARTICLE 2. SCOPE OF THE WORK

The scope of the work is described in the Bid Specifications and Contract Documents, including without limitation the Bid Form, which are incorporated herein by this reference.

ARTICLE 3. TIME OF COMPLETION

CONTRACTOR shall commence operations upon receiving the written Notice to Proceed from COUNTY and at such time to complete the contract work within the time indicated below. Project completion shall be defined as 100% completion of all items of the project including correction of deficiencies. The project shall be fully complete within Two Hundred and Ten (210) days of COUNTY'S Notice to Proceed.

The time of completion is an essential condition of this Contract.

ARTICLE 4. PAY QUANTITIES AND UNIT PRICES

COUNTY shall pay the CONTRACTOR for all work done on the basis of the pricing set forth in the Bid Form for all work acceptably completed in accordance with the Contract Documents.

DJS Initial
ARTICLE 5. PROGRESS PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment monthly according to the "General Requirements" section entitled "Progress Payments". Applications for Payment will be processed by COUNTY. COUNTY shall make progress payments on account of the Contract Price on the basis of CONTRACTOR'S Applications for Payment as approved by the COUNTY. All progress payments will be on the basis of the progress of the Work measured by the schedule of values, and in the case of Unit Price Work based on the number of units completed. No progress payments will be made if the CONTRACTOR does not have a current progress schedule accepted by the COUNTY and/or CONTRACTOR has not provided or COUNTY has not approved any required Conditional Waiver and Release on Progress Payment.

ARTICLE 6. FINAL PAYMENT AND ACCEPTANCE

When all work provided for under this contract has been completed in conformance with the Bid Specifications and Contract Documents, and accepted without regard to the provisions of guarantee as provided under the terms of this contract, a final cost estimate shall be prepared by CONTRACTOR and approved by COUNTY and with COUNTY and with CONTRACTOR within fifteen (15) days after the date of acceptance of the work as a statement of the amount due the CONTRACTOR. This estimate shall be based on appropriate unit quantities of material placed, including any charges for extra work ordered and properly chargeable under this contract, and deducting any sum properly deductible under this contract.

ARTICLE 7. THE CONTRACT DOCUMENTS

Up to four (4) full sets of drawings and two (2) full sets of Contract Documents will be provided to CONTRACTOR by COUNTY at no cost to CONTRACTOR. CONTRACTOR may purchase additional sets at the printing cost plus ten percent (10%) for handling.

The Contract Documents which comprise the entire agreement between COUNTY and CONTRACTOR concerning the work consist of the following:

a. This Agreement.
b. Exhibits to this Agreement, including the General Requirements.
c. Performance and Payment Bonds.
d. Notice of Award.
e. Notice to Proceed.
f. COUNTY's Request for Bid No. 21-023 and Specifications for the project including the drawings set forth therein.
g. CONTRACTOR's Proposal Response in response to Request for Bid No. 21-023 and Bid Form.
h. All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents, which may be delivered or issued after the Effective Date of the Agreement, and are not attached hereto.

There are no Contract Documents other than those listed in this Article. The Contract Documents may be amended, modified, or supplemented only in one or more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by a Field Order, or COUNTY'S written interpretation.

DJS Initial
or clarification. In the event of a conflict between this Agreement and the other Contract Documents, this Agreement shall control.

ARTICLE 8. RATES OF PAY

CONTRACTOR hereby agrees that the prevailing rates of pay shall be paid to skilled and unskilled labor employed under the terms of this contract. The CONTRACTOR shall forfeit to COUNTY one hundred dollars ($100) for each workman employed, for each calendar day, or portion thereof, such workman is paid less than the said stipulation rates for any work done under said contract, by him or by any subcontractor under him.
ARTICLE 9. PERFORMANCE OF THE WORK

CONTRACTOR, acting as an independent contractor, shall furnish all supervision, labor, equipment, tools, materials, and supplies necessary to perform and shall perform all work in accordance with the Contract Documents and any applicable County ordinances, and state and federal laws. CONTRACTOR represents and warrants that he has special skills which qualify him to perform the Work in accordance with the Contract and that he is free to perform all such work and is not a party to any other agreement, written or oral, the performance of which would prevent or interfere with the performance, in whole or in part, of the work. The prime CONTRACTOR must perform, with its own organization, contract work amounting to not less than 40% of the total original contract.

ARTICLE 10. SUPERVISION

CONTRACTOR shall supervise and direct the work, using CONTRACTOR’s best skill and attention. CONTRACTOR shall be solely responsible for and have control over means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the Contract, unless Contract Documents give other specific instructions concerning those matters.

ARTICLE 11. SAFETY

COUNTY and any consulting engineer hired by the COUNTY may have personnel on the project site from time to time. All information and/or instructions shall be requested in writing by CONTRACTOR and responded to in writing. No opinion or instructions will be given to CONTRACTOR on safety.

CONTRACTOR shall be solely responsible for the safety on and around the project site including shoring, ladders, drop cords, scaffolding, barricades, means, methods, techniques, sequences and procedures.

CONTRACTOR shall comply with all requirements of Section 292.675 RSMo., as amended, which is incorporated herein by this reference. Said statute relates to the OSHA Construction Safety Program. COUNTY hereby notifies CONTRACTOR that the penalties for failure to comply with the training and all other requirements set forth in said statute include the forfeiture of penalties to COUNTY of two thousand five hundred dollars ($2,500.00) plus one hundred dollars ($100.00) for each employee employed by CONTRACTOR or a subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 12. INDEMNITY

To the fullest extent permitted by law, CONTRACTOR shall indemnify and hold harmless COUNTY, any consulting engineer hired by the COUNTY, their consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property other than the work itself, including loss of use resulting there from, but only to the extent caused in whole or in part by negligent acts or omissions of CONTRACTOR, a subcontractor, or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not...
such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity, which would otherwise exist as to a party or person described in this Article.

In claims against any person or entity indemnified under the above paragraph by an employee of the CONTRACTOR, a subcontractor, or anyone directly or indirectly employed by them or anyone whose acts they may be liable, the indemnification obligation under this paragraph shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the CONTRACTOR or a subcontractor under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

The obligations of CONTRACTOR under this Article shall not extend to the liability of COUNTY, the COUNTY'S consultants, and agents and employees of any of them arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders, designs or specifications, or (2) the giving of or the failure to give directions, after requested in writing by the CONTRACTOR, or instructions by COUNTY, COUNTY'S consultants, and agents and employees of any of them provided such instructions or failure to give is the primary cause of the injury or damage.

ARTICLE 13. TERMINATION BY COUNTY OR CONTRACTOR

(a) If CONTRACTOR is adjudged to be bankrupt, or if CONTRACTOR makes a general assignment for the benefit of creditors, or if a receiver is appointed on account of CONTRACTOR's insolvency, or if CONTRACTOR fails, except in cases for which extension of time is provided, to make progress in accordance with the project schedule, or if CONTRACTOR fails to make prompt payment to subcontractors or prompt payment for material or labor, or disregards laws, ordinances or the instructions of COUNTY, or otherwise breaches any provision of the Contract Documents, COUNTY may, without prejudice to any other right or remedy, terminate the contract by giving written notice to CONTRACTOR and his surety. Upon such notification COUNTY shall be entitled to take possession of the work and of all materials and equipment thereon and finish the work by whatever method COUNTY may deem expedient, which may include, but is not limited to, COUNTY itself completing the work or COUNTY hiring others to complete said work. In such case, CONTRACTOR shall not be entitled to receive any further payment until the work is finished. If the unpaid balance of the Contract Price shall exceed the expenses of finishing the work, including additional engineering, architectural, managerial and administrative expenses, such excess shall be paid to CONTRACTOR. If such expenses and damages exceed the unpaid balance of the Contract Price, CONTRACTOR shall pay the difference to COUNTY promptly upon demand. In the event of termination pursuant to this paragraph, CONTRACTOR, upon the request of COUNTY, shall promptly:
   i. assign to the COUNTY in the manner and to the extent directed by COUNTY all right, title and interest of the CONTRACTOR under any subcontracts, purchase orders and construction equipment leases to which CONTRACTOR is a party and which relate to the work or to construction equipment required therefore, and
   ii. make available to COUNTY to the extent directed by COUNTY all construction equipment owned by CONTRACTOR and employed in connection with the work.

(b) Performance of the work hereunder may be terminated by COUNTY by giving three (3) days prior written notice to CONTRACTOR if COUNTY, in its sole discretion, decides to discontinue or suspend the work. In the event of such termination, as opposed to termination pursuant to

_DJS_ Initial
paragraph (a) of this Article 13, the Contract Price shall be reduced in an equitable manner by agreement between the parties.

ARTICLE 14. AUDIT CLAUSE

Examination of Records

CONTRACTOR’s records which shall include, but not be limited to, accounting records (hard copy, as well as computer readable data), written policies and procedures, subcontractor files, indirect cost records, overhead allocation records, correspondence, instructions, drawings, receipts, vouchers, memoranda, and any other data relating to this contract shall be open to inspection and subject to audit and/or reproduction by the County Auditor, or a duly authorized representative from the COUNTY, at the COUNTY’s expense. The CONTRACTOR shall preserve all such records for a period of three years, unless permission to destroy them is granted by the COUNTY, or for such longer period as may be required by law, after the final payment. Since the CONTRACTOR is not subject to the Missouri Sunshine Law (Chapter 610, RSMo), information regarding CONTRACTOR’s operations obtained during audits will be kept confidential. CONTRACTOR shall require all subcontractors under this contract to comply with the provisions of this Article by including the requirements herein in written contracts with said subcontractors.

ARTICLE 15. CHOICE OF LAW; VENUE.

The Contract Documents shall be governed by and construed in accordance with the laws of the State of Missouri. Venue for any legal action in connection with the Contract Documents shall lie in the Circuit Court of St. Charles County, Missouri.
IN WITNESS WHEREOF the parties hereto have caused this instrument to be executed in four (4) original counterparts as of the day and year last written below.

CONTRACTOR

By: [Signature] Date: 01/26/2021

Name (printed): Dan Stokes

Title: Group Manager

NOTARY:

Subscribed and sworn to before me this 5 day of February, 2021. I am commissioned as a notary public within the County of St. Louis, State of Missouri, and my commission expires on Nov 19, 2021.

[Signature of Notary] Date Feb 5, 2021

Notary seal:

DJS Initial
ST. CHARLES COUNTY, MISSOURI

By: ___________________________ Date: ______________
    Steve Ehlmann, County Executive

ATTESTED BY:

______________________________
County Registrar

CERTIFICATE OF FINANCE DIRECTOR

I certify pursuant to § 50.660 RSMo., as amended, that there is a balance otherwise
unencumbered to the credit of the appropriation to which this contract is chargeable, and a cash
balance otherwise unencumbered in the treasury to the credit of the fund from which payment is
to be made, each sufficient to meet this obligation.

__________________________________
Bob Schnur, Finance Director

DJS Initial
GENERAL REQUIREMENTS

1. SUMMARY OF WORK

The work to be performed under this Contract is summarized as follows: Remove and replace chiller, Alternative 1 replace cooling tower and Alternative 2 replace circulation pumps.

The complete scope of work is as set forth in Article 2 of the Agreement. Exceptions and clarifications in regards to this scope are attached herein as Attachment 1.

2. GENERAL

COUNTY reserves the right to add or reduce any quantity of all contract bid items at the contract unit price for that item.

3. DRAWINGS

Drawings are included in the Bid Specifications. These drawings and specifications are intended to be so coordinated that any work included in one and not in the other, shall be executed as if included in both.

All work contemplated and described in the Bid Specifications shall be carried out in accordance with the general and detail drawings made a part thereof and with such additional detail drawings and directions as may be given from time to time during the progress of the work. On all drawings, computed dimensions shall take precedence over measurements by scale and full-sized details over scale drawings.

CONTRACTOR shall maintain a record set of drawings at the site and mark thereon any changes as the work proceeds. These drawings shall indicate the vertical and horizontal location of improvements in plan and profile view.

Upon completion of the work, these “as-built” changes shall be transferred, with changes clearly identified, onto blueprint drawings which will be furnished to COUNTY. These “as-built” drawings, certified by a Land Surveyor or Engineer registered in the State of Missouri, shall be delivered to COUNTY for its review and approval prior to final payment.

4. INSURANCE

CONTRACTOR shall maintain all required insurance and provide required certificates in accordance with the insurance requirements listed in the Request for Bid and/or Bid Specifications.

5. PERFORMANCE BOND

A bond will be required for the full amount of the contract price with a surety company, conditioned for the faithful performance of this contract and the guarantee of the work. Both Contract and bond shall be executed in quadruplicate and in a form acceptable to COUNTY. The cost of the performance bond shall be incidental to the price bid.

DJS Initial
6. PAYMENT AND MATERIALS BOND

A bond will be required for the full amount (100 percent Labor and Material) of the Contract Price with a surety company. The bond shall be executed in quadruplicate and in a form acceptable to COUNTY. The cost of the payment and materials bond shall be incidental to the price bid.

7. REFERENCE STANDARDS

Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard, specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of COUNTY, CONTRACTOR, or Engineer, or any of their consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Engineer, or any of Engineer's Consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the work.

8. LIQUIDATED DAMAGES

Liquidated Damages of $1,000.00 dollars per day for late delivery of project will be enforced after date established by contract, as adjusted by change orders.

9. COORDINATION WITH OTHER CONTRACTORS

There is a possibility that other contractors may be working in the vicinity during the performance of this contract. CONTRACTOR shall inform himself fully of the conditions relating to performance and labor under which the work will be or is now being performed, and CONTRACTOR must employ as far as possible such methods and means in carrying out his work as will not cause any interruptions or interference to any other contractor. When necessary for proper prosecution of work, each contractor shall permit the other access through the overlapping construction areas and the use of any access or haul roads constructed by others.

10. SHOP DRAWINGS

In all cases where details or shop drawings are required, CONTRACTOR shall submit copies of such drawings to COUNTY for review before any of the work is begun. Should extensive changes be necessary, corrected drawings shall be submitted for final review. CONTRACTOR shall thoroughly review the shop drawings for compliance with the Contract Documents before submitting them to COUNTY. The shop drawings shall be stamped "reviewed" by CONTRACTOR before submitting them to COUNTY. When it is required to submit material or equipment, shop drawings, manufacturer's brochures, or samples for review, said submittals are to be made to COUNTY through the general CONTRACTOR.

Each item submitted for approval must be identified by reference to specification paragraph number and/or plan drawing number.

DJS Initial
If the item described or submitted is not exactly as specified by the plans and/or specifications, the procedure shall be as follows:

With the submittal, CONTRACTOR shall state in writing that the item is not exactly as specified by the plans and/or specifications and shall state the difference. COUNTY will then evaluate the submittal and will transmit the accepted or rejected submittal to CONTRACTOR.

When substitutions for the specified items are approved, the submitting CONTRACTOR will be responsible for all costs incurred due to the changes from plans and/or specifications. This includes additional design costs, material and equipment costs and any appurtenant cost that may be incurred by other trades.

COUNTY and/or any consulting engineer hired by COUNTY will not be responsible for errors in the shop drawings which their examination and scrutiny many have failed to detect, and CONTRACTOR shall be absolutely responsible for the correctness of the drawings furnished by it or its subcontractors.

11. RIGHTS-OF-WAY

All improvements will be performed within land owned by COUNTY and the public right-of-way shown on the plans.

Upon completion of the contract work, CONTRACTOR shall restore, without additional cost to COUNTY, all improvements within the vicinity of the Animal Control Facility and right-of-way to substantially the same conditions as they were at the commencement of the work, unless otherwise noted. At project closeout, COUNTY will ensure the conditions of areas located outside of the construction area and existing right-of-way were not damaged, and if damaged were repaired to the same as at the commencement of the work. Non-approval can result in the withholding of final payment.

All costs resulting from the maintenance or improvement of areas outside the construction limits depicted on the plans – such as incidental grading, and the repair of improvements damaged by CONTRACTOR – shall be borne by CONTRACTOR.

12. INSPECTIONS

CONTRACTOR shall assure that representatives of COUNTY shall have the privilege of inspecting and reviewing work done by CONTRACTOR or his subcontractors on this project.

CONTRACTOR shall also assure that all of his subcontractors, if any, maintain all books, documents, papers and other evidence pertaining to cost incurred in connection with the Contract and make such materials available at such CONTRACTOR’s office at all reasonable times during the contract period.

_DJS_ Initial
13. LABOR POSTINGS

All information as required by state and/or federal wage/labor laws shall be posted by CONTRACTOR on the job site.

14. CONFLICT WITH PERSONNEL

If a conflict between personnel of CONTRACTOR and COUNTY escalates to the point that it hinders the progress of the work and cannot be settled amicably, CONTRACTOR's personnel involved in the conflict shall be removed from the project.

A personnel conflict shall not give cause for CONTRACTOR to terminate this contract nor to pull off employees from active job sites. If CONTRACTOR withdraws crews, COUNTY may, in its sole discretion, consider the contract to be terminated under the provisions of Article 13 of the Agreement. If COUNTY so determines, notices shall be given as set forth therein.

15. EROSION-CONTROL MEASURES

CONTRACTOR will provide as a part of the construction plans an Erosion Control Plan, providing for adequate erosion control and sediment features in accordance with any local, state and federal regulations, including without limitation the St. Charles County Erosion Control and Sediment Guidelines. CONTRACTOR shall submit the proposed Erosion Control Plan to COUNTY for approval prior to the start of construction. CONTRACTOR shall be responsible for maintaining compliance with the Erosion Control Plan until the project is acceptably completed.

16. PROGRESS SCHEDULE

CONTRACTOR shall, prior to or at the preconstruction meeting, prepare and submit to COUNTY for approval a detailed schedule of all operations showing the following:

1. The anticipated time of commencing and completion of various operations to be performed under this contract.
2. The estimated time required for fabrication and/or delivery of all materials and equipment required for the work.
3. Utilities relocations by others and how it affects CONTRACTOR schedules.

COUNTY may require CONTRACTOR to adjust his plan, equipment or construction forces, if progress falls behind the approved schedule such that completion within the specified time appears doubtful.

CONTRACTOR must update the progress schedule and resubmit to COUNTY for acceptance anytime work falls behind the current accepted schedule.

17. PROGRESS REPORTS

CONTRACTOR shall submit progress reports on a monthly basis beginning the first Friday after award of the project and continuing through closeout of the project. The reports shall briefly describe work accomplished during the time period and projected work for the next time period. They shall indicate the project number, and the days CONTRACTOR was unable to work due to

_DJS__ Initial
conditions beyond his control (list specific reason, i.e. rain, cold, etc.). They shall be in a neat, legible form and submitted to the COUNTY (four copies).

18. PROGRESS PAYMENTS

CONTRACTOR shall submit original signed monthly pay requests to COUNTY by the tenth of the month. Such pay requests shall include for approval by COUNTY a 'Conditional Waiver and Release on Progress Payment' to waive and release any lien, stop payment notice, and/or payment bond rights which any supplier or subcontractor of CONTRACTOR may have for labor or services provided or material delivered to CONTRACTOR for the project. Payment will be made by the first of the next month. The pay request will reflect the following changes and totals made on past invoices for:

- Contract Amount
- Certified Payroll documentation to verify prevailing wage requirements are being met
- Total Change Order amounts
- Pay Item quantities of work completed that month
- Additional pay items
- Previously paid invoices
- Total retainage to date
- Total amount due this pay request

A retainage of five percent (5%) shall be withheld from each partial payment. It will be returned when COUNTY accepts the project as complete.

First payment will not be made until the following items have been approved by COUNTY.

- Project Schedule
  - Erosion Control Plan (Not required per SCCC Chief Plan Review Engineer)
- Conditional Waiver and Release on Progress Payment

Subsequent progress payments will be suspended unless CONTRACTOR's project schedule is up to date and acceptable to COUNTY, weekly payroll statements of compliance are current, and COUNTY has approved any applicable Conditional Waiver and Release on Progress Payment.

19. HOURS OF WORK

During central standard time, all work is to be accomplished between the hours of 7:00 a.m. and 4:00 p.m. CST Monday through Friday and between 7:30 a.m. and 4:00 p.m. CST on Saturday. During central daylight savings time, all work is to be accomplished between the hours of 7:00 a.m. and 4:00 p.m. CST Monday through Friday and between 7:30 a.m. and 4:00 p.m. CST on Saturday.

CONTRACTOR shall notify COUNTY no less than 48 hours in advance of any work scheduled to be done on Saturday. No work shall be performed on Sunday. Work outside of these hours, including incidentals, can only be done following a written request to and subsequent written approval from COUNTY.

_DJS Initial_
20. PROTECTION DURING CONSTRUCTION

During the progress of the work, CONTRACTOR shall protect all existing and new work from injury or defacement and particular care shall be taken of all finished parts. Any damage occurring to the work from any cause, including any damage caused by others and utilities, shall be properly repaired and/or replaced at CONTRACTOR'S expense to the satisfaction of COUNTY.

CONTRACTOR is also responsible for any repair and/or maintenance required throughout the project from Notice to Proceed until final acceptance.

21. CLEANING UP

CONTRACTOR shall have all rubbish and debris removed from the premises from time to time as directed by COUNTY. Upon the completion of the work, the premises shall be left in a neat and presentable condition.

22. TEMPORARY FACILITIES

Temporary Toilet For Workmen -- CONTRACTOR shall provide temporary toilet facilities conforming to requirements of all Health and Sanitation Codes for use by workmen employed on the project. The location of the toilet shall be as directed by COUNTY and the facilities shall be kept in a clean, sanitary condition at all times. The cost for the temporary toilet shall be included in the bid price for other work.

Temporary Light and Power -- CONTRACTOR shall provide and pay all charges for temporary light and power as required for the work.

Temporary Water -- CONTRACTOR shall provide and pay for temporary water service as required for the work, including that required for the construction washoff pad.

Temporary Field Office -- CONTRACTOR may provide and maintain a temporary field office for his use. COUNTY shall approve the location of the proposed office. No direct payment will be made for this work.

23. HAULING OVER STREETS

All streets over which hauling is performed shall be kept reasonably clean of spilled or tracked on materials at all times and shall be thoroughly cleaned of such materials daily, within one hour after the suspension of hauling operations if said street is used by the traveling public.

CONTRACTOR will be required to secure from the proper City, County, and State authority any permits which may be required to haul over city, County or state streets, and any hauling operation shall be subject to the requirements of such permits and to any applicable City, County or State regulations and ordinances governing hauling and the movement of equipment over said city, County, or state streets. CONTRACTOR is reminded that they must follow posted weight limits for bridges.

DJS Initial
24. PROJECT SURVEYS

All survey staking will be at the sole cost of CONTRACTOR at no additional cost to COUNTY. Stakeout and as-built information will be used to verify actual earthwork quantities. Five (5) business days notification shall be given to COUNTY, or to a consulting engineer hired by the County if so directed, prior to stakeout.

25. PROJECT SUBMITTALS AND CLOSEOUT

25.1 Although not an all-inclusive list, the following submittals shall be required by CONTRACTOR prior to the start of construction:
   - Bid Guaranty Submitted:
   - Contract Agreement Submitted:
   - Performance Bond Submitted:
   - Payment & Materials Bond Submitted:
   - Certificate of Insurance Submitted:
   - Preliminary Work Schedule Submitted:
   - List of Desired Substitutions Submitted:
   - List of Subcontractors Submitted:
   - List of Suppliers Submitted:

25.2 The following documents are required from CONTRACTOR to make Final Payment:
   - Prevailing Wage Affidavit (Prime & subcontractors) Submitted:
   - Contractor's Certification Regarding Settlement of Claims (Prime) Submitted:
   - Contractor's Final Lien Waiver (Prime) Submitted:
   - Contractor's Final Lien Waiver (Subcontractor(s)) Submitted:
   - Contractor's Final Lien Waiver (Supplier) Submitted:
   - Contractor's Final Pay Invoice (Prime) Submitted:

25.3 CONTRACTOR shall close out the project in the following manner or as otherwise directed by COUNTY:
   - Final inspection and approval by COUNTY.
   - Any claim from his subcontractors, utilities, or adjacent property owners must be cleared.
   - Final inspection and approval from all State and County agencies involved in the project.
   - CONTRACTOR shall supply as-built markups, if required, on a clean set of drawings.
   - CONTRACTOR, including all subcontractors, shall supply final lien waivers for all material, labor and equipment with final pay request.

26. WORK IN EXISTING DRAINAGE AREA

The attention of CONTRACTOR is directed to the fact that the site of the work conveys overland and/or piped storm water drainage. CONTRACTOR shall inform himself fully, of the conditions relating to the construction and labor under which work will be performed. CONTRACTOR shall employ as far as possible such methods and means in carrying out his work as not to cause any interruptions or interference to the flow of storm water. CONTRACTOR shall take special care to prevent the obstruction of the existing or new storm water facilities. In addition, all debris and

_DJS_ Initial
material that could cause obstruction to downstream culverts, if a storm were to occur, must be removed immediately. All excavation shall be planned and executed in a manner to minimize the duration of exposure of unprotected soils. All borrow areas and embankments shall be managed to prevent sediment from entering nearby water or land. Disturbed areas shall be restored with permanent vegetative diversion, or siltation retention facilities shall be provided to protect water courses.
Exception Sheet

If the item(s) and/or services proposed in the response to this bid is in any way different from that contained in this proposal or bid, the bidder is responsible to clearly identify all such differences in the space provided below. Otherwise, it will be assumed that the bidder's offer is in total compliance with all aspects of the proposal or bid. Below are the exceptions or differences to the stated specifications (attach additional sheets as needed):

NCC Inclusions/Clarifications:

NCC assumes reusing existing piping as much as possible for installation of new equipment. We are not aware of any previous problems with existing piping systems. We have not included and additional repairs or modifications.

All new piping 2-1/2" and larger will be grooved and 2" and smaller will be black screwed or copper to match existing.

Piping to be pressure tested prior to insulation and start up.

NCC included verification of chilled and condenser water flows per factory specifications at time of start up.

NCC included insulation as required for all new or modified water piping only.

Per addendum #1 we are utilizing the existing ramp in mechanical room for chiller removal and installation and have not included any modification to ramp.

NCC included 1/2 hour per day per man for arrival and leaving from building.

See attached sheet for additional items.

Date: 01/08/2021
Signature: 
Title: Group Manager
Company: Nooter Construction Company
Inclusions/Clarifications Continued:

NCC's work schedule is 7:00 AM - 3:30 PM Monday through Friday. Any required modification to this schedule could result in additional costs.

This proposal is based on working under mutually agreeable contract terms.

Exclusions:

Overtime or Premium Time.

Sales Tax.

Painting.

Additional work not called out in inclusions stated in RFO. Additional work to be carried out on a Time and Material basis.

Per the Temperature Control Contractor we are excluding the replacement of the pneumatic 3-Way Valves and Damper Actuators at the AHUs.

Delay of work due to security restrictions at the building.

Delay of work due to any circumstance outside of NCC's control. Including but not limited to: weather (including wind impacts on crane work), pandemic, work by others that interferes with this project.

Chemical Treatment. We will work with your existing chemical treatment vendor but have not included any cost for chemical treatment.

Glycol for chilled water system.

Furnishing or installation of refrigerant monitor. Existing monitor is installed in the Mechanical Room.
Audit Clause for Contracts

Examination of Records

The Contractor's records must include, but not be limited to, accounting records (hard copy, as well as computer readable data), written policies and procedures, subcontractor files, indirect cost records, overhead allocation records, correspondence, instructions, drawings, receipts, vouchers, memoranda, and any other data relating to this contract shall be open to inspection and subject to audit and/or reproduction by the County Auditor, or a duly authorized representative from the County, at the County's expense. The contractor must preserve all such records for a period of three years, unless permission to destroy them is granted by the County, or for such longer period as may be required by law, after the final payment. Since the Contractor is not subject to the Missouri Sunshine Law (Chapter 610, RSMo), information regarding the Contractor's operations, obtained during audits, will be kept confidential.

The Contractor will require all subcontractors under this contract to comply with the provisions of this article by including the requirements listed above in written contracts with the subcontractors.

Vendor Information

Company Name: Nooter Construction Company

Business Address: 1500 S. Second St., St. Louis, MO 63104

Business Hours: 7:00 AM to 3:30 PM M-F

Phone: (314)-421-7291

Fax: (314)-421-7745

Email address: sales@nooter.com

Contact Person: Dan Stokes

Authorized Signature: [Signature]

(Date): 01/08/2021

ORIGINAL
LEGAL NOTICE

INVITATION FOR FORMAL BID

IFB 21-023

For

Justice Center Chiller Replacement

For

ST. CHARLES COUNTY GOVERNMENT
ST. CHARLES, MISSOURI

St. Charles County is seeking bids for Justice Center Chiller Replacement. The vendor must guarantee the quoted prices for a period of Ninety (90) days. The county reserves the right to terminate the contract for any violation, by the successful bidder, of any term or condition of the contract by giving thirty (30) days written notice stating the reasons therefore and giving the party time to remedy any deficiencies. All bid prices submitted must be guaranteed for ninety (90) days.
BID INSTRUCTIONS

One [1] signed original and one [1] signed copy of the bid must be received in a sealed envelope plainly marked “21-023 Justice Center Chiller Replacement” with the date and time of the bid opening in the lower left corner of the envelope. An authorized representative of the company/person submitting the bid must sign the bid, in blue ink.

Bids must be submitted to the St. Charles County Finance Department, 201 North Second Street Room 541 St. Charles MO 63301 prior to the bid opening.

Bid opening will be on 1/8/2021 at 2:00 PM, in Room 116 of the St. Charles County Administration Building, 201 North Second Street, St. Charles, MO 63301.

St. Charles County reserves the right to accept and/or reject any and all bids.

Bid results may be obtained by going to our St Charles County Government website @ http://www.sccmo.org/Bids.aspx click on “show Closed/Awarded/Cancelled bids”, select bid and click on “related documents”. No phone calls please. The time it takes for final bid results to be made public depends on the complexity of the project and the cost of the project.

BID INQUIRIES

Any questions or clarifications concerning this Request for Bid must be submitted in writing via E-mail (preferred), mail or fax to:

Pam Luesse
St. Charles County Government
Finance Department
201 North Second St
St. Charles, Missouri 63301
Fax: (636)949-7589
pluesse@sccmo.org

For questions or inquiries concerning the specifications please contact:
Brian Cox, Project Manager
Facilities Management Department
St Charles County Government
300 North Second St, Room 101
St. Charles, Missouri 63301
Fax: (636)949-3014
bccox@sccmo.org

A mandatory pre-bid meeting will be held at 301 N. Second St., St. Charles Mo 63301 on 12-16-20 at 10:00 a.m.

- The bid number and title shall be referenced on all correspondence.
- All questions must be received no later than 2:00 PM on 12/23/2020. Any question received after this deadline may not be answered.

ORIGINAL

21-023 Justice Center Chiller Replacement

Proposal Response from (please complete)

Nooter Construction Company

Name of Company or Individual
Responses to questions/clarifications will be placed on the County's website http://www.sccmo.org/Bids.aspx. Check this website frequently for updates and any addendum that are issued.

Prohibited Communication

Contact with any representative, other than through the procedure outlined in the section titled "Bid Inquiries", concerning this request is prohibited PRIOR TO BID OPENING. Representative shall include, but not be limited to, all elected and appointed officials, and employees of St. Charles County and their Agents within St. Charles County. Any Offeror engaging in such prohibited communications prior to Bid Opening may be disqualified at the sole discretion of St. Charles County.
TERMS AND CONDITIONS

➤ St. Charles County reserves the right to reject any and all bids or parts of a bid and waive technicalities, and to adjust quantities.

➤ All bids will be considered final. No additions, deletions, corrections, or adjustments will be accepted after the time of bid opening.

➤ All delivery costs or charges must be included in the F.O.B. destination bid price.

➤ City, County and State of Missouri Sales Tax and Federal Taxes are not applicable to sales made to St. Charles County and must be excluded.

➤ The contract shall be effective for the approximate seven (7) month period from the date of the notice of award.

➤ The County, with the consent of the vendor, shall have the option to renew said contract for one (1) additional three (3) month period at the same specifications and terms and conditions of any contract that may be derived from this request for proposal.

➤ The electronic version of this bid/RFP is available upon request. The document was entered into WORD for Microsoft Windows. The Purchasing Office does not guarantee the completeness and accuracy of any information provided on the electronic version. Therefore, respondents are cautioned that the hard copy of this bid/RFP on file in the Purchasing Office governs in the event of a discrepancy between the information contained in or on the electronic version and that which is on the hard copy.

➤ Vendors are required to clearly identify any deviations from the specifications in this document.

➤ An authorized officer of the company submitting the bid must sign all bids, in blue ink.

➤ Vendors must submit two [2] signed copies of their bid; one is to be an original and so marked.

➤ All prices and notations must be in blue ink or typewritten on the attached form. Mistakes must be crossed out, corrections typed adjacent and must be initialed in blue ink by the person signing the bid.

➤ St. Charles County will not award any bid to an individual or business having any outstanding amounts due from a prior Contract or business relationship with the County or who owes any amount(s) for delinquent Federal, State or Local taxes, fees and licenses.
Sealed proposals received after the designated time of the receipt of the sealed proposals will be considered as "No Bid" and "Void" and will not be opened.

The successful bidder is specifically denied the right of using in any form or medium the names of St. Charles County or any other public agency within St. Charles County Government for public advertising unless express written permission is granted.

All bidders must possess the necessary and appropriate business and/or professional licenses in their field.

Award will be made to the low responsive, responsible bidder, or to the offeror whose proposal is most advantageous to the County, price and other factors considered including geographic location. When payments are to be made to the County, award will be made to the most advantageous offer.

County reserves the right to accept any item or group of items offered, unless the bidder qualifies his bid by specific limitations. The bid can be on an "all or none" basis if wording in the bid so states and if all items solicited are included in the bid.

When applicable, provide unit prices and extension prices. Where there is disagreement in the unit and extension prices, the unit price shall govern.

MISSOURI PREVAILING HOURLY WAGE RATES

The proposal for this Contract shall be based upon the required payment by the Bidder for wages for each craft or type of workmen required to execute the Contract as determined by the Department of Labor and Industrial Relations of Missouri, pursuant to Sections 290.210 to 290.340, RSMo. For those projects with a total cost of more than $75,000.00, a schedule of such prevailing hourly rate of wages as determined by the Department of Labor and Industrial Relations of Missouri, pursuant to said statutory provisions and made a part of this Contract, Annual Wage Order #27, as of July 1, 2020.

Effective August 28, 2018, the provisions of sections 290.210 to 290.340 shall not apply to the construction of public works for which either the engineer's estimate of the bid accepted by the City for the total project is in the amount of $75,000.00 or less. For any awarded bid in the amount of $75,000.00 or less that becomes subject to a contract amendment that increases the total project cost in excess of $75,000.00, the provisions of 290.210 to 290.340 shall apply only to that portion of the project that is in excess of $75,000.00.
INSURANCE:

The successful bidder must agree to provide and maintain during the life of the Contract the insurance(s) listed below, in the minimum amounts specified, with an insurance company licensed to do business in the State of Missouri. All policies must name the County as an additional insured and provide for thirty (30) days written notice prior to any material changes or cancellation. Successful bidder will be awarded contract once a Certificate of Insurance is provided.

Workers Compensation: Statutory limits as required by the statutes of the State of Missouri and Employer's Liability with limits no less than $500,000.

Comprehensive General Liability (including automobile): Limits of no less than $1,000,000/3,000,000/1,000,000 per occurrence or $3,000,000CSL.

BONDS:

Bid Bond- A 5% deposit of the bid total, presented in the form of a cashier's check, Certified check, or bid bond, made payable to St. Charles County.

Performance Bond- A 100% Performance and Payment Bond in favor of the Owner. The Security Co. representing Contractor must be authorized to do business in the State of Missouri and be approved by Owner. Performance and Payment bond will be required if project is $50,000.00 or greater.
Employment of Unauthorized Aliens Prohibited (Missouri Revised Statutes Section 285.530)

As a condition for the award of any contract or grant in excess of five thousand dollars by St. Charles County to a business entity, the business entity shall, by sworn affidavit and provision of documentation**, affirm its enrollment and participation in a federal work authorization program (E-Verify) with respect to the employees working in connection with the contracted services. Every such business entity shall sign an affidavit affirming that it does not knowingly employ any person who is an unauthorized alien in connection with the contracted services. [RSMO 285.530 (2)]

An employer may enroll and participate in a federal work authorization program (E-Verify) and shall verify the employment eligibility of every employee in the employer’s hire whose employment commences after the employer enrolls in a federal work authorization program. The employer shall retain a copy of the dated verification report received from the federal government. Any business entity that participates in such program shall have an affirmative defense that such business entity has not violated subsection 1 of this section. [RSMO 285.530 (4)]

Any entity contracting with St. Charles County shall only be required to provide the referenced affidavit on an annual basis. A copy of the affidavit in included in this bid request. Vendors may choose to send the required documentation using one of the following options:

- Send the notarized affidavit and E-Verify MOU signature page to: St. Charles County, Attn: Purchasing Manager, 201 N Second Street, Room 541, St. Charles, MO 63301 prior to responding to any solicitations; OR
- Send the notarized affidavit and E-Verify MOU signature page along with a bid solicitation response.

These documents will be kept on file. The notarized affidavit and E-Verify MOU signature page will remain current for one year from the date of the notarized affidavit.

** PLEASE NOTE:  
Acceptable enrollment and participation documentation consists of a valid copy of the signature page of the E-Verify Memorandum of Understanding, completed and signed by the Contractor, and the Department of Homeland Security - Verification Division

The online address to enroll in the E-verify program is:

**Open Records**

Any and all information contained in or submitted with the bid becomes a public record subject to the Missouri Sunshine Law when the bids are opened. If the bidder believes that any information contained in or submitted with the bid is protected from disclosure by the Missouri Sunshine Law, the bidder must clearly identify what information the bidder believes is so protected and must also clearly identify the legal basis therefor.

**Veteran Friendly Employment Policy**

"Indicate whether you have developed a veteran friendly employment policy and, if so, attach a copy of such policy to your response as a point of information."

_____ "YES" our company has a veteran friendly employment policy.

X "NO" our company does not have a veteran friendly employment policy.

Please include a copy of your veteran friendly employment policy with your submission.
Justice Center Chiller Replacement

St. Charles County Government Facilities Management Department is seeking bids for supply and installation of a centrifugal chiller replacement at the criminal justice center and alternates to adding year-round cooling to the mechanical operations.

Scope Description:

The Criminal Justice currently has two chillers that provide cooling only during the summer months. The chiller that is being replaced in this scope of work is a Trane 200-ton CVHE020 CentraVac low pressure centrifugal chiller that was originally installed in the mid 1980’s. The Trane 250-ton helical screw chiller that was installed in 2007 is to remain in use and only have the isolation valves on the evaporator piping replaced with new resilient seal valves and electric actuator. The base bid will also include replacement of the air separator tank and air vent, along with reinsulating all piping associated with the base bid. The replacement of the pressure valve taps on steel piping will need to be replaced with ¼” sockets welded with a ¾” ball valve with a bushing to tie the piping together with a Tee fitting and a single gauge. The current temperature gauges and thermowells shall also be replaced while using existing threaded socket.

The County also has two bid alternates, Alternate 1 is to replace cooling tower one on the roof and configure the new tower for year-round cooling with a basin heater. This will also include replacing the heat tracing, insulation, and weatherproof jacket on all exposed condenser water and make-up water piping. As part of the alternate bid provide chilled water freeze protection pumps and controls. Alternate 2 is to replace the circulation pumps that circulate condenser water to the cooling tower as well as the chilled water supply and return loop. Alternate 2 includes new chilled water and condenser water pumps with variable frequency drives replace all isolation valves, vibration isolators, triple duty valves, piping of a pressure manifold with isolation valves to a single gauge, and insulation all piping associated with this alternate.

With the replacement chiller, the County is wanting to increase the capacity of the new chiller to 250-tons. The current condenser supply and return piping is 6” diameter, .25” wall carbon steel piping, the chilled water supply and return piping is 6” diameter, .25” wall carbon steel piping, and the electrical power is a Federal Pacific 480-volt 400-amp fused switch bucket fed from the main switch gear. The new chiller will be a low-pressure centrifugal chiller that utilizes R-514a refrigerant. The County has a new refrigerant monitor that was installed in the mechanical room and the monitor is configured to monitor R-123, R-134a, and R-514a refrigerant. The County elected to specify the R-514a refrigerant for its low global warming potential (GWP) of 2 and an ozone depletion potential (ODP) of zero as well as its non-flammable categorization. With the higher toxicity of 320 ppm occupational exposure limit (OEL), it was incorporated into the parameters of the refrigerant monitoring system while monitoring current refrigerants in the mechanical room.
General Conditions:

➤ The Contractor must comply with all Federal and State Employment/Labor regulations including those from the U.S. "Occupational Safety and Health Administration".
➤ The Contractor must provide all applicable Insurance Certificates to the County upon the award of the bid.
➤ The Contractor must specifically claim and include any exclusions or deviations from the bid specifications with the proposal submitted.
➤ The Contractor shall be permitted to work Monday through Friday between the hours of 7:30 am and 4:00 pm. Any changes to the specified work schedule must be approved by the Project Manager at least 2 days before the change occurs.
➤ The Contractor shall have all proper licenses that are current with the County and State of Missouri.
➤ The Contractor shall agree to have all employees working in the facility to undergo a background check performed by St Charles County Department of Corrections. The Contractor shall submit a digital photo of the driver’s license of each employee working on site. This is a zero-tolerance policy and ANY employee working in the jail must pass the background check. This could apply to any persons working for the contractor depending on the duration of time in the building. Contractor will always be escorted while working in the secure area of the jail.
➤ The Contractor is required to have every employee working on the site, that has passed a background check, sign a Prison Rape Elimination Act (PREA) acknowledgement form. This form is attached to the bid document.
➤ The Contractor shall provide a key contact for when work on the system will be performed. This key contact shall notify the County Project Manager when they will be performing work.
➤ The County will provide a PDF of the floorplan that equipment is being replaced on. Contractor shall be responsible for providing an as-build drawing showing where devices are located, and device address. This shall be provided to the County in a PDF digital format.
➤ The Contractor shall notify the project manager of any deficiencies in the building that may impact project cost. The Contractor shall provide a cost for any deficiencies and is to not proceed with work unless a notice to proceed is issued from the project manager. Should the Contractor proceed without proper written authorization, Contractor will be performing work at risk and payment for said work will not be provided.
➤ There shall be no smoking or use of tobacco products inside the facility, or on the roof of the facility. Contractor shall be liable for roof cigarette burns. No smoking shall be permitted within 15 feet of all building entrances per County Ordinance No. 18-070. This also applies to electronic smoking devices.
➤ The Contractor shall notify the County Project Manager of no less than 2 days in advance and get permission before proceeding with disruptive operations.
➢ All new equipment must be tied into the existing Trane Tracer building controls. All programing and compatible controls will be supplied and installed by mechanical contractor.
➢ Ladders or other equipment used to access the roof must be pulled and stored in a secure location when not in use, and much to be accessible to any inmate.
➢ A kick-off meeting will be held prior to work commencing to discuss restriction in work environment as a result of working in a correctional environment.
➢ This is a turnkey project all necessary trades need to be included and a subcontract of the mechanical contractor for the bid to be considered.
➢ The Contractor must comply with all provisions of the Prevailing Wage Law under Annual Wage Order #27 as amended 7-01-2020 for this project. The contractor will forfeit a penalty to the County of $100 per day (or portion of a day) if a worker is paid less than the prevailing rate for any work done under the contract by the contractor or by any subcontractor (see section 290.250, RSMo). Certified Payroll shall be submitted with request for payment.

Project Specifications and Drawings:

Refer to the attached following document:

G&W Project Manual dated 11-19-20

G&W Engineering Sheets:

M0.0.0 Date 11-19-20
M0.0.1 Date 11-19-20
M0.0.2 Date 11-19-20
M0.0.3 Date 11-19-20
M1.1.1 Date 11-19-20
M1.1.2 Date 11-19-20
M2.1.1 Date 11-19-20
M2.1.2 Date 11-19-20
E.0.0.0 Date 11-19-20
E1.1.1 Date 11-19-20
E1.1.2 Date 11-19-20
E2.1.1 Date 11-19-20
E2.1.2 Date 11-19-20
Exception Sheet

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Below are the exceptions or differences to the stated specifications (attach additional sheets as needed):

NCC Inclusions/Clarifications:

NCC assumes reusing existing piping as much as possible for installation of new equipment. We are not aware of any previous problems with existing piping systems. We have not included and additional repairs or modifications.

All new piping 2-1/2" and larger will be grooved and 2" and smaller will be black screwed or copper to match existing.

Piping to be pressure tested prior to insulation and start up.

NCC included verification of chilled and condenser water flows per factory specifications at time of start up.

NCC included insulation as required for all new or modified water piping only.

Per addendum #1 we are utilizing the existing ramp in mechanical room for chiller removal and installation and have not included any modification to ramp.

NCC included 1/2 hour per day per man for arrival and leaving from building.

See attached sheet for additional items.

Date: 01/08/2021
Signature: [Signature]
Title: Group Manager
Company: Nooter Construction Company
Inclusions/Clarifications Continued:

NCC's work schedule is 7:00 AM - 3:30 PM Monday through Friday. Any required modification to this schedule could result in additional costs.

This proposal is based on working under mutually agreeable contract terms.

Exclusions:

Overtime or Premium Time.

Sales Tax.

Painting.

Additional work not called out in inclusions stated in RFQ. Additional work to be carried out on a Time and Material basis.

Per the Temperature Control Contractor we are excluding the replacement of the pneumatic 3-Way Valves and Damper Actuators at the AHUs.

Delay of work due to security restrictions at the building.

Delay of work due to any circumstance outside of NCC's control. Including but not limited to: weather (including wind impacts on crane work), pandemic, work by others that interferes with this project.

Chemical Treatment. We will work with your existing chemical treatment vendor but have not included any cost for chemical treatment.

Glycol for chilled water system.

Furnishing or installation of refrigerant monitor. Existing monitor is installed in the Mechanical Room.
# BID FORM

**IFB 21-023**

*Justice Center Chiller Replacement*

<table>
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<tr>
<th>Item</th>
<th>Lump Sum Cost</th>
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<tbody>
<tr>
<td>Mechanical Material</td>
<td>$323,697.00</td>
</tr>
<tr>
<td>Mechanical Labor</td>
<td>$108,017.00</td>
</tr>
<tr>
<td>Electrical Labor and Material</td>
<td>$5,520.00</td>
</tr>
<tr>
<td>Alternative 1</td>
<td>$183,899.00</td>
</tr>
<tr>
<td>Alternative 2</td>
<td>$105,310.00</td>
</tr>
<tr>
<td>Bonds: Additional cost to provide Performance and Payment bond if the award exceeds $50,000</td>
<td>$8,639.00</td>
</tr>
<tr>
<td><strong>Total Contract Amount including Bond, Alternative 1 and Alternative 2</strong></td>
<td><strong>$735,082.00</strong></td>
</tr>
</tbody>
</table>

**Authorized Signature:**

(signature indicates acceptance of all bid terms and conditions)

*original*
AFFIDAVIT OF WORK AUTHORIZATION

The bidder/contractor who meets the section 285.525, RSMo definition of a business entity must complete and return the following Affidavit of Work Authorization.

Comes now Dan Stokes (Name of Business Entity Authorized Representative) as Group Manager (Position/Title) first being duly sworn on my oath, affirm Nooter Construction Company (Business Entity Name) is enrolled and will continue to participate in the E-Verify federal work authorization program with respect to employees hired after enrollment in the program who are proposed to work in connection with the services related to contract(s) with the County for the duration of the contract(s), if awarded in accordance with subsection 2 of section 285.530, RSMo. I also affirm that Nooter Construction Company (Business Entity Name) does not and will not knowingly employ a person who is an unauthorized alien in connection with the contracted services provided to the contract(s) for the duration of the contract(s), if awarded.

In Affirmation thereof, the facts stated above are true and correct. (The undersigned understands that false statements made in this filing are subject to the penalties provided under section 575.040, RSMo.)

Authorized Representative's Signature

Dan Stokes
Printed Name

Group Manager
Title
01/08/2021
Date

djstokes@nooter.com
E-Mail Address

Subscribed and sworn to before me this 8 of January 1 am
(DAY) (MONTH, YEAR)

commissioned as a notary public within the County of St Louis, State of Missouri and my commission expires on 11.19.21
(NAME OF COUNTY) (NAME OF STATE) (DATE)

Signature of Notary

1.8.21
Date

21-023 Justice Center Chiller Replacement
Proposal Response from (please complete)
Nooter Construction Company
Name of Company or Individual

ORIGINAL
EXHIBIT A

ST. CHARLES COUNTY
DOMESTIC PRODUCTS PROCUREMENT ACT (BUY AMERICAN)

The Missouri Domestic Products Procurement Act (34.350-34.359 RSMo) requires that for all bids with a value of $25,000 or more, the goods or commodities purchased by any public agency (which definition includes all political subdivisions of the State, including counties) or used or supplied in the construction, alteration, repair, or maintenance of any public works must be manufactured or produced in the United States. As defined in 34.350 RSMo, United States means the United States of America, the District of Columbia, and all territories and possessions subject to the jurisdiction of the United States. The law also requires that the bidder must provide proof of compliance. Note: In general, if an import tariff is applied to an item, it does not qualify for the Buy American preference. In addition, Most Favored Nation status does not allow application of the preference.

Section A – All Products Are Manufactured or Produced In U.S.
If all products bid qualify as domestic products under Missouri law, complete only Section A.

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<thead>
<tr>
<th>SIGNATURE</th>
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<td>[Signature]</td>
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<tr>
<th>COMPANY NAME</th>
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<tr>
<td>Nooter Construction Company</td>
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If Section A is completed, do not complete Section B.

Section B – Only One Product Line or No Products Are Manufactured or Produced In U.S.
If only one product line or no products are manufactured or produced in the U.S., complete only section B.

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<tr>
<th>SIGNATURE</th>
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<th>COMPANY NAME</th>
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<tr>
<td>[Company Name]</td>
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Section C – Products May Qualify Because of Qualifying Treaty
If some or all products bid qualify for domestic status because of a trade treaty, etc., then the bidder must identify each product, country and qualifying treaty, etc. below. The bidder must list ALL products which are or may qualify as domestic below. If more space is needed, please copy this form and submit as an attachment.

<table>
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21-023 Justice Center Chiller Replacement
Proposal Response from (please complete)
Nooter Construction Company
Name of Company or Individual
Bidders shall sign this Addendum as acknowledgment and return it with the bid.

BID ADDENDUM

Addendum #1

Dated 12/23/20

We, the undersigned, acknowledge the receipt of the above addendum, as dated.

By: Dan Stokes

Title: Group Manager

Company: Nooter Construction Co.

Date: 01/08/2021
NON-DISCLOSURE AGREEMENT

This NON-DISCLOSURE AGREEMENT (hereinafter “Agreement”), entered into this 8th day of January, 2021, is by and between Nooter Construction Company, located at 1500 S. Second St., St Louis, MO 63104 (hereinafter "Contractor") and St. Charles County, Missouri, a charter county and political subdivision of the State of Missouri, located at 201 North Second Street, St. Charles County, Missouri 63301 (hereinafter "County").

WHEREAS, Contractor has been engaged by the County to provide certain products and/or services; and

WHEREAS, in its performance of services for the County, Contractor may have access to certain confidential or proprietary information or data;

WHEREAS, it is in the interests of the parties that discussions and exchange of information and/or data be carried on in a controlled environment and that confidential and proprietary information or data developed by the parties, or accessed by Contractor or its employees or agents, whether from County resources directly or from other sources by virtue of the County having access to such sources, be protected from further disclosure unless the County approves its release;

NOW, THEREFORE, for and in consideration of the engagement of Contractor to provide certain products and/or services for the County, Contractor agrees as follows:

1. In the course of its performance of services for the County, Contractor will have access to certain information or data which is confidential and/or proprietary, including but not limited to the County’s confidential business and/or other technical information and private data of citizens (hereinafter referred to collectively as “Confidential Information”). Confidential Information may be in written, electronic, photographic or other tangible form, and it may be provided orally or visually. Confidential Information disclosed in a tangible or electronic form may be marked or otherwise identified as such by the County, but in no event shall the absence of such a mark or identification in any way affect Contractor’s obligations hereunder, including without limitation its obligation to treat such information or data as confidential. Contractor shall treat all information or data of which Contractor becomes aware as a result of its engagement with the County as confidential unless: (a) the information/data was rightfully known to Contractor, without restriction on disclosure, prior to its engagement with the County; (b) the information/data is or has become generally available to the public, without the fault or negligence of Contractor; (c) Contractor rightfully received the information/data from a third party without a duty of confidentiality; (d) Contractor independently developed the information/data without use of County’s confidential information; or (e) authorized, in writing, by the County. Confidential Information made available to Contractor may include information of third parties, and the source of such information or data shall not affect its treatment hereunder.

2. Except as specifically permitted in this Agreement or as otherwise authorized in writing by the County, Contractor and its employees and agents shall not, at any time, in any fashion, form or manner, whether directly, indirectly or by accident, divulge, disclose, communicate or use, any Confidential Information, or methods of accessing same, that is received, obtained, acquired or developed in association with its engagement with the County, whether prior to, during or subsequent to its engagement, unless necessary to effectuate the purposes of its engagement with the County. Contractor’s sole purpose for accessing and/or using Confidential Information shall be to perform its contractual obligations to the County. Contractor is permitted to make exact
copies of the Confidential Information but only to the extent necessary to effectuate the purposes of its engagement with the County.

3. Contractor agrees that any Confidential Information it receives from the County or accesses by virtue of its engagement with the County shall be provided only to staff who have an official business need and who have read, understood and agreed to terms substantially similar to those stated in this Agreement. Contractor agrees that when access to Confidential Information results in access to information beyond that which is necessary for the purpose for which access was granted, it will access only the information or data needed for the purpose for which access was given. When Contractor’s employees or agents no longer have a need for access to Confidential Information, whether because of termination of employment, reassignment of job duties or otherwise, Contractor shall ensure that access of such employees or agents is terminated.

4. Contractor acknowledges and agrees that it, its employees and agents are bound by all applicable federal and state laws governing confidentiality and/or privacy of information including but in no way limited to individuals’ personally identifiable information, e.g., protected health information (PHI) under the Health Insurance Portability and Accountability Act of 1996 (HIPAA).

5. The parties hereby acknowledge and agree that this Agreement is subject to, and the parties will act in accordance with, the Missouri Sunshine Law (Chapter 610, RSMo.). Contractor agrees to immediately notify the County of any request for information or data concerning or related to County business received from a third party. Contractor is permitted to disclose the Confidential Information as required by a court or other governmental entity of competent jurisdiction; provided, however, that Contractor shall: (a) where permitted by law, give the County prompt written notice upon receipt of a disclosure requirement and before the disclosure is made; (b) take reasonable actions and provide reasonable assistance to the County to ensure confidential treatment of the Confidential Information, at Contractor’s cost; and (c) disclose only such Confidential Information as is legally compelled.

6. Contractor agrees not to issue any press release, give or make any presentation, or give to any print, electronic or other news media any information regarding its engagement with the County without the advance approval in writing by the County.

7. Contractor agrees that all Confidential Information in its possession as a result of the engagement, including all intellectual property rights therein, at all times remains the sole property of the County. Nothing herein shall be construed as granting Contractor any rights, express or implied, including without limitation any intellectual property rights, in the Confidential Information, other than the limited right to use it to effectuate the purpose of its engagement with the County.

8. Contractor’s right to access and/or use the Confidential Information shall cease upon completion of its engagement with the County; however, its obligations hereunder shall survive in perpetuity. Upon completion of its engagement or upon request by the County, Contractor will turn over to the County all reports, notes, memoranda, notebooks, drawings, and other information or data developed, received, compiled by or delivered to Contractor and/or its employees or agents, regardless of the source of said Confidential Information. Contractor agrees to return or, with the written consent of County, destroy all Confidential Information, including all copies, at the conclusion of the engagement or at an earlier date set forth by the County in its sole discretion. “Destruction” includes the complete purging of all Confidential Information from all computers and back-up media storage. Upon request by the County, Contractor shall certify in writing that it has complied with its obligations under this section.

Rev. 04/2017
9. Contractor, its employees and agents shall not attach or load any additional hardware or software to County equipment unless authorized by the County in writing, and will only use those access rights and will only access those systems, directories, information or data authorized by the County for its/his/her use to effectuate the purpose of Contractor's engagement with the County. All requests for access must be communicated to the County's System Administrator.

10. Contractor agrees to transmit Confidential Information only through the use of secure methods and that it shall use the same or a greater degree of care in safeguarding the Confidential Information as it uses for its own confidential information (but no less than reasonable care). Upon the discovery of any disclosure or misuse of the Confidential Information, Contractor shall immediately notify the County and shall act to prevent any further disclosure or misuse, including enforcing obligations of parties to whom it has disclosed the County's Confidential Information. Contractor shall be liable for any such unauthorized disclosure or misuse.

11. Contractor agrees to store any Confidential Information it receives in secure, locked containers. Where data is stored on a computer or other electronic media, Contractor must have an appropriate computer security policy that protects Confidential Information from unauthorized disclosure. The computer security policy must include provisions that address the physical security of computer resources; equipment security to protect equipment from theft and unauthorized use; software and data security; and access control. Any access to the stored data, wherever and however stored, must be limited to staff who have an official business need and who have read, understood and agreed to terms substantially similar to those stated in this Agreement. Responsibility for computer security must be assigned to a specific individual or organization, and that assignment must be documented.

12. Contractor agrees: (a) to use the Confidential Information furnished under this Agreement only to effectuate the purposes of its engagement with the County; and (b) to retain such Confidential Information only so long as necessary to effectuate the purposes of its engagement with the County.

13. Contractor agrees that if it and/or its employees or agents breaches or threatens to breach this Agreement, in addition to having its engagement with the County terminated, the County shall have all equitable and legal rights (including the right to obtain injunctive relief) to prevent such breach and/or to be fully compensated (including reasonable attorneys' fees) for losses and damages resulting such breach or threatened breach. Contractor acknowledges that compensation may not be sufficient and that injunctive relief to prevent or limit any breach may be the only viable remedy to fully protect the Confidential Information. Contractor further understands and agrees that the terms of this Agreement shall survive the term of the engagement, and Contractor will abide by the terms of this Agreement in perpetuity.

14. Contractor shall indemnify and hold harmless the County from any and all claims, suits, causes of action, damages, and costs of any kind (including attorneys' fees) arising out of or in any way related to Contractor's unauthorized disclosure and/or misuse of Confidential Information.

15. Contractor agrees that it shall not assign any of its rights or delegate any of its obligations under this Agreement without the County's prior written consent.

16. This Agreement constitutes the entire agreement between to the parties as to the subject matter hereof. It may be modified only by written agreement of the parties. It shall be governed by the laws of the State of Missouri, without regard to choice of law provisions.

Rev. 04/2017
17. This Agreement may be executed in counterparts, each of which shall be deemed an original for all purposes and all of which together constitute one and the same instrument. This Agreement may be executed and delivered by facsimile or other electronic signature by either party and such signature will be deemed binding for all purposes hereof without delivery of an original signature being thereafter required.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their duly authorized officials.

By St. Charles County, Missouri

Signature

Printed Name

Title

Date

By (Company Name): Nooter Construction Co.

Signature

Printed Name

Group Manager

Title

01/08/2021

Date

State of Missouri

County of St. Louis

On this 8 day of January, in the year 2021, before me, Dawn Uhrig Winner, a Notary Public in and for said state, personally appeared Dan Stokes, known to me to be the person who executed the within Non-Disclosure Agreement on behalf of Nooter Construction Co. and acknowledged to me that he or she executed the same for the purposes therein stated.

Dawn Uhrig Winner

Official signature and official seal of notary

Rev. 04/2017

ORIGINAL
Bid Bond

CONTRACTOR:
(Name, legal status and address)
NOOTER CONSTRUCTION COMPANY
1500 S. Second Street
St. Louis, MO 63104

SURETY:
(Name, legal status and principal place of business)
PACIFIC INDEMNITY COMPANY
2028 Half's Mill Road
Whitehouse Station, NJ 08889

OWNER:
(Name, legal status and address)
ST. CHARLES COUNTY
201 N. Second Street, St. Charles, MO 63301

BOND AMOUNT: Five Percent of Amount bid
(5% of Amount bid)

PROJECT:
(Name, location or address, and Project number, if any)
IFB 21-023 Justice Center Clerk Replacement, St. Charles, MO

Project Number, if any:

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this 6th day of January, 2021

[Signatures]

NOOTER CONSTRUCTION COMPANY
(Principal)

PACIFIC INDEMNITY COMPANY
(Surety)

Salena Wood, Attorney in Fact
CHUBB
Power of Attorney
Federal Insurance Company | Vigilant Insurance Company | Pacific Indemnity Company
Westchester Fire Insurance Company | ACE American Insurance Company

Know All by These Presents, that FEDERAL INSURANCE COMPANY, an Indiana corporation, VIGILANT INSURANCE COMPANY, a New York corporation, PACIFIC INDEMNITY COMPANY, a Wisconsin corporation, WESTCHESTER FIRE INSURANCE COMPANY, WESTCHESTER FIRE INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, and ACE AMERICAN INSURANCE COMPANY, each a corporation of the Commonwealth of Pennsylvania, do each hereby constitute and appoint Christina L. Barret, Catherine L. Geimer, Thomas U. Krippene, Barbara Panhier, Eric D. Sauer, Susan R. Schwartz, Jennifer Williams and Salena Wood of St. Louis, Missouri

as their true and lawful Attorney-In-Fact to execute under such designation in their names and to affix their corporate seals to and deliver for and on their behalf as surety thereon or otherwise, bonds and undertakings and other writings obligatory in the nature thereof (other than bail bonds) given or executed in the course of business, and any instruments amending or altering the same, and consents to the modification or alteration of any instrument referred to in said bonds or obligations.

In Witness Whereof, said FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY have each executed and attested these presents and affixed their corporate seals on this 16th day of January, 2020.

Dawn M. Chioros, Assistant Secretary

Stephen M. Haney, Vice President

STATE OF NEW JERSEY
County of Hunterdon

On this 16th day of January, 2020 before me, a Notary Public of New Jersey, personally came Dawn M. Chioros and Stephen M. Haney, to me known to be Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY, the companies which executed the foregoing Power of Attorney, and said Dawn M. Chioros and Stephen M. Haney, being by me duly sworn, severally and each for himself and himself did depose and say that they are Assistant Secretary and Vice President, respectively, of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY and know the corporate seals thereof, that the seals affixed to the foregoing Power of Attorney are such corporate seals and were thereto affixed by authority of said Companies; and that their signatures as such officers were duly affixed and subscribed by them.

Notary Seal

KATHERINE J. ADELAR
NOTARY PUBLIC OF NEW JERSEY
No. 2316809
Commission Expires July 16, 2024

CERTIFICATION

Resolutions adopted by the Boards of Directors of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, and PACIFIC INDEMNITY COMPANY on August 30, 2006; WESTCHESTER FIRE INSURANCE COMPANY on December 11, 2006; and ACE AMERICAN INSURANCE COMPANY on March 20, 2009.

"RESOLVED, that the following authorities relate to the execution, for and on behalf of the Company, of bonds, undertakings, recognizances, contracts and other written commitments of the Company entered into in the ordinary course of business (each a "Written Commitment")

(1) Each of the Chairman, the President and the Vice Presidents of the Company hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise.

(2) Each duly appointed attorney-in-fact of the Company is hereby authorized to execute any Written Commitment for and on behalf of the Company, under the seal of the Company or otherwise, to the extent that such action is authorized by the grant of powers provided for in such persons written appointment as such attorney-in-fact.

(3) Each of the Chairman, the President and the Vice Presidents of the Company hereby authorized, for and on behalf of the Company, to appoint in writing any person the attorney-in-fact of the Company with full power and authority to execute, for and on behalf of the Company, under the seal of the Company or otherwise, such Written Commitments of the Company as may be specified in such written appointment, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(4) Each of the Chairman, the President and the Vice Presidents of the Company hereby authorized, for and on behalf of the Company, to delegate in writing to any other officer of the Company the authority to execute, for and on behalf of the Company, under the Company's seal or otherwise, such Written Commitments of the Company as are specified in such written delegation, which specification may be by general type or class of Written Commitments or by specification of one or more particular Written Commitments.

(5) The signature of any officer or other person executing any Written Commitment or appointment or delegation pursuant to this Resolution, and the seal of the Company, may be affixed by facsimile on such Written Commitment or written appointment or delegation.

FURTHER RESOLVED, that the foregoing Resolution shall not be deemed to be an exclusive statement of the powers and authority of officers, employees and other persons to act for and on behalf of the Company, and such Resolution shall not limit or otherwise affect the exercise of any such power or authority otherwise validly granted or vested.

I, Dawn M. Chioros, Assistant Secretary of FEDERAL INSURANCE COMPANY, VIGILANT INSURANCE COMPANY, PACIFIC INDEMNITY COMPANY, WESTCHESTER FIRE INSURANCE COMPANY and ACE AMERICAN INSURANCE COMPANY (the "Companies") do hereby certify that

(1) the foregoing Resolution adopted by the Board of Directors of the Companies are true, correct and in full force and effect,

(2) the foregoing Power of Attorney is true, correct and in full force and effect.

Given under my hand and seals of said Companies at Whitehouse Station, N.J. this 16/1/21

Dawn M. Chioros, Assistant Secretary

IN THE EVENT YOU WISH TO VERIFY THE AUTHENTICITY OF THIS BOND OR NOTIFY US OF ANY OTHER MATTER, PLEASE CONTACT US AT:
Telephone (908) 303-3493  Fax (908) 303-2666  e-mail: surety@chubb.com

ORIGINAL

Contd fed vic w/fm 11-18 (rev. 11-18)
St. Charles County is seeking bids for **Justice Center Chiller Replacement**. The vendor must guarantee the quoted prices for a period of Ninety (90) days. The county reserves the right to terminate the contract for any violation, by the successful bidder, of any term or condition of the contract by giving thirty (30) days written notice stating the reasons therefore and giving the party time to remedy any deficiencies. All bid prices submitted must be guaranteed for ninety (90) days.
BID INSTRUCTIONS

One [1] signed original and one [1] signed copy of the bid must be received in a sealed envelope plainly marked “21-023 Justice Center Chiller Replacement” with the date and time of the bid opening in the lower left corner of the envelope. An authorized representative of the company/person submitting the bid must sign the bid, in blue ink.

Bids must be submitted to the St. Charles County Finance Department, 201 North Second Street Room 541 St. Charles MO 63301 prior to the bid opening.

**Bid opening will be on 1/8/2021 at 2:00 PM, in Room 116** of the St. Charles County Administration Building, 201 North Second Street, St. Charles, MO 63301.

St. Charles County reserves the right to accept and/or reject any and all bids.

Bid results may be obtained by going to our St Charles County Government website @ http://www.sccmo.org/Bids.aspx, click on “show Closed/Awarded/Cancelled bids”, select bid and click on “related documents”. **No phone calls please**. The time it takes for final bid results to be made public depends on the complexity of the project and the cost of the project.

BID INQUIRIES

Any questions or clarifications concerning this Request for Bid must be submitted in writing via E-mail (preferred), mail or fax to:

Pam Luesse  
St. Charles County Government  
Finance Department  
201 North Second St  
St. Charles, Missouri 63301  
Fax: (636)949-7589  
pluesse@sccmo.org

For questions or inquiries concerning the specifications please contact:

Brian Cox, Project Manager  
Facilities Management Department  
St Charles County Government  
300 North Second St, Room 101  
St. Charles, Missouri 63301  
Fax: (636)949-3014  
bcox@sccmo.org

A mandatory pre-bid meeting will be held at 301 N. Second St., St. Charles Mo 63301 on 12-16-20 at 10:00 a.m.

- The bid number and title shall be referenced on all correspondence.
- All questions must be received no later than 2:00 PM on 12/23/2020. Any question received after this deadline may not be answered.
Responses to questions/clarifications will be placed on the County’s website http://www.sccmo.org/Bids.aspx. Check this website frequently for updates and any addendum that are issued.

**Prohibited Communication**

*Contact with any representative, other than through the procedure outlined in the section titled “Bid Inquiries”, concerning this request is prohibited PRIOR TO BID OPENING. Representative shall include, but not be limited to, all elected and appointed officials, and employees of St. Charles County and their Agents within St. Charles County. Any Offeror engaging in such prohibited communications prior to Bid Opening may be disqualified at the sole discretion of St. Charles County.*
TERMS AND CONDITIONS

- St. Charles County reserves the right to reject any and all bids or parts of a bid and waive technicalities, and to adjust quantities.

- All bids will be considered final. No additions, deletions, corrections, or adjustments will be accepted after the time of bid opening.

- All delivery costs or charges must be included in the F.O.B. destination bid price.

- City, County and State of Missouri Sales Tax and Federal Taxes are not applicable to sales made to St. Charles County and must be excluded.

- The contract shall be effective for the approximate seven (7) month period from the date of the notice of award.

- The County, with the consent of the vendor, shall have the option to renew said contract for one (1) additional three (3) month period at the same specifications and terms and conditions of any contract that may be derived from this request for proposal.

- The electronic version of this bid/RFP is available upon request. The document was entered into WORD for Microsoft Windows. The Purchasing Office does not guarantee the completeness and accuracy of any information provided on the electronic version. Therefore, respondents are cautioned that the hard copy of this bid/RFP on file in the Purchasing Office governs in the event of a discrepancy between the information contained in or on the electronic version and that which is on the hard copy.

- Vendors are required to clearly identify any deviations from the specifications in this document.

- An authorized officer of the company submitting the bid must sign all bids, in blue ink.

- Vendors must submit two [2] signed copies of their bid; one is to be an original and so marked.

- All prices and notations must be in blue ink or typewritten on the attached form. Mistakes must be crossed out, corrections typed adjacent and must be initialed in blue ink by the person signing the bid.

- St. Charles County will not award any bid to an individual or business having any outstanding amounts due from a prior Contract or business relationship with the County or who owes any amount(s) for delinquent Federal, State or Local taxes, fees and licenses.
Sealed proposals received after the designated time of the receipt of the sealed proposals will be considered as “No Bid” and “Void” and will not be opened.

The successful bidder is specifically denied the right of using in any form or medium the names of St. Charles County or any other public agency within St. Charles County Government for public advertising unless express written permission is granted.

All bidders must possess the necessary and appropriate business and/or professional licenses in their field.

Award will be made to the low responsive, responsible bidder, or to the offeror whose proposal is most advantageous to the County, price and other factors considered including geographic location. When payments are to be made to the County, award will be made to the most advantageous offer.

County reserves the right to accept any item or group of items offered, unless the bidder qualifies his bid by specific limitations. The bid can be on an "all or none" basis if wording in the bid so states and if all items solicited are included in the bid.

When applicable, provide unit prices and extension prices. Where there is disagreement in the unit and extension prices, the unit price shall govern.

MISSOURI PREVAILING HOURLY WAGE RATES

The proposal for this Contract shall be based upon the required payment by the Bidder for wages for each craft or type of workmen required to execute the Contract as determined by the Department of Labor and Industrial Relations of Missouri, pursuant to Sections 290.210 to 290.340, RSMo. For those projects with a total cost of more than $75,000.00, a schedule of such prevailing hourly rate of wages as determined by the Department of Labor and Industrial Relations of Missouri, pursuant to said statutory provisions and made a part of this Contract, Annual Wage Order #27, as of July 1, 2020.

Effective August 28, 2018, the provisions of sections 290.210 to 290.340 shall not apply to the construction of public works for which either the engineer’s estimate of the bid accepted by the City for the total project is in the amount of $75,000.00 or less. For any awarded bid in the amount of $75,000.00 or less that becomes subject to a contract amendment that increases the total project cost in excess of $75,000.00, the provisions of 290.210 to 290.340 shall apply only to that portion of the project that is in excess of $75,000.00.
➢ INSURANCE:

The successful bidder must agree to provide and maintain during the life of the Contract the insurance(s) listed below, in the minimum amounts specified, with an insurance company licensed to do business in the State of Missouri. All policies must name the County as an additional insured and provide for thirty (30) days written notice prior to any material changes or cancellation. Successful bidder will be awarded contract once a Certificate of Insurance is provided.

Workers Compensation: Statutory limits as required by the statutes of the State of Missouri and Employer’s Liability with limits no less than $500,000.

Comprehensive General Liability (including automobile): Limits of no less than $1,000,000/3,000,000/1,000,000 per occurrence or $3,000,000CSL.

➢ BONDS:

Bid Bond- A 5% deposit of the bid total, presented in the form of a cashier’s check, Certified check, or bid bond, made payable to St. Charles County

Performance Bond- A 100% Performance and Payment Bond in favor of the Owner. The Security Co. representing Contractor must be authorized to do business in the State of Missouri and be approved by Owner. Performance and Payment bond will be required if project is $50,000.00 or greater
Employment of Unauthorized Aliens Prohibited (Missouri Revised Statutes Section 285.530)

As a condition for the award of any contract or grant in excess of five thousand dollars by St. Charles County to a business entity, the business entity shall, by sworn affidavit and provision of documentation**, affirm its enrollment and participation in a federal work authorization program (E-Verify) with respect to the employees working in connection with the contracted services. Every such business entity shall sign an affidavit affirming that it does not knowingly employ any person who is an unauthorized alien in connection with the contracted services. [RSMO 285.530 (2)]

An employer may enroll and participate in a federal work authorization program (E-Verify) and shall verify the employment eligibility of every employee in the employer’s hire whose employment commences after the employer enrolls in a federal work authorization program. The employer shall retain a copy of the dated verification report received from the federal government. Any business entity that participates in such program shall have an affirmative defense that such business entity has not violated subsection 1 of this section. [RSMO 285.530 (4)]

Any entity contracting with St. Charles County shall only be required to provide the referenced affidavit on an annual basis. A copy of the affidavit in included in this bid request. Vendors may choose to send the required documentation using one of the following options:

- Send the notarized affidavit and E-Verify MOU signature page to: St. Charles County, Attn: Purchasing Manager, 201 N Second Street, Room 541, St. Charles, MO 63301 prior to responding to any solicitations; OR
- Send the notarized affidavit and E-Verify MOU signature page along with a bid solicitation response.

These documents will be kept on file. The notarized affidavit and E-Verify MOU signature page will remain current for one year from the date of the notarized affidavit.

** PLEASE NOTE:

Acceptable enrollment and participation documentation consists of a valid copy of the signature page of the E-Verify Memorandum of Understanding, completed and signed by the Contractor, and the Department of Homeland Security - Verification Division

The online address to enroll in the E-verify program is:

Open Records

Any and all information contained in or submitted with the bid becomes a public record subject to the Missouri Sunshine Law when the bids are opened. If the bidder believes that any information contained in or submitted with the bid is protected from disclosure by the Missouri Sunshine Law, the bidder must clearly identify what information the bidder believes is so protected and must also clearly identify the legal basis therefor.

Veteran Friendly Employment Policy

"Indicate whether you have developed a veteran friendly employment policy and, if so, attach a copy of such policy to your response as a point of information."

_____ "YES" our company has a veteran friendly employment policy.

_____ "NO" our company does not have a veteran friendly employment policy.

Please include a copy of your veteran friendly employment policy with your submission.
Justice Center Chiller Replacement

St. Charles County Government Facilities Management Department is seeking bids for supply and installation of a centrifugal chiller replacement at the criminal justice center and alternates to adding year-round cooling to the mechanical operations.

Scope Description:

The Criminal Justice currently has two chillers that provide cooling only during the summer months. The chiller that is being replaced in this scope of work is a Trane 200-ton CVHE020 CentraVac low pressure centrifugal chiller that was originally installed in the mid 1980’s. The Trane 250-ton helical screw chiller that was installed in 2007 is to remain in use and only have the isolation valves on the evaporator piping replaced with new resilient seal valves and electric actuator. The base bid will also include replacement of the air separator tank and air vent, along with reinsulating all piping associated with the base bid. The replacement of the pressure valve taps on the steel piping will need to be replaced with ¾” sockets welded with a ¾” ball valve with a bushing to tie the piping together with a Tee fitting and a single gauge. The current temperature gauges and thermowells shall also be replaced while using existing threaded socket.

The County also has two bid alternates, Alternate 1 is to replace cooling tower one on the roof and configure the new tower for year-round cooling with a basin heater. This will also include replacing the heat tracing, insulation, and weatherproof jacket on all exposed condenser water and make-up water piping. As part of the alternate bid provide chilled water freeze protection pumps and controls. Alternate 2 is to replace the circulation pumps that circulate condenser water to the cooling tower as well as the chilled water supply and return loop. Alternate 2 includes new chilled water and condenser water pumps with variable frequency drives replace all isolation valves, vibration isolators, triple duty valves, piping of a pressure manifold with isolation valves to a single gauge, and insulation all piping associated with this alternate.

With the replacement chiller, the County is wanting to increase the capacity of the new chiller to 250-tons. The current condenser supply and return piping is 6” diameter .25” wall carbon steel piping, the chilled water supply and return piping is 6” diameter .25” wall carbon steel piping, and the electrical power is a Federal Pacific 480-volt 400-amp fused switch bucket fed from the main switch gear. The new chiller will be a low-pressure centrifugal chiller that utilizes R-514a refrigerant. The County has a new refrigerant monitor that was installed in the mechanical room and the monitor is configured to monitor R-123, R-134a, and R-514a refrigerant. The County elected to specify the R-514a refrigerant for its low global warming potential (GWP) of 2 and an ozone depletion potential (ODP) of zero as well as its non-flammable categorization. With the higher toxicity of 320 ppm occupational exposure limit (OEL), it was incorporated into the parameters of the refrigerant monitoring system while monitoring current refrigerants in the mechanical room.
General Conditions:

- The Contractor must comply with all Federal and State Employment / Labor regulations including those from the U.S. “Occupational Safety and Health Administration”.
- The Contractor must provide all applicable Insurance Certificates to the County upon the award of the bid.
- The Contractor must specifically claim and include any exclusions or deviations from the bid specifications with the proposal submitted.
- The Contractor shall be permitted to work Monday through Friday between the hours of 7:30 am and 4:00 pm. Any changes to the specified work schedule must be approved by the Project Manager at least 2 days before the change occurs.
- The Contractor shall have all proper licenses that are current with the County and State of Missouri.
- The Contractor shall agree to have all employees working in the facility to undergo a background check performed by St Charles County Department of Corrections. The Contractor shall submit a digital photo of the driver’s license of each employee working on site. This is a zero-tolerance policy and ANY employee working in the jail must pass the background check. This could apply to any persons working for the contractor depending on the duration of time in the building. Contractor will always be escorted while working in the secure area of the jail.
- The Contractor is required to have every employee working on the site, that has passed a background check, sign a Prison Rape Elimination Act (PREA) acknowledgement form. This form is attached to the bid document.
- The Contractor shall provide a key contact for when work on the system will be performed. This key contact shall notify the County Project Manager when they will be performing work.
- The County will provide a PDF of the floorplan that equipment is being replaced on. Contractor shall be responsible for providing an as-build drawing showing where devices are located, and device address. This shall be provided to the County in a PDF digital format.
- The Contractor shall notify the project manager of any deficiencies in the building that may impact project cost. The Contractor shall provide a cost for any deficiencies and is to not proceed with work unless a notice to proceed is issued from the project manager. Should the Contractor proceed without proper written authorization, Contractor will be performing work at risk and payment for said work will not be provided.
- There shall be no smoking or use of tobacco products inside the facility, or on the roof of the facility. Contractor shall be liable for roof cigarette burns. No smoking shall be permitted within 15 feet of all building entrances per County Ordinance No. 18-070. This also applies to electronic smoking devices.
- The Contractor shall notify the County Project Manager of no less than 2 days in advance and get permission before proceeding with disruptive operations.
- All new equipment must be tied into the existing Trane Tracer building controls. All programming and compatible controls will be supplied and installed by mechanical contractor.
- Ladders or other equipment used to access the roof must be pulled and stored in a secure location when not in use, and much to be accessible to any inmate.
- A kick-off meeting will be held prior to work commencing to discuss restriction in work environment as a result of working in a correctional environment.
- This is a turnkey project all necessary trades need to be included and a subcontract of the mechanical contractor for the bid to be considered.
- The Contractor must comply with all provisions of the Prevailing Wage Law under Annual Wage Order #27 as amended 7-01-2020 for this project. The contractor will forfeit a penalty to the County of $100 per day (or portion of a day) if a worker is paid less than the prevailing rate for any work done under the contract by the contractor or by any subcontractor (see section 290.250, RSMo). Certified Payroll shall be submitted with request for payment.

Project Specifications and Drawings:

Refer to the attached following document:

G&W Project Manual dated 11-19-20

G&W Engineering Sheets:

M0.0.0 Date 11-19-20
M0.0.1 Date 11-19-20
M0.0.2 Date 11-19-20
M0.0.3 Date 11-19-20
M1.1.1 Date 11-19-20
M1.1.2 Date 11-19-20
M2.1.1 Date 11-19-20
M2.1.2 Date 11-19-20
E.0.0.0 Date 11-19-20
E1.1.1 Date 11-19-20
E1.1.2 Date 11-19-20
E2.1.1 Date 11-19-20
E2.1.2 Date 11-19-20
**Exception Sheet**

If the item(s) and/or services proposed in the response to this bid is in any way different from that contained in this proposal or bid, the bidder is responsible to clearly identify all such differences in the space provided below. Otherwise, it will be assumed that the bidder’s offer is in total compliance with all aspects of the proposal or bid. Below are the exceptions or differences to the stated specifications (attach additional sheets as needed):

Date: ________________

Signature: __________________________________

Title: _________________________________

Company: ______________________________
<table>
<thead>
<tr>
<th>Item</th>
<th>Lump Sum Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical Material</td>
<td>$</td>
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<tr>
<td>Mechanical Labor</td>
<td>$</td>
</tr>
<tr>
<td>Electrical Labor and Material</td>
<td>$</td>
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<tr>
<td>Alternative 1</td>
<td>$</td>
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<tr>
<td>Alternative 2</td>
<td>$</td>
</tr>
<tr>
<td>Bonds: Additional cost to provide Performance and Payment bond if the award exceeds $50,000</td>
<td>$</td>
</tr>
<tr>
<td><strong>Total Contract Amount Including Bond, Alternative 1 and Alternative 2</strong></td>
<td><strong>$</strong></td>
</tr>
</tbody>
</table>

**Authorized Signature:**

_________________________________________________

(signature indicates acceptance of all bid terms and conditions)
Audit Clause for Contracts

Examination of Records

The Contractor's records must include, but not be limited to, accounting records (hard copy, as well as computer readable data), written policies and procedures, subcontractor files, indirect cost records, overhead allocation records, correspondence, instructions, drawings, receipts, vouchers, memoranda, and any other data relating to this contract shall be open to inspection and subject to audit and/or reproduction by the County Auditor, or a duly authorized representative from the County, at the County's expense. The contractor must preserve all such records for a period of three years, unless permission to destroy them is granted by the County, or for such longer period as may be required by law, after the final payment. Since the Contractor is not subject to the Missouri Sunshine Law (Chapter 610, RSMo), information regarding the Contractor's operations, obtained during audits, will be kept confidential.

The Contractor will require all subcontractors under this contract to comply with the provisions of this article by including the requirements listed above in written contracts with the subcontractors.

Vendor Information

Company Name: ___________________________________
Business Address: ________________________________
Business Hours: _________________________________
Phone: ________________________________
Fax: ________________________________
Email address: ________________________________
Contact Person: ________________________________
Authorized Signature: ________________________________
(Indicates acceptance of all bid terms and conditions)
Date: ________________________________
AFFIDAVIT OF WORK AUTHORIZATION

The bidder/contractor who meets the section 285.525, RSMo definition of a business entity must complete and return the following Affidavit of Work Authorization.

Comes now __________________________ (Name of Business Entity Authorized Representative) as __________________________ (Position/Title) first being duly sworn on my oath, affirm __________________________ (Business Entity Name) is enrolled and will continue to participate in the E-Verify federal work authorization program with respect to employees hired after enrollment in the program who are proposed to work in connection with the services related to contract(s) with the County for the duration of the contract(s), if awarded in accordance with subsection 2 of section 285.530, RSMo. I also affirm that __________________________ (Business Entity Name) does not and will not knowingly employ a person who is an unauthorized alien in connection with the contracted services provided to the contract(s) for the duration of the contract(s), if awarded.

In Affirmation thereof, the facts stated above are true and correct. (The undersigned understands that false statements made in this filing are subject to the penalties provided under section 575.040, RSMo.)

Authorized Representative's Signature __________________________  Printed Name __________________________

Title __________________________  Date __________________________

E-Mail Address __________________________

Subscribed and sworn to before me this _______________ of _______________. I am __________________________ (DAY) __________________________ (MONTH, YEAR) commissioned as a notary public within the County of __________________________, State of __________________________, and my commission expires on __________________________.

Signature of Notary __________________________  Date __________________________
EXHIBIT A

ST. CHARLES COUNTY
DOMESTIC PRODUCTS PROCUREMENT ACT (BUY AMERICAN)

The Missouri Domestic Products Procurement Act (34.350-34.359 RSMo) requires that for all bids with a value of $25,000 or more, the goods or commodities purchased by any public agency (which definition includes all political subdivisions of the State, including counties) or used or supplied in the construction, alteration, repair, or maintenance of any public works must be manufactured or produced in the United States. As defined in 34.350 RSMo, United States means the United States of America, the District of Columbia, and all territories and possessions subject to the jurisdiction of the United States. The law also requires that the bidder must provide proof of compliance. Note: In general, if an import tariff is applied to an item, it does not qualify for the Buy American preference. In addition, Most Favored Nation status does not allow application of the preference.

Section A – All Products Are Manufactured or Produced In U.S.
If all products bid qualify as domestic products under Missouri law, complete only Section A.

I hereby certify that all products qualify as domestic, that the information provided is true and correct, and complies with all provisions of Sections 34.350-34.359 RSMo. I understand that any misrepresentation herein constitutes the commission of a class A misdemeanor pursuant to Section 34.355 of the Revised Statutes of Missouri.

SIGNATURE
COMPANY NAME

If Section A is completed, do not complete Section B.

Section B – Only One Product Line or No Products Are Manufactured or Produced In U.S.
If only one product line or no products are manufactured or produced in the U.S. complete only section B.

I hereby certify that there is only one product line or no product manufactured or produced in the U.S., that the information provided is true and correct, and complies with all provisions of Sections 34.350-34.359 RSMo. I understand that any misrepresentation herein constitutes the commission of a class A misdemeanor pursuant to Section 34.355 of the Revised Statutes of Missouri.

SIGNATURE
COMPANY NAME

Section C – Products May Qualify Because of Qualifying Treaty
If some or all products bid qualify for domestic status because of a trade treaty, etc., then the bidder must identify each product, country and qualifying treaty, etc. below. The bidder must list ALL products which are or may qualify as domestic below. If more space is needed, please copy this form and submit as an attachment.

<table>
<thead>
<tr>
<th>BID ITEM NUMBER(S)</th>
<th>COUNTRY WHERE MANUFACTURED OR PRODUCED</th>
<th>QUALIFYING TREATY, LAW, AGREEMENT, OR REGULATION</th>
</tr>
</thead>
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</tbody>
</table>

SECTION C
I hereby certify that the specific items listed above are domestic, that the information provided is true and correct, and complies with all provisions of Sections 34.350-34.359 RSMo. I understand that any misrepresentation herein constitutes the commission of a class A misdemeanor pursuant to Section 34.355 of the Revised Statutes of Missouri.

SIGNATURE
COMPANY NAME
St. Charles County
Department of Corrections

Security Clearance Identification Form

Type:  ☐ EMPLOYEE  ☐ CONTRACTOR  ☐ VOLUNTEER  ☐ OTHER:________________________

Name:_______________________________ SS#:_________ - - -
(First) (M.I.) (Last)

Today’s Date:_______________________

Maiden/alias Name(s):________________________ Date of Birth: __________________________

Driver’s License #:____________________ State of Issue: __________________________

Address:________________________________________________________________________
(Street) (City) (State) (Zip Code)

Home Phone #:______________________ Cell Phone #:____________________

Eye Color:_______ Hair Color:_______ Height:_______

Emergency Contact: _________________________________________________________________
(Name) (Relationship) (Phone #)

Have you ever been arrested or convicted of a crime? ______________________________
If yes, please specify: ______________________________________________________________

Have you ever been incarcerated before? __________ If yes, where and when? ________________

Have you ever visited or communicated with an inmate at our facility or any other facility? If yes,
whom and where? ________________________________________________________________

Do you require any special accommodations for your position at the SCCDOC If yes, what are they?
________________________________________________________________________________

Employment Position:________________________ Company Name:___________________________

SCCDOC Start Date:____________________ Approximate SCCDOC End Date:_______________

__________________________________________________
Director of Corrections/Designee

SCCDOC FORM 119C
I, ______________, having made application for employment, etc. for the position of ______________, or conducting business with in the St. Charles County Department of Corrections (SCCDC), understand that the SCCDOC must gather specific information about prior employment and background to comply with the Prison Rape Elimination Act (PREA) and professional standards. I hereby authorize the SCCDOC to investigate and ascertain any and all information concerning my prior employment and background. I understand that the information or documents may be obtained from any person, institution, or other source for this purpose. I hereby authorize any former employer, volunteer agency, contracted agency or persons from any and all liability for any information or documents furnished to SCCDOC for employment/ PREA backgrounds. (§115.17 [c][2], §115.17[g])

In consideration of this release, the SCCDOC and their subcontractors shall regard all information obtained as confidential. I understand that the same shall not be released to any individual, including myself, or organization, absent good cause.

I agree that the SCCDOC may admit this information into evidence in order to defend any administrative or court proceeding. I retain the right to challenge the accuracy of such information, in such a proceeding, but waive all objections as to the admissibility of the information.

- Have you ever been employed or volunteered for any amount of time in a prison, jail, local lockup, community confinement facility, juvenile facility, or other institution (as defined in 42 U.S.C. 1997) to include facilities for persons who are mentally ill, disabled, chronically ill or handicapped; alcohol or drug rehabilitation, residential care, or treatment facilities, and facilities that provide skill nursing, intermediate or long-term care (28 C.F.R. §115.17 [a][1])?  
  No___ Yes___ If yes, fill out the attached (Consent to Release Information for PREA Compliance form.)

Applicant Signature ________________________________  Print Name ________________________________  Date ________________________________

Staff member receiving this form (name) ________________________________  Date ________________________________

Only sign below if you are refusing to allow the SCCDOC to conduct PREA/Background investigations as listed above:

I ______________, having made application for employment or conducting business with the SCCDOC, do not desire to sign the authorization stated above. I understand that the SCCDOC may not hire or utilize an individual who will come in contact with inmates without conducting a background investigation compliant with the Prison Rape Elimination Act (PREA), and that declining to sign the above authorization will result in my being passed over for such employment or positions.

Applicant Signature ________________________________  Print Name ________________________________  Date ________________________________
CONSENT TO RELEASE INFORMATION FOR PREA COMPLIANCE
EMPLOYMENT RECORD

Complete this form if you have ever been employed or volunteered for any amount of time in a prison, jail, local lockup, community confinement facility, juvenile facility, or other institution to include facilities for persons who are mentally ill, disabled, chronically ill or handicapped; alcohol or drug rehabilitation, residential care, or treatment facilities; and facilities that provide skilled nursing, intermediate or long term care or custodian care. Attach additional sheets if necessary.

Contract Agency (If Applicable):
Facility Name:
Address:
Telephone Number:
Dates of Employment:
Job Title:

Contract Agency (If Applicable):
Facility Name:
Address:
Telephone Number:
Dates of Employment:
Job Title:

Contract Agency (If Applicable):
Facility Name:
Address:
Telephone Number:
Dates of Employment:
Job Title:

Contract Agency (If Applicable):
Facility Name:
Address:
Telephone Number:
Dates of Employment:
Job Title:

SCCDOC FORM 119C
CONTRACTOR’S AGREEMENT FOR
XXXXXXX PROJECT

This agreement made as of the **XX** day of **XXXX** in the year 2021

Between the **Owner:** St. Charles County
201 North Second Street
St. Charles, MO 63301
636-949-7900

And the **Contractor:** Company
Contact
Address
City
Phone

Now therefore, CONTRACTOR and COUNTY, in consideration of mutual covenant herein set forth, agree as follows:

**ARTICLE 1. CONTRACT PRICE**

COUNTY shall pay CONTRACTOR in current funds, for completion of the Work designated in Article 2 in accordance with the Contract Documents, an amount equal to the sum of the established unit prices for each separately identified item of Unit Price Work multiplied by the quantity of that item as indicated in CONTRACTOR’S Bid, for the total amount of **Dollars ($000.00)**.

**ARTICLE 2. SCOPE OF THE WORK**

The scope of the work is described in the Bid Specifications and Contract Documents, including without limitation the Bid Form, which are incorporated herein by this reference.

**ARTICLE 3. TIME OF COMPLETION**

CONTRACTOR shall commence operations upon receiving the written Notice to Proceed from COUNTY and at such time to complete the contract work within the time indicated below. Project completion shall be defined as 100% completion of all items of the project including correction of deficiencies. The project shall be fully complete within **One Hundred and Sixty (210) days** of COUNTY’s Notice to Proceed.

The time of completion is an essential condition of this Contract.

**ARTICLE 4. PAY QUANTITIES AND UNIT PRICES**

COUNTY shall pay the CONTRACTOR for all work done on the basis of the pricing set forth in the Bid Form for all work acceptably completed in accordance with the Contract Documents.
ARTICLE 5. PROGRESS PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment monthly according to the “General Requirements” section entitled “Progress Payments”. Applications for Payment will be processed by COUNTY. COUNTY shall make progress payments on account of the Contract Price on the basis of CONTRACTOR’S Applications for Payment as approved by the COUNTY. All progress payments will be on the basis of the progress of the Work measured by the schedule of values, and in the case of Unit Price Work based on the number of units completed. No progress payments will be made if the CONTRACTOR does not have a current progress schedule accepted by the COUNTY and/or CONTRACTOR has not provided or COUNTY has not approved any required Conditional Waiver and Release on Progress Payment.

ARTICLE 6. FINAL PAYMENT AND ACCEPTANCE

When all work provided for under this contract has been completed in conformance with the Bid Specifications and Contract Documents, and accepted without regard to the provisions of guarantee as provided under the terms of this contract, a final cost estimate shall be prepared by CONTRACTOR and approved by COUNTY and filed with COUNTY and with CONTRACTOR within fifteen (15) days after the date of acceptance of the work as a statement of the amount due the CONTRACTOR. This estimate shall be based on appropriate unit quantities of material placed, including any charges for extra work ordered and properly chargeable under this contract, and deducting any sum properly deductible under this contract.

ARTICLE 7. THE CONTRACT DOCUMENTS

Up to four (4) full sets of drawings and two (2) full sets of Contract Documents will be provided to CONTRACTOR by COUNTY at no cost to CONTRACTOR. CONTRACTOR may purchase additional sets at the printing cost plus ten percent (10%) for handling.

The Contract Documents which comprise the entire agreement between COUNTY and CONTRACTOR concerning the work consist of the following:

a. This Agreement.
b. Exhibits to this Agreement, including the General Requirements.
c. Performance and Payment Bonds.
d. Notice of Award.
e. Notice to Proceed.
f. COUNTY’s Request for Bid No. XX-XXXX and Specifications for the project including the drawings set forth therein.
g. CONTRACTOR’s Proposal Response in response to Request for Bid No. XX-XXXX and Bid Form.
h. All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents, which may be delivered or issued after the Effective Date of the Agreement, and are not attached hereto.

There are no Contract Documents other than those listed in this Article. The Contract Documents may be amended, modified, or supplemented only in one or more of the following ways: (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by a Field Order, or COUNTY’S written interpretation.

_________Intial
or clarification. In the event of a conflict between this Agreement and the other Contract Documents, this Agreement shall control.

ARTICLE 8. RATES OF PAY

CONTRACTOR hereby agrees that the prevailing rates of pay shall be paid to skilled and unskilled labor employed under the terms of this contract. The CONTRACTOR shall forfeit to COUNTY one hundred dollars ($100) for each workman employed, for each calendar day, or portion thereof, such workman is paid less than the said stipulation rates for any work done under said contract, by him or by any subcontractor under him.
ARTICLE 9. PERFORMANCE OF THE WORK

CONTRACTOR, acting as an independent contractor, shall furnish all supervision, labor, equipment, tools, materials, and supplies necessary to perform and shall perform all work in accordance with the Contract Documents and any applicable County ordinances, and state and federal laws. CONTRACTOR represents and warrants that he has special skills which qualify him to perform the Work in accordance with the Contract and that he is free to perform all such work and is not a party to any other agreement, written or oral, the performance of which would prevent or interfere with the performance, in whole or in part, of the work. The prime CONTRACTOR must perform, with its own organization, contract work amounting to not less than 40% of the total original contract.

ARTICLE 10. SUPERVISION

CONTRACTOR shall supervise and direct the work, using CONTRACTOR’S best skill and attention. CONTRACTOR shall be solely responsible for and have control over means, methods, techniques, sequences and procedures and for coordinating all portions of the work under the Contract, unless Contract Documents give other specific instructions concerning those matters.

ARTICLE 11. SAFETY

COUNTY and any consulting engineer hired by the COUNTY may have personnel on the project site from time to time. All information and/or instructions shall be requested in writing by CONTRACTOR and responded to in writing. No opinion or instructions will be given to CONTRACTOR on safety.

CONTRACTOR shall be solely responsible for the safety on and around the project site including shoring, ladders, drop cords, scaffolding, barricades, means, methods, techniques, sequences and procedures.

CONTRACTOR shall comply with all requirements of Section 292.675 RSMo., as amended, which is incorporated herein by this reference. Said statute relates to the OSHA Construction Safety Program. COUNTY hereby notifies CONTRACTOR that the penalties for failure to comply with the training and all other requirements set forth in said statute include the forfeiture of penalties to COUNTY of two thousand five hundred dollars ($2,500.00) plus one hundred dollars ($100.00) for each employee employed by CONTRACTOR or a subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 12. INDEMNITY

To the fullest extent permitted by law, CONTRACTOR shall indemnify and hold harmless COUNTY, any consulting engineer hired by the COUNTY, their consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property other than the work itself, including loss of use resulting there from, but only to the extent caused in whole or in part by negligent acts or omissions of CONTRACTOR, a subcontractor, or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not
such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such
obligation shall not be construed to negate, abridge, or reduce other rights or obligations of
indemnity, which would otherwise exist as to a party or person described in this Article.

In claims against any person or entity indemnified under the above paragraph by an employee
of the CONTRACTOR, a subcontractor, or anyone directly or indirectly employed by them or
anyone whose acts they may be liable, the indemnification obligation under this paragraph shall
not be limited by a limitation on amount or type of damages, compensation or benefits payable
by or for the CONTRACTOR or a subcontractor under workers’ or workmen’s compensation
acts, disability benefit acts or other employee benefit acts.

The obligations of CONTRACTOR under this Article shall not extend to the liability of
COUNTY, the COUNTY’S consultants, and agents and employees of any of them arising out of
(1) the preparation or approval of maps, drawings, opinions, reports, surveys, Change Orders,
designs or specifications, or (2) the giving of or the failure to give directions, after requested in
writing by the CONTRACTOR, or instructions by COUNTY, COUNTY’S consultants, and agents
and employees of any of them provided such instructions or failure to give is the primary cause
of the injury or damage.

ARTICLE 13. TERMINATION BY COUNTY OR CONTRACTOR

(a) If CONTRACTOR is adjudged to be bankrupt, or if CONTRACTOR makes a general
assignment for the benefit of creditors, or if a receiver is appointed on account of
CONTRACTOR’s insolvency, or if CONTRACTOR fails, except in cases for which extension of
time is provided, to make progress in accordance with the project schedule, or if
CONTRACTOR fails to make prompt payment to subcontractors or prompt payment for material
or labor, or disregards laws, ordinances or the instructions of COUNTY, or otherwise breaches
any provision of the Contract Documents, COUNTY may, without prejudice to any other right or
remedy, terminate the contract by giving written notice to CONTRACTOR and his surety. Upon
such notification COUNTY shall be entitled to take possession of the work and of all materials
and equipment thereon and finish the work by whatever method COUNTY may deem expedient,
which may include, but is not limited to, COUNTY itself completing the work or COUNTY hiring
others to complete said work. In such case, CONTRACTOR shall not be entitled to receive any
further payment until the work is finished. If the unpaid balance of the Contract Price shall
exceed the expenses of finishing the work, including additional engineering, architectural,
managerial and administrative expenses, such excess shall be paid to CONTRACTOR. If such
expenses and damages exceed the unpaid balance of the Contract Price, CONTRACTOR shall
pay the difference to COUNTY promptly upon demand. In the event of termination pursuant to
this paragraph, CONTRACTOR, upon the request of COUNTY, shall promptly:
 i. assign to the COUNTY in the manner and to the extent directed by COUNTY all right,
title and interest of the CONTRACTOR under any subcontracts, purchase orders and
construction equipment leases to which CONTRACTOR is a party and which relate to
the work or to construction equipment required therefore, and
 ii. make available to COUNTY to the extent directed by COUNTY all construction
equipment owned by CONTRACTOR and employed in connection with the work.

(b) Performance of the work hereunder may be terminated by COUNTY by giving three (3) days
prior written notice to CONTRACTOR if COUNTY, in its sole discretion, decides to discontinue
or suspend the work. In the event of such termination, as opposed to termination pursuant to

_________ Initial
paragraph (a) of this Article 13, the Contract Price shall be reduced in an equitable manner by agreement between the parties.

ARTICLE 14. AUDIT CLAUSE

Examination of Records

CONTRACTOR’s records which shall include, but not be limited to, accounting records (hard copy, as well as computer readable data), written policies and procedures, subcontractor files, indirect cost records, overhead allocation records, correspondence, instructions, drawings, receipts, vouchers, memoranda, and any other data relating to this contract shall be open to inspection and subject to audit and/or reproduction by the County Auditor, or a duly authorized representative from the COUNTY, at the COUNTY’s expense. The CONTRACTOR shall preserve all such records for a period of three years, unless permission to destroy them is granted by the COUNTY, or for such longer period as may be required by law, after the final payment. Since the CONTRACTOR is not subject to the Missouri Sunshine Law (Chapter 610, RSMo), information regarding CONTRACTOR’s operations obtained during audits will be kept confidential. CONTRACTOR shall require all subcontractors under this contract to comply with the provisions of this Article by including the requirements herein in written contracts with said subcontractors.

ARTICLE 15. CHOICE OF LAW; VENUE.

The Contract Documents shall be governed by and construed in accordance with the laws of the State of Missouri. Venue for any legal action in connection with the Contract Documents shall lie in the Circuit Court of St. Charles County, Missouri.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]
IN WITNESS WHEREOF the parties hereto have caused this instrument to be executed in four (4) original counterparts as of the day and year last written below.

CONTRACTOR

By: ________________________  Date: ______________
Name (printed):_____________________
Title:______________________________

NOTARY:

Subscribed and sworn to before me this _____ day of ____________, 201__. I am commissioned as a notary public within the County of ____________, State of ____________, and my commission expires on ____________.

____________________
Signature of Notary                     Date

Notary seal:

_______ Intial
ST. CHARLES COUNTY, MISSOURI

By: ________________________  Date:______________
    Steve Ehlmann, County Executive

ATTESTED BY:

______________________________
County Registrar

CERTIFICATE OF FINANCE DIRECTOR

I certify pursuant to § 50.660 RSMo., as amended, that there is a balance otherwise unencumbered to the credit of the appropriation to which this contract is chargeable, and a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made, each sufficient to meet this obligation.

______________________________
Bob Schnur, Finance Director

_______Intial
GENERAL REQUIREMENTS

1. SUMMARY OF WORK

The work to be performed under this Contract is summarized as follows: Remove and replace existing fuel island station, underground tank, and equipment.

The complete scope of work is as set forth in Article 2 of the Agreement.

2. GENERAL

COUNTY reserves the right to add or reduce any quantity of all contract bid items at the contract unit price for that item.

3. DRAWINGS

Drawings are included in the Bid Specifications. These drawings and specifications are intended to be so coordinated that any work included in one and not in the other, shall be executed as if included in both.

All work contemplated and described in the Bid Specifications shall be carried out in accordance with the general and detail drawings made a part thereof and with such additional detail drawings and directions as may be given from time to time during the progress of the work. On all drawings, computed dimensions shall take precedence over measurements by scale and full-sized details over scale drawings.

CONTRACTOR shall maintain a record set of drawings at the site and mark thereon any changes as the work proceeds. These drawings shall indicate the vertical and horizontal location of improvements in plan and profile view.

Upon completion of the work, these “as-built” changes shall be transferred, with changes clearly identified, onto blueprint drawings which will be furnished to COUNTY. These “as-built” drawings, certified by a Land Surveyor or Engineer registered in the State of Missouri, shall be delivered to COUNTY for its review and approval prior to final payment.

4. INSURANCE

CONTRACTOR shall maintain all required insurance and provide required certificates in accordance with the insurance requirements listed in the Request for Bid and/or Bid Specifications.

5. PERFORMANCE BOND

A bond will be required for the full amount of the contract price with a surety company, conditioned for the faithful performance of this contract and the guarantee of the work. Both Contract and bond shall be executed in quadruplicate and in a form acceptable to COUNTY. The cost of the performance bond shall be incidental to the price bid.
6. PAYMENT AND MATERIALS BOND

A bond will be required for the full amount (100 percent Labor and Material) of the Contract Price with a surety company. The bond shall be executed in quadruplicate and in a form acceptable to COUNTY. The cost of the payment and materials bond shall be incidental to the price bid.

7. REFERENCE STANDARDS

Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to the laws or regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard specification, manual, code, or laws or regulations in effect at the time of opening of Bids, except as may be otherwise specifically stated. However, no provision of any referenced standard, specification, manual, or code (whether or not specifically incorporated by reference in the Contract Documents) shall be effective to change the duties and responsibilities of COUNTY, CONTRACTOR, or Engineer, or any of their consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to Engineer, or any of Engineer's Consultants, agents, or employees, any duty or authority to supervise or direct the furnishing or performance of the work.

8. LIQUIDATED DAMAGES

Liquidated Damages of $1,000.00 dollars per day for late delivery of project will be enforced after date established by contract, as adjusted by change orders.

9. COORDINATION WITH OTHER CONTRACTORS

There is a possibility that other contractors may be working in the vicinity during the performance of this contract. CONTRACTOR shall inform himself fully of the conditions relating to performance and labor under which the work will be or is now being performed, and CONTRACTOR must employ as far as possible such methods and means in carrying out his work as will not cause any interruptions or interference to any other contractor. When necessary for proper prosecution of work, each contractor shall permit the other access through the overlapping construction areas and the use of any access or haul roads constructed by others.

10. SHOP DRAWINGS

In all cases where details or shop drawings are required, CONTRACTOR shall submit copies of such drawings to COUNTY for review before any of the work is begun. Should extensive changes be necessary, corrected drawings shall be submitted for final review. CONTRACTOR shall thoroughly review the shop drawings for compliance with the Contract Documents before submitting them to COUNTY. The shop drawings shall be stamped “reviewed” by CONTRACTOR before submitting them to COUNTY. When it is required to submit material or equipment, shop drawings, manufacturer’s brochures, or samples for review, said submittals are to be made to COUNTY through the general CONTRACTOR.

Each item submitted for approval must be identified by reference to specification paragraph number and/or plan drawing number.
If the item described or submitted is not exactly as specified by the plans and/or specifications, the procedure shall be as follows:

With the submittal, CONTRACTOR shall state in writing that the item is not exactly as specified by the plans and/or specifications and shall state the difference. COUNTY will then evaluate the submittal and will transmit the accepted or rejected submittal to CONTRACTOR.

When substitutions for the specified items are approved, the submitting CONTRACTOR will be responsible for all costs incurred due to the changes from plans and/or specifications. This includes additional design costs, material and equipment costs and any appurtenant cost that may be incurred by other trades.

COUNTY and/or any consulting engineer hired by COUNTY will not be responsible for errors in the shop drawings which their examination and scrutiny many have failed to detect, and CONTRACTOR shall be absolutely responsible for the correctness of the drawings furnished by it or its subcontractors.

11. RIGHTS-OF-WAY

All improvements will be performed within land owned by COUNTY and the public right-of-way shown on the plans.

Upon completion of the contract work, CONTRACTOR shall restore, without additional cost to COUNTY, all improvements within the vicinity of the Animal Control Facility and right-of-way to substantially the same conditions as they were at the commencement of the work, unless otherwise noted. At project closeout, COUNTY will ensure the conditions of areas located outside of the construction area and existing right-of-way were not damaged, and if damaged were repaired to the same as at the commencement of the work. Non-approval can result in the withholding of final payment.

All costs resulting from the maintenance or improvement of areas outside the construction limits depicted on the plans – such as incidental grading, and the repair of improvements damaged by CONTRACTOR – shall be borne by CONTRACTOR.

12. INSPECTIONS

CONTRACTOR shall assure that representatives of COUNTY shall have the privilege of inspecting and reviewing work done by CONTRACTOR or his subcontractors on this project.

CONTRACTOR shall also assure that all of his subcontractors, if any, maintain all books, documents, papers and other evidence pertaining to cost incurred in connection with the Contract and make such materials available at such CONTRACTOR's office at all reasonable times during the contract period.
13. LABOR POSTINGS

All information as required by state and/or federal wage/labor laws shall be posted by CONTRACTOR on the job site.

14. CONFLICT WITH PERSONNEL

If a conflict between personnel of CONTRACTOR and COUNTY escalates to the point that it hinders the progress of the work and cannot be settled amicably, CONTRACTOR’s personnel involved in the conflict shall be removed from the project.

A personnel conflict shall not give cause for CONTRACTOR to terminate this contract nor to pull off employees from active job sites. If CONTRACTOR withdraws crews, COUNTY may, in its sole discretion, consider the contract to be terminated under the provisions of Article 13 of the Agreement. If COUNTY so determines, notices shall be given as set forth therein.

15. EROSION CONTROL MEASURES

CONTRACTOR will provide as a part of the construction plans an Erosion Control Plan, providing for adequate erosion control and sediment features in accordance with any local, state and federal regulations, including without limitation the St. Charles County Erosion Control and Sediment Guidelines. CONTRACTOR shall submit the proposed Erosion Control Plan to COUNTY for approval prior to the start of construction. CONTRACTOR shall be responsible for maintaining compliance with the Erosion Control Plan until the project is acceptably completed.

16. PROGRESS SCHEDULE

CONTRACTOR shall, prior to or at the preconstruction meeting, prepare and submit to COUNTY for approval a detailed schedule of all operations showing the following:

1. The anticipated time of commencing and completion of various operations to be performed under this contract.
2. The estimated time required for fabrication and/or delivery of all materials and equipment required for the work.
3. Utilities relocations by others and how it affects CONTRACTOR schedules.

COUNTY may require CONTRACTOR to adjust his plan, equipment or construction forces, if progress falls behind the approved schedule such that completion within the specified time appears doubtful.

CONTRACTOR must update the progress schedule and resubmit to COUNTY for acceptance anytime work falls behind the current accepted schedule.

17. PROGRESS REPORTS

CONTRACTOR shall submit progress reports on a monthly basis beginning the first Friday after award of the project and continuing through closeout of the project. The reports shall briefly describe work accomplished during the time period and projected work for the next time period. They shall indicate the project number, and the days CONTRACTOR was unable to work due to
conditions beyond his control (list specific reason, i.e. rain, cold, etc.). They shall be in a neat, legible form and submitted to the COUNTY (four copies).

18. PROGRESS PAYMENTS

CONTRACTOR shall submit original signed monthly pay requests to COUNTY by the tenth of the month. Such pay requests shall include for approval by COUNTY a ‘Conditional Waiver and Release on Progress Payment’ to waive and release any lien, stop payment notice, and/or payment bond rights which any supplier or subcontractor of CONTRACTOR may have for labor or services provided or material delivered to CONTRACTOR for the project. Payment will be made by the first of the next month. The pay request will reflect the following changes and totals made on past invoices for:

- Contract Amount
- Certified Payroll documentation to verify prevailing wage requirements are being met
- Total Change Order amounts
- Pay Item quantities of work completed that month
- Additional pay items
- Previously paid invoices
- Total retainage to date
- Total amount due this pay request

A retainage of five percent (5%) shall be withheld from each partial payment. It will be returned when COUNTY accepts the project as complete.

First payment will not be made until the following items have been approved by COUNTY.

- Project Schedule
- Erosion Control Plan
- Conditional Waiver and Release on Progress Payment

Subsequent progress payments will be suspended unless CONTRACTOR’s project schedule is up to date and acceptable to COUNTY, weekly payroll statements of compliance are current, and COUNTY has approved any applicable Conditional Waiver and Release on Progress Payment.

19. HOURS OF WORK

During central standard time, all work is to be accomplished between the hours of 7:00 a.m. and 4:00 p.m. CST Monday through Friday and between 7:30 a.m. and 4:00 p.m. CST on Saturday. During central daylight savings time, all work is to be accomplished between the hours of 7:00 a.m. and 4:00 p.m. CST Monday through Friday and between 7:30 a.m. and 4:00 p.m. CST on Saturday.

CONTRACTOR shall notify COUNTY no less than 48 hours in advance of any work scheduled to be done on Saturday. No work shall be performed on Sunday. Work outside of these hours, including incidentals, can only be done following a written request to and subsequent written approval from COUNTY.
20. PROTECTION DURING CONSTRUCTION

During the progress of the work, CONTRACTOR shall protect all existing and new work from injury or defacement and particular care shall be taken of all finished parts. Any damage occurring to the work from any cause, including any damage caused by others and utilities, shall be properly repaired and/or replaced at CONTRACTOR’S expense to the satisfaction of COUNTY.

CONTRACTOR is also responsible for any repair and/or maintenance required throughout the project from Notice to Proceed until final acceptance.

21. CLEANING UP

CONTRACTOR shall have all rubbish and debris removed from the premises from time to time as directed by COUNTY. Upon the completion of the work, the premises shall be left in a neat and presentable condition.

22. TEMPORARY FACILITIES

Temporary Toilet For Workmen -- CONTRACTOR shall provide temporary toilet facilities conforming to requirements of all Health and Sanitation Codes for use by workmen employed on the project. The location of the toilet shall be as directed by COUNTY and the facilities shall be kept in a clean, sanitary condition at all times. The cost for the temporary toilet shall be included in the bid price for other work.

Temporary Light and Power -- CONTRACTOR shall provide and pay all charges for temporary light and power as required for the work.

Temporary Water -- CONTRACTOR shall provide and pay for temporary water service as required for the work, including that required for the construction washoff pad.

Temporary Field Office -- CONTRACTOR may provide and maintain a temporary field office for his use. COUNTY shall approve the location of the proposed office. No direct payment will be made for this work.

23. HAULING OVER STREETS

All streets over which hauling is performed shall be kept reasonably clean of spilled or tracked on materials at all times and shall be thoroughly cleaned of such materials daily, within one hour after the suspension of hauling operations if said street is used by the traveling public.

CONTRACTOR will be required to secure from the proper City, County, and State authority any permits which may be required to haul over city, County or state streets, and any hauling operation shall be subject to the requirements of such permits and to any applicable City, County or State regulations and ordinances governing hauling and the movement of equipment over said city, County, or state streets. CONTRACTOR is reminded that they must follow posted weight limits for bridges.
24. PROJECT SURVEYS

All survey staking will be at the sole cost of CONTRACTOR at no additional cost to COUNTY. Stakeout and as-built information will be used to verify actual earthwork quantities. Five (5) business days notification shall be given to COUNTY, or to a consulting engineer hired by the County if so directed, prior to stakeout.

25. PROJECT SUBMITTALS AND CLOSEOUT

25.1 Although not an all-inclusive list, the following submittals shall be required by CONTRACTOR prior to the start of construction:
- Bid Guaranty Submitted: __________
- Contract Agreement Submitted: __________
- Performance Bond Submitted: __________
- Payment & Materials Bond Submitted: __________
- Certificate of Insurance Submitted: __________
- Preliminary Work Schedule Submitted: __________
- List of Desired Substitutions Submitted: __________
- List of Subcontractors Submitted: __________
- List of Suppliers Submitted: __________

25.2 The following documents are required from CONTRACTOR to make Final Payment:
- Prevailing Wage Affidavit (Prime & subcontractors) Submitted: __________
- Contractor's Certification Regarding Settlement of Claims (Prime) Submitted: __________
- Contractor's Final Lien Waiver (Prime) Submitted: __________
- Contractor's Final Lien Waiver (Subcontractor(s)) Submitted: __________
- Contractor's Final Lien Waiver (Supplier) Submitted: __________
- Contractor's Final Pay Invoice (Prime) Submitted: __________

25.3 CONTRACTOR shall close out the project in the following manner or as otherwise directed by COUNTY:
- Final inspection and approval by COUNTY.
- Any claim from his subcontractors, utilities, or adjacent property owners must be cleared.
- Final inspection and approval from all State and County agencies involved in the project.
- CONTRACTOR shall supply as-built markups, if required, on a clean set of drawings.
- CONTRACTOR, including all subcontractors, shall supply final lien waivers for all material, labor and equipment with final pay request.

26. WORK IN EXISTING DRAINAGE AREA

The attention of CONTRACTOR is directed to the fact that the site of the work conveys overland and/or piped storm water drainage. CONTRACTOR shall inform himself fully, of the conditions relating to the construction and labor under which work will be performed. CONTRACTOR shall employ as far as possible such methods and means in carrying out his work as not to cause any interruptions or interference to the flow of storm water. CONTRACTOR shall take special care to prevent the obstruction of the existing or new storm water facilities. In addition, all debris and
material that could cause obstruction to downstream culverts, if a storm were to occur, must be removed immediately. All excavation shall be planned and executed in a manner to minimize the duration of exposure of unprotected soils. All borrow areas and embankments shall be managed to prevent sediment from entering nearby water or land. Disturbed areas shall be restored with permanent vegetative diversion, or siltation retention facilities shall be provided to protect water courses.
PROJECT MANUAL FOR:

ST. CHARLES COUNTY JUSTICE CENTER
CHILLER REPLACEMENT
301 NORTH SECOND STREET
ST. CHARLES, MISSOURI 63301

OWNER:
ST. CHARLES COUNTY GOVERNMENT
300 NORTH SECOND STREET
SUITE 101
ST. CHARLES, MISSOURI 63301

DOCUMENT DATE: NOVEMBER 19, 2020

PRE BID CONFERENCE: DECEMBER 16, 2020 @ 10:00 A.M.

BID OPENING: JANUARY 8, 2021 @ 2:00 P.M.

SCCJC NO: 2005743
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SECTION 23 0516
EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Expansion joints and compensators.

1.02 RELATED REQUIREMENTS
A. Section 23 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

PART 2 PRODUCTS
2.01 EXPANSION JOINTS - DOUBLE SPHERE, FLEXIBLE COMPENSATOR
A. Manufacturers:
B. Pressure Rating, Sizes 1-1/2 Inch to 12 Inch: 100 psi and 100 degrees F.
C. Maximum Compression: 1/2 inch.
D. Maximum Elongation: 1/2 inch.
E. Maximum Offset: 1/4 inch.
F. Maximum Angular Movement: 7 degrees.
G. Joint: Drilled steel flanges.
H. Size: Use pipe sized units.
I. Accessories: Stainless steel limit bolt set at factory.
J. Application: Steel piping 2 inches and over.

PART 3 EXECUTION
3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.

END OF SECTION 23 0516
SECTION 23 0519
METERS AND GAUGES FOR HVAC PIPING

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Flow meters.
B. Pressure gauges and pressure gauge taps.
C. Thermometers and thermometer wells.

1.02  RELATED REQUIREMENTS
A. Section 23 0923 - Direct-Digital Control System for HVAC.
B. Section 23 2113 - Hydronic Piping.

1.03  REFERENCE STANDARDS
A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

1.04  SUBMITTALS
A. Product Data:  Provide list that indicates use, operating range, total range and location for manufactured components.

1.05  FIELD CONDITIONS
A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2  PRODUCTS

2.01  LIQUID FLOW METERS
A. Manufacturers:
B. Calibrated Wafer-type orifice plate designed to be mounted between two flanges with two readout valves with integral check valves, and valve taps, chart for conversion of differential pressure readings to flow rate, with pressure gauge in case.
C. Annular element flow stations with meter set.
   1. Portable Meter Set:  Dry single diaphragm type pressure gauge with 6 inch dial pointer, stainless steel wetted metal parts, variable pulsation damper, equalizing valve, two bleed valves, and master chart for direct conversion of meter readings to flow rate, mounted in rust-proof carrying case with two ten foot long rubber test hoses with brass valves or quick connections for measuring stations.

2.02  PRESSURE GAUGES
A. Manufacturers:
B. Pressure Gauges: ASME B40.100, 304 stainless steel case, phosphor bronze C or coil shaped bourdon tube, OT 59 brass movement, OT 58 brass with restricted orifice socket, with front recalibration adjustment, black scale on white background.
   2. Size:  4 inch diameter.
   3. Full-Scale Accuracy. +/- 1.5 percent.
   4. Scale:  Psi and KPa.
   5. Enclosure Rating: IP65
2.03 PRESSURE GAUGE TAPPINGS
   A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi.

2.04 STEM TYPE THERMOMETERS
   A. Manufacturers:
   B. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
      1. Size: 9 inch scale.
      2. Window: Clear Lexan.
      4. Accuracy: +/- 1 percent, per ASTM E77.
      5. Calibration: Degrees F.

2.05 THERMOMETER WELLS
   A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

PART 3 EXECUTION
3.01 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Provide one pressure gauge per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gauge.
   C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
   D. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets. Refer to Section 23 0943. Where thermometers are provided on local panels, duct or pipe mounted thermometers are not required.
   E. Provide instruments with scale ranges selected according to service with largest appropriate scale.
   F. Install gauges and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
   G. Adjust gauges and thermometers to final angle, clean windows and lenses, and calibrate to zero.

3.02 SCHEDULE
   A. Flow Meters, Location:
      1. Chilled water system.
   B. Pressure Gauges, Location and Scale Range:
      1. Pumps, 0 to 100 psi.
      2. Chiller - across chilled water inlet and outlet, 0 to 100 psi.
      3. Chiller - across condenser water inlet and outlet, 0 to 100 psi.
   C. Pressure Gauge Tappings, Location:
      1. Chiller - chilled and condenser water inlets and outlets.
      2. Pumps - chilled and condenser water inlets and outlets.
   D. Stem Type Thermometers, Location and Scale Range:
      1. Chiller - inlets and outlets, 30 to 240 degrees F.
      2. Chilled water pumps, 30 to 240 degrees F.
3. Condenser water pumps, 30 to 240 degrees F
4. Chiller condenser water - inlets and outlets, 30 to 240 degrees F.

E. Thermometer Sockets, Location:
2. Chilled water pumps - inlets and outlets.
3. Condenser water pumps - inlets and outlets.

END OF SECTION 23 0519
SECTION 23 0523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1  GENERAL

1.01  SECTION INCLUDES
   A.  Applications.
   B.  General requirements.
   C.  Ball valves.
   D.  Butterfly valves.

1.02  RELATED REQUIREMENTS
   A.  Section 23 0553 - Identification for HVAC Piping and Equipment.
   B.  Section 23 0716 - HVAC Equipment Insulation.
   C.  Section 23 0719 - HVAC Piping Insulation.
   D.  Section 23 2113 - Hydronic Piping.

1.03  ABBREVIATIONS AND ACRONYMS
   A.  CWP: Cold working pressure.
   B.  EPDM: Ethylene propylene copolymer rubber.
   C.  NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
   D.  PTFE: Polytetrafluoroethylene.
   E.  TFE: Tetrafluoroethylene.

1.04  REFERENCE STANDARDS
   A.  ASME B1.20.1 - Pipe Threads, General Purpose (Inch); 2013.
   G.  ASME B31.9 - Building Services Piping; 2014.
   K.  AWWA C606 - Grooved and Shouldered Joints; 2015.
   L.  MSS SP-45 - Bypass and Drain Connections; 2003 (Reaffirmed 2008).
   N.  MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010.

1.05  SUBMITTALS
   A.  Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
   B.  Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
C. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, maintenance and repair data, and parts listings.

D. Maintenance Materials: Furnish Owner with one wrench for every five plug valves, in each size of square plug valve head.

1.06 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.
   2. Company must specialize in manufacturing products specified in this section, with not less than three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Minimize exposure of operable surfaces by setting plug and ball valves to open position.
   2. Protect valve parts exposed to piped medium against rust and corrosion.
   3. Protect valve piping connections such as grooves, weld ends, threads, and flange faces.
   4. Adjust butterfly valves to closed or partially closed position.

B. Use the following precautions during storage:
   1. Maintain valve end protection and protect flanges and specialties from dirt.
      a. Provide temporary inlet and outlet caps.
      b. Maintain caps in place until installation.
   2. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

C. Exercise the following precautions for handling:
   1. Handle large valves with sling, modified to avoid damage to exposed parts.
   2. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Provide the following valves for the applications if not indicated on drawings:
   1. Throttling (Hydronic): Butterfly, Ball, Globe, and Angle.
   2. Throttling (Steam): Butterfly, Gate, Ball, and Plug.
   3. Isolation (Shutoff): Butterfly, Gate, Ball, and Plug.
   4. Swing Check (Pump Outlet):
      a. 2 NPS and Smaller: Bronze with bronze disc.
      b. 2-1/2 NPS and Larger: Iron with lever and weight, lever and spring, center-guided metal, or center-guided with resilient seat.
   5. Dead-End: Butterfly, single-flange (lug) type.

B. Substitutions of valves with higher CWP classes or SWP ratings for same valve types are permitted when specified CWP ratings or SWP classes are not available.

C. Required Valve End Connections for Non-Wafer Types:
   1. Steel Pipe:
      a. 2 NPS and Smaller: Threaded ends.
      b. 2-1/2 NPS and Larger: Grooved ends.
   2. Copper Tube:
      a. 2 NPS and Smaller: Threaded ends (Exception: Solder-joint valve-ends).
      b. 2-1/2 NPS and Larger: Grooved ends.
   3. Steam and Steam Condensate Pipe: Grooved ends not acceptable.

D. Chilled Water Valves:
   1. 2 NPS and Smaller, Brass and Bronze Valves:
      a. Threaded ends.
b. Angle: Bronze disc, Class 125.
c. Ball: Full port, one piece, brass trim.
d. Swing Check: Bronze disc, Class.
e. Gate: NRS, Class 125.
f. Globe: Bronze disc, Class 125.

2. 2-1/2 NPS and Larger, Iron Valves:
   a. 2-1/2 NPS to 4 NPS: Threaded ends.
   b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
   c. Single-Flange Butterfly: 2-1/2 NPS to 12 NPS, aluminum-bronze disc, EPDM seat, 200 CWP.
   d. Single-Flange Butterfly: 14 NPS to 24 NPS, aluminum-bronze disc, EPDM seat, 150 CWP.
   e. Grooved-End Butterfly: 2-1/2 NPS to 12 NPS, 175 CWP.
   g. Swing Check: Metal seats, Class 125.
   h. Swing Check with Closure Control: 2-1/2 NPS to 12 NPS, lever and spring, Class 125.
   i. Grooved-End Check: 3 NPS to 12 NPS, 300 CWP.
   j. Center-Guided Check: Compact-wafer, metal seat, Class 125.
   k. Plate-Type Check: Single plate, metal seat, Class 125.
   l. Gate: NRS, Class 125.
   m. Globe: Class 125.
   n. Lubricated Plug: Regular gland, threaded, Class 125.
   o. Eccentric Plug: Resilient seating, 175 CWP.

E. Condenser Water Valves:
1. 2 NPS and Smaller, Brass and Bronze Valves:
   a. Threaded ends.
   b. Angle: Bronze disc, Class 125.
   c. Ball: Full port, one piece, brass trim.
   d. Swing Check: Bronze disc, Class 125.
   e. Gate: NRS, Class 125.
   f. Globe: Bronze disc, Class 125.

2. 2-1/2 NPS and Larger, Iron Valves:
   a. 2-1/2 NPS to 4 NPS: Threaded ends.
   b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
   c. Single-Flange Butterfly: 2-1/2 NPS to 12 NPS, aluminum-bronze disc, EPDM seat, 200 CWP.
   d. Single-Flange Butterfly: 14 NPS to 24 NPS, 150 CWP, aluminum-bronze disc, EPDM seat, 150 CWP.
   e. Grooved-End Butterfly: 2-1/2 NPS to 12 NPS, 175 CWP.
   g. Swing Check: Metal seats, Class 125.
   h. Swing Check with Closure Control, 2-1/2 NPS to 12 NPS: Lever and spring, Class 125.
   i. Grooved-End Swing Check: 3 NPS to 12 NPS, 300 CWP.
   j. Iron Center-Guided Check: 2-1/2 NPS to 24 inch, compact-wafer, metal seat, Class 125.
   k. Iron Plate-Type Check: Single plate, metal seat, Class 125.
   l. Iron Gate: NRS, Class 125.
   m. Iron Globe: 2-1/2 NPS to 12 NPS, Class 125.
   n. Lubricated Plug: Regular gland, Class 125.

F. Heating Hot Water Valves:
1. 2 NPS and Smaller, Brass and Bronze Valves:
   a. Threaded ends.
b. Angle: Bronze disc, Class 125.
c. Ball: Full port, one piece, brass trim.
d. Swing Check: Bronze disc, Class 125.
e. Gate: NRS, Class 125.
f. Globe: Bronze disc, Class 125.

2. 2-1/2 NPS and Larger, Iron Valves:
a. 2-1/2 NPS to 4 NPS: Threaded ends.
b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
c. Single-Flange Butterfly: 2-1/2 NPS to 12 NPS, aluminum-bronze disc, EPDM seat, 200 CWP.
d. Single-Flange Butterfly: 14 NPS to 24 NPS, aluminum-bronze disc, EPDM seat, 150 CWP.
e. Grooved-End Butterfly: 2-1/2 NPS to 12 NPS, 175 CWP.
g. Swing Check: Metal seats, Class 125.
h. Swing Check: 2-1/2 NPS to 12 NPS, lever and spring closure control, Class 125.
i. Grooved-End Swing Check: 3 NPS to 12 NPS, 300 CWP.
j. Center-Guided Check: Compact-wafer, metal seat, Class 125.
k. Plate-Type Check: Single plate, metal seat, Class 125.
l. Gate: NRS, Class 125.
m. Globe: 2-1/2 NPS to 12 NPS, Class 125.

G. Low Pressure Steam Valves (15 PSIG or Less):

1. 2 NPS and Smaller, Brass and Bronze Valves:
a. Angle: Bronze disc, Class 125.
b. Ball: Full port, one piece, brass trim.
c. Swing Check: Bronze disc, Class 125.
d. Gate: NRS, Class 125.
e. Globe: Bronze disc, Class 125.

2. 2-1/2 NPS and Larger, Iron Valves:
a. 2-1/2 NPS to 4 NPS: Threaded or Flanged ends.
b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
d. Swing Check: Metal seats, Class 125.
e. Swing Check: 2-1/2 NPS to 12 NPS, lever and spring closure control, Class 125.
f. Gate: NRS, Class 125.
g. Globe: 2-1/2 NPS to 12 NPS, Class 125.

H. High Pressure Steam Valves (Greater than 15 PSIG):

1. 2 NPS and Smaller, Brass and Bronze Valves:
a. Angle: Bronze disc, Class 125.
b. Ball: Full port, one piece, brass trim.
c. Swing Check: Bronze disc, Class 125.
d. Gate: NRS, Class 125.
e. Globe: Bronze disc, Class 125.

2. 2-1/2 NPS and Larger, Iron Valves:
a. 2-1/2 NPS to 4 NPS: Threaded or Flanged ends.
b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
d. Swing Check: Metal seats, Class 125.
e. Swing Check: 2-1/2 NPS to 12 NPS, lever and spring closure control, Class 125.
f. Gate: NRS, Class 125.
g. Globe: 2-1/2 NPS to 12 NPS, Class 125.

I. Steam-Condensate Valves:

1. 2 NPS and Smaller, Brass and Bronze Valves:
a. Gate: NRS and RS, Class 125.
b. Ball: Full port, one piece, brass trim.
c. Angle: Bronze disc, Class 150.
d. Globe: Bronze disc, Class 125.

2. 2-1/2 NPS and Larger, Iron Valves:
   a. Provide 2-1/2 NPS to 4 NPS with threaded or flanged ends.
   b. Ball: 2-1/2 NPS to 10 NPS, Class 150.
   d. Swing Check: Metal seats, Class 125.
   e. Swing Check: Lever and spring closure control, Class 125.
   f. Gate: NRS, Class 125.
   g. Globe: 2-1/2 NPS to 12 NPS, Class 125.
   h. Lubricated Plug: Threaded, cylindrical, threaded, Class 125.

2.02 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:
   1. Gear Actuator: Quarter-turn valves 8 NPS and larger.
   4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the “Valve Installation” Article.
   5. Motor Operated Actuator: Bray Series 70 Electric Actuator, compact low profile, 90-degree operation, easy access for field wiring and adjustment, built to withstand line vibration, enclosure polyester coated die-cast aluminum, captive cover, two conduit connections, and high visibility valve position display labeled and color coded to indicate position throughout full range of travel. Motor shall be 24VAC 60 Hz. Gear train shall be self-locking, permanently lubricated at factory, with an Oldham coupler to correct any misalignment. Travel switches: Single-pole, double throw Form C Type UL listed and CSA Approved, pre-wired to a terminal block, internal wiring shall range from 12-22 AWG, limit travel in either direction, held in brackets for accurate and repeatable valve position feedback, cams for each travel limit switch shall be infinitely adjustable by finger touch or screw driver.

D. Valves in Insulated Piping: Provide 2-inch stem extensions and the following features:
   1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Memory Stops: Fully adjustable after insulation is installed.

F. Valve-End Connections:

G. General ASME Compliance:

H. Bronze Valves:
   1. Fabricate from dezincification resistant material.
   2. Copper alloys containing more than 15 percent zinc are not permitted.
I. Valve Bypass and Drain Connections: MSS SP-45.

2.03 BRONZE BALL VALVES

A. Two Piece, Full Port with Bronze or Brass Trim:
   1. Comply with MSS SP-110.
   2. SWP Rating: 150 psig.
   3. CWP Rating: 600 psig.
   5. Ends: Threaded.
   6. Seats: PTFE.
   7. Stem: Bronze or brass.
   8. Ball: Chrome plated brass.
   9. Manufacturers:
      b. Viega LLC: www.viega.us/#sle.

2.04 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug type: Bi-directional dead end service without downstream flange.
   1. Comply with MSS SP-67, Type I.
   2. CWP Rating: 150 psig.
   5. Seat: EPDM.
   7. Manufacturers:

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
B. Verify valve parts to be fully operational in all positions from closed to fully open.
C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.
C. Provide butterfly valves with motor actuators on the chilled water supply and return piping at the chiller.
D. Provide butterfly valves with manual handwheel operators on the chilled water and condenser water pumps in the supply and return lines.
E. Provide butterfly valves with manual operator with stops on the supply and return condenser water piping at the chiller and the cooling tower.

END OF SECTION 23 0523
SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Support and attachment components for equipment, piping, and other HVAC/hydronic work.

1.02 RELATED REQUIREMENTS
A. Section 23 0548 - Vibration and Seismic Controls for HVAC.

1.03 REFERENCE STANDARDS
D. MFMA-4 - Metal Framing Standards Publication; 2004.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS
A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
   1. Fiberglass Channel (Strut) Framing Systems: Include requirements for strength derating according to ambient temperature.
B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
   1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.
C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE
A. Comply with applicable building code.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

St. Charles County Justice Center 23 0529 - 1 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
Project No. 2005743
PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
1. Comply with MSS SP-58.
2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
B. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Manufacturers:
      d. Unistrut, a brand of Atkore International Inc: www.unistrut.com/#sle.
      e. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.
   2. Provide factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   4. Channel Material:
      a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
      b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
   5. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: minimum 1/2 inch diameter.
      b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
      c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
      d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
D. Anchors and Fasteners:
   1. Manufacturers - Mechanical Anchors:
      b. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
2. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
3. Concrete: Use expansion anchors or screw anchors.
4. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
7. Steel: Use beam clamps, machine bolts, or welded threaded studs.
10. Plastic and lead anchors are not permitted.
11. Powder-actuated fasteners are not permitted.
12. Hammer-driven anchors and fasteners are not permitted.
13. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify that field measurements are as indicated.
B. Verify that mounting surfaces are ready to receive support and attachment components.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Install products in accordance with manufacturer's instructions.
B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
G. Field-Welding (where approved by Architect): Comply with Section 05 5000.
H. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
I. Equipment Support and Attachment:
   1. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
J. Secure fasteners according to manufacturer's recommended torque settings.
K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL
A. Inspect support and attachment components for damage and defects.
B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 23 0529
SECTION 23 0548
VIBRATION AND SEISMIC CONTROLS FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Vibration isolation requirements.
B. Seismic control requirements.
   1. Includes requirements for seismic qualification of equipment not specified in this section.
C. Vibration isolators.

1.02 RELATED REQUIREMENTS
A. Section 23 0529 - Hangers and Supports for HVAC Piping and Equipment.

1.03 DEFINITIONS
A. HVAC Component: Where referenced in this section in regards to seismic controls, applies to any portion of the HVAC system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., ductwork, piping).
B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.04 REFERENCE STANDARDS
F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

1.05 SUBMITTALS
A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   2. Seismic Controls: Include seismic load capacities.
D. Shop Drawings - Seismic Controls:
   1. Include dimensioned plan views and sections indicating proposed HVAC component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
   2. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   3. Indicate proposed arrangement of distributed system trapeze support groupings.
   4. Indicate proposed locations for distributed system flexible fittings and/or connections.
   5. Indicate locations of seismic separations where applicable.
E. Seismic Design Data:
1. Compile information on project-specific characteristics of actual installed HVAC components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
   a. Component operating weight and center of gravity.
   b. Component elevation in the building in relation to the roof elevation (z/h).
   c. Component importance factor \( (I_p) \).
   d. For distributed systems, component materials and connection methods.
   e. Component amplification factor \( (a_p) \) and component response modification factor \( (R_p) \), determined in accordance with ASCE 7 tables.
   f. Applicability of overstrength factor (for certain anchorage in concrete and masonry).

### 1.06 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

   1. Designer may be employed by the manufacturer of the seismic restraint products.

### PART 2 PRODUCTS

#### 2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing HVAC equipment and/or HVAC connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

   1. Select vibration isolators to provide required static deflection.
   2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
   3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
   4. Select vibration isolators for outdoor equipment to comply with wind design requirements.

#### 2.02 SEISMIC CONTROL REQUIREMENTS

A. Design and provide HVAC component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor HVAC components.

B. Component Importance Factor \( (I_p) \): HVAC components essential to life safety to be assigned a component importance factor \( (I_p) \) of 1.5 as indicated or as required. This includes but is not limited to:

   1. HVAC components required to function for life safety purposes after an earthquake.

C. Seismic Restraints:

   1. Provide seismic restraints for HVAC components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
   2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:

      a. ASHRAE (HVACA).
      b. FEMA 412.
      c. FEMA 413.
      d. FEMA 414.
      e. FEMA E-74.
      f. SMACNA (SRM).
3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

4. Seismic Type Vibration Isolators:
   a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

5. Ductwork Applications:
   a. Provide independent support and seismic restraint for in-line components (e.g., fans, heat exchangers, humidifiers) having an operating weight greater than 75 pounds.
   b. Positively attach appurtenances (e.g., dampers, louvers, diffusers) with mechanical fasteners.

D. Seismic Attachments:
   1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
   2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
   3. Do not use power-actuated fasteners.
   4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
   5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
   6. Concrete Housekeeping Pads:
      a. Increase size of pad as required to comply with anchor requirements.
      b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

E. Seismic Interactions:
   1. Include provisions to prevent seismic impact between HVAC components and other structural or nonstructural components.
   2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

F. Seismic Relative Displacement Provisions:
   1. Use suitable fittings or flexible connections to accommodate:
      a. Relative displacements at connections between components, including distributed systems (e.g., ductwork, piping); do not exceed load limits for equipment utility connections.
      b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
      c. Design displacements at seismic separations.
      d. Anticipated drifts between floors.

2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

2.04 VIBRATION ISOLATORS

A. Manufacturers:
   1. Vibration Isolators:

B. General Requirements:
   2. Spring Elements for Spring Isolators:
a. Color code or otherwise identify springs to indicate load capacity.

b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.

c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.

d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

e. Selected to provide designed deflection of not less than 75 percent of specified deflection.

f. Selected to function without undue stress or overloading.

3. Seismic Snubbing Elements for Seismic Isolators:
   a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

C. Vibration Isolators for Seismic Applications:
   1. Resilient Material Isolator Mounts, Seismic:
      a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
   2. Restrained Spring Isolators, Seismic:
      a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
      b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
      c. Furnished with integral leveling device for positioning and securing supported equipment.
      d. Provides constant free and operating height.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as shown on the drawings.
   B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 CODE-REQUIRED SPECIAL INSPECTIONS
   A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Owner or Architect in accordance with statement of special inspections as required by applicable building code.
   B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
      1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
      2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
   C. Seismic special inspections include, but are not limited to:
      1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with the certificate of compliance.
2. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
3. Installation and anchorage of ductwork designed to carry hazardous materials for Seismic Design Categories C, D, E, and F; periodic inspection.
4. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
C. Secure fasteners according to manufacturer's recommended torque settings.
D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
E. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
      c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
   3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
   4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
   5. Adjust isolators to be free of isolation short circuits during normal operation.
   6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.
F. Seismic Controls:
   1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
   2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
   3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
   4. Equipment with Sheet Metal Housings:
      a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
      b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
      c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
   5. Concrete Housekeeping Pads:
      a. Size in accordance with seismic design to meet anchor requirements.
b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Inspect vibration isolation and/or seismic control components for damage and defects.
C. Vibration Isolation Systems:
   1. Verify isolator static deflections.
   2. Verify required clearance beneath vibration-isolated equipment support bases.
   3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.
D. Seismic Controls:
   1. Verify snubbing element air gaps.
E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION 23 0548
SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Nameplates.
B. Tags.
C. Pipe markers.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
B. Product Data: Provide manufacturers catalog literature for each product required.

PART 2 PRODUCTS

2.01 IDENTIFICATION APPLICATIONS
A. Automatic Controls: Tags. Key to control schematic.
B. Control Panels: Nameplates.
D. Major Control Components: Nameplates.
E. Piping: Pipe markers.
F. Pumps: Nameplates.
G. Thermostats: Nameplates.
H. Valves: Tags.

2.02 NAMEPLATES
B. Letter Height: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances.
C. Background Color: Black.
D. Plastic: Conform to ASTM D709.

2.03 TAGS
A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.
C. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.04 PIPE MARKERS
B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
PART 3 EXECUTION

3.01 PREPARATION
   A. Degrease and clean surfaces to receive adhesive for identification materials.

3.02 INSTALLATION
   A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
   B. Install tags with corrosion resistant chain.
   C. Install plastic pipe markers in accordance with manufacturer's instructions.
   D. Use tags on piping 3/4 inch diameter and smaller.
      1. Identify service, flow direction, and pressure.
      2. Install in clear view and align with axis of piping.
      3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

END OF SECTION 23 0553
SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Testing, adjustment, and balancing of air systems.
B. Testing, adjustment, and balancing of hydronic systems.

1.02 REFERENCE STANDARDS

1.03 SUBMITTALS
A. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit to Architect.
   2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   3. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
   4. Include at least the following in the plan:
      a. Preface: An explanation of the intended use of the control system.
      b. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      c. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      d. Identification and types of measurement instruments to be used and their most recent calibration date.
      e. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      f. Final test report forms to be used.
      g. Detailed step-by-step procedures for TAB work for each system and issue, including:
         1) Terminal flow calibration (for each terminal type).
         2) Diffuser proportioning.
         3) Branch/submain proportioning.
         4) Total flow calculations.
         5) Rechecking.
         6) Diversity issues.
      h. Expected problems and solutions, etc.
      i. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.
      j. Details of how TOTAL flow will be determined; for example:
         1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
         2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.
      k. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
l. Confirmation of understanding of the outside air ventilation criteria under all conditions.
m. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
n. Method of checking building static and exhaust fan and/or relief damper capacity.
o. Proposed selection points for sound measurements and sound measurement methods.
p. Methods for making coil or other system plant capacity measurements, if specified.
q. Time schedule for TAB work to be done in phases (by floor, etc.).
r. Description of TAB work for areas to be built out later, if any.
s. Time schedule for deferred or seasonal TAB work, if specified.
t. False loading of systems to complete TAB work, if specified.
u. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
v. Interstitial cavity differential pressure measurements and calculations, if specified.
w. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
x. Procedures for formal progress reports, including scope and frequency.
y. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Quality-control Testing of Laboratory Fume Hoods:
1. Product Data sheets for all equipment proposed for use in on-site as-installed testing.
2. Sample Test Report.
3. List of laboratory fume hoods to be tested. Submit a minimum of one week prior to commencement of testing.
4. Test data demonstrating that each type of fume hood provided for the project has been successfully tested in the factory as per requirements of Section 11 5313.

D. Field Logs: Submit at least twice a week to the Commissioning Authority.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Progress Reports.

G. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Revise TAB plan to reflect actual procedures and submit as part of final report.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
6. Include the following on the title page of each report:
   a. Name of Testing, Adjusting, and Balancing Agency.
   b. Address of Testing, Adjusting, and Balancing Agency.
   c. Telephone number of Testing, Adjusting, and Balancing Agency.
   d. Project name.
   e. Project location.
   f. Project Engineer.
   g. Project Contractor.
   h. Report date.
PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. SMACNA (TAB).
   3. NEBB, National Environmental Balancing Bureau
   4. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

F. Pre-Qualified TAB Agencies:
   1. Dynamic Air Solutions.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Hydronic systems are flushed, filled, and vented.
   5. Pumps are rotating correctly.
   6. Proper strainer baskets are clean and in place.
   7. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
   1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

A. Hydronic Systems: Adjust to within plus or minus 10 percent of design.
3.05 RECORDING AND ADJUSTING
A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   4. Lists of completed tests.
B. Ensure recorded data represents actual measured or observed conditions.
C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
H. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 WATER SYSTEM PROCEDURE
A. Adjust water systems to provide required or design quantities.
B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
D. Effect system balance with automatic control valves fully open to heat transfer elements.
E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

3.07 SCOPE
A. Test, adjust, and balance the following:
   1. HVAC Pumps.
   2. Centrifugal Water Chillers.
   3. Cooling Towers.

3.08 MINIMUM DATA TO BE REPORTED
A. Pumps:
   1. Identification/number.
   2. Manufacturer.
   3. Size/model.
   4. Impeller.
   5. Service.
   6. Design flow rate, pressure drop, BHP.
   7. Actual flow rate, pressure drop, BHP.
   8. Discharge pressure.
   10. Total operating head pressure.
11. Shut off, discharge and suction pressures.
12. Shut off, total head pressure.

B. Chillers:
1. Identification/number.
2. Manufacturer.
3. Capacity.
4. Model number.
5. Serial number.
6. Evaporator entering water temperature, design and actual.
7. Evaporator leaving water temperature, design and actual.
8. Evaporator pressure drop, design and actual.
9. Evaporator water flow rate, design and actual.
10. Condenser entering water temperature, design and actual.
11. Condenser pressure drop, design and actual.
12. Condenser water flow rate, design and actual.

C. Cooling Tower:
1. Tower identification/number.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Rated capacity.
6. Entering air WB temperature, specified and actual.
7. Leaving air WB temperature, specified and actual.
8. Ambient air DB temperature.
9. Condenser water entering temperature.
10. Condenser water leaving temperature.
11. Condenser water flow rate.
12. Fan RPM.

END OF SECTION 23 0593
SECTION 23 0716
HVAC EQUIPMENT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Equipment insulation.
   B. Covering.

1.02 RELATED REQUIREMENTS
   A. Section 23 0553 - Identification for HVAC Piping and Equipment.
   B. Section 23 2113 - Hydronic Piping: Placement of hangers and hanger inserts.
   C. Section 23 2114 - Hydronic Specialties.

1.03 REFERENCE STANDARDS

1.04 SUBMITTALS
   A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for equipment scheduled.
   B. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS
   A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 FLEXIBLE ELASTOMERIC CELLULAR INSULATION
   A. Manufacturer:
      1. Aeroflex USA, Inc: www.aeroflexusa.com/#sle.
   B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1, in sheet form.
      1. Minimum Service Temperature: Minus 40 degrees F.
      2. Maximum Service Temperature: 220 degrees F.
   C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION
   A. Install in accordance with manufacturer's instructions.
   B. Factory Insulated Equipment: Do not insulate.
   C. Exposed Equipment: Locate insulation and cover seams in least visible locations.
D. Apply insulation close to equipment by grooving, scoring, and beveling insulation. Fasten insulation to equipment with studs, pins, clips, adhesive, wires, or bands.

E. Fill joints, cracks, seams, and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

F. Insulated equipment containing fluids below ambient temperature; insulate entire system.

G. Fiber glass insulated equipment containing fluids below ambient temperature; provide vapor barrier jackets, factory-applied or field-applied. Finish with glass cloth and vapor barrier adhesive.

H. Inserts and Shields:
   1. Application: Equipment 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between hangers and inserts.
   3. Insert Location: Between support shield and equipment and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

I. Finish insulation at supports, protrusions, and interruptions.

J. Equipment in Mechanical Equipment Rooms or Finished Spaces: Finish with PVC jacket and fitting covers from floor level to 8-feet above finished floor.

K. Exterior Applications:
   1. Provide vapor barrier jacket or finish with glass mesh reinforced vapor barrier cement.
   2. Cover with aluminum.

L. Equipment Requiring Access for Maintenance, Repair, or Cleaning: Install insulation so it can be easily removed and replaced without damage.

3.03 SCHEDULE

A. Cooling Systems:
   1. Pump Bodies:
   2. Air Separators:
   3. Chiller Cold Surfaces (Not Factory Insulated):

END OF SECTION 23 0716
SECTION 23 0719
HVAC PIPING INSULATION

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Piping insulation.
B. Jackets and accessories.

1.02  REFERENCE STANDARDS

B. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

1.03  SUBMITTALS

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.04  QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the type of work specified in this section and approved by manufacturer.

1.05  DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2  PRODUCTS

2.01  REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02  GLASS FIBER

A. Manufacturers:

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
   1. K Value: ASTM C177, 0.23 at 75 degrees F.
   2. Maximum Service Temperature: 220 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.

F. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Manufacturer:
   1. Aeroflex USA, Inc; Aerocel: www.aeroflexusa.com/#sle.

B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
   1. Minimum Service Temperature: 40 degrees F.
   2. Maximum Service Temperature: 180 degrees F.

C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.04 JACKETS

A. PVC Plastic.
   1. Manufacturers:
      c. Proto Corporation; LoSmoke.
      d. Speedline Corporation; SmokeSafe.
   2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
      a. Minimum Service Temperature: 0 degrees F.
      b. Maximum Service Temperature: 150 degrees F.
      c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
      d. Thickness: 10 mil.
      e. Connections: Brush on welding adhesive.

   1. Thickness: 0.016 inch sheet.
   2. Finish: Smooth.
   4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
C. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
   1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
   2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

D. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

E. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

F. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

G. Heat Traced Piping: Insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.03 SCHEDULE

A. Cooling Systems:
   1. Chilled Water:
   2. Condenser Water:

B. Other Systems:
   1. Piping Exposed to Freezing with Heat Tracing:

END OF SECTION 23 0719
SECTION 23 0913
INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Control panels.
B. Control Valves:
   1. Ball valves and actuators.
   2. Globe pattern.
   4. Electronic operators.
C. Damper Operators:
   1. Electric operators.
   2. Inlet vane operators.
D. Input/Output Sensors:
   1. Temperature sensors.
   2. Static pressure (air pressure) sensors.
   3. Equipment operation (current) sensors.
   4. Digital to pneumatic transducers.
   5. Damper position indicators.
E. Thermostats:
   1. Low-limit temperature cutout switch (freezestat)
   2. Outdoor reset thermostats.
F. Transmitters:
   1. Pressure transmitters.
   2. Air pressure transmitters.
   3. Temperature transmitters.
G. Transducers:
   1. Electropneumatic transducers.

1.02 RELATED REQUIREMENTS

A. Section 23 0923 - Direct-Digital Control System for HVAC.
B. Section 23 2113 - Hydronic Piping: Installation of control valves, flow switches, temperature sensor sockets, and gauge taps.
C. Section 23 2114 - Hydronic Specialties.
D. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2013.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.

1.05 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL
A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS
A. NEMA 250, general purpose utility enclosures with enameled finished face panel.
B. Provide common keying for all panels.

2.03 CONTROL VALVES
A. Ball Valves and Actuators:
   1. Manufacturers:
      a. Belimo Aircontrols (USA), Inc; www.belimo.com/#sle.
   2. Service: Use for chilled water or hot water.
   3. Flow Characteristic: Include 3-way mixing operation configured to fail normally closed (NC).
   4. Replacements in Kind: Provide pressure-independent type.
   5. Rangeability: 500 to 1.
   6. ANSI Rating: Class 150.
   7. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
   8. Body Size:
      a. Under 2-1/2 inches:
         1) Connection: NPT.
         2) Materials:
            (a) Body: Brass.
            (b) Flanges: Ductile iron.
            (c) Ball: Chrome-plated brass.
            (d) Stem: Nickel-plated brass.
            (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
            (f) Stem Seal: EPDM O-Rings.
            (g) Flow Control Disk: Thermoplastic synthetic-resin.
      b. Service Temperature:
         1) Fluid Side: 0 to 284 degrees F liquid or 25 psig steam.
         2) Ambient Side: From minus 4 to 122 degrees F.
   9. Actuator Requirements:
      b. Input: 0 to 5 VDC configured for proportional control.
      c. Accessories: Provide with valve position indicator and manual override.

B. Globe Pattern:
   1. Over 2 inches: Iron body, bronze trim, rising stem, plug-type disc, flanged ends, renewable seat and disc.
   2. Hydronic Systems:
      a. Rate for service pressure of 125 psig at 250 degrees F.
      b. Replaceable plugs and seats of stainless steel.
      c. Size for 3 psig maximum pressure drop at design flow rate.
      d. Three way valves linear characteristics. Size two-way valve operators to close valves against pump shut off head.

C. Butterfly Pattern:
   1. Iron body, bronze disc, resilient replaceable seat for service to 180 degrees F wafer or lug ends, extended neck.
   2. Hydronic Systems:
      a. Rate for service pressure of 125 psig at 250 degrees F.
      b. Size for 1 psig maximum pressure drop at design flow rate.
D. Electronic Operators:
   1. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
   2. Select operator for full shut off at maximum pump differential pressure.

2.04 DAMPER OPERATORS

A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.

B. Electric Operators:
   1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch.

C. Inlet Vane Operators:
   1. High pressure with pilot positioners and sufficient force to move vanes when fan is started with vanes in closed position. Return vane operator to closed position on fan shutdown.

2.05 INPUT/OUTPUT SENSORS

A. Temperature Sensors:
   1. Use thermistor or RTD type temperature sensing elements with characteristics resistant to moisture, vibration, and other conditions consistent with the application without affecting accuracy and life expectancy.
   2. Temperature Sensing Device: Compatible with project DDC controllers.
   3. Performance Characteristics:
      a. RTD:
         1) Duct Averaging Accuracy: Plus/minus 0.50 degrees F minimum.
         2) Chilled Water Accuracy: Plus/minus 0.50 degrees F minimum.
         3) All Other Accuracy: Plus/minus 0.75 degrees F minimum.
         4) Range: Minus 40 degrees F through 220 degrees F minimum.
      b. Thermistor:
         1) Accuracy (All): Plus/minus 0.36 degrees F minimum.
         2) Range: Minus 25 degrees F through 122 degrees F minimum.
         3) Heat Dissipation Constant: 2.7 mW per degree C.
      c. Temperature Transmitter:
         1) Accuracy: 0.10 degree F minimum or plus/minus 0.20 percent of span.
         2) Output: 4 to 20 mA.
      d. Temperature Averaging Elements:
         1) Use averaging elements where prone to stratification with sensor length 8 ft, 16 ft, or 24 ft.

B. Static Pressure (Air Pressure) Sensors:
   1. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F.
   2. Accuracy: One percent of full scale with repeatability 0.3 percent.
   3. Output: 0 to 5 vdc with power at 12 to 28 vdc.

C. Equipment Operation (Current) Sensors:
   1. Status Inputs for Fans: Differential pressure switch with adjustable range of 0 to 5 inches wg.
   2. Status Inputs for Pumps: Differential pressure switch piped across pump with adjustable pressure differential range of 8 to 60 psi.

D. Digital to Pneumatic Transducers:
   1. Convert plus or minus 12 vdc pulse width modulation outputs to 0 to 20 psi.
E. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.

2.06 THERMOSTATS
A. Low-Limit Temperature Cutout Switch (low-limit thermostat or freeze stat):
   2. Sensing Length: 4 feet.
   5. Sensing Range: 15 to 55 degrees F.
   7. Field Interface: Connect load line-voltage to stater.
   8. Electrical Rating: Pilot duty, 125 VA at 125 to 600 VAC.

B. Outdoor Reset Thermostats:
   1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.

2.07 TRANSMITTERS
A. Pressure Transmitters:
B. Air Pressure Transmitters:
   1. General: Provide dry media differential pressure transducers to monitor duct and room pressure.
      a. Media Compatibility: Dry air.
      b. Input Power: Class 2; 12 to 30 VDC; 2-wire: 20 mA max.
      c. Output: Field selectable, 2-wire, loop-powered 4 to 20 mA (DC only, clipped and capped).
      d. Pressure Ranges: 4 and 7, field selectable.
      e. Response Time:
         1) Standard: T95 in 20 seconds.
         2) Fast: T95 in 2 seconds.
         3) Switch selectable.

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Beginning of installation means installer accepts existing conditions.
C. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.

3.02 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Mount control panels adjacent to associated equipment on vibration free walls or free standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and engraved plastic nameplates on cabinet face.
C. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.
SECTION 23 0923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES
A. System description.
B. Operator interface.
C. Controllers.
D. Power supplies and line filtering.
E. System software.
F. Controller software.
G. HVAC control programs.
H. Chiller control programs.

1.02 RELATED REQUIREMENTS
A. Section 23 0913 - Instrumentation and Control Devices for HVAC.
B. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS
D. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2014g.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
G. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

1.05 SUBMITTALS
A. Product Data: Provide data for each system component and software module.
B. Shop Drawings:
   1. Indicate trunk cable schematic showing programmable control unit locations, and trunk data conductors.
   2. List connected data points, including connected control unit and input device.
   3. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration digital media containing graphics.
   4. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
   5. Indicate description and sequence of operation of operating, user, and application software.
C. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.
D. Designer's Qualification Statement.
E. Manufacturer's Qualification Statement.
F. Installer's Qualification Statement.

G. Project Record Documents: Record actual locations of control components, including control units, control panels, thermostats, and sensors.
   1. Revise shop drawings to reflect actual installation and operating sequences.
   2. Include submittals data in final "Record Documents" form.

H. Operation and Maintenance Data:
   1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
   2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
   3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.

I. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner’s name and registered with manufacturer.

1.06 QUALITY ASSURANCE
   A. Perform work in accordance with NFPA 70.
   B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
   C. Installer Qualifications: Company specializing in performing work of the type specified and with minimum three years of documented experience.
   D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

1.07 WARRANTY
   A. Correct defective Work within a five year period after Substantial Completion.
   B. Provide five year manufacturer's warranty for field programmable micro-processor based units.

1.08 PROTECTION OF SOFTWARE RIGHTS
   A. Prior to delivery of software, the Owner and the party providing the software will enter into a software license agreement with provisions for the following:
      1. Limiting use of software to equipment provided under these specifications.
      2. Limiting copying.
      3. Preserving confidentiality.
      4. Prohibiting transfer to a third party.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   C. Schneider Electric: www.schneider-electric.us/#sle.
   D. Siemens AG, Building Technologies Division: www.siemens.com/#sle.

2.02 SYSTEM DESCRIPTION
   A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.
   B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
   C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
D. Controls for variable air volume terminals, radiation, reheat coils, unit heaters, fan coils, and the like when directly connected to the control units. Individual terminal unit control is specified in Section 23 0913.

E. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.03 OPERATOR INTERFACE

A. PC Based Work Station:
   1. Resides on high speed network with building controllers.
   2. Connected to server for full access to all system information.

B. Workstation, controllers, and control backbone to communicate using BACnet protocol and addressing.

C. BACnet protocol to comply with ASHRAE Std 135.

D. LonTalk protocol to comply with CTA-709.1.

E. Hardware:

2.04 BACNET WEB SERVER

A. The WEB Server Hardware shall comply with the following.
      a. Where multiple simultaneous user access is not required, hardware platform may alternately be at a minimum Microsoft Windows 10 Professional.
   2. Processor: Pentium Quad Core 2 GHz
   3. Memory: 4 GB minimum

B. The WEB Server Database shall comply with the following:
   1. Complete controller database of each building controller, custom application controller, and application specific controller shall reside (at a minimum) within the respective device. The Web Server Hardware may retain and utilize a backup of the database within each device; however, the complete and original database must reside in the building controllers, custom application controllers, and application specific controllers.

C. The WEB Server Software shall comply with the following:
   1. Provide licensed copy of the Control System WEB Enabled Application Software described in Section 2.4. This license shall allow unlimited isolated systems to be served and access by an unlimited number of users.
   2. The Owner shall sign a copy of the manufacturer's standard software and firmware licensing agreement as a condition of this contract. Such license shall grant use of all programs and application software to Owner and defined by the manufacturer's license agreement, but shall protect manufacturer's rights to disclosure of trade secrets contained within such software.
      a. Manufacturer's Standard Software and Firmware licensing agreement shall be executed by Owner in writing prior to software acquisition and/or installation.

2.05 WEB BASED HTML BROWSER INTERFACE

A. Web Based:
   1. HTML based browser interface (Web Server) for accessing the DDC System. This shall include all hardware and software to provide an Ethernet twisted pair connection to the owners local or wide area network (LAN or WAN) that can be used to access the DDC system through a standard internet browser.
   2. All information shall be provided to the owners IT staff to facilitate connection through the owners LAN/WAN.
3. At a minim, this interface shall be capable of all functions described under the Operator Interface section, Password Protection, Operator Commands, and Logs and Summary subsections of this specification.

2.06 WEB ENABLED APPLICATION SOFTWARE

A. The WEB Enabled Application software and Graphical User Interface (GUI) is to be stored on the WEB had disk drive server. WEB Enabled Applications that require system graphics to be stored on the client machines will not be acceptable. The application shall support unlimited access by 20 simultaneous clinets using standard Web brower such as Internet Explorer.

B. The WEB enabled application shall perform native BACnet internetwork. Applications that require translation of data, gateways, or mapping of any kind shall not be acceptable.

C. The WEB Enabled Application shall provide the same methodology as the Operator Interface application when viewing the BACnet Internetwork in terms of network architecture, system graphics, calendars, logs, etc. systems utilizing Web Enabled Applications and Control Operator Workstation Applications of different manufacturer shall implement both applications so that the methodology is the same. Control Systems that utilize different methodology between the WEB Enabled Application and the Control System Operator Workstation Application for network architecture views, system graphic presentation or request, object, schedule or alarm interaction will not be acceptable.

D. Real-time values displayed on a Web page shall update automatically without requiring a manual "refresh" of the Web page.

E. Users shall have administrator defined access privileges. Depending on the access privileges assigned, the user shall be able to utilize those features described herein at different levels of interface varying between View only and Modify.

F. HTML programming shall not be required to create or display system graphics or data on a Web page.

G. A new point displayed on the Operator Interface graphic screen shall appear automatically on the identical graphic screen served by the web-server with no further programming or file transfer required.

H. The WEB Enable Application shall support via the Web Browser client the following as it is described in the Control System Operator Workstation Application as a minimum:

1. Password Protection
2. Alarming and Event Notification
3. Weekly, Annual and Special Event Exception Scheduling
4. Trend Log Graphing, and the capability to export in ASCII and Microsoft Excel format
5. Runtime Log Information
6. Ability to Manually Override any Database point
7. Ability to Adjust any Setpoint

I. The WEB Enabled Application shall support via the Web Browser client the following in addition to what is described above.

1. Color Graphical User Interface (GUI)
   a. All color graphic displays shall be dynamic with current point data automatically updated from the BACnet internetwork to browser without operator intervention. Manual operator intervention shall use the same methodology as on the Operator Interface application.
   b. Depending upon configured access level; the operator shall be able to manually adjust digital, analog or calculated values in the system, adjust values of control loops, override points to automatic mode.

2. System Graphic screens developed for the Operator Interface shall be the same image file used for the Web Browser Client. Systems, which require special translation or re-export of graphics to accommodate the web domain, will not be accepted. The Web Browser client shall support any System Graphic animation supported by the Operator Interface. System Graphic screens on the Web Browser client shall support hypertext links to other
location on the Internet or on Intranet sites by specifying the Uniform Resource Locator (URL) for the desired link.

J. The WEB Enabled Application shall provide the capability to create a user's (as determined by the log-on user identification) home page. Provide the ability to limit a specific user to a defined home page. From the home page, links to other views, or pages in the system shall be possible, if allowed by the system administrator.

K. The WEB Enable Application shall include an Audit Trail feature that automatically records the time, date, and user, and action associated with all user changes made via Web Browser clients.

L. The WEB Enable Application shall store complete help files describing system configuration, and use of the Browser Client interface. The help files shall be served on-line as part of the Browser Client interface. Creation, storage and serving of custom-made help files by the owner shall be possible, in lieu of the manufacturer's help files.

2.07 CONTROLLERS

A. Building Controllers:
   1. General:
      a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.
      b. Provide sufficient memory to support controller's operating system, database, and programming requirements.
      c. Share data between networked controllers.
      d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
      e. Utilize real-time clock for scheduling.
      f. Continuously check processor status and memory circuits for abnormal operation.
      g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
      h. Communication with other network devices to be based on assigned protocol.

   2. Communication:
      a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.
      b. Perform routing when connected to a network of custom application and application specific controllers.
      c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

   3. Anticipated Environmental Ambient Conditions:
      a. Outdoors and/or in Wet Ambient Conditions:
         1) Mount within waterproof enclosures.
         2) Rated for operation at 40 to 150 degrees F.
      b. Conditioned Space:
         1) Mount within dustproof enclosures.
         2) Rated for operation at 32 to 120 degrees F.

   4. Local Keypad and Display for each Controller:
      a. Use for interrogating and editing data.
      b. System security password prevents unauthorized use.

   5. Provisions for Serviceability:
      a. Diagnostic LEDs for power, communication, and processor.
      b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

   6. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

   7. Power and Noise Immunity:
a. Maintain operation at 90 to 110 percent of nominal voltage rating.
b. Perform orderly shutdown below 80 percent of nominal voltage.
c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

B. Custom Application Controller:
   1. General:
      a. Provide sufficient memory to support controller's operating system, database, and programming requirements.
      b. Share data between networked, microprocessor based controllers.
      c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.
      d. Utilize real-time clock for scheduling.
      e. Continuously check processor status and memory circuits for abnormal operation.
      f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.
      g. Communication with other network devices to be based on assigned protocol.
   2. Communication:
      a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
      b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
   3. Anticipated Environmental Ambient Conditions:
      a. Outdoors and/or in Wet Ambient Conditions:
         1) Mount within waterproof enclosures.
         2) Rated for operation at 40 to 150 degrees F.
      b. Conditioned Space:
         1) Mount within dustproof enclosures.
         2) Rated for operation at 32 to 120 degrees F.
   4. Local Keypad and Display for each Controller:
      a. Use for interrogating and editing data.
      b. System security password prevents unauthorized use.
   5. Provisions for Serviceability:
      a. Diagnostic LED’s for power, communication, and processor.
      b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
   6. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
   7. Power and Noise Immunity:
      a. Maintain operation at 90 to 110 percent of nominal voltage rating.
      b. Perform orderly shutdown below 80 percent of nominal voltage.
      c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

C. Application Specific Controllers:
   1. General:
      a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.
      b. Customized for operation within the confines of equipment served.
      c. Communication with other network devices to be based on assigned protocol.
   2. Communication:
      a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.
      b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.
3. Anticipated Environmental Ambient Conditions:
   a. Outdoors and/or in Wet Ambient Conditions:
      1) Mount within waterproof enclosures.
      2) Rated for operation at 40 to 150 degrees F.
   b. Conditioned Space:
      1) Mount within dustproof enclosures.
      2) Rated for operation at 32 to 120 degrees F.
4. Local Keypad and Display for each Controller:
   a. Use for interrogating and editing data.
   b. System security password prevents unauthorized use.
5. Provisions for Serviceability:
   a. Diagnostic LEDs for power, communication, and processor.
   b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.
6. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
7. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.
D. Input/Output Interface:
   1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
   2. All Input/Output Points:
      a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
      b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
   3. Binary Inputs:
      a. Allow monitoring of On/Off signals from remote devices.
      b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
      c. Sense dry contact closure with power provided only by the controller.
   4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
   5. Analog Inputs:
      a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
      b. Compatible with and field configurable to commonly available sensing devices.
   6. Binary Outputs:
      a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
      b. Outputs provided with three position (On/Off/Auto) override switches.
      c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.
   7. Analog Outputs:
      a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.
      b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.
      c. Drift to not exceed 0.4 percent of range per year.
8. Tri State Outputs:
   a. Coordinate two binary outputs to control three point, floating type, electronic actuators
      without feedback.
   b. Limit the use of three point, floating devices to the following zone and terminal unit
      control applications:
      1) VAV terminal units.
      2) Duct mounted heating coils.
      3) Zone dampers.
      4) Radiation.
   c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours
      for verification of operator tracking.

9. System Object Capacity:
   a. System size to be expandable to twice the number of input output objects required by
      providing additional controllers, including associated devices and wiring.
   b. Hardware additions or software revisions for the installed operator interfaces are not
      to be required for future, system expansions.

2.08 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:
   1. Provide UL listed control transformers with Class 2 current limiting type or over-current
      protection in both primary and secondary circuits for Class 2 service as required by the
      NEC.
   2. Limit connected loads to 80 percent of rated capacity.
   3. Match DC power supply to current output and voltage requirements.
   4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
   5. Regulation to be 1 percent combined line and load with 100 microsecond response time
      for 50 percent load changes.
   6. Provide over-voltage and over-current protection to withstand a 150 percent current
      overload for 3 seconds minimum without trip-out or failure.
   7. Operational Ambient Conditions: 32 to 120 degrees F.
   8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD 810 for shock and
      vibration.
   9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:
   1. Provide external or internal transient voltage and surge suppression component for all
      workstations and controllers.
   2. Minimum surge protection attributes:
      a. Dielectric strength of 1000 volts minimum.
      b. Response time of 10 nanoseconds or less.
      c. Transverse mode noise attenuation of 65 dB or greater.
      d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.09 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).
B. LAN Capacity: Not less than 60 stations or nodes.
C. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.
D. LAN Data Speed: Minimum 19.2 Kb.
E. Communication Techniques: Allow interface into network by multiple operation stations and by
   auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.
F. Transmission Median: Fiber optic or single pair of solid 24 gage twisted, shielded copper cable.
G. Network Support: Time for global point to be received by any station, shall be less than 3
   seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable
is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.10 SYSTEM SOFTWARE

A. Operating System:
   1. Concurrent, multi-tasking capability.
      b. Acceptable Operating Systems: TBD.

2. System Graphics:
   a. Allow up to 10 graphic screens, simultaneously displayed for comparison and monitoring of system status.
   b. Animation displayed by shifting image files based on object status.
   c. Provide method for operator with password to perform the following:
      1) Move between, change size, and change location of graphic displays.
      2) Modify on-line.
      3) Add, delete, or change dynamic objects consisting of:
         (a) Analog and binary values.
         (b) Dynamic text.
         (c) Static text.
         (d) Animation files.

3. Custom Graphics Generation Package:
   a. Create, modify, and save graphic files and visio format graphics in TIFF, .dwg, and JPG, BMP, SWF, PNG formats.
   b. HTML graphics to support web browser compatible formats.
   c. Capture or convert graphics from AutoCAD.

4. Standard HVAC Graphics Library:
   a. HVAC Equipment:
      1) Chillers.
      2) Boilers.
      3) Air Handlers.
      4) Terminal HVAC Units.
      5) Fan Coil Units.
      6) Unit Ventilators.
      7) Roof Top Units.
   b. Ancillary Equipment:
      1) Fans.
      2) Pumps.
      3) Coils.
      4) Valves.
      5) Piping.
      6) Dampers.
      7) Ductwork.
   c. File Format Compatible with Graphics Generation Package Program.

B. Workstation System Applications:
   1. Automatic System Database Save and Restore Functions:
      a. Current database copy of each Building Controller is automatically stored on hard disk.
      b. Automatic update occurs upon change in any system panel.
      c. In the event of database loss in any system panel, the first workstation to detect the loss automatically restores the database for that panel unless disabled by the operator.
   2. Manual System Database Save and Restore Functions by Operator with Password Clearance:
a. Save database from any system panel.
b. Clear a panel database.
c. Initiate a download of a specified database to any system panel.
3. Software provided allows system configuration and future changes or additions by operators under proper password protection.
4. On-line Help:
   a. Context-sensitive system assists operator in operation and editing.
   b. Available for all applications.
   c. Relevant screen data provided for particular screen display.
   d. Additional help available via hypertext.
5. Security:
   a. Operator log-on requires user name and password to view, edit, add, or delete data.
   b. System security selectable for each operator.
   c. System supervisor sets passwords and security levels for all other operators.
   d. Operator passwords to restrict functions accessible to viewing and/or changing system applications, editor, and object.
   e. Automatic, operator log-off results from keyboard or mouse inactivity during user-adjustable time period.
   f. All system security data stored in encrypted format.
6. System Diagnostics:
   a. Operations Automatically Monitored:
      1) Workstations.
      2) Printers.
      3) Modems.
      4) Network connections.
      5) Building management panels.
      6) Controllers.
   b. Device failure is annunciated to the operator.
7. Alarm Processing:
   a. All system objects are configurable to "alarm in" and "alarm out" of normal state.
   b. Configurable Objects:
      1) Alarm limits.
      2) Alarm limit differentials.
      3) States.
      4) Reactions for each object.
8. Alarm Messages:
   b. Recognizable Features:
      1) Source.
      2) Location.
      3) Nature.
9. Configurable Alarm Reactions by Workstation and Time of Day:
   a. Logging.
   b. Printing.
   c. Starting programs.
   d. Displaying messages.
   e. Dialing out to remote locations.
   f. Paging.
   g. Providing audible annunciation.
   h. Displaying specific system graphics.
10. Custom Trend Logs:
    a. Definable for any data object in the system including interval, start time, and stop time.
    b. Trend Data:
1) Sampled and stored on the building controller panel.
2) Archivable on hard disk.
3) retrievable for use in reports, spreadsheets and standard database programs.
4) Archival on LAN accessible storage media including hard disk, tape, Raid array drive, and virtual cloud environment.
5) Protected and encrypted format to prevent manipulation, or editing of historical data and event logs.

11. Alarm and Event Log:
   a. View all system alarms and change of states from any system location.
   b. Events listed chronologically.
   c. Operator with proper security acknowledges and clears alarms.
   d. Alarms not cleared by operator are archived to the workstation hard disk.

12. Object, Property Status and Control:
   a. Provide a method to view, edit if applicable, the status of any object and property in the system.
   b. Status Available by the Following Methods:
      1) Menu.
      2) Graphics.
      3) Custom Programs.

13. Reports and Logs:
   a. Reporting Package:
      1) Allows operator to select, modify, or create reports.
      2) Definable as to data content, format, interval, and date.
      3) Archivable to hard disk.
   b. Real-time logs available by type or status such as alarm, lockout, normal, etc.
   c. Stored on hard disk and readily accessible by standard software applications, including spreadsheets and word processing.
   d. Set to be printed on operator command or specific time(s).

14. Reports:
   a. Standard:
      1) Objects with current values.
      2) Current alarms not locked out.
      3) Disabled and overridden objects, points and SNVTs.
      4) Objects in manual or automatic alarm lockout.
      5) Objects in alarm lockout currently in alarm.
      6) Logs:
         (a) Alarm History.
         (b) System messages.
         (c) System events.
         (d) Trends.
   b. Custom:
      1) Daily.
      2) Weekly.
      3) Monthly.
      4) Annual.
      5) Time and date stamped.
      6) Title.
      7) Facility name.
   c. Tenant Override:
      1) Monthly report showing total, requested, after-hours HVAC and lighting services on a daily basis for each tenant.
      2) Annual report showing override usage on a monthly basis.
   d. Electrical, Fuel, and Weather:
      1) Electrical Meter(s):
(a) Monthly showing daily electrical consumption and peak electrical demand with time and date stamp for each meter.
(b) Annual summary showing monthly electrical consumption and peak demand with time and date stamp for each meter.

2) Fuel Meter(s):
(a) Monthly showing daily natural gas consumption for each meter.
(b) Annual summary showing monthly consumption for each meter.

3) Weather:
(a) Monthly showing minimum, maximum, average outdoor air temperature and heating/cooling degree-days for the month.

Daily Operating Condition of Chiller(s) Based on ASHRAE Std 147:
1) Chilled water inlet and outlet temperature.
2) Chilled water flow.
3) Chilled water inlet and outlet pressure.
4) Evaporator refrigerant pressure and temperature.
5) Condenser refrigerant pressure and temperature.
6) Condenser refrigerant pressure and liquid temperature.
7) Condenser water flow.
8) Refrigerant levels.
9) Oil pressure and temperature.
10) Oil level.
11) Compressor refrigerant discharge temperature.
12) Refrigerant suction temperature.
13) Addition of refrigerant.
14) Addition of oil.
15) Vibration levels or observation that vibration is not excessive.
16) Motor amperes per phase.
17) Motor volts per phase.
18) PPM refrigerant monitor level.
19) Purge exhaust time or discharge count.
20) Ambient temperature (dry-bulb and wet-bulb).
21) Date and time logged.

C. Workstation Applications Editors:
1. Provide editing software for each system application at PC workstation.
2. Downloaded application is executed at controller panel.
3. Full screen editor for each application allows operator to view and change:
   a. Configuration.
   b. Name.
   c. Control parameters.
   d. Set-points.
4. Scheduling:
   a. Monthly calendar indicates schedules, holidays, and exceptions.
   b. Allows several related objects to be scheduled and copied to other objects or dates.
   c. Start and stop times adjustable from master schedule.
5. Custom Application Programming:
   a. Create, modify, debug, edit, compile, and download custom application programming during operation and without disruption of all other system applications.
   b. Programming Features:
      1) English oriented language, based on BASIC, FORTRAN, C, or PASCAL syntax allowing for free form programming.
      2) Alternative language graphically based using appropriate function blocks suitable for all required functions and amenable to customizing or compounding.
      3) Insert, add, modify, and delete custom programming code that incorporates word processing features such as cut/paste and find/replace.
4) Allows the development of independently, executing, program modules designed to enable and disable other modules.

5) Debugging/simulation capability that displays intermediate values and/or results including syntax/execution error messages.

6) Support for conditional statements (IF/THEN/ELSE/ELSE-F) using compound Boolean (AND, OR, and NOT) and/or relations (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

7) Support for floating-point arithmetic utilizing plus, minus, divide, times, square root operators; including absolute value; minimum/maximum value from a list of values for mathematical functions.

8) Language consisting of resettable, predefined, variables representing time of day, day of the week, month of the year, date; and elapsed time in seconds, minutes, hours, and days where the variable values can be used in IF/THEN comparisons, calculations, programming statement logic, etc.

9) Language having predefined variables representing status and results of the system software enables, disables, and changes the set points of the controller software.

2.11 CONTROLLER SOFTWARE

A. All applications reside and operate in the system controllers and editing of all applications occurs at the operator workstation.

B. System Security:
   1. User access secured via user passwords and user names.
   2. Passwords restrict user to the objects, applications, and system functions as assigned by the system manager.
   3. User Log On/Log Off attempts are recorded.
   4. Automatic Log Off occurs following the last keystroke after a user defined delay time.

C. Object or Object Group Scheduling:
   1. Weekly Schedules Based on Separate, Daily Schedules:
      a. Include start, stop, optimal stop, and night economizer.
      b. 10 events maximum per schedule.
      c. Start/stop times adjustable for each group object.
   2. Exception Schedules:
      a. Based on any day of the year.
      b. Defined up to one year in advance.
      c. Automatically discarded and replaced with standard schedule for that day of the week upon execution.
   3. Holiday or Special Schedules:
      a. Capability to define up to 99 schedules.
      b. Repeated annually.
      c. Length of each period is operator defined.

D. Provide standard application for equipment coordination and grouping based on function and location to be used for scheduling and other applications.

E. Alarms:
   1. Binary object is set to alarm based on the operator specified state.
   2. Analog object to have high/low alarm limits.
   3. All alarming is capable of being automatically and manually disabled.
   4. Alarm Reporting:
      a. Operator determines action to be taken for alarm event.
      b. Alarms to be routed to appropriate workstation.
      c. Reporting Options:
         1) Start programs.
         2) Print.
         3) Logged.
4) Custom messaging.
5) Graphical displays.
6) Dial out to workstation receivers via system protocol.

F. Demand Limiting:
1. Building power consumption monitored from signals generated by a pulse generator, mounted at the building power meter.
2. Demand limit controlled via load shedding or load restoration in a predetermined and predictive manner.
3. Demand Reduction Methods:
   a. Supply air temperature reset.
   b. Space temperature set-point reset.
   c. Equipment off/on prioritization.
4. Relevant variables that influence demand limiting control are based on the power company methodology for computing demand charges.
5. Operator On-Line Changes Allowed:
   a. Addition and deletion of loads controlled.
   b. Changes in demand intervals.
   c. Changes in demand limit for meter(s).
   d. Maximum equipment shutoff time.
   e. Minimum equipment shutoff time.
   f. Select rotational or sequential shedding and restoring.
   g. Shed/restore priority.
6. Information and Reports available Hourly, Daily, and Monthly:
   a. Total electric consumption.
   b. Peak demand.
   c. Date and time of peak demand.
   d. Daily peak demand.

G. Maintenance Management: System monitors equipment status and generates maintenance messages based upon user-designated run-time limits.

H. Sequencing: Application software based upon specified sequences of operation in Section 23 0993.

I. PID Control Characteristics:
1. Direct or reverse action.
2. Anti-windup.
3. Calculated, time-varying, analog value, positions an output or stages a series of outputs.

J. Staggered Start Application:
1. Prevents all controlled equipment from simultaneously restarting after power outage.
2. Order of equipment startup is user selectable.

K. Energy Calculations:
1. Accumulated instantaneous power or flow rates are converted to energy use data.
2. Algorithm calculates a rolling average and allows window of time to be user specified in minute intervals.
3. Algorithm calculates a fixed window average with a digital input signal from a utility meter defining the start of the window period that in turn synchronizes the fixed-window average with that used by the power company.

L. Anti-Short Cycling:
1. All binary output objects protected from short-cycling.
2. Allows minimum on-time and off-time to be selected.

M. On-Off Control with Differential:
1. Algorithm allows binary output to be cycled based on a controlled variable and set-point.
2. Algorithm to be direct-acting or reverse-acting incorporating an adjustable differential.
N. Run-Time Totalization:
1. Totalize run-times for all binary input objects.
2. Provides operator with capability to assign high run-time alarm.

2.12 HVAC CONTROL PROGRAMS

A. General:
1. Support Inch-pounds and SI (metric) units of measurement.
2. Identify each HVAC Control system.

B. Optimal Run Time:
1. Control start-up and shutdown times of HVAC equipment for both heating and cooling.
2. Base on occupancy schedules, outside air temperature, seasonal requirements, and interior room mass temperature.
3. Start-up systems by using outside air temperature, room mass temperatures, and adaptive model prediction for how long building takes to warm up or cool down under different conditions.
4. Use outside air temperature to determine early shut down with ventilation override.
5. Analyze multiple building mass sensors to determine seasonal mode and worse case condition for each day.
6. Operator commands:
   a. Define term schedule.
   b. Add/delete fan status point.
   c. Add/delete outside air temperature point.
   d. Add/delete mass temperature point.
   e. Define heating/cooling parameters.
   f. Define mass sensor heating/cooling parameters.
   g. Lock/unlock program.
   h. Request optimal run time control summary.
   i. Request optimal run time mass temperature summary.
   j. Request HVAC point summary.
   k. Request HVAC saving profile summary.
7. Control Summary:
   a. HVAC Control system begin/end status.
   b. Optimal run time lock/unlock control status.
   c. Heating/cooling mode status.
   d. Optimal run time schedule.
   e. Start/Stop times.
   f. Selected mass temperature point ID.
   g. Optimal run time system normal start times.
   h. Occupancy and vacancy times.
   i. Optimal run time system heating/cooling mode parameters.
8. Mass temperature summary:
   a. Mass temperature point type and ID.
   b. Desired and current mass temperature values.
   c. Calculated warm-up/cool-down time for each mass temperature.
   d. Heating/cooling season limits.
   e. Break point temperature for cooling mode analysis.
9. HVAC point summary:
   a. Control system identifier and status.
   b. Point ID and status.
   c. Outside air temperature point ID and status.
   d. Mass temperature point ID and point.
   e. Calculated optimal start and stop times.
   f. Period start.

C. Supply Air Reset:
1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot
deck and cold deck temperatures on dual duct and multizone systems, single zone unit
discharge temperatures.

2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
   a. Raising cooling temperatures to highest possible value.
   b. Reducing heating temperatures to lowest possible level.

3. Operator commands:
   a. Add/delete fan status point.
   b. Lock/unlock program.
   c. Request HVAC point summary.
   d. Add/Delete discharge controller point.
   e. Define discharge controller parameters.
   f. Add/delete air flow rate.
   g. Define space load and load parameters.
   h. Request space load summary.

4. Control summary:
   a. HVAC control system status (begin/end).
   b. Supply air reset system status.
   c. Optimal run time system status.
   d. Heating and cooling loop.
   e. High/low limits.
   f. Deadband.
   g. Response timer.
   h. Reset times.

5. Space load summary:
   a. HVAC system status.
   b. Optimal run time status.
   c. Heating/cooling loop status.
   d. Space load point ID.
   e. Current space load point value.
   f. Control heat/cool limited.
   g. Gain factor.
   h. Calculated reset values.
   i. Fan status point ID and status.
   j. Control discharge temperature point ID and status.
   k. Space load point ID and status.
   l. Air flow rate point ID and status.

D. Enthalpy Switchover:
   1. Calculate outside and return air enthalpy using measured temperature and relative
      humidity; determine energy expended and control outside and return air dampers.
   2. Operator commands:
      a. Add/delete fan status point.
      b. Add/delete outside air temperature point.
      c. Add/delete discharge controller point.
      d. Define discharge controller parameters.
      e. Add/delete return air temperature point.
      f. Add/delete outside air dew point/humidity point.
      g. Add/delete return air dew point/humidity point.
      h. Add/delete damper switch.
      i. Add/delete minimum outside air.
      j. Add/delete atmospheric pressure.
      k. Add/delete heating override switch.
      l. Add/delete evaporative cooling switch.
      m. Add/delete air flow rate.
n. Define enthalpy deadband.
o. Lock/unlock program.
p. Request control summary.
q. Request HVAC point summary.

3. Control summary:
a. HVAC control system begin/end status.
b. Enthalpy switchover optimal system status.
c. Optimal return time system status.
d. Current outside air enthalpy.
e. Calculated mixed air enthalpy.
f. Calculated cooling cool enthalpy using outside air.
g. Calculated cooling cool enthalpy using mixed air.
h. Calculated enthalpy difference.
i. Enthalpy switchover deadband.
j. Status of damper mode switch.

2.13 CHILLER CONTROL PROGRAMS
A. Control function of condenser water reset, chilled water reset, and chiller sequencing. Support inch-pounds and SI (metric) units of measurement.

B. Condenser Water Reset: Automatically reset controlled condenser water temperature using measured outside wet bulb temperature and load being handled.

C. Chilled Water Reset: Automatically reset controlled chilled water temperature satisfying cooling coil requiring greatest cooling.

D. Chiller Sequencing: Determine which combination of chillers will most efficiently satisfy chilled water load, by cycling chillers, based on comparing load to switchover limits defined for each chiller.

PART 3 EXECUTION

3.01 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.02 INSTALLATION
A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
B. Install software in control units and in operator work station. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 23 0993.
C. Provide with 120v AC, 15 amp dedicated emergency power circuit to each programmable control unit.
D. Provide conduit and electrical wiring in accordance with Section 26 0583. Electrical material and installation shall be in accordance with appropriate requirements of .

3.03 MANUFACTURER’S FIELD SERVICES
A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.
B. Provide service engineer to instruct Owner’s representative in operation of systems plant and equipment for 3 day period.
C. Provide basic operator training for 6 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 40 hours dedicated instructor time. Provide training on site.
3.04 DEMONSTRATION AND INSTRUCTIONS
   A. Demonstrate complete and operating system to Owner.

3.05 MAINTENANCE
   A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
   B. Provide service and maintenance of energy management and control systems for one year from Date of Substantial Completion.

3.06 SCHEDULES
   A. Input/Output Schedule:
      1. Point Description:
      2. Digital Input:
         a. Auxiliary Contact:
         b. Switches:
            1) Switch Closing:
            2) Flow Switch:
            3) Optical:
         c. Current:
         d. Pressure:
      3. Digital Output:
         a. Control Relay:
         b. Solenoid:
         c. Contactor:
      4. Analog Input:
         a. Temperature:
         b. Relative Humidity:
         c. Pressure/Vacuum:
         d. Filter:
         e. Flow:
         f. Current:
         g. Liquid Level:
         h. Photocell:
      5. Analog Output:
         a. Pneumatic Transducer:
         b. 4-20 ma Module:
         c. 0-16 v DC:
      6. Alarm:
   B. Input/Output Schedule:
      1. Point Description:
      2. Inputs:
         a. Temperature:
         b. Relative Humidity:
         c. Pressure:
         d. Flow:
         e. Level:
         f. Position:
         g. Energy:
         h. Power:
      3. Outputs:
         a. Status:
         b. Alarm:
         c. Pneumatic Position:
         d. Electronic Position:
e. Set Point Adjust:
f. Start/Stop:
g. Off/Low/High:
4. Software Features:
a. PID Control (DDC):
b. High Limit:
c. Low Limit:
d. Run Time Totalization:
e. Consumption Totalization:
f. Program Start/Stop:
g. Load Shed:
h. Duty Cycle:
i. Enthalpy Switchover:
j. Optimal Run Time:
k. Supply Air Reset:
l. O.A. Interlock:
m. O.A. Temperature Reset:
n. Free Cooling Mode:
o. Warm-up Mode:
p. Boiler Interlock:
q. Chiller Sequencing:
r. Energy Calculation:

C. Alarm Schedule:

END OF SECTION 23 0923
SECTION 23 2113
HYDRONIC PIPING

PART 1  GENERAL
1.01  SECTION INCLUDES
A.  Hydronic system requirements.
B.  Chilled water piping, above grade.
C.  Condenser water piping, above grade.
D.  Equipment drains and overflows.
E.  Pipe hangers and supports.
F.  Unions, flanges, mechanical couplings, and dielectric connections.
G.  Flow controls.

1.02  RELATED REQUIREMENTS
A.  Section 23 0523 - General-Duty Valves for HVAC Piping.
B.  Section 23 0553 - Identification for HVAC Piping and Equipment.
C.  Section 23 0719 - HVAC Piping Insulation.
D.  Section 23 2114 - Hydronic Specialties.

1.03  REFERENCE STANDARDS
A.  ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing and Fusing Operators; 2017.
C.  ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2012.
E.  ASME B31.9 - Building Services Piping; 2014.
J.  ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2016.
N.  AWWA C606 - Grooved and Shouldered Joints; 2015.

1.04  ADMINISTRATIVE REQUIREMENTS
A.  Coordination: Coordinate the installation of chiller, cooling tower condenser water and chilled water pumps with size, location and installation of service utilities.
B.  Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
C.  Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.
1.05 SUBMITTALS
   A. Product Data:
      1. Include data on pipe materials, pipe fittings, valves, and accessories.
      2. Provide manufacturers catalogue information.
      3. Indicate valve data and ratings.
      4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product
         submittals, specifically identified with the manufacturer’s style or series designation.
   B. Manufacturer’s Installation Instructions: Indicate hanging and support methods, joining
      procedures.
   C. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.06 QUALITY ASSURANCE
   A. Manufacturer Qualifications: Company specializing in manufacturing products of the type
      specified in this section, with minimum three years of experience.
   B. Installer Qualifications: Company specializing in performing work of the type specified in this
      section.
   C. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single
      manufacturer.
   D. Coupling Manufacturer:
      1. Perform on-site training by factory-trained representative to the Contractor’s field personnel
         in the proper use of grooving tools and installation of grooved joint products.
      2. Periodic job site visits by factory-trained representative to ensure best practices in grooved
         joint installation.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
   B. Protect piping systems from entry of foreign materials by temporary covers, completing sections
      of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS
   A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
   B. Piping: Provide piping, fittings, hangers and supports as required, as indicated, and as follows:
      1. Where more than one piping system material is specified, provide joining fittings that are
         compatible with piping materials and ensure that the integrity of the system is not
         jeopardized.
      2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
      3. Grooved mechanical joints may be used in accessible locations only.
         a. Accessible locations include those exposed on interior of building, in pipe chases, and
            in mechanical rooms, aboveground outdoors, and as approved by Architect.
         b. Use rigid joints unless otherwise indicated.
         c. Use flexible joints at pumps, chillers, cooling towers.
      4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless
         indicated otherwise.
   C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings
      to allow disconnection of components for servicing; do not use direct welded, soldered, or
      threaded connections.
      1. Where grooved joints are used in piping, provide grooved valve/equipment connections if
         available; if not available, provide flanged ends and grooved flange adapters.
   D. Valves: Provide valves where indicated:
1. Provide drain valves where indicated, and if not indicated provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
2. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
3. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.02 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
   3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.03 CONDENSER WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
   2. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
   3. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.04 EQUIPMENT DRAINS AND OVERFLOWS

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn; using one of the following joint types:
      a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

2.05 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.
   1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.
2.06 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe 2 Inches and Less:
B. Flanges for Pipe 2 Inches and Greater:
C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
   1. Dimensions and Testing: In accordance with AWWA C606.
   2. Mechanical Couplings: Comply with ASTM F1476.
   4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

2.07 FLOW CONTROLS

A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com/#sle.
B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
C. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
C. Remove scale and dirt on inside and outside before assembly.
D. Prepare piping connections to equipment using jointing system specified.
E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install chilled water, and condenser water piping to ASME B31.9 requirements.
C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
D. Install piping to conserve building space and to avoid interfere with use of space.
E. Group piping whenever practical at common elevations.
F. Slope piping and arrange to drain at low points.
G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 0516.
   1. Flexible couplings may be used in header piping to accommodate thermal growth, thermal contraction in lieu of expansion loops.
   2. Use flexible couplings in expansion loops.
H. Grooved Joints:
   1. Install in accordance with the manufacturer's latest published installation instructions.
   2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.
I. Pipe Hangers and Supports:
   1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
   2. Support horizontal piping as scheduled.
   3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
   4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.


7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

8. Provide copper plated hangers and supports for copper piping.

9. Prime coat exposed steel hangers and supports. Refer to Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 0719.

K. Provide access where valves and fittings are not exposed.

L. Use eccentric reducers to maintain top of pipe level.

M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

N. Install valves with stems upright or horizontal, not inverted.

3.03 SCHEDULES

A. Hanger Spacing for Steel Piping.
   1. 6 inches: Maximum span, 17 feet; minimum rod size, 1/2 inch.
   2. 8 inches: Maximum span, 19 feet; minimum rod size, 5/8 inch.

END OF SECTION 23 2113
SECTION 23 2114
HYDRONIC SPECIALTIES

PART 1  GENERAL

1.01 SECTION INCLUDES
A. Air vents.
B. Air separators.
C. Suction diffusers.
D. Combination pump discharge valves.

1.02 RELATED REQUIREMENTS
A. Section 23 2113 - Hydronic Piping.

1.03 REFERENCE STANDARDS

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination: Coordinate the installation of air separator with size, location and installation of service utilities.
B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.05 SUBMITTALS
A. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.
B. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.

1.06 DELIVERY, STORAGE, AND HANDLING
A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2  PRODUCTS

2.01 AIR VENTS
A. Manufacturers:
   1. ITT Bell & Gossett; Model 107A High Capacity: www.bellgossett.com/#sle.
B. Float Type:
   1. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.

2.02 AIR SEPARATORS
A. Centrifugal Air Separators:
   1. Manufacturers:
      a. ITT Bell & Gossett; Rolairtrol: www.bellgossett.com/#sle.
   2. Steel, tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure, without integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.
2.03 SUCTION DIFFUSERS
A. Manufacturers:
   1. ITT Bell & Gossett: www.bellgossett.com/sle.
B. Fitting: Angle pattern, cast-iron body, threaded for 2 inch and smaller, flanged for 2-1/2 inch and larger, rated for 175 psi working pressure, with inlet vanes, cylinder strainer with 3/16 inch diameter openings, disposable 5/32 inch mesh strainer to fit over cylinder strainer, 20 mesh start up screen, and permanent magnet located in flow stream and removable for cleaning.
C. Accessories: Adjustable foot support, blowdown tapping in bottom, gauge tapping in side.

2.04 COMBINATION PUMP DISCHARGE VALVES
A. Manufacturers:
B. Valves: Straight pattern, flanged cast-iron valve body with bolt-on bonnet for 175 psi operating pressure, non-slam check valve with spring-loaded bronze disc and seat, stainless steel stem, and calibrated adjustment permitting flow regulation.

PART 3 EXECUTION
3.01 INSTALLATION
A. Install specialties in accordance with manufacturer's instructions.
B. Provide air separator on suction side of system circulation pump and connect to expansion tank.
C. Provide valved drain and hose connection on strainer blow down connection.
D. Provide pump suction fitting on suction side of base mounted centrifugal pumps where indicated. Remove temporary strainers after cleaning systems.
E. Provide combination pump discharge valve on discharge side of base mounted centrifugal pumps where indicated.
F. Support pump fittings with floor mounted pipe and flange supports.
G. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.
H. Clean and flush new piping before putting systems in operation.

END OF SECTION 23 2114
SECTION 23 2123
HYDRONIC PUMPS

PART 1 GENERAL
1.01 SECTION INCLUDES
A. In-line circulators.
B. Base-mounted pumps.

1.02 RELATED REQUIREMENTS
A. Section 23 0716 - HVAC Equipment Insulation.
B. Section 23 0719 - HVAC Piping Insulation.
C. Section 23 2113 - Hydronic Piping.
D. Section 23 2114 - Hydronic Specialties.

1.03 SUBMITTALS
A. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.
B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

PART 2 PRODUCTS
2.01 MANUFACTURERS
A. Bell & Gossett, a Xylem Inc. brand: www.bellgossett.com/#sle.

2.02 HVAC PUMPS - GENERAL
A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
B. Products Requiring Electrical Connection: Listed and classified by UL or testing agency acceptable to Authority Having Jurisdiction as suitable for the purpose specified and indicated.

2.03 IN-LINE CIRCULATORS
A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in-line mounting, oil lubricated, for 125 psi maximum working pressure.
B. Casing: Cast iron, with flanged pump connections.
C. Impeller: Non-ferrous keyed to shaft.
D. Bearings: Oil-lubricated bronze sleeve.
E. Shaft: Alloy steel with bronze sleeve, integral thrust collar.
F. Seal: Manufacturer's standard seal, 225 degrees F maximum continuous operating temperature.

2.04 BASE-MOUNTED PUMPS
A. Type: Horizontal shaft, single stage, direct connected, radially or horizontally split casing, for 125 psi maximum working pressure.
B. Casing: Cast iron with suction and discharge gauge ports, renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction and discharge.
C. Impeller: 304 Stainless Steel, fully enclosed, keyed to shaft.
D. Bearings: Oil lubricated roller or ball bearings.
E. Shaft: Alloy steel with stainless steel shaft sleeve.
F. Seal: Manufacturer's standard seal, 225 degrees F maximum continuous operating temperature.

G. Drive: Flexible coupling with coupling guard.

H. Baseplate: Cast iron or fabricated steel with integral drain rim.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.

C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close-coupled or base-mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.

D. Provide line sized shut-off valve and pump suction fitting with strainer on pump suction, and line sized combination pump discharge valve on pump discharge.

E. Provide drains for bases and seals, piped to and discharging into floor drains.

F. Check, align, and certify alignment of base-mounted pumps prior to start-up.

G. Install base-mounted pumps on existing housekeeping base, with anchor bolts, set and level, and grout in place.

H. Lubricate pumps before start-up.

END OF SECTION 23 2123
PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Chiller package.
   B. Charge of refrigerant and oil.
   C. Controls and control connections.
   D. Chilled water connections.
   E. Condenser water connections.
   F. Variable speed drives.
   G. Starters.
   H. Electrical power connections.

1.02 RELATED REQUIREMENTS
   A. Section 23 0513 - Common Motor Requirements for HVAC Equipment.
   B. Section 23 0553 - Identification for HVAC Piping and Equipment.
   C. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
   D. Section 23 2113 - Hydronic Piping.
   E. Section 23 2114 - Hydronic Specialties.
   F. Section 23 2123 - Hydronic Pumps.
   G. Section 26 0583 - Wiring Connections.

1.03 REFERENCE STANDARDS
   C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   F. UL 508 - Industrial Control Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS
   A. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.
   B. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate equipment, piping and connections, valves, strainers, and thermostatic valves required for complete system.
   C. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
   D. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble- shooting guide.
   E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.
1.05 DELIVERY, STORAGE, AND HANDLING
   A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.06 WARRANTY
   A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
   B. Provide a two year warranty to include coverage for compressor including materials only.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. Trane, a brand of Ingersoll Rand; CVHE: www.trane.com/#sle.

2.02 CHILLER APPLICATIONS
   A. Chiller CH-1: Water-cooled, three-stage, single compressor.
      1. Refrigerant: R-514A.
      2. Rating: Energy Efficiency Rating (EER)/Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1 I-P.
      3. Evaporator:
         b. Fouling Factor: 0.0001.
      4. Condenser Water:
         b. Fouling Factor: 0.00025.

2.03 CHILLERS
   A. Chillers: Factory assembled and tested, packaged, water cooled, chillers consisting of centrifugal compressors, compressor motor, condenser, evaporator, refrigeration accessories, instrument and control panel including gauges and indicating lights, auxiliary components and accessories, and motor starters.
   B. Rating: Comply with AHRI 550/590 (I-P).
   C. Comply with ASME BPVC-VIII-1 for construction and testing of centrifugal chillers.
   D. Comply with ASHRAE Std 15 for safe construction and operation of centrifugal chillers.
   E. Energy efficiency for electrically operated, water-cooled units:
      1. Capacity: Greater than or equal to 150 tons and less than 300 tons:
         b. Full load Efficiency: 0.5315 kW/ton.

2.04 COMPRESSORS
   A. Manufacturers:
   B. Compressor Casing: Cast iron, horizontally or vertically split with machined passages and leak tested to 45 psig. Provide refrigerant sight glass.
   C. Impellers: Single or multi-stage, in-line design, fully shrouded, statically and dynamically balanced, tested to 20 percent over operating speed, mounted on heat treated forged or rolled steel shaft, nonferrous, labyrinth seals between stages.
   D. Guide Vanes: Modulating radial blade dampers, on each stage, with externally mounted electric operator, suitable for capacity reduction to 10 percent of specified load without hot gas bypass when supplied with design entering water quantity and temperature.
   E. Bearings: Steel or aluminum journal bearings, pressure lubricated.
   F. Gear Box: Double helical design, symmetrical and center supported by spherically seated, self aligning bearing, arranged for inspection without disassembly.
1. Provide speed increasing transmissions for variable speed chillers to not exceed 10,000 rpm compressor speed.
   
   G. Motor: Hermetically sealed, single speed, low slip induction type. Refer to Section 23 0513.
   
   H. Lubrication: Oil pump, with oil cooler, pressure regulator, oil filters, thermostatically controlled oil heater, and motor controls. Interlock to start before chiller motor and run after motor is shut down. Provide sight glass or electronic sensors for monitoring oil level.
   
   I. Refrigerant: Site-charge unit with refrigerant specified above and provided by unit manufacturer.

2.05 EVAPORATOR

   A. Provide evaporator of shell and tube type, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Position intermediate tube support sheets along length of shell to avoid contact and relative motion between adjacent tubes.
   
   B. Test and, where applicable, stamp refrigerant side for 45 psig working pressure and water side for 150 psig working pressure, in accordance with ASME BPVC-VIII-1.
   
   C. Insulate evaporator and cold surfaces with 0.75 inch minimum thick flexible expanded polyvinyl chloride insulation with maximum K value of 0.28.
   
   D. Provide thermometer wells or thermistors for temperature controller and low temperature cutout.
   
   E. Design and construct evaporator to prevent liquid refrigerant from entering the compressor.
   
   F. Provide carbon rupture disc or relief valve on shell in accordance with ASHRAE Std 15.
   
   G. Construction and materials to comply with ASME BPVC-VIII-1 or ASHRAE Std 15 as applicable to chiller manufacturer and chiller model.

2.06 CONDENSERS

   A. Provide condensers of shell and tube type, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Position intermediate tube support sheets along shell length to avoid contact and relative motion between adjacent tubes.
   
   B. Test and, where applicable, stamp refrigerant side for 45 psig working pressure and water side for 150 psig working pressure; in accordance with ASME BPVC-VIII-1.
   
   C. Provide marine type water boxes, machine welded to heat exchanger with tapped drain and vent connections, and flanged or mechanical joint connections arranged to permit inspection of tubes from either end without disturbing refrigerant and removable without disturbing water piping.
   
   D. Provide carbon rupture disc or relief valve on shell in accordance with ASHRAE Std 15.
   
   E. Provide baffles to ensure even distribution of incoming gas and to concentrate non-condensible gases.
   
   F. Construction and materials to comply with ASME BPVC-VIII-1.

2.07 PURGE SYSTEM

   A. Provide purge system on positive pressure units, incorporating a low temperature refrigeration system to automatically remove non-condensibles, water and air.
   
   B. System discharge shall be maximum 0.60 pound of refrigerant per pound of air discharged.

2.08 CONTROLS

   A. Disconnect Switch: Factory mount disconnect switch in starter control panel.
   
   B. On chiller, provide microprocessor based control panel containing solid state, fully automatic operating and safety controls.
   
   C. Provide the following manufacturer's standard safety controls, including the following minimum functions, so that operating any one will shut down machine and require manual reset:
1. Low evaporator refrigerant temperature.
2. High condenser refrigerant pressure.
3. Low oil pressure.
4. Low refrigerant (evaporator) pressure.
5. Starter-contactor failure.
7. Low evaporator water temperature.
8. High vacuum lockout.
9. Low oil temperature.
10. Excessive purge.
11. Phase unbalance.
12. Phase loss.
13. Phase reversal.
15. Current overload.
16. High motor winding temperature.
17. Surge detection.
18. Overvoltage and undervoltage.
19. Power factor and kW measurement.
20. Short cycling.

D. Provide the manufacturer's standard safety controls arranged so that operating any one will shut down machine and automatically reset.

E. Provide the following devices on control panel:

F. Provide the following operating controls:
   1. Solid state, chilled water temperature controller that controls electronic guide vane operator. Locate temperature sensor in entering chilled water.
   2. Adjustable thirty minute off timer prevents compressor from short cycling.
   3. Demand limit device to manually set maximum current infinitely between 40 percent and 100 percent of full load amperes.
   4. Automatic start that determines demand for chilled water from proof of chilled water flow and temperature differential between chilled water set point and supply temperature.

2.09 VARIABLE FREQUENCY DRIVE (VFD), UNIT MOUNTED

A. Furnish chiller with factory-mounted, liquid-cooled variable frequency drive (VFD) shipped completely factory-assembled, wired, and tested.

B. Specifically design VFD to interface with the centrifugal water chiller controls and allow for the operating ranges and specific characteristics of the chiller. VFD control logic is to optimize chiller efficiency by coordinating compressor motor speed and compressor inlet guide vane position to maintain the chilled water setpoint while avoiding surge. If surge is detected, VFD surge avoidance logic is to make adjustments to move away from and avoid surge at similar conditions in the future.

C. VFD Efficiency: 97 percent or better at full speed and full load.

D. Fundamental Displacement Power Factor: Minimum of 0.96.

E. Provide voltage and current regulated, solid state, microprocessor-based pulse-width modulated (PWM) VFD. Output power devices to be IGBT transistors.

F. Provide liquid-cooled heatsink to cool the power semi-conductor and capacitor.

G. Provide cleanable shell and tube heat exchanger with water-cooled design. Do not provide plate and frame heat exchanger.

H. Furnish VFD in a NEMA Type 1 metal enclosure having a minimum short circuit withstand rating of 65,000 amps per UL 508. Include three phase input lugs plus a grounding lug for electrical connections, output motor connection via factory-installed bus bars and all components properly segregated and completely enclosed in a single, metal enclosure.
1. Enclosure to include a padlockable, door-mounted circuit breaker with shunt trip and AIC rating of 65,000 amps.
2. Entire chiller package to be listed by Underwriter's Laboratories Inc.

I. VFD to be tested according to UL 508 and listed by a Nationally Recognized Testing Laboratory (NRTL) as designated by OSHA.

J. Comply with recommendations stated in IEEE 519.
1. Include integrated active rectification control system to limit total demand distortion (TDD) in current at the VFD to less than or equal to 5 percent as measured at the VFD input. If active filters are used to meet this requirement, then the losses associated with the filter are to be included in the chiller performance on the selection.

K. Fundamental Displacement Power Factor: Minimum of 0.96.

L. Voltage Input: Nominal 480 volts, three phase, 60 hertz AC, plus or minus 10 percent of nominal voltage.

M. Line Frequency: 38 to 60 hertz.

N. VSD to include the following:
1. All control circuit voltages physically and electrically isolated from power circuit voltage.
2. 150 percent instantaneous torque available for improved surge control.
5. Insensitivity to incoming power phase sequence.
6. VSD and motor protection from the following faults:
   a. Output line-to-line short circuit.
   b. Line-to-ground short circuit.
   c. Phase loss at AFD input.
   d. Phase reversal/imbalance.
   e. Over-voltage.
   f. Under-voltage.
   g. Over-temperature.

O. Include the following VFD status indicators available to facilitate startup and maintenance:
1. Output speed in hertz and rpm.
2. Input line voltage.
3. Input line kW.
4. Output/load amps.
5. Average current in percent RLA.
6. Load power factor.
7. Fault.
8. VFD transistor temperature.

P. Service Conditions (at full output power; no external venting or heat exchangers required):
1. Operating Ambient Temperature: Between 32 degrees F and 104 degrees F.
2. Room Ambient Relative Humidity: Up to 95 percent.
3. Elevation: Up to 3,300 feet. For every 300 feet above 3,300 feet, decrease the rated output current by one percent.

2.10 VARIABLE SPEED DRIVE (VSD), UNIT-MOUNTED.

A. Furnish chiller with unit mounted, air-cooled variable speed drive (VSD) shipped completely factory-assembled, wired, and tested.

B. Specifically design VSD to interface with the centrifugal water chiller controls and allow for the operating ranges and specific characteristics of the chiller. VSD control logic is to optimize chiller efficiency by coordinating compressor motor speed and compressor inlet guide vane position to maintain the chilled water setpoint while avoiding surge. If surge is detected, VSD is to move away from and avoid surge at similar conditions in the future.

C. VSD Efficiency: 97 percent or better at full speed and full load.
D. Fundamental Displacement Power Factor: Minimum of 0.97.

E. Provide voltage and current regulated, solid state, microprocessor-based pulse-width modulated (PWM) VSD. Output power devices to be IGBT transistors.

F. Provide liquid- or air-cooled heatsink to cool power semi-conductor and capacitor.

G. Furnish VSD in a NEMA Type 1 metal enclosure having a minimum short circuit withstand rating of 65,000 amps per UL 508. Include three phase input lugs plus a grounding lug for electrical connections, output motor connection via factory installed bus bars and all components properly segregated and completely enclosed in a single metal enclosure.
   1. Enclosure to include padlockable, door-mounted circuit breaker with minimum AIC rating of 65,000 amps.
   2. Entire chiller package to be listed by Underwriter’s Laboratories Inc.

H. VSD to be tested according to UL 508 and listed by a National Recognized Testing Laboratory (NRTL) as designated by OSHA.

I. Comply with recommendations for harmonic mitigation.
   1. Include a DC link reactor on positive and negative rails to minimize power line harmonics and protect the VSD from power line transients.

J. Voltage Input: Nominal 460 volts, three phase, 60 Hertz AC power, plus or minus 10 percent of nominal voltage.

K. Line Frequency: 38 to 60 Hertz.

L. VSD is to include the following features:
   1. All control circuit voltages physically and electrically isolated from power circuit voltage.
   2. 150 percent instantaneous torque available for improved surge control.
   5. Insensitivity to incoming power phase sequence.
   6. VSD and motor protection from the following faults:
      a. Output line-to-line short circuit.
      b. Line-to-ground short circuit.
      c. Phase loss at AFD input.
      d. Phase reversal/imbalance.
      e. Over-voltage.
      f. Under-voltage.
      g. Over-temperature.

M. Include the following VSD status indicators available to facilitate startup and maintenance:
   1. Output speed in hertz and rpm.
   2. Input line voltage.
   3. Input line kW.
   4. Output/load amps.
   5. Average current in percent RLA.
   6. Load power factor.
   7. Fault.
   8. VSD transistor temperature.

N. Service Conditions:
   1. Operating Ambient Temperature: Between 14 degrees F and 104 degrees F.
   2. Room Ambient Relative Humidity: Up to 95 percent.
   3. Elevation: Up to 3,300 feet. For every 3,300 feet above 3,300 feet, decrease the rated output current by 4 percent up to 9,900 feet.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer’s instructions.
B. Provide for connection to electrical service.
C. Align chiller on concrete foundations, sole plates, and sub-bases. Level, grout, and bolt in place.
D. Install manufacturer provided isolation pads.
E. Install manufacturer provided flow switches and temperature sensors.
F. Provide evaporator connections to chilled water piping.
   1. On inlet, provide:
      a. Thermometer well for temperature controller.
      b. Thermometer well and thermometer.
      c. Nipple and flow switch.
      d. Flexible pipe connector.
      e. Pressure gauge.
      f. Shut-off valve.
   2. On outlet, provide:
      a. Thermometer well and thermometer.
      b. Flexible pipe connector.
      c. Pressure gauge.
      d. Shut-off valve.
G. Furnish and install necessary auxiliary water piping for oil cooling units and purge condensers.
H. Provide condenser connection to condenser water piping.
   1. On inlet, provide:
      a. Thermometer well for temperature controller.
      b. Thermometer well and thermometer.
      c. Nipple and flow switch.
      d. Flexible pipe connector.
      e. Pressure gauge.
      f. Shut-off valve.
   2. On outlet, provide:
      a. Thermometer well and thermometer.
      b. Flexible pipe connector.
      c. Pressure gauge.
      d. Shut-off valve.
I. Arrange piping for easy dismantling to permit tube cleaning.
J. Provide piping from chiller rupture disc to outdoors. Size as recommended by manufacturer.

3.02 SYSTEM STARTUP
A. Provide services of factory trained representative for minimum of one day to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, and calibrate controls.
B. Supply initial charge of refrigerant and oil.

3.03 CLOSEOUT ACTIVITIES
A. Train operating personnel in operation and maintenance of units.
B. Provide the services of the manufacturer's field representative to conduct training.

END OF SECTION 23 6416
SECTION 23 6500
COOLING TOWERS

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Open-circuit, induced-draft, counter-flow cooling towers.

1.02  RELATED REQUIREMENTS
A. Section 23 0548 - Vibration and Seismic Controls for HVAC.
B. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.
C. Section 23 2113 - Hydronic Piping.
D. Section 23 2123 - Hydronic Pumps.
E. Section 26 0583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03  REFERENCE STANDARDS
C. CTI STD-111 - Gear Speed Reducers for Application on Industrial Water Cooling Towers; 2009.

1.04  SUBMITTALS
A. Product Data: Provide rated capacities, dimensions, weights and point loadings, accessories, furnished specialties, required clearances, electrical requirements and wiring diagrams, and location and size of field connections. Submit schematic indicating capacity controls.
B. Shop Drawings: Indicate suggested structural steel supports including dimensions, sizes, and locations for mounting bolt holes. Assembled unit dimensions, weight and load distribution, required clearances for maintenance and operation, sizes and locations of piping, wiring diagrams for power, signal, and control wiring.
C. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
D. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories.
E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05  REGULATORY REQUIREMENTS
A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.06  DELIVERY, STORAGE, AND HANDLING
A. Factory assemble entire unit. For shipping, disassemble into as large as practical sub-assemblies so that minimum amount of field work is required for re-assembly.
B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.07  WARRANTY
A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
B. Provide a five year warranty on entire unit to include coverage for defects in material and workmanship, one year labor only. All from date of shipment.
C. Fans, fan shafts, bearings, sheaves, gearboxes, drive shafts, couplings, and mechanical equipment support must be warranted against defects in materials and workmanship for a period of five years from date of shipment.
PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 MANUFACTURED UNITS
   A. Provide units for outdoor use, factory assembled and tested, induced draft counter flow cooling tower complete with fan, fill, louvers, accessories and rigging supports.

2.03 COMPONENTS
   A. Cold Water Basin:
      1. Sloped with depressed section with drain/clean-out connection. Type 304 welded stainless steel panels and structural members. Basins with bolted seams or constructed of 301 stainless steel are not acceptable.
   B. Casing Panels and Framework:
      1. Casing panels, fan cowl and guard, framework, and fasteners will be constructed of corrosion resistant Type 304 stainless steel to minimize maintenance requirements and prolong equipment life.
   C. Fans: Aluminum, high efficiency axial propeller type, with gear drive.
      1. Fan(s) must be both statically and dynamically balanced to provide for vibration-free performance.
      2. Fan(s) must be provided with a removable wire-mesh screens complying with OSHA regulations.
      3. Balancing: Fans will have maximum residual balance as per DIN ISO 1940.
   D. Motors and Drives:
      2. Fan Drive System:
         a. Gear Drive with External Motor: Industrial duty, right angle gear designed in accordance with CTI STD-111. Gear must be rated for service factor of 2.0 with forward and reverse operation. Oil level fill port and sight glass located on the gear. Connected to motor with a drive shaft.
   E. Fan Guard: Welded steel rod and wire guard, 304 stainless steel after fabrication.
   F. Distribution Section: Polyvinyl chloride piping header and branches with ABS plastic spray nozzles.
   G. Fill:
      1. Polyvinyl chloride plastic with flame spread index of 25 or less, when tested in accordance with ASTM E84.
      2. Fungal Resistance: No growth when tested according to ASTM G21.
   H. Drift Eliminators: Three pass PVC, drift loss limited to 0.001 percent of total water circulated. Drift eliminators shall be self-extinguishing, with flame spread index of 25 or less, when tested in accordance with ASTM E84, and shall be resistant to rot, decay and biological attack.
   I. Basin Water Level Control: Brass, make-up valve with plastic float.

2.04 ACCESSORIES
   A. Electric Immersion Heaters: In pan suitable to maintain temperature of water in pan at 40 degrees F when outside temperature is 0 degrees F and wind velocity is 15 mph; immersion thermostat and float control operate heaters on low temperature when the pan is filled. Heaters will be constructed of copper.
   B. Electric Temperature Controller: In pan; with sensor to cycle fans.
   C. Access Packages: See submittal documents for access package requirements. Platforms and ladders must ship assembled from cooling tower manufacturer.
1. Plenum Access: Cooling tower fill removal is an acceptable means of accessing the platform.
2. Internal Platform: An internal platform shall be provided in the plenum section to provide for inspection and maintenance. All working surfaces shall be able to withstand 50 psf live load or 200 pound concentrated load. Platforms and ladders must ship assembled from cooling tower manufacturer.
3. External Service Platform with Ladder: An external service platform compliant with OSHA shall be provided at the motor access door of the unit extending the full length of the access door. Each platform shall have at least a 36 inch wide walking surface. The platforms shall have galvanized steel grating, supported by galvanized steel framework attached to the unit and surrounded by a handrail, knee rail and toe plate system designed to meet OSHA standards. Mounting channels shall be the same material as the casing section. A vertical ladder shall be provided from the base of the unit to the platform. Safety cage shall be provided on vertical ladder and ship mounted. Safety cage shall begin between 7 feet (minimum) and 8 feet (maximum) above roof.

D. Vibration Switch: Vibration cutoff switch, operating on 120 VAC feed, to protect the fan and drive assembly from damage in the event of excess vibration. Vibration switch shall be DPDT.
E. Float Valve Assembly: Mechanical float valve assembly is constructed of a bronze valve connected to a float assembly and is activated by a large foam filled plastic float. Float is mounted on an all thread rod held in place by wing nuts.

PART 3 EXECUTION

3.01 INSTALLATION
A. Install in accordance with manufacturer's instructions.
B. Install tower on structural steel beams as instructed by manufacturer.
C. Connect condenser water piping with flanged connections to tower. Pitch condenser water supply to tower and condenser water suction away from tower. Refer to Section 23 2113.
D. Connect make-up water piping with flanged or union connections to tower. Pitch to tower.
E. Connect overflow, bleed, and drain, to roof drain.

3.02 FIELD QUALITY CONTROL
A. Provide the services of the manufacturer's field representative to inspect tower after installation and submit report prior to start-up, verifying installation is in accordance with specifications and manufacturer's recommendations.

3.03 SYSTEM STARTUP
A. Start-up tower in presence of and instruct Owner's operating personnel.

END OF SECTION 23 6500
SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES
A. Single conductor building wire.
B. Variable-frequency drive cable.
C. Photovoltaic wire.
D. Wiring connectors.
E. Electrical tape.
F. Wire pulling lubricant.
G. Cable ties.

1.02 RELATED REQUIREMENTS
A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
L. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.
N. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
O. UL 2277 - Outline of Investigation for Flexible Motor Supply Cable and Wind Turbine Tray Cable; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.

1.05 SUBMITTALS
   A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
   B. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS
   A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS
   A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
   B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS
   A. Provide products that comply with requirements of NFPA 70.
   B. Provide products listed, classified, and labeled as suitable for the purpose intended.
   C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
   D. Comply with NEMA WC 70.
   E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
   F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
   G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
   H. Conductor Material:
      1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
      2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   I. Minimum Conductor Size:
      1. Branch Circuits: 12 AWG.
         a. Exceptions:
            1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
            2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.
            3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.
   J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
K. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 208Y/120 V, 3 Phase, 4 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
         4) Neutral/Grounded: White.
      c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE
A. Manufacturers:
   1. Copper Building Wire:
      a. Alpha Wire Company
      b. Belden, Inc.
      e. General Cable Technologies Corporation: www.generalcable.com/#sle.
      f. Okonite Company
      g. Southwire Company: www.southwire.com/#sle.
      h. WESCO

B. Description: Single conductor insulated wire.
C. Conductor Stranding:
   1. Feeders and Branch Circuits:
      b. Size 8 AWG and Larger: Stranded.
D. Insulation Voltage Rating: 600 V.
E. Insulation:
   1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
      a. Size 4 AWG and Larger: Type XHHW-2.

2.04 VARIABLE-FREQUENCY DRIVE CABLE
A. Manufacturers:
   2. Substitutions: See Section 01 6000 - Product Requirements.
B. Description: Flexible motor supply cable listed and labeled as complying with UL 2277 in accordance with NFPA 79; specifically designed for use with variable frequency drives and associated nonlinear power distortions.
C. Conductor Stranding: Stranded.
D. Insulation Voltage Rating: 1000 V.
E. Insulation: Use only thermoset insulation types; thermoplastic insulation types are not permitted.
F. Grounding: Full-size integral equipment grounding conductor or symmetrical arrangement of multiple conductors of equivalent size.

G. Provide metallic shielding.

H. Jacket: PVC or Chlorinated Polyethylene (CPE).

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 0526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.

E. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      c. NSI Industries LLC: www.nsiindustries.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

F. Push-in Wire Connectors: Rated 600 V, 221 degrees F.
   1. Manufacturers:
      b. NSI Industries LLC: www.nsiindustries.com/#sle.
      c. Wago Corporation: www.wago.us/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

G. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:

H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
   1. Manufacturers:
      c. ________.
2.06 WIRING ACCESSORIES

A. Electrical Tape:
   1. Manufacturers:
      a. 3M: www.3m.com/sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.
   2. Vinyl Color Coding Electrical Tape: Integarly colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
   3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
   1. Manufacturers:

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.
B. Verify that work likely to damage wire and cable has been completed.
C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
D. Verify that field measurements are as indicated.
E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
   5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
   6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
   7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.
C. Perform work in accordance with NECA 1 (general workmanship).
D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer’s recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.

G. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
   a. Use listed fittings.
   b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

H. Variable-Frequency Drive Cable: Terminate shielding at both variable-frequency motor controller and associated motor using glands or termination kits recommended by manufacturer.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION 26 0519
SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL
1.01 SECTION INCLUDES
A. Grounding and bonding requirements.
B. Conductors for grounding and bonding.
C. Connectors for grounding and bonding.
D. Ground bars.
E. Ground rod electrodes.

1.02 RELATED REQUIREMENTS
A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS
A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
C. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS
A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS
2.01 GROUNDING AND BONDING REQUIREMENTS
A. Do not use products for applications other than as permitted by NFPA 70 and product listing.
B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
D. Bonding and Equipment Grounding:
   1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
   2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

2.02 GROUNDING AND BONDING COMPONENTS
A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.
B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).
C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use compression connectors for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors or compression connectors for accessible connections.
   4. Manufacturers - Mechanical and Compression Connectors:

PART 3 EXECUTION
3.01 EXAMINATION
A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that field measurements are as indicated.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Mechanical Connectors: Secure connections according to manufacturer’s recommended torque settings.
D. Identify grounding and bonding system components in accordance with Section 26 0553.

END OF SECTION 26 0526
SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.01  SECTION INCLUDES
A. Support and attachment components for equipment, conduit, cable, boxes, and other electrical work.

1.02  RELATED REQUIREMENTS
A. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
B. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.03  REFERENCE STANDARDS
D. MFMA-4 - Metal Framing Standards Publication; 2004.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04  ADMINISTRATIVE REQUIREMENTS
A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
   2. Coordinate the work with other trades to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
   4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05  SUBMITTALS
A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.

1.06  QUALITY ASSURANCE
A. Comply with NFPA 70.
B. Comply with applicable building code.

1.07  DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2  PRODUCTS

2.01  SUPPORT AND ATTACHMENT COMPONENTS
A. General Requirements:
1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.

2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.

3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.

4. Do not use products for applications other than as permitted by NFPA 70 and product listing.

5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
   3. Manufacturers:
      d. Thomas & Betts Corporation; _________: www.tnb.com/#sle.

C. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
   1. Manufacturers:
      d. Thomas & Betts Corporation; _________: www.tnb.com/#sle.

D. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   2. Manufacturers:
      c. Unistrut, a brand of Atkore International Inc; _________: www.unistrut.com/#sle.
      d. Source Limitations: Furnish channels (struts) and associated fittings, accessories, and hardware produced by a single manufacturer.

E. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Busway Supports: 1/2 inch diameter.
      c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
      d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
      e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
      f. Outlet Boxes: 1/4 inch diameter.
      g. Luminaires: 1/4 inch diameter.
F. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
   4. Manufacturers:
      a. Cooper B-Line, a division of Eaton Corporation;  
         www.cooperindustries.com/#sle.
      b. Erico International Corporation;  
         www.ericocom/#sle.
      c. PHP Systems/Design;  
         www.phpsd.com/#sle.
      d. Unistrut, a brand of Atkore International Inc;  
         www.unistrut.com/#sle.

G. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
   7. Sheet Metal: Use sheet metal screws.
   8. Wood: Use wood screws.
   9. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
      b. Channel Material: Use galvanized steel.
      c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that mounting surfaces are ready to receive support and attachment components.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Perform work in accordance with NECA 1 (general workmanship).
   C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
   E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
   F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
   G. Equipment Support and Attachment:
      1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
      2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch high concrete pad constructed in accordance with Section 03 3000.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: Also comply with Section 26 0533.13.
I. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
J. Secure fasteners according to manufacturer's recommended torque settings.
K. Remove temporary supports.

3.03 FIELD QUALITY CONTROL
A. Inspect support and attachment components for damage and defects.
B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
C. Correct deficiencies and replace damaged or defective support and attachment components.
SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Intermediate metal conduit (IMC).
C. Flexible metal conduit (FMC).
D. Liquidtight flexible metal conduit (LFMC).
E. Electrical metallic tubing (EMT).
F. Conduit fittings.
G. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.
C. Section 26 0533.16 - Boxes for Electrical Systems.
D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2013.
F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
H. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
I. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
K. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
L. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
M. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS
   A. Product Data: Provide manufacturer’s standard catalog pages and data sheets for conduits and fittings.
   B. Shop Drawings:
      1. Include proposed locations of roof penetrations and proposed methods for sealing.

1.06 QUALITY ASSURANCE
   A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
   A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer’s instructions.

PART 2 PRODUCTS
2.01 CONDUIT APPLICATIONS
   A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
   B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.
   C. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).
   D. Concealed Within Hollow Stud Walls: Use electrical metallic tubing (EMT).
   E. Concealed Above Accessible Ceilings: Use electrical metallic tubing (EMT).
   F. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
   G. Exposed, Interior, Not Subject to Physical Damage: Use electrical metallic tubing (EMT).
   H. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
      1. Locations subject to physical damage include, but are not limited to:
         a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
         b. Where exposed below 20 feet in warehouse areas.
   I. Exposed, Exterior: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   K. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
      1. Maximum Length: 6 feet.
   L. Connections to Vibrating Equipment:
      1. Dry Locations: Use flexible metal conduit.
      2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
      3. Maximum Length: 6 feet unless otherwise indicated.
      4. Vibrating equipment includes, but is not limited to:
         a. Transformers.
         b. Motors.

2.02 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 1/2 inch (16 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Control Circuits: 1/2 inch (16 mm) trade size.
   4. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
   5. Underground, Interior: 3/4 inch (21 mm) trade size.
   6. Underground, Exterior: 1 inch (27 mm) trade size.

E. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Manufacturers:
   1. AFC Cable Systems
   3. O-Z/Gedney; a brand of Emerson Industrial Automation
   4. Perma-Cote
   6. Southwire Company
   7. Thomas & Betts Corporation
   8. Western Tube and Conduit Corporation

B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

C. Fittings:
   1. Manufacturers:
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
   1. AFC Cable Systems
   2. O-Z/Gedney; a brand of Emerson Industrial Automation
   3. Perma-Cote
   4. Southwire Company
   5. Thomas & Betts Corporation
   6. Western Tube and Conduit Corporation
B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
   1. Manufacturers:
   2. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
   2. Allied Tube & Conduit
   4. O-Z/Gedney; a brand of Emerson Industrial Automation
   5. Perma-Cote
   6. Republic Conduit
   7. Southwire Company
   8. Thomas & Betts Corporation
   9. Western Tube and Conduit Corporation
   10. Wheatland Tube Company

B. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:
   1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
   2. Allied Tube & Conduit
   4. O-Z Gedney; a brand of Emerson Industrial Automation
   5. Perma-Cote
   6. Republic Conduit
   7. Southwire Company
   8. Thomas & Betts Corporation
   9. Western Tube and Conduit Corporation
   10. Wheatland Tube Company

B. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

C. Fittings:
   1. Manufacturers:
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.

2.07 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   3. Thomas & Betts Corporation
   4. Western Tube and Conduit Corporation

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:
   1. Manufacturers:
   2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   3. Material: Use steel or malleable iron.
   4. Connectors and Couplings: Use compression (gland) or set-screw type.
      a. Do not use indenter type connectors and couplings.

2.08 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

B. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

C. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

D. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
   1. Products:
      a. ______.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Conduits in the following areas may be exposed, unless otherwise indicated:
      a. Electrical rooms.
      b. Mechanical equipment rooms.
      c. Within joists in areas with no ceiling.
4. Unless otherwise approved, do not route conduits exposed:
   a. Across floors.
   b. Across roofs.
5. Arrange conduit to maintain adequate headroom, clearances, and access.
6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
7. Arrange conduit to provide no more than 150 feet between pull points.
8. Route conduits above water and drain piping where possible.
9. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
10. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
11. Group parallel conduits in the same area together on a common rack.

F. Conduit Support:
1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use conduit strap to support single surface-mounted conduit.
   a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
9. Use of spring steel conduit clips for support of conduits is permitted only as follows:
   a. Support of electrical metallic tubing (EMT) up to 1 inch (27 mm) trade size concealed above accessible ceilings and within hollow stud walls.
10. Use of wire for support of conduits is not permitted.
11. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

G. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
7. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

H. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

I. Underground Installation:
1. Provide trenching and backfilling in accordance with Section 31 2316 and Section 31 2323.
2. Minimum Cover, Unless Otherwise Indicated or Required:
   b. Under Slab on Grade: 12 inches to bottom of slab.
3. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length for service entrance where not concrete-encased.

J. Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 3000 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.

K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where conduits are subject to earth movement by settlement or frost.

L. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

N. Provide grounding and bonding in accordance with Section 26 0526.

O. Identify conduits in accordance with Section 26 0553.

3.03 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING
A. Clean interior of conduits to remove moisture and foreign matter.
3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 0533.13
SECTION 26 0533.16

BOXES FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.01  SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
C. Floor boxes.
D. Underground boxes/enclosures.

1.02  RELATED REQUIREMENTS

A. Section 08 3100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.
B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
C. Section 26 0529 - Hangers and Supports for Electrical Systems.
D. Section 26 0533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
E. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
F. Section 26 2726 - Wiring Devices:
   1. Wall plates.
   2. Poke-through assemblies.
   3. Access floor boxes.
   4. Additional requirements for locating boxes for wiring devices.
G. Section 27 1000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

1.03  REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.
E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04  ADMINISTRATIVE REQUIREMENTS

A. Coordination:
1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS
A. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
   1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 upon request.
B. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE
A. Conform to requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING
A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS
2.01 BOXES
A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
   5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
   4. Use suitable concrete type boxes where flush-mounted in concrete.
   5. Use suitable masonry type boxes where flush-mounted in masonry walls.
6. Use raised covers suitable for the type of wall construction and device configuration where required.
7. Use shallow boxes where required by the type of wall construction.
8. Do not use "through-wall" boxes designed for access from both sides of wall.
9. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
10. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
13. Minimum Box Size, Unless Otherwise Indicated:
   a. Wiring Devices: 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
   b. Communications Systems Outlets: Comply with Section 27 1000.
   c. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
   d. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
14. Wall Plates: Comply with Section 26 2726.
15. Manufacturers:
   b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
   e. Thomas & Betts Corporation: www.tnb.com/#sle.
   f. Wiremold / Legrand / Pass & Seymour
C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
   1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA 250 Environment Type, Unless Otherwise Indicated:
      a. Indoor Clean, Dry Locations: Type 1, painted steel.
      b. Outdoor Locations: Type 3R, painted steel.
   3. Junction and Pull Boxes Larger Than 100 cubic inches:
      a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
   4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
      a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
   5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
   6. Manufacturers:

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that mounting surfaces are ready to receive boxes.
   C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer’s instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
      b. Communications Systems Outlets: Comply with Section 27 1000.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
   9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
   10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 0533.13.
   11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.
      b. Within joists in areas with no ceiling.
      c. Electrical rooms.
      d. Mechanical equipment rooms.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

J. Install boxes plumb and level.
K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 26 0526.

3.03 CLEANING
   A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION
   A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION 26 0533.16
SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1  GENERAL

1.01  SECTION INCLUDES

A.  Electrical identification requirements.
B.  Identification nameplates and labels.
C.  Wire and cable markers.

1.02  RELATED REQUIREMENTS

A.  Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables:  Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

PART 2  PRODUCTS

2.01  IDENTIFICATION REQUIREMENTS

A.  Identification for Equipment:
   1.  Use identification label to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.

B.  Identification for Conductors and Cables:
   1.  Color Coding for Power Conductors 600 V and Less:  Comply with Section 26 0519.
   2.  Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
      a.  At each source and load connection.
      b.  Within boxes when more than one circuit is present.

C.  Identification for Devices:
   1.  Identification for Communications Devices:  Comply with Section 27 1000.
   2.  Wiring Device and Wallplate Finishes:  Comply with Section 26 2726.

2.02  IDENTIFICATION NAMEPLATES AND LABELS

A.  Identification Labels:
   1.  Manufacturers:
      c.  Champion America
      d.  Hellermann Tyton
      e.  LEM Products
      f.  Marking Services, Inc
      g.  Panduit Corp:  www.panduit.com/#sle.
   3.  Text:  Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

B.  Format for Receptacle Identification:
   1.  Minimum Size:  3/8 inch by 1.5 inches.
   2.  Legend:  Power source and circuit number or other designation indicated.
   3.  Text:  All capitalized unless otherwise indicated.
   5.  Color:  Black text on clear background.

2.03  WIRE AND CABLE MARKERS

A.  Manufacturers:
   1.  Champion America
   2.  LEM Products
   3.  Marking Services
B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Conductors and Cables: Legible from the point of access.
   2. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

**3.02 FIELD QUALITY CONTROL**

A. See Section 01 4000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION 26 0553**
PART 1 GENERAL

1.01 RELATED REQUIREMENTS
   A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
   B. Section 26 0529 - Hangers and Supports for Electrical Systems.

1.02 REFERENCE STANDARDS
   A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
   B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
   E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.01 MANUFACTURERS
   A. ABB/GE; ______: www.geindustrial.com/#sle.
   B. Eaton Corporation; __________: www.eaton.com/#sle.
   C. Rockwell Automation, Inc; Allen-Bradley Products; __________: ab.rockwellautomation.com/#sle.
   D. Schneider Electric; Square D Products; ______: www.schneider-electric.us/#sle.
   E. Siemens Industry, Inc; __________: www.usa.siemens.com/#sle.

2.02 ENCLOSED CONTROLLERS
   A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
   B. Provide products listed, classified, and labeled as suitable for the purpose intended.
   C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
   D. Service Conditions:
      1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
         a. Altitude:
            1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet.
            2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet.
         b. Ambient Temperature: Between 32 degrees F and 104 degrees F.
      2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
   E. Short Circuit Current Rating:
F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Enclosures:
   2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
   3. Finish: Manufacturer's standard unless otherwise indicated.

H. Manual Motor Starters:
   1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
   2. Configuration: Non-reversing unless otherwise indicated.
   3. Fractional-Horsepower Manual Motor Starters:
      a. Furnish with toggle operator.
      b. Overload Relays: Bimetallic or melting alloy thermal type.
   4. Integral-Horsepower Manual Motor Starters:
      a. Furnish with toggle or pushbutton operator.
      b. Overload Relays: Bimetallic or melting alloy thermal type.

I. Motor-Starting Switches: Horsepower-rated switches without overload protection; toggle operator.

2.03 OVERCURRENT PROTECTIVE DEVICES

A. Overload Relays:
   1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
   2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
   3. Trip-free operation.
   4. Visible trip indication.
   5. Resettable.
      a. Employ manual reset unless otherwise indicated.
      b. Do not employ automatic reset with two-wire control.
   6. Bimetallic Thermal Overload Relays:
      a. Interchangeable current elements/heaters.
      b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
      c. Trip test function.
   7. Melting Alloy Thermal Overload Relays:
      a. Interchangeable current elements/heaters.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Install controllers in accordance with NECA 1 (general workmanship).
C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
D. Provide required support and attachment in accordance with Section 26 0529.
E. Install enclosed controllers plumb and level.
F. Provide grounding and bonding in accordance with Section 26 0526.
G. Install all field-installed devices, components, and accessories.
H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

END OF SECTION 26 2913
SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Wall switches.
   B. Receptacles.
   C. Wall plates.

1.02 RELATED REQUIREMENTS
   A. Section 26 0533.16 - Boxes for Electrical Systems.

1.03 REFERENCE STANDARDS
   A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2017h.
   B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); 2017g.
   C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
   D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2010.
   E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).
   F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.
   G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
   I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS
   A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
   B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
   C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
   D. Provide GFCI protection for receptacles installed within 6 feet of sinks.
   E. Provide GFCI protection for receptacles installed in kitchens.

2.02 WIRING DEVICE FINISHES
   A. Provide wiring device finishes as described below unless otherwise indicated.
   B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.

2.03 WALL SWITCHES
   A. Manufacturers:
B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 RECEPTACLES

A. Manufacturers:
   5. Eaton (Arrowhart).
   6. Substitutions: See Section 01 6000 - Product Requirements.
   7. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   3. Weather Resistant GFCI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

2.05 WALL PLATES

A. Manufacturers:
   5. Eaton (Arrowhart).
   6. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall Plates: Comply with UL 514D.
1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
3. Screws: Metal with slotted heads finished to match wall plate finish.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.
B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
D. Verify that final surface finishes are complete, including painting.
E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
F. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.
B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:
   a. Wall Switches: 42 inches above finished floor.
   b. Receptacles: 18 inches above finished floor or 6 inches above counter.
2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.
D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
H. Install wiring devices plumb and level with mounting yoke held rigidly in place.
I. Install wall switches with OFF position down.
J. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.
K. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

L. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

3.04 FIELD QUALITY CONTROL
A. See Section 01 4000 - Quality Requirements, for additional requirements.
B. Inspect each wiring device for damage and defects.
C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
D. Test each receptacle to verify operation and proper polarity.
E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING
A. Adjust devices and wall plates to be flush and level.

3.06 CLEANING
A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 2726
SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 RELATED REQUIREMENTS
A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
B. Section 26 0529 - Hangers and Supports for Electrical Systems.
C. Section 26 2813 - Fuses.
D. Section 26 2913 - Enclosed Controllers: Manual motor controllers.

1.02 REFERENCE STANDARDS
A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2018.
C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
E. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
G. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 MANUFACTURERS
C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES
A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; general duty; ratings, configurations, and features as indicated on the drawings.
B. Provide products listed, classified, and labeled as suitable for the purpose intended.
C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
D. Horsepower Rating: Suitable for connected load.
E. Voltage Rating: Suitable for circuit voltage.
F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
   2. Minimum Ratings:
      a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
      b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.
   1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N. Heavy Duty Switches:
   2. Conductor Terminations:
      a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

O. General Duty Switches:
   1. Conductor Terminations:
      a. Provide mechanical lugs.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Provide externally operable handle with means for locking in the OFF position, capable of accepting two padlocks.

PART 3 EXECUTION

3.01 EXAMINATION
   A. Verify that field measurements are as indicated.
   B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
   C. Verify that mounting surfaces are ready to receive enclosed safety switches.
   D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION
   A. Install products in accordance with manufacturer's instructions.
   B. Perform work in accordance with NECA 1 (general workmanship).
   C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
   D. Provide required support and attachment in accordance with Section 26 0529.
   E. Install enclosed switches plumb.
   F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
   G. Provide grounding and bonding in accordance with Section 26 0526.
H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

3.03 ADJUSTING
   A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.04 CLEANING
   A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
   B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION 26 2816.16
MECHANICAL SUPPLEMENTAL CONDITIONS

MECHANICAL PIPE & PIPE INSULATION

SPECIFICATION SCHEDULE

NOT ALL ITEMS WILL BE REQUIRED ON THE PROJECT

MECHANICAL PIPIING

MECHANICAL ABBREVIATIONS

MECHANICAL SYMBOL LIST

MECHANICAL PIPE LINING

MECHANICAL SUPPLEMENTAL CONDITIONS

1. Shop Drawings must be submitted in PDF format using a software compatible with AutoCAD. All drawings must be i

2. The General Contractor is responsible for furnishing and installing all electrical and plumbing systems, as well as gas, fuel, and oil lines, as required. The mechanical contractor is responsible for all mechanical systems, including heating, ventilation, air conditioning, and refrigeration. The electrical and plumbing contractors are responsible for all electrical and plumbing systems, including water supply, waste disposal, and gas lines. The mechanical contractor is responsible for all mechanical systems, including heating, ventilation, air conditioning, and refrigeration.

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ACCESS PLATFORM WITH LADDER AND PROTECTION GUARD.

WELD PLAN DETAILS

SHEET NO. DATE: CHECKED BY: DRAWN BY: JOB NO: FOR BID:

BALL VALVE

FREEZE PUMP

CA CA

M M

SENSOR IN AIRSTREAM

301 NORTH SECOND STREET

PIPE INSULATION DETAIL

PIPE SUPPORT DETAIL

FLANGE / UNION

ADJUSTABLE CLEVIS HANGER

INSULATION SHIELD

SEAL JOINT

PIPE SIZE 1"

1-1/4"

SHALL BE USED FOR STRAINERS

SAME INSULATING METHOD

NOTE:

FACTORY FORMED IN BASE

COMPOSITE SUPPORT

FLANGE / UNION

AT HANGER

4x4 FOAM RUBBER

INSULATION SHIELD

UNDER INSULATION SHIELD

SEAL JOINT

PIPE & TUBING SUPPORT SPACING

PIPE HANGER DETAILS

PRESSURE GAUGE DETAIL

END SUCTION PUMP DETAIL

ROLARTROL- TYPICAL INSTALLATION

AIR SEPARATOR SCHEDULE

CENTRIFUGAL CHILLER SCHEDULE

COOLING TOWER SCHEDULE (ALTERNATE NO. 1)

FREEZE PUMP SCHEDULE

PUMP SCHEDULE (ALTERNATE NO. 2)

AIR SEPARATOR SCHEDULE

CHILLED WATER COIL FREEZE PROTECTION PUMP DETAIL
THE SUPPLY AIR FAN, RETURN/EXHAUST FAN AND EXHAUST FAN WILL BE INTERLOCKED AND WILL RUN.

THE FREEZE PROTECTION PUMP SHALL REMAIN OFF AND THE BYPASS CONTROL VALVE CLOSED WHEN THE AIR TEMPERATURE DROPS BELOW 40°F (ADJ) THE BYPASS CONTROL VALVE SHALL OPEN AND THE OUTSIDE AIR DAMPER SHALL BE POSITIONED TO BYPASS THE COOLING COIL.

WITH THE "HEAT-COOL" SWITCH IN THE "HEAT" POSITION: THE TIME CLOCK STARTS BOTH THE SUPPLY, EXHAUST/RETURN AIR FANS TO RUN CONTINUALLY. THE DAY ROOM HEATING THERMOSTAT WILL OPERATE TO PROVIDE 100% OUTSIDE AIR AND 100% EXHAUST AIR, REGARDLESS OF THE HEATING UNOCCUPIED MODE.

WITH THE "HEAT-COOL" SWITCH IN "COOL" POSITION: THE TIME CLOCK WILL CAUSE THE FOLLOWING: THE AIR HANDLING SYSTEM AHU-7 & 10 TO RUN CONTINUOUSLY AND IN UNISON. THE OUTSIDE AIR DAMPERS WILL MODULATE TO PROVIDE ASHRAE 55°F (ADJ) OUTSIDE AIR, RETURN DAMPER SHALL MAINTAIN 80% RETURN AIR, AND THE EXHAUST AIR DAMPER SHALL MAINTAIN 15% EXHAUST AIR. THE SPACE STATIC PRESSURE CONTROLLER WILL PROPORTION EXHAUST/RETURN AIR FAN INLET VANE ACTUATOR.

THE ZONE THERMOSTATS WILL MODULATE THEIR RESPECTIVE ZONE DAMPERS TO MAINTAIN A SPACE SETPOINT 75°F (ADJ). THE DISCHARGE TEMPERATURE IS RESET BASED ON ZONE DEMAND.

THE COLD DECK WILL BE CONTROLLED BY A DISCHARGE CONTROLLER WHICH WILL PROPORTION THE CHILLED WATER 3-WAY CONTROL VALVE. THE CHILLED WATER 3-WAY CONTROL VALVE PROVIDE HOT WATER TO THE HEATING COIL CONTROL VALVE. THE CHILLED WATER 3-WAY CONTROL VALVE SHALL BE POSITIONED TO BYPASS THE COOLING COIL.

THE HOT DECK WILL BE CONTROLLED BY A DISCHARGE CONTROLLER MODULATING A THREE-WAY HOT WATER VALVE ON THE HOT WATER COIL TO MAINTAIN 110°F (ADJ) DISCHARGE TEMPERATURE.
CONDENSER WATER SYSTEM SEQUENCE OF OPERATION (CT-1)

1. The chilled water temperature shall be controlled by the individual chiller

2. When the chiller is no longer needed, the chiller control panel shall disable the chiller and allow it to stop. The chiller shall remain off for at least five minutes before being allowed to start.

3. If the chiller remains off for more than five minutes, the associated chiller and condenser water pump shall stop and the motORIZED valves in the chilled water lines shall close.

4. When the condenser water system is enabled, the cooling tower shall maintain the entering condenser water temperature by first modulating the normally open bypass valve and then setting the chilled water temperature to the entering condenser water temperature setpoint. The tower fans shall continue to operate to maintain the entering condenser water temperature setpoint plus 2.0 deg. F (ADJ.).

5. The condenser water pump shall stop if the chilled water temperature stays above the entering condenser water temperature setpoint by 2.0 deg. F (ADJ.) and the entering condenser water temperature reaches the condenser water bypass valve is fully closed and the entering condenser water temperature remains above 60°F (ADJ.) with a 5°F differential (ADJ.).

6. If after 30 seconds (ADJ.), the pump fails to start, the chiller control panel shall provide an alarm and the chiller shall not start.

7. The pump shall continue to run for 3 minutes (ADJ.) after the chiller has shut down.

8. The chilled water system shall be enabled when cooling mode is enabled and water flow shall be established prior to ch-1 starting.

9. Cooling mode shall be enabled manually by the system operator at the chiller operator interface pad located on the chiller.

10. The cooling tower one (ct-1) fan speed control, and provide monitoring and diagnostic information for the chiller-tower bypass control:

   - Chilled water system enable/disabelle
   - Chiller pump (p-3)
   - Condenser water pump (p-5)
   - Cooling tower bypass valve
   - Cooling tower

11. The professional engineer's seal and signature apply only to the document to which they are affixed. The user of this electronic drawing file agrees to assume all responsibility for any modification to or use of this drawing file that is inconsistent with the requirements of the rules and regulations of the Missouri Code of State Regulations Title 4, Division 30. No person may make any modifications to this electronic drawing file without the engineer's express written permission.

12. The engineer expressly disclaims any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part of the engineering project.
PLAN NOTES - MECHANICAL

1. LOCK OUT POWER TO CH-1, SEE ELECTRICAL PLAN. REMOVE REFRIGERANT PIPE AT CHILLER PRIOR TO REMOVING CHILLER.

2. PROVIDE AND INSTALL PIPE INSULATION ON EXISTING PIPE WHERE REQUIRED. CONNECT EXISTING 6" CWS, CWR, CS, AND CR TO CHILLER AS REQUIRED. 

3. CAREFULLY REMOVE INSULATION COVERING PIPE AND CORD. REMOVE EMBRACE GAMEenaire WITHOUT DAMAGE. INSTALL REFRIGERANT FILTERS AND INSTALL NEW MERV 8 FILTERS AT COMPLETION OF PLAN NOTES - MECHANICAL DEMOLITION.

4. PROVIDE AND INSTALL PIPE INSULATION ON EXISTING PIPE WHERE REQUIRED. CONNECT EXISTING 6" CWS, CWR, CS, AND CR TO CHILLER AS REQUIRED.

5. PROVIDE MECHANICAL, PHOTOVOLTAIC SYSTEM AND AUXILIARY POWER CONNECTIONS AS PER ELECTRICAL PLAN.

6. PROVIDE ELECTRICAL POWER AND CONTROL INSTALLATION MANUAL. CONNECT ELECTRICAL POWER AND CONTROL WIRING.

7. OWNER. WHEN APPROVAL IS ISSUED, PROTECT EACH RETURN AIR DUCT OPENING WITH MERV 8 FILTERS AND INSTALL MERV 8 FILTER(S) IN OWNER. WHEN APPROVAL IS ISSUED, PROTECT THE ENGINEER AND OWNER WHEN APPROVAL IS ISSUED, PROTECT THE ENGINEER AND OWNER. WHEN APPROVAL IS ISSUED, PROTECT THE ENGINEER AND OWNER.

8. OWNER RESERVES THE RIGHT TO CEASE ANY OR ALL DEMOLITION WORK AT ANY TIME WHEN SUCH WORK INTERFERES WITH THE OPERATION OF THE CONSTRUCTION SITE.

PUBLIC WORKER'S RIGHTS NOTICE

CHILLER (CH-1) TOP-SIDE VIEW

CHILLER (CH-1) LEFT-SIDE VIEW

CHILLER (CH-1) FRONT-SIDE VIEW

EXISTING CHILLER (CH-1) LEFT-SIDE VIEW

NOT TO SCALE
1. Disconnect controls and control wiring to the existing systems and save for disconnection.
2. Provide and install new riser and main connections of the existing 6" CS and CR piping at the tower.
3. Drill and install new support steel. Provide all shims as required.
4. Connect existing 6" CR manifold to maintain service access.
5. Remove 6" CS and CR piping at tower in preparation of removal.
6. Disconnect and remove as needed 6" CS and CR piping at tower in preparation of removal.
7. Disconnect control wiring.
8. Drain CT-1 and prepare support steel, clean and paint at preparation of removal.
9. Provide balance valves to be removed and rotated 180 degrees.
10. Provide makeup water from all new makeup piping and existing piping.

**GENERAL NOTES - MECHANICAL DEMOLITION**

- The contractor shall not commence any demolition work involving the existing mechanical systems without the approval of the owner and architect.
- The contractor shall field verify conditions prior to demolition.
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ELECTRICAL SUPPLEMENTAL CONDITIONS

1. BEFORE SIGNING THIS DRAWING, THE ELECTRICAL CONTRACTOR MUST CALL THE SITE OF WORK AND BECOME
   FAMILIAR WITH THE EXISTING INSTALLATION. ELECTRICAL CONTRACTORS ARE REQUIRED TO KNOWN THE SITE OF
   WORK, THE EXISTING INSTALLATION, AND EXTEND THE BOUNDARY OF THE PROJECT TO THE LIMITS OF THE
   DRAWING AND SPECIFICATER TECHNICAL SPECIFICATIONS AND PROJECT DOCUMENTS.

2. THE ELECTRICAL CONTRACTOR SHALL WORK IN CLOSE COORDINATION WITH THE GENERAL CONTRACTOR, OWNER,
   TENANT, AND ALL OTHER WORKERS INSTALLING THE BUILDING. THE GENERAL CONTRACTOR SHALL KEEP IN
   CLOSE PERSONAL CONTACT WITH THE ELECTRICAL CONTRACTOR TO AVOID ANY DISTURBANCE. AFTER A
   PLAN ACCEPTABLE TO THE OWNER OR TENANT HAS BEEN FORMULATED AND AGREED UPON, THE GENERAL
   CONTRACTOR SHALL DIRECT THE SOLUTION BEFORE INSTALLATION OF THE WORK.

3. THE ELECTRICAL CONTRACTOR SHALL HAVE ACCESS TO ELECTRONIC FILES OWNED AND/OR CREATED BY G&W
   ENGINEERING CORPORATION. THE ELECTRICAL CONTRACTOR SHALL HAVE ACCESS TO ELECTRONIC FILES
   OWNED AND/OR CREATED BY G&W ENGINEERING CORPORATION. THE ELECTRICAL CONTRACTOR SHALL
   PERFORM WORK IN A SAFE MANNER. COMPLY WITH APPLICABLE OSHA SAFETY LAWS. ELECTRICAL WORK
   SHALL BE PROVIDED TO COMPLY WITH NFPA 70, THE 2014 NATIONAL ELECTRICAL CODE (NEC), ELECTRICAL
   CODE IN CONFORMANCE WITH LAWS.

4. FIRE ALARM ANNUNCIATOR PANEL

5. FIRE ALARM

6. ALL ELECTRICAL REPLACEMENTS OR SUBSTITUTIONS MUST BE APPRORIATRED WITHIN THE APPROPRIATE
   AUTHORITY HAVING JURISDICTION. COORDINATION WITH STRUCTURAL MEMBERS, ARCHITECTURAL WORK, AND
   ALL OTHER ITEMS BEING INSTALLED BY OTHER CONSTRUCTION CONTRACTORS, ARE NOT UNDERSTOOD OR
   WHERE CONFLICTS MAY EXIST. CLARIFICATIONS MUST BE PRESENTED AS A "REQUEST FOR INFORMATION"
   (RFI) IN WRITING PRIOR TO SUBMITTING A BID. RFI SHALL BE PRESENTED A MINIMUM OF FIVE (5) WORKING

7. PROVIDE ALL NECESSARY EQUIPMENT, FITTINGS, HANGERS, BOXES, SUPPORTS, OFFSETS AND ACCESS
   TO MATERIALS. PROVIDE ALL NECESSARY EQUIPMENT, FITTINGS, HANGERS, BOXES, SUPPORTS, OFFSETS AND
   ACCESS TO MATERIALS. PROVIDE ALL NECESSARY EQUIPMENT, FITTINGS, HANGERS, BOXES, SUPPORTS, OFFSETS AND
   ACCESS TO MATERIALS.

8. ELECTRICAL WORK, REPAIRS, OCCURRING IN ANY PART OF THE ELECTRICAL SYSTEM AND ITS COMPONENTS,
   INCLUDING, BUT NOT LIMITED TO, ELECTRICAL WIRING, CABLES, PANELS, DISTRIBUTION, CONTROL, AND
   COMMUNICATION SYSTEMS, SHALL BE PERFORMED IN A MANNER THAT IS CONFORMAL TO THE DRAWING
   AND SPECIFICATIONS, PROJECT DOCUMENTS, AND REQUIRED CODES AND LAWS. THE ELECTRICAL
   CONTRACTOR SHALL REPORT ANY CONFLICTS OR DIFFICULTIES IN REGARD TO THE INSTALLATION IMMEDIATELY
   TO THE GENERAL CONTRACTOR. SHOULD ANY DISTURBANCE OF THE EXISTING INSTALLATION BE NECESSARY, THE
   GENERAL CONTRACTOR SHALL REPORT ANY CONFLICTS OR DIFFICULTIES IN REGARD TO THE INSTALLATION IMMEDIATELY
   TO THE GENERAL CONTRACTOR. SHOULD ANY DISTURBANCE OF THE EXISTING INSTALLATION BE NECESSARY, THE
   GENERAL CONTRACTOR SHALL REPORT ANY CONFLICTS OR DIFFICULTIES IN REGARD TO THE INSTALLATION IMMEDIATELY
   TO THE GENERAL CONTRACTOR.

9. ELECTRICAL CONTRACTOR SHALL HAVE ACCESS TO ELECTRONIC FILES OWNED AND/OR CREATED BY G&W
   ENGINEERING CORPORATION. UNLESS OTHERWISE NOTED UNLESS OTHERWISE NOTED UNLESS OTHERWISE NOTED
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10. ELECTRICAL CONTRACTOR SHALL HAVE ACCESS TO ELECTRONIC FILES OWNED AND/OR CREATED BY G&W
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    ENGINEERING CORPORATION. UNLESS OTHERWISE NOTED UNLESS OTHERWISE NOTED UNLESS OTHERWISE NOTED
    UNLESS OTHERWISE NOTED.
GENERAL NOTES - ELECTRICAL

1. All work on this project shall be in accordance with the procedures described herein.

2. Any drawings or specifications not herein described shall be in accordance with the manufacturer's written instructions.

3. All work shall be in accordance with the Missouri Code of State Regulations Title 4, Division 30. No person may make any changes or additions to any drawings or specifications without the written consent of the Engineer.

4. All work shall be in accordance with the Missouri Board for Architects, Professional Engineers, Professional Land Surveyors, and Landscape Architects, the user of this electronic drawing file agrees to assume all responsibility for any change or addition to any work done by others.

5. The Professional Engineer's seal and signature apply only to the document to which they are affixed. The Engineer expressly disclaims any responsibility for all other plans, specifications, estimates, reports or other documents.

6. This electronic drawing file is released under the authority of the Engineer.

PLAN NOTES - DEMOLITION

1. Remove existing heat trace from all exterior piping back to existing branch circuit from existing conduit roof stub.

2. Disconnect and remove safety switch.

3. Connect wiring from safety switch to motor strip heaters.

4. Provide type 15A BAB circuit breaker in panelboard blank.

5. Connect wiring from thermostat to cooling tower control panel per equipment supplier specifications.

6. Connect wiring from immersion heater to cooling tower control panel per equipment supplier specifications.

7. Trace contactor conditions, verify and coordinate material with M.C. prior to submitting a bid. Install heat trace cable, thermostat, contactor, controller, CR, HPWR, HPWS and MUW piping exposed to ambient.

PLAN NOTES - ELECTRICAL

1. Provide NVent Raychem XL-Trace 8XL-2-CR on cooling tower CS, new panel.

2. Existing cooling tower, CT-1, to remain.

3. Existing heat trace junction boxes.

4. Existing heat trace control contactors to remain.

5. Existing branch circuit from existing conduit roof stub to existing branch circuit.

6. Provide wiring and conduit from cooling tower vibration cutout switch to cooling tower control panel per equipment supplier specifications. Sensor wiring provided and installed by mechanical controls contractor. Coordination installation with M.C.

7. Provide J.B. and conduit from cooling tower vibration cutout switch to immersion heater control panel per equipment supplier specifications. Sensor wiring provided and installed by mechanical controls contractor. Coordination installation with M.C.
ENLARGED AHU ROOM 53069 - ELECTRICAL

ENLARGED AHU ROOM 33001 - ELECTRICAL

ENLARGED AHU ROOM 44016 - ELECTRICAL

ENLARGED AHU ROOM 63001 - ELECTRICAL
1. Existing Federal Pacific "LDP" panelboard. Provide two (2) 15A Type BAB circuit breakers in blank spaces 15 and 17 for freeze pump branch circuits.

2. Existing Federal Pacific "NQLP" panelboard. Provide one (1) 15A Type BAB circuit breaker in blank space 26 for freeze pump branch circuit.

# A. Coordinate work with M.C.
December 23, 2020

ADDENDUM #1

IFB 21-023 Justice Center Chiller Replacement

Addendum # 1 is being issued to address questions and add documents to the bid specifications:

1. What is the volume of the refrigerant and oil that we will need to pump down? Literature indicates the system holds 9 gallons of oil and the unit equipment tag indicates the “Refrigerant system to be field charged with 450 lbs”
2. Does the scope of work need to be completed in 160 or 210 days after project approval? It states both on the RFP. 210 Days
3. What is the weight capacity for the ramp by the chillers? The capacity is unknown but it was used to bring the existing equipment in, so it is assumed to be adequate for the new equipment.
4. What is the seismic criteria for the building? Site Class D Importance factor 1.5”
5. Will the county be supplying street blocking for the crane or will that be the responsibility of the mechanical? It’s the responsibility of the contractor
   a. What if there is any sidewalk blocking that will be needed? What are the county’s requirements? Follow OSHA guidelines
   b. Will the county be supplying a landing area / material or tool storage on site? Yes, this will have to be coordinated.
   c. Technician parking? Free public parking is available
6. If we will be doing the crane pick and placement during business hours, what is your policy about how many floors need to be evacuated of staff? This will have to be coordinated once the hoisting path is established.
7. Will the county be supplying all permits? We will supply the mechanical and the electrical permits. The contractor will be responsible for coordinating all inspections.
8. Will the county be responsible for the removal of the old units off site? Contractor responsible for disposal of equipment.
9. Is there any water management that we need to work with for the draining down of the system? Will need to coordinate with the County PM for the drain down of the condenser water systems and the chilled water systems and filling of same systems.
10. Can you please clarify on where the freeze pumps need to be allocated? The drawings say base bid, but the write up in the front ends, says alternate #1. Freeze protection pumps are in the base bid.
11. Will the county be supplying recommended roof protection during tower related work, Alternate #1? No, this is the contractor’s responsibility.
12. Can we have the EOR provide a VFD specification, Alternate #2 See additional addendum 1 documents
14. Section 23 6416 Centrifugal Water Chillers lists Trane CVHE as the only acceptable manufacture. Is Trane the only acceptable manufacturer? See additional addendum 1 documents
SEE DOCUMENTS ATTACHED

Bidders shall sign this Addendum as acknowledgment and return it with the bid.

BID ADDENDUM

Addendum #1  Dated 12/23/20

We, the undersigned, acknowledge the receipt of the above addendum, as dated.

By:

Title:

Company:

Date:
REQUEST FOR INFORMATION

PROJECT: SCCJC Chiller Replacement
SUBCONTRACTOR/VENDOR: Trane
Pre-bid RFI NUMBER: 02

Subject: Temperature Controls
Specification Section: _____ Drawing Number: _____ Column Intersection: _____

EXPLANATION OF ISSUE:

1. What controls do systems need to tie into?

SUBMITTED BY: Jake Schanzmeyer DATE: 12/21/2020

ARCHITECT'S/ENGINEER'S RESPONSE:

1. The controls are to be connected to the existing Trane Tracer system.

Base Bid: Controls for new chiller and all new motorized isolation valves along with control of the existing cooling tower, condenser, and chilled water pumps associated with the new chiller.

Alternate No. 1: Control for new chiller, cooling tower, and motorized valves along with control of the existing condenser, and chilled water pumps associated with the new chiller.

Alternate No. 2: Control for new chiller, cooling tower, motorized valves, and condenser and chilled water pumps associated with both new and existing chillers.

ARCHITECT/ENGINEER:

BY: David Gockley, G&W Engineering DATE: 12/21/2020

File: 2020-0221.00 JCCJC Chiller Replacement
GENERAL NOTES - ELECTRICAL

1. disconnect line voltage circuit(s) to trane control panel.

2. disconnect and cap services and remove equipment; when equipment to be removed and salvaged: disconnect and cap services and remove, clean, and store equipment; when equipment to be removed and reinstalled: disconnect and reinstall.

3. remove equipment. remove electrical wiring and conduit components indicated to be removed.

4. these definitions are applicable to work shown on drawings e1.1.1 and e1.1.2.

5. these notes are applicable to work shown on drawings e1.1.1 and e1.1.2.

6. these definitions are applicable to work shown on drawings e1.1.1 and e1.1.2.

7. general notes - demolition

8. general notes - electrical

9. plan notes - demolition

10. plan notes - electrical
1. Identify existing branch circuit at unit heater outlet box. Connect to freeze pump.

2. Connect freeze pump branch circuits to existing receptacle circuit.

3. Coordinate work with M.C.

ENLARGED AHU ROOM 53069 - ELECTRICAL

ENLARGED AHU ROOM 33001 - ELECTRICAL

ENLARGED AHU ROOM 44016 - ELECTRICAL

ENLARGED AHU ROOM 63001 - ELECTRICAL
VFD Pump Controller Specification (Basis of Design)

### TECHNOLOGIC STANDARD FEATURES

| CONTROL METHOD | Constant Pressure, Linear Control Curve, Quadratic Control Curve, Factory configured for sensor less operation (optional). Field configurable for use with a wired transducer. |
| CONTROL ZONES | Up to 4 zones. |
| STARTUP GENIE | Quick start for programming hydraulic specific applications and pump protections. |
| MULTIPUMP | Up to 4 pumps via RS485. |
| ENCLOSURE | UL Type I, II D, III R, IV X (Bypass has type I and 12 only) |
| POWER DISCONNECT SWITCH | Standard Disconnect, 3-used Disconnect Switch (Fused Disconnect Switch is standard for Drive-Bypass and 150-600HP Drive) |
| EMI/RFI CONTROL | Integrated filter to meet EN62800-3. |
| HARMONIC SUPPRESSION | Integrated non-saturating dual DC link reactors provide better harmonic performance than a 5% AC line reactor. |
| COOLING | Fan-cooled through temperature controlled and easy replacement. |
| AMBIENT TEMPERATURE RATING | 14°F to 113°F (-10°C to 45° C) |
| COMMUNICATION PROTOCOLS | BACnet, Modbus RTU, N2 Metasys as standard |
| ANALOG INPUTS | 1 configurable for either voltage (0 to 10VDC) or current (0/4 to 20mA) and 1 current (0/4 to 20mA). |
| ANALOG OUTPUTS | 1 (0 to 20mA) up to 500 ohm load accurate to 1% of full scale |
| DIGITAL INPUTS | 4 (0 to 24VDC), NPN or PNP, 0 to 24VDC, on 5 msec scan interval. Up to 2 can be configured as pulse inputs. |
| DIGITAL OUTPUTS | 2 (0 to 24VDC), 40mA max current, configurable as pulse outputs. |
| RELAY OUTPUTS | 2 programmable, 240VAC or 400VAC up to 2 A |
| BYPASS OPTION | Drive-Bypass, 3 Contactor, 100 KA SCRF, Electronic Control, Fused Disconnect Switch |

### SPECIFICATIONS

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### Drive Drawings and Specification Table

<table>
<thead>
<tr>
<th>Frame Size</th>
<th>Nominal Weight lbs/Kg</th>
<th>Enclosure Rating</th>
<th>Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TYPE 1</td>
<td>TYPE 12</td>
<td>H inches/mm</td>
</tr>
<tr>
<td><strong>A2</strong></td>
<td>10.8/4.9</td>
<td>X</td>
<td>19.1/485</td>
</tr>
<tr>
<td><strong>A3</strong></td>
<td>14.6/6.6</td>
<td>X</td>
<td>19.1/485</td>
</tr>
<tr>
<td><strong>A5</strong></td>
<td>31.3/14.2</td>
<td>X</td>
<td>16.5/420</td>
</tr>
<tr>
<td><strong>B1</strong></td>
<td>51/23</td>
<td>X</td>
<td>18.9/480</td>
</tr>
<tr>
<td><strong>B2</strong></td>
<td>60/27</td>
<td>X</td>
<td>25.6/650</td>
</tr>
<tr>
<td><strong>C2</strong></td>
<td>143/65</td>
<td>X</td>
<td>30.2/770</td>
</tr>
</tbody>
</table>

**Note:**

D1 and D3 are the same if the option A/B card does not require a new LCP frame.