CIVIC CAMPUS HVAC UPGRADE
PROJECT REBID

PACIFIC, WASHINGTON

Bid Number CC2201

Prepared by:
City of Pacific
100 3rd Avenue SE
Pacific, Washington 98047

June 2022
CIVIC CAMPUS HVAC UPGRADE PROJECT
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ADVERTISEMENT FOR BIDS

CITY OF PACIFIC
CIVIC CAMPUS HVAC SYSTEM UPGRADE PROJECT
CONTRACT NO. CC2201

BID

Notice is hereby given that sealed proposals will be received by the City of Pacific at City Hall, 100 3rd Avenue SE, Pacific, Washington 98047 until 11:00 a.m. local time on July 13, 2022, for the Replacement of the City of Pacific System located at 100 3rd Ave SE. Bids received after that date and time, even if mailed earlier, will not be accepted. Any questions may be referred to: Jim Morgan, Public Works Manager, (253) 929-1113.

GENERAL SCOPE OF WORK

There will NOT be a mandatory pre-bid conference. However, Prospective bidders may schedule a pre-bid escorted walk through the site.

The work to be performed will include all labor, materials, equipment, permits, agency and public notifications, disposal fees, and incidentals necessary to install new HVAC systems in the Senior Center and the East Room of the Community Center buildings located at 100 3rd Avenue SE. The following is a partial list of the HVAC upgrades required:

- Demolition;
- Systems Design
- New HVAC Systems;
- Electrical Systems Modifications

Estimated Bid Range: $75,000 - $100,000

This project is financed through the funds obtained from the U.S. Government. The contract will be subject to regulations of the Departments of Labor and Housing, and Urban Development.

Attention is called to federal provisions for Equal Employment Opportunity, HUD Section 3 requirements, and the minimum wages as set forth in the contract documents.

All bid proposals shall be accompanied by a bid security (bid deposit) in the form of a cash deposit, certified or cashier’s check, postal money order, or surety bond made payable to the City of Pacific, for a sum not less than five percent (5%) of the amount of such bid, including sales tax. Should the successful bidder fail to enter into such contract and furnish satisfactory payment and performance bonds within the time stated in the Specifications, the bid security (bid deposit/bond) shall be forfeited to the City of Pacific.

The award of the Contract will go to the qualified bidder submitting the lowest responsible bid. The City reserves the right to reject any and all bids or waive any informality in the bidding and make the award as deemed to be in the best interest of the City.

Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color or national origin in consideration for an award.

Notice is given to all potential bidders that any bid responses may be subject to release under the Public Records Act Chapter 42.56 RCW and the City may be required to disclose bid responses upon a request. Bidders are advised to mark any records believed to be trade secrets or confidential in nature as “confidential.” If records marked as “confidential” are found to be responsive to the request for records, the City may elect to give notice to the bidder of the request so as to allow the bidder to seek a protective order from a Court. Please be advised, however, that any records deemed responsive to a public records request may be released at the sole discretion and without notice by the City.

Specifications, addenda and the bidders list may be viewed and obtained online from the City of Pacific Website: Current Projects - City of Pacific, WA (pacificwa.gov). Bidders may contact James J. Morgan, P.E., of the City of Pacific with questions at (253) 929-1115.

Published in The Seattle Daily Journal of Commerce, June 15 and June 22, 2022
NOTICE TO PROSPECTIVE BIDDERS
CIVIC CAMPUS HVAC UPGRADE PROJECT

In accordance with Section 1-02.4(1) of the Standard Specifications, it is the City of Pacific’s policy that questions concerning the project during the bidding process be submitted in written form. Please submit any questions that are pertinent to bidding the contract, and that are not answered by information contained in the Contract Documents, to the City of Pacific Engineering Department via telephone facsimile (fax): (253) 887-9910, Attention: James J. Morgan, P.E.

All faxes must be received at least 3 business days prior to the bid opening for a response. All prospective bidder questions and the City’s response will be sent via fax or email, if possible, to all prospective bidders who have purchased plans approximately 2 days prior to the bid opening.

If you believe the Contract Documents contain an error or error(s), please provide us with that information via fax. An addendum will be issued to all prospective bidders if a correction is needed.

I have the following question(s)/comment(s):

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

I believe the Contract Document(s) has (have) the following error(s):

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

Please respond to:

Name: ________________________________________

Representing: ________________________________

Address: _____________________________________

____________________________________________________________________________________

____________________________________________________________________________________

Fax Number: ___________________________________
INFORMATION AND CHECKLIST FOR BIDDERS

The following supplements the information in the Advertisement for Bids:

1. **Pre-Bid Conference**

   There will **NOT** be a mandatory pre-bid conference. However, Prospective bidders may schedule a pre-bid escorted walk through the site. This will be your only opportunity to ask direct questions related to the project. Information from the pre-bid conference will not be made available to bidders who do not attend. The Engineer will transmit to all prospective Bidders of record such addenda as the Engineer considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

2. **Examination of Plans, Specifications, and Site**

   Before submitting his/her bid, the Contractor shall carefully examine each component of the Bid Documents and any other available supporting data so as to be thoroughly familiar with all the requirements.

   The Bidder shall make an alert, heads-up, eyes-open reasonable examination of the project site and conditions under which the Work is to be performed, including but not limited to: current site topography, soil and moisture conditions; underground obstructions; the obstacles and character of materials which may be encountered; traffic conditions; public and private utilities; the availability and cost of labor; and available facilities for transportation, handling and storage of materials and equipment.

3. **Property Issues**

   All bidders shall base their bids upon full restoration of all property within the right-of-way and easements, and wherever Bidder will have right-of-entry. The easements and right of entry documents that have been acquired are available for inspection and review. The Bidder is advised to review the conditions of the permits, easements, and rights-of-entry, as he shall be required to comply with all conditions at no additional cost to the Owner. All other permits, licenses, etc., shall be the responsibility of the Bidder. The Bidder shall comply with the requirements of each.

4. **Interpretation of Bid Documents**

   The Bidder shall promptly notify Owner of any discovered conflicts, ambiguities, or discrepancies in or between, or omissions from the Bid Documents. Questions or comments about these Bid Documents should be directed to the attention of: James J. Morgan, P.E., City Engineer for the City of Pacific, 100 3rd Avenue SE, Pacific, WA 98047, phone (253) 929-1113.

   Questions received less than 3 days prior to the date of bid opening may not be answered. Any interpretation or correction of the Bid Documents will be made only by addendum, and a copy of such addendum will be mailed or delivered to each person receiving a set of such Bid Documents. The Owner will not be responsible for any other explanations or interpretations of the Bid Documents. No oral interpretations of any provision in the Bid Documents will be made to any Bidder.
5. Bidding Checklist

All bids shall be submitted on the exact forms provided in these Bid Documents, and listed below. Failure to submit any of these forms may be grounds for rejection of the bid. Sealed bids for this proposal shall be submitted as specified in the Advertisement for Bids. Each bid must be submitted in a sealed envelope bearing on the outside the name and address of the Bidder, and the name and number of the project for which the bid is submitted. All bids will remain subject to acceptance for sixty (60) calendar days after the day of the bid opening.

A. Proposal – Bidders must bid on all items contained in the Proposal. If any unit price is left blank, it will be considered no charge for that bid item, regardless of what has been placed in the extension column.

B. Bid Security – Bid Bond is to be executed by the Bidder and the surety company unless bid is accompanied by a cash deposit, cashier’s or certified check, or postal money order. The amount of this bond shall be not less than five percent (5%) of the total bid, including sales tax, if applicable, and may be shown in dollars. Surety must be authorized to do business in the State of Washington, and must be on the current Authorized Insurance List in the State of Washington per Section 1-02.7 of the Standard Specifications.

   i. The bid bond/deposit of the successful Bidder will be returned provided he executes the Contract, furnishes satisfactory performance bond covering the full amount of work, provides evidence of insurance coverage, and other documents required by the contract documents within 14 calendar days after Notice of Award. Should he/she fail or refuse to do so, the Bid Deposit or Bond shall be forfeited to the City of Pacific as liquidated damages for such failure.

   ii. The City reserves the right to retain the security of the three lowest bidders until the successful Bidder has executed the Contract and furnished the performance bond.

C. Non-Collusion Declaration – DOT Form 272-036H EF included in these Contract Provisions must be returned with the bid proposal.

D. Bidder's Qualification Form – Regarding forms D and E, the Owner reserves the right to check all statements and to judge the adequacy of the Bidders qualifications.

E. DBE Utilization Certification Form – Must be filled in and signed.

6. Contract Checklist

The following forms are to be executed by the successful Bidder after the Contract is awarded. The Contract and Performance and Payment Bond are included in these Bid Documents and should be carefully examined by the Bidder.

A. Contract – Three copies to be executed by the successful Bidder.

B. Performance/Payment Bond and Warranty Bond – Three copies to be executed by the successful Bidder and his surety company. This bond covers successful completion of all work and payment of all laborers, subcontractors, suppliers, etc. The bond form included in these Bid Documents MUST be used; no substitute will be accepted. If an Attorney-in-fact signs the bond, a certified and effectively dated copy of their Power of Attorney must accompany the bond.

C. Certificates of Insurance – To be executed by an insurance company acceptable to the Owner, on ACCORD Forms. Required coverages are listed in Section 1-07.18 of the Standard Specifications.
Specifications, as may be modified by the Special Provisions. The Owner shall be named as “Additional Insured” on the insurance policies.

D. Selection of Retainage Option – The above Bid and Contract Documents must be executed by the Contractor’s President or Vice-President if a corporation, or by a partner if a partnership. In the event another person has been duly authorized to execute contracts, a copy of the resolution or other minutes establishing this authority must be attached to the Proposal and Contract documents.

E. Prevailing Wage Requirements –

Prevailing wage rates can be found on the L and I website:

Prevailing Wage Rates

7. Contractor Disqualification

1) A bidder will be deemed not responsible and the proposal rejected if the bidder does not meet the responsibility criteria in RCW 39.04.

2) A bidder may be deemed not responsible and the proposal rejected if:

   a. More than one proposal is submitted for the same project from a bidder under the same or different names;

   b. Evidence of collusion exists with any other bidder or potential bidder. Participants in collusion will be restricted from submitting further bids;

   c. The bidder, in the opinion of the Contracting Agency, is not qualified for the work or to the full extent of the bid, or to the extent that the bid exceeds the authorized prequalification amount as may have been determined by a prequalification of the bidder;

   d. An unsatisfactory performance record exists based on past or current Contracting Agency work or for work done for others, as judged from the standpoint of conduct of the work; workmanship; progress; affirmative action; equal employment opportunity practices; or Disadvantaged Business Enterprise, Minority Business Enterprise, or Women’s Business Enterprise utilization;

   e. There is uncompleted work (Contracting Agency or otherwise) which might hinder or prevent the prompt completion of the work bid upon;

   f. The bidder failed to settle bills for labor or materials on past or current contracts;

   g. The bidder has failed to complete a written public contract or has been convicted of a crime arising from a previous public contract;

   h. The bidder is unable, financially or otherwise, to perform the work; or

   i. There are any other reasons deemed proper by the Contracting Agency.
# Certification of Materials Origin
(Required for Acceptance of Steel Materials)

<table>
<thead>
<tr>
<th>Awarding Agency Contract No. and Title</th>
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<tbody>
<tr>
<td>Contractor</td>
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<tr>
<td>Subcontractor</td>
<td></td>
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<tr>
<td>Manufacturer / Supplier</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Materials: Bid Item No. / Bid Item Description</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Material Description</td>
<td></td>
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</table>

The following Certification of Materials Origin is made for the purposes of establishing materials acceptance under Contract Provisions entitled “Buy America.” Materials as described above are furnished for use in compliance with the certification as noted in 1 or 2 below. Manufacturing processes for the materials are defined on the back of this form.

1. The materials covered by this certification are American-Made with all manufacturing processes entirely within the United States of America.

2. The materials furnished for this project under this certification contain steel or iron manufactured, all or in part, outside the United States of America, as indicated below.

The Description of these materials and the Country of Origin of these materials is as follows:

The Invoice Cost for the above described foreign-made materials is:

I declare under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct.

Contractor / Subcontractor / Manufacturer / Supplier Name

Authorized Official Signature

Date

Place

---

DOT Form 356108 EF
Revised 07/2012

Side 1 of 2
The following items are considered to be Steel or Iron Manufacturing Processes

1. Any process from the original reduction from ore to the finished product constitutes a manufacturing process for iron. Foreign source steel ingots or foreign source steel billets used in any manufacturing process of a steel product is considered foreign steel under the Buy America Provision.

2. Production of Steel by any of the following processes:
   a. Open Hearth Furnace.
   b. Basic Oxygen.
   c. Electric Furnace.
   d. Direct Reduction.

3. Rolling, heat treating, and any other similar processing.

4. Fabrication of the products:
   a. Spinning wire into cable or strand.
   b. Corrugating and rolling into culverts.
   c. Shop fabrication.

5. Protective coatings such as zinc, aluminum, epoxy, paint, or any other coating that protects or enhances the value of steel or iron.

6. Due to a nationwide waiver, Buy America does not apply to raw materials (iron ore and alloys), scrap (recycled steel or iron), and pig iron or processed, pelletized, and reduced iron ore.
## STATEMENT OF INTENT TO PAY PREVAILING WAGES

**Public Works Contract**  
$40.00 Filing Fee Required

### Intent ID # (Assigned by L&I)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Contract Number</th>
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<table>
<thead>
<tr>
<th>Contract Awarding Agency</th>
<th>(public agency - not federal or private)</th>
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<table>
<thead>
<tr>
<th>Awarding Agency Address</th>
<th>City</th>
<th>State</th>
<th>ZIP+4</th>
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<tr>
<th>Awarding Agency Project Contact Person</th>
<th>Phone Number</th>
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<th>County where work will be performed</th>
<th>City where work will be performed</th>
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<tr>
<th>Bid due date (mm/dd/yy)</th>
<th>Date contract awarded (mm/dd/yy)</th>
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### Prime Contractor (has contract with the public agency)

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<th>Prime’s Phone Number</th>
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<tr>
<th>Will all work be subcontracted?</th>
<th>Do you intend to use subcontractors?</th>
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<tbody>
<tr>
<td>☐ Yes ☐ No</td>
<td>☐ Yes ☐ No</td>
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### Prime’s Contractor Registration Number

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<tr>
<th>Prime’s UIN Number</th>
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<tr>
<th>Number of Owner/Operators that own at least 30% of the company who will perform work on the project:</th>
<th>Will employees perform work on this project? ☐ Yes ☐ No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected job start date (mm/dd/yy)</td>
<td>Do you intend to use apprentice employees? ☐ Yes ☐ No</td>
</tr>
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<table>
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<tr>
<th>Craft/trade/occupation (Do NOT list apprentices.) When using employees in more than one craft, each craft transition must be accurately recorded on the time sheet</th>
<th>Estimated number of workers</th>
<th>Rate of hourly pay</th>
<th>Rate of hourly fringe benefits</th>
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<th>Industrial Insurance Account Number</th>
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### For L&I Use Only

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<tr>
<th>APPROVED:</th>
<th>Department of Labor and Industries</th>
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<tr>
<td></td>
<td>By Industrial Statistician</td>
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<tr>
<th>Statement of intent to pay prevailing wages 05-08</th>
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**Sample**

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### Company Name

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<th>Address</th>
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**Note**: This form must be typed or printed in ink. Fill in all blanks or form will be returned for correction (see back). Please allow a minimum of 10 working days for processing. Once approved, your form will be posted online at the website above.

---

**DO NOT SEPARATE FORMS PRIOR TO APPROVAL BY L&I**

(While & carry copies must be submitted-carries will be retained by L&I after approval.)
# AFFIDAVIT OF WAGES PAID

Public Works Contract  
$40.00 Filing Fee Required

<table>
<thead>
<tr>
<th>Affidavit ID # (Assigned by L&amp;I)</th>
<th>Contract Number</th>
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<tr>
<th>Project Name</th>
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<th>Awarding Agency Address</th>
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<tr>
<th>Awarding Agency Project Contact Person</th>
<th>Phone Number</th>
<th>County where work was performed</th>
<th>City where work was performed</th>
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<th>Bid date (mm/dd/yyyy)</th>
<th>Date contract awarded (mm/dd/yyyy)</th>
<th>Date work completed (mm/dd/yyyy)</th>
<th>Date Intent filed (mm/dd/yyyy)</th>
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<th>Was all work subcontracted?</th>
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<td>Yes</td>
<td>No</td>
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<tr>
<th>Responding “Yes” to either of the above questions will require that you fill out Addendum B, List of Next Tier Subcontractors.</th>
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<tr>
<th>Job start date (mm/dd/yyyy)</th>
<th>Number of workers</th>
<th>Total # of hours worked - ea. trade</th>
<th>Rate of hourly pay</th>
<th>Rate of hourly fringe benefits</th>
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| Craft/trade/occupation and apprentices. (For apprentices, give name, registration #, trade, dates of work on project, stage of progression, wage and fringe.) |
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<th>Company Name</th>
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<tr>
<th>For L&amp;I Use Only</th>
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<tbody>
<tr>
<td>Check Number</td>
<td>$40 or $</td>
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<td>Issued By</td>
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| $700-007-008 affidavit of wages 05-08 |

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<tr>
<th>AFFIDAVIT OF WAGES PAID</th>
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<tr>
<td>Public Works Contract</td>
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<th>Approved Department of Labor and Industries</th>
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PROPOSAL
CITY OF PACIFIC
CIVIC CAMPUS HVAC UPGRADE PROJECT
CONTRACT NO. CC2201

To: Mayor and City Council
City of Pacific, Washington

Contractor: _________________________________ State License No.: _______________________

Date: _________________________________ Month/Day/Year

Bidder’s Declaration and Understanding

The Bidder declares that he has carefully examined the Contract Documents for the construction of the project, that he has personally inspected the site, that he has satisfied himself as to the quantities involved, including materials and equipment, and conditions of work involved, including the fact that the description of the quantities of work and materials, as included herein, is brief and is intended only to indicate the general nature of the work and to identify the said quantities with the detailed requirements of the Contract Documents, and that this Proposal is made according the provisions and under the terms of the Contract Documents, which Documents are hereby made a part of this Proposal. The Bidder further declares that he has exercised his own judgment regarding the interpretation, of subsurface information and has utilized all data, which he believes pertinent from City and other sources and has made such independent investigations as the Bidder deems necessary in arriving at his conclusions.

Bidder understands that any bid response documents may be subject to release under the Public Records Act Chapter 42.56 RCW and the City may be required to disclose bid responses upon a request. Bidder acknowledges that he has advised to mark any records believed to be trade secrets or confidential in nature as “confidential.” If records marked as “confidential” are found to be responsive to the request for records, the City as a courtesy to the Bidder may elect to give notice to Bidder of the request so as to allow Bidder to seek a protective order from a Court. Bidder acknowledges and agrees that any records deemed responsive to a public records request may be released at the sole discretion and without notice by the City.

Contract Execution

The Bidder agrees that if this Proposal is accepted, it will, within fourteen (14) calendar days after Notice of Award, complete and sign the Contract in the form annexed hereto, and will at that time deliver to the City executed copies of the Performance Bond, Labor and Material Payment bond, the Certificate of Insurance, and other documentation required by the Contract Documents, and will, to the extent of his Proposal, furnish all machinery, tools, apparatus and other means of construction and do the work and furnish all the materials or services necessary to complete all work as specified or indicated in the Contract Documents.

Start of Construction and Contract Completion

The Bidder further agrees that within 15 calendar days of July 27, 2022, it will meet with engineering personnel and begin work no earlier than July 27, 2022, and complete the construction within 60 working days of August 9, 2022, weather and material supply permitting.

Lump Sum and Unit Price Work

The Bidder further proposes to accept as full payment for the work proposed herein the amounts computed under the provisions of the Contract Documents and based on lump sum and unit price amounts, it being expressly understood that the unit prices are independent of the exact quantities
involved. The Bidder agrees that the lump sum prices and the unit prices represent a true measure of the labor, services, and materials required to perform the work, including all allowances for overhead and profit for each type and unit of work called for in these Contract Documents.

If any material, item, or service required by the Contract Documents has not been mentioned specifically, the same shall be furnished and placed with the understanding that the full cost to the City has been merged with prices named in the proposal.
NOTE: If a discrepancy between the numerical unit price and the written (words) unit price is found, the written (words) unit price shall control.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Estimated Quantity</th>
<th>SP/STD</th>
<th>Description of Item</th>
<th>Unit Price</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Lump Sum STD</td>
<td></td>
<td>Mobilization</td>
<td>L.S. $__________</td>
<td>$ _______</td>
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<td></td>
<td></td>
<td></td>
<td>(Words) (1-09) Per Lump Sum</td>
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<tr>
<td>2.</td>
<td>Lump Sum SP</td>
<td></td>
<td>Permits and Licenses</td>
<td>L.S. $__________</td>
<td>$ _______</td>
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<td></td>
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<td></td>
<td>(Words) (1-07) Per Lump Sum</td>
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<tr>
<th>OTHER ITEMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Force Account STD Minor Change</td>
</tr>
<tr>
<td>$Fifteen Thousand Dollars (Words) (1-04) Force Account</td>
</tr>
<tr>
<td>4. Lump Sum SP East Room HVAC Demolition</td>
</tr>
<tr>
<td>(Words) (SP) Per Lump Sum</td>
</tr>
<tr>
<td>5. Lump Sum SP East Room HVAC System</td>
</tr>
<tr>
<td>$15,000.00 $15,000.00 (Words) (SP) Per Lump Sum</td>
</tr>
<tr>
<td>6. Lump Sum SP East Room Electrical system modifications</td>
</tr>
<tr>
<td>(Words) (SP) Per Lump Sum</td>
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<tr>
<td>7. Lump Sum SP Senior Center Demolition</td>
</tr>
<tr>
<td>(Words) (SP) Per Lump Sum</td>
</tr>
<tr>
<td>8. Lump Sum SP Senior Center HVAC System</td>
</tr>
<tr>
<td>(Words) (SP) Per Lump Sum</td>
</tr>
<tr>
<td>9. Lump Sum SP Senior Center Electrical system modifications</td>
</tr>
<tr>
<td>(Words) (SP) Per Lump Sum</td>
</tr>
</tbody>
</table>

Sub Total $__________

Washington State Sales Tax (10.1%) $__________

TOTAL BID: $__________
The undersigned bidder hereby agrees to start construction on this project, if awarded, no later than fourteen (14) calendar days after notice to proceed and to complete the project within the time stipulated in the contract. By signing below, bidder acknowledges receipt of the following addenda to the bid documents:

CITY OF PACIFIC

CIVIC CAMPUS HVAC UPGRADE PROJECT
CONTRACT NO. CC2201

<table>
<thead>
<tr>
<th>Addendum No.</th>
<th>Date of Receipt</th>
<th>Addendum No.</th>
<th>Date of Receipt</th>
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<tbody>
<tr>
<td>____________</td>
<td>______________</td>
<td>____________</td>
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</table>

NOTE: Failure to acknowledge receipt of Addenda may be considered as an irregularity in the Bid Proposal and Owner reserves the right to determine whether the bid will be disqualified.

By signing below, Bidder certifies that he/she has reviewed the insurance provisions of the Bid Documents and will provide the required coverage.

Bidder: ______________________________________________________________________________
Address: _____________________________________________________________________________
Phone Number: _______________________________________________________________________
Signature of Authorized Official: _________________________________________________________
Printed Name and Title: _________________________________________________________________

NOTES: If the Bidder is a co-partnership, give firm name under which business is transacted; proposal must be executed by a partner. If the Bidder is a corporation, proposal must be executed in the corporate name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign).

STATE OF _________________________________ )
COUNTY OF ________________________________ )ss.

I certify that I know or have satisfactory evidence that ____________________________ signed this proposal, on oath stated that he/she was authorized to execute the proposal and acknowledged it as the (title) of ____________________________ (name of party on behalf of whom proposal was executed) and acknowledged it to be his/her free and voluntary act for the uses and purposes mentioned in this proposal.

Dated this _____ day of ____________________, 20____.

_______________________________________
Notary Public

_______________________________________
Printed Name

My Commission Expires: _________________
BIDDER’S QUALIFICATION FORM
CITY OF PACIFIC
CIVIC CAMPUS HVAC UPGRADE PROJECT
CONTRACT NO. CC2201

1. Firm Name: ____________________________________________________________
   Firm Address: __________________________________________________________
   __________________________________________________________

2. Telephone No. (______) ______________________ Fax No.: (______)________________

3. Washington State License No. ________________________ Expire s: ________________

4. Number of years engaged in contracting business under above name:

5. Particular types of construction performed by your company:
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

6. Gross amount of contracts now on hand: $ _________________________________

7. List similar recent construction projects that your firm has done in the last 5 years (i.e., water and
   storm and sanitary sewer main construction, road reconstruction, excavations, extensive dewatering, etc.):

<table>
<thead>
<tr>
<th>Amount</th>
<th>Type</th>
<th>Owner’s Name</th>
<th>Phone</th>
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<tbody>
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</tbody>
</table>
8. What is the construction experience of the principal individuals to be assigned to this project?

<table>
<thead>
<tr>
<th>Name</th>
<th>Title</th>
<th>Years of Construction Experience</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

9. List equipment available for anticipated work:

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Item</th>
<th>General Description, Size, Capacity, Title</th>
<th>Ownership (Own, Rent, Lease)</th>
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10. Bank Reference:

<table>
<thead>
<tr>
<th>Name, Account Type</th>
<th>Address</th>
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By: ____________________________

(Authorized Signature)

Title: ____________________________

(1) Any bidder having current outstanding litigation with the City will not be considered responsible and will be rejected by the City.
Pursuant to RCW 60.28.011, five percent (5%) of all monies earned by the Contractor on estimates during the progress of the work shall be retained by the City for the purposes mentioned in said statute. The Contractor elects to have these monies (check one):

☐ Retained in a fund by the Owner until sixty (60) days following the final acceptance of said improvement or work is completed;

☐ Deposited by the Owner in an interest bearing account in a bank, mutual savings bank, or savings and loan association, not subject to withdrawal until after the final acceptance of said improvement or work is completed, or until agreed to by both parties: Provided that interest on such account shall be paid to the Contractor; or

☐ Placed in escrow with a bank or trust company by the Owner until sixty (60) days following the final acceptance of said improvement or work is completed. When the monies reserved are to be placed in escrow, the Owner shall issue a check representing the sum of the monies reserved payable to the bank or trust company and the Contractor jointly. Such check shall be converted into bonds and securities chosen by the Contractor and approved by the Owner and such bonds and securities shall be held in escrow. Interest on such bonds and securities shall be paid to the Contractor as the said interest accrues. Contractor hereby further agrees to be fully responsible for payment of all costs or fees incurred as a result of placing said retained percentage in escrow and investing it as authorized by statute. The City of Port Orchard shall not be liable in any way for any cost or fees in connection therewith.

Name of Financial Institution

Address of Financial Institution

City, State, Zip Code of Financial Institution

Escrow Account Number

Contractor’s Signature ________________________ Date ______________
BID SECURITY
CITY OF PACIFIC
CIVIC CAMPUS HVAC UPGRADE PROJECT
CONTRACT NO. CC2201

Bid Deposit:
The undersigned Principal hereby submits a Bid Deposit with the City of PACIFIC in the form of a cash deposit, certified or cashier’s check, or postal money order in the amount of ________________________ Dollars ($__________________).

Bid Bond:
KNOW ALL MEN BY THESE PRESENTS: That we, __________________________________, as Principal and ____________________________, as Surety, are held firmly bound unto the City of PACIFIC, Washington, as Obligee, in the penal sum of __________ ______________________ Dollars, for the payment of which the Principal and the Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally by these presents.

The conditions of this obligation are such that if the Obligee shall make any award to the Principal for _____________________________________________, PACIFIC, Washington, according to the terms of the Proposal or Bid made by the Principal therefore, and the Principal shall duly make and enter into a contract with the Obligee in accordance with the terms of said Proposal or Bid and award and shall give bond for the faithful performance thereof, with Surety or Sureties approved by the Obligee, or if the Principal shall, in case of failure to do so, pay and forfeit to the Obligee the penal amount of the deposit specified in the call for bids, then this obligation shall be null and void; otherwise it shall be and remain in full force and effect and the Surety shall forthwith pay and forfeit to the Obligee, as penalty and liquidated damages, the amount of this Bond. Principle and Surety agree that if the Obligee is required to engage the services of an attorney in connection with enforcement of this bond each shall pay the Obligee reasonable attorney’s fees, whether or not suit is commenced, in addition to the penal sum.

Signed, Sealed and Dated this ______ day of ____________________, 20____.

Principal

Signature of Authorized Official

Printed Name and Title

Name and address of local office of
Agent and/or Surety Company:

Surety

Signature of Authorized Official

By ___________________ _________________

Attorney-in-Fact (Attach Power of Attorney)

Surety companies executing bonds must appear on the current Authorized Insurance List in the State of Washington per Section 1-02.7 of the Standard Specification.
Failure to return this Declaration as part of the bid proposal package will make the bid nonresponsive and ineligible for award.

NON-COLLUSION DECLARATION

I, by signing the proposal, hereby declare, under penalty of perjury under the laws of the United States that the following statements are true and correct:

1. That the undersigned person(s), firm, association or corporation has (have) not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with the project for which this proposal is submitted.

2. That by signing the signature page of this proposal, I am deemed to have signed and to have agreed to the provisions of this declaration.

NOTICE TO ALL BIDDERS

To report rigging activities call:

1-800-424-9071

The U.S. Department of Transportation (USDOT) operates the above toll-free “hotline” Monday through Friday, 8:00 a.m. to 5:00 p.m., eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the “hotline” to report such activities.

The “hotline” is part of USDOT’s continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the USDOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.
To be eligible for award of this contract the bidder must fill out and submit, as part of its bid proposal, the following Disadvantaged Business Enterprise Utilization Certification relating to Disadvantaged Business Enterprise (DBE) requirements. The Contracting Agency shall consider as non-responsive and shall reject any bid proposal that does not contain a DBE Certification which properly demonstrates that the bidder will meet the DBE participation requirements in one of the manners provided for in the proposed contract. If the bidder is relying on the good faith effort method to meet the DBE assigned contract goal, documentation in addition to the certificate must be submitted with the bid proposal as support for such efforts. The successful bidder’s DBE Certification shall be deemed a part of the resulting contract. Information on certified firms is available from OMWBE, telephone 360-753-9693.

Name of Bidder certifies that the Disadvantaged Business Enterprise (DBE) Firms listed below have been contacted regarding participation on this project. If this bidder is successful on this project and is awarded the contract, it shall assure that subcontracts or supply agreements are executed with those firms where an “Amount to be Applied Towards Goal” is listed. (If necessary, use additional sheet.)

<table>
<thead>
<tr>
<th>Name of DBE Certificate Number</th>
<th>Project Role <em>(Prime, Subcontractor, Manufacturer, Regular Dealer)</em></th>
<th>Description of Work</th>
<th>Amount to be Applied Towards Goal</th>
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Disadvantaged Business Enterprise Subcontracting Goal: ________________  DBE Total $ ________________  

* Regular Dealer status must be approved prior to bid submittal by the Office of Equal Opportunity, Wash. State Dept. of Transportation, on each contract.

** See the section “Counting DBE Participation Toward Meeting the Goal” in the Contract Document.

*** The Contracting Agency will utilize this amount to determine whether or not the bidder has met the goal. In the event of an arithmetic difference between this total and the sum of the individual amounts listed above, then the sum of the amounts listed shall prevail and the total will be revised accordingly.

City of Pacific  
Civic Campus HVAC Upgrade Project Rebid  
Contract Documents  
Contract CC.2201  
June 2022
CONTRACT
CITY OF PACIFIC
CIVIC CAMPUS HVAC UPGRADE PROJECT
CONTRACT NO. CC2201

THIS AGREEMENT made and entered into this _____ day of _____, 2022, by and between the City of Pacific, a municipality incorporated and existing under the laws of the State of Washington, by its City Council and Mayor, hereinafter called the “City,” and __________________________ hereinafter called the “Contractor.”

WITNESSETH:

Contractor Services. The Contractor shall furnish at its own cost and expense all labor, tools, materials and equipment required to construct and complete in a good workmanlike manner, and to the satisfaction of the City, the public works project known as CIVIC CAMPUS HVAC UPGRADE PROJECT, all in accordance with this Contract and all Contract Documents.

1. The Contract Documents, duly identified in this Section and Section 2 below, together with the Instructions to Bidders, a confirmed copy of the Proposal made by the Contractor on July 13, 2022, and the 2018 WSDOT Standard Specifications for Road, Bridge, and Municipal Construction, as modified by Amendments and Special Provisions, The WSDOT Standard Plans, and the City of Pacific Development Guidelines and Standard Details are hereby made a part of this Contract and are mutually cooperative therewith. Time is of the essence of this Contract. It is agreed that the work covered by this Contract shall start within 14 calendar days after Notice to Proceed is issued and that all construction shall be complete within 120 calendar days after the Notice to Proceed Date.

CIVIC CAMPUS HVAC UPGRADE Project ("Project"). The Project is detailed in the Scope of Work, Exhibit A, and the following additional Contract Documents, which are attached hereto and incorporated herein by reference:

- Project Specifications
- Plans and Contract Drawings
- Federal Contract Requirements
- Selection of Retainage Option
- Payment and Performance Bonds
- Statement of Intent To Pay Prevailing Wages
- Affidavit of Wages Paid

2. Notice to Proceed; Time of Completion. The Contractor shall commence work within fourteen (14) days after the City issues a written Notice to Proceed, and shall complete the work no later than September 30, 2021. The time of beginning, rate of progress and time of completion are essential conditions of this Contract.
3. **Payment.**

3.1 **Payment amount and procedures.** The City shall pay the Contractor for all work and services covered by this Contract in an amount that shall not exceed Four Hundred ____________________ Dollars ($____________), including applicable sales tax. The payment amount shall exclude approved change orders, in accordance with the quantity and unit prices shown on the attached bid proposal. The Contractor shall submit monthly invoices for work and services performed in a previous calendar month in a format acceptable to the City. The City shall pay for the portion of the work described in the invoice that has been completed by Contractor and approved by the City. The City's payment shall not constitute a waiver of the City's right to final inspection and acceptance of the work.

3.2 **Defective or Unauthorized Work.** If during the course of the Contract, the work rendered does not meet the requirements set forth in the Contract, the Contractor shall correct or modify the required work to comply with the requirements of the Contract. The City shall have the right to withhold payment for such work until it meets the requirements of the Contract. If the Contractor is unable, for any reason, to satisfactorily complete any portion of the work, the City may complete the work by contract or otherwise, and the Contractor shall be liable to the City for any additional costs incurred by the City. "Additional costs" means all reasonable costs incurred by the City, including legal costs and attorneys' fees, beyond the maximum contract price under this Contract. The City further reserves the right to deduct the cost to complete the work, including any additional costs, from any amounts due or to become due to the Contractor.

3.3 **Final Payment; Waiver of Claim.** Thirty (30) days after completion and final acceptance of the Project by the City as complying with the terms of this Contract, the City shall pay to the Contractor all sums due as provided by this Contract except those required to be withheld by law or agreed to in special contract provisions. THE CONTRACTOR'S ACCEPTANCE OF FINAL PAYMENT (EXCLUDING WITHHELD RETAINAGE) SHALL CONSTITUTE A WAIVER OF CLAIMS, EXCEPT THOSE PREVIOUSLY AND PROPERLY MADE AND IDENTIFIED BY THE CONTRACTOR AS UNSETTLED AT THE TIME REQUEST FOR FINAL PAYMENT IS MADE.

3.4 **Retainage.** The City shall hold back a retainage in the amount of five percent (5%) of any and all payments made to the Contractor for a period of sixty (60) days after the date of final acceptance, or until receipt of all necessary releases from the State Department of Revenue and the State Department of Labor and Industries, and until settlement of any liens filed under Chapter 60.28 RCW, whichever is later.

4. **Prevailing Wage.** The Contractor shall comply with and pay prevailing wages as required by Chapter 39.12 RCW, as it may be amended in the future. Prevailing rate shall be paid on public works and building service maintenance contracts, funded in part or in whole with Federal funds. Federal wage laws and regulations shall be applicable. No worker, laborer or mechanic employed in the performance of any part of this Contract shall be paid less than the prevailing rate of wage as determined by the Industrial Statistician of the Department of Labor and Industries for the State of Washington.

Prior to making any payment under this Contract, the Contractor must submit to the City an approved copy of the “Statement of Intent to Pay Prevailing Wages” from the Department of Labor and Industries. It is the Contractor’s responsibility to obtain and file the Statement. The Contractor shall be responsible for all filing fees. Notice from Contractor and all subcontractors
of intent to pay prevailing wages and prevailing wage rates for the Project must be posted for the benefit of the workers. Each invoice shall include a signed statement that prevailing wages have been paid by the Contractor and all subcontractors. Following the final acceptance of services rendered, Contractor shall submit a “Minimum Wage Affidavit” for themselves and any subcontractors.

In case any dispute arises as to what are the prevailing rates of wages for work of a similar nature and such dispute cannot be adjusted by the parties of interest, including labor and management representatives, the matter shall be referred for arbitration to the Director of the Department of Labor and Industries of the State and his/her decision therein shall be final and conclusive and binding on all parties involved in the dispute as provided for by RCW 39.12.060, as it may be amended in the future.

5. **Indemnification and Hold Harmless.** The Contractor shall protect, defend, indemnify and hold harmless the City, its officers, officials, employees, agents and volunteers from any and all claims, risks, injuries, damages, losses, suits, judgments, and attorney’s fees or other expenses of any kind arising out of or in any way connected with the performance of this Contract, except for injuries and damages caused by the sole negligence of the City. The City's inspection or acceptance of any of the work shall not be grounds to avoid any of these covenants of indemnification.

Should a court of competent jurisdiction determine that this Contract is subject to RCW 4.24.115, then, in the event of liability for damages arising out of bodily injury to persons or damages to property caused by or resulting from the concurrent negligence of the Contractor and the City, its officers, officials, employees, agents and volunteers, the Contractor’s liability under this section shall be only to the extent of the Contractor’s negligence.

It is further specifically and expressly understood that the indemnification provided under this section constitutes the Contractor’s waiver of immunity under Industrial Insurance, Title 51 RCW, solely for the purposes of this indemnification. This waiver has been mutually negotiated by the parties.

The provisions of this section shall survive the expiration or termination of this Contract.

6. **Compliance with Laws.** The Contractor shall comply with all federal, state and local laws and regulations applicable to the work done under this Contract. Any violation of the provisions of these applicable laws and regulations shall be considered a violation of a material provision of this Contract and shall be grounds for cancellation, termination or suspension of the Contract by the City, in whole or in part, and may result in ineligibility for further work for the City.

7. **Job Safety.**

7.1 **Work Site Safety.** The Contractor will be solely and completely responsible for conditions of the job site, including safety of all persons and property during the performance of the Contract and work done. This requirement will apply continuously and not be limited to working hours. It is further understood that the City shall be in no way responsible for the Contractor’s compliance with safety regulations and that the Contractor shall fully comply with all applicable local, county, State, and Federal safety laws, rules, and regulations. Such safety procedures, if adopted or followed by the Contractor in whole or in part, shall be used at the risk and responsibility of the Contractor, and the City shall assume no responsibility.
7.2 **Trench Safety.** All trenches shall be provided with adequate safety systems as required by Chapter 49.17 RCW and WAC 296-155-650 and 655. Contractor is responsible for providing the competent person and registered professional engineer required by WAC 296-155-650 and 655.

8. **Utility Location.** Contractor is solely responsible for locating any underground utilities affected by the work and is deemed to be an “excavator” for the purposes of Chapter 19.122 RCW, as amended. Contractor shall be responsible for compliance with Chapter 19.122 RCW including utilization of the “one call” locator system, before commencing any excavation activities.

9. **Warranty and Guarantee.** Contractor shall warrant and guarantee the materials and work to be free of defects for a period of two (2) years after the City's final acceptance of the entire Project. Contractor shall be liable for any costs, losses, expenses or damages including consequential damages suffered by the City resulting from defects in the Contractor’s work including, but not limited to, cost of materials and labor expended by the City in making emergency repairs and cost of engineering, inspection and supervision by the City. The Contractor shall hold the City harmless from any and all claims, which may be made against the City as a result of any defective work, and the Contractor shall defend any claims at its own expense. Where materials or procedures are not specified in the Contract, the City will rely on the professional judgment of the Contractor to make the appropriate selections.

10. **Correction of Defects.** Contractor shall be responsible for correcting all defects in workmanship and/or materials discovered after the acceptance of this work. When corrections of defects are made, Contractor shall be responsible for correcting all defects in workmanship and/or materials in the corrected work for one year after the acceptance of the corrections of the City. The Contractor shall start work to remedy such defects within seven (7) days of the City's mailed notice of discovery, and shall complete such work within a reasonable time agreed to by both parties. In emergencies where damage may result from delay or where loss of service may result, such corrections may be made by the City, in which case the Contractor shall pay all costs incurred by the City to perform the correction. In the event the Contractor does not accomplish corrections within the time specified, the correction work will be otherwise accomplished by the City and all costs of same shall be paid by the Contractor.

11. **Change Order/Contract Modification.**

11.1 **Amendments.** This Contract, together with attachments and/or other addenda, represents the entire and integrated Contract between the parties hereto and supersedes all prior negotiations, representations, or agreements, either written or oral. This Contract may be amended, modified or added to only in writing, signed by the duly authorized representatives of both parties.

11.2 **Change orders.** The City may issue a written change order for any change in the work during the performance of this Contract. If the Contractor determines, for any reason, that a change order is necessary, the Contractor must submit a written change order request to the City within fourteen (14) calendar days of the date the Contractor knew or should have known of the facts and events giving rise to the requested change. If the City determines that the change increases or decreases the Contractor's costs or time for performance, the City will make an equitable adjustment. The City will attempt, in good faith, to reach agreement with the Contractor on all equitable adjustments. If the parties are unable to agree, the City will
determine the equitable adjustment as it deems appropriate. The Contractor shall proceed with the change order work upon receiving the written change order. If the Contractor fails to require a change order within the time frame allowed, the Contractor waives its right to make any claim or submit subsequent change order requests for that portion of the work. If the Contractor disagrees with the equitable adjustment, the Contractor must complete the change order work; however, the Contractor may elect to protest the adjustment as provided below.

11.3 Procedure and Protest by Contractor. If the Contractor disagrees with anything required by a change order, another written order, or an oral order from the City, including any direction, instruction, interpretation, or determination by the City, the Contractor shall, within fourteen (14) calendar days, provide a signed written notice of protest to the City that states the date of the notice of the protest, the nature and circumstances that caused the protest, the provisions of the Contract that support the protest, the estimated dollar cost, if any, of the protested work and how the estimate was determined, and an analysis of the progress schedule showing the schedule change or disruption, if applicable. The Contractor shall keep complete records of extra costs and time incurred as a result of the protested work. The City shall have access to any of the Contractor's records needed to evaluate the protest. If the City determines that a protest is valid, the City will adjust the payment for work or time by an equitable adjustment.

11.4 Failure to Protest or Follow Procedures Constitutes Waiver. By not protesting or failing to follow procedures as this section provides, the Contractor waives any additional entitlement or claims for protested work, and accepts from the City any written or oral order (including directions, instructions, interpretations, and determinations).

11.5 Contractor's Duty to Complete Protested Work. In spite of any protest, the Contractor shall proceed to promptly complete work that the City has ordered.

11.6 Contractor's Acceptance of Changes. The Contractor accepts all requirements of a change order by: (1) endorsing the change order; (2) writing a separate acceptance; or (3) not protesting in the manner this section provides. A change order that is accepted by the Contractor as provided herein shall constitute full payment and final settlement of all claims for contract time and for direct, indirect, and consequential costs, including costs of delays related to any work, either covered or affected by the change.

12. Claims. The Contractor shall give written notice to the City of all claims other than change orders within thirty (30) days of the occurrence of events giving rise to the claim, but in no event later than the time of approval by the City for final payment. Any claim for damages, additional payment for any reason, or extension of time shall be conclusively deemed to have been waived by Contractor unless a timely written claim is made in strict accordance with the applicable provisions of this Contract. At a minimum, a Contractor's written claim must include the information required in Section 11.3 regarding protests.

FAILURE TO PROVIDE A COMPLETE, WRITTEN NOTIFICATION OF CLAIM IN THE TIME ALLOWED SHALL BE AN ABSOLUTE WAIVER OF ANY CLAIMS ARISING IN ANY WAY FROM THE FACTS OR EVENTS SURROUNDING THAT CLAIM.

The Contractor must, in any event, file any claim or bring any suit arising from or connected to this Contract within 120 calendar days from the date the work is completed. Contractor, upon making application for the final payment, shall be deemed to have waived its
right to claim for any other damages for which application has not been made, unless such claim for final payment includes notice of additional claim and fully describes such claim.

13. **Contractor's Risk of Loss.** It is understood that the whole of the work under this Contract is to be done at the Contractor's risk, and that he/she has familiarized himself/herself with all existing conditions and other contingencies likely to affect the work, and has made his/her bid accordingly, and that Contractor shall assume the responsibility and risk of all loss or damage to materials or work which may arise from any cause whatsoever prior to completion.

14. **Insurance.** The Contractor shall procure and maintain for the duration of the Contract, insurance against claims for injuries to persons or damage to property which may arise from or in connection with the performance of the work hereunder by the Contractor, its agents, representatives, employees or subcontractors.

   A. **Minimum Scope of Insurance.** Contractor shall obtain insurance of the types described below:

   1. **Automobile Liability** insurance covering all owned, non-owned, hired and leased vehicles. Coverage shall be written on Insurance Services Office (ISO) form CA 00 01 or a substitute form providing equivalent liability coverage. If necessary, the policy shall be endorsed to provide contractual liability coverage.

   2. **Commercial General Liability** insurance shall be written on ISO occurrence form CG 00 01 and shall cover liability arising from premises, operations, independent contractors and personal injury and advertising injury, and liability assumed under an insured contract. The Commercial General Liability insurance shall be endorsed to provide the Aggregate per Project Endorsement ISO form CG 25 03 11 85. There shall be no endorsement or modification of the Commercial Liability insurance for liability arising from explosion, collapse or underground property damage. The City shall be named by endorsement as an insured under the Contractor's Commercial General Liability insurance policy with respect to the work performed for the City using ISO additional endorsement CG 20 10 01 and CG 20 37 10 01 or substitute endorsements providing equivalent coverage.

   3. **Workers' Compensation** coverage as required by the Industrial Insurance laws of the State of Washington.

   B. **Minimum Amounts of Insurance.** Contractor shall maintain the following insurance limits:

   1. **Automobile Liability** insurance with a minimum combined single limit for bodily injury and property damage of $1,000,000 per accident.

   2. **Commercial General Liability** insurance shall be written with limits no less than $1,000,000 each occurrence, $2,000,000 general aggregate and a $2,000,000 products-completed operation aggregate limit.

   3. **Employer's Liability** insurance each accident $1,000,000, Employer’s Liability Disease each employee $1,000,000, and Employer’s Liability Disease – Policy Limit $1,000,000.

   C. **Other Insurance Provisions.** The insurance policies are to contain, or be endorsed to contain, the following provisions for Automobile Liability, Commercial General Liability, and Builders Risk insurance:
1. The Contractor’s insurance coverage shall be primary insurance as respect to the City. Any insurance, self-insurance, or insurance pool coverage maintained by the City shall be in excess of the Contractor’s insurance and shall not contribute with it.

2. The Contractor’s insurance shall be endorsed to state that coverage shall not be cancelled by either party, except after thirty (30) days’ prior written notice by certified mail, return receipt requested, has been given to the City.

3. The City will not waive its right to subrogation against the Contractor. The Contractor’s insurance shall be endorsed acknowledging that the City will not waive its right to subrogation. The Contractor’s insurance shall be endorsed to waive the right of subrogation against the City, or any self-insurance, or insurance pool coverage maintained by the City.

4. If any coverage is made on a “claims made” basis, then a minimum of a three (3) year extended reporting period shall be included with the claims made policy and proof of this extended reporting period provided to the City.

D. Acceptability of Insurers. Insurance is to be placed with insurers with a current A.M. Best rating of not less than A: VII.

E. Verification of Coverage. Contractor shall furnish the City with original certificates and a copy of the amendatory endorsements, including but not necessarily limited to the additional insured endorsement, evidencing the Automobile Liability and Commercial General Liability insurance of the Contractor before commencement of the work.

F. Subcontractors. The Contractor shall include all subcontractors as insured under its policies or shall furnish separate certifications and endorsements for each subcontractor. All coverage for subcontractors shall be subject to all of the same insurance requirements as stated herein for the Contractor.

The Contractor’s insurance shall contain a clause stating that the coverage shall apply separately to each insured against whom claim is made or suit is brought, except with respects to the limits of the insured liability. The Contractor’s insurance shall be primary insurance with respect to the City, and the City shall be given thirty (30) days’ prior written notice of any cancellation, suspension or material change in coverage.

15. Payment and Performance Bonds. (City must check and initial above one of the following boxes.) The City ☐ waives ☒ does not waive the bond/surety provisions of this section pursuant to RCW 39.04.155(3). If the City waives these provisions then Contractor need not complete this section. If the City does not waive these provisions then Contractor shall provide the following:

Payment and Performance bonds shall be received by the City in the amount of 100% of the Contract price and no less. The bonds must be accepted by the City prior to the execution of the Contract, and shall be in a form approved by the City. The bonds shall be released thirty (30) days after the date of final acceptance of the work performed under this Contract and receipt of all necessary releases from the Department of Revenue and Department of Labor and Industries in settlement of any liens filed under Chapter 60.28 RCW, whichever is later.
16. **Termination.**

A. **Termination without cause.** This Agreement may be terminated by the City at any time for public convenience, for the Contractor’s insolvency or bankruptcy, or the Contractor’s assignment for the benefit of creditors.

B. **Termination upon completion of the work.** This Contract shall terminate upon satisfactory completion of the work described in the Scope of Work (Exhibit A) and final payment by the City.

C. **Rights Upon Termination.**

1. Upon termination for any reason, all finished or unfinished reports or documents of the Contractor relating to this Contract shall be submitted to the City, and the Contractor shall be entitled to just and equitable compensation for any satisfactory work performed prior to the date of termination, not to exceed the total compensation in Section 3 of this Agreement (together with any approved Change Orders). Contractor shall not be entitled to any reallocation of cost, profit or overhead. Contractor shall not in any event be entitled to anticipated profit on work not performed because of such termination. Upon termination, the City may take over the work and prosecute the same to completion, by contract or otherwise.

2. **Termination for Cause or Default.** In the event this Contract is terminated by the City for cause, Contractor shall not be entitled to receive any further amounts due under this Contract up to the termination date, until the work specified in the Scope of Work (Exhibit A) is satisfactorily completed, as scheduled. At such time, if the unpaid balance of the amount to be paid under the Contract exceeds the expense incurred by the City in finishing the work, and all damages sustained by the City or which may be sustained by the City or which may be sustained by the reason of such refusal, neglect, failure or discontinuance of employment, such excess shall be paid by the City to the Contractor. If the City’s expense and damages exceed the unpaid balance, Contractor and his surety shall be jointly and severally liable therefore to the City and shall pay such difference to the City. Such expense and damages shall include all legal costs incurred by the City to protect the rights and interests of the City under the Contract, provided such legal costs shall be reasonable.

17. **General Administration.** The Project Manager of the City shall have primary responsibility for the City under this Contract to oversee and approve all work performed as well as all financial invoices.

18. **Ownership of Documents.** On payment to the Contractor by the City of all compensation due under this Contract, all finished or unfinished documents and material prepared by the Contractor with funds paid by the City under this Contract shall become the property of the City and shall be forwarded to the City upon its request. Any records, reports, information, data or other documents or materials given to or prepared or assembled by the Contractor under this Contract will be kept confidential and shall not be made available to any individual or organization by the Contractor without prior written approval of the City or by court order.

19. **Subletting or Assigning of Contracts.** Neither the City nor the Contractor shall assign, transfer, or encumber any rights, duties or interests accruing from this Contract without the prior written consent of the other. If subcontract work is needed, prior to approval by the City, the
Contractor must verify that their first tier subcontractors meet the bidder responsibility criteria as written in Chapter 39.04.350 RCW.

20. **Relationship of Parties.** The parties intend that an independent contractor - client relationship will be created by this Contract. As Contractor is customarily engaged in an independently established trade which encompasses the specific service provided to the City hereunder, no agent, employee, representative or subcontractor of Contractor shall be or shall be deemed to be the employee, agent, representative or subcontractor of the City. None of the benefits provided by the City to its employees, including, but not limited to, compensation, insurance and unemployment insurance, are available from the City to the Contractor or his employees, agents, representatives or subcontractors. Contractor will be solely and entirely responsible for his acts and for the acts of Contractor’s agents, employees, representatives and subcontractors during the performance of this Contract. The City may, during the term of this Contract, engage other independent contractors to perform the same or similar work that Contractor performs hereunder.

21. **Nonwaiver of Breach.** The failure of the City to insist upon strict performance of any of the terms and rights contained in this Contract, or to exercise any option contained in this Contract in one or more instances, shall not be construed to be a waiver or relinquishment of those terms and rights and such terms and rights shall remain in full force and effect.

22. **Written Notice.** All communications regarding this Contract shall be sent to the Parties at the addresses listed below in the Contact information, unless otherwise notified. Any written notice shall become effective on delivery, but in any event on the date three (3) calendar days after the date of mailing by registered or certified mail, and shall be deemed sufficiently given if sent to the addressee at the address stated in this Contract.

23. **Discrimination.** The Contractor agrees not to discriminate against any employee or applicant for employment or any other person in the performance of this Agreement because of race, creed, color, national origin, marital status, sex, sexual orientation, age, disability, or other circumstance prohibited by federal, state or local law or ordinance, except for a bona fide occupational qualification.

24. **Term.** This Contract shall be effective from the date of Contract execution through expiration of the warranty period as described in Section 9.

25. **Severability.** The provisions of this Contract are declared to be severable. If any provision in this Agreement is for any reason held by a court of competent jurisdiction to be invalid or unconstitutional, such invalidity or unconstitutionality shall not affect the validity or constitutionality of any other provision.

26. **Public Disclosure.** Contractor understands that his bid response documents and any contract documents may be subject to release under the Public Records Act Chapter 42.56 RCW and the City may be required to be disclosed upon a request. Contractor acknowledges that he has been advised to mark any records believed to be trade secrets or confidential in nature as “confidential.” If records marked as “confidential” are found to be responsive to the request for records, the City as a courtesy to the Contractor, may elect to give notice to Contractor of the request so as to allow Contractor to seek a protective order from a Court. Contractor acknowledges and agrees that any records deemed responsive to a public records request may be released at the sole discretion and without notice by the City.
With this Contract, Contractor is furnishing a Corporate Surety Bond in the amount of

_________________________________ and X/100ths Dollars ($_________ ______________) with

____________________ as Surety, to insure full compliance, execution and performance of this Contract
by the Contractor in accordance with all its terms and provisions.

In the event of litigation, venue shall be within King County, Washington.

IN WITNESS WHEREOF the parties hereto have caused these presents to be duly executed.

CITY OF PACIFIC:

Signature: ____________________________
MAYOR, Leanne Guier
Date: _______________________________

CONTRACTOR:

Signature: ____________________________
Print Name: __________________________
Title: _______________________________
Date: _______________________________
Taxpayer ID #: _______________________

CITY CONTACT:
Print Name: Jim Morgan, Public Works Manager

CONTRACTOR CONTACT:
Print Name: __________________________
Address: _____________________________
_____________________________________
Phone: _______________________________
Fax: _________________________________

Contractor License #: __________________

(if this is a new contractor or if Contractor has never conducted work with the City, a W-9 form
must be attached to this agreement)
CITY OF PACIFIC
PUBLIC WORKS PROJECT
PERFORMANCE BOND

CITY PROJECT #: CC2201
SURETY BOND #: 
DATE POSTED: 
PROJECT COMPLETION DATE: 

RE: Project Name: CIVIC CAMPUS HVAC UPGRADE PROJECT
Contractor: 
Project Address: 100 3rd Ave SE S Pacific, WA 98047

KNOW ALL PERSONS BY THESE PRESENTS: That we, (hereinafter called the "Principal"), and a corporation organized under the laws of the State of , and authorized to transact surety business in the State of Washington (hereinafter called the "Surety"), are held and firmly bound unto the City of Pacific, Washington, in the sum of ($ ), lawful money of the United States of America, for the payment of which sum we and each of us bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents. THE CONDITIONS of the above obligation are such that:

WHEREAS, the above named Principal has entered into a certain agreement with the City, to perform the following public works project within the City: CIVIC CAMPUS HVAC UPGRADE PROJECT; and

WHEREAS, the agreement with the City requires that certain improvements be made as part of the public works project; and that such improvements be constructed in full compliance with City standards, and the plans and specifications as required by the City; and

WHEREAS, the agreement with the City requires that the improvements are to be made or constructed within a certain period of time, unless an extension is granted in writing by the City; and

NOW, THEREFORE, it is understood and agreed that this obligation shall continue in effect until released in writing by the City of Pacific, but only after the Principal has performed and satisfied the following conditions:
A. Conditions.

1. The improvements to be constructed by the Principal include:
   Remove and replace existing HVAC systems in the City of Pacific Community Center East Room and Senior Center. Upgrade electrical system as required.

2. The Principal must construct the improvements to conform to the design, location, materials and other specifications for the indicated site improvements, as required by the City in the above-referenced project. In addition, the Principal must construct the improvements according to the applicable ordinances and standards of the City and/or state statutes, as the same now exist or are hereafter amended.

3. The Principal must have completed all improvements required by the above-referenced conditions, plans and City file within ____________ which time period shall begin to run from the earlier of ____________ unless an extension is granted by the City.

4. The Principal must have paid all sums owing to laborers, contractors, mechanics, subcontractors, material-men and suppliers or others as a result of such work for which a lien against any City property has arisen or may arise. The Principal shall indemnify and hold harmless the City of Pacific, its officers, officials and agents from any claim for such payment.

5. The Principal must obtain acceptance by the City of the work completed, all on or before thirty (30) days after the completion date set forth in Section A(3) above.

6. The Principal shall indemnify and hold harmless the City of Pacific, its officers, officials and agents from any claims relating to defect(s) in any of the workmanship entering into any part of the work or designated equipment covered by the contract between the Principal and the City. Once the work has been completed and accepted by the City, and all other conditions of this Bond have been satisfied, this Performance bond will be released and replaced with a two (2) year Maintenance Bond. The Maintenance bond amount shall be for ____________/100ths Dollars ($__________), which is not less than twenty percent (20%) of the total contract amount. This hold harmless and indemnification agreement shall survive the expiration of this Bond.

B. Default.

1. If the Principal defaults and does not perform the above conditions within the time specified, then the Surety shall, within twenty (20) days of demand of the City, make a written commitment to the City that it will either:
a). remedy the default itself with reasonable diligence pursuant to a time schedule acceptable to the City; or

b). tender to the City within an additional ten (10) days the amount necessary, as determined by the City, for the City to remedy the default, up to the total bond amount.

Upon completion of the Surety's duties under either of the options above, the Surety shall then have fulfilled its obligations under this bond. If the Surety elects to fulfill its obligation pursuant to the requirements of subsection B(1)(b), the City shall notify the Surety of the actual cost of the remedy, upon completion of the remedy. The City shall return, without interest, any overpayment made by the Surety, and the Surety shall pay to the City any actual costs, which exceeded the City's estimate, limited to the bond amount.

2. In the event the Principal fails to complete all of the above referenced improvements within the time period specified by the City, then the City, its employees and agents shall have the right at the City's sole election to enter onto said property described above for the purpose of completing the improvements. This provision shall not be construed as creating an obligation on the part of the City or its representatives to complete such improvements.

C. Corrections. Any corrections required by the City shall be commenced within seven (7) days of notification by the City and completed within thirty (30) days of the date of notification. If the work is not performed in a timely manner, the City shall have the right, without recourse to legal action, to take such action under this Bond as described in Section B above.

D. Extensions and Changes. No change, extension of time, alteration or addition to the terms of the contract or to the work to be performed by the Principal or the specifications accompanying the same shall in any way affect the obligation of the Principal or Surety on this bond, unless the City specifically agrees, in writing, to such alteration, addition, extension or change. The Surety waives notice of any such change, extension, alteration or addition thereunder. The Surety hereby agrees that modifications and changes may be made in the terms and provisions of the aforesaid contract without notice to Surety and any such modifications or changes increasing the total amount to be paid the Principal shall automatically increase the obligation on this Performance Bond in a like amount.

E. Enforcement. It is specifically agreed by and between the parties that in the event any legal action must be taken to enforce the provisions of this bond or to collect said bond, the prevailing party shall be entitled to collect its costs and reasonable attorney fees as a part of the reasonable costs of securing the obligation hereunder. In the event of settlement or resolution of these issues prior to the filing of any suit, the actual costs incurred by the City, including reasonable attorney fees, shall be considered a part of the obligation hereunder secured. Said costs and reasonable legal fees shall be recoverable by the prevailing party, not only from the proceeds of this bond, but also over and above
said bond as a part of any recovery (including recovery on the bond) in any judicial proceeding. The Surety hereby agrees that this Agreement shall be governed by the laws of the State of Washington. Venue of any litigation arising out of this Agreement shall be in King County Superior Court.

F. Bond Expiration. This bond shall remain in full force and effect until the obligations secured hereby have been fully performed and a Maintenance Bond as described in Section A(6) of this Bond has been submitted to the City, in a form suitable to the City and until released in writing by the City.

DATED this ___ day of __________________, 2022.

SURETY COMPANY
(Signature must be notarized)  CONTRACTOR
(Signature must be notarized)

By: ____________________________  By: ____________________________
    Its __________________________  Its __________________________

Print Name: __________________________

Business Name: __________________________

Business Address: __________________________

City/State/Zip Code: __________________________

Telephone Number: __________________________

CITY OF PACIFIC

By: ____________________________  Date: ____________________________
    Its: Mayor

APPROVED AS TO FORM:

__________________________
Charlotte Archer, City Attorney

CHECK FOR ATTACHED NOTARY SIGNATURE

____ Individual (Form P-1)

____ Corporation (Form P-2)
FORM P-2 / NOTARY BLOCK - (Use For Partnership or Corporation Only)

STATE OF WASHINGTON  )
    ) ss.
COUNTY OF  )

I certify that I know or have satisfactory evidence that ____________________________ is the person who appeared before me, and said person acknowledged as the _______________ of ______________________________ that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: ______________________________

 ______________________________________
(print or type name)

NOTARY PUBLIC in and for the State of Washington, residing at: _________________________________
My Commission expires: _____________________

(For Surety Company)
STATE OF WASHINGTON  )
    ) ss.
COUNTY OF  )

I certify that I know or have satisfactory evidence that ____________________________ is the person who appeared before me, and said person acknowledged as the _______________ of ______________________________ that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: ______________________________

 ______________________________________
(print or type name)

NOTARY PUBLIC in and for the State of Washington, residing at: _________________________________
My Commission expires: _____________________
CITY OF PACIFIC
MAINTENANCE/WARRANTY BOND

Project #: CC2201
Surety Bond #: 
Date Posted: 
Expiration Date: 

RE: Project Name: CIVIC CAMPUS HVAC UPGRADE PROJECT
Owner/Developer/Contractor: 
Project Address: 100 3rd Avenue SE Pacific, WA 98047

KNOW ALL PERSONS BY THESE PRESENTS: That we, ______________ (hereinafter called the "Principal"), and ______________, a corporation organized under the laws of the State of ______________, and authorized to transact surety business in the State of Washington (hereinafter called the "Surety"), are held and firmly bound unto the City of Pacific, Washington, in the sum of ______________ dollars ($______________), lawful money of the United States of America, for the payment of which sum we and each of us bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, by these presents. THE CONDITIONS of the above obligation are such that:

WHEREAS, the above named Principal has constructed and installed certain improvements on public property in connection with a project as described above within the City of Pacific; and

WHEREAS, the Principal is required to post a bond for the twenty-four (24) months following written and final acceptance of the project in order to provide security for the obligation of the Principal to repair and/or replace said improvements against defects in workmanship, materials or installation during the twenty-four (24) months after written and final approval/acceptance of the same by the City;

NOW, THEREFORE, this Maintenance Bond has been secured and is hereby submitted to the City. It is understood and agreed that this obligation shall continue in effect until released in writing by the City, but only after the Principal has performed and satisfied the following conditions:

A. The work or improvements installed by the Principal and subject to the terms and conditions of this Bond are as follows: (insert complete description of work here)

B. The Principal and Surety agree that the work and improvements installed in the above-referenced project shall remain free from defects in material, workmanship and installation (or, in the case of landscaping, shall survive,) for a period of twenty-four (24) months after written and final approval of the same and approval by the City. Maintenance is defined as acts carried out to prevent a decline, lapse or cessation of the state of the project or improvements as accepted by the City during the twenty-four (24) month period after final and written acceptance, and includes, but is not limited to, repair or replacement of defective workmanship, materials or installations.

C. The Principal shall, at its sole cost and expense, carefully replace and/or repair any damage or defects in workmanship, materials or installation to the City-owned real property on which improvements have been installed, and leave the same in as good condition as it was before commencement of the work.

D. The Principal and the Surety agree that in the event any of the improvements or restoration work installed or completed by the Principal as described herein, fail to remain free from defects in materials,
workmanship or installation (or in the case of landscaping, fail to survive), for a period of twenty-four (24) months from the date of approval/acceptance of the work by the City, the Principal shall repair and replace the same within ten (10) days of demand by the City, and if the Principal should fail to do so, then the Surety shall:

1. Within twenty (20) days of demand of the City, make written commitment to the City that it will either:
   a). remedy the default itself with reasonable diligence pursuant to a time schedule acceptable to the City; or
   b). tender to the City within an additional ten (10) days the amount necessary, as determined by the City, for the City to remedy the default, up to the total bond amount.

Upon completion of the Surety's duties under either of the options above, the Surety shall then have fulfilled its obligations under this bond. If the Surety elects to fulfill its obligation pursuant to the requirements of subsection D(1)(b), the City shall notify the Surety of the actual cost of the remedy, upon completion of the remedy. The City shall return, without interest, any overpayment made by the Surety, and the Surety shall pay to the City any actual costs which exceeded the City estimate, limited to the bond amount.

2. In the event the Principal fails to make repairs or provide maintenance within the time period requested by the City, then the City, its employees and agents shall have the right at the City's sole election to enter onto said property described above for the purpose of repairing or maintaining the improvements. This provision shall not be construed as creating an obligation on the part of the City or its representatives to repair or maintain such improvements.

E. Corrections. Any corrections required by the City shall be commenced within ten (10) days of notification by the City and completed within thirty (30) days of the date of notification. If the work is not performed in a timely manner, the City shall have the right, without recourse to legal action, to take such action under this bond as described in Section D above.

F. Extensions and Changes. No change, extension of time, alteration or addition to the work to be performed by the Principal shall affect the obligation of the Principal or Surety on this bond, unless the City specifically agrees, in writing, to such alteration, addition, extension or change. The Surety waives notice of any such change, extension, alteration or addition thereunder.

G. Enforcement. It is specifically agreed by and between the parties that in the event any legal action must be taken to enforce the provisions of this bond or to collect said bond, the prevailing party shall be entitled to collect its costs and reasonable attorney fees as a part of the reasonable costs of securing the obligation hereunder. In the event of settlement or resolution of these issues prior to the filing of any suit, the actual costs incurred by the City, including reasonable attorney fees, shall be considered a part of the obligation hereunder secured. Said costs and reasonable legal fees shall be recoverable by the prevailing party, not only from the proceeds of this bond, but also over and above said bond as a part of any recovery (including recovery on the bond) in any judicial proceeding. The Surety hereby agrees that this Agreement shall be governed by the laws of the State of Washington. Venue of any litigation arising out of this Agreement shall be in King County Superior Court.
H. Bond Expiration. This bond shall remain in full force and effect until the obligations secured hereby have been fully performed and until released in writing by the City at the request of the Surety or Principal.

DATED this day of , 2021.

SURETY COMPANY
(Signature must be notarized)

By: ____________________________
    Its __________________________

Business Name: __________________________

Business Address: __________________________

City/State/Zip Code: __________________________

Telephone Number: __________________________

CONTRACTOR
(Signature must be notarized)

By: ____________________________
    Its __________________________

Business Name: __________________________

Business Address: __________________________

City/State/Zip Code: __________________________

Telephone Number: __________________________

CITY OF PACIFIC

By: ____________________________
    Leanne Guier, Mayor

Date: ____________________________

APPROVED AS TO FORM:

Charlotte Archer,
City Attorney

CHECK FOR ATTACHED NOTARY SIGNATURE

_____ Individual (Form P-1)

_____ Corporation (Form P-2)

_____ Surety Company (Form P-2)
FORM P-2 / NOTARY BLOCK  (Use For Partnership or Corporation Only)

(Developer/Owner)
STATE OF WASHINGTON  )
) ss.
COUNTY OF  )

I certify that I know or have satisfactory evidence that ____________________________ is the person who appeared before me, and said person acknowledged as the ____________________________ of ____________________________ that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: ____________________________

___________________________________
___________________________________
(print or type name)

NOTARY PUBLIC in and for the State of Washington, residing at: ____________________________
My Commission expires: ______________

(Surety Company)
STATE OF WASHINGTON  )
) ss.
COUNTY OF  )

I certify that I know or have satisfactory evidence that ____________________________ is the person who appeared before me, and said person acknowledged as the ____________________________ of ____________________________ that (he/she) signed this instrument, on oath stated that (he/she) was authorized to execute the instrument and acknowledged it to be (his/her) free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: ____________________________

___________________________________
___________________________________
(print or type name)

NOTARY PUBLIC in and for the State of Washington, residing at: ____________________________
My Commission expires: ______________
CITY OF PACIFIC

SPECIAL PROVISIONS

The work on this project shall be accomplished in accordance with the Standard Specifications for Road, Bridge and Municipal Construction, 2018 edition, as issued by the Washington State Department of Transportation (WSDOT) and the American Public Works Association (APWA), Washington State Chapter (hereafter “Standard Specifications”). The Standard Specifications, as modified or supplemented by the Amendments to the Standard Specifications and these Special Provisions, all of which are made a part of the Contract Documents, shall govern all of the Work.

These Special Provisions are from various sources, which may have project-specific fill-ins; and project-specific Special Provisions. Each Provision either supplements, modifies, or replaces the comparable Standard Specification or is a new Provision. The deletion, amendment, alteration, or addition to any subsection or portion of the Standard Specifications is meant to pertain only to that particular portion of the section, and in no way should it be interpreted that the balance of the section does not apply.

Several types of Special Provisions are included in this Contract: General, APWA, Contracting Agency, and Project Specific. Special Provisions types are differentiated as follows:

\[(\text{date})\] WSDOT General Special Provision
\[(\text{date APWA GSP})\] APWA General Special Provision
\[(******)\] Project Specific Special Provision.

WSDOT General Special Provisions (and Bridges and Structures Special Provisions, if applicable) are similar to Standard Specifications in that they typically apply to many projects. Usually, the only difference from one project to another is the inclusion of variable project data, inserted as a “fill-in”.

APWA General Special Provisions are specifications developed by the American Public Works Association for use by local agencies.

Project Specific Special Provisions normally appear only in the contract for which they were developed.

Also incorporated into the Contract Documents by reference are:

- Manual on Uniform Traffic Control Devices for Streets and Highways, currently adopted edition, with Washington State modifications, if any
- Standard Plans for Road, Bridge and Municipal Construction, WSDOT/APWA, current edition
- City of Pacific Standard Drawings

Contractor shall obtain copies of these publications, at Contractor’s own expense.
DIVISION NO. 1 GENERAL REQUIREMENTS

1-01.3 Definitions
(January 4, 2016 APWA GSP)

Section 1-01.3 is supplemented with the following:

Delete the heading Completion Dates and the three paragraphs that follow it, and replace them with the following:

**Dates**

**Bid Opening Date**
The date on which the Contracting Agency publicly opens and reads the Bids.

**Award Date**
The date of the formal decision of the Contracting Agency to accept the lowest responsible and responsive Bidder for the Work.

**Contract Execution Date**
The date the Contracting Agency officially binds the Agency to the Contract.

**Notice to Proceed Date**
The date stated in the Notice to Proceed on which the Contract Time begins.

**Substantial Completion Date**
The day the Engineer determines the Contracting Agency has full and unrestricted use and benefit of the facilities, both from the operational and safety standpoint, any remaining traffic disruptions will be rare and brief, and only minor incidental work, replacement of temporary substitute facilities, plant establishment periods, or correction or repair remains for the Physical Completion of the total Contract.

**Physical Completion Date**
The day all of the Work is physically completed on the project. All documentation required by the Contract and required by law does not necessarily need to be furnished by the Contractor by this date.

**Completion Date**
The day all the Work specified in the Contract is completed and all the obligations of the Contractor under the contract are fulfilled by the Contractor. All documentation required by the Contract and required by law must be furnished by the Contractor before establishment of this date.

**Final Acceptance Date**
The date on which the Contracting Agency accepts the Work as complete.

Supplement this Section with the following:

All references in the Standard Specifications, Amendments, or WSDOT General Special Provisions, to the terms “Department of Transportation”, “Washington State Transportation Commission”, “Commission”, “Secretary of Transportation”, “Secretary”, “Headquarters”, and “State Treasurer” shall be revised to read “Contracting Agency”.

All references to the terms “State” or “state” shall be revised to read “Contracting Agency” unless the reference is to an administrative agency of the State of Washington, a State statute or regulation, or the context reasonably indicates otherwise.

All references to “State Materials Laboratory” shall be revised to read “Contracting Agency designated location”.

City of Pacific  
Civic Campus HVAC Upgrade Project  
III-2  
Contract CC2201  
April 2022
All references to “final contract voucher certification” shall be interpreted to mean the Contracting Agency form(s) by which final payment is authorized, and final completion and acceptance granted.

**Additive**
A supplemental unit of work or group of bid items, identified separately in the Bid Proposal, which may, at the discretion of the Contracting Agency, be awarded in addition to the base bid.

**Alternate**
One of two or more units of work or groups of bid items, identified separately in the Bid Proposal, from which the Contracting Agency may make a choice between different methods or material of construction for performing the same work.

**Business Day**
A business day is any day from Monday through Friday except holidays as listed in Section 1-08.5.

**Contract Bond**
The definition in the Standard Specifications for “Contract Bond” applies to whatever bond form(s) are required by the Contract Documents, which may be a combination of a Payment Bond and a Performance Bond.

**Contract Documents**
See definition for “Contract”.

**Contract Time**
The period of time established by the terms and conditions of the Contract within which the Work must be physically completed.

**Notice of Award**
The written notice from the Contracting Agency to the successful Bidder signifying the Contracting Agency’s acceptance of the Bid Proposal.

**Notice to Proceed**
The written notice from the Contracting Agency or Engineer to the Contractor authorizing and directing the Contractor to proceed with the Work and establishing the date on which the Contract Time begins.

**Traffic**
Both vehicular and non-vehicular traffic, such as pedestrians, bicyclists, wheelchairs, and equestrian traffic.

### 1-2 BID PROCEDURES AND CONDITIONS

1-02.1 Prequalification of Bidders
Delete this Section and replace it with the following:
1-02.1 Qualifications of Bidder
(January 24, 2011 APWA GSP)
Before award of a public works contract, a bidder must meet at least the minimum qualifications of RCW 39.04.350(1) to be considered a responsible bidder and qualified to be awarded a public works project.

1-02.1(1) Supplemental Qualifications Criteria
(July 31, 2017 APWA GSP)

In addition, the Contracting Agency has established Contracting Agency-specific and/or project-specific supplemental criteria, in accordance with RCW 39.04.350(3), for determining Bidder responsibility, including the basis for evaluation and the deadline for appealing a determination that a Bidder is not responsible. These criteria are contained in Section 1-02.14 Option B of these Special Provisions.

1-02.5 Proposal Forms
(July 31, 2017 APWA GSP)

Delete this section and replace it with the following:

The Proposal Form will identify the project and its location and describe the work. It will also list estimated quantities, units of measurement, the items of work, and the materials to be furnished at the unit bid prices. The bidder shall complete spaces on the proposal form that call for, but are not limited to, unit prices; extensions; summations; the total bid amount; signatures; date; and, where applicable, retail sales taxes and acknowledgment of addenda; the bidder’s name, address, telephone number, and signature; the bidder’s UDBE/DBE/M/WBE commitment, if applicable; a State of Washington Contractor’s Registration Number; and a Business License Number, if applicable. Bids shall be completed by typing or shall be printed in ink by hand, preferably in black ink. The required certifications are included as part of the Proposal Form.

The Contracting Agency reserves the right to arrange the proposal forms with alternates and additives, if such be to the advantage of the Contracting Agency. The bidder shall bid on all alternates and additives set forth in the Proposal Form unless otherwise specified.

1-02.6 Preparation of Proposal
(July 11, 2018 APWA GSP)

Supplement the second paragraph with the following:

4. If a minimum bid amount has been established for any item, the unit or lump sum price must equal or exceed the minimum amount stated.

5. Any correction to a bid made by interlineation, alteration, or erasure, shall be initialed by the signer of the bid.

Delete the last two paragraphs, and replace them with the following:

If no Subcontractor is listed, the Bidder acknowledges that it does not intend to use any Subcontractor to perform those items of work.

The Bidder shall submit with their Bid a completed Contractor Certification Wage Law Compliance form, provided by the Contracting Agency. Failure to return this certification as part of the Bid Proposal package will make this Bid Nonresponsive and ineligible for Award. A Contractor Certification of Wage Law Compliance form is included in the Proposal Forms.
The Bidder shall make no stipulation on the Bid Form, nor qualify the bid in any manner.

A bid by a corporation shall be executed in the corporate name, by the president or a vice president (or other corporate officer accompanied by evidence of authority to sign).

A bid by a partnership shall be executed in the partnership name, and signed by a partner. A copy of the partnership agreement shall be submitted with the Bid Form if any UDBE requirements are to be satisfied through such an agreement.

A bid by a joint venture shall be executed in the joint venture name and signed by a member of the joint venture. A copy of the joint venture agreement shall be submitted with the Bid Form if any UDBE requirements are to be satisfied through such an agreement.

1-02.7 Bid Deposit

(March 8, 2013 APWA GSP)

Supplement this section with the following:

Bid bonds shall contain the following:

1. Contracting Agency-assigned number for the project;
2. Name of the project;
3. The Contracting Agency named as obligee;
4. The amount of the bid bond stated either as a dollar figure or as a percentage which represents five percent of the maximum bid amount that could be awarded;
5. Signature of the bidder's officer empowered to sign official statements. The signature of the person authorized to submit the bid should agree with the signature on the bond, and the title of the person must accompany the said signature;
6. The signature of the surety's officer empowered to sign the bond and the power of attorney.

If so stated in the Contract Provisions, bidder must use the bond form included in the Contract Provisions.

If so stated in the Contract Provisions, cash will not be accepted for a bid deposit.

1-02.9 Delivery of Proposal

******

Delete this section and replace it with the following:

Each Proposal shall be submitted in a sealed envelope, with the Project Name and Project Number as stated in the Call for Bids clearly marked on the outside of the envelope, or as otherwise required in the Bid Documents, to ensure proper handling and delivery.

The Contracting Agency will not open or consider any Bid Proposal that is received after the time specified in the Call for Bids for receipt of Bid Proposals, or received in a location other than that specified in the Call for Bids.

1-02.10 Withdrawing, Revising, or Supplementing Proposal

(July 23, 2015 APWA GSP)

Delete this section, and replace it with the following:

After submitting a physical Bid Proposal to the Contracting Agency, the Bidder may withdraw, revise, or supplement it if:
1. The Bidder submits a written request signed by an authorized person and physically delivers it to the place designated for receipt of Bid Proposals, and

2. The Contracting Agency receives the request before the time set for receipt of Bid Proposals, and

3. The revised or supplemented Bid Proposal (if any) is received by the Contracting Agency before the time set for receipt of Bid Proposals.

If the Bidder’s request to withdraw, revise, or supplement its Bid Proposal is received before the time set for receipt of Bid Proposals, the Contracting Agency will return the unopened Proposal package to the Bidder. The Bidder must then submit the revised or supplemented package in its entirety. If the Bidder does not submit a revised or supplemented package, then its bid shall be considered withdrawn.

Late revised or supplemented Bid Proposals or late withdrawal requests will be date recorded by the Contracting Agency and returned unopened. Mailed, emailed, or faxed requests to withdraw, revise, or supplement a Bid Proposal are not acceptable.

1-02.13 Irregular Proposals
(June 20, 2017 APWA GSP)

Delete this section and replace it with the following:

1. A Proposal will be considered irregular and will be rejected if:
   a. The Bidder is not prequalified when so required;
   b. The authorized Proposal form furnished by the Contracting Agency is not used or is altered;
   c. The completed Proposal form contains any unauthorized additions, deletions, alternate Bids, or conditions;
   d. The Bidder adds provisions reserving the right to reject or accept the award, or enter into the Contract;
   e. A price per unit cannot be determined from the Bid Proposal;
   f. The Proposal form is not properly executed;
   g. The Bidder fails to submit or properly complete a Subcontractor list, if applicable, as required in Section 1-02.6;
   h. The Bidder fails to submit or properly complete an Underutilized Disadvantaged Business Enterprise Certification, if applicable, as required in Section 1-02.6;
   i. The Bidder fails to submit written confirmation from each UDBE firm listed on the Bidder’s completed UDBE Utilization Certification that they are in agreement with the bidder’s UDBE participation commitment, if applicable, as required in Section 1-02.6, or if the written confirmation that is submitted fails to meet the requirements of the Special Provisions;
   j. The Bidder fails to submit UDBE Good Faith Effort documentation, if applicable, as required in Section 1-02.6, or if the documentation that is submitted fails to demonstrate that a Good Faith Effort to meet the Condition of Award was made;
   k. The Bid Proposal does not constitute a definite and unqualified offer to meet the material terms of the Bid invitation; or
   l. More than one Proposal is submitted for the same project from a Bidder under the same or different names.

2. A Proposal may be considered irregular and may be rejected if:
   a. The Proposal does not include a unit price for every Bid item;
   b. Any of the unit prices are excessively unbalanced (either above or below the amount of a reasonable Bid) to the potential detriment of the Contracting Agency;
   c. Receipt of Addenda is not acknowledged;
d. A member of a joint venture or partnership and the joint venture or partnership submit Proposals for the same project (in such an instance, both Bids may be rejected); or

e. If Proposal form entries are not made in ink.

1-02.14 Disqualification of Bidders

(May 17, 2018 APWA GSP, Option B (modified))

Delete this section and replace it with the following:

A Bidder will be deemed not responsible if the Bidder does not meet the mandatory bidder responsibility criteria in RCW 39.04.350(1), as amended; or does not meet Supplemental Criteria 1-7 listed in this Section.

The Contracting Agency will verify that the Bidder meets the mandatory bidder responsibility criteria in RCW 39.04.350(1), and Supplemental Criteria 1-2. Evidence that the Bidder meets Supplemental Criteria 3-7 shall be provided by the Bidder as stated later in this Section.

1. Delinquent State Taxes

A. Criterion: The Bidder shall not owe delinquent taxes to the Washington State Department of Revenue without a payment plan approved by the Department of Revenue.

B. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder does not owe delinquent taxes to the Washington State Department of Revenue, or if delinquent taxes are owed to the Washington State Department of Revenue, the Bidder must submit a written payment plan approved by the Department of Revenue, to the Contracting Agency by the deadline listed below.

2. Federal Debarment

A. Criterion: The Bidder shall not currently be debarred or suspended by the Federal government.

B. Documentation: The Bidder shall not be listed as having an “active exclusion” on the U.S. government’s “System for Award Management” database (www.sam.gov).

3. Subcontractor Responsibility

A. Criterion: The Bidder’s standard subcontract form shall include the subcontractor responsibility language required by RCW 39.06.020, and the Bidder shall have an established procedure which it utilizes to validate the responsibility of each of its subcontractors. The Bidder’s subcontract form shall also include a requirement that each of its subcontractors shall have and document a similar procedure to determine whether the sub-tier subcontractors with whom it contracts are also “responsible” subcontractors as defined by RCW 39.06.020.

B. Documentation: The Bidder, if and when required as detailed below, shall submit a copy of its standard subcontract form for review by the Contracting Agency, and a written description of its procedure for validating the responsibility of subcontractors with which it contracts.

4. Claims Against Retainage and Bonds

A. Criterion: The Bidder shall not have a record of excessive claims filed against the
retainage or payment bonds for public works projects in the three years prior to the bid submittal date, that demonstrate a lack of effective management by the Bidder of making timely and appropriate payments to its subcontractors, suppliers, and workers, unless there are extenuating circumstances and such circumstances are deemed acceptable to the Contracting Agency.

B. Documentation: The Bidder, if and when required as detailed below, shall submit a list of the public works projects completed in the three years prior to the bid submittal date that have had claims against retainage and bonds and include for each project the following information:

- Name of project
- The owner and contact information for the owner;
- A list of claims filed against the retainage and/or payment bond for any of the projects listed;
- A written explanation of the circumstances surrounding each claim and the ultimate resolution of the claim.

5. Public Bidding Crime

A Criterion: The Bidder and/or its owners shall not have been convicted of a crime involving bidding on a public works contract in the five years prior to the bid submittal date.

B. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder and/or its owners have not been convicted of a crime involving bidding on a public works contract.

6. Termination for Cause / Termination for Default

A Criterion: The Bidder shall not have had any public works contract terminated for cause or terminated for default by a government agency in the five years prior to the bid submittal date, unless there are extenuating circumstances and such circumstances are deemed acceptable to the Contracting Agency.

B. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder has not had any public works contract terminated for cause or terminated for default by a government agency in the five years prior to the bid submittal date; or if Bidder was terminated, describe the circumstances.

7. Lawsuits

A Criterion: The Bidder shall not have lawsuits with judgments entered against the Bidder in the five years prior to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, unless there are extenuating circumstances and such circumstances are deemed acceptable to the Contracting Agency.

B. Documentation: The Bidder, if and when required as detailed below, shall sign a statement (on a form to be provided by the Contracting Agency) that the Bidder has not had any lawsuits with judgments entered against the Bidder in the five years prior
to the bid submittal date that demonstrate a pattern of failing to meet the terms of contracts, or shall submit a list of all lawsuits with judgments entered against the Bidder in the five years prior to the bid submittal date, along with a written explanation of the circumstances surrounding each such lawsuit. The Contracting Agency shall evaluate these explanations to determine whether the lawsuits demonstrate a pattern of failing to meet of terms of construction related contracts.

As evidence that the Bidder meets the Supplemental Criteria stated above, the apparent low Bidder must submit to the Contracting Agency by 12:00 P.M. (noon) of the second business day following the bid submittal deadline, a written statement verifying that the Bidder meets the supplemental criteria together with supporting documentation (sufficient in the sole judgment of the Contracting Agency) demonstrating compliance with the Supplemental Criteria. The Contracting Agency reserves the right to request further documentation as needed from the low Bidder and documentation from other Bidders as well to assess Bidder responsibility and compliance with all bidder responsibility criteria. The Contracting Agency also reserves the right to obtain information from third-parties and independent sources of information concerning a Bidder's compliance with the mandatory and supplemental criteria, and to use that information in their evaluation. The Contracting Agency may consider mitigating factors in determining whether the Bidder complies with the requirements of the supplemental criteria.

The basis for evaluation of Bidder compliance with these mandatory and supplemental criteria shall include any documents or facts obtained by the Contracting Agency (whether from the Bidder or third parties) including but not limited to: (i) financial, historical, or operational data from the Bidder; (ii) information obtained directly by the Contracting Agency from others for whom the Bidder has worked, or other public agencies or private enterprises; and (iii) any additional information obtained by the Contracting Agency which is believed to be relevant to the matter.

If the Contracting Agency determines the Bidder does not meet the bidder responsibility criteria above and is therefore not a responsible Bidder, the Contracting Agency shall notify the Bidder in writing, with the reasons for its determination. If the Bidder disagrees with this determination, it may appeal the determination within two (2) business days of the Contracting Agency’s determination by presenting its appeal and any additional information to the Contracting Agency. The Contracting Agency will consider the appeal and any additional information before issuing its final determination. If the final determination affirms that the Bidder is not responsible, the Contracting Agency will not execute a contract with any other Bidder until at least two business days after the Bidder determined to be not responsible has received the Contracting Agency’s final determination.

Request to Change Supplemental Bidder Responsibility Criteria Prior To Bid: Bidders with concerns about the relevancy or restrictiveness of the Supplemental Bidder Responsibility Criteria may make or submit requests to the Contracting Agency to modify the criteria. Such requests shall be in writing, describe the nature of the concerns, and propose specific modifications to the criteria. Bidders shall submit such requests to the Contracting Agency no later than five (5) business days prior to the bid submittal deadline and address the request to the Project Engineer or such other person designated by the Contracting Agency in the Bid Documents.

1-02.15 Pre Award Information
(August 14, 2013 APWA GSP)

Revise this section to read:

Before awarding any contract, the Contracting Agency may require one or more of these items or actions of the apparent lowest responsible bidder:
1. A complete statement of the origin, composition, and manufacture of any or all materials to be used,
2. Samples of these materials for quality and fitness tests, A progress schedule (in a form the Contracting Agency requires) showing the order of and time required for the various phases of the work,
3. A breakdown of costs assigned to any bid item,
4. Attendance at a conference with the Engineer or representatives of the Engineer,
5. Obtain, and furnish a copy of, a business license to do business in the city or county where the work is located.
6. Any other information or action taken that is deemed necessary to ensure that the bidder is the lowest responsible bidder.

1-3 AWARD AND EXECUTION OF CONTRACT

1-03.1 Consideration of Bids
(January 23, 2006 APWA GSP)

Revise the first paragraph to read:

After opening and reading proposals, the Contracting Agency will check them for correctness of extensions of the prices per unit and the total price. If a discrepancy exists between the price per unit and the extended amount of any bid item, the price per unit will control. If a minimum bid amount has been established for any item and the bidder's unit or lump sum price is less than the minimum specified amount, the Contracting Agency will unilaterally revise the unit or lump sum price, to the minimum specified amount and recalculate the extension. The total of extensions, corrected where necessary, including sales taxes where applicable and such additives and/or alternates as selected by the Contracting Agency, will be used by the Contracting Agency for award purposes and to fix the Awarded Contract Price amount and the amount of the contract bond.

1-03.3 Execution of Contract
(October 1, 2005 APWA GSP)

Revise this section to read:

Copies of the Contract Provisions, including the unsigned Form of Contract, will be available for signature by the successful bidder on the first business day following award. The number of copies to be executed by the Contractor will be determined by the Contracting Agency.

Within 10 calendar days after the award date, the successful bidder shall return the signed Contracting Agency-prepared contract, an insurance certification as required by Section 1-07.18, and a satisfactory bond as required by law and Section 1-03.4. Before execution of the contract by the Contracting Agency, the successful bidder shall provide any pre-award information the Contracting Agency may require under Section 1-02.15.

Until the Contracting Agency executes a contract, no proposal shall bind the Contracting Agency nor shall any work begin within the project limits or within Contracting Agency-furnished sites. The Contractor shall bear all risks for any work begun outside such areas and for any materials ordered before the contract is executed by the Contracting Agency.

If the bidder experiences circumstances beyond their control that prevents return of the contract documents within the calendar days after the award date stated above, the Contracting Agency may grant up to a maximum of 10 additional calendar days for return of
1-03.4 Contract Bond
(July 23, 2015 APWA GSP)

Delete the first paragraph and replace it with the following:

The successful bidder shall provide executed payment and performance bond(s) for the full contract amount. The bond may be a combined payment and performance bond; or be separate payment and performance bonds. In the case of separate payment and performance bonds, each shall be for the full contract amount. The bond(s) shall:

1. Be on Contracting Agency-furnished form(s)
2. Be signed by an approved surety (or sureties) that:
   a. Is registered with the Washington State Insurance Commissioner, and
   b. Appears on the current Authorized Insurance List in the State of Washington published by the Office of the Insurance Commissioner
3. Guarantee that the Contractor will perform and comply with all obligations, duties, and conditions under the Contract, including but not limited to the duty and obligation to indemnify, defend, and protect the Contracting Agency against all losses and claims related directly or indirectly from any failure:
   a. Of the Contractor (or any of the employees, subcontractors, or lower tier subcontractors of the Contractor) to faithfully perform and comply with all contract obligations, conditions, and duties, or
   b. Of the Contractor (or the subcontractors or lower tier subcontractors of the Contractor) to pay all laborers, mechanics, subcontractors, lower tier subcontractors, material person, or any other person who provides supplies or provisions for carrying out the work
4. Be conditioned upon the payment of taxes, increases, and penalties incurred on the project under titles 50, 51, and 82 RCW; and
5. Be accompanied by a power of attorney for the Surety’s officer empowered to sign the bond; and
6. Be signed by an officer of the Contractor empowered to sign official statements (sole proprietor or partner). If the Contractor is a corporation, the bond(s) must be signed by the president or vice president, unless accompanied by written proof of the authority of the individual signing the bond(s) to bind the corporation (i.e., corporate resolution, power of attorney, or a letter to such effect signed by the president or vice president).

(******)

Add the following at the end of this Section:

Maintenance Bond: The successful bidder shall provide an executed maintenance bond in the form provided in the Invitation.

1-4 SCOPE OF THE WORK

1-04.2 Coordination of Contract Documents, Plans, Special Provisions, Specifications, and Addenda
(March 13, 2012 APWA GSP, Modified)
Revise the second paragraph to read:

Any inconsistency in the parts of the Contract shall be resolved by following this order of precedence (e.g., 1 presiding over 2, 2 over 3, 3 over 4, and so forth):

1. Addenda,
2. Proposal Form,
3. Special Provisions – including Project Special Provisions,
4. Scope of Work (Exhibit A),
5. Plans and Contract Drawings (Exhibit B),
6. Amendments to the Standard Specifications – Current through the Bid Opening Date,
7. 2018 WSDOT Standard Specifications,
8. City of Pacific Standards
9. All applicable codes, permits, and regulations.

1-04.5 Procedure and Protest by the Contractor

Replace the first and second paragraphs and subsections 1 and 2(a) of the third paragraph of this Section with the following:

The Contractor accepts all requirements of a change order by: (1) endorsing it, (2) writing a separate acceptance, or (3) not protesting in the way this Section provides. A change order that is not protested as provided in this Section shall be full payment and final settlement of all claims for Contract Time and for all costs of any kind, including costs of delays, related to any Work either covered or affected by the change.

By not protesting as this Section provides, the Contractor waives any claim or entitlement to additional compensation, adjustment to the Contract Price, adjustment to the Contract Time, and any other legal or equitable relief. Also, by not protesting as provided by this Section the Contractor thereby accepts any written or oral order, change or direction, instruction, interpretation, and determination issued by the Engineer.

If an occurrence, event, or action occurs whereby the Contractor believes it has or will have a right to additional compensation, adjustment to the Contract Price, adjustment to the Contract Time, legal or equitable relief, damages, or any modification or equitable adjustment of the terms of the Contract, or if the Contractor is in disagreement with anything required in a change order, another written order, an oral order, determination, or any other action by the Engineer, the Contractor shall:

1. Immediately give a signed written notice of protest to the Project Engineer or the Project Engineer’s field Inspectors before doing any Work related to the occurrence, event, or action that is the subject of the protest. In all cases, the notice of protest must be given within ten (10) calendar days of the occurrence, event, or action that is the subject of the protest. The notice of protest must include the date and description of the event, occurrence, or action together with a statement describing the anticipated effect of the event, occurrence, or action upon the Work and the Contract.

2. Supplement the written protest within fourteen (14) calendar days with a written statement and supporting documents providing the following:
   a. The date and nature of the occurrence, event, action, order, direction, instruction, interpretation, or determination that is the subject of the protest;

1-5 CONTROL OF WORK

1-05.4 Conformity With and Deviations from Plans and Stakes
Supplement this section with the following:

Roadway and Utility Surveys

Surveying, calculations, and measuring required for setting and maintaining the necessary lines and grades shall be the Contractor’s responsibility.

The Contractor shall inform the Engineer when monuments are discovered that were not identified in the Plans, and which may be disturbed or damaged by construction activity. All monuments shall be protected or replaced at the Contractor’s expense. Where monuments may be disturbed or replaced, the Contractor shall conform to the governing body’s applicable requirements for such work.

The survey work shall include but not be limited to the following:

1. Verify the primary horizontal and vertical control furnished by the Contracting Agency, and expand into secondary control by adding stakes and hubs as well as any additional survey control needed for the project. Provide descriptions of secondary control to the Contracting Agency. The description shall include coordinates and elevations of all secondary control points.

2. For all other types of construction included in this provision, provide staking and layout as necessary to adequately locate, construct, and check the specific construction activity.

3. Provide survey offset points as required to establish line and grade for all underground utilities, structures and foundations.

4. Provide staking as necessary to grade the site as shown in the Contract Plans.

5. Record the vertical and horizontal locations of utilities located as part of the pre-construction investigations.

6. All other staking necessary to construct the improvements as shown in the Contract Plans.

The Contractor shall provide the Contracting Agency copies of any calculations and staking data when requested by the Project Engineer.

Measurement

No measurement will be made for the lump sum bid item “Construction Surveying and Staking”

Payment

Payment will be made in accordance with Section 1-04.1 for the following bid item when included in the proposal:

“Construction Surveying and Staking”, lump sum.

The lump sum contract price for “Construction Surveying and Staking” shall be full pay for all labor, equipment, materials, and supervision utilized to perform the Work specified, including any resurveying, checking, correction of errors, replacement of missing or damaged hubs or stakes, and coordination efforts.

The Contractor shall provide sufficient, safe, adequate space for the surveyors to set points and elevations, and shall use caution whenever it is necessary to have equipment working at the same time and in the same vicinity as the surveyors. Unsafe conditions will be reported.
to the Engineer. The surveyors may be withdrawn until corrective action is taken to the satisfaction of the Engineer.

The Engineer will determine what stakes are necessary to construct the project and at what intervals they shall be staked for each type of work. The Contractor shall assume full responsibility for the interpretation of these stakes and measurements from these hubs, stakes, or marks. If the Contractor notices any discrepancies in line or grade, he shall bring them to the immediate attention of the Engineer, prior to constructing the affected work.

The Contractor shall submit written staking requests to the inspector at least three (3) working days prior to commencement of any staking operations.

**1-05.7 Removal of Defective and Unauthorized Work**  
*(October 1, 2005 APWA GSP)*

Supplement this section with the following:

If the Contractor fails to remedy defective or unauthorized work within the time specified in a written notice from the Engineer, or fails to perform any part of the work required by the Contract Documents, the Engineer may correct and remedy such work as may be identified in the written notice, with Contracting Agency forces or by such other means as the Contracting Agency may deem necessary.

If the Contractor fails to comply with a written order to remedy what the Engineer determines to be an emergency situation, the Engineer may have the defective and unauthorized work corrected immediately, have the rejected work removed and replaced, or have work the Contractor refuses to perform completed by using Contracting Agency or other forces. An emergency situation is any situation when, in the opinion of the Engineer, a delay in its remedy could be potentially unsafe, or might cause serious risk of loss or damage to the public.

Direct or indirect costs incurred by the Contracting Agency attributable to correcting and remedying defective or unauthorized work, or work the Contractor failed or refused to perform, shall be paid by the Contractor. Payment will be deducted by the Engineer from monies due, or to become due, the Contractor. Such direct and indirect costs shall include in particular, but without limitation, compensation for additional professional services required, and costs for repair and replacement of work of others destroyed or damaged by correction, removal, or replacement of the Contractor’s unauthorized work.

No adjustment in Contract Time or compensation will be allowed because of the delay in the performance of the work attributable to the exercise of the Contracting Agency’s rights provided by this Section.

The rights exercised under the provisions of this section shall not diminish the Contracting Agency’s right to pursue any other avenue for additional remedy or damages with respect to the Contractor’s failure to perform the work as required.

**1-05.11 Final Inspection**

Section 1-05.11 is revised to read:

(******)

**Substantial Completion Date**

When the Contractor considers the work to be substantially complete, the Contractor shall so notify the Engineer and request the Engineer establish the Substantial Completion Date. The Contractor’s request shall list the specific items of work that remain to be completed in order to reach physical completion. The Engineer will schedule an inspection of the work with the
Contractor to determine the status of completion. The Engineer may also establish the Substantial Completion Date unilaterally.

If, after this inspection, the Engineer concurs with the Contractor that the work is substantially complete and ready for its intended use, the Engineer, by written notice to the Contractor, will set the Substantial Completion Date. If, after this inspection the Engineer does not consider the work substantially complete and ready for its intended use, the Engineer will, by written notice, so notify the Contractor giving the reasons therefore.

Upon receipt of written notice concurring in or denying substantial completion, whichever is applicable, the Contractor shall pursue vigorously, diligently and without unauthorized interruption, the work necessary to reach Substantial and Physical Completion. The Contractor shall provide the Engineer with a revised schedule indicating when the Contractor expects to reach substantial and physical completion of the work.

The above process shall be repeated until the Engineer establishes the Substantial Completion Date and the Contractor considers the work physically complete and ready for final inspection.

**Final Inspection and Physical Completion Date**

When the Contractor considers the work physically complete and ready for final inspection the Contractor, by written notice, shall request the Engineer to schedule a final inspection. The Engineer will set a date for final inspection. The Engineer and the Contractor will then make a final inspection and the Engineer will notify the Contractor in writing of all particulars in which the final inspection reveals the work incomplete or unacceptable. The Contractor shall immediately take such corrective measures as are necessary to remedy the listed deficiencies. Corrective work shall be pursued vigorously, diligently, and without interruption until physical completion of the listed deficiencies. This process will continue until the Engineer is satisfied the listed deficiencies have been corrected.

If action to correct the listed deficiencies is not initiated within 7 days after receipt of the written notice listing the deficiencies, the Engineer may, upon written notice to the Contractor, take whatever steps are necessary to correct those deficiencies pursuant to Section 1-05.7.

The Contractor will not be allowed an extension of Contract Time because of a delay in the performance of the work attributable to the exercise of the Engineer’s right hereunder.

Upon correction of all deficiencies, the Engineer will notify the Contractor and the Contracting Agency, in writing, of the date upon which the work was considered physically complete. That date shall constitute the Physical Completion Date of the contract, but shall not imply acceptance of the work or that all the obligations of the Contractor under the contract have been fulfilled.

**Testing**

It is the intent of the Contracting Agency to have at the Physical Completion Date a complete and operable system. Therefore when the work involves the installation of machinery or other mechanical equipment; street lighting, electrical distribution or signal systems; irrigation systems; buildings; or other similar work it may be desirable for the Engineer to have the Contractor operate and test the work for a period of time after final inspection but prior to the physical completion date. Whenever items of work are listed in the Contract Provisions for testing they shall be fully tested under operating conditions for the time period specified to ensure their acceptability prior to the Physical Completion Date.

Testing shall include testing of each equipment item installed and operational testing of the complete facility. During and following testing, the Contractor shall correct any items of workmanship, materials, or equipment which prove faulty, or that are not in first class operating
condition. Equipment, electrical controls, meters, or other devices and equipment shall be tested under the observation of the Engineer, so that the Engineer may determine their suitability for the purpose for which they were installed. See Section 11-01.3(8) for startup and testing requirements, including:

- Equipment start-up and testing (must be completed to the satisfaction of the Engineer as a prerequisite to substantial completion)
- Pump station start-up and operational testing (must be completed to the satisfaction of the Engineer as a prerequisite to physical completion)

The costs for power, gas, labor, material, supplies, and everything else needed to successfully complete operational testing, shall be included in the unit contract prices related to the system being tested, unless specifically set forth otherwise in the proposal.

Operational and test periods, when required by the Engineer, shall not affect a manufacturer's guaranties or warranties furnished under the terms of the contract.

1-05.12 Final Acceptance

Add the following new section:

1-05.12(1) One-Year Guarantee Period
(March 8, 2013 APWA GSP)

The Contractor shall return to the project and repair or replace all defects in workmanship and material discovered within one year after Final Acceptance of the Work. The Contractor shall start work to remedy any such defects within 7 calendar days of receiving Contracting Agency’s written notice of a defect, and shall complete such work within the time stated in the Contracting Agency's notice. In case of an emergency, where damage may result from delay or where loss of services may result, such corrections may be made by the Contracting Agency’s own forces or another contractor, in which case the cost of corrections shall be paid by the Contractor. In the event the Contractor does not accomplish corrections within the time specified, the work will be otherwise accomplished and the cost of same shall be paid by the Contractor.

When corrections of defects are made, the Contractor shall then be responsible for correcting all defects in workmanship and materials in the corrected work for one year after acceptance of the corrections by Contracting Agency.

This guarantee is supplemental to and does not limit or affect the requirements that the Contractor's work comply with the requirements of the Contract or any other legal rights or remedies of the Contracting Agency.

1-05.13 Superintendents, Labor and Equipment of Contractor
(August 14, 2013 APWA GSP)

Delete the sixth and seventh paragraphs of this section.

1-05.15 Method of Serving Notices
(March 25, 2009 APWA GSP)

Revise the second paragraph to read:

All correspondence from the Contractor shall be directed to the Project Engineer. All correspondence from the Contractor constituting any notification, notice of protest, notice of dispute, or other correspondence constituting notification required to be furnished under the
Contract, must be in paper format, hand delivered or sent via mail delivery service to the Project Engineer's office. Electronic copies such as e-mails or electronically delivered copies of correspondence will not constitute such notice and will not comply with the requirements of the Contract.

Add the following new section:

1-05.16 Water and Power
(October 1, 2005 APWA GSP)

The Contractor shall make necessary arrangements, and shall bear the costs for power and water necessary for the performance of the work, unless the contract includes power and water as a pay item.

1-6 CONTROL OF MATERIAL

1-06.1 Approval of Materials Prior to Use

Section 1-06.1 is supplemented as follows:

(******)

All notifications to the Engineer shall be at least seven (7) calendar days prior to use.

1-06.2(2) Statistical Evaluation of Materials for Acceptance
(******)

Section 1-06.2(2) shall not apply to this project.

1-7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

1-07.1 Laws to be Observed
(October 1, 2005 APWA GSP)

Supplement this section with the following:

In cases of conflict between different safety regulations, the more stringent regulation shall apply.

The Washington State Department of Labor and Industries shall be the sole and paramount administrative agency responsible for the administration of the provisions of the Washington Industrial Safety and Health Act of 1973 (WISHA).

The Contractor shall maintain at the project site office, or other well-known place at the project site, all articles necessary for providing first aid to the injured. The Contractor shall establish, publish, and make known to all employees, procedures for ensuring immediate removal to a hospital, or doctor’s care, persons, including employees, who may have been injured on the project site. Employees should not be permitted to work on the project site before the Contractor has established and made known procedures for removal of injured persons to a hospital or a doctor’s care. The Contractor shall have sole responsibility for the safety, efficiency, and adequacy of the Contractor’s plant, appliances, and methods, and for any damage or injury resulting from their failure, or improper maintenance, use, or operation. The Contractor shall be solely and completely responsible for the conditions of the project site, including safety for all persons and property in the performance of the work. This requirement shall apply continuously, and not be limited to normal working hours. The required or implied duty of the Engineer to conduct construction review of the Contractor’s performance does not, and shall not, be intended to include review and adequacy of the
Contractor’s safety measures in, on, or near the project site.

1-07.2 State Sales Tax
Delete this section, including its sub-sections, in its entirety and replace it with the following:

1-07.2 State Sales Tax  
(June 27, 2011 APWA GSP)

The Washington State Department of Revenue has issued special rules on the State sales tax. Sections 1-07.2(1) through 1-07.2(3) are meant to clarify those rules. The Contractor should contact the Washington State Department of Revenue for answers to questions in this area. The Contracting Agency will not adjust its payment if the Contractor bases a bid on a misunderstood tax liability.

The Contractor shall include all Contractor-paid taxes in the unit bid prices or other contract amounts. In some cases, however, state retail sales tax will not be included. Section 1-07.2(2) describes this exception.

The Contracting Agency will pay the retained percentage (or release the Contract Bond if a FHWA-funded Project) only if the Contractor has obtained from the Washington State Department of Revenue a certificate showing that all contract-related taxes have been paid (RCW 60.28.051). The Contracting Agency may deduct from its payments to the Contractor any amount the Contractor may owe the Washington State Department of Revenue, whether the amount owed relates to this contract or not. Any amount so deducted will be paid into the proper State fund.

1-07.2(1) State Sales Tax — Rule 171
WAC 458-20-171, and its related rules, apply to building, repairing, or improving streets, roads, etc., which are owned by a municipal corporation, or political subdivision of the state, or by the United States, and which are used primarily for foot or vehicular traffic. This includes storm or combined sewer systems within and included as a part of the street or road drainage system and power lines when such are part of the roadway lighting system. For work performed in such cases, the Contractor shall include Washington State Retail Sales Taxes in the various unit bid item prices, or other contract amounts, including those that the Contractor pays on the purchase of the materials, equipment, or supplies used or consumed in doing the work.

1-07.2(2) State Sales Tax — Rule 170
WAC 458-20-170, and its related rules, apply to the constructing and repairing of new or existing buildings, or other structures, upon real property. This includes, but is not limited to, the construction of streets, roads, highways, etc., owned by the state of Washington; water mains and their appurtenances; sanitary sewers and sewage disposal systems unless such sewers and disposal systems are within, and a part of, a street or road drainage system; telephone, telegraph, electrical power distribution lines, or other conduits or lines in or above streets or roads, unless such power lines become a part of a street or road lighting system; and installing or attaching of any article of tangible personal property in or to real property, whether or not such personal property becomes a part of the realty by virtue of installation.

For work performed in such cases, the Contractor shall collect from the Contracting Agency, retail sales tax on the full contract price. The Contracting Agency will automatically add this sales tax to each payment to the Contractor. For this reason, the Contractor shall not include the retail sales tax in the unit bid item prices, or in any other contract amount subject to Rule 170, with the following exception.
Exception: The Contracting Agency will not add in sales tax for a payment the Contractor or a subcontractor makes on the purchase or rental of tools, machinery, equipment, or consumable supplies not integrated into the project. Such sales taxes shall be included in the unit bid item prices or in any other contract amount.

1-07.2(3) Services
The Contractor shall not collect retail sales tax from the Contracting Agency on any contract wholly for professional or other services (as defined in Washington State Department of Revenue Rules 138 and 244).

1-07.4 Sanitation
Section 1-07.4 is supplemented with the following:

(******)
Portable Toilet Facility
The Contractor shall supply at least one portable toilet on the job site at all times when the Contractor has any employees on the job site performing contract work. Portable toilets shall be serviced on a weekly basis.

This item shall be included in the bid item for mobilization. An amount approximating the actual cost per week will be subtracted from the bid item for mobilization for each week the portable toilet is not supplied on the job site or serviced on a weekly basis.

1-07.13 Contractor’s Responsibility for Work
1-07.13(4) Repair of Damage
Section 1-07.13(4) is revised to read:

(******)
The Contractor shall promptly repair all damage to either temporary or permanent work as directed by the Engineer. For damage qualifying for relief under Sections 1-07.13(1), 1-07.13(2) or 1-07.13(3), payment will be made in accordance with Section 1-09.4. Payment will be limited to repair of damaged work only. No payment will be made for delay or disruption of work.

1-07.18 Public Liability and Property Damage Insurance
Delete this section in its entirety, and replace it with the following:

1-07.18 Insurance
(January 4, 2016 APWA GSP (Modified)

1-07.18(1) General Requirements The Contractor shall procure and maintain the insurance described in all subsections of section 1-07.18 of these Special Provisions, from insurers with a current A. M. Best rating of not less than A-: VII and licensed to do business in the State of Washington. The Contracting Agency reserves the right to approve or reject the insurance provided, based on the insurer’s financial condition.

A. The Contractor shall keep this insurance in force without interruption from the commencement of the Contractor’s Work through the term of the Contract and for thirty (30) days after the Physical Completion date, unless otherwise indicated below.

B. If any insurance policy is written on a claims made form, its retroactive date, and that of all subsequent renewals, shall be no later than the effective date of this Contract. The policy shall state that coverage is claims made, and state the retroactive date. Claims- made form coverage shall be maintained by the Contractor for a minimum of 36 months following the
Completion Date or earlier termination of this Contract, and the Contractor shall annually provide the Contracting Agency with proof of renewal. If renewal of the claims made form of coverage becomes unavailable, or economically prohibitive, the Contractor shall purchase an extended reporting period (“tail”) or execute another form of guarantee acceptable to the Contracting Agency to assure financial responsibility for liability for services performed.

C. The Contractor’s Automobile Liability, Commercial General Liability and Excess or Umbrella Liability insurance policies shall be primary and non-contributory insurance as respects the Contracting Agency’s insurance, self-insurance, or self-insured pool coverage. Any insurance, self-insurance, or self-insured pool coverage maintained by the Contracting Agency shall be excess of the Contractor’s insurance and shall not contribute with it.

D. The Contractor shall provide the Contracting Agency and all additional insureds with written notice of any policy cancellation, within two business days of their receipt of such notice.

E. The Contractor shall not begin work under the Contract until the required insurance has been obtained and approved by the Contracting Agency.

F. Failure on the part of the Contractor to maintain the insurance as required shall constitute a material breach of contract, upon which the Contracting Agency may, after giving five business days’ notice to the Contractor to correct the breach, immediately terminate the Contract or, at its discretion, procure or renew such insurance and pay any and all premiums in connection therewith, with any sums so expended to be repaid to the Contracting Agency, or at the sole discretion of the Contracting Agency, offset against funds due the Contractor from the Contracting Agency.

G. All costs for insurance shall be incidental to and included in the unit or lump sum prices of the Contract and no additional payment will be made.

H. Products and Completed Operations coverage shall be provided for a period of 3 years following Substantial Completion of the Work.

1-07.18(2) Additional Insured

All insurance policies, with the exception of Workers Compensation, and of Professional Liability and Builder’s Risk (if required by this Contract) shall name the following listed entities as additional insured(s) using the forms or endorsements required herein: the Contracting Agency and its officers, elected officials, employees, agents, and volunteers.

The above-listed entities shall be additional insured(s) for the full available limits of liability maintained by the Contractor, irrespective of whether such limits maintained by the Contractor are greater than those required by this Contract, and irrespective of whether the Certificate of Insurance provided by the Contractor pursuant to 1-07.18(4) describes limits lower than those maintained by the Contractor.

For Commercial General Liability insurance coverage, the required additional insured endorsements shall be at least as broad as ISO forms CG 20 10 10 01 for ongoing operations and CG 20 37 10 01 for completed operations.

1-07.18(3) Subcontractors

The Contractor shall cause each Subcontractor of every tier to provide insurance coverage that complies with all applicable requirements of the Contractor-provided insurance as set forth herein, except the Contractor shall have sole responsibility for determining the limits of coverage required to be obtained by Subcontractors.

The Contractor shall ensure that all Subcontractors of every tier add all entities listed in 1-07.18(2) as additional insureds, and provide proof of such on the policies as required by that section as detailed in 1-07.18(2) using an endorsement as least as broad as ISO CG 20 10 10.
Upon request by the Contracting Agency, the Contractor shall forward to the Contracting Agency evidence of insurance and copies of the additional insured endorsements of each Subcontractor of every tier as required in 1-07.18(4) Verification of Coverage.

1-07.18(4) Verification of Coverage

The Contractor shall deliver to the Contracting Agency a Certificate(s) of Insurance and endorsements for each policy of insurance meeting the requirements set forth herein when the Contractor delivers the signed Contract for the work. Failure of Contracting Agency to demand such verification of coverage with these insurance requirements or failure of Contracting Agency to identify a deficiency from the insurance documentation provided shall not be construed as a waiver of Contractor’s obligation to maintain such insurance.

Verification of coverage shall include:

1. An ACORD certificate or a form determined by the Contracting Agency to be equivalent.
2. Copies of all endorsements naming Contracting Agency and all other entities listed in 1-07.18(2) as additional insured(s), showing the policy number. The Contractor may submit a copy of any blanket additional insured clause from its policies instead of a separate endorsement.
3. Any other amendatory endorsements to show the coverage required herein.
4. A notation of coverage enhancements on the Certificate of Insurance shall not satisfy these requirements – actual endorsements must be submitted.

Upon request by the Contracting Agency, the Contractor shall forward to the Contracting Agency a full and certified copy of the insurance policy(s). If Builders Risk insurance is required on this Project, a full and certified copy of that policy is required when the Contractor delivers the signed Contract for the work.

1-07.18(5) Coverages and Limits The insurance shall provide the minimum coverages and limits set forth below. Contractor’s maintenance of insurance, its scope of coverage, and limits as required herein shall not be construed to limit the liability of the Contractor to the coverage provided by such insurance, or otherwise limit the Contracting Agency’s recourse to any remedy available at law or in equity.

All deductibles and self-insured retentions must be disclosed and are subject to approval by the Contracting Agency. The cost of any claim payments falling within the deductible or self-insured retention shall be the responsibility of the Contractor. In the event an additional insured incurs a liability subject to any policy’s deductibles or self-insured retention, said deductibles or self-insured retention shall be the responsibility of the Contractor.

1-07.18(5)A Commercial General Liability

Commercial General Liability insurance shall be written on coverage forms at least as broad as ISO occurrence form CG 00 01, including but not limited to liability arising from premises, operations, stop gap liability, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract. There shall be no exclusion for liability arising from explosion, collapse or underground property damage.

The Commercial General Liability insurance shall be endorsed to provide a per project general aggregate limit, using ISO form CG 25 03 05 09 or an equivalent endorsement.

Contractor shall maintain Commercial General Liability Insurance arising out of the Contractor’s completed operations for at least three years following Substantial Completion of the Work.
Such policy must provide the following minimum limits:

- $2,000,000 Each Occurrence
- $2,000,000 General Aggregate
- $2,000,000 Products & Completed Operations Aggregate
- $2,000,000 Personal & Advertising Injury each offense
- $1,000,000 Stop Gap / Employers’ Liability each accident

1-07.18(5)B Automobile Liability

Automobile Liability shall cover owned, non-owned, hired, and leased vehicles; and shall be written on a coverage form at least as broad as ISO form CA 00 01. If the work involves the transport of pollutants, the automobile liability policy shall include MCS 90 and CA 99 48 endorsements.

Such policy must provide the following minimum limit:

- $2,000,000 Combined single limit each accident

1-07.18(5)C Workers’ Compensation

The Contractor shall comply with Workers’ Compensation coverage as required by the Industrial Insurance laws of the State of Washington.

1-07.18(5)D Excess or Umbrella Liability

(January 4, 2016 APWA GSP)

The Contractor shall provide Excess or Umbrella Liability insurance with limits of not less than $2 Million Dollars ($2,000,000) each occurrence and annual aggregate. This excess or umbrella liability coverage shall be excess over and as least as broad in coverage as the Contractor’s Commercial General and Auto Liability insurance All entities listed under 1-07.18(2) of these Special Provisions shall be named as additional insureds on the Contractor’s Excess or Umbrella Liability insurance policy.

This requirement may be satisfied instead through the Contractor’s primary Commercial General and Automobile Liability coverages, or any combination thereof that achieves the overall required limits of insurance.

1-07.18(5)E LHWCA Insurance

(January 4, 2016 APWA GSP)

If this Contract involves work on or adjacent to Navigable Waters of the United States, the Contractor shall procure and maintain insurance coverage in compliance with the statutory requirements of the U.S. Longshore and Harbor Workers’ Compensation Act (LHWCA).

Such policy must provide the following minimum limits:

- $1,000,000 Bodily Injury by Accident – each accident
- $1,000,000 Bodily Injury by Disease – each employee
- $1,000,000 Bodily Injury by Disease – policy limits

1-07.18(5)J Pollution Liability

(January 4, 2016 APWA GSP)

The Contractor shall provide a Contractors Pollution Liability policy, providing coverage for claims involving bodily injury, property damage (including loss of use of tangible property that has not been physically injured), cleanup costs, remediation, disposal or other handling of
pollutants, including costs and expenses incurred in the investigation, defense, or settlement of claims, arising out of any one or more of the following:

1. Contractor’s operations related to this project.
2. Remediation, abatement, repair, maintenance or other work with lead-based paint or materials containing asbestos.
3. Transportation of hazardous materials away from any site related to this project.

All entities listed under 1-07.18(2) of these Special Provisions shall be named by endorsement as additional insureds on the Contractors Pollution Liability insurance policy.

Such Pollution Liability policy shall provide the following minimum limits:

$2,000,000 each loss and annual aggregate

1-07.18(5)K Professional Liability
(January 4, 2016 APWA GSP)

The Contractor and/or its Subcontractor(s) and/or its design consultant providing construction management, value engineering, or any other design-related non-construction professional services shall provide evidence of Professional Liability insurance covering professional errors and omissions.

Such policy shall provide the following minimum limits:

$1,000,000 per claim and annual aggregate

If the scope of such design-related professional services includes work related to pollution conditions, the Professional Liability insurance shall include coverage for Environmental Professional Liability. If insurance is on a claims made form, its retroactive date, and that of all subsequent renewals, shall be no later than the effective date of this Contract.

1-07.23(1) Construction Under Traffic
(May 2, 2017 APWA GSP)

Revise the third sentence of the second paragraph to read:

Accessibility to existing or temporary pedestrian push buttons shall not be impaired; if approved by the Contracting Agency activating pedestrian recall timing or other accommodation may be allowed during construction.

1-07.24 Rights of Way
(July 23, 2015 APWA GSP)

Delete this section and replace it with the following:

Street Right of Way lines, limits of easements, and limits of construction permits are indicated in the Plans. The Contractor’s construction activities shall be confined within these limits, unless arrangements for use of private property are made.

Generally, the Contracting Agency will have obtained, prior to bid opening, all rights of way and easements, both permanent and temporary, necessary for carrying out the work. Exceptions to this are noted in the Bid Documents or will be brought to the Contractor’s attention by a duly issued Addendum.

Whenever any of the work is accomplished on or through property other than public Right of Way, the Contractor shall meet and fulfill all covenants and stipulations of any easement agreement obtained by the Contracting Agency from the owner of the private property. Copies of the easement agreements may be included in the Contract Provisions or made available to
the Contractor as soon as practical after they have been obtained by the Engineer.

Whenever easements or rights of entry have not been acquired prior to advertising, these areas are so noted in the Plans. The Contractor shall not proceed with any portion of the work in areas where right of way, easements or rights of entry have not been acquired until the Engineer certifies to the Contractor that the right of way or easement is available or that the right of entry has been received. If the Contractor is delayed due to acts of omission on the part of the Contracting Agency in obtaining easements, rights of entry or right of way, the Contractor will be entitled to an extension of time. The Contractor agrees that such delay shall not be a breach of contract.

Each property owner shall be given 48 hours notice prior to entry by the Contractor. This includes entry onto easements and private property where private improvements must be adjusted.

The Contractor shall be responsible for providing, without expense or liability to the Contracting Agency, any additional land and access thereto that the Contractor may desire for temporary construction facilities, storage of materials, or other Contractor needs. However, before using any private property, whether adjoining the work or not, the Contractor shall file with the Engineer a written permission of the private property owner, and, upon vacating the premises, a written release from the property owner of each property disturbed or otherwise interfered with by reasons of construction pursued under this contract. The statement shall be signed by the private property owner, or proper authority acting for the owner of the private property affected, stating that permission has been granted to use the property and all necessary permits have been obtained or, in the case of a release, that the restoration of the property has been satisfactorily accomplished. The statement shall include the parcel number, address, and date of signature. Written releases must be filed with the Engineer before the Completion Date will be established.

1-8 PROSECUTION AND PROGRESS

Add the following new section:

1-08.0 Preliminary Matters
(May 25, 2006 APWA GSP)

Add the following new section:

1-08.0(1) Preconstruction Conference
(October 10, 2008 APWA GSP)

Prior to the Contractor beginning the work, a preconstruction conference will be held between the Contractor, the Engineer and such other interested parties as may be invited. The purpose of the preconstruction conference will be:

1. To review the initial progress schedule;
2. To establish a working understanding among the various parties associated or affected by the work;
3. To establish and review procedures for progress payment, notifications, approvals, submittals, etc.;
4. To establish normal working hours for the work;
5. To review safety standards and traffic control; and
6. To discuss such other related items as may be pertinent to the work.
The Contractor shall prepare and submit at the preconstruction conference the following:

1. A breakdown of all lump sum items;
2. A preliminary schedule of working drawing submittals; and
3. A list of material sources for approval if applicable.

(******)

The Contractor shall request the preconstruction conference a minimum of 10 calendar days prior to the start of construction. The actual date of the preconstruction conference will depend on availability of District staff and the various parties associated with the work.

Add the following new section:

1-08.0(2) Hours of Work

(******)

Except in the case of emergency or unless otherwise approved by the Contracting Agency, the normal straight time working hours for the contract shall be any consecutive 8-hour period between 8:00 a.m. and 5:00 p.m. of a working day with a maximum 1-hour lunch break and Monday through Friday work week. The normal straight time 8-hour working period for the contract shall be established at the preconstruction conference or prior to the Contractor commencing the work.

If a Contractor desires to perform work on holidays, Saturdays, Sundays, or before 8:00 a.m. or after 5:00 p.m. on any day, the Contractor shall apply in writing to the Engineer for permission to work such times. Permission to work longer than an 8-hour period between 8:00 a.m. and 5:00 p.m. is not required. Such requests shall be submitted to the Engineer no later than noon on the working day prior to the day for which the Contractor is requesting permission to work.

The Contractor shall comply with local ordinances, including Pacific Municipal Code (PMC) 9.26 governing Public Disturbance Noises. Normal hours of work are limited from 7:00 AM to 7:00 PM. The Contractor has full responsibility for confining his operations to these hours and obtaining any needed waivers. Permission to work outside these hours may be granted on a case-by-case basis upon application to the City of Pacific Public Works Manager, through the Engineer. Approval to continue work during these hours may be revoked at any time the Contractor exceeds the noise control regulations or complaints are received from the public or adjoining property owners regarding the noise or light glare from the Contractor’s operations. The Contractor shall have no claim for damages or delays should such permission be revoked for these reasons.

Permission to work Saturdays, Sundays, holidays or other than the agreed upon normal straight time working hours Monday through Friday may be given subject to certain other conditions set forth by the Contracting Agency or Engineer. These conditions may include but are not limited to: requiring the Engineer or such assistants as the Engineer may deem necessary to be present during the work; requiring the Contractor to reimburse the Contracting Agency for the costs in excess of straight-time costs for Contracting Agency employees who worked during such times, on non-Federal aid projects; considering the work performed on Saturdays, Sundays, and holidays as working days with regards to the Contract Time. Assistants may include, but are not limited to, survey crews; inspectors; and other Contracting Agency employees when in the opinion of the Engineer, such work necessitates their presence.

Add the following new section:
1-08.0(3) Reimbursement for Overtime Work of Contracting Agency Employees
(******)

Where the Contractor elects to work on a Saturday, Sunday, or holiday, or longer than an 8-hour work shift on a regular working day, as defined in the Standard Specifications, such work shall be considered as overtime work. On all such overtime work an inspector will be present, and a survey crew may be required at the discretion of the Engineer. In such case, the Contracting Agency may deduct from amounts due or to become due to the Contractor for the costs in excess of the straight-time costs for employees of the Contracting Agency required to work overtime hours.

The minimum overtime pay is two (2) hours at one and one-half (1½) time District rates on weekdays (before or after normal work hours), Saturday, Sunday, or holidays.

The Contractor by these specifications does hereby authorize the Engineer to deduct such costs from the amount due or to become due to the Contractor.

1-08.3(2)A Type A Progress Schedule
(March 13, 2012 APWA GSP)

Revise this section to read:

The Contractor shall submit $1 copies of a Type A Progress Schedule no later than at the preconstruction conference, or some other mutually agreed upon submittal time. The schedule may be a critical path method (CPM) schedule, bar chart, or other standard schedule format. Regardless of which format used, the schedule shall identify the critical path. The Engineer will evaluate the Type A Progress Schedule and approve or return the schedule for corrections within 15 calendar days of receiving the submittal.

1-08.4 Prosecution of Work

Delete this section and replace it with the following:

1-08.4 Notice to Proceed and Prosecution of Work
(******)

Notice to Proceed will be given after the contract has been executed and the contract bond and evidence of insurance have been approved and filed by the Contracting Agency. The Contractor shall not commence with the work until the Notice to Proceed has been given by the Engineer. Immediately following issuance of the Notice to Proceed, the Contractor shall begin procuring materials with extended lead times including, but not limited to, pumps, control systems, structures and generators. The Contractor shall commence physical construction activities on the project site immediately following delivery of all extended lead time materials and equipment, unless otherwise approved in writing. The Contractor shall diligently pursue the work to the physical completion date within the time specified in the contract. Voluntary shutdown or slowing of operations by the Contractor shall not relieve the Contractor of the responsibility to complete the work within the time(s) specified in the contract.

When shown in the Plans, the first order of work shall be the installation of high visibility fencing to delineate all areas for protection or restoration, as described in the Contract. Installation of high visibility fencing adjacent to the roadway shall occur after the placement of all necessary signs and traffic control devices in accordance with 1-10.1(2). Upon construction of the fencing, the Contractor shall request the Engineer to inspect the fence. No other work shall be performed on the site until the Contracting Agency has accepted the installation of high visibility fencing, as described in the Contract.
1-08.5 Time for Completion
(September 12, 2016 APWA GSP, Option A (modified))

Revise the third and fourth paragraphs to read:

Contract Time shall begin on the first working day following the Notice to Proceed Date.

Each working day shall be charged to the contract as it occurs, until the contract work is physically complete. If substantial completion has been granted and all the authorized working days have been used, charging of working days will cease. Each week the Engineer will provide the Contractor a statement that shows the number of working days: (1) charged to the contract the week before; (2) specified for the physical completion of the contract; and (3) remaining for the physical completion of the contract. The statement will also show the nonworking days and any partial or whole day the Engineer declares as unworkable. Within 10 calendar days after the date of each statement, the Contractor shall file a written protest of any alleged discrepancies in it. To be considered by the Engineer, the protest shall be in sufficient detail to enable the Engineer to ascertain the basis and amount of time disputed. By not filing such detailed protest in that period, the Contractor shall be deemed as having accepted the statement as correct. If the Contractor is approved to work 10 hours a day and 4 days a week (a 4-10 schedule) and the fifth day of the week in which a 4-10 shift is worked would ordinarily be charged as a working day then the fifth day of that week will be charged as a working day whether or not the Contractor works on that day.

Revise the sixth paragraph to read: The Engineer will give the Contractor written notice of the completion date of the contract after all the Contractor’s obligations under the contract have been performed by the Contractor. The following events must occur before the Completion Date can be established:

1. The physical work on the project must be complete; and
2. The Contractor must furnish all documentation required by the contract and required by law, to allow the Contracting Agency to process final acceptance of the contract. The following documents must be received by the Project Engineer prior to establishing a completion date:
   a. Material Acceptance Certification Documents
   b. Monthly Reports of Amounts Credited as DBE Participation, as required by the Contract Provisions.
   c. Final Contract Voucher Certification
   d. Copies of the approved “Affidavit of Prevailing Wages Paid” for the Contractor and all Subcontractors
   e. Property owner releases per Section 1-07.24

Section 1-08.5 is supplemented with the following:

(*****)

This project shall be physically completed within *** _______ *** working days.

1-08.9 Liquidated Damages
(August 14, 2013 APWA GSP)

Revise the fourth paragraph to read:
When the Contract Work has progressed to **Substantial Completion as defined in the Contract**, the Engineer may determine that the work is Substantially Complete. The Engineer will notify the Contractor in writing of the Substantial Completion Date. For overruns in Contract Time occurring after the date so established, the formula for liquidated damages shown above will not apply. For overruns in Contract Time occurring after the Substantial Completion Date, liquidated damages shall be assessed on the basis of direct engineering and related costs assignable to the project until the actual Physical Completion Date of all the Contract Work. The Contractor shall complete the remaining Work as promptly as possible. Upon request by the Project Engineer, the Contractor shall furnish a written schedule for completing the physical Work on the Contract.

### 1-9 MEASUREMENT AND PAYMENT

#### 1-09.9 Payments

*(March 13, 2012 APWA GSP)*

Delete the first four paragraphs and replace them with the following:

The basis of payment will be the actual quantities of Work performed according to the Contract and as specified for payment.

The Contractor shall submit a breakdown of the cost of lump sum bid items at the Preconstruction Conference, to enable the Project Engineer to determine the Work performed on a monthly basis. A breakdown is not required for lump sum items that include a basis for incremental payments as part of the respective Specification. Absent a lump sum breakdown, the Project Engineer will make a determination based on information available. The Project Engineer’s determination of the cost of work shall be final.

Progress payments for completed work and material on hand will be based upon progress estimates prepared by the Engineer. A progress estimate cutoff date will be established at the preconstruction conference.

The initial progress estimate will be made not later than 30 days after the Contractor commences the work, and successive progress estimates will be made every month thereafter until the Completion Date. Progress estimates made during progress of the work are tentative, and made only for the purpose of determining progress payments. The progress estimates are subject to change at any time prior to the calculation of the final payment.

The value of the progress estimate will be the sum of the following:

1. Unit Price Items in the Bid Form — the approximate quantity of acceptable units of work completed multiplied by the unit price.
2. Lump Sum Items in the Bid Form — based on the approved Contractor’s lump sum breakdown for that item, or absent such a breakdown, based on the Engineer’s determination.
3. Materials on Hand — 100 percent of invoiced cost of material delivered to Job site or other storage area approved by the Engineer.
4. Change Orders — entitlement for approved extra cost or completed extra work as determined by the Engineer.

Progress payments will be made in accordance with the progress estimate less:

1. Retainage per Section 1-09.9(1), on non FHWA-funded projects;
2. The amount of progress payments previously made; and
3. Funds withheld by the Contracting Agency for disbursement in accordance with the Contract Documents.

Progress payments for work performed shall not be evidence of acceptable performance or an admission by the Contracting Agency that any work has been satisfactorily completed. The determination of payments under the contract will be final in accordance with Section 1-05.1.

1-09.11(3) Time Limitation and Jurisdiction
(July 23, 2015 APWA GSP)

Revise this section to read:

For the convenience of the parties to the Contract it is mutually agreed by the parties that any claims or causes of action which the Contractor has against the Contracting Agency arising from the Contract shall be brought within 180 calendar days from the date of final acceptance (Section 1-05.12) of the Contract by the Contracting Agency and it is further agreed that any such claims or causes of action shall be brought only in the Superior Court of the county where the Contracting Agency headquarters is located, provided that where an action is asserted against a county, RCW 36.01.05 shall control venue and jurisdiction. The parties understand and agree that the Contractor’s failure to bring suit within the time period provided, shall be a complete bar to any such claims or causes of action. It is further mutually agreed by the parties that when any claims or causes of action which the Contractor asserts against the Contracting Agency arising from the Contract are filed with the Contracting Agency or initiated in court, the Contractor shall permit the Contracting Agency to have timely access to any records deemed necessary by the Contracting Agency to assist in evaluating the claims or action.

1-09.13(3) Claims $250,000 or Less
(October 1, 2005 APWA GSP)

Delete this section and replace it with the following:

The Contractor and the Contracting Agency mutually agree that those claims that total $250,000 or less, submitted in accordance with Section 1-09.11 and not resolved by nonbinding ADR processes, shall be resolved through litigation unless the parties mutually agree in writing to resolve the claim through binding arbitration.
August 31, 2021

RE: City of Pacific Community Center-East Room and Senior Center HVAC replacement Design RFP

Project Description:

This project requires the bidder to design and install a new HVAC system for the City of Pacific Community Center-East Room and Senior Center buildings. All required mechanical, electrical, and building work associated with this work shall be included in the bid. There is a set of specifications attached to this narrative that provide further requirements on acceptable methods and materials to facilitate this work and shall be considered part of this RFP. The owner is pursuing grant money through PSE for financial assistance on this project. Providing relative information, calculations, design drawings required to finalize the grant acceptance shall be considered part of this project.

Existing Conditions:

Senior Center: The City of Pacific Senior Center building is a wood and steel single story building with a flat roof. It currently has electric resistance baseboard heating throughout. Ventilation air is currently provided via operable windows, some of which have been painted shut. Cooling is provided by portable window air conditioning units, which are installed seasonally and stored during the winter months. A large portion of the building has T-bar ceiling with acoustic ceiling tiles. Ceiling space is very limited at beam locations. Dimensions shall be field verified prior to bid and during installation. The majority of the building area is a large community space, commercial kitchen and small offices.

The building has a single, standalone, underground utility fed, electrical service from a pole top transformer across the street. The service entrance conductors are routed down the pole and underground to the building and terminate in a single self-contained meter base mounted to the exterior of the building. There is a single, 120/240V, single-phase, 30 pole, 200A main circuit breaker load center which serves all electrical branch circuits in the building.

Community Center: The “East Room” portion of the Community Center building is a wood construction single story building. It includes a large amount of vertical and horizontal glazing. Ventilation air is currently provided via operable windows. Cooling is currently provided by portable window air conditioning units, which are installed seasonally and stored during the winter months. There is an accessible attic space that currently houses the gas fired furnace and associated ductwork that heat the space. Locations and dimensions shall be field verified prior to bid and during installation.

The electrical system serving the building is limited to 120V/240V, single-phase and is connected to a campus distribution system, including a backup generator. The generator serves the entire Community Center Building related to this project scope as well as other buildings on the campus. There is an existing...
400A main circuit breaker Panel ‘M’ which serves as the main service disconnect for the Community Building and is mounted to the exterior of the building, adjacent to the automatic transfer switch and distribution panel for the entire campus. There are (3), 2P-100A branch circuit breakers in Panel ‘M’ which serve panels within the Community Center. The existing 200A main lug only Panel ‘EXT-KIT’ is adjacent to the East Room and is fed by an adjacent 400A fused disconnect switch with 400Amp fuses. Panel ‘EXT-KIT’ was metered for 30-days and indicated a peak demand of approximately 24 Amps. The 400Amp service to the Community Center, Panel ‘M’ was metered for 30-days and indicated a peak demand of approximately 68 Amps. The 1000Amp generator distribution system was metered for 30-days in May 2021 and indicated a peak demand of approximately 150Amps. Since the Community Center is also connected to the campus wide generator distribution system, any additional load to be added to the Community Center should be coordinated with current projects under separate contracts to verify electrical capacity of the existing generator and electrical distribution system.

Demolition Scope:

**General:** In addition to minor core drilling, cutting, patching and surface repair for routing new mechanical and electrical devices and equipment. There is no domestic plumbing scope as part of this project. Domestic cold water, hot water systems and plumbing fixtures shall all remain in their existing configuration. Completely remove all accessible conductors which are no longer used. Remove empty surface mounted conduit and abandon in place inaccessible raceways. Provide blank covers on all existing junction boxes to remain.

**Senior Center:** The demolition of the existing mechanical system is part of this contract and shall include the baseboard heaters and associated controls. Existing restroom fans shall be replaced in kind.

The existing panel in the Senior Center contains several tandem circuit breakers which are loose, arcing and creating an unsafe condition and therefore the entire panel and all existing circuit breakers must be removed and replaced. Additional electrical demolition will be limited to what is required for modification to the existing electrical distribution system to support equipment and devices as required, for removal of existing mechanical equipment and connections to new mechanical equipment.

**Community Center:** The demolition of the existing mechanical system is part of this contract and shall include the existing gas fired furnace with associated ductwork and gas piping as well as the existing stand-alone controls. Electrical demolition will be limited to what is required for modification to the existing electrical distribution system within the Community Center Building to support new electrical distribution system equipment, devices and connections to mechanical equipment.

**HVAC System:**

**Senior Center:** The new heating and cooling system for the building shall consist of a variable refrigerant flow (VRF) system with modulating compressors and heat sharing capabilities. Each zone shall be controlled separately from adjacent zones via manufacturers VRF controls and sensors. Thermostats shall be provided with the capability of temperature adjustment within a 6 degree window (three degrees up and three degrees down) from global setpoint. Individual zones shall have ceiling cassettes, properly sized based on engineering building loads calculations. There are 2 single person offices, and the kitchen which shall each be on their own zone with dedicated ceiling cassette(s) and thermostat. The kitchen has heat producing equipment including but not limited to a commercial refrigerator, stove top with natural gas pilot light, coffee maker. This equipment shall be taken into account with equipment sizing. The open
area of the senior center shall be provided with evenly spaced ceiling cassettes tied to one zone thermostat. Open ceiling space between framing is approximately 19” of height. At roof beams, space is very limited and may accommodate not much more than refrigerant piping and electrical conduits. Condensate piping shall be routed parallel with roof beams to the exterior of the building and down the exterior wall with downturned elbows 8” above finished grade at planting beds.

The new ventilation system planned for the senior center shall consist of a rooftop dedicated outdoor air system (DOAS) with central air-to-air heat exchanger, minimum 50% effectiveness when comparing the outside air and return air enthalpies. The air distribution ductwork to be located on the roof due to space limitation inside the building. Air drops shall be curbed and flashed per roofing system manufactures recommendations. Electric or VRF conditioning shall be provided within the DOAS unit for delivery air tempering.

Exhaust shall be provided above the large copy machines to purge ozone produced by the machines. Exhaust shall also be provided in the storage room.

The outdoor condensing unit(s) for the VRF system shall be connected to all of the indoor VRF units. The condensing unit(s) shall be anchored to a concrete pad outside the senior center, as coordinated with the owner. Outdoor condensing unit(s) shall have a minimum 5 year manufactures warranty.

During design, coordinate with Design Build Electrical Contractor to select and provide mechanical equipment that can be accommodated by the existing electrical service.

Architectural and structural design professionals shall be included to assess and address impacts to roofing structure and material.

Community Center: The new heating and cooling system for the building shall consist of a single zone split system heat pump sized to meet the building heating and cooling needs of the community center. A 7-day programmable thermostat shall be provided. The air distribution ductwork shall be located in the attic and shall provide even air distribution to the facility via ceiling diffusers. Condensate piping shall be routed to the exterior of the building and down the exterior wall with downturned elbows 8” above finished grade at planting beds.

The new ventilation system planned for the community center shall consist of a dedicated outdoor air system (DOAS) with central air-to-air heat exchanger, minimum 50% effectiveness when comparing the outside air and return air enthalpies. The unit and distribution ductwork shall be located in the attic with louvers or roof hoods for air intake and exhaust. Electric or modulating gas conditioning shall be provided within the DOAS unit for delivery air tempering.

The outdoor condensing unit for the split system heat pump shall be anchored to a concrete pad outside the community center, as coordinated with the owner. Outdoor condensing unit shall have a minimum 5 year manufactures warranty.

During design, coordinate with Design Build Electrical Contractor to select and provide mechanical equipment that can be accommodated by the existing electrical service.
Electrical System:

The existing electrical service capacity of the building is expected to be adequate to support the new/added electrical loads from the mechanical equipment installed for this project. During design, assist the Design Build Mechanical Contractor with establishing existing baseline peak electrical usage, applicable demand factors and demand calculations for new equipment to prove all new and existing portions of the electrical distribution system are properly sized to support new/added electrical loads without an electrical service upgrade.

The new electrical system equipment and devices that shall be designed, procured, and installed for this project include, but are not limited to the following:

General:
1. Electrical connections to all new equipment and devices to be installed for this project
   a. Provide starters, disconnects, fuses and other overcurrent protection equipment as required for the new equipment. Coordinate with the Mechanical Contractor and Manufactures Instructions for exact requirements to connect devices and equipment.
   b. Provide conduit and backbox rough-in and conduit sleeves as required by other trades for installing such things as refrigerant piping and thermostats.
2. Provide new or verify that an existing, general purpose, convenience, 120V, 20A duplex receptacle is installed within 25’ of all equipment installed for this project.
3. Provide appropriate ratings (i.e. wet, outdoor, weatherproof, NEMA 3R) for all electrical equipment, devices, appurtenances and connections as required for the condition in which they are installed.
4. Provide Ground Fault Circuit Interrupters (GFCI) for all equipment and devices as required.

Senior Center:
1. Provide new 120/240V, single phase, main panelboard(s).
   a. Size new panelboard(s) to accommodate all existing and new branch circuits for existing and new equipment for each circuit to be on its own (i.e. no tandem breakers are to be used in the new panel) and 20% spare spaces.
   b. Coordinate with PSE for modifications to existing service. Provide and install new meter base as required to support new installation in accordance with PSE standards and requirements.
   c. To the satisfaction of the electrical inspector, provide 30-day demand metering, in conjunction with code required demand factors and a demand calculation of all new/added loads to prove all new and existing portions of the electrical distribution system are properly sized to support new/added electrical loads.

Community Center:
1. Provide new branch circuit breakers in existing 200A, 120/240V, single phase, Panel ‘EXT-KIT’ as required to support new mechanical equipment. Note the feeder overcurrent protection for Panel ‘EXT-KIT’ is limited to 100A.
   a. To the satisfaction of the electrical inspector, provide 30-day demand metering, in conjunction with code required demand factors and a demand calculation of all new/added loads to prove all new and existing portions of the electrical distribution system are properly sized to support new/added electrical loads.
b. Adjust the physical location of each existing and new circuit breaker to balance the total load of the panel to be as even as possible

**Design Requirements:**

Provide drawings, details, calculations, shop drawings, product data sheets and specifications to adequately describe for estimation and installation the equipment, material, and devices to be installed for this project. Provide such relevant design information to the satisfaction of the Owner, the local Authority Having Jurisdiction (AHJ) and any sub-contractors. Design/Contract and Shop Drawings shall be legible and produced with electronic drafting software such as AutoCAD. Minimum plan size shall be 24”x36” when printed with 1/8” minimum text height. Supporting documentation, calculations, specifications, and product data sheets shall be typewritten, legible and may be on 8.5”x11” paper. Highlight all relevant information on manufacturers product data sheets that is to be included for this project. Cross out all non-relevant information or material that is not to be provided.
# CITY OF PACIFIC
## SENIOR CENTER & E ROOM HVAC RFP
### BCE PROJECT NO. 221-188.00
#### AUGUST 2021

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PART 1 - GENERAL

1.01 GENERAL

A. Includes, but not limited to, furnishing labor, materials, and equipment for completion of work unless indicated or noted otherwise. General Conditions of this contract including General and Supplementary Conditions, and Division 1 specification sections apply to this contract.

B. Work indicated on the mechanical plans and in the specifications that will not be performed by this Mechanical Contractor (i.e. duct and pipe block-outs, penetrations through walls, floors, and attic, wall patching, work indicated to be performed by other Contractors, etc.) shall be coordinated with the General Contractor prior to bid. The Mechanical Contractor is responsible for identifying quantity, size, and type of work with the General Contractor. Work not coordinated will be the responsibility of the Mechanical Contractor and shall not be charged as additional cost to the Owner.

C. All work included in Division 23 shall be the responsibility of a single Mechanical Subcontractor.

D. This Contractor shall obtain and pay for all permits required by State and local authorities governing the installation of the mechanical work. It is the Contractor's responsibility to contact all utility organizations serving the building, prior to bid, and to include all charges for inspections, installation of materials, equipment, and connection of all required utilities.

E. Furnish exact location of electrical connections and complete information on motor controls to Division 26, prior to bid.

F. Put heating, ventilating, cooling, and exhaust systems into full operation and continue their operation during each working day of testing and balancing.

G. Make changes in mechanical drive systems (pulleys, belts, VFD's, motor speed, etc.) and dampers or add dampers as required for correct balance as recommended by Section 23 05 93 and at no additional cost to Owner. All equipment shall be provided with a single point electrical connection, unless otherwise indicated.

H. The ductwork and accessibility to HVAC equipment shall take precedence over all other equipment in the ceiling interstitial spaces or other mechanical areas including, but not limited to, heating piping, domestic water piping, and electrical conduit.
I. Coordinate with Electrical Contractor to select and provide mechanical equipment that can be accommodated by the existing electrical service.

1.02 RELATED SECTIONS

A. General and Supplementary Conditions and Division 1 apply to this Section.

1.03 SUBMITTALS REQUIREMENTS OF THIS SECTION

A. Access doors.

1.04 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:
   1. Perform work in accordance with applicable Codes.
   2. In case of differences between building codes, state laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern.

B. Product Approvals: See paragraphs elsewhere in this specification.

C. Warranties:
   1. In addition to guarantee specified in General Conditions, guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
   2. In order to be protected, secure proper guarantees from suppliers and Subcontractors.
   3. Provide certificates of warranty for each piece of equipment. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation & Maintenance Manual.

D. Manufacture: Use domestic made pipe, pipe fittings, and motors on Project.

E. Identification: Motor and equipment name plates as well as applicable UL and AGA labels shall be in place when Project is turned over to Owner.

1.05 CODES AND STANDARDS

A. Codes and agencies having jurisdictional authority over mechanical installation.
6. Local Sewer and Water District Requirements
7. State and County Department of Health
8. Local Fire Marshal
9. Occupational Safety and Health Administration (OSHA)
10. Washington Industrial Safety and Health Act (WISHA)
11. National Fire Protection Association (NFPA)

1.06 SYSTEMS DESCRIPTION
A. Site Inspection:
   1. Examine premises and understand the conditions which may affect performance of work of this Division before submitting proposals for this work.
   2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

1.07 COORDINATION DRAWINGS
A. Develop coordination drawings, and other pre-installation coordination methods as necessary to coordinate layouts prior to installation. Coordination drawings shall consist of overlay drawings, or other similar methods to graphically indicate plumbing, fire protection, HVAC, electrical, and other similar elements in a single location in order to identify conflicts. All elements shall be drawn to scale. Coordination drawings are not required to be submitted for approval, except where indicated otherwise in the specification. However, a minimum of one hard copy of coordination drawings shall be present on site at all times and made available to the Architect/Engineer (A/E) Representative upon request. If coordination drawings are not on file, or if systems are not installed per coordination drawings, costs and delays of required re-engineering, replacement, and other work required to correct conflicts shall be solely the Contractor’s.
   1. Contractor shall have the underground coordination drawings available upon request by A/E Representative within 60 days after Notice to Proceed.
   2. Contractor shall have the aboveground coordination drawings available upon request by A/E Representative within 90 days after Notice to Proceed.
B. Coordination drawings shall consist of:
   1. Drawing sheets developed sequentially by each trade with all components drawn to scale and color coded to represent each trade.

C. Where coordination drawings, or other preinstallation coordination methods show that available space is inadequate or that modifications will affect architectural elements, request information from the Architect before proceeding with work. No additional payment will be made for installation conflicts which could have been identified by coordination drawings or other pre-installation coordination methods.

D. Make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. Each subcontractor shall:
   1. Indicate the exact name, location, and dimension of each element to be provided by that subcontractor.
   2. Arrange components as necessary to avoid conflict with new and existing conditions and the work of other subcontractors as directed by the General Contractor.
   3. Note requirements for sleeves, block-outs, cutting, patching, access doors, blocking, supports, inserts, and other similar items.
   4. Notify the General Contractor of conflicts.
   5. Approve the coordination drawings when all conflicts are resolved and an acceptable layout is obtained.

F. The General Contractor shall coordinate the layouts indicated on the coordination drawings and resolve any conflicts prior to commencement of subject portions of the work.

1.08 ELECTRICAL

A. All electrical work, conduit, boxes, and devices in connection with control wiring as required to install the control equipment as specified herein or shown on the drawings shall be furnished and installed complete by the Division 26 Contractor.

B. All electrical work performed under this Section of the Specifications shall conform to all applicable portions of the Division 26 specifications and shall conform to all governing codes.

C. All equipment shall be factory wired to a junction box for connection to electrical service.
D. Where a piece of equipment specified includes an electric motor, the motor shall be furnished and mounted by this Contractor. Motor starter, disconnect switches, and wiring from the electrical panel to the motor control devices and to the motor shall be provided by the Division 26 Contractor unless stated otherwise in the mechanical specification and/or on the mechanical drawings.

E. All motor controllers and equipment panels (including but not limited to packaged equipment, custom control panels, custom air handler panels, etc.) shall comply with NEC (including, but not limited to, marking on controllers and labeling requirements).

1.09 TEMPORARY HEATING

A. Temporary heating for facility during construction phase shall not be supplied by the permanent system installed under these specifications, unless all of the following are satisfied:

1. Product warranties shall be extended to account for construction use. Contractor shall furnish certified document stating such extended warranties.

2. Contractor shall obtain letter of approval from the Owner stating that they understand equipment expected life may be shortened due to severe usage.

3. Contractor shall be responsible for pressure cleaning all coils and vacuum cleaning all ductwork prior to occupancy.

1.10 PRODUCT HANDLING AND PROTECTION

A. Contractor is responsible for protection of all material, equipment and apparatus provided under this Section from damage, water, corrosion, freezing and dust, both in storage and when installed, until final project acceptance.

B. Provide temporary heated and sheltered storage facilities for material and equipment.

C. Completely cover motors and other moving machinery to protect from dirt and water during construction.

D. Handle and protect equipment and/or material in manner precluding unnecessary fire hazard.

E. Equipment requiring rotation and/or lubrication during storage shall have records maintained and witnessed on a monthly basis and forwarded to the Architect/Engineer prior to acceptance. Provide recorded maintenance for the O&M Manual.

F. Material or equipment damaged because of improper storage or protection will be rejected.
G. Equipment finish that is damaged by handling, storage, etc. shall be corrected by the Contractor at no additional cost to the Owner.

1.11 DEFINITIONS

A. Finished Spaces: Spaces used for habitation or occupancy where rough surfaces are plastered, paneled, or otherwise treated to provide a pleasing appearance.

B. Unfinished Spaces: Spaces used for storage or work areas, such as fan rooms, mechanical and boiler rooms, etc., where appearance is not a factor.

C. Concealed Spaces: Spaces out of sight. For example, above ceilings; below floors; between double walls; furred-in areas; pipe and duct shafts; and similar spaces.

D. Exposed: Open to view. For example, pipe running through a room and not covered by other construction.

E. Outside: Open to view up to 5 feet beyond the exterior side of walls, above the roof, and unexcavated or crawl spaces.

F. Conditioned Space: An area, room, or space normally occupied and being heated or cooled for human habitation by any equipment as defined by the extent of the building envelope insulation.

G. Replace: Existing mechanical equipment and components shall be demolished and discarded from the project site or as directed otherwise. New mechanical equipment and components shall be installed in the area where the existing mechanical equipment and components were demolished or as indicated on the contract documents.

H. Removed: Existing mechanical equipment and components identified on the contract documents shall be taken apart, taken down, and discarded from the project site unless directed otherwise on plan. Removed items shall not be brought back to the project site for use or reinstallation.

I. Reinstall: Existing mechanical equipment and components identified on the contract documents that need to be taken down and installed in the same or new location.

1.12 ABBREVIATIONS

A. ADA Americans with Disabilities Act
B. A/E Architect/Engineer
C. AFF Above Finish Floor
D. AGA American Gas Association
E. AMCA Air Moving & Conditioning Association
F. ANSI American National Standards Institute
G. APWA American Public Works Association
H. ASHRAE American Society of Heating, Refrigerating and Air Conditioning Engineers
I. ASME American Society of Mechanical Engineers
J. ASTM American Society of Testing & Materials
K. AWWA American Water Works Association
L. BFF Below Finish Floor
M. BHP Brake Horsepower
N. BTU British Thermal Unit
O. CFM Cubic Feet per Minute
P. CISPI Cast Iron Soil Pipe Institute
Q. fpm feet per minute
R. FS Federal Specifications
S. FDC Fire Department Connection
T. FCO Flush Cleanout
U. FD Floor Drain
V. FPWH Freeze Proof Wall Hydrant
W. GPM Gallons per Minute
X. HP Horsepower
Y. IAPMO International Association of Plumbing and Mechanical Officials
Z. IAQ Indoor Air Quality
AA. IEEE Institute of Electrical and Electronics Engineers
AB. KW Kilowatt
AC. LPG Liquefied Petroleum Gas
AD. MBH One Thousand British Thermal Units per Hour
AE. MS Military Specifications
AF. MSS Manufacturers Standardization Society
AG. NEC National Electrical Code
AH. NEMA National Electrical Manufacturers Association
AI. NFPA National Fire Protection Association
AJ. NP  Non-Potable Water
AK. NPSH  Net Positive Suction Head
AL. OS&Y  Outside Screw and Yoke
AM. PIV  Post Indicator Valve
AN. PDI  Plumbing and Drainage Institute
AO. per  in accordance with
AP. POC  Point of Connection
AQ. PSI  Pounds per Square Inch Gauge Pressure
AR. PVC  Polyvinyl Chloride
AS. SMACNA  Sheet Metal and Air Conditioning Contractors National Association
AT. SP  Static Pressure
AU. SWP  Steam Working Pressure
AV. UL  Underwriter's Laboratories
AW. VFD  Variable Frequency Drive
AX. VTR  Vent Thru Roof
AY. wg  Water Gauge (inches of water)
AZ. WP  Working Pressure
BA. WPL  Weatherproof Louver
BB. WQA  Water Quality Association
BC. Additional abbreviations are as listed on the drawings or elsewhere in these specifications.
1.13 SUBMITTAL PROCEDURES

A. All material used on the project shall be new and free of defects. The Architect and/or Engineer reserve the right to reject any material, the appearance of which has been damaged on the site or in shipment. The material shall be of pre-approved equal quality to that which is specified. Should the make and type of material differ from that specified, the Contractor may be required to submit catalog and engineering data (samples if requested) necessary to make a comparison and determine its suitability. The Contractor shall also bear the cost of all changes to any aspect of the project (electrical, mechanical, building, etc.) made necessary by any approved substitutions. Approved substitutions include those listed as approved manufacturers or approved substitutions. Tentative approval of substitute material and equipment will be made prior to bid only. Such request for approval shall be made two weeks in advance of the bid opening to allow time to assess its suitability. Failure to obtain approval prior to bid shall require the successful bidder to furnish materials and equipment only as specified herein (see paragraph 2.01, this specification).

B. Equipment submittals shall be submitted per one of the following processes as selected by the Architect/Engineer Representative and/or Owner:

1. Electronic Submittal Process:
   a. The Contractor shall upload one complete PDF file of the Electronic Submittal Package to the Architect's SharePoint Site for approval. The Electronic Submittal package shall include the following:
      1) All required submittals (i.e. equipment cut sheets, shop drawings, etc.) per each specification section.
      2) Table of contents identifying each specification section, submittal requirement of each specification, and the manufacturer name and model number of each item submitted.
      3) Index sheet for each specification section.
      4) Submission of PDF files of individual specifications or equipment cuts will be automatically rejected.
      5) The Contractor shall complete and upload a Submittal Information Form, in Microsoft WORD format, for the A/E team to review. The equipment submittal will not be considered “Received” nor will a review be provided until both the Electronic Submittal Package and Submittal information Form have been uploaded.
6) If the Electronic Submittal Process is not feasible for a particular submittal section (i.e. samples, certain shop drawings, recorded videos, CD’s, etc.), the Contractor shall submit a request in writing to the A/E Representative to deviate from the Electronic Submittal Process. If acceptable by the A/E Representative the Contractor shall follow the Hard Copy Submittal Process for the submission.

2. Review of submittal data by the Engineer or Architect does not relieve the Contractor of responsibility for quantities, measurements, and compliance with the intent of all contract documents.

3. Furnish submittals generally according to the list below. Individual sections may contain more specific submittal listing of the particular section labeled “Submittal Requirements.” Furnish on each particular section and the following equipment:
   a. Pipe
   b. Pipe Insulation
   c. Duct Insulation and Lining
   d. Valves
   e. Pipe Hangers
   f. Piping Specialties
   g. HVAC Equipment
   h. Temperature Control Equipment and Shop Drawings
   i. Air Balance Contractor
   j. Any material found to be installed without prior approval will be required to be removed and replaced with only specified material at Contractor’s cost.
   k. Mechanical Drawings for the project have been developed by the Engineer using AutoCAD™ Revision 2015 software. These drawing files will be made available to the Contractor for development of shop drawings and/or "As-Builts" for a fee of $30.00 per sheet. Full payment to be made prior to release of drawing files.
1.14 OPERATION AND MAINTENANCE MANUAL FOR MECHANICAL SYSTEMS

A. Bind Operation & Maintenance Manual for Mechanical Systems in three-ring, hard-backed binder with clear plastic pocket on spine. Spine of each binder shall have following typewritten lettering inserted:

OPERATION

AND

MAINTENANCE

MANUAL

FOR MECHANICAL SYSTEMS

B. Provide master index at beginning of Manual showing items included. Use plastic permanent tab indexes for Sections of Manual.

C. First Section shall consist of name, address, and phone number of Architect, General Contractor, and Mechanical, Plumbing, Sheet Metal, Refrigeration, Temperature control, and Electrical Subcontractors. Also include complete list of equipment installed with name, address, and phone number of each vendor.

D. Provide Section for each type of item of equipment.

E. Submit copies as specified by Division 1 and at a minimum provide three (3) copies of Operation & Maintenance Manual to Architect for his approval.

F. Include descriptive literature (Manufacturer’s catalog data) of each manufactured item. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.

G. Include all warranties/guarantees including extended warranties.

H. Include all start-up logs.

I. Operating Instructions shall include:

1. General description of each mechanical system.

2. Step-by-step procedure to follow in putting each piece of mechanical equipment into operation.

3. Provide schematic control diagrams for all systems. Each diagram shall show locations of start-stop switches, insertion thermostats, room thermostats, thermometers, firestats, pressure gauges, automatic valves, and refrigeration accessories. Mark correct operating settings for each control instrument on these diagrams.

4. Provide diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays.
5. Provide drawing of each temperature control panel identifying components on panels and their function.

J. Maintenance Instructions shall include:
   1. Manufacturer's maintenance instructions for each piece of mechanical equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
   2. Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
   3. List of mechanical equipment used indicating name, model, serial number, and name plate data of each item together with number and name associated with each system item.

1.15 COMMISSIONING

A. General Requirements: The building's systems shall be tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with the approved plans and specifications. This shall include the following:
   1. Commissioning Plan
   2. Systems Testing and Balancing
   3. Controls Functional Performance Testing
   4. Preliminary Commissioning Report
   5. Post Construction Documentation
   6. Final Commissioning Report

B. Commissioning Plan: A commissioning plan shall be developed by a registered design professional or approved agency and shall include at a minimum the following:
   1. A detailed explanation of the design intent.
   2. Equipment and systems to be tested.
   3. Functions to be tested (for example, economizer control, discharge air temperature control, etc.)
   4. Conditions under which the test shall be performed.
   5. Measurable criteria for acceptable performance.

C. System Testing and Balancing: Provide testing and balancing as specified in Sections 23 05 93.
D. Controls Functional Performance Testing: Functional testing shall demonstrate the correct installation and operation of each component, system, and system to system intertie relationship in accordance with the plans and specifications. This demonstration is to prove operation, function, and maintenance serviceability for each of the commissioned systems. Testing shall include all modes of operation, including:

1. All modes as described in the sequence of operation.
2. Performance of alarms.
3. Mode of operation upon a loss of power and restored power.
4. The HVAC control system shall be tested to ensure that control devices, components, equipment, and systems are calibrated, adjusted, and operate in accordance with the plans and specifications.

E. Preliminary Commissioning Report: The preliminary commissioning report, completed and certified by the registered design professional or approved agency, shall be provided to the Owner. The preliminary commissioning report shall include test procedures and results, and shall identify the following:

1. Deficiencies found during testing which have not been corrected at the time of report preparation and the anticipated date of correction.
2. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions. Include the climatic conditions required for testing and the anticipated date of each deferred test.
3. Record of progress and completion of operator training.

F. Post Construction Documentation: Provide Operation and Maintenance (O&M) data, as-built record drawings, final commissioning report, and test and balance report, as specified in this section, within 90 days of the date of receipt of the Certificate of Occupancy.

G. Final Commissioning Report: Provide a complete report of test procedures and results to the Engineer and the Owner. The report shall identify the following:

1. Procedures and results of all functional performance tests.
2. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.

H. The Contractor is responsible to submit to the code official a commissioning compliance checklist, Figure C408.1.2.1 of the WSEC, signed by the building owner.
1.16 WARRANTY
A. All warranty information shall be submitted as part of the “Operation and Maintenance Manual for Mechanical Systems” in this section.
B. All warranties for mechanical and plumbing equipment shall start upon completion of commissioning.

1.17 AS-BUILT DRAWINGS
A. The Contractor shall maintain, in addition to coordination drawings, an as-built set of prints that clearly identify all deviations from the original design. The As-Built drawings shall be drafted per one of the following methods:
   1. Draft all revisions on a separate dark layer, on the coordination drawing set. The Contractor shall maintain a copy of the original coordination drawing set.
   2. Draft all revisions on the design drawings with a red color pencil.
B. This red lined set shall identify all drawing revisions including addenda items, change orders, and Contractor revisions.
C. Drawings shall show locations of all underground pipe and duct installed by this Contractor. Underground pipes and ducts shall be shown with cross section elevations. All pipe, raceway, manholes, or lines of other trades shall be included.
D. The Contractor shall update all references to specific products to indicate products actually installed on project. This shall include, but not be limited to, air handlers, heat pumps etc.
   1. Upon completion of the Division 23 Work, the Contractor shall deliver the red lined drawings and one set of neatly drafted as-built drawings on electronic media in ACAD 2015 format and PDF files to the Engineer for transmittal through the Engineer to the Owner.

PART 2 - PRODUCTS
2.01 APPROVED MANUFACTURERS
A. Any reference to the specifications or on the drawings to any article, device, product, material, fixture, form, or type of construction by manufacturer, name, make, or catalog number shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition.
B. The manufacturers listed as Approved Manufacturers are approved to bid the project for the items indicated without obtaining prior approval. Other manufacturers desiring to bid the project require prior approval.
C. The listing of a manufacturer as an Approved Manufacturer does not necessarily mean that the products of that manufacturer are equal to those specified. The listing is only an indication of those manufacturers which may be capable of manufacturing, or have in the past manufactured, items equal to those specified, and is intended to aid the Contractor in identifying manufacturers.

D. Products provided by Approved Manufacturers shall be equal to or superior to the specified manufacturer's item in function, appearance, and quality, and shall fulfill all requirements of the plans and specifications. The Architect/Engineer shall be the final judge as to whether an item meets these requirements or not. If a manufacturer is not certain that his product meets these requirements or not, then the manufacturer shall submit data as required to obtain the Design Consultant's approval prior to bid opening.

E. The approval of a manufacturer applies to the manufacturer only and does not relieve the Contractor from the responsibility of meeting all applicable requirements of the plans and specifications.

F. Contractor shall be responsible for all costs to other trades and all revisions required in accommodating any products which are different from those specified or shown.

G. In reviewing a manufacturer for acceptance, factors considered include the following: engineering data showing item's performance, proper local representation of manufacturer, likelihood of future manufacturer's local support of product, service availability, previous installation, previous use by Owner/Engineer/Architect, and record, product quality, availability/quality of maintenance and operation data, capacity/performance compared to specified items, acoustics, items, geometry/access utility needs, and similar concerns.

H. If approval is received to use other than specified items, responsibility for specified capacities and ensuring that items to be furnished will fit space available lies with this Division.

I. If non-specified equipment is used and it will not fit job site conditions, this Division assumes responsibility for replacement with items named in Specification.

2.02 ACCESS DOORS

A. This Contractor shall be responsible for furnishing and installing flush mounted access doors in walls, ceilings, floors, and chases where the following equipment is concealed and is not accessible through same.
   1. Valves (shut off, balancing, control, trap primers, etc.).
   2. Dampers (control, balancing, fire, smoke, etc.).
B. Doors shall be UL listed 20 ga. cold rolled steel with concealed hinge, screwdriver operated lock and prime coated. Furnish suitable for area mounted. Provide stainless steel access doors for non-painted surfaces (i.e. tile, MDF)

C. Approved Manufacturers:
   1. Milcor
   2. Acudor
   3. Greenheck
   4. Nystrom

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. This Contractor shall provide completed systems with a neat and finished appearance. If, in the judgment of the Engineer, any portion of the work has not been performed in a workmanlike manner or is left in a rough, unfinished state, this Contractor will be required to remove, reinstall, or replace same and patch and paint surrounding surfaces in a manner acceptable to the Engineer, without increase in cost to the Owner.

3.02 FINAL INSPECTION

A. Final Inspection:
   1. Prior to acceptance of the mechanical work, the Contractor shall put all mechanical systems into operation for a period of not less than 5 working days so that they may be inspected by the Architect/Engineer and the Owner's representatives.
   2. The time of the final inspection shall be mutually agreed to by the Owner, Engineer, and Contractor.
   3. The Contractor shall furnish adequate staff to operate the mechanical systems during inspection.

3.03 OPERATION AND MAINTENANCE TRAINING

A. Upon completion of the work, and after all tests and final inspection of the work by the Authority(s) having jurisdiction, the Contractor shall demonstrate and instruct the Owner’s designated operation and maintenance personnel in the operation and maintenance of the various mechanical systems. The Contractor shall arrange scheduled instruction periods with the Owner. The Contractor’s representatives shall be Superintendents or Foremen knowledgeable in each system and Supplier’s Representative when so specified.
B. Scheduled instruction periods shall be:
   1. HVAC System Controls 16 Hours
   2. HVAC Equipment Maintenance 8 Hours

C. The contractor shall, at a minimum, include an Owner Training sign-in sheet in the O&M Manual that indicates the start and end times of the training and the type of training provided. Owner shall sign off on the Owner training sign-in sheet to be considered complete and satisfactory to Owner.

D. Costs for time involved by Contractor shall be included in the bid.

### 3.04 CLOSEOUT SUBMITTALS

A. Requirements: Final approval of mechanical installation will be recommended upon completion of the following:
   1. Completion of all punchlist items
   2. Owner Training Sign-In sheet with Owner’s signature
   3. Permit Submittal
   4. Reproducible As-Built drawings delivered to Owner
   5. Air Balance Report
   6. Guarantees
   7. Equipment Manufacturer of all HVAC compressor units shall provide start-up logs.

### 3.05 PREPARATION

A. Existing Buildings:
   1. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
   2. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes by General Contractor.
   3. Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
   4. This work shall be scheduled such that utility services and/or existing systems for the facility are not interrupted during normal operating hours, without prior written permission of the Owner’s representative. Work that is performed during normal operational hours shall not interfere with the normal function of the facility’s daily operation.
5. The Mechanical Contractor shall be responsible for the removal of all existing mechanical equipment and utilities indicated to be removed on the drawings. The Mechanical Contractor shall also be responsible for the removal and reinstallation of all existing mechanical equipment and utilities that will interfere with installation and operation of any new construction indicated or required and shall be responsible for the removal of all existing mechanical equipment and utilities indicated to be abandoned that will interfere with installation and operation of any new construction indicated or required. All mechanical equipment (other than piping) to be removed shall remain the property of the Owner, and shall be transported, stored, or disposed of, as directed by the Owner. This will be at no cost to the Owner.

3.06 INSTALLATION

A. Install mechanical equipment to permit easy access for normal maintenance, and so that parts requiring periodic replacement or maintenance, (e.g., coils, heat exchanger bundles, sheaves, filters, motors, bearings, etc.) can be removed. Relocate items which interfere with access.

B. Provide access doors in equipment, ducts, and walls/ceilings as required to allow for inspection and proper maintenance.

C. Valves, damper operators, and other devices which are manually adjusted or operated shall be located so as to be easily accessible by a person standing on the floor. Any such items which are not in the open shall be made accessible through access openings in the building construction.

D. Gauges, thermometers, instrumentation, and other components which are installed to monitor equipment performance, operating conditions, etc., shall be oriented so as to be easily read by a person standing on the floor. Provide necessary brackets and hangers as needed.

E. If circumstances at a particular location make the accessible installation of an item difficult or inconvenient, the situation shall be discussed with the Architect/Engineer before installing the item in a poor access location.

F. Belts, pulleys, couplings, projecting set screws, keys, and other rotating parts which may pose a danger to personnel, shall be fully enclosed or guarded in accordance with OSHA regulations.

G. Dissimilar Metals: Provide separations between all dissimilar metals. Where not specified in another way, use 10 mil black plastic tape wrapped at point of contact or plastic centering inserts.
H. Provide offsets around all electrical panels (and similar electrical equipment) to maintain space clear above and below panel to structure and clearance of 3.5 feet directly in front of panel, except where indicated otherwise or required by NEC to be more. Such offsets are typically not shown on the drawings, but are required per this paragraph.

I. Piping Through Framing: Piping through framing shall be installed in the approximate center of the member. Where located such that nails or screws are likely to damage the pipe, a steel plate at least 1/16-inch thick shall be installed to provide protection. At metal framing, wrap piping to prevent contact of dissimilar metals. At metal and wood framing, provide plastic pipe insulators at piping penetrations through framing nearest each fixture and on at least 48-inch centers.

J. Safety Protection: All ductwork, piping, and related items installed by this Contractor that present a safety hazard (i.e., items installed at/near head height, items projecting into maintenance access paths, etc.) shall be covered (at hazardous area) with 3/4" thick elastomeric insulation and 2" wide reflective red/white striped self-sticking safety tape.

K. Equipment Access: Access to equipment is of utmost importance. Contractor shall apply extra attention to the laying out of pipe and duct routings, and in coordinating all work. Poor access to equipment will not be accepted. Contractor shall note that in essentially all areas, piping routed in ceiling space needs to run in joist space, necessitating elbows/fittings/transitions at crosses with other trades, at structural beams, and at all connections to mains and branches. Hatched areas at HVAC units indicate equipment access areas. These (and all other) access areas shall be clear of obstructions. The Mechanical Contractor is responsible to coordinate and ensure that all trades stay clear of access areas for any Division 23 furnished equipment.

L. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents.

M. Pipe Installation: Install piping in longest reasonable lengths. The use of short lengths of pipe with multiple couplings where a single length of pipe could have been used is not acceptable.

3.07 ADJUSTMENT AND CLEANING

A. Properly lubricate equipment before Owner's acceptance.

B. Clean exposed piping, ductwork, equipment, and fixtures, remove debris from site. Repair all damaged finishes and leave everything in working order.

C. Remove stickers from fixtures and adjust flush valves.
3.08 PAINTING
A. Paint all exposed pieces of equipment if not factory finished or painted under the Architectural Section of these specifications. Paint shall be one coat primer and two coats enamel color as directed by the Architect.

3.09 REBATES
A. Furnish vendor invoices on heat pumps to Owner after installation for power company rebates.

3.10 REQUESTS FOR INFORMATION (RFI)
A. It is our intent to provide a timely response for RFIs regarding Division 23 Work. To further expedite this process, if a suggestion can be determined or derived at by the initiator of the RFI, it is required this suggestion be supplied with the submitted RFI. If no suggestion is given where one is possible, the RFI will be returned as incomplete. RFI’s will be returned to the Contractor within seven (7) business days from the time received by the Architect/Engineer Representative.
PART 1 - GENERAL

1.01 GENERAL
A. Includes, but not limited to, motors 1/12 HP or larger used in Division 23.

1.02 RELATED SECTIONS
A. General Conditions, Division 1
B. Section 20 00 00 – General Mechanical Requirements

1.03 SUBMITTALS REQUIREMENTS OF THIS SECTION
A. All variable drives.
B. Total harmonic voltage distortion calculation.

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Check out sheet for each variable drive showing all programmed parameters. Date of check out, and name and company address of employee responsible for checkout.
B. Programming manual explaining how to access and change all programmable points.
C. International wiring diagram for each different unit.
D. Parts diagram with replacement parts listed.
E. Trouble shooting guide.

PART 2 - PRODUCTS

2.01 MOTORS
A. Motors located indoors shall be open frame, drip-proof type, unless indicated otherwise. Motors located outdoors exposed to weather shall have corrosion resistant finish and shall be totally enclosed fan cooled (TEFC) or totally enclosed non-ventilated (TENV) type, unless indicated otherwise. Motors used in fans serving dishwashing hoods shall be TEFC type.
B. All motors shall be UL listed.
C. All motors used with variable frequency drives shall be premium efficiency inverter ready and shall be capable of running at least 85 Hz.
D. All motors 1 HP and larger shall be energy efficient type and shall meet the 2018 Washington State Energy Code requirements.
E. All fan motors 1/12 HP or greater and less than 1 HP shall be Electronically Commutated Motors (ECM) or shall have a minimum motor efficiency of 70 percent when rated in accordance with DOE 10 C.F.R. 431. These motor speeds shall be adjustable.

F. Motors shall not be smaller than indicated on drawings; however, motors shall be of adequate size to drive the respective equipment when handling the quantities specified without exceeding the nameplate full load current at any conditions encountered in actual operation. If it becomes evident that a motor furnished is too small to meet these requirements as a result of the Contractor using substituted equipment or having revised the system arrangement, the Contractor shall replace it with a motor of adequate size at no additional cost to the Owner. This Contractor shall also arrange with the Electrical Contractor to increase the size of the wiring, motor starter and other accessories as required to serve the larger motor at no additional cost to the Owner.

G. ECM (Electrically Commutated Motors) shall conform to the motor requirements listed above. In addition, the Contractor purchasing the HVAC equipment that includes the ECM is responsible for ensuring the ECM motor control speed control is set to match the required component operation. The ECM motor control speed control may be preset by the HVAC equipment manufacturer. The Contractor purchasing the HVAC equipment shall provide documentation showing the appropriate ECM motor control board jumper pins, dip switches and/or multi-pin plugs settings for correct HVAC equipment component operation.

H. Approved Manufacturers:
1. General Electric
2. Westinghouse
3. Reliance
4. Allis-Chalmers
5. Gould
6. Century
7. Wagner
8. Baldor
9. U.S. Motors Marathon

2.02 VARIABLE FREQUENCY DRIVES (VFD UNDER 5 HP)

A. Variable Frequency Drives (VFD):

1. Description:
   a. Provide enclosed adjustable speed drives suitable for operating at the current, voltage, and horsepower indicated on the equipment schedule. Conform to requirements of NEMA ICS 3.1.
b. VFD shall not increase the voltage distortion above 5% at the input terminals of the VFD or line filters. The manufacturer shall make all modifications to the drive necessary to meet this requirement.

B. Ratings:

1. VFD must operate, without fault or failure, when voltage varies plus or minus 10 percent from rating and frequency varies plus or minus 5 percent from rating.
2. VFD shall be voltage as shown on schedule.
3. Operating Ambient Temperature: 14 degrees F to 104 degrees F.
4. Humidity: non-condensing to 95%.
5. Altitude: to 3300 feet, higher altitudes achieved by derating.
6. Starting Torque: 100% starting torque shall be available from 0.5 Hz to 60 Hz.
7. Overload capability: 110% of rated F.L.A. (full load amps) for 60 seconds; 150% of rated F.L.A., instantaneously.
8. The VFD must meet the requirements for Radio Frequency Interface (RFI) above 7 MHz as specified by FCC regulations, part 15, subpart J, Class A devices.
9. In compliance with IEEE 519, the Total Harmonic Voltage Distortion for the VFD shall be no greater than 5%, the supplier of the VFD shall provide a dc bus choke or line reactors to ensure compliance. In order to estimate THVD the following is needed: Point of Common Coupling (PCC) and the KVA, and secondary voltage of the supply transformer. Assume 5.00% transformer impedance. If no transformer is present assume 50% of service demand.
10. VFDs must have a minimum short circuit rating of 65 Kamps RMS without additional input fusing.

C. Design:

1. VFD shall employ microprocessor-based inverter logic, isolated from all power circuits.
2. VFD shall include surface mount technology, with conformal coating.
3. VFD shall employ a PWM (pulse width modulated) inverter system, consisting of:
   a. Input Section:
      i. VFD input power stage shall convert three-phase AC line power into a fixed DC voltage via a solid-state full wave diode rectifier, with MOV (metal oxide varistor) protection.
   b. Intermediate Section:
      i. DC bus as a supply to the VFD Output Section shall maintain a fixed voltage with filtering and short circuit protection.
ii. DC Bus shall be interfaced with the VFD diagnostic logic circuit, for continuous monitoring and protection of the power components.

c. Output Section:
   i. Insulated gate bipolar transistors (IGBT's) shall convert DC bus voltage to variable frequency and voltage.
   ii. PWM sine coded output to the motor.

4. The VFD must be selected for operation at carrier frequencies at or above 5 kHz without derating to satisfy the conditions for current, voltage and horsepower as indicated on the equipment schedule.

5. VFD shall include one independent remote reference input. The input shall be 0 - 10 VDC or 4 – 20mA. Input shall respond to a programmable bias and gain.

6. VFD shall include a minimum of two digital input terminals:
   a. Reverse rotation direction
   b. Remote Reset

7. VFD shall provide terminals for remote contacts, to allow starting in the automatic mode.

8. VFD shall include one fully rated form “A” contact and one fully rated form “C” contact. The contact purpose is selectable and shall provide one of two functions:
   a. Drive Running
   b. Drive Faulted

9. VFD shall include a power loss ride of 2 seconds.

10. VFD shall include front mounted control operators that set the motor overheat drive shutdown, set the acceleration and deceleration, and set the output frequency limits. Operating mode (auto or manual) and speed setting functions shall also be provided.

11. VFD shall include electronic thermal overload protection for both the drive and motor. The electronic thermal motor overload shall be approved by UL. If the electronic thermal motor overload is not approved by UL, a separate UL approved thermal overload relay shall be provided in the VFD enclosure.

12. VFD shall include the following program functions:
   a. Auto restart capability.
   b. Stall prevention capability.
   c. Ability to close fault contact after the completion of all fault restart attempts.

13. VFD shall include factory settings for all parameters, and the capability for those settings to be reset.

14. VFD shall include the capability to adjust the following functions, while the VFD is running:
   a. Forward/Reverse direction.
   b. Acceleration adjustment from 0 to 3600 seconds.
   c. Deceleration adjustment from 0 to 3600 seconds.
   d. One preset speed.
15. All units to be provided with fused disconnect integral to the VFD. Fuse sized for the equipment per NEC.

D. Product Options:
1. Provide the following:
   a. RFI (radio frequency interference) filters to attenuate possible VFD generated noise. The addition of these filters should reduce the line conducted noise levels within the limits of FCC regulations, part 15, subpart J, for Class A devices.
   b. Current limiting input fusing for the protection of VFD semiconductor devices.
   c. Line reactors reduce the effect of the load and line side transients on the drive. May be used on either the input side or output side of the drive.
   d. “DC bus reactor”, to attenuate harmonic distortion.
   e. DV/DT Filtering: When inverter duty type motors are not provided, maximum allowed VFD output rise is 1000 volts in 2 microseconds.

E. Fabrication:
1. Enclosure: NEMA Type 1 unless otherwise specified on drawings.

F. Source Quality Control:
1. In-circuit testing of all printed circuit boards shall be conducted, to insure the proper mounting and correct value of all components.
2. All printed circuit boards shall be burned in for 96 hours, at 85 degrees C.
3. Final printed circuit board assemblies shall be functionally tested, via computerized test equipment. All tests and acceptance criteria shall be preprogrammed. All tests results shall be stored as detailed quality assurance data.
4. All fully assembled controls shall be functionally tested, with fully loaded induction motors. The combined test data shall then be analyzed, to insure adherence to quality assurance specifications.
5. Inspect and production test, under load each completed VFD assembly.

G. Acceptable Manufacturers:
1. Square D
2. ABB
3. Yaskawa
4. Danfoss
2.03 VARIABLE FREQUENCY DRIVES (VFD 5 HP AND OVER)

A. Variable Frequency Drives (VFD):
   1. Description:
      a. Provide enclosed adjustable speed drives suitable for operating at the current, voltage, and horsepower indicated on the equipment schedule. Conform to requirements of NEMA ICS 3.1.
      b. VFD shall not increase the voltage distortion above 5% at the input terminals of the VFD or line filters. The manufacturer shall make all modifications to the drive necessary to meet this requirement.

B. Ratings:
   1. VFD must operate, without fault or failure, when voltage varies plus or minus 10 percent from rating, and frequency varies plus or minus 5 percent from rating.
   2. VFD shall be voltage as shown on schedule.
   3. Displacement Power Factor: 0.98 over entire range of operating speed and load.
   4. Operating Ambient Temperature: 14 degrees F to 104 degrees F.
   5. Humidity: non-condensing to 95%.
   6. Altitude: to 3300 feet, higher altitudes achieved by derating.
   7. Minimum Efficiency: 96% at half speed; 98% at full speed.
   8. Starting Torque: 100% starting torque shall be available from 0.5 Hz to 60 Hz.
   10. The VFD must meet the requirements for Radio Frequency Interface (RFI) above 7 MHz as specified by FCC regulations, part 15, subpart J, Class A devices.
   11. In compliance with IEEE 519, the Total Harmonic Voltage Distortion for the VFD shall be no greater than 5%, the supplier of the VFD shall provide a dc bus choke or line reactors to ensure compliance. In order to estimate THVD the following is needed: Point of Common Coupling (PCC) and the KVA, secondary voltage, and impedance of the supply transformer.
   12. VFDs must have a minimum short circuit rating of 65 Kamps RMS without additional input fusing.
   13. All motors with variable frequency drives over 5 HP shall have power factor correction to 0.95 or better.

C. Design:
   1. VFD shall employ microprocessor-based inverter logic, isolated from all power circuits.
   2. VFD shall include surface mount technology, with conformal coating.
3. VFD shall employ a PWM (pulse width modulated) inverter system, consisting of:
   a. Input Section:
      i. VFD input power stage shall convert three-phase AC line power into a fixed DC voltage via a solid-state full wave diode rectifier, with MOV (metal oxide varistor) protection.
   b. Intermediate Section:
      i. DC bus as a supply to the VFD Output Section shall maintain a fixed voltage with filtering and short circuit protection.
      ii. DC Bus shall be interfaced with the VFD diagnostic logic circuit, for continuous monitoring and protection of the power components.
   c. Output Section:
      i. Insulated gate bipolar transistors (IGBT's) shall convert DC bus voltage to variable frequency and voltage.
      ii. PWM sine coded output to the motor.

4. The VFD must be selected for operation at carrier frequencies at or above 5 kHz without derating to satisfy the conditions for current, voltage and horsepower as indicated on the equipment schedule. Exception to this requirement is allowed only for VFDs providing 80 amps or more.

5. VFD shall have an adjustable carrier frequency: The carrier frequency shall have a minimum of six settings to allow adjustment in the field.

6. VFD shall include two independent remote reference inputs. One shall be 0 - 10 VDC or 4 - 20mA. Either input shall respond to a programmable bias and gain.

7. VFD shall include a minimum of five multi-function input terminals, capable of being programmed to determine their function when their state is changed. These terminals shall provide up to 30 functions, including but not limited to:
   a. Remote/Local operation selection
   b. Detection of external fault condition
   c. Remote Reset
   d. Multi-step speed commands
   e. Jog Command

8. VFD shall include a 0-10V DC analog output for either monitoring, or "speed tracking" the VFD. The 0-10V DC analog output signal will be proportional to output frequency, output current, output power, or DC bus voltage.

9. VFD shall provide terminals for remote contacts, to allow starting in the automatic mode.
10. VFD shall include at least one external fault input, which shall be programmable for a normally open or normally closed contact. The contacts can be used for connection to firestats, freezestats, etc.

11. VFD shall include one fully rated form “A” contact and one fully rated form “C” contact, capable of being programmed to determine what conditions must be met in order for them to change their state. These contacts shall be rated for at least 1 Amp at 250 VAC. These terminals shall provide up to 18 functions, including but not limited to:
   a. Speed agree detection.
   b. Low and high frequency detection.
   c. Missing frequency reference detection.
   d. Overtorque/Undertorque detection.
   e. Drive Running
   f. Drive Faulted

12. VFD shall include a power loss ride of 2 seconds.

13. VFD shall include a front mounted, sealed keypad operator, with an English language illuminated LCD display. The operator will provide complete programming, operating, monitoring, and diagnostic capability. Keys provided shall include commands for RUN, STOP and RESET. Operating mode (auto or manual) and speed setting functions shall also be provided.

14. VFD English display shall provide readouts of; output frequency in hertz, output voltage in volts, output current in amps, output power in kilowatts, D.C. bus voltage in volts, interface terminal status, and fault codes. All displays shall be viewed in an easy-to-read illuminated LCD with English language as standard.

15. VFD unit shall include the following meters to estimate use of energy:
   a. Elapsed Time Meter
   b. Kilowatt Meter
   c. Kilowatt Hour Meter

16. VFD shall be capable of PID (Proportional, Integral, Derivative) logic, to provide closed-loop setpoint control capability, from a remote reference. In addition, an energy saving sleep function should be used in conjunction with the PID control. The SLEEP function reduces the unnecessary operation of equipment. When the SLEEP function senses a minimal deviation of a sensor (pressure, temperature), the system reacts by removing the run signal from the equipment. Upon receiving an ample sensor signal deviation, the equipment returns the run signal and resumes normal operation.

17. VFD shall include loss of input signal protection, with a speed default to 80% of the most recent speed.
18. VFD shall include electronic thermal overload protection for both the drive and motor. Protection profiles are available for variable or constant torque applications. The electronic thermal motor overload shall be approved by UL. If the electronic thermal motor overload is not approved by UL, a separate UL approved thermal overload relay shall be provided in the VFD enclosure.

19. VFD shall include the following program functions:
   a. Critical frequency rejection capability: 2 selectable, adjustable deadbands.
   b. Auto restart capability: 0 to 10 attempts.
   c. Stall prevention capability.
   d. “S” curve soft start capability.
   e. “Speed search” capability, in order to start a rotating load.
   f. 1 preset and 1 custom volts per hertz pattern.
   g. One fully adjustable volts per hertz pattern.
   h. Current limit adjustment capability, from 30% to 200% of rated full load current of the VFD.
   i. Anti “wind-milling” function capability.
   k. Undertorque/Overtorque Detection.
   l. Ability to close fault contact after the completion of all fault restart attempts.

20. VFD shall include factory settings for all parameters, and the capability for those settings to be reset.

21. VFD shall include the capability to adjust the following functions, while the VFD is running:
   a. Forward/Reverse direction.
   b. Acceleration adjustment from 0 to 3600 seconds.
   c. Deceleration adjustment from 0 to 3600 seconds.
   d. A minimum of six different preset speeds.
   e. Analog output gain, to calibrate the signal for the application used.

22. All units to be provided with fused disconnect integral to the VFD. Fuse sized for the equipment per NEC.

23. Miscellaneous Options:
   a. RFI (radio frequency interference) filters to attenuate possible VFD generated noise. The addition of these filters should reduce the line conducted noise levels within the limits of FCC regulations, part 15, subpart J, for Class A devices.
   b. Current limiting input fusing for the protection of VFD semiconductor devices.
   c. Line reactors reduce the effect of the load and line side transients on the drive. May be used on either the input side or output side of the drive.
d. DV/DT Filtering: When inverter duty type motors are not provided, maximum allowed VFD output rise is 1000 volts in 2 microseconds.

e. Pressure transducer (3 to 15 PSI input = 0 to 10 V DC output), to convert a pneumatic signal into a VFD auto reference signal.

D. Fabrication:
   1. Enclosure: NEMA Type 1 unless otherwise specified on drawings.

E. Source Quality Control:
   1. In-circuit testing of all printed circuit boards shall be conducted, to insure the proper mounting and correct value of all components.
   2. All printed circuit boards shall be burned in for 96 hours, at 85 degrees C.
   3. Final printed circuit board assemblies shall be functionally tested, via computerized test equipment. All tests and acceptance criteria shall be preprogrammed. All tests results shall be stored as detailed quality assurance data.
   4. All fully assembled controls shall be functionally tested, with fully loaded induction motors. The combined test data shall then be analyzed, to insure adherence to quality assurance specifications.
   5. Inspect and production test, under load each completed VFD assembly.

F. Approved Manufacturers:
   1. Square D
   2. ABB
   3. Yaskawa
   4. Danfoss

PART 3 - EXECUTION
Not Applicable

END OF SECTION
SECTION 23 05 29
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.01 GENERAL
A. Includes:
   1. Pipe Hangers and Supports
   2. Duct Hangers and Supports
   3. Mechanical Equipment Anchors and Supports

1.02 RELATED SECTIONS
A. General Conditions, Division 1
B. Section 20 00 00 – General Mechanical Requirements
C. Section 22 20 00 – Excavation & Backfill for Mechanical Underground Utilities
D. Section 23 05 48 – Vibration and Seismic Control
E. Section 23 07 19 – HVAC Piping Insulations
F. Section 23 11 19 – HVAC Piping Specialties
G. Section 23 20 00 – Hydronic System
H. Section 23 23 00 – Refrigerant Piping

1.03 QUALITY ASSURANCE
B. All methods, materials, and workmanship shall conform to the International Building Code (IBC) and International Mechanical Code (IMC), as amended and adopted by the authority having jurisdiction.

1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Hangers.
B. Struts.
C. Anchors.
D. Shop drawings are required for all equipment supports and fabricated supports or assemblies.

1.05 OPERATION AND MAINTENANCE OF THIS SECTION
A. Not Applicable
PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Hangers and Supports: Elcen, Grinnell, B-Line Systems, Unistrut, Caddy, Tolco, PHD.


2.02 GENERAL HANGERS AND SUPPORTS

A. Hanger Rods: Threaded hot rolled steel, electro-galvanized or cadmium plated. Hanger rods shall be sized so that the total load (including pipe or duct, insulation, hangers, and fluid) does not exceed the following:

<table>
<thead>
<tr>
<th>Nominal Rod Diameter</th>
<th>Maximum Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 Inch</td>
<td>610 Pounds</td>
</tr>
<tr>
<td>1/2 Inch</td>
<td>1130 Pounds</td>
</tr>
</tbody>
</table>

B. Hanger Straps: Galvanized steel. Straps shall be sized so that the total load does not exceed the following:

<table>
<thead>
<tr>
<th>Strap Size</th>
<th>Maximum Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; x 22 Gauge</td>
<td>230 Pounds</td>
</tr>
<tr>
<td>1&quot; x 20 Gauge</td>
<td>290 Pounds</td>
</tr>
<tr>
<td>1&quot; x 18 Gauge</td>
<td>380 Pounds</td>
</tr>
<tr>
<td>1&quot; x 16 Gauge</td>
<td>630 Pounds</td>
</tr>
</tbody>
</table>

C. Beam Attachments: Shall be of the following type:

<table>
<thead>
<tr>
<th>MSS Type</th>
<th>Elcen Figure No.</th>
<th>Grinnel Figure No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>33, 34</td>
<td>131</td>
</tr>
<tr>
<td>22</td>
<td>67</td>
<td>66</td>
</tr>
<tr>
<td>23</td>
<td>29A</td>
<td>87</td>
</tr>
<tr>
<td>28</td>
<td>95</td>
<td>292, 228</td>
</tr>
<tr>
<td>30</td>
<td>95</td>
<td>229</td>
</tr>
</tbody>
</table>

D. Anchors: Masonry anchors shall be Phillips wedge anchors, Phillips "Red Head" or Rawl "Saber-Tooth".

E. Steel: Structural steel per ASTM A36.

F. Wood: Shall be fire treated.

2.03 PIPE HANGERS AND SUPPORTS

A. All hangers used directly on copper pipe shall be copper plated or have a factory applied 1/16-inch thick (minimum) plastic coating on all contact surfaces.

B. Riser clamps shall be epoxy coated.

C. All other hangers, supports, and hardware shall be cadmium plated or galvanized.
D. Pipe Hangers and Supports: Shall be of the following type (numbers are 'MSS'):

<table>
<thead>
<tr>
<th>Maximum System Temperature</th>
<th>Insulated Pipe Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>120 to 450 Degrees</td>
<td>1, 3, 7, 9, 10, 41, 42, 43, 44, 45, 46, E</td>
</tr>
<tr>
<td>60 to 120 Degrees</td>
<td>1, 3, 7, 9, 10</td>
</tr>
<tr>
<td>33 to 59 Degrees</td>
<td>1, 3, 5, 7, 9, 10, 41, 42, 43, 44, 45, 46, E</td>
</tr>
</tbody>
</table>

E. Vertical Pipe Supports: MSS Type 8 riser clamp (Elcen Fig. 39 and 339; Grinnel Fig. 261 and 261C).

F. Trapeze Hangers: Shall be constructed of carbon steel angles, channels, or other structural shapes with flat surface for point of support. Trapeze hangers shall be supported with hanger rods suspended from concrete inserts or approved structural clips. Provide a steel washer plate (Elcen Fig. 84 or equal) where hanger rod nuts bear on trapeze hanger.

G. Insulated Pipe Inserts and Insulation Shields:

1. Insulation material at pipe insert shall be calcium silicate with jacket of nylon reinforced kraft paper bonded to aluminum foil cover on insulation. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.

2. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 23 07 19 for insulation sizes.

3. Provide shield per Section 23 11 19 HVAC Piping Specialties.

4. Manufacturers:
   a. TPS Thermal Pipe Shields
   b. B-Line
   c. Clement Support Services

2.04 REFRIGERANT PIPE HANGERS AND SUPPORTS

A. All horizontal refrigerant pipe shall utilize clevis, strut-mounted, or trapeze style supports.

B. All hangers, supports, and hardware shall be cadmium-plated or galvanized where used indoors, and galvanized where used outdoors.

C. Secure refrigerant pipe to strut channel using either of the following:

1. Snap in Shield Supports:
   a. Polypropylene Copolymer construction.
   b. Rated for an operating temperature of -40°F to 178°F.
   c. Material shall be paintable.
   d. UL 723 (ASTM E 84) listed.
   e. Meets UL 94 HB flammability standards.
   f. Approved Manufacturers:
      1) Eaton Snap ‘N Shield
      2) TB Concept, Inc. Insuguard
2. Insulated Pipe Inserts and Insulation Shields:
   a. Insulation material at pipe insert shall be calcium silicate with jacket of nylon reinforced Kraft paper bonded to aluminum foil cover on insulation. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.
   b. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 23 07 19 for insulation sizes.
   c. Provide shield per Section 23 11 19 HVAC Piping Specialties.
   d. Manufacturers:
      1) TPS Thermal Pipe Shields
      2) B-Line
      3) Clement Support Services

D. Trapeze Hangers: Shall be constructed of carbon steel strut supports. Trapeze hangers shall be supported with hanger rods suspended from approved structural clips. Provide a steel washer plat (Elcen Fig. 84 or equal) where hanger rod nuts bear on trapeze hanger.

E. Clevis Hangers:
   1. ANSI/SP-69 and SP-58 (Type 1).
   2. Provide with electro-galvanized finish.
   3. Install snap-in shield, or insulated pipe inserts, and insulation shields at each clevis hanger support.
   4. Snap in shields shall comply with the following requirements:
      a. Material: Polypropylene
      b. UL-723 (ASTM E 84) and UL-2043
      c. Service Temperature: -40°F to 178°F
      d. Approved Manufacturers:
         1) Eaton Snap 'N Shield
         2) TB Concept Inc. Insuguard
   5. Insulated Pipe Inserts and Insulation Shields:
      a. Insulation material at pipe insert shall be calcium silicate with jacket of nylon reinforced Kraft paper bonded to aluminum foil cover on insulation. Insulated pipe insert shall have no more than 5% deformation at 100 psi and a thermal conductivity no more than 0.38 Btu/hr./sq. ft./degree F/1-inch thick at 75°F.
      b. Insulated pipe insert shall be same thickness as adjoining pipe insulation and sized to match pipe in which it is used on. See Section 23 07 19 for insulation sizes.
      c. Provide shield per Section 23 11 19 HVAC Piping Specialties.
      d. Manufacturers:
         1) TPS Thermal Pipe Shields
         2) B-Line
3) Clement Support Services

6. Approved Manufacturers:
   a. Caddy
   b. PHD, Inc.
   c. B-Line

F. Vertical refrigerant pipe supports shall utilize struts with cushion clamps.

1. Cushion Clamps:
   a. Temperature: -65°F to 275°F
   b. Yellow trivalent plated mild steel
   c. Provide with nylon locknut washer
   d. Approved Manufacturers:
      1) Holdrite
      2) BlueRidge
      3) Caddy
      4) PHD, Inc.

2.05 DUCT HANGERS AND SUPPORTS

A. Hangers: As shown in SMACNA HVAC Duct Construction Standards.

B. Vertical Duct Supports at Floor: 1-1/2" x 1-1/2" x 1/8" (minimum) galvanized steel angle and to support ducts, as shown in SMACNA HVAC Duct Construction Standards Figure 4-6. For ducts over 30 inches wide, provide riser reinforcing with hanger rods between the riser support and riser reinforcing.

C. Vertical Duct Supports at Wall: 1-1/2" x 1/8" (minimum) strap or 1-1/2" x 1-1/2" x 1/8" (minimum) angle bracket and as shown in SMACNA HVAC Duct Construction Standards Figure 4-7.

D. Hanger Attachments to Structure: As shown in SMACNA HVAC Duct Construction Standard Figures 4-1, 4-2, 4-3 to suit building construction and as allowed on structural drawings. Where C-clamps are provided, retainer clips shall be used. Friction beam clamps shall not be used.

E. Hanger Attachments to Ducts: As shown in SMACNA HVAC Duct Construction Standards Figure 4-4.

PART 3 - EXECUTION

3.01 INSTALLATION - GENERAL

A. Provide all necessary bolts, nuts, washers, turnbuckles, rod connectors, and any other miscellaneous accessories required for the support and anchoring of all pipes, ducts, and mechanical equipment.

B. Install steel or wood backing in walls (anchored to studs) as required to provide support for items hung from walls.
C. Install concrete inserts and anchors in accordance with manufacturer's instructions.

D. All welded steel support assemblies shall have a power wire brush and primer paint finish.

E. Maximum spans between piping supports may be significantly less than the maximum spans allowed herein due to structural limitations of allowable loads on hangers. The most restrictive criteria shall govern. Reference structural drawings.

3.02 INSTALLATION OF PIPE HANGERS AND SUPPORTS

A. Use of zip ties or plastic straps is strictly prohibited.

B. Insulation shall be continuous at pipe hangers and supports. Insulation may only be broken at vertical pipe supports where insulated cushion clamps are utilized.

C. Above ground pipe shall be adequately anchored to the structure to prevent sagging and to keep pipe in alignment.

D. All pipe supports shall be provided with a means of adjustment for the aligning and leveling of the pipe after installation.

E. Installation and sizing of pipe supports and accessories shall be in accordance with the manufacturer’s recommendations and standard MSS SP-89 and MSS SP-69, NFPA #13 for fire protection piping, UPC, and IMC.

F. Provide supports at each change in direction of piping.

G. Copper Tubing: Maximum spacing between supports:

<table>
<thead>
<tr>
<th>Nominal Tubing Diameter</th>
<th>Maximum Span Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>½ Inch</td>
<td>5 Feet</td>
</tr>
<tr>
<td>¾ to 1 ¼ Inch</td>
<td>6 Feet</td>
</tr>
<tr>
<td>1 ½ to 2 ½ Inch</td>
<td>8 Feet</td>
</tr>
<tr>
<td>3 Inches and Larger</td>
<td>10 Feet</td>
</tr>
</tbody>
</table>

H. Soft Copper Pipe: Maximum spacing between supports:

<table>
<thead>
<tr>
<th>Nominal Tubing Diameter</th>
<th>Maximum Span of Soft Copper</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Sizes</td>
<td>5 Feet</td>
</tr>
</tbody>
</table>

I. Vertical Piping Supports: Support piping at each floor line with pipe clamps and at intermediate points as required to prevent excessive pipe movement and so as to comply with the maximum spacings cited above. Support all pipe stacks at their bases with a concrete pier or suitable hanger. For vertical pipe drops which occur away from a wall or similar anchoring surface, provide angled bracing from nearest structure to provide rigid anchoring of pipe drop. Any pipe requiring insulation shall use an insulated pipe insert at pipe clamp with 360° shield.
3.03 INSTALLATION OF DUCT HANGERS AND SUPPORTS

A. Provide anchors and supports for all ductwork.

B. Rectangular Duct: Supports and hangers shall be of size and spacing as shown in SMACNA HVAC Duct Construction Standards for the appropriate class of duct. (Hangners maximum allowable loads shall not be as shown in SMACNA Tables but shall be as specified in these specifications.)

C. Round Duct: Supports and hangers shall be of size and spacing as shown in SMACNA HVAC Duct Construction Standards for the appropriate class of duct.

D. Maximum Hanger Spacing (provided duct gauge and reinforcement comply with SMACNA Standards for such spacing):

<table>
<thead>
<tr>
<th>Duct Area</th>
<th>Maximum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 4 sq. ft. (27&quot; Diameter)</td>
<td>8 Feet</td>
</tr>
<tr>
<td>4.1 to 10 sq. ft. (28&quot; to 42&quot; Diameter)</td>
<td>6 Feet</td>
</tr>
<tr>
<td>10.1 sq. ft. and up (43&quot; Diameter and up)</td>
<td>4 Feet</td>
</tr>
</tbody>
</table>

E. Provide supports at each change in direction of duct. Locate hangers at inside and outside corners of elbows, or at each end of fitting, on each side.

F. Provide additional supports at each side concentrated loads (such as modulating dampers, duct heaters, sound attenuators, etc.)

G. Provide supports for exterior ductwork per SMACNA HVAC Duct Construction Standards or as detailed on the drawings.

3.04 CEILING AIR TERMINALS/SERVICES

A. Ceiling mounted air terminals or services weighing less than 20 pounds shall be positively attached to the ceiling suspension main runners or to cross runners with the same carrying capacity as the main runners.

B. Terminals or services weighing 20 pounds but not more than 56 pounds in addition to the above shall have two No. 12 gauge hangers connected from the terminal or service to the ceiling system hangers or to the structure above. These wires may be slack.

C. Terminals or services weighing more than 56 pounds shall be supported directly from the structure above by approved hangers.

D. All air terminals that use side inlet "plenums" or have fire dampers shall be supported directly from the structure with approved hangers (regardless of total weight).

3.05 INSTALLATION OF MECHANICAL EQUIPMENT ANCHORS AND SUPPORTS

A. Provide anchoring and supports for all mechanical equipment.
B. Heating, Ventilating and Air Conditioning equipment where suspended from structure shall be supported per SMACNA HVAC Duct Construction Standards or as shown on the drawings.

C. Equipment shall be supported and anchored in such a way so that no equipment vibration is transmitted to the building structure.

D. Added supports and bracing shall be provided per Section 23 05 48.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. This section includes, but not limited to, vibration isolation and seismic restraint installation for all equipment, ductwork, and piping as described herein.

B. Seismic Restraints shall be bidder-designed. Seismic Design Criteria are to be established per the International Building Code and ASCE along with Project Structural drawings.

C. Items not included in this specification shall not relieve the contractor of the responsibility of providing seismic bracing that meets all the criteria required by the referenced codes and in accordance with the seismic design guidelines and the project structural drawings.

1.02 REFERENCED CODE AND STANDARDS

A. The latest adopted versions of the following codes and standards apply to this section.

1. International Building Code (IBC)
2. National Fire Protection Association (NFPA-13)
4. ASCE 7-10, American Society of Civil Engineers “Minimum Design Loads for Buildings and Other Structures”
5. Applicable Project Structural Drawings for Seismic Design Criteria
6. Applicable Manufacturer’s Seismic Design Guides for proprietary listed seismic bracing and mounting hardware
7. Where there is a conflict in requirements between these guidelines and above-mentioned codes the more stringent parameters shall prevail.

1.03 RELATED SECTIONS

A. General Conditions, Division 1 and Division 23
B. Section 20 00 00 – General Mechanical Requirements

1.04 DESIGN CRITERIA

A. Occupancy Category of Structure (I-IV) per IBC or ASCE
B. Component Importance Factor (I_p) per ASCE
C. Mapped Acceleration Parameters (S_1 and S_s) per IBC and Project Structural Drawings
D. Site Class (A – F) per IBC and Project Structural Drawings
E. Site Coefficient (F_v) per IBC and Project Structural Drawings
F. Site Coefficient (F_a) per IBC and Project Structural Drawings
G. Seismic Design Category (A – D) based on Short Period Response Accelerations per IBC and Project Structural Drawings
H. Seismic Design Category (A – D) based on 1-Second Period Response Acceleration per IBC and Project Structural Drawings
I. Amplification Factor \( a_p \) per ASCE
J. Response Modification Factor \( R_p \) per ASCE

1.05 SUBMITTAL REQUIREMENTS

A. Isolation Pads
B. Spring Isolators
C. Seismic Control:
   1. Include design calculations and details for selecting seismic restraints complying with performance requirements, design criteria, and analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Design Calculations: Calculate static and dynamic loading due to equipment weight, operation, seismic, and wind forces required to select vibration isolators, seismic and wind restraints.
      a. Coordinate design calculations with wind load calculations required for equipment mounted outdoors. Comply with requirements in other sections for equipment mounted outdoors.
   3. Seismic and Wind Restraint Details:
      a. Design Analysis: To support selection and arrangement of seismic and wind restraints. Include calculations of combined tensile and shear loads.
      b. Details: Indicate fabrication and arrangement. Detail attachments of restraint to the restrained items and to the structure. Show attachment locations, methods, and spacing’s. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
      c. Coordinate seismic-restraint and vibration isolation details with wind-restraint details required for equipment mounted outdoors.
   4. Periodic Special Inspections: The mechanical contractor shall provide a list of components/systems requiring periodic special inspections per IBC.
5. Special Certification Requirements: Each contractor responsible for the construction of a “Designated Seismic System” for active mechanical equipment that must remain operable following the design earthquake, or components with hazardous contents certified by the manufacturer to maintain containment following the design earthquake shall submit a Manufacturer’s Certificate of Compliance for review and approval by the Registered Design Professional responsible for the design of the system. This information shall then be submitted to the AHJ.

6. All brace or restraint components, mounting devices, snubbers and anchors.

1.06 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 - PRODUCTS

2.01 NEOPRENE ISOLATORS

A. Isolation Pads: Oil resistant neoprene pads, minimum ¼-inch thick, with cross-ribbed or waffle design. Size pads for not more than 50 psi or as recommended by vibration isolator manufacturer.

B. Floor Mounted Isolators: Double deflection type neoprene mounts, having minimum deflection of 0.35 inch. All metal surfaces shall be neoprene covered, base plate shall have mounting holes, and top shall have threaded steel plate or threaded steel insert. Element shall be color coded or labeled with molded symbols to identify capacity. Mason Series ND, Amber Booth “RV” or approved.

C. Suspension Isolators: Shall be double deflection neoprene type, with isolator encased in open steel bracket and minimum 3/8-inch deflection. Hanger rod shall be isolated from steel bracket with neoprene grommets. Mason Series HD, Amber Booth “BRD” or approved.
2.02 SPRING ISOLATORS

A. General: The load carried by each isolator shall be carefully calculated and isolators selected so that the static deflection will be the same and the supported equipment will remain level. Isolators shall be so designed that the ends of the springs will remain parallel during and after deflection to operating height. At operating height, springs shall have additional travel to complete (solid) compression equal to at least 50 percent of the operating deflection. Suspension isolator springs shall have a static deflection (as shown on drawings) not less than 1-1/2", except that for units with components rotating at 1000 rpm and less, the static deflection shall be not less than 2 inches. Floor isolator springs shall have deflection of not less than 1 inch. All isolators shall provide at least 96% isolation efficiency. Note: Deflections other than these may be used where circumstances warrant and more optimum isolation results can be achieved.

B. Floor Type Spring Isolators: Shall be open spring type with approximate ratio between horizontal and vertical spring constant of 1.0. A ribbed neoprene acoustical friction pad shall be bonded to the underside of the isolator. Provide with height saving bracket.

1. Approved Manufacturers:
   a. Mason Series SLF
   b. Amber Booth "SW" or approved

C. Floor Housed Type: Housed spring isolator with ductile iron housing, steel base plate with mounting holes, spring inspection ports, neoprene cushion, leveling screws.

1. Approved Manufacturers:
   a. Mason Series SSLFH
   b. Amber Booth "XLS" or approved

D. Suspension Type Spring Isolators: Shall consist of a rigid steel frame, a stable steel spring in the bottom part of the frame, and double deflection neoprene isolating pad at the top of the frame. Where supporting rods pass through the frame, a clearance of not less than on half rod diameter shall be provided all around the rod.

1. Approved Manufacturers:
   a. Mason Series DNHS
   b. Amber Booth "BSSR" or approved

2.03 SEISMIC RESTRAINTS

A. General:

1. All seismic hangers and components shall be domestically made. Products designed domestically and fabricated in a foreign country are prohibited.
2. Products not permitted include: powder actuated anchors, gas actuated anchors, or anchors requiring epoxy.
3. Only Steel or Ductile Iron components shall be provided. No Cast Iron or Cast Aluminum components are allowed.
4. Steel shall be per ASTM A36; hangers and other devices shall be as shown in “SMACNA Seismic Restraint Manual” or approved manufacturers seismic design guidelines.

B. Seismic Bracing (rigid and cable):
1. Approved Manufacturers:
   a. Tolco
   b. International Seismic Application Technology (ISAT)
   c. Mason Industries
   d. Cooper B-Line
   e. Kinetics Noise Control
   f. AFCON
   g. Gripple
   h. PHD
   i. Unistrut
   j. Anvil or prior approved equal.

C. Seismic Anchorages (for wood, steel and concrete):
1. Approved Manufacturers:
   a. Hilti
   b. ITW Ramset/Red Head
   c. ITW Buildex
   d. Mason Industries
   e. Tolco, AFCON
   f. Simpson Strong-Tie
   g. Powers Fasteners, Inc. or prior approved equal.

D. Flexible Connectors:
1. Approved Manufacturers:
   a. Mason Industries
   b. Metraflex
   c. Victaulic
   d. Kinetics Noise
   e. International Seismic Application Technology (ISAT) or prior approved equal.

E. Pipe Hanger Components:
1. Approved Manufacturers:
   a. Tolco
   b. International Seismic Application Technology (ISAT)
   c. Mason Industries
   d. Cooper B-Line
   e. Kinetics Noise Control
PART 3 - EXECUTION

3.01 VIBRATION ISOLATION

A. Motorized equipment shall be mounted on or suspended from spring vibration isolators either integral or external to the equipment. Floor mounted or suspended isolators.

B. Unless otherwise indicated, resilient mounts for motorized equipment shall be of the type and size to provide maximum ten percent transmissibility. Use unhoused, free-standing stable steel springs which are preferred over housed spring assemblies. The horizontal stiffness of the spring shall be approximately equal to its vertical stiffness. The spring deflection shall be selected based on the equipment power range (HP), speed range (RPM), and static deflection of the supporting structural floor. It is a specific recommendation that whenever a steel spring is used, two pads of ribbed waffle-pattern neoprene be used in series with the spring.

C. The design of vibration dampening shall consider lateral load as well as vertical load and be suitably snubbed against earthquake forces.

D. A list of isolators accompanied by certified transmissibility ratings for the required duty shall be submitted for each item of equipment.

E. Unless noted otherwise, all vibration isolating equipment shall be of the same make and shall be submitted as one group.

F. All piping in the mechanical equipment rooms connected to vibrating equipment shall be supported from resilient ceiling hangers or from floor mounted resilient supports.

G. Special equipment, such as boilers, etc., shall be selected on an individual basis.

H. Inertia bases shall be provided for all equipment with rotating or reciprocating parts when such equipment is located above occupied spaces and for equipment where the motor is separate from equipment. Bases shall be constructed of welded steel angles and channel frame filled solid with structural concrete with #4 rebar at 6 inches on center spanning short dimensions.
3.02 SEISMIC BRACING GENERAL REQUIREMENTS

A. Support and bracing from the structure to pipes, ducts and mechanical equipment shall conform to ASCE and the plumbing & HVAC industry standard SMACNA “Seismic Restraint Manual, Guidelines for Mechanical Systems” or approved manufacturer’s listed seismic assemblies.

B. Provide snubbers for all equipment that is supported on isolators and weighing over 400 lbs. including base. Provide minimum of four snubbers for equipment weighing less than 2,000 lbs., and eight snubbers for heavier equipment.

C. Housekeeping pads shall be properly anchored to the roof deck or floor per ASCE.

3.03 SEISMIC BRACING GENERAL REQUIREMENTS - PIPING

A. When determining horizontal load requirements, consider all pipes full of water and maximum equipment heights unless calculated for other substances and equipment.

B. Seismic bracing shall not limit the expansion and contraction of the piping system. When thermal expansion or contraction is involved, longitudinal bracing shall be designed at the anchor point of the piping system. The longitudinal bracing and the connections must be capable of resisting the additional force induced by expansion and contraction.

C. Seismic bracing for fire sprinkler system piping and riser components shall be as specified per Division 21.

3.04 INSTALLATION

A. Installation of seismic restraints shall be as follows:

1. Upon completion of installation of all seismic restraint materials and before start up of restrained equipment, all debris shall be cleaned from beneath all protected equipment, leaving equipment free to contact snubbers.

2. All external utility connections to restrained equipment shall be designed to allow differential seismic motion without damage to the equipment or utility connections.

3. Adjust isolators and restraints after piping systems have been filled and equipment is at its operating weight, following manufacturer’s written instructions.

4. After equipment installation is completed, adjust limit stops following manufacturer’s written instructions so they are out of contact during normal operation.

5. Adjust snubbers according to manufacturer’s written instructions.

6. torque anchor bolts according to anchor manufacturer’s written instructions to resist seismic forces.
7. Attach piping to the trapeze per seismic restraint manufacturer’s design. Install cables so they do not bend across sharp edges of adjacent equipment or building structure.

8. Install vertical braces to stiffen hanger rods and prevent buckling per seismic restraint manufacturer’s design. Clamp vertical brace to hanger rods. Requirements apply equally to hanging equipment. Do not weld vertical braces to rods.

9. Housekeeping Pads must be adequately reinforced and adequately sized for proper installation of equipment anchors. Refer to seismic restraint manufacturer’s written instructions.

3.05 SPECIAL INSPECTIONS

A. When required continuous or periodic special inspections of the equipment and systems designated on the list provided by the mechanical contractor shall be performed in accordance with the IBC and ASCE. The owner shall reserve the right to employ an approved special inspector.

B. Per the IBC, the registered design professional in responsible charge may designate members of the A&E team to act as special inspectors provided those personnel meet the qualification requirements of the IBC to the satisfaction of the building official.
SECTION 23 05 93
AIR SYSTEM TESTING AND BALANCING

PART 1 - GENERAL

1.01 GENERAL
A. Includes, but not limited to, testing, balancing and adjusting of air heating, cooling and exhaust systems.

1.02 RELATED SECTION(S)
A. General Conditions and Division 1 apply to this section.
B. Division 23 shall make changes in pulley, belts, and dampers as required for correct balance as recommended by Air Testing & Balancing Agency at no additional cost to Owner.
C. Division 23 shall repair leaks in ductwork at no additional cost to Owner.

1.03 SYSTEM DESCRIPTION (PERFORMANCE REQUIREMENTS)
A. Perform testing and balancing in complete accordance with the Associated Air Balancing Council (AABC), National Environmental Balancing Bureau (NEBB), or National Balancing Council (NBC) standards and procedures.
B. Air Testing & Balance Agency shall perform tests specified, compile test data, and submit copies of complete test data to Contractor for forwarding to Architect/Engineer for evaluation and approval.

1.04 SUBMITTALS REQUIRED BY THIS SECTION
A. Company information including Washington State Contractors’ license.
B. Key personnel and resumes.
C. AABC, NEBB, or NBC certifications.
D. Provide reference of five (5) completed jobs of similar size and complexity.

1.05 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Final air balance report shall be bound in the O & M Manual or provided under a separate volume.
B. Preliminary air balance report shall be submitted to the Architect/Engineer for approval. Preliminary report shall note all finished measured data.
C. Final Test Data:
   1. Provide project name, name and telephone number of balancing firm, GC, MC, Architect, and Engineer in the cover (or first page) of report.
   2. Provide a summary of air balance findings regarding airtightness of each ducted systems, deficiencies of equipment to meet design requirements, deficiencies of space pressure relationships, etc.
3. Cover sheet shall have a statement from the site project manager that reads, "The air system testing and balancing report contained here in is true and factual based on actual field measurements and adjustments. I have personally performed or witnessed a minimum of 5% of the airflow tests."

4. Each page of test report to have a unique page number.

5. Provide fan curve or chart of each fan in system.

6. Provide final approved test report in PDF format on CD. Provide one more CD than hard copies of test report.

7. Obtain and provide a copy of the air barrier test (building tightness) whether or not the Air Balance Contractor produced the test.

1.06 QUALITY ASSURANCE (QUALIFICATIONS)

A. Mechanical Contractor shall procure services of an independent Air Testing & Balance Agency, which specializes in testing, and balancing of heating, ventilating, and cooling systems to balance, adjust, test air-moving equipment, air distribution, and exhaust systems.

B. Agency shall be approved in writing by Consultant.

C. Instruments used by Agency shall be accurately calibrated and maintained good working order.

D. If requested, conduct tests in presence of Architect/Owner/Engineer.

1.07 SEQUENCING & SCHEDULING

A. Mechanical Contractor shall award test and balance contract to approved agency upon receipt of his contract to proceed to allow Agency to schedule this work in cooperation with other Sections involved and comply with completion date.

B. Begin air testing and balancing upon completion of air cooling, heating, and exhaust systems including installation of all specialties and devices.

C. Mechanical Contractor shall put heating, ventilating, and cooling systems and equipment into full operation and continue their operation during each working day of testing and balancing.

PART 2 - PRODUCT

Not Applicable

PART 3 - EXECUTION

3.01 FIELD QUALITY CONTROL

A. Testing Procedure: Air Testing & Balancing Agency shall perform following tests and balance system in accordance with following requirements at design conditions of supply and a minimum outside air CFM (not 100% return or 100% economizer).

1. Test, adjust, and record fan rpm to design requirements.
2. Test and record motor amperes at design conditions.
3. Make pitot tube traverse of main supply duct and obtain design cfm at fans. (systems of 1000 CFM or greater)
4. Test and record system static pressures: suction, discharge, and clean filters (if applicable; for systems of 2000 CFM or greater)
5. Test, adjust, and record system for design cfm air.
6. Test, adjust, and record system for design cfm outside air.
7. Test, adjust, and record each diffuser, grille, and register to within 10% of design requirements.
8. On a floor plan, identify each diffuser, grille, and register to location and area using a designation symbol unique to that page.
9. Identify and list size, type, and manufacturer of diffusers, grilles, registers, and testing equipment. Use manufacturer's rating on equipment to make required calculations.
10. In readings and tests of diffusers, grilles, and registers, include required cfm and test cfm after adjustments.
11. In cooperation with Division 23, set adjustments of automatically operated dampers to operate as specified, indicated, or noted.
12. Adjust diffusers, grilles, and registers to minimize drafts.
13. Identify at each volume damper with permanent mark, the position of actuator handle once final balance has been achieved.
14. Measure and record all pressure differential relationships as identified by the control's diagrams (i.e. labs, kitchen, pharmacy, art rooms, building pressure, etc). These measurements are to be taken when all HVAC is running after full balance has been completed. Note the measured reference points to determine the pressure differential.
15. For any spaces with exhaust and supply to them where design airflows cannot be obtained, the systems shall be adjusted to produce a negative pressure to the adjacent space (i.e. workrooms, restrooms, labs, nurse rooms, etc.)
16. When reconciling supply, return, outside, and exhaust air quantities, priority shall be placed on outside air quantities (typically, return air quantities noted on plans are for duct sizing only).
17. Where duct pressure sensors are noted in controls diagrams (i.e. variable volume systems) adjust system to its minimum pressure point that still achieves full airflow to all terminals. Record this setpoint in test report and provide data to controls contractor.
18. For variable volume systems, adjust sheave package to produce maximum airflow (or diversity as applicable) at 60 Hz with simulated filter loading. If maximum airflow cannot be obtained at 60 Hz, increase frequency until maximum airflow is obtained as allowed by the equipment manufacturer and maximum motor amperes. Record final values.
19. Verify that all gravity backdraft dampers are moving freely, open in proper direction, and are unbound.
20. After balancing system, measure terminal CFM when system is in 100% economizer. If supply is greater than design, coordinate with controls contractor or MC to provide damper stops to provide design CFM during 100% economizer.

21. On All Motors with Variable Drives: Set maximum amperage safety to protect motor from over loading.

B. Final Inspection & Adjustments:

1. Balancing agency shall be represented at final inspection meeting by qualified testing personnel with balancing equipment and two copies of air balancing test report.
   a. Architect may choose and direct spot balancing of one zone. Differences between the spot balance and test report will be justification for requiring repeat of testing and balancing for entire building.
   b. Rebalancing shall be done in presence of Architect and subject to his approval.
   c. Spot balance and rebalance shall be performed at no additional cost to Owner.

2. System shall be completely balanced and all reports submitted to Architect prior to prefinal inspection.

3. Where equipment supplied to job site provides over 5% more air than schedule requirements, rooms supplied by that equipment shall have their supply air quantities increased by the ratio of actual total air quantity supplied to minimum air quantity required by schedule.

3.02 BALANCING FIRMS (APPROVED)

A. Hardin and Sons
B. MTW Design
C. Airtest Company, Inc.
D. American Air Balance Company
E. Advanced Mechanical Services, Inc.
F. Testing & Commissioning Services
G. Precision Test and Balance, Inc.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL
A. This section describes the insulation requirement to meet or exceed the 2012 Washington State Energy Code. Lining installation is per 23 31 13.

1.02 RELATED SECTION(S)
A. General Conditions, Division 1
B. Section 20 00 00 - General Mechanical Conditions
C. Section 23 31 13 - Steel Ductwork

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Wrap Insulation

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Not Applicable

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
A. Not Applicable

2.02 DUCTWORK INSULATION
A. Manufacturers: Manville Corporation Owens Corning, Knauf Insulation, Manson Insulation, or approved equal.
B. Flexible Fiber Glass Blanket (Wrap Insulation): Manville, Microlite Type 75 meeting ASTM C553, Type 1, Class B-2; flexible blanket.
1. 'K' ('ksi') Value: 0.27 at 75°F (0.040 at 24°C) installed.
2. Density and R-value:
   a. R-3.3: 1.0" inch of 1.5 to 3.0 lb/cu. Ft. glass fiber blanket.
   b. R-5.3: 2.0" inches of 0.75 lb/cu. Ft. or 1.5 inches of 1.5 to 3.0 lb/cu. Ft. glass fiber blanket.
   c. R-7: 3.0 inches of 0.75 lb/cu. Ft. or 2.0 inches of 1.5 to 3.0 lb/cu. Ft. glass fiber blanket.
3. Vapor Barrier Jacket: FSK, aluminum foil reinforced with fiber glass yarn and laminated to fire-resistant kraft, secured with UL listed pressure sensitive tape and/or outward cinched expanded staples and vapor barrier mastic as needed.
C. Rigid Fiber Glass Board: Insulation Board meeting ASTM C 612 Type IA and IB; rigid.

1. ‘K’ (‘ksi’) Value: ASTM C 177, 0.22 at 75°F mean temperature.
2. Maximum Service Temperature: 450°F.
3. Vapor Retarder Jacket: ASJ conforming to ASTM C 1136 Type I, or FSK or PSK conforming to ASTM C 1136 Type II.
4. Securement: Secured in place using adhesive and mechanical fasteners spaced a minimum of 12" on center with a minimum of 2 rows per side of duct. Insulation shall be secured with speed washers and all joints, breaks and punctures sealed with appropriate pressure-sensitive foil tape, or glass fabric and vapor retarder mastic.
5. Density and R-value:
   a. R-4.5: 1.0” of 6.0 lb./cu.ft.
   b. R-6.8: 1.5” of 6.0 lb./cu.ft.
   c. R-9.1: 2.0” of 6.0 lb./cu.ft.

D. Duct Insulation Protection:

1. Aluminum Jacket: 0.016-inch (.045 mm) thick sheet, smooth/embossed finish, with longitudinal slip joints and 2-inch (50 mm) lamps.
2. Manville Insulkote ET, a non-water-vapor retarder, non-burning, weatherproof coating for use over insulation where “breathing” is required.
5. Self-Adhering Jacketing: Material to be VentureClad [1579CW] with a white finish. Jacketing material is to have a maximum flame spread/smoke developed index of 25/20 per UL 723, 1 0.0000 water vapor permeance rating per ASTM E-96, mold inhibitors incorporated, and be UV stable.

2.03 DUCTWORK LINING

A. See Section 23 31 13 - Steel Ductwork.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Verify that ductwork has been tested for leakage in accordance with SMACNA standards before applying insulation materials.

B. Verify that all surfaces are clean, dry, and free of foreign material.
C. External Ductwork Insulation:

1. Provide insulated ductwork conveying air below ambient temperature with vapor retardant jacket. Seal all vapor retardant jacket seams and penetrations with UL listed tapes or vapor retardant adhesive.

2. Provide insulated ductwork conveying air above ambient temperature with or without vapor retardant jacket. Where service access is required, bevel and seal ends of insulation.

3. Continue insulation through walls, sleeves, hangers, and other duct penetrations except where prohibited by code.

4. The underside of ductwork 24 inches or greater shall be secured with mechanical fasteners and speed clips spaced approximately 18 inches on center. The protruding ends of the fasteners should be cut off flush after the speed clips are installed, and then, when required, sealed with the same tape as specified above.

5. For ductwork exposed to physical abuse in unfinished and exposed spaces, finish with duct insulation protection.

6. For outdoor applications, provide insulation with a weather protection jacket. Manville Zeston 2000, VentureClad self-adhering or approved equal. Install per manufacturer’s instructions.

D. For installation of lining insulation, see Section 23 07 13.
### 3.02 INSULATION SCHEDULE

**A.** Provide wrap insulation and duct liner for the duct systems indicated per the following table (R-value indicates the thickness to be provided as defined in Section 23 07 13 for wrap insulation and Section 23 31 13 for liner):

<table>
<thead>
<tr>
<th>DUCT TYPE AND LOCATION</th>
<th>LINER</th>
<th>WRAP</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Conditioned Space:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Supply Air</td>
<td>R - 3.3</td>
<td>Not Required</td>
</tr>
<tr>
<td>- Return Air</td>
<td>R - 3.3</td>
<td>Not Required</td>
</tr>
<tr>
<td>- Primary Air</td>
<td>Not Required</td>
<td>R – 3.3¹</td>
</tr>
<tr>
<td>- Relief Air</td>
<td>Not Required</td>
<td>R – 3.3¹²</td>
</tr>
<tr>
<td>- Transfer Air</td>
<td>R-3.3</td>
<td>Not Required</td>
</tr>
<tr>
<td>- Exhaust Air</td>
<td>R-3.3</td>
<td>Not Required²</td>
</tr>
<tr>
<td>- HRU Exhaust Air</td>
<td>Not Required</td>
<td>R – 7¹²</td>
</tr>
<tr>
<td>- HRU Return Air</td>
<td>R-3.3</td>
<td>Not Required</td>
</tr>
<tr>
<td>- Outside Air</td>
<td>Not Required</td>
<td>R - 7¹²</td>
</tr>
</tbody>
</table>

| **In cold attic, in cold ceiling space, in cold wall, in cold garage, in cold crawl space:** |       |      |
| - Supply Air           | R – 6³ | R – 6³ |
| - Return Air           | R – 6³ | R – 6³ |
| - Relief Air           | Not Required | Not Required |
| - Transfer Air         | Not Required | Not Required |
| - Exhaust Air          | Not Required | Not Required |
| - Outside Air          | Not Required | Not Required |

| **On exterior of building, on roof:** |       |      |
| - Supply Air           | R – 8³ | R – 8³ |
| - Return Air           | R – 8³ | R – 8³ |
| - Relief Air           | Not Required | Not Required |
| - Transfer Air         | Not Required | Not Required |
| - Exhaust Air          | Not Required | Not Required |
| - Outside Air          | Not Required | Not Required |

| **In concrete, in ground:** |       |      |
| - Supply Air           | R - 5.3 | Not Required |
| - Return Air           | R - 5.3 | Not Required |
| - Relief Air           | Not Required | Not Required |
| - Transfer Air         | Not Required | Not Required |
| - Exhaust Air          | Not Required | Not Required |
| - Outside Air          | Not Required | Not Required |

**Table Footnotes:**

1. Where duct is exposed to view, provide wrap with paintable duct insulation protection.
2. Building level insulation is required from backdraft/motorized damper to louver or roof hood. See plans for additional details. Coordinate with GC for insulation.
3. Use liner or rigid fiberglass board.
B. For purposes of the Insulation Schedule above, the following defines the duct systems:

1. Supply Air: Air that has passed through mechanical conditioning device, such as a furnace, coil, evaporative section, heat recovery device, etc. that is distributed to the conditioned space.
2. Return Air: Air from the conditioned space to an air handler.
3. Primary Air: See Section 23 31 13 – Steel Ductwork.
4. Relief Air: Air from the conditioned space to the outdoors or to a large semi-conditioned or non-conditioned space.
5. Transfer Air: Air from one conditioned space to another conditioned space.
6. Exhaust Air: Air from a space moved by a fan to directly outside. Also, air downstream of a heat recovery device to directly outside.
7. HRU Return Air: Return air from a grille to a heat recovery device.
8. HRU Exhaust Air: Exhaust air from heat recovery devise to directly outside.
9. Outside Air: Air from the outside to a mechanical conditioning device such as a furnace, coil, evaporative section, heat recovery device, etc.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL

A. Includes, but not limited to, insulating of piping and fittings per schedule in Part 3 of this specification.

B. Insulation at Hangers: Insulation shall be continuous through hangers on all insulated systems. Inserts at hangers are specified in Section 23 05 29 and are considered as part of the hanger and support system. Inserts are required to be installed at the time of pipe installation and are intended to be installed by the Contractor installing the pipe hangers/supports. See Section 23 05 29.

C. The intent of this section is to meet or exceed the requirements of the most current version of the Washington State Energy Code (WSEC). The stricter of this section and WSEC shall be met.

1.02 RELATED SECTIONS

A. General Conditions, Division 01
B. Section 20 00 00 – General Mechanical Requirements
C. Section 23 05 29 – Hangers and Supports for HVAC Piping & Equipment
D. Section 23 23 00 – Refrigerant Piping System

1.03 SECTION INCLUDES

A. Piping insulation, jackets, and accessories.

1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. All insulation
B. Field Applied Jackets

1.05 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable
2.02 PIPE INSULATIONS

A. Elastomeric Insulation (Type 1): Meeting ASTM C534; flexible, closed cell, cellular elastomeric, molded or sheet.

1. Thermal Conductivity: 0.25 Btu-in/hr. Ft\(^2\)°F.
2. Maximum Service Temperature of -70 degrees F. (-40 degrees C) to 220 degrees F (104 degrees C)
4. Maximum Smoke Developed: 25/50 through 1" wall.
5. Maximum water vapor permeability, wet cup, perm-in .10.
6. Connection: Waterproof vapor retarder adhesive as needed.
7. UV-Protection: Outdoor protective coating.
8. Shall have R-Value of 4.2 at 1" and R=8 at 2".
9. The material shall be manufactured under an independent third-party supervision testing program covering the properties of fire performance, thermal conductivity and WVT.
10. Shall be fiber free, formaldehyde-free, and low VOC's.
11. Approved Manufacturers:
   a. Armacell
   b. Kflex
   c. Aeroflex

B. Elastomeric Insulation (Type 2): Meeting ASTM C411; flexible, closed cell, and light weight EPDM rubber based elastomeric, molded or sheet.

1. Thermal Conductivity: 0.245 Btu-in/hr. Ft\(^2\)°F at 75°F.
2. Maximum Service Temperature of -297 degrees F. (-57 degrees C) to 257 degrees F (125 degrees C)
3. Shall be able to withstand up to 300°F.
5. Maximum Smoke Developed: 25/50 through 1" wall.
6. Water vapor permeability, per ASTM E96: 0.03 perm.
7. Connection: Waterproof vapor retarder adhesive as needed.
8. UV-Protection: Outdoor protective coating.
9. Shall have R-Value of 4.0 at 1".
10. Shall be fiber free, formaldehyde-free, and low VOC's.
11. Approved Manufacturers:
   a. K-Flex HT
   b. Aeroflex Aerocel

C. Field Applied Jackets:

1. PVC Plastic: One-piece molded type fitting covers and jacketing material, gloss white.
   a. Connections: Tacks; Pressure sensitive color matching vinyl tape.
2. Canvas Jacket: UL listed fabric, 6 oz/sq yd (220 g/sq m), plain weave cotton treated with dilute fire-retardant lagging adhesive.
3. Aluminum Jacket: 0.016-inch (0.045 mm) thick sheet, (smooth/embossed) finish, with longitudinal slip joints and 2-inch (50 mm) laps, die shaped fitting covers with factory attached protective liner.


D. Approved Manufacturers (Cellular Glass Excluded):
   1. Manville
   2. Armstrong
   3. Knauf
   4. Owens Corning
   5. IMCOA (for Flexible Unicellular Polyolefin only)

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION
   A. Verify that piping has been tested for leakage in accordance with IMC standards before applying insulation materials.
   B. Verify that all surfaces are clean, dry, and free of foreign material.

3.02 INSTALLATION
   A. Install materials in accordance with manufacturer's recommendations, building codes, and industry standards.
   B. Continue insulating vapor barrier through penetrations except where prohibited by code.
   C. Piping Insulation:
      1. Locate insulation and cover seams in least visible locations.
      2. Neatly finish insulation at supports, protrusions, and interruptions.
      3. Provide insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature with vapor retardant jacket with self sealing laps. Insulate complete system.
      4. For insulated pipes conveying fluids above ambient temperature, secure jackets with self sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions.
      5. For pipe exposed in mechanical equipment rooms or exposed in finished spaces up to 10 feet above finished floor, finish with Manville Zeston 2000 PVC jacket and fitting covers or aluminum jacket.
      6. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with Manville Zeston 2000 PVC or aluminum jacket. Jacket seams shall be located on bottom side of horizontal piping.
7. Refrigeration Piping:
   a. Install insulation in snug contact with pipe and in accordance with manufacturer’s recommendations.
   b. Stagger joints on layered insulation.
   c. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.
   d. Seal joints in insulation.
   e. Insulate flexible pipe connectors.
   f. Insulation exposed outside building shall have “slit” joint seams placed on bottom of pipe and given two coats of gray adhesive finish.
   g. Insulate fittings with sheet insulation and as recommended by manufacturer.

3.03 PIPING INSULATION SCHEDULE

<table>
<thead>
<tr>
<th>INSULATION TYPE</th>
<th>PIPE SIZE</th>
<th>THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastomeric Insulation (Type 1):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refrigerant Suction/Discharge (Non-VRF)</td>
<td>All Sizes</td>
<td>1½&quot;</td>
</tr>
<tr>
<td>Refrigerant Liquid (Non-VRF)</td>
<td>All Sizes</td>
<td>½&quot;</td>
</tr>
<tr>
<td>Elastomeric Insulation (Type 2):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VRF Refrigerant High/Low Pressure Gas</td>
<td>All Sizes</td>
<td></td>
</tr>
<tr>
<td>VRF Refrigerant Suction Gas Pipe</td>
<td>All Sizes</td>
<td>1&quot;</td>
</tr>
<tr>
<td>VRF Refrigerant Liquid Pipe</td>
<td>All Sizes</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

3.04 PIPING HANGERS

   A. Do not allow pipes to come in contact with hangers.

END OF SECTION
SECTION 23 09 00
STAND ALONE CONTROLS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS
   A. Conform to General Conditions and Supplemental Conditions for Washington State Facilities Construction.
   B. The General Provisions of the Contract, including General, Supplementary, and Special Conditions, and Division 1- General Requirements, apply to work specified in this section. Subcontractor must familiarize himself with the terms of the above documents.

1.02 SCOPE OF WORK
   A. Scope of Work: The following Stand Alone Controls manufacturers are approved for use on this project. No substitutions of manufacturers other than those listed will be considered. Input and output devices are not restricted to these manufacturers. Systems approved for bidding are:
      1. Approved Manufacturers:
         a. Honeywell.
         b. Trane.
         c. Carrier

1.03 RELATED DOCUMENTS
   A. All work of this Division shall be coordinated and provided by the single Controls Contractor.
   B. The work of this Division shall be scheduled, coordinated, and interfaced with the associated work of other trades. Reference the Division 23 Sections for details.

1.04 DEFINITIONS
   A. Analog: A continuously variable system or value not having discrete levels. Typically exists within a defined range of limiting values.
   B. Binary: A two-state system where an “ON” condition is represented by one discrete signal level and an “OFF” condition is represented by a second discrete signal level each separated by a defined deadband. Digital Inputs and Digital Outputs are examples.
   C. Controls Contractor: The single Contractor to provide the work of this Division. This Contractor shall be the primary installer, commissioner and ongoing service provider for the Controls work.
   D. Control Sequence: A pre-programmed arrangement of software algorithms, logical computation, target values and limits as required to attain the defined operational control objectives.
E. Direct Digital Control: The digital algorithms and pre-defined arrangements included in the controls software to provide direct closed-loop control for the designated equipment and controlled variables. Inclusive of Proportional, Derivative and Integral control algorithms together with target values, limits, logical functions, arithmetic functions, constant values, timing considerations and the like.

F. Node: A digitally programmable entity existing on the controls network.

G. PC: Personal Computer from a recognized major manufacturer. PC “clones” assembled by a third-party Subcontractor is not acceptable. PC must also have documentation verifying that it has been tested and is completely compatible with all installed software and communicates with any peripherals such as modems, NEC cards, printers, hubs, zip drives, etc. that may be attached.

H. Wiring: The term “Wiring” and its derivatives when used in this Division shall mean provide the controls wiring and terminations.

I. Install: The term “Install” and its derivatives when used in this Division shall mean receive at the jobsite and mount.

J. Software: The term “software” and its derivatives when used in this Division shall mean all of programmed digital processor software, preprogrammed firmware and project specific digital process programming and database entries and definitions as generally understood in the controls industry for real-time, integrated controls configurations.

K. The following abbreviations and acronyms may be used in describing the work of this Division:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADC</td>
<td>Analog to Digital Converter</td>
</tr>
<tr>
<td>AI</td>
<td>Analog Input</td>
</tr>
<tr>
<td>ANSI</td>
<td>American National Standards Institute</td>
</tr>
<tr>
<td>AO</td>
<td>Analog Output</td>
</tr>
<tr>
<td>ASCII</td>
<td>American Standard Code for Information Interchange</td>
</tr>
<tr>
<td>AWG</td>
<td>American Wire Gauge</td>
</tr>
<tr>
<td>CFM</td>
<td>Cubic Feet Per Minute</td>
</tr>
<tr>
<td>DAC</td>
<td>Digital to Analog Converter</td>
</tr>
<tr>
<td>DDC</td>
<td>Direct Digital Control</td>
</tr>
<tr>
<td>DI</td>
<td>(Binary) Digital Input</td>
</tr>
<tr>
<td>DO</td>
<td>(Binary) Digital Output</td>
</tr>
<tr>
<td>EEPROM</td>
<td>Electronically Erasable Programmable Read Only Memory</td>
</tr>
<tr>
<td>EMI</td>
<td>Electromagnetic Interference</td>
</tr>
<tr>
<td>FAS</td>
<td>Fire Alarm Detection and Annunciation System</td>
</tr>
<tr>
<td>HOA</td>
<td>Hand-Off-Auto</td>
</tr>
<tr>
<td>ID</td>
<td>Identification</td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers</td>
</tr>
<tr>
<td>I/O</td>
<td>Input/Output</td>
</tr>
</tbody>
</table>
1.05 QUALITY ASSURANCE

A. General:

1. The Controls Contractor shall have a branch facility within a 100-mile radius of the job site supplying complete maintenance and support services on a 24 hour, 7-day-a-week basis. This branch facility shall provide the work for this project. This support facility shall have spare parts and all necessary test and diagnostic equipment required to install, commission and service the stand alone controls.

2. As evidence and assurance of the Contractor’s ability to support the Owner’s system with service and parts, the Contractor must have been in business for at least the last ten (10) years and have successfully completed three projects comparable to the value of this contract in the preceding five years.

B. Quality Management Program:

1. Provide a competent and experienced Controls Project Manager employed by the Controls Contractor. The Project Manager shall be supported as necessary by other Controls Contractor employees in order to provide professional management service for the work. The Project Manager shall attend scheduled Project Meetings as required and shall be empowered to make technical, scheduling and related decisions on behalf of the Controls Contractor.
1.06 REFERENCES

A. All work shall conform to the following Codes and Standards, as applicable:
   3. Underwriters Laboratories (UL) listing and labels.
   4. UL 916 Energy Management
   5. NFPA 70 - National Electrical Code.
   7. NFPA 92A and 92B Smoke Purge/Control Equipment.
   8. Factory Mutual (FM).
  10. National Electric Manufacturer’s Association (NEMA).
  11. American Society of Mechanical Engineers (ASME).
  12. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
  14. Institute of Electrical and Electronic Engineers (IEEE).
  17. Occupational Safety and Health Administration (OSHA).
  20. Americans Disability Act (ADA)

B. In the case of conflicts or discrepancies, the more stringent regulation shall apply.

C. All work shall meet the approval of the Authorities Having Jurisdiction at the project site.

1.07 SUBMITTALS

A. Control Drawings, Product Data, and Samples:
   1. The Controls Contractor shall submit a complete controls package divided in two sections. The first section shall be delivered within 30 days after the contract has been awarded and the second section shall be delivered within 60 days after the contract has been awarded.
   2. Allow at least 15 working days for the review of each package by the Engineer.
3. Equipment and systems requiring approval of local authorities must comply with such regulations and be approved. Filing shall be at the expense of the Controls Contractor where filing is necessary. Provide a copy of all related correspondence and permits to the Owner.

B. Submittal Section 1:
1. Product data sheets for all products including software.

C. Submittal Section 2:
1. Controller wiring diagrams and sequences. Control drawings shall be created on AUTOCAD software, version 14 or newer.
2. Detailed Bill of Material, identifying part number, quantity, description, and optional features.
3. Room Schedule including a separate line for each terminal unit showing system name, minimum/maximum cfm, box area, and number of reheat stages.
4. Details of all interfaces and connections to the work of other trades.

1.08 RECORD DOCUMENTATION

A. Operation and Maintenance Manuals:
1. Three (3) copies of the Operation and Maintenance Manuals shall be provided to the Owner's Representative upon completion of the project. The entire Operation and Maintenance Manual shall be furnished on Compact Disc media, and include the following for the controls provided:
   a. Table of contents
   b. As-built Control Drawings using AutoCAD Version 14 or newer. Drawings shall represent the as-built condition of the system and incorporate all information supplied with the approved submittal.
   c. Manufacturer’s product data sheets for all products including software.
   d. System Operator’s manuals.
   e. Wiring termination diagrams (use AutoCAD version 14 or newer).
   f. Interfaces to all third-party products and work by other trades.
   g. Valve, Damper and Room Schedules
   h. Point to point checkout sheets with dates and checkout signatures
   i. Repair contact name and phone number.
1.09 WARRANTY

A. Standard Material and Labor Warranty:

1. Provide a one-year labor warranty on the Stand Alone Controls.
2. The controls components shall be free from defects in material and workmanship under normal use and service. If within one (1) year from the date of awarding of the Certificate of Occupancy any controls equipment is found to be defective, it will be replaced, repaired or adjusted by the Controls Contractor free of charge. The Controls Contractor is not responsible for the removal or reinstallation of any components that were originally installed by others, such as valves, dampers, wells, air flow stations, etc.
3. Maintain an adequate supply of materials within 100 miles of the Project site such that replacement of key parts and labor support, including programming. Warranty work shall be done during Controls Contractor’s normal business hours unless there is an emergency.
4. Maintain an on-site record of all work done, all items removed from site, all items returned to site, all new replacement items installed and all remedial programming and database entry work undertaken including software revisions installed. Maintain a record of all re-calibrations required as a result of Warranty service.

1.10 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Not Applicable

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 STAND ALONE CONTROLS DESCRIPTION

A. Each unit shall have individual stand alone controls that perform all the functions listed in the drawings. Stand alone controls described as programmable shall have 7-day programmable schedules with at least two cycles (off/on) per day and 10-hour battery back-up, one cycle including night setback. All programmable stand alone controllers shall have schedule override capabilities. All controllers shall have the ability to adjust the controlling variable setpoint. Units that control heating and cooling shall have a minimum 5°F heating and cooling deadband. Units shall have optimum start/stop. Unitary air-cooled heat pump controllers shall minimize supplemental heat usage during start-up, set-up and defrost, use compressor as first heat stage and indicate visually, when the supplemental heat is active.
B. The work of the single Controls Contractor shall be as defined individually and collectively in all Sections of this Division specifications together with the associated Point Sheets and Drawings and the associated interfacing work as referenced in the related documents as are listed in Part 1 of this Section.

C. The controls work shall consist of the provision of all labor, materials, etc. as Specified in these Division documents which are required for the complete, fully functional and commissioned stand alone controls.

D. Provide a complete, neat and workmanlike installation. Use only employees who are skilled, experienced, trained, and familiar with the specific equipment, software and configurations to be provided for this Project.

E. Manage and coordinate the controls work in a timely manner in consideration of the Project schedules. Coordinate cooperatively with the associated work of other trades so as to assist the progress and not impede or delay the work of associated trades.

2.03 NODES

A. HVAC and Application Nodes:
1. HVAC Node shall provide standalone direct digital control of HVAC systems.
2. A dedicated HVAC Node shall be configured and provided for each primary HVAC system (air handler, chiller, boiler) and each terminal HVAC system (VAV Box, Unit Heater, Fan Coil Unit, Cabinet Heater, Heat Pump, Fan Powered Box, CV Box)
3. Each HVAC Node shall retain its function and setpoint information in the event of a power failure, and shall return to normal operation upon restoration of power.
4. Each HVAC system with an economizer shall have an economizer control module included as part of the HVAC node control package.
5. Application Nodes shall be physically separate from server hardware and software, reside in the building, and be the only means of EMCS data transfer to the server. Application node shall be a complete off the shelf software/hardware package manufactured by a licensed Application node manufacturer.

PART 3 - PERFORMANCE/EXECUTION

3.01 CONTROLS SPECIFIC REQUIREMENTS

A. Temperature Sensors:
1. Room temperature sensors shall be mounted 48” AFF unless otherwise specified on drawings. Verify locations with customer representative.
B. Actuation / Control Type:

1. Primary Equipment:
   a. As a default, spring return is required in all equipment exposed to outside air and/or fail-safe situations.
   b. All air handling equipment damper and valve actuation shall be electric, spring return and proportionally controlled.
   c. Air handling equipment is defined as any unit with outside air intake.
   d. All 120 VAC driven actuators shall have disconnects in accordance with electrical standards.

C. Adjust room numbers and floor plans as necessary to reflect actual conditions.

3.02 INSTALLATION PRACTICES

A. Stand Alone Controls Wiring:

1. All conduit, wiring, accessories and wiring connections required for the installation of the Stand Alone Controls, as herein specified, shall be provided by the Controls Contractor unless specifically shown on the Electrical Drawings under Division 26 Electrical. All wiring shall comply with the requirements of applicable portions of Division 26 and all local and national electric codes, unless specified otherwise in this section.

2. All Controls wiring materials and installation methods shall comply with Controls manufacturer recommendations.

3. The sizing type and provision of cable, conduit, cable trays, and raceways shall be the design responsibility of the Controls Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, raceways and/or conduit by the Controls Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.

4. Wire/conduit ratios shall follow the same wire/conduit ratios included in Division 26.

5. Class 2 Wiring:
   a. All Class 2 (24VAC or less) wiring shall be installed in conduit or be plenum rated and shall be installed in accordance with local code requirements.
   b. Conduit is not required for Class 2 wiring in concealed accessible locations. Inaccessible locations such as “hard lid” ceilings require conduit.
   c. Wire supports and be installed per local wiring code requirements. As a default, wire shall be supported every 5' from the building structure utilizing metal hangers designed for this application.
d. Where it is not possible to conceal raceways in finished locations, surface raceway (Wiremold) may be used as approved by the Engineer.

e. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.

f. Provide firestopping for all penetrations used by dedicated Controls conduits and raceways using approved fire resistive sealant. All other project firestopping to be by other trade.

g. All wiring passing through penetrations, including walls or other structure, shall be in conduit or enclosed raceway.

h. Penetrations of floor slabs shall be by core drilling. All penetrations shall be plumb, true, and square.

i. No penetrations in structural elements shall be made before receipt of written approval from the Structural Engineer.

6. Class 2 signal wiring and 24VAC power can be run in the same conduit. Power wiring 120VAC and greater cannot share the same conduit with Class 2 signal wiring.

7. Perform circuit tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:
   a. All circuits are continuous and free from short circuits and grounds.
   b. All circuits are free from unspecified grounds; that resistance to ground of all circuits is no less than 50 megaohms.
   c. All circuits are free from induced voltages.

8. Provide complete testing for all cables used under this Contract. Provide all equipment, tools, and personnel as necessary to conduct these tests.

9. Provide for complete grounding of all signal and communications cables, panels and equipment so as to ensure system integrity of operation. Ground cabling and conduit at the panel terminations. Avoid grounding loops.

B. Controls Line Voltage Power Source:

1. 120-volt AC circuits used for the controls shall be taken from panelboards and circuit breakers provided by Division 26. Coordinate circuit installation with Division 26. Division 26 shall be responsible for the installation of 120 VAC controls circuits.

2. Circuits used for the controls shall be dedicated and shall not be used for any other purposes.

3. Terminal unit controllers may use 120-volt AC power from motor power circuits.

C. Controls Identification Standards:

1. Node Identification: All nodes shall be identified by a permanent label fastened to the outside of the enclosure. Labels shall be suitable for the node location.
2. Cable and/or conduit shall be labeled at suitable intervals with the controlled unit’s name. Labeling shall be sufficient to trace cable from device to unit.
3. Specify a different wire color for analog, digital, power and communication wiring. Include wiring color on control drawings legends.
4. Raceway Identification: All the covers to junction and pull boxes of the control's raceways shall be labeled.
5. Wire Identification: All low and line voltage control wiring shall be identified by a number, as referenced to the associated shop drawing and as-built drawing, at each end of the conductor or cable. Identification number shall be permanently secured to the conductor or cable and shall be typed.

D. Stand Alone Node Installation:
1. The controls panels and cabinets shall be mounted at shoulder height wherever possible. All panels shall be accessible. Each cabinet shall be anchored per the manufacturer's recommendations.
2. The Controls Contractor shall be responsible for coordinating panel locations with other trades and Electrical and Mechanical Contractors.

E. Input Devices:
1. All Input devices shall be installed per the manufacturer recommendation and shall be of the type and accuracy suitable for this specific application.
2. Locate components in accessible local control panels wherever possible.
3. The Mechanical Contractor shall install all in-line devices such as temperature wells, pressure taps, airflow stations, etc.
4. Outside Air Sensors:
   a. Sensors shall be mounted on the North wall to minimize solar radiant heat impact or located in a continuous intake flow adequate to monitor outside air conditions accurately.
   b. Sensors shall be installed with a rain proof, perforated cover.
5. Building Differential Air Pressure Applications (-0.25" to +0.25" w.c.):
   a. Transmitter’s exterior sensing tip shall be installed with a shielded static air probe to reduce pressure fluctuations caused by wind.
   b. The interior tip shall be inconspicuous and located as shown on the drawings.
6. Duct Temperature Sensors:
   a. Duct mount sensors shall mount in an electrical box through a hole in the duct and be positioned so as to be easily accessible for repair or replacement.
b. The sensors shall be insertion type and constructed as a complete assembly including lock nut and mounting plate.

c. For ductwork greater in any dimension than 48 inches or where air temperature stratification exists such as a mixed air plenum, utilize an averaging sensor.

d. The sensor shall be mounted to suitable supports using factory approved element holders.

7. Low Temperature Limit Switches:
   a. Install on the discharge side of the first water or steam coil in the air stream.
   b. Mount element horizontally across coil in a serpentine pattern ensuring each square foot of coil is protected by 1 foot of sensor.
   c. For large duct areas where the sensing element does not provide full coverage of the air stream, provide additional switches as required to provide full protection of the air stream.

8. Air Differential Pressure Status Switches:
   a. Install with static pressure tips, tubing, fittings, and air filter.

9. Room Temperature Sensor:
   a. Install sensor with insulation if mounted on an exterior wall.

F. HVAC Output Devices:

1. All output devices shall be installed per the manufacturer’s recommendation and shall be suitable in type and accuracy for this specific application. The Mechanical Contractor shall install all in-line devices such as control valves, dampers, etc.

2. Actuators: All control actuators shall be sized capable of closing against the maximum system shut-off pressure. The actuator shall modulate in a smooth fashion through the entire stroke.

3. Electronic Signal Isolation Transducers: Whenever an analog output signal from the controls are to be connected to an external control system as an input (such as a chiller control panel), or is to receive as an input a signal from a remote system, provide a signal isolation transducer. Signal isolation transducer shall provide ground plane isolation between systems. It is the Controls Contractor’s responsibility to determine if isolation is necessary.

4. Relays: All relays used to start/stop any piece of mechanical equipment that does not have an HOA switch shall have a Closed-Open-Auto override switch located on the load side of the relay.
3.03 TRAINING

A. The Controls Contractor shall provide the following training services:
   1. Provide one day of on-site orientation by a system technician who is fully knowledgeable of the specific installation details of the project. This orientation shall, at a minimum, consist of a review of the project as-built drawings and a walk through of the facility to identify panel and device locations. Training may be split into smaller sessions on different days if the Owner prefers.
   2. Supply a list of available factory training classes and contact information.

3.04 COMMISSIONING

A. Controls Contractor shall provide the Commissioning Agent with a completed Acceptance Verification document prior to beginning point-to-point activities. Final Acceptance Verification document shall be included in the Commissioning Field Notebook. The commissioning agent may be an independent agent, the customer, or the Design Engineer.

B. Acceptance Verification Document is defined as a series of check sheets that include all stand alone controls and functions. Each point entry shall be signed and dated verifying that each point and function has been fully calibrated and tested.

C. The Controls Contractor shall provide qualified technician to support the commissioning requirements outlined in specification Sections 01 65 00 and 15995. The Controls Contractor shall provide support to the commissioning agent during the performance testing and shall provide trends as needed for their review.

D. Conduct functional performance tests to demonstrate that controls systems maintain setpoints and operates through the full range of operations. The commissioning agent will provide functional tests that the Controls Contractor shall review and provide comments on the tests for incorporation into the final test documents.

E. Provide all necessary specialist labor, materials and tools to demonstrate to the Engineer that the stand alone controls have been commissioned and are operating in compliance with the contract. Prepare a list of noted deficiencies signed by both the Engineer and the Controls Contractor.

F. Promptly rectify all listed deficiencies and submit to the Engineer that this has been done.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL
A. Furnish devices as indicated with complete installation procedures for systems.

1.02 RELATED SECTIONS
A. General Conditions, Division 1
B. Section 20 00 00 – General Mechanical Requirements
C. Section 23 05 23 – Valves for HVAC Piping
D. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Thermometers
B. Gauges
C. Strainers
D. Unions
E. Dielectric Unions
F. Flexible Connectors
G. Backflow Prevention Devices
H. Pressure Reducing Valves
I. Expansion Joint Assemblies

1.04 OPERATION AND MAINTENANCE OF THIS SECTION
A. Backflow Prevention Devices

PART 2 - PRODUCTS

2.01 THERMOMETERS
A. Adjustable angle type, 304 stainless steel stem, 5" reading dial type, true anti-parallax-dial black numerals, markings in degrees F., stainless steel, double-strength glass viewing window. Provide sockets with extension necks where installed on insulated piping.
2.02 UNIONS

A. Unions on Copper Pipe:
   1. In 2-Inch Pipe and Smaller: Wrought copper solder joint copper to copper union.
      a. Approved Manufacturers:
         i. Nibco
         ii. Watts
         iii. Mueller
   2. In 2-1/2-Inch Pipe and Larger: Brass flange unions.
      a. Approved manufacturers:
         i. Nibco
         ii. Watts
         iii. Mueller

2.03 DIELECTRIC UNIONS

A. Dielectric Unions: Rated at 250 psi at 180 deg. F., conforming to ANSI B16.39. Type and size to match piping.

B. Approved Manufacturers:
   1. Victaulic 647, or prior approved equal

2.04 EXPANSION/SEISMIC JOINT ASSEMBLIES

A. Flexible Expansion Loops:
   1. Provide flexible expansion loops of size and type as required per the pipe installation. At a minimum provide one (1) expansion loop per 100 feet of straight pipe. Flexible loops shall consist of two flexible sections of hose and braid, two 90° elbows, and a 180° return assembled in such a way that the piping does not change direction, but maintains its course along a single axis. Flexible loops shall have a factory supplied, center support nut located at the bottom of the 180° return, and a drain/air release plug. Flexible loops shall impart no thrust loads to system support anchors or building structure. Loops shall be installed in a neutral, pre-compressed or pre-extended condition as required for the application. Install and guide per manufacturer’s recommendations. Materials of construction and end fitting type shall be consistent with pipe material and equipment/pipe connection fittings. For potable water service, connectors shall be UL classified in accordance with ANSI/NSF 61-1088 standards.
   2. Approved Manufacturers:
      a. Metraflex, or prior approved equal
B. Externally Pressurized Expansion Joint:

1. Expansion joints to be of the packless, externally pressurized type. Pressure rated for 150 psi @ 700 F or 300 psi @ 700 F. Movement capabilities to be 4", 6", or 8" axial movement, as required. All welded construction with multiple ply stainless steel bellows, heavy gauge steel shroud, integral guide rings, and internal liner. System line pressure to be external to the bellows to minimize squirm. Double end joints shall have anchor base to act as intermediate anchor. All joints to be provided with drain connection and lifting lug. All materials of construction, pressure ratings, and end fittings shall be appropriate for the application. Guiding and anchoring per EJMA recommendations and guidelines.

2. Approved Manufacturers:
   a. Metraflex MetraGator, or prior approved equal

PART 3 - EXECUTION

3.01 INSTALLATION

A. Thermometers: Install thermometers and thermal wells in piping at locations indicated, and so as to be easily read.

B. Pressure Gauges: Install pressure gauges at each side of pressure reducing valves; and as indicated.

C. Strainers: Install strainers as indicated. Provide plugged gate or ball valve in blow-off connection on strainers, valve shall be same size as blow-off tapping.

D. Unions: Install unions in pipe connections to control valves, coils, regulators, reducers, all equipment, and where it may be necessary to disconnect the equipment or piping for repairs or maintenance; and as indicated.

E. Expansion/Seismic Joint Assemblies: Install every 100 feet of straight length of pipe (pipe runs without any change in direction) unless shown otherwise on drawings.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL
A. Includes sleeving and sealing of piping and ductwork.

1.02 RELATED SECTIONS
A. General Conditions, Division 1
B. Section 22 11 16 – Domestic Water Pipe and Fittings
C. Section 23 31 13 – Steel Ductwork.

1.03 REFERENCES
A. ASTM E814: Fire Tests of Through-Penetration Fire Stops
B. UL 1479: Through-Penetration Fire Stop Systems.

1.04 SUBMITTAL REQUIREMENTS
A. Submittal requirements for this Section.
   1. Seals

1.05 OPERATION AND MAINTENANCE REQUIREMENTS FOR THIS SECTION
A. Not Applicable

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
A. Products shall comply with Section 20 00 00, paragraph 2.01, Approved Manufacturers.
B. Fire Seals: 3M, Dow Corning, General Electric, Rectorseal Metacaulk.

2.02 PIPE SLEEVES
A. Size: Inside diameter of pipe sleeves shall be at least 1/2-inch larger than the outside diameter of the pipe or pipe covering, so as to allow free movement of piping.
B. Ends: Sleeve ends shall be cut flush with finished surfaces, except in rooms having floor drains where sleeves shall be extended 3/4-inch above finished floor.
C. Material - Structural: Sleeves through structural elements shall be fabricated from Schedule 40 steel pipe.
D. Material - Non-structural: Sleeves through non-structural elements shall be fabricated from 18-gauge galvanized sheet metal or 24-gauge spiral duct.

E. De-burr pipe ends and smooth slab penetration (to accept final slab finish) from sleeves extending above finished floor.

2.03 DUCT SLEEVES

A. Size: Inside dimension of sleeves shall be at least ½” larger than the outside dimensions of the duct or duct covering on all sides.

B. Ends: Sleeve ends shall be cut flush with finished surface.

C. Material - Non-structural: Sleeves shall be fabricated from 20-gauge galvanized steel, shall be continuous around the interior without holes or openings, and shall match the configuration of the item being sleeved.

D. Material - Structural: Sleeves through structural elements shall be fabricated from Schedule 40 steel pipe (round openings) and welded steel supporting elements (sizes/arrangement as shown on drawings) for other openings.

2.04 SEALS

A. Seals in Interior Fire Rated Assemblies: Shall be tested in accordance with ASTM E814 and shall be UL classified per UL 1479 as a through-penetration fire stop device.

B. Seals in Exterior Masonry Walls and Floors:
   1. Piping: Seals shall consist of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall opening. The seal assembly shall expand when mechanically tightened to provide an absolute watertight seal between the pipe and wall opening. Sizing shall be per manufacturer’s recommendations. Seal shall be Thunderline “Link-Seal” or approved equal.
   2. Ducts: Silicone type sealant, designed for use with duct material involved as weatherproof sealant and as specified in Section 07900.

C. Seals in Other Areas: Packed fiberglass or wool insulation, where no weatherproofing or adhesive properties are required; otherwise, sealants shall be silicone type, as specified in applicable Division 7 Specification Section.
PART 3 - EXECUTION

3.01 INSTALLATION OF PIPE SLEEVES

A. Provide pipe sleeves for all piping passing through walls, floors, partitions, roofs, foundations, footings, grade beams, and similar elements, except that sleeves are not required for penetrations through existing single solid elements, having no voids, at the location where the piping passes through the solid elements (e.g., solid wood stud, core drilled solid concrete, etc.). Where a sleeve is required, such sleeve shall continue all the way through any solid items within that element.

B. Set sleeves plumb or level (or sloped as required for drainage pipe) in proper position, tightly fitted into the work.

C. Fill openings around outside of pipe sleeve with same material as surrounding construction, or with material of equivalent fire and smoke rating.

D. Seal around all pipes inside of pipe sleeve.

E. Insulation shall run continuous through sleeves in non-fire rated elements. Insulation shall not run continuous through sleeves in fire rated elements unless the fire sealant system used is UL accepted for use with insulated pipes.

F. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade.

3.02 INSTALLATION OF DUCT SLEEVES

A. Provide duct sleeves for all round ducts less than 15 inches in diameter where the duct passes through any floors, walls, ceilings, partitions, or roofs and similar elements.

B. Provide duct sleeves for all square and rectangular ducts having their largest dimension 14 inches and less where the duct passes through any floors, walls, ceilings, partitions, roofs, and similar elements.

C. Round ducts larger than 15 inches in diameter, and square of rectangular ducts larger than 14 inches in any dimension, shall have framed openings where the duct passes through any element. Such framed openings shall be of the same type as the structural materials used in the wall and shall comply with materials specified for this project. Sleeves shall be provided in addition to the framed opening where any void space(s) occurs through the penetration (as through CMU walls, double walls, etc.).

D. Set sleeves plumb or level, in proper position and location, tightly fitted into the work.

E. Fill openings around outside of duct sleeve with same material as surrounding construction, or with material of equivalent fire and smoke rating.
F. Sleeves are not required for penetrations through existing single solid elements, having no voids, at the location where the duct passes through the element (e.g., precast concrete panels with pre-framed openings, core drilled/saw cut solid concrete, etc.). Where a sleeve is required, such sleeve shall continue all the way through any solid items within that element however.

G. Insulation shall run continuous through sleeves in non-fire rated elements. Insulation shall not run continuous through sleeves in fire rated elements unless the fire sealant system used is UL accepted for use with insulated pipes.

H. Sleeves for fire dampers shall be as specified for fire dampers and be in compliance with the damper UL listing.

3.03 INSTALLATION OF SEALS

A. Provide seals around all piping and ducts passing through walls, floors, roofs, foundations, footings, grade beams, partitions, and similar elements.

B. Seals shall be of material and workmanship to maintain the fire and smoke rating of element being penetrated. Seals ability to maintain the rating of the element being penetrated shall be listed in UL Laboratories Building Materials Directory or otherwise confirmed by an approved listing agency. It shall be the Contractor's responsibility to submit shop drawings and technical data showing seals and systems proposed, and corresponding agency approval. The Contractor shall also be responsible to submit any data as required by local agencies to satisfy them that the Contractor's proposed fire seals are satisfactory.

C. Seals shall be watertight where the penetration may be exposed to water or moisture.

D. Duct penetrations through roof or exterior wall assemblies shall be provided with flashings for a weathertight assembly in accordance with SMACNA HVAC Duct Construction Standards. Such openings shall be sealed to be weatherproof.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL

A. Includes, but not limited to, the furnishing and installation of piping for refrigeration systems. The general arrangement and location of piping is shown on the plans. The pipe sizing and exact arrangements shall be designed by this contractor. This contractor shall provide all labor, materials, equipment, refrigeration specialties, testing, evacuation, oil and refrigerant charging as required for a complete and operational system. The design and installation shall conform to the equipment manufacturer's recommendations and installation instructions and all local mechanical and environmental codes.

B. Single line indicated on plans designates the proposed routing for the refrigeration piping between the indoor and outdoor units. That single line represents all the required piping runs required for the system designed. Contractor to verify quantity of circuits, piping runs and sizing prior to bid and installation.

1.02 RELATED SECTIONS

A. General Conditions, Division 01

B. Section 20 00 00 – General Mechanical Requirements

C. Section 22 00 00 – Excavation and Backfill For Mechanical Underground Utilities

D. Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

E. Section 23 07 19 – HVAC Piping Insulation

F. Section 23 81 45 – Variable Refrigerant Zone System

1.03 QUALITY ASSURANCE

A. Refrigerant piping shall be installed by a refrigeration contractor licensed in the State of Washington, having a minimum of five (5) years' experience in refrigeration piping installation, and certification of technical training specifically in refrigeration from an industry recognized training program. Proof of license, experience and training shall be submitted as part of the Mechanical Submittals, see Section 20 00 00. All technicians working on-site shall be certificated in the use and handling of refrigerants in accordance with federal EPA regulation 40 CFR Part 82, sub-paragraph F.
1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION
   A. Pipe
   B. Fittings
   C. Brazing Material
   D. Isolation Valves
   E. Shop Drawings and Calculations
   F. Certified Installer Information

1.05 OPERATION AND MAINTENANCE REQUIREMENTS FOR THIS SECTION
   A. Valve Diagram
   B. Shop Drawings and Calculations

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
   A. Not Applicable

2.02 REFRIGERANT PIPING
   A. Meet the requirements of ASTM B 280-86, "Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service", ACR hard drawn straight lengths.
   B. Use of pre-charged soft copper line sets is prohibited.

2.03 REFRIGERANT FITTINGS
   A. General: 100% Wrot copper with long radius elbows.
   B. Approved Manufacturers: Mueller Streamline, Nibco.

2.04 BRAZING MATERIAL
   A. Brazing rods with a minimum of 5% silver content shall be utilized. Rods containing Cadmium will not be permitted.

2.05 ISOLATION VALVES
   A. Line size, ball type isolation valves shall be provided on both vapor and liquid lines of all systems. Provide one vapor and 2 liquid line valves (for filter/drier isolation) at the outdoor unit.
   B. Valves shall be suitable for use with HFC refrigerants, forged brass body, seal cap and wrot copper fitting extensions. Temperature rating shall be -40°F to +325°F minimum.
C. Coordinate optimum location of valves with filter/dryer unit (a valve on each side of the filter) to facilitate replacement with minimal loss of refrigerant. At minimum, provide one set of schrader valves located on the indoor coil side of the valves to facilitate evacuation and charging of the piping.

PART 3 - EXECUTION

3.01 SHOP DRAWINGS AND CALCULATIONS

A. Provide shop drawings of each system in the project. Drawings are to be at 1/8th inch per foot minimum, and in sufficient detail to count fittings and devices with all vertical and horizontal runs fully dimensioned. Show sizes of all piping and type of fittings. Provide large scale details of indoor and outdoor equipment connections with all devices located, chases through the building components, refrigerant traps, and underground piping runs.

B. Provide calculations that support the shop drawings with an individual pipe sizing calculation for each piping system. These calculations are to be performed by the equipment manufacturer's technical support personnel and submitted to the Engineer. These calculations shall provide total system capacity loss due to piping, system vapor velocities and critical system operating temperatures.

C. **All piping systems shall be sized as required to prevent no more than 5% system capacity loss due to piping.**

D. Each piping system is to be individually sized accounting for that particular unit’s capacity, piping lengths, fittings and devices. Oil return is a major consideration and refrigerant vapor velocity must be sufficient to entrain oil. Minimum velocity must be 800 fpm in horizontal runs and 1500 fpm in vertical suction risers.

3.02 PIPING INSTALLATION

A. All vapor lines shall be sloped downward towards the compressor at a rate of one (1) inch per 10 lineal feet to facilitate oil return.

B. Provide oil traps at vertical risers where required to return oil to compressor and to prevent liquid migration back to the compressor in the off cycle.

C. Refrigeration system connections shall be copper-to-copper type properly cleaned and brazed. Use flux only where required for brazing brass components. Soft solder connections are prohibited. Only silver solder containing a minimum of 5% silver shall be utilized.

D. Circulate dry nitrogen as a shield gas through piping while being brazed to eliminate formation of copper oxide during brazing operation.
E. All piping shall be secured using unistrut type channel with "Hydrosorb" type clamps. All clamps shall be specifically designed for use with refrigeration piping and shall contain internal plastic grommet for vibration and thermal isolation. The use of general-purpose clamps, conduit straps or plumbers' tape is strictly prohibited. Carefully plan routing and grouping of all piping to ensure a neat and professional installation.

F. Where necessary to offset piping around obstructions, utilize 45° elbows in lieu of 90° elbows to minimize pressure losses.

G. Where piping is installed underground, provide an utilidor or conduit type system in which all piping shall be routed and protected against physical damage and moisture. Refer to drawings for additional installation details.

H. A complete review of all installation recommendations produced by the equipment manufacturer is recommended prior to the installation of ACR piping. Conformance to all manufacturers' recommendations will be enforced.

I. All leak testing shall be performed and verified prior to covering any concealed or buried piping. See Field Leak Tests.

3.03 FIELD LEAK TESTS

A. All leak tests shall be witnessed and confirmed by the Engineer or Owner's representative. The purpose of all leak testing is to confirm the integrity of field installed piping. If equipment is provided with a factory provided refrigerant charge, the equipment may be isolated and excluded from the test. If shipped with only a "holding charge" or no charge, the isolation valves shall be opened, and the equipment shall be included in the pressure testing.

B. Following completion of the refrigeration piping systems, the following tests shall be performed.

1. Connect test gauge with minimum of "2% accuracy to the piping system to be tested and pressurize piping system with dry nitrogen gas to 1.25 x design service pressure (minimum of 250 psi) or as recommended by the equipment manufacturer. Do not introduce any refrigerant into the system prior to pressure testing. The test gauge shall remain connected throughout the test period. Record actual test gauge pressure, date, time and ambient temperature. System shall remain under test for a period of one week. At the conclusion of the test period, record pressure, date, time and ambient temperature. If the test gauge is within 1% (2.5 PSIG) of the original test pressure as witnessed by the Engineer, (plus adjustment fluctuations in ambient temperatures) the system will be "Passed" and approved for evacuation and charging procedures.
3.04 OIL/REFRIGERANT CHARGING

A. Prior to commencing oil and refrigerant charging procedures, this Contractor shall refer to and closely follow the manufacturers’ specific procedures for charging the system. As a minimum, the following procedures shall be followed:

1. Calculate oil charge using manufacturer’s recommended method and add oil to compressor crankcase as necessary for size of piping system. Affix permanent, weatherproof label to unit indicating date, type of oil, and amount added, signed by the technician performing the task.

2. Draw a vacuum on each entire system with vacuum pump to 200 microns using vacuum gauge calibrated in microns. Break vacuum with refrigerant shipped with unit and re-establish a 200-micron vacuum (double evacuation). Calculate recommended charge and add the appropriate refrigerant charge by weight using a digital scale. Check and adjust charge as necessary to obtain manufacturer’s specified operating pressures and superheat during start-up procedure.

3.05 SYSTEM START-UP

A. Perform a system start-up and check-out procedure as recommended by the equipment manufacturer, and as indicated on the enclosed system Start-up and Check-out Log. This start-up and check-out shall be performed in the presence of the Engineer or Owner’s representative.

B. Provide one week’s written notice to the Engineer prior to start of equipment start-up and check-out.

C. Submit the following completed documentation including copies of the completed compressor warranty registration forms to the Engineer upon completion of system start-up.

3.06 START-UP LOG

(See attached.)
### START-UP LOG

Date: ____________________________  Project Title: ____________________________
Contractor: ______________________  Tech. Name: ____________________________
Refrigerant License #: ____________________________

#### EQUIPMENT:

<table>
<thead>
<tr>
<th>Indoor</th>
<th>Outdoor</th>
<th>Accessories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit #:</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>Make:</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>Model:</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>Serial#:</td>
<td>_______</td>
<td>_______</td>
</tr>
<tr>
<td>Location:</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

#### REFRIGERANT CHARGE:

Type: ______  Amount:

#### OIL CHARGE:

Type: ______  Amount:

#### TEMPERATURES:

Indoor: ______  Outdoor: ______
Return Air: ______  Supply Air: ______

#### COMPRESSOR(S):

<table>
<thead>
<tr>
<th>#1</th>
<th>#2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling</td>
<td>Cooling</td>
</tr>
<tr>
<td>Discharge Pressure:</td>
<td>_______</td>
</tr>
<tr>
<td>Suction Pressure:</td>
<td>_______</td>
</tr>
<tr>
<td>Actual</td>
<td>Rated</td>
</tr>
<tr>
<td>Amps:</td>
<td>_______</td>
</tr>
<tr>
<td>Volts(at disconnect) L1 - L2</td>
<td>______</td>
</tr>
</tbody>
</table>

#### INDOOR MOTOR:

Direct Drive ______  Belt Drive ______  Belt Size
Amps-Actual ______  Amps-Rated ______  Volts
Rotation Verified? Yes ( )  No ( )
OUTDOOR MOTOR:
Amps-Actual _____ Amps-Rated _____ Volts

HEAT:
Electric: KW ____________ Volts ____________
None: ________________ (check if no heat)

THERMOSTAT OPERATION:
Type ____________ Fan On During Occupied? Yes ( ) No ( )

Setpoints Occupied Cool _____ Unoccupied Cool

FILTERS:
Type:_____ Size:_____ Quantity:

COMMENTS: _______________________________________________________
___________________________________________________________
___________________________________________________________

TECHNICIAN SIGNATURE: ____________________________________________

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL
   A. Includes, but not limited to, furnishing and installing above-ground ductwork and related items specified below and shown on Drawings.

1.02 RELATED SECTIONS
   A. General Conditions and Division 01 apply to this Section.
   B. Section 20 00 00 - General Mechanical Conditions
   C. Section 23 05 29 - Hangers and Supports for HVAC Piping & Equipment
   D. Section 23 07 13 - Equipment/Ductwork Insulation
   E. Section 23 33 00 - HVAC Specialties

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
   A. Duct liner
   B. Acoustic duct
   C. Access doors
   D. Volume dampers
   E. Motorized dampers
   F. Duct Silencers
   G. Duct Sealers
   H. Duct Closure Collars
   I. Turning vanes

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
   A. Motorized dampers

1.05 DEFINITIONS
   A. Duct Sizes: All duct dimensions shown are inside clear dimensions. Where inside duct lining is specified or indicated, duct dimensions are to the inside face of lining.
   B. Low Pressure System: Velocities less than 2,000 fpm and static pressure in duct 2 inches w.g. or less.
   C. Medium Pressure System: Velocities greater than 2,000 fpm or static pressure in duct up through 6 inches w.g.
D. High Pressure System: Velocities greater than 2,000 fpm or static pressure in duct over 6 inches w.g. and up to 10 inches w.g.

E. Primary Duct System: Any duct between an air handler and a terminal (capable of heating and/or cooling) in a variable air volume or induction terminal system.

F. Gauges: Steel sheet and wire are U.S. Standard Gauge; aluminum sheet is Brown and Sharpe Gauge.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 DUCTS

A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal, except as indicated. Fabricate of zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A 527-85, "Specification for Sheet Steel Zinc Coated (Galvanized) by the Hot-Dip Process, Lock Forming Quality", with G 60 coating.

B. Construct T’s, bends, and elbows with radius of 1-1/2 times width of duct on centerline. Where not possible, provide turning vanes.

C. Increase duct sizes gradually, not exceeding 30° divergence and 45° convergence.

D. Use crimp joints with or without bead for joining round duct sizes 8 inches (200 mm) and smaller with crimp in direction of airflow.

2.03 DUCT JOINTS

A. General: Duct with sides or diameter up to and including 36 inches shall be as scheduled below.

<table>
<thead>
<tr>
<th>Max. Side Inches</th>
<th>Required Minimum Metal Gauges Steel, U.S. Standard Gauge</th>
<th>Type of Transverse Joint Connections</th>
<th>Bracing Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 13”</td>
<td>26</td>
<td>S-drive, pocket or bar slips on 7-10” centers</td>
<td>None</td>
</tr>
<tr>
<td>13” to 24”</td>
<td>24</td>
<td>S-drive, pocket or bar slips on 7-10” centers</td>
<td>None</td>
</tr>
<tr>
<td>25” to 30”</td>
<td>24</td>
<td>S-drive, 1” pocket or 1” bar slips on 7-10” centers</td>
<td>1”x1”x1/8” angles 4’ from joints</td>
</tr>
<tr>
<td>31” to 36”</td>
<td>22</td>
<td>Drive 1” pocket or 1” bar slips on 7-10” centers</td>
<td>1”x1”x1/8” angles 4’ from joints</td>
</tr>
</tbody>
</table>
B. Ducts with sides over 36 inches to 48 inches, transverse duct joint system by Ductmate/25, Nexus, or WDCI (Lite) (SMACNA "E" or "G" Type connection).

C. Ducts 48 inches and larger, Ductmates/35, Nexus, or WDCI (Heavy) (SMACNA "J" Type connection).

D. Proprietary duct connections may be used on other sizes, Ductmate, WDCI, or equal.

2.04 ROUND DUCT


B. Gauge Selection Table:

<table>
<thead>
<tr>
<th>Duct Diameter in Inches</th>
<th>Maximum 2&quot; w.g. Static Positive</th>
<th>Maximum 2&quot; w.g. Static Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spiral Seam Gauge</td>
<td>Longitudinal Seam Gauge</td>
</tr>
<tr>
<td>3 thru 8</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>9 thru 14</td>
<td>28</td>
<td>26</td>
</tr>
<tr>
<td>15 thru 26</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>27 thru 36</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>37 thru 50</td>
<td>22</td>
<td>20</td>
</tr>
<tr>
<td>51 thru 60</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>61 thru 84</td>
<td>18</td>
<td>16</td>
</tr>
</tbody>
</table>

C. Provide insulation where required by the Insulation Schedule in Section 23 07 13 - Equipment/Ductwork Insulation.

2.05 SPIRAL DUCT

A. The outer pressure sheet shall be manufactured from galvanized steel meeting ASTM A 527-67 in the following minimum gauges:

<table>
<thead>
<tr>
<th>Nominal Size Range</th>
<th>Solid Spiral Wound Duct Outer Pressure Shell</th>
<th>Solid Welded Fitting Outer Pressure Shell</th>
</tr>
</thead>
<tbody>
<tr>
<td>3&quot;-12&quot;</td>
<td>26 Ga.</td>
<td>20 Ga.</td>
</tr>
<tr>
<td>13&quot;-24&quot;</td>
<td>24 Ga.</td>
<td>20 Ga.</td>
</tr>
<tr>
<td>25&quot;-34&quot;</td>
<td>22 Ga.</td>
<td>20 Ga.</td>
</tr>
<tr>
<td>35&quot;-48&quot;</td>
<td>20 Ga.</td>
<td>18 Ga.</td>
</tr>
<tr>
<td>50&quot;-58&quot;</td>
<td>18 Ga.</td>
<td>16 Ga.</td>
</tr>
</tbody>
</table>

2.06 DUCT LINER

A. Densities and R-value:
   1. R-3.3: 1.0 inch of 1.5 to 3.0 lb/cu. Ft. duct liner.
2. R-5.3: 1.5 inches of 1.5 to 3.0 lb/cu. Ft. duct liner.
3. R-7: 2.0 inches of 1.5 to 3.0 lb/cu. Ft. duct liner

B. Duct Liner:
1. 'K' ('ksi') Value: ASTM C518, 0.25 at 75°F (0.036 at 24°C).
2. Noise Reduction Coefficient: 0.65 or higher based on "Type A mounting".
3. Maximum Velocity on Mat or Coated Air Side: 5,000 ft/min (25.4 m/sec).
5. Fasteners: Duct liner galvanized steel pins, welded or mechanically fastened.
6. Approved Manufacturers:
   a. Manville Permacote Linacoustic (HP)

C. Spiral Duct Liner:
1. For ductwork requiring 1-inch (25 mm) Spiracoustic Plus System Lining:
   a. The installed 1-inch lining shall have a Thermal Resistance (R-Value) of 4.3 (.76) at 75°F (24°C) mean temperature, and Noise Reduction Coefficients (NRC) per ASTM C 423, Type "A" mounting.
   b. Metal duct with inside diameters from 8 inches to 18 inches (203 to 457 mm) shall be lined with 1-inch Preformed Round Liner.
      i. Approved Manufacturers:
         a) Permacote Spiracoustic Liner
   c. Metal duct with inside diameters from 18 inches to 32 inches (457 to 813 mm) shall be lined with 1-inch Round Liner Board.
      i. Approved Manufacturers
         a) Spiracoustic Plus “SD” Liner
   d. Metal duct with inside diameters greater than or equal to 34 inches (364 mm) shall be lined with 1-inch Round Liner Board.
      i. Approved Manufacturers
         a) Spiracoustic Plus “LD” Liner
2. For ductwork requiring 1 1/2-inch (38 mm) Lining:
   a. The installed 1 1/2-inch lining shall have a Thermal Resistance (R-Value) of 6.3 (1.11) at 75°F (24°C) mean temperature, and a Noise Reduction Coefficient (NRC) of 0.95 per ASTM C 423, Type "A" mounting.
   b. Metal duct with inside diameters from 9 inches to 18 inches (229 to 457 mm) shall be lined with 1 1/2-inch Preformed Round Liner.
      i. Approved Manufacturers:
         a) Permacote Spiracoustic Liner
c. Metal duct with inside diameters from 22 inches to 38 inches (559 to 965 mm), shall be lined with 1 1/2-inch Round Liner Board.
   i. Approved Manufacturers:
      a) Spiracoustic Plus “SD” Liner

d. Metal duct with inside diameters greater than or equal to 40 inches (1.02 m), shall be lined with 1 1/2-inch Spiracoustic Plus LD Round Liner Board.

2.07 ACOUSTIC DUCT

A. Provide internally insulated, sound control duct and fittings to be acousti-k (perforated liner) Type K (solid liner).

1. Outer pressure shell per spiral duct above.
2. The spiral wound inner liner duct (perforated or solid) is made from 28-gauge galvanized steel and is ribbed for diameters from 9 through 58 inches.
3. The inner liner of the fitting is made from 26-gauge galvanized steel for fittings 3 through 28 inches in diameter, 24 gauge for fittings 29 through 40 inches in diameter, and 22 gauge for fittings 42 through 58 inches in diameter.
4. The construction is to give specific acoustic impedance to conform to the noise reduction characteristics published by United Sheet Metal. The construction is to provide a thermal conductivity “K” factor of .27 BTU/hr./Sq.ft./in. deg. F. at 75 deg. mean temperature. The products shall conform to published performance test data for energy loss of duct and fittings. The construction shall have mechanical means to maintain positive concentricity of liner with shell and mechanical means to retain insulation against dislocation by assembly processes. Adhesives of any type are not permitted in construction unless the Flame Spread, Smoke Developed and Sound Attenuation tests were performed with the adhesives as used.
5. Where indicated on drawings or Part 3 of the specifications, provide duct and fittings with construction to provide 100% mechanical separation and air stream. Construction to provide protection against any possibility of fiber entrainment.
   a. Joints 0”-20” diameter, interior slip coupling beaded at center, fastened to duct with sealing compound applied continuously around joint before assembling and after fastening. Wrap joints with 3-inch wide duct tape.
   b. Joints 21”-72” diameter, use 3 piece, gasketed, flanged joints consisting of 2 internal flanges (with integral mastic sealant) split to accommodate minor differences in duct diameter, and one external closure bank designed to compress gasketing between internal flanges. Example: Ductmate Spiralmate or equal.
6. Approved Manufacturer:
   a. McGill AirFlow

2.08 ACCESS DOORS IN DUCTS

A. At each backdraft damper and at each motorized damper, install factory built 1" insulated access door with hinges and sash locks. Locate doors within 6 inches of installed dampers. Construction shall be galvanized sheet metal, 22 ga. minimum frame and 24 ga. minimum door. Minimum door shall be 12x12. If duct is too small for 12" door, then maximum door size shall be installed in duct.

B. Access doors for fire damper shall have a minimum clear opening of 12"x12" or as specified on Drawings to easily service fire damper. Doors shall be within 6 inches of fire dampers.

C. Approved Manufacturers:
   1. Nailor - Hart Industries Inc.
   2. Cesco - Advanced Air
   3. AirBalance Fire/Seal
   4. Louvers & Dampers
   5. Kees Inc.
   6. Ductmate Industries Inc "Sandwich" Access Door
   7. National Controlled Air Inc.
   8. Greenheck
   9. Elmdor

2.09 FLEXIBLE EQUIPMENT CONNECTIONS

A. Provide flexible equipment connections between ductwork and equipment. See Section 23 33 00 - HVAC Specialties.

2.10 VOLUME DAMPERS

A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

B. Fabricate splitter dampers of same material and gage as duct to 24 inches (600 mm) size in either direction, and two gages heavier for larger sizes, secured with continuous hinge or rod, operated with minimum 1/4-inch (6 mm) diameter rod.

C. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch (240 x 760 mm).

D. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch (300 x 825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

E. Except in round ductwork 12 inches (300 mm) in diameter and smaller, provide end bearings.
F. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches (750 mm), provide regulator at both ends.

2.11 MOTORIZED DAMPERS

A. General:
   1. Coordinate actuator type with Controls Contractor.
   2. Damper actuators and actuator linkages shall be mounted in the airstream for all rooftop fans/roof hoods and mounted external of the airflow at all other locations, unless specifically indicated otherwise on plans.
   3. Multi section damper assemblies shall be provided with a factory installed common jackshaft.
   4. Provide with double flange duct connection.
   5. Shall be Class IA leakage rated.

B. Damper Blades:
   1. Extruded aluminum or galvanized steel air foils with replaceable rubber blade seals, 6-inches wide maximum.
   2. 304 stainless steel when installed in dishwasher hood ductwork.
   3. Jamb seals shall be flexible metal compression type.
   4. Parallel blade airfoil type.

C. Performance:
   1. Maximum leakage rate shall be 3 cfm/sq. ft. of damper area per 1.0-inch w.g. in accordance with AMCA Standard 500D.
   2. Maximum pressure drop for a 12"x12" damper shall be 0.08" w.g. at 1,000 fpm face velocity.

D. Approved Manufacturers:
   1. Ruskin (CD50/CD60)
   2. Greenheck (VCD-33/VCD-43)

2.12 DUCT HANGERS

A. See Section 23 05 29 - Hangers and Supports for HVAC Piping & Equipment.

2.13 DUCT SILENCERS

A. Equal to:
   1. AIRSAN by Air Filter Corp
   2. Commercial Acoustics.
2.14 DUCT SEALANT AND ADHESIVES

A. Duct Sealant technical makeup shall be water based, solvent-free and of the synthetic latex family. Sealants shall be UL 181 Listed, meet all SMACNA pressure and seal classes and be rated to ± 15 inches water gauge. Sealants shall have flame spread of 0 and smoke development of 0 when tested in accordance to ASTM E-84. They shall be formulated to withstand working temperatures of -25°F to +200°F. All sealants shall exceed 500 hours under ASTM C-732 (Artificial Weathering) and pass ASTM C-734 (Low Temperature Flexibility after Artificial Weathering). All sealants shall be of an elastomeric nature, have a minimum weight of 12 pounds and a minimum solids content by weight of 66% ± 2%. Sealants shall be resistant to cracking, peeling, mold and mildew. Sealants shall also have excellent water and UV resistance. Sealants shall meet FDA, USDA and EPA standards as well as meet NFPA 90A and 90B requirements. Sealant shall be Design Polymeric DP 1010 or DP 1020 duct sealant or equal.

B. Solvent based duct sealant VOC shall be less than or equal to 50 g/l and be UL 723 Classified with a flame spread of 0 and a smoke development of 0. Sealant shall have passed 1000 hours of QUV accelerated outdoor aging testing. Sealant shall be Design Polymeric DP 1090 duct sealant or equal.

1. All traverse joints, longitudinal seams and penetrations in duct systems shall be sealed with duct sealant of the type specified. Spiral lockseams are not longitudinal seams and do not require duct sealant. All sealant shall be applied per the manufactures' recommendations. Joints that are not fully welded shall be sealed. For spiral and flat oval duct slip connections; coat both the female and male ends. The slip connections should then be brushed over with an additional coat 2 to 3 inches wide 20 to 40 mils thick.

2. All conditioned air supply ducts, return ducts and fresh air intakes shall have all joints and seams sealed or welded, except spiral seams round and flat oval ducts, which are exempt.

3. Seal sealants and joint sealants shall not be used as a substitute for good workmanship. No ductwork will be covered or installed until inspected and pressure tested if necessary.

C. Gaskets for TDC, TDF and applied flange connections shall meet all SMACNA pressure and seal classes. The gasket shall meet UL 723, ASTM E-84, NFPA 90A and 90B requirements as well as FDA, USDA and EPA standards. The tape shall be 5/8 inches by 3/16 inches and applied according to the manufactures' directions. Expanded or extruded foam gaskets are not acceptable. Gasket shall be Design Polymeric DP 1040 Butyl Gasket Tape or equal.

D. Exterior Ductwork: Sealant shall be Design Polymeric DP 1090, or equal.
2.15 DUCT CLOSURE COLLARS

A. General: Closure collars shall provide closure of opening between duct and opening in element penetrated and shall abut tight up to and overlap duct and shall consist of rolled angle material (for round ducts) and welded framed angles (for rectangular/round ducts).

B. Size: Closure collars shall be sized to match duct/opening applied to and shall have minimum 2-inch overlap on duct side and 2-inch overlap at opening/penetrated element side but shall completely cover opening in element penetrated with minimum 1-inch overlap to undisturbed element (i.e., wall, floor, etc.).

C. Material: Closure collars shall be fabricated of 20-gauge galvanized steel for ducts 15 inches diameter and less and shall be fabricated of 18-gauge galvanized steel duct for all larger ducts and all square and rectangular ducts.

2.16 TURNING VANES

A. Turning vanes may be either Contractor or factory fabricated. Factory fabricated vanes shall be Barber Colman "Airturns" or approved.

B. Vanes and runners shall be fabricated of minimum 24 gauge galvanized.

C. Turning vanes shall comply with SMACNA HVAC Duct Construction Standards. For duct widths less than 19 inches, vanes may be single wall construction; for widths greater than 19 inches, vanes shall be double wall "airfoil" type.

D. Turning vanes shall be equally spaced, parallel to each other, and securely attached to runners.

E. For elbows where the inlet and outlet dimensions are not the same, modify vane shape or angle to provide optimum turning.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Ducts:

1. Straight and smooth on inside with joints neatly finished unless otherwise directed.
2. Duct panels through 48-inch dimension having acoustic duct liner need not be crossbroken or beaded.
3. Crossbreak unlined ducts and duct panels larger than 48 inch or bead 12 inches on center.
4. Securely anchor ducts to building structure with screws.
5. Brace and install ducts so they shall be free of vibration under all conditions of operation.
6. Round, horizontal ducts shall be hung with bands, which extend the entire perimeter of the duct.
7. Ducts shall be braced and guyed to prevent lateral or horizontal swing.
8. Ducts shall not bear on top of structural members.
9. Make duct take-offs to branches, registers, grilles, and diffusers as detailed on Drawings.
10. Ducts shall be large enough to accommodate inside duct liner. Dimension shown on Drawings are net clear inside dimensions after duct liner has been installed.
11. Properly flash where ducts protrude above roof.
12. Install internal ends of slip joints in direction of flow. Make joints airtight using specified duct sealer.
13. Cover horizontal and longitudinal joints on exterior ducts two layers of Hardcast tape installed with Hardcast HC-20 adhesive according to Manufacturer's recommendations.
14. Ducts installed on mechanical space floor or walkway where ducts may be subject to abuse shall have Ductmate/35 or (heavy) SMACNA "J" type connection on all joints.
15. Contractor shall obtain a signed statement from kitchen Contractor verifying ceiling height and hood configuration prior to hood ductwork fabrication.
16. Provide acoustic duct for first 15 feet downstream of all air handling unit supply and return ducts.
17. All exposed ducts shall be spiral.
18. Quick fit duct shall be used where called out on the plans or as called out in specialty exhaust specifications (i.e. 23 35 13 Sawdust Collection System).
19. Provide duct transitions to equipment openings.

B. Duct Liner:

1. Adhere insulation to sheet metal with full coverage of a UL listed adhesive.
2. Secure insulation with mechanical liner fasteners as indicated by SMACNA or manufacturer. Pin length should be as recommended by the liner manufacturer.
3. All exposed edges of the fibrous type liner must be factory or field coated. For systems operating at 4000 fpm or higher, a metal nosing must be installed in all liner leading edges.
4. Repair fibrous type liner surface penetrations with UL listed adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.
6. Provide duct liner for all return air ducts unless specifically excluded in Section 23 07 13.
7. Provide acoustic duct liner for duct indicated on plan and Section 23 07 13.
8. Provide liner for all supply duct unless specifically excluded from Section 23 07 13.
9. Provide ductliner for first 10’ in and out of all exhaust fans (excluding dishwasher, kitchen fume, and particulate fans).

C. Turning Vanes:
   1. Install turning vanes in all square duct turns, and at locations shown on drawings.
   2. Securely attach turning vane runners to ductwork.

D. Flexible Connections: See Section 23 33 00 - HVAC Specialties.

E. Balancing Dampers:
   1. Provide each take-off with an adaptable volume damper to balance that branch.
   2. Anchor dampers securely to duct.
   3. Install dampers in main ducts within insulation.
   4. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.

F. Motorized Dampers:
   1. Motorized dampers shall be installed in all outside air intakes, exhaust outlets, and relief outlets per WSEC and as shown on drawings.

G. Grilles, Registers, and Diffusers: Install and anchor securely.

H. Adjustable Lock Splitter Dampers:
   1. Dampers in equipment rooms shall be complete with locking quadrant.
   2. Other dampers shall have concealed ceiling damper regulator with plate.

I. Painting of Ductwork: Paint ductwork visible through registers, grilles, and diffusers flat black.

J. Duct Cleanliness Criteria: Unless otherwise specified, the delivery, storage, and installation of all un-lined ductwork shall comply with the intermediate duct cleanliness level of SMACNA Duct Cleanliness for New Construction Guidelines. All lined and acoustic duct shall comply with the advanced level.
PART 1 - GENERAL

1.01 SUMMARY
A. Includes, but not limited to, furnishing and installing specified material as described in Contract Documents.
B. Filters used in air handling units and heat pumps.
C. Flexible ductwork from supply air branch duct runouts to diffusers where indicated on drawings.
D. Furnishing and installing fire dampers, ceiling radiation, and fire/smoke dampers at penetrations of fire rated walls, floors, and ceiling membranes, at ducts, registers, grilles, or louvers as indicated on drawings. Installation shall be complete with sleeves, angles, and all other accessories as required by UL installation instructions, local codes, and reviewing authorities.
E. Section Includes:
   1. Backdraft dampers.
   2. Filters and filter housing.
   3. Flexible connections.

1.02 RELATED SECTIONS
A. General Conditions
B. Division 01
C. Section 20 00 00 - General Mechanical Requirements
D. Section 23 31 13 - Steel Ductwork

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Backdraft dampers
B. Filters
C. Filter housing
D. Air filter gauge
E. Flexible ductwork
F. Flexible equipment connections
G. Duct smoke detectors
1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

A. Backdraft dampers

B. Filters (Summarized list including equipment tag and size and quantity of filter per unit.)
1. Provide dates or projected dates of extra filter replacement.

C. Air filter gauge pressure drop

D. Fire and/or smoke dampers

E. Duct smoke detectors

1.05 QUALITY ASSURANCES

A. Requirements of Regulatory Agencies:
1. Bear the AMCA seal and UL label, NSF approved.
2. Fire and fire/smoke dampers to conform to UL Standards 555, 5558, and 555C and NFPA requirements as required and bear the correct UL label for the damper’s application.
3. Fire and fire/smoke dampers shall be approved by State Fire Authorities where so required.
4. Fabric duct shall be UL listed in accordance with the 25/50 flame spread/smoke developed requirements of NFPA-90-A.

1.06 SPARE PARTS

A. Deliver with O&M Manuals six fusible links of each type used on the project where replaceable link-type dampers are furnished.

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS

A. Not Applicable

2.02 BACKDRAFT DAMPERS (COUNTER BALANCED)

A. General: 0.125 inches extruded aluminum frame, 0.07 inches aluminum blades with extruded vinyl edges, synthetic bearings, counterbalance, adjustable zinc plated bar on blades.

B. Backdraft dampers are to be factory set to open at 0.01” w.c. of building pressure and shall have a maximum static pressure drop of 0.05” w.c. at 700 fpm per AMCA Standard 500. Backdraft dampers shall have a leakage rate at no more than 20 CFM/sq. ft. at 1” w.c. of static pressure with a dimension of 24” or greater and 40 CFM/sq. ft. at 1” w.c. of static pressure with dimension smaller than 24” per AMCA Standard 500D.

C. Approved Manufacturer:
1. Ruskin
2. Greenheck
2.03 FILTERS

A. 2" MERV 8:

1. General: 30% efficient filters as specified herein shall be medium efficiency, pleated panel type, disposable filters; Farr 30/30 or approved and shall have an average efficiency of 25-30% atmospheric and 90-92% arrestance by ASHRAE Standard 52-76 unless instructed otherwise.

2. Filter Housings: Shall be sized to fit furnished unit or duct to be installed in and provide minimum filter sizes to obtain a maximum filter velocity of 300 fpm.

3. Resistance: Initial resistance of a 24"x24"x2" filter handling 2000 CFM shall not exceed 0.31" w.g.

4. Duct Holding Capacity: Shall be no less than 60 grams per square foot of face area at 1.0" w.g.

5. Size: Filters shall be 2" deep (unless indicated otherwise), with number and sizes indicated, or as required to give minimum nominal face area as scheduled on drawings.

6. Provide a filter pull strap for all multiple filter sets longer than 24 inches.

7. Approved Manufacturers:
   a. Farr Co.
   b. Airguard
   c. Purolator
   d. Eco-Air

B. 2" or 4" MERV 13 Low Static:

1. General: 80% efficient filters as specified herein shall be high efficiency, pleated panel type, disposable filters; Filtration Group MERV 13 Green Pleat or approved and shall have a Minimum Efficiency Reporting Value of MERV 13 when evaluated under the guidelines of ASHRAE Standard 52.2 2007.

2. Filter Housings: Shall be sized to fit furnished unit or duct to be installed in and provide minimum filter sizes to obtain a maximum filter velocity of 300 fpm.

3. Resistance: Initial resistance of a 24"x24"x2" filter handling 500 fpm shall not exceed 0.38" w.g. and 24"x24"x4" shall not exceed 0.23" w.g.

4. Duct Holding Capacity: Shall be no less than 60 grams per square foot of face area at 1.0" w.g.

5. Size: Filters shall be 2" deep (unless indicated otherwise), with number and sizes indicated, or as required to give minimum nominal face area as scheduled on drawings.

6. Provide a filter pull strap for all multiple filter sets longer than 24 inches.

7. Approved Manufacturers:
   a. Filtration Group
C. 2" or 4" MERV 13:

1. General: 80% efficient filters as specified herein shall be high efficiency, pleated panel type, disposable filters and shall have a Minimum Efficiency Reporting Value of MERV 13 when evaluated under the guidelines of current ASHRAE Standard 52.2.

2. Filter Housings: Shall be sized to fit furnished unit or duct to be installed in and provide minimum filter sizes to obtain a maximum filter velocity of 300 fpm.

3. Resistance: Initial resistance of a 24"x24"x2" filter handling 500 CFM shall not exceed 0.41" w.g. and 24"x24"x4" shall not exceed 0.35" w.g.

4. Duct Holding Capacity: Shall be no less than 60 grams per square foot of face area at 1.0" w.g.

5. Size: Filters shall be 2" deep (unless indicated otherwise), with number and sizes indicated, or as required to give minimum nominal face area as scheduled on drawings.

6. Provide a filter pull strap for all multiple filter sets longer than 24 inches.

7. Approved Manufacturers:
   a. Farr
   b. Airguard
   c. Purolator
   d. Eco-Air

2.04 FILTER HOUSINGS - FAN COIL UNITS

A. Shall be fabricated and furnished as part of the fan coil units.

2.05 FILTER HOUSINGS - DUCT MOUNTED

A. Filter housings shall be factory or Contractor fabricated of not less than 20-gauge galvanized steel.

B. Housing shall have access doors on two sides, constructed of minimum 20-gauge galvanized steel and shall be hinged type with minimum of two heavy-duty latches (Ventlock or equal) and have neoprene sponge gasketing.

C. Holding frames shall be constructed of minimum 20-gauge galvanized steel, with U-type bearing channels, polyurethane gasketing on surfaces adjacent to filters.

2.06 TEMPORARY AIR INLET FILTERS

A. Type: Glass fiber or synthetic material blanket type filter media. Inlets and outlets shall be MERV 8 and unit shall be same as final.

B. Capacity: Shall have an average arrestance no less than 64%; dust holding capacity of 172 grams.

C. Size: Minimum 1" thick cut to size as required to cover inlets.
2.07 FLEXIBLE DUCTWORK

A. Formable, flexible, circular duct shall have a fiberglass scrim (or equivalent) and retain its cross-section, shape, rigidity, and shall not restrict air flow after bending.

B. Normal 1-1/2 inches thick, 3/4 lb./cu ft density fiberglass insulation with airtight, see-through polyethylene or polyester core, sheathed in seamless vapor barrier jacket factory installed over flexible assembly.

C. Assembly including insulation and vapor barrier, shall meet Class 1 requirements of NFPA 90A and be UL 181 rated, with flame spread of 25 or less and smoke developed rating of 50 or under.

D. Approved Manufacturers:
   1. Wiremold
   2. Flexible Air Movers Inc.
   3. J.P. Lamborn
   4. General Flex Corp.
   5. Young & Co. Mfg. 165
   6. Thermaflex ‘GKM’
   7. Cleavaflex

2.08 FLEXIBLE EQUIPMENT CONNECTIONS (INDOOR)

A. General: 30 oz. closely woven UL approved glass fabric, double coated with neoprene. Fire retardant, waterproof, airtight, resistant to acids and grease, and withstand constant temperatures of 200°F.

B. Approved Manufacturers:
   1. Ventglas by Ventfabrics
   2. DuroDyne MFN

2.09 FLEXIBLE EQUIPMENT CONNECTIONS (OUTDOOR)

A. General: 26 oz. closely woven UL approved glass fabric, double coated with Hypalon. Fire retardant, waterproof, airtight, resistant to acids and grease, resistant to ozone and weathering, and withstand constant temperatures of 250°F.

B. Approved Manufacturers:
   1. Ventglas by Ventfabrics
   2. DuroDyne MFN

2.10 DUCT SMOKE DETECTORS

A. General: Smoke detectors shall be installed in supply duct within 4'-0' of each air handler of 2000 cfm and above.

B. Responsibility: This Contractor shall be responsible for control circuit from smoke detectors to fan starter and to remote test station.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

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

3.02 INSTALLATION

A. Backdraft Dampers: Provide access doors to backdraft dampers.

B. Filters and Filter Housing:

1. Contractor to install temporary filters to provide temporary sealing of all duct systems during the construction period to prevent the entry of dirt, dust and debris into the duct systems. These systems that are operated during the construction period shall have temporary filters installed over all inlets and filters installed in the air handling equipment. Filters installed in equipment shall be same type as final filters required for the units. Temporary air inlet type filters shall be taped over all inlets to completely filter all air drawn into the systems.

2. Contractor to provide and install four (4) complete sets of all filters as scheduled below:

   a. At equipment start-up.
   b. Prior to balancing system.
   c. Three (3) months after building occupancy.
   d. During the one-year warranty to be scheduled with Owner.

3. Construct and install filter housings to prevent passage of unfiltered air. Provide sheet metal blanks, felt, rubber, and/or neoprene seals as necessary.

4. Furnish Owner with schedule of filter sizes for each air handler, heat pump, furnace, and fan coil unit.

C. Flexible Equipment Connections:

1. Provide insulated flexible equipment connections between ducts and vibrating equipment. Fans which are internally isolated with spring isolators do not require flexible connections, unless indicated on the plans.

2. Install flexible connections with sufficient slack to permit 2 inches of horizontal or vertical movement of ducts or equipment at connection point without stretching the flexible material.
3. Where installed exposed to weather, provide a galvanized "hat" channel protecting top and vertical stretches of flexible connector from sunlight and weather.

D. Flexible Ductwork:

1. Install duct in fully extended condition free of sags and kinks, using ten-foot maximum lengths.
2. Make duct connections by coating exterior of duct collar for 3 inches with duct sealer and securing duct in place over sheet metal collar with 1/2-inch-wide metal cinch bands and sheet metal screws. Tape exterior of flex to duct ahead of damper.

E. Install duct smoke detectors in air handling units over 2000 CFM.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. Includes But Not Limited To: Furnish and install specified material as described in Contract Documents.
B. Related Sections: General Conditions and Division 1 apply to this Section.

1.02 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Fan terminal boxes
B. VAV Shut-off boxes
C. Sound Data (discharge, intake, and radiated)

1.03 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Submittal Data
B. Unit Operation and Maintenance Manual

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
A. Trane
B. Titus
C. Nailor
D. Price
E. ENVIRO-TEC (ETI)

2.02 SHUT-OFF VAV BOX
A. Casing:
   1. Unit casing shall be 22-gauge, galvanized steel with round or flat oval inlets (flanged).
   2. Units shall be internally lined with 1” dual density fiberglass insulation. Edges shall be sealed against airflow erosion. Units shall meet NFPA 90A and UL 181 standards.
B. Inlet Damper Assemblies shall be of galvanized steel construction with a fully closed leakage rate no greater than 2% at 3.0" wg. Damper blades shall be fitted with flexible seals for tight closure. In the fully closed position, air leakage past the closed damper shall not exceed 2% of the nominal catalog rating at 3" w.g. inlet static pressure as rated by ASHRAE Standard 130. Each unit shall be complete with factory mounted DDC controls including actuators, which shall be fully coordinated with Controls Contractor prior to equipment ordering. Gauge tap ports shall be supplied in the piping between the flow pick up and the controller.

2.03 ELECTRIC COILS

A. Provide electric coils sized and staged per equipment schedule.

PART 3 - EXECUTION

3.01 GENERAL

A. Physical size and noise criteria will be strictly enforced. Approved manufacturers are listed for quality only, not for noise and size. It is up to the equipment supplier to provide equal VAV boxes to those listed on the schedule.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. Includes But Not Limited To:
   1. Furnish and install complete, all air terminals described in Contract Documents.
   2. Ceiling diffusers with damper.
   3. Louvers connected to ductwork.
   4. Roof hoods.

1.02 RELATED SECTIONS
A. General Conditions and Division 1 apply to this Section.
B. Section 20 00 00 - General Mechanical Conditions.

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Grilles, registers, and diffusers
B. Louvers
C. Wall caps
D. Roof hoods

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Not Applicable

PART 2 - PRODUCTS

2.01 GRILLES,Registers AND DIFFUSERS (GRD)
A. Shall be as scheduled on drawings.
B. Provide the various grilles, registers and diffusers shown on the plans and of the various types herein before specified. All terminals with prime-coat finish shall be installed before the walls and ceiling is painted, in order that they may be finish painted by the General Contractor. Those with factory finish or aluminum construction shall be installed after the walls and ceilings are painted. All air terminals located in shower, toilet rooms, locker and dressing rooms shall be of aluminum construction w/baked off-white finish. All other Air Terminals shall be of a standard steel construction; wall-mounted terminals shall be prime coat finish; ceiling diffusers, exhaust and return air terminals shall have factory-applied baked enamel finish, color as selected by Architect.
C. Approved Manufacturers: (subject to submittal approval):

1. Anemostat  
2. Nailor  
3. Kees  
4. Krueger  
5. Price  
6. Titus  
7. Tuttle & Bailey  
8. Shoemaker (except 700MA)

2.02 LOUVERS

A. Provide stationary type with 4" frame, drainable blades, and aluminum bird screen. Frame and blade shall be 6063-T-5 aluminum alloy. Blades shall be at 37.5° angle and supported by hidden mullions. Intermediate support mullions shall not interrupt blade exterior appearance. Louvers shall receive finish color coating of modified fluoropolymer baked enamel following cleaning and pretreatment of metal. A 50% Kynar resin shall provide approximately 0.3" total dry film thickness when baked at 450°F. Color shall be as selected by the Architect. Provide appropriate frame type for installation type.

B. Louvers shown are minimum sizes for airflow requirements. Refer to Architectural elevations for exact size and location of louvers. This contractor is to provide full size louver as shown on the plans or Architectural elevations (whichever is larger), including but not limited to: hidden mullions, louver extensions, and louver shapes. Any louver area not used for ductwork shall be blanked off with sheet metal. The General Contractor to provide insulation for blanked off sections.

C. Louver performance shall be as follows:

1. Maximum S.P. drop of 0.15" at 800 ft./min.  
2. Minimum beginning point of water penetration at 0.01 oz/sq. ft. is 800 feet per minute (48"x48" size at 15-minute test period).  
3. Minimum AMCA rated free area of 54% (48"x48" size).  
4. Approved Manufacturers:  
   a. Ruskin (ELF 375DX)  
   b. American Warming  
   c. Wonder Metals  
   d. Greenheck  
   e. Metal Form  
   f. United Enertech

2.03 WALL CAPS

A. Wall caps shall be constructed of extruded aluminum, with bird screen, sizes and model numbers as indicated on plans.

B. Dryer vent caps shall be of aluminum construction with integral backdraft damper.
2.04 ROOF HOOD

A. Manufactured of extruded aluminum complete with roof curb to fit slope of roof and have minimum 12" height.
   1. ½ inch mesh 16-gauge aluminum bird screen.
   2. Units shall be factory prime coated to be field painted. Coordinate with General Contractor to field paint; color selected by Architect.
   3. Size: Roof vents shall have throat size as shown on the drawings.
   4. Dampers: Dampers shall be gravity, counter-balanced, or motorized.
   5. Provide 4" wide flashing all around, with cant strip.
   6. Approved Manufacturers:
      a. Cook
      b. Penn Ventilator
      c. Greenheck
      d. Equals as approved by Architect

B. For Dryers and Residential Type Hoods:
   1. PennBarry WC
   2. Greenheck GRSR/GRSF

2.05 MISCELLANEOUS

A. Bird Screen: 1/2-inch mesh, constructed of either 0.051-inch aluminum wire or 19-gauge galvanized steel wire.

B. Insect Screen: 14 x 18, 0.009" galvanized steel mesh.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The interior of duct connection including opposed blade damper and all visible duct interiors at connection shall be painted matte black.

B. Each air terminal shall be installed with a spun rubber gasket between the flange and the frame or wall.

C. Each air terminal with flexible duct connection shall have a square-to-round transition adapter box.

D. Anchor securely into openings.

E. All air terminals that supply, return, and/or exhaust air, which are not required to have an OBD, shall be provided with a volume damper.

F. Provide round neck to flex duct reducers as required.

G. Provide bird screened openings (1/2" mesh) on all duct openings where indicated and where openings do not have grilles or registers.

H. All outlet and inlets exposed to the weather shall be adequately flashed and installed in a manner to assure complete weatherproofness.
I. Provide blank-off panels on louver portion not connected to a duct. Blank-off panels to be painted flat black.

J. Install louver level and plumb.

K. Secure louver frames in openings with concealed fasteners.

L. Provide bird screen for all louvers, wall caps, and roof hoods.

M. Provide insect screen where indicated on drawings.

N. Install roof caps in accordance with manufacturer’s recommendations.

O. Provide louvers with motorized dampers on all ductless, through wall relief penetrations unless otherwise noted on the drawings.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. Includes But Not Limited To: Furnish and install material as described in Contract Documents.
B. Related Sections:
   1. General Conditions, Division 1
   2. Section 20 00 00 – General Mechanical Requirements

1.02 QUALITY ASSURANCE
A. Qualifications: Units shall be started, checked out, and adjusted by Unit Manufacturer's authorized factory trained service mechanic.
B. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Equipment
B. Fan Curves
C. Sound Data

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Submittal Information
B. Operation and Maintenance Manual

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
A. Innovent
B. Annexair
C. Extex
D. Aaon
E. Trane
F. Daikin
2.02 AIR-TO-AIR HEAT EXCHANGER

A. Air-to-air heat exchanger shall be as manufactured as shown on equipment schedule. Substitutions, provided they meet all requirements of plans and specifications, shall have prior approval from Engineer/Owner. Contractor will be required to furnish plan and elevation details of units in the event of substitution. Any capacity increase in pumps, piping, cooling tower or boiler will be Contractor's responsibility. Any changes in electrical loads due to substitution of equipment other than that specified shall be coordinated with the Electrical Contractor and any additional costs for this work shall be borne by the Contractor and/or supplier.

B. Packaged Heat Recovery Unit:
   1. Packaged unit includes: Supply air inlet section, exhaust air inlet section, heat exchanger, supply fan(s) section, exhaust fan(s) section and control panel
   2. Unit is constructed of 18 gauge electro-galvanized and bonderized sheet metal with two (2) exterior coats of acrylic vinyl paint
   3. Unit reinforced with galvanized steel angles and channels to form a rigid assembly
   4. Entire casing insulated with 1" thick, 1.5lb. density glass-fiber acoustic insulation with aluminum face, meets NFPA 90
   5. Access doors for easy access to all serviceable interior components, hinged and gasketed with quick opening type door latches providing a tight closure

C. Supply Air Inlet Section:
   1. Filter section per Section 23 33 00 – HVAC Specialties
   2. Filter access door
   3. Low leak face and bypass dampers are modulated by a frost and a temperature control thermostat: Defrost mode fresh air bypasses heat exchanger/temperature control mode dampers modulate to achieve set temperature

D. Exhaust Air Inlet Section:
   1. Plenum access door
   2. Water-tight condensate pan with bottom pitched to drain fitting to drain off condensate from heat exchanger

E. Heat Exchanger:
   1. Arranged for counter flow air pattern
   2. Aluminum plates with completely separated airstreams for use in 5 to 8 ph environments
   3. Airtight sealant between adjacent airstreams of elastic synthetic resin adhesive suitable for temperature of -40°F to +212°F
   4. Unit is reinforced to withstand 10" W.G. pressure differential across surfaces without leakage or deflection of plates
5. Casing constructed of aluminum with 3/4" I.P.S. condensate drain located in exhaust section
6. Heat exchanger is tested to ASHRAE Standard 84-78 for zero leakage, efficiency and pressure drop by an independent test lab

F. Supply Fan(s) Section:
1. Centrifugal type, forward-curved, Class I wheel, DWDI
2. Fans are statically and dynamically balanced, rated and tested in accordance with AMCA and ASHRAE Standards
3. Bearings are ball bearing type, grease lubricated with an average life of 200,000 hours
4. Solid steel shafts oversized to assure that any RPM encountered will not be greater than 75% of the first critical speed

G. Exhaust Fan(s) Section:
1. Centrifugal type, forward-curved, Class I wheel, DWDI
2. Fans are statically and dynamically balanced, rated and tested in accordance with AMCA and ASHRAE Standards
3. Bearings are ball bearing type, grease lubricated with an average life of 200,000 hours
4. Solid steel shafts oversized to assure that any RPM encountered will not be greater than 75% of the first critical speed

H. Motor and Drive:
1. Motors mounted on a NEMA standard adjustable sliding base for belt adjustment
2. Base mounted on spring isolators selected for 95% efficiency at required fan RPM, snubbers where required for seismic restraint
3. V-belt drive with variable pitch motor sheaves selected for 150% of the motors rated horsepower

I. Control Panel:
1. Magnetic starters with external motor overload protection
2. Low voltage control circuit
3. Low voltage damper actuators and controls
4. Factory mounted disconnect switch
5. Control box and controls are UL listed
6. Access door provided so electrical components can be serviced without opening airflow components

J. Electric Auxiliary Heat in Supply Fan Section:
1. Casing is galvanized steel with insulated frames
2. Nickel and 20% chromium open resistance coils
3. Controls and interlocks: Differential airflow switch, disk type automatic reset thermal cutout for primary protection, manual reset thermal cutout for secondary protection de-mercury type contactors, over-current protection for each stage including dual element type fuses, unfused disconnect switch, control transformer with primary fusing, individual control contactor for each heating stage, and step controller.

K. Filters: As specified in Section 23 33 00 – HVAC Specialties.

L. Controls: Unit shall be furnished with devices that are compatible with the Section 23 09 00 - Control System. Unit shall have all necessary interconnections.

M. Hydronic Coils: See Section 23 20 00 – Hydronic System

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.

B. Piping: Provide condensate.

C. Unit Protection: Units shall be protected during construction to prevent debris from depositing on the unit.

D. Horizontal Units:
   1. Pitch units towards condensate drain outlet to facilitate condensate drainage.
   2. Hung Units: Support units with hangers, rods, and manufacturer furnished clips and vibration isolators.
   3. Drain Pan: Provide drain pans below each unit; pipe drain pan to nearest point of drainage.

E. Vertical Units: Install units on isolator pad to minimize vibration transfer to structure. Large vertical units shall be installed on external rubber type vibration isolators.

3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to ensure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.

B. Testing and Adjustment: Operate unit in various modes of operation to test for proper operation, including fan rotation, proper damper travel (where applicable), correct interface to other controls.
C. Final Check: When testing and adjustment is complete, a final check of each unit shall be done by the manufacturer's authorized service representative to verify proper unit operation.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL
A. Includes, but not limited to, furnishing and installing material as described in Contract Documents.
B. Ductless split systems shall be separate from VRF systems.

1.02 RELATED SECTIONS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 01 Specification Sections, apply to this Section.
B. Section 20 00 00 - General Mechanical Requirements
C. Section 23 23 00 – Refrigerant Piping System
D. Section 23 33 00 - HVAC Specialties

1.03 QUALITY ASSURANCE
A. Qualifications: Air-cooled condensing section shall be rated according to ARI standards.
B. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

1.04 WARRANTY
A. This Contractor shall warrant the systems to be free from defects in material, equipment and workmanship under normal use and service and any time within one (1) year as defined in Section 20 00 00, with repair or replacement without cost to the Owner, any material, equipment or workmanship found to be defective. The date of final acceptance shall be recorded on a warranty certificate for each unit. The certificate is to be included in Operation & Maintenance Manual.
B. At the end of the first year the contractor shall present a service contract to the owner which would cover the following warranty and filter replacement:
C. In addition to the above one-year warranty, all motor compressors furnished under this Contract shall be warranted to be free from defects in material and workmanship under normal use and service for an additional four (4) years.

1.05 REFERENCES
A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment
PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
   A. Mitsubishi
   B. Daikin
   C. LG

2.02 MANUFACTURED UNITS
   A. Cabinet to be 20-gauge galvanized steel.
   B. Fans to be centrifugal type and dynamically balanced.
   C. Coil is seamless, copper tubing with aluminum fins mechanically attached.
   D. Compressor shall be of the hermetic design.
   E. Wall sleeve shall be fully weatherproof for outdoor installation.
   F. Refrigerant shall meet the latest EPA requirements.
   G. Isolate moving parts from cabinets to reduce noise.
   H. Single point electrical connection.
   I. Accumulator as required per manufacturer.
   J. Unit subbase which includes prewired receptacle, conceals power cord, attaches to wall sleeve, and has leveling legs.
   K. Compressor heat shall operate down to 25°F.

2.03 CONTROLS
   A. For heat pumps, thermostats to be installed integral to the unit by the equipment manufacturer. Heat pump microprocessor controls shall minimize supplemental electric resistance heat. Compressor heat shall always be first stage. Controls shall indicate the use of supplemental heat with LED indicators. Include all wiring.

PART 3 - EXECUTION

3.01 INSTALLATION
   A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.
   B. Piping: Provide condensate piping from unit to outdoors.
   C. Unit Protection: Units shall be protected during construction to prevent debris from depositing on the unit.
D. Installation of factory provided refrigerant pipe line sets is acceptable where the entire length of refrigerant pipe run is located above a ceiling unexposed to view. Locations where the refrigerant piping crosses through an exposed space (e.g., open to structure or below a ceiling) other than a mechanical, electrical, elevator machine, server, or telecommunications room, shall use piping, per Section 23 23 00.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Includes, but not limited to, furnishing and installing material as described in Contract Documents.

B. Related Sections:
   1. General Conditions and Division 1
   2. Section 20 00 00 - Mechanical General Requirements
   3. Section 22 07 19 - Piping Insulation
   4. Section 23 05 29 - Hangers and Supports for HVAC Piping & Equipment
   5. Section 23 07 19 – HVAC Piping Insulations
   6. Section 23 23 00 - Refrigerant Piping System
   7. Section 23 33 00 - HVAC Specialties

1.02 QUALITY ASSURANCE

A. Qualifications: Units shall be ARI certified and bear the certification symbol.
   1. Condensing units shall be started up, checked out, and adjusted by Condensing Unit Manufacturer’s authorized factory trained service mechanic.
   2. Mechanic shall use check-out sheet provided by Manufacturer, complete and sign all items on sheet, and submit to Architect.

B. Requirements of Regulatory Agencies: Each unit shall be UL labeled.

1.03 WARRANTY

A. This Contractor shall warrant the systems to be free from defects in material, equipment, and workmanship under normal use and service and any time within one (1) year from date of final acceptance, with repair or replacement without cost to the Owner, any material, equipment, or workmanship found to be defective. The date of final acceptance shall be recorded on a warranty certificate for each unit. The certificate is to be included in Operation & Maintenance Manual. See Section 20 00 00.

B. All systems and control equipment shall be inspected and serviced or adjusted as required for optimum and satisfactory performance a minimum of four (4) times during the next twelve (12) months after the date of final acceptance. The first inspection shall be made approximately thirty (30) days after final acceptance and the final inspection shall be made during the eleventh month thereafter.
C. At the end of the first year the Contractor shall present a service contract to the Owner which would cover filter replacement for an additional four (4) years.

1.04 REFERENCES
A. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment
B. ARI 270 – Sound Rating of Outdoor Unitary Equipment

1.05 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Outdoor Units
B. Indoor Units
C. Fan Curve

1.06 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Submittal Data
B. Operation and Maintenance Manual

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
A. Carrier
B. Lennox
C. Trane
D. Samsung
E. York

2.02 MANUFACTURED UNITS
A. Indoor Units:
   1. Cabinets:
      a. Constructed of 18 gauge or heavier steel with protective enamel on zinc coated finish or galvanized steel, adequately braced and reinforced, and of sectionalized construction.
      b. Panels shall be side removable for easy access to interior of unit.
      c. With interior mounted motors, hinged access doors with ventlock style handle.
      d. Cabinet panels shall be internally insulated with 1” thick, 1-1/2 lb. density, vinyl coated glass fiber insulation.
2. **Drain Pan:** Provide double sloped drain pan with condensate drain connection. Extend drain pan under coil headers and refrigerant distributors.

3. **Fans:**
   a. Provide with a forward curved centrifugal type designed for Class I operation.
   b. Base fan ratings on test conducted in accordance with AMCA Code #210.
   c. Construct fan housings with streamline inlet and side sheets.
   d. Fans shall be statically and dynamically balanced and tested as an assembly at design RPM to meet design specifications. Maximum rated fan RPM shall be below first critical fan shaft speed.
   e. Flexible connection to unit cabinet.
   f. Fans serving units 5 tons or larger shall be internally isolated with 2” open spring isolations.
   g. Units without internal isolation must be externally isolated.

4. **Fan Shaft:** Solid high carbon steel.

5. **Bearings:**
   a. Self-aligning, grease lubricated, ball type, and shall perform to L50 200,000 hour average life.
   b. Provide lubrication fittings. Permanently lubricated bearings are not acceptable.
   c. Provide clear extended lubrication lines to accessible side of unit.

6. **Sheaves and Belts for Belt Driven Units:**
   a. Rate V-belt drives at 150% of motor rating.
   b. Motor sheaves shall be of adjustable pitch type giving 30% speed variation.

7. **Motors:**
   a. As scheduled in Contract Documents and mounted internal to unit with fan, motor, and drive assembly internally isolated. If unit is belt driven, mount motor on adjustable slide base to allow belt tightening.
   b. Locate motor on side of unit most accessible.

8. **Refrigerant Coils:**
   a. Coils shall be mounted in the unit casing to be accessible for service and can be removed from the unit through the side. Capacities, pressure drops, and selection procedure shall be certified in accordance with ARI Standard 410 or as indicated on schedule.
   b. All coils shall be enclosed in an insulated coil section. Coil headers and U-bends shall not be exposed. Suction and distributor headers shall be made of copper tubing and penetrate coil cover panel to allow for sweat connection of refrigerant lines.
c. Coils shall be proof tested to 425 psig and leak tested to 300 psig, air pressure under water. Coils shall be dried after testing and filled with a 10 psig holding charge of nitrogen.
d. Coils shall have an equalizing type vertical distributor to ensure that each coil circuit receives the same amount of refrigerant liquid.
e. Each refrigeration circuit is to be controlled by a factory-installed expansion valve.

9. Filter Boxes: See Section 23 33 00 - HVAC Specialties.

10. Expansion Valves:
   a. Stainless steel diaphragm and same refrigerant in thermostatic elements as in system. Externally or internally equalized as required by evaporator/condensing system.
   b. Size valves to provide full rated capacity of cooling coil served.
   c. Furnished by evaporator coil/condensing unit supplier and coordinated to provide bleed holes for system pressure equalization, if required.
   d. Electronic or thermal expansion valves shall be used to control refrigerant expansion. The expansion valves shall be adjusted to the manufacturer's superheat and sub-cooling levels. No capillary tube expansion type devices will be allowed.

B. Outdoor Units:

1. Condenser units having side inlets shall have coil guards.

2. Fans:
   a. Each fan shall have a safety guard.
   b. Fans shall be direct driven propeller upflow type.
   c. Fan motors shall be resiliently mounted and suitable for outside use. Provide with permanent lubricated ball bearing.
   d. Fans shall be constructed of aluminum.

3. Controls:
   a. Factory wired and located in separate enclosure as the main condensing unit.
   b. Safety devices shall consist of high and low pressure cutouts, and condenser fan motor overload devices.

4. Casing:
   a. Fully weatherproof for outdoor installation. Finish shall be weather resistant.
   b. Panels shall be removable for servicing.
   c. Provide openings for power and refrigerant connections.
   d. Constructed of 18 gauge or heavier steel with protective enamel on zinc coated finish or galvanized steel, adequately braced and reinforced, and of sectionalized construction.
5. Condensing Unit:
   a. All condensing units shall use the same refrigerant.
   b. Only one liquid line, one suction line, and one power connection shall be made to each compressor.
   c. Provide charging valves.
   d. Must have an EER, SEER, COP and IPLV, as defined by ARI, which complies with the most current Washington State Energy Code.
   e. Install each condensing unit on neoprene isolation pads located at each corner and having a minimum size of 4”x4”x3/4” high.
   f. Insulate refrigerant lines according to Section 23 07 19 HVAC Piping Insulation.

6. Condenser coil shall have aluminum plate fins mechanically bonded to seamless copper or aluminum tubes.

7. Fan motor shall be single or two speed, thermostatically controlled and designed with permanent protection.

8. Compressor shall be of hermetic design with the following features.
   a. Externally mounted brass service valves with charging connections.
   b. Crankcase heater.
   c. Resilient rubber mounts.
   d. Compressor motor overload protection.
   e. Single speed

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: Install units in locations shown on plans and in accordance with manufacturer's instructions.

B. Piping: Insulate refrigerant piping according to Section 22 07 19. Provide condensate piping to unit. Condensate line shall drain to the nearest drainage point or where indicated on plans.

C. Unit Protection: Units shall be protected during construction to prevent debris from depositing on the unit per Section 20 00 00.

D. Horizontal Units:
   1. Pitch units towards condensate drain outlet to facilitate condensate drainage.
   2. Support hung units with hangers, rods, and manufacturer furnished clips and vibration isolators.

E. Set condensing units on a 3” high (minimum) concrete slab.
3.02 START-UP

A. Initial Checks: Prior to operating units, checks shall be made to insure that adequate voltage, duct connections, electrical connections, control connections, and other items as listed by the manufacturer are properly provided/connected and operating to insure safe and proper unit operation.

B. Testing and Adjustment: Operate unit in various modes of operation to test for proper operation, including fan rotation, proper damper travel (where applicable), proper cooling/heating, correct interface to other controls (time clock, fans, etc.). Make necessary adjustments per manufacturer's directions.

C. Final Check: When testing and adjustment is complete, a final check of each unit shall be done by the manufacturer's authorized service representative to verify proper unit operation.

D. Start-Up Log: Provide a start-up log per Section 23 23 00 - Refrigerant Piping System.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. The Variable Refrigerant Zone (VRFZ) system is a heat pump air conditioning system that shall have a variable capacity, heat pump heat recovery, and one outdoor unit shall support multiple indoor units.

1.02 RELATED SECTIONS

A. General Conditions, Division 01
B. Section 20 00 00 – General Mechanical Requirements
C. Section 22 11 16 – Domestic Water Pipe and Fittings
D. Section 23 07 19 – HVAC Piping Insulation
E. Section 23 23 00 – Refrigerant Piping System

1.03 QUALITY ASSURANCE

A. The units shall be listed by ETL or UL and bear its label.
B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
D. The VRFZ system shall be installed by a factory authorized/trained contractor/dealer. Contractor shall be required to submit training certification proof at the request of the Engineer. The mandatory contractor service and install training should be performed by the manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Unit shall be stored and handled according to the manufacturer’s recommendation.

1.05 WARRANTY

A. The units shall have a manufacturer’s warranty for a period of one (1) year from date of installation. The compressor shall have a warranty of six (6) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer.

1.06 SUBMITTAL REQUIREMENTS OF THIS SECTION

A. Indoor Units
B. Outdoor Units
C. Controls
D. Refrigerant Diagram
E. Branch Connectors
F. Certified Installer Information

1.07 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Submittal Data
B. Operation and Maintenance Manual for all Equipment
C. Total Refrigerant in System

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURER
A. Mitsubishi
B. Daikin
C. LG
D. Samsung

2.02 WALL HUNG INDOOR UNIT
A. General: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipe will be charged with dry air instead of refrigerant before shipment from factory.

B. Unit Cabinet:
1. The casing shall have a white finish.
2. Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining shall be standard.
3. There shall be a separate back plate which secures the unit firmly to the wall.

C. Fan:
1. The indoor fan shall be an assembly with a line-flow fan direct driven by a single motor.
2. The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. The indoor fan shall consist of two (2) speeds, High and Low.
5. Fan motor shall be thermally protected.
6. A motorized air sweep flow louver shall provide an automatic change in air flow by directing the air up and down to provide for uniform air distribution.

D. Filter:
1. Return air shall be filtered by means of an easily removable washable filter.

E. Coil:
1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phoscopper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.

F. Control:
1. This unit shall have a wireless controller to perform input functions necessary to operate the system.
2. The controller shall consist of a Power On-Off switch, Mode Selector, Temperature Setting, Timer Control, Fan Speed Select and Auto Vane selector.
3. The indoor unit shall perform Self-Diagnostic Function, Test Run switching and Check Mode switching.
4. Temperature changes shall be by 2 °F increments with a range of 65 – 87 °F.
5. The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless controller, providing emergency operation and controlling the outdoor unit.
6. The control voltage between the indoor unit and the outdoor unit shall be 12 to 16 volts, DC.
7. The system shall be capable of automatic restart when power is restored after power interruption.
8. Control system shall control the continued operation of the air sweeplouvers, as well as provide on/off and system/mode function switching.
2.03 FAN COIL INDOOR UNIT

A. General: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
   1. The cabinet shall be space saving, low profile, ceiling concealed, ducted.
   2. The cabinet panel shall have provisions for a field installed mixing box.

C. Fan:
   1. The indoor unit fan shall be an assembly with one or two fan(s) direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
   3. The indoor fan shall consist of two (2) speeds, High and Low, which are selectable on the room controller.
   4. The indoor unit shall have a ducted air outlet system and ducted return air system.
   5. The fan motor shall be thermally protected.

D. Coil:
   1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   2. The tubing shall have inner grooves for high efficiency heat exchange.
   3. All tube joints shall be brazed with phos-copper or silver alloy.
   4. The coils shall be pressure tested at the factory.
   5. A condensate pan and drain shall be provided under the coil.
   6. The condensate shall be gravity drained from the fan coil.

E. Controls:
   1. This unit shall use controls provided by manufacturer to perform functions necessary to operate the system.
2.04 RECESSED CEILING – INDOOR UNIT

A. General: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function ceiling – recessed cassette, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

B. Unit Cabinet:
   1. The cabinet shall be space saving.
   2. Grille shall be fixed to bottom of cabinet allowing one, two, three or four-way blow, as indicated on plans.

C. Fan:
   1. The indoor unit fan shall be an assembly with a turbo fan direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
   3. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, which are selectable on the room controller.
   4. The auto airswing vanes shall be capable of automatically swinging up and own for uniform air distribution.

D. Coil:
   1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   2. The tubing shall have inner grooves for high efficiency heat exchange.
   3. All tube joints shall be brazed with phos-copper or silver alloy.
   4. The coils shall be pressure tested at the factory.
   5. A condensate pan and drain shall be provided under the coil.
   6. The condensate lift mechanism shall be able to raise drain water 33 inches above the condensate pan.
   7. Return air shall be filtered by means of a long-life washable permanent filter.

E. Controls:
   1. This unit shall use controls provided by manufacturer to perform functions necessary to operate the system.
2.05 OUTDOOR UNIT

A. General: The outdoor unit is designed specifically for use with the indoor units. These units are equipped with a circuit board that interfaces to the indoor unit and perform all functions necessary for operation. The unit must have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired. Each unit must be run tested at the factory. Unit shall be capable of operating at 0°F and above. The system will automatically restart operation after a power failure and will not cause any settings to be lost.

B. Unit Cabinet:
   1. The casing shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel.

C. Fan:
   1. The unit shall be furnished with direct drive, variable speed propeller type fans.
   2. The motor shall have inherent protection, be permanently lubricated bearings and be completely variable speed.
   3. The fan motor shall be mounted for quiet operation.
   4. The fan shall be provided with a raised guard to prevent contact with moving parts.
   5. The outdoor unit shall have vertical discharge airflow.

D. Coil:
   1. The condenser coil shall be of nonferrous construction with lanced or corrugated plate fins on copper tubing.
   2. The coil shall be protected with an integral metal guard.
   3. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

E. Compressor:
   1. The compressor shall be one inverter driven, modulating capacity scroll compressor, and one scroll compressor. Variable capacity down to 16% of rated capacity.
   2. The outdoor unit shall have an accumulator.
   3. The compressor will be equipped with an internal thermal overload.
   4. The compressor shall be mounted to avoid the transmission of vibration.
   5. Provide crankcase heater.

F. Electrical:
   1. The outdoor unit shall be controlled by the microprocessor located in the indoor unit and outdoor unit.
   2. The control voltage between the indoor unit and the outdoor unit shall be 12 to 16 volts, DC.
G. Refrigerant:
   1. R410A shall be required for outdoor unit systems.

2.06 BRANCH SELECTOR (BS) BOX

   A. General:
      1. BS box shall be factory assembled, wired, and piped.
      2. BS box must be run tested at the factory.
      3. BS box must be mounted indoors.

   B. Unit Cabinet:
      1. Units shall have a galvanized steel plate casing.
      2. Each cabinet shall house multiple refrigeration control valves and a liquid gas separator.
      3. The cabinet shall contain a tube in tube heat exchanger.
      4. The unit shall have sound absorption thermal insulation material made of flame and heat resistant foamed polyethylene.

   C. Refrigerant Valves:
      1. The unit shall be furnished with 5 electronic expansion valves to control the direction of refrigerant flow.
      2. The refrigerant connections must be of the braze type.

   D. Condensate Removal:
      1. The unit shall not require provisions for condensate removal.

2.07 BRANCH CIRCUIT (BC) CONTROLLERS

   A. The BC (Branch Circuit) Controllers shall be equipped with a circuit board that interfaces to the manufacturer’s controls system and shall perform all functions necessary for operation. The BC Controller shall completely factory assembled, piped and wired. Each unit shall be run tested at the factory.

   B. BC Unit Cabinet:
      1. The casing shall be fabricated of galvanized steel.
      2. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
      3. The unit shall house two tube-in-tube heat exchangers.

   C. Refrigerant Valves:
      1. The unit shall be furnished with multiple two position refrigerant valves.
      2. Each circuit shall have one (54,000 Btu/h or smaller indoor unit section) two-position liquid line valve and a two-position suction line valve.
      3. Linear electronic expansion valves shall be used to control the variable refrigerant flow.
D. Integral Drain Pan:
   1. An integral condensate pan and drain shall be provided.

E. Electrical:
   1. The BC Controller shall be controlled by integral microprocessors.
   2. The control circuit between the indoor units and the outdoor unit shall be 12 VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

2.08 REFRIGERANT PIPE
A. See Section 23 23 00 – Refrigerant Piping System.

2.09 REFRIGERANT PIPE INSULATION
A. See Section 23 07 19 – HVAC Piping Insulations.

2.10 CONTROLS
A. VRFZ authorized dealer shall install VRFZ system controls and wiring. Authorized dealer shall provide and install complete LONWORKS interface including dedicated LMAPS or BACNET interface including dedicated PC and permanent license BACNET gateway software.

B. VRFZ authorized dealer shall coordinate interface and EMCS graphics with EMCS Contractor.

PART 3 - EXECUTION

3.01 INSTALLATION
A. Install indoor unit per manufacturer’s recommendations.
B. Install outdoor unit per installation detail on plans.
C. Support refrigerant pipe per Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY
A. Includes but not limited to: Furnishing and installing specified material as described in the Contract Documents.
B. Related Sections:
   1. General Conditions and Division 1 apply to this section.
   2. Section 20 00 00 – General Mechanical Requirements.

1.02 QUALITY ASSURANCE
A. Units to be UL listed.
B. Shall conform to NEC and NFPA requirements.

1.03 SUBMITTAL REQUIREMENTS OF THIS SECTION
A. Electric Heaters

1.04 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. Operation and Maintenance Manual

PART 2 - PRODUCTS

2.01 APPROVED MANUFACTURERS
A. Not Applicable

2.02 DUCT HEATERS
A. Heaters:
   1. Eighty (80%) percent nickel, 20% chromium resistance coils insulated by floating ceramic bushings and supported in an aluminized steel frame.
   2. Bushing shall be recessed into embossed openings and staked into supporting brackets spaced 3-1/2 inches maximum center to center.
   3. Coils shall be machine crimped into stainless steel terminals and insulated with phenolic bushings.
   4. Heaters shall be listed by UL for zero clearance to combustible surfaces.
   5. Heater casings shall be of flanged type for attachment to external duct flanges and shall be made to accommodate internally insulated ducts with insulation thickness as specified.
B. Furnish disc-type thermal cutouts for primary and secondary protection.
   1. Automatic reset primary cutout shall be suitable for scheduled voltage operation.
   2. Manual reset secondary cutouts shall be factory wired directly in series with each circuit.
   3. Non-reusable thermal links are not acceptable.

C. Voltage, phase and number of heating stages to be furnished are shown on Drawings. Limit step controller to eight steps.
   1. Three phase heaters shall have equal, balanced circuits.
   2. Circuits shall be rated at 48-amps maximum.
   3. Heating elements shall be de-rated to 35-watts per sq. ft. of element surface.
   4. Test heaters di-electrically at 2,000 volts before shipments.

D. Each heater shall have following built-in components which shall be wired to terminal blocks for field connections. Internal wiring shall be suitable for 105°C.
   1. Mercury contactors shall disconnect circuits.
   2. Control transformer shall be dry industrial type, sized to carry full contactor holding coil load. Primary winding to be factory fused.
   3. Door mounted unfused disconnect switch, snap acting, industrial type to be built into access door. Hinged, latched disconnect switch and door cover shall lock in closed position when switch is on.
   4. Built-in fuses properly sized complete with fuse block.
   5. Air-flow switch wired in series with automatic reset thermal cutout.
   6. Provide heaters of 100 KW capacity or greater with recycling relay to prevent all steps from simultaneously energizing after power interception.

E. Approved Manufacturers:
   1. Indeeco
   2. Trane
   3. Markel

PART 3 - EXECUTION
Not Applicable

END OF SECTION
PART 1 - GENERAL

1.01 SUMMARY

A. Includes But Limited To: Demolition and maintaining existing systems.

B. Related Sections: General Conditions, Division 1 and Section 20 00 00 apply to this Section.

1.02 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION

Not Applicable

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 DEMOLITION

A. The Mechanical Contractor shall be responsible for the removal of all existing Mechanical equipment including, but not limited to piping, fixtures, HVAC equipment, ductwork in areas as described in the RFP.

B. The Mechanical Contractor shall also be responsible for the removal and/or relocation of all Mechanical equipment that will interfere with installation and operation of any new construction indicated or required.

C. Any existing equipment to which modifications are made under this contract shall be painted and labeled in accordance with specifications for new materials.

D. All Mechanical equipment (other than piping) to be removed shall remain the property of and shall be transported, stored, or disposed as directed by the Owner. This will be at no cost to the Owner.

END OF SECTION
# CITY OF PACIFIC

**SENIOR CENTER & E ROOM HVAC RFP**

**BCE PROJECT NO. 221-188.00**

**AUGUST 2021**

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PART 1 - GENERAL

1.01 GENERAL
A. Related Documents: The Request For Proposal (RFP) Description of Work and general conditions of this contract, including General and Supplementary Conditions and Division 1 Specification Sections apply to work of this section.

1.02 WORK INCLUDED
A. The Electrical General Conditions are in addition to the General Conditions and General Requirements, and shall be an extension of this section of the Specifications.
B. The Electrical General Conditions apply to all electrical materials, equipment, installations, and services supplied under any portion of the work.
C. It is the intention of this division of the specifications and the accompanying RFP/Description of Work to describe the scope of electrical work for a bidder design project. These performance specifications set a minimum standard for installation and materials. It shall be the Contractor's responsibility to design and provide for the furnishing, installing, testing and placing in satisfactory and successful operation all equipment, materials, devices, and necessary appurtenances to provide a complete and usable electrical system, together with such other miscellaneous installations and equipment hereinafter specified. The work shall include all materials, appliances and apparatus not specifically mentioned herein or noted in the RFP, but which are necessary to make a complete working installation of all electrical systems described herein. Equipment and devices furnished and installed under other divisions of this specification (or by the Owner) shall be connected under this division.

1.03 CONTRACTOR DESIGN RESPONSIBILITY
A. Contractor shall provide a professional engineered, stamped set of drawings, if the Authority having jurisdiction requires it for permit. It shall be the Contractor's responsibility to design and provide complete drawings and calculations. Contractor shall submit the following for review prior to equipment purchase and installation and per Owner's schedule:
   1. Complete plans, including site plan, riser diagrams, panel schedules, and floor plans showing all equipment connections and branch circuiting.
   2. Verification of existing electrical demand with 30-day load monitoring and application of required demand factors.
3. Load calculations including service, feeders, and panels, back to Utility service point AND City owned backup generator (applicable to Community Center Building only).
5. NREC Forms.

1.04 SUBMITTALS-PRODUCT DATA SHEETS AND SHOP DRAWINGS.RELATED WORK

A. Mechanical Control Wiring – See Division 23.

1.05 STANDARDS AND REGULATIONS

A. The work shall comply with the latest edition of the applicable Standards and Codes of the following:

- ASTM American Society for Testing and Materials
- NBFU National Board of Fire Underwriters
- NEC National Electrical Code
- State Electrical Code
- NESC National Electrical Safety Code
- NEMA National Electrical Manufacturers Association
- NFPA National Fire Protection Association
- U.L. Underwriters Laboratories Inc.
- IPCEA Insulated Power Cable Engineers Associated
- CBM Certified Ballasts Manufacturers
- Federal, State and Local Building Codes
- ETL Electrical Testing Laboratories
- WAC Washington State Administrative Code
- WSEC Washington State Energy Code

B. If any conflict occurs between Government adopted Code Rules and this specification, the codes are to govern. Nothing in these specifications shall be construed to permit work not conforming with governing codes. Also, this shall not be construed as relieving the Contractor from complying with any requirements of the plans and specifications which may be in excess of, but not in conflict with, requirements of the Governing Codes.

1.06 COMPLETION DATES

A. The Contractor shall be in position to meet all completion dates as agreed to and as contracted with the Owner.

1.07 PERMITS & FEES

A. This work shall include the procurement of and payment for all permits, licenses and fees as necessary for the performance of the electrical work by the Contractor. The Contractor shall arrange for inspection of work by the inspectors and shall give the inspectors all necessary assistance in their work of inspection.

B. The Contractor shall consult with and follow the requirements of the local power, utilities serving the facility and shall coordinate the work with them. Provide notice to the electrical utility for the increase in the calculated electrical load.
1.08 ELECTRICAL CHARACTERISTICS
A. Existing Service Entrance Voltage is 120/240V, 1-phase, 3-wire. Electrical Contractor shall coordinate with local utility company and with the Mechanical Contractor for any modifications to the existing electrical service.

1.09 DEFINITIONS
A. When “furnish” is used, it shall be interpreted as “purchase, deliver to job site, and store as directed”.
B. When “install” is used, it shall be interpreted as “place in proper location and make mechanically secure as specified to building structure”.
C. When “connect” it shall be interpreted as, “to attach electrical conduit and wire such that equipment is complete and ready for use”.
D. When “provide” is used, it shall be interpreted as “furnishing and installing complete in operating condition and ready for use”.
E. When “Contractor” is used, it shall be interpreted as “the Electrical Contractor” unless noted otherwise.
F. When “exposed” is used, it shall be interpreted as “capable of being seen after completion of construction”.
G. When “or Equal” is used, it shall be interpreted as “same as specified item in the opinion of Owner’s Representative”.

1.10 SUMMARY OF ELECTRICAL SYSTEMS
The following is a general description of the work included in this contract. This description is not all inclusive nor is the work limited to the following:
A. Power Distribution: Coordinate as necessary with existing power utility for the increased electrical load to the facility. New panelboards shall have at least 20% spare capacity and at least 10% spare circuit spaces and 10% spare breakers.
B. Receptacles: Provide receptacles and circuitry for receptacles. A maximum of six (6) duplex convenience receptacles shall be allowed on one 20 amp, 120 volt circuit. No 20 amp, 120 volt circuits shall exceed 1600 volt-amperes. Verify existing or install a new receptacle within 25’ of each new piece of mechanical equipment.
C. Mechanical Equipment: Provide power circuitry and connections complete for all mechanical equipment installed under this project. Provide fused disconnects, motor controllers, combination disconnect-motor controllers, or manual starters as required if they are not provided with the mechanical equipment. Coordinate with the design/build mechanical contractor criteria and provide required electrical equipment and connections.
D. Mechanical Control Power Circuits: Provide separate power circuits as required for mechanical equipment control power. Coordinate with design/build mechanical contractor for rough-in and conduit sleeve requirements for control wires and cables.

E. Fire Alarm: Contractor shall provide duct smoke detectors as required to automatically shut down mechanical units rated 2000cfm or greater. Coordinate with the design/build mechanical contractor for installation and connection to mechanical equipment controller for automatic shut down upon detection of smoke.

1.11 CONTRACT DRAWINGS

A. Work for this project shall include all hangers, fittings, and miscellaneous items although not specifically indicated or specified.

B. Electronic Drafting/AutoCAD Requirement: All design drawings, details, and specifications for this project shall be done using AutoCAD or equal. Hand drafted design drawings and record drawings are not acceptable.

C. It shall be this Contractor’s responsibility to familiarize himself with the Facility and to coordinate his work with all other trades, and include electrical connections for equipment indicated on the drawings.

D. The Contractor shall verify exact locations of all existing utilities prior to starting work and shall be responsible for any damage or interruptions caused by demolition or construction.

E. The Contractor shall make all field measurements required for his work and shall be responsible for their accuracy.

1.12 PROTECTION

A. The Contractor shall store and guard all equipment before installation and shall protect same, and replace any equipment that has been damaged prior to final acceptance.

1.13 HOUSEKEEPING

A. All electrical materials shall be kept stored in an orderly fashion protected from heat, cold, and the weather.

B. All marred surfaces shall be refinished and painted after installation.

C. All debris shall be removed from premises during work, as directed, and at completion of job.

1.14 TEMPORARY USE

A. Temporary or interim use of any and all portions of the electrical system shall be under the supervision of the Electrical Contractor.

B. Temporary power and lighting for use during construction shall be provided by the Contractor.
1.15 AS-BUILT/RECORD DRAWINGS

A. At completion of the work, and prior to final payment, the Contractor shall furnish to the Owner's Representative, one set of reproducible As-Built Drawings, one red-line set showing location of all feeders, concealed conduits, all homerun junction boxes, all system junction boxes, and all deviations from the original drawings, Owner's Field Orders, Change Orders, CCA's, and Supplemental Instructions. Mark the actual installed depth of all buried electrical conduit and cable and show the measured horizontal distance from permanent construction such as building walls. Also, specifically indicate locations of all riser conduits.

1.16 WARRANTY

A. Provide a written warranty that the Division 26 work and components is free from mechanical and electrical defects. Contractor shall replace and repair, to the satisfaction of the Owner’s Representative, any parts of the installation which may fail within a period of 12 months after the date of final acceptance by the Owner's Representative, provided that such failure is due to defects in material or workmanship, or failure to follow the specifications and drawings.

1.17 OPERATING AND MAINTENANCE MANUALS

A. A preliminary copy, complete except for the bound cover, shall be submitted 30 days prior to completion of the project for checking and review. Four (4) bound, corrected copies shall be delivered to the Owner 14 days prior to scheduled instruction periods as specified under Section 1.16 "Instruction Periods" after review of the preliminary copy.

B. Manuals shall contain shop drawings, wiring diagrams, operating and maintenance instructions, replacement parts lists, and equipment nameplate data for all equipment and systems installed under the project. Signal equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation. Manuals shall contain original brochures supplied by manufacturers. Copies of originals are not acceptable.

C. Each type of device provided shall be identified in the O & M Manual using the same identification as shown on the contract drawings and specifications. The information included must be the exact equipment installed, not the complete "line" of the manufacturer. Installed equipment shall be neatly and clearly identified on sheets where both installed equipment and other equipment are shown. Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled and/or renumbered parts information as reassigned by equipment supplier are not acceptable. The following information shall be provided for each device:

1. Manufacturer’s name, address, and phone number.
2. Local supplier's or nearest authorized service representative’s name, address, and phone number.
3. Complete parts lists including quantities and manufacturer's part numbers.
4. Installation instructions.
5. Recommended maintenance items including maintenance procedure and recommended interval of maintenance listed in hours of operation, calendar unit or other similar time unit.
6. The O & M Manual shall be assembled in a loose leaf, 3-ring, hard cover binder and electronically on a thumb drive or compact disc. The information contained in the manuals shall be grouped in an orderly arrangement by specification index. The manuals shall have a typewritten index and divider sheets between categories with identifying tabs. The covers shall be imprinted with the name of the job, Owner, Division 26 Contractor, and year of completion. The back edge shall be imprinted with the name of the job, Owner, and year of completion.

1.18 WORK NOT INCLUDED
A. Indicated motors, controls, and equipment as described in other divisions shall be furnished by other trades, but shall be moved, set, and wired to electrical controls and power supply by the Electrical Contractor.

1.19 INSTRUCTION PERIODS
A. Upon completion of the work and after all tests and final inspection of the work by the authority(ies) having jurisdiction, the Contractor shall demonstrate and instruct the Owner's designated operation and maintenance personnel in the operation and maintenance of the various electrical systems. The Contractor's representatives shall be superintendents or foremen knowledgeable in each system and suppliers' representatives when so specified. The Contractor shall provide the Owner with a letter indicating the names of the Owner's personnel instructed. Provide eight hours of instruction. Schedule training times and topics with the Owner's approval.
B. Costs for time involved by Contractor shall be included in the bid.

1.20 PORTABLE AND DETACHABLE PARTS
A. The Contractor shall be responsible for all portable and detachable parts or portions of the installation such as fuses, keys, locks, adapters, locking clips, and inserts until final completion of his work. These parts shall then be delivered to the Owner or his authorized representative and an itemized receipt obtained. Refer to item entitled "Conditions Precedent to Final Payment".
1.21 COMPLETION OF WORK

A. Upon completion of the Division 26 work, the Contractor shall deliver to the Owner’s Representative a completion letter stating that all of the requirements of the Contract for Division 26 work have been fulfilled as set forth in the drawings and specifications and that all items in pre-final inspection lists submitted by the Owner’s Representative have been satisfactorily completed.

B. Arrange for and obtain all required inspections and certificates pertaining to the Division 26 work and deliver the certificates to the Owner’s Representative in triplicate.

1.22 CONDITIONS PRECEDENT TO FINAL PAYMENT

A. The following items shall be prepared and submitted to the Architect before final payment is made to the Contractor. Include combined within the Operating and Maintenance Manual.

1. Completion Letter
2. Certificate of Final Inspection:
   Electrical Inspector
   Fire Department
3. Warranty to Owner
4. Marked Set of As-Built Electrical Drawings
4. Certificate of Completion and Document Requirements for Protective Device Study
5. Motor Current Readings
6. Phase Current Readings
7. Panelboard and Special Equipment Shop Drawings and Final Approved List of Materials Installed
8. Certificate of Feeders Torque Results
9. Receipt from person to whom delivered the following: Spare Fuses for Switches, Spare Keys for Panelboards, etc.
10. Wiring diagrams, Maintenance Manuals, Operation Instructions, and Brochures
1.23 SUBMITTALS

A. The Contractor shall submit for review with such promptness as not to cause delay in his or the work of any Contractor or Subcontractor, shop drawings and brochures. All submittals shall include a stamped indication that the submittals have been previously reviewed for compliance with the contract documents, that all coordination required prior to field installation has occurred and that the material submitted is approved for installation.

B. All submittals should generally include the following:

1. Manufacturer's Catalog Data.
2. Complete Physical and Technical Data.
3. Wiring Diagrams.
4. Detailed Reference (written or highlighted) noting compliance with the appropriate specification section and applicable item numbers within that section.

C. Any variations from the specific material shall be noted The Contractor shall submit to the Owner electronic shop drawings in PDF format.

1. A separate PDF file shall be submitted for each Division including All submittal items for that Division as outlined below:
   a. Division 26 – Electrical
2. The contractor shall provide either a digital or hardware method of transporting the electronic submittal to the Owner. Files larger than 10Megabytes shall not be sent via email and shall be transferred via a file transfer protocol, PC compatible CD or PC compatible thumb drive. Divisions shall not be broken up into separate files for transfer via email.
3. Each Specification PDF shall be submitted with the following format and salient attributes:
   a. Cover page including:
      i. Project Title as indicated on the plans
      ii. Project Location including address, city, state, country
      iii. Prime Contractor name, phone number, and email address
      iv. Sub-Contractor name, phone number, and email address
      v. Specification Division number and title
      vi. Contractors approval stamp
   b. Index Page outlining each specification section included in the submittal. This list shall be linked to a corresponding Specification Section Divider for each section. This link shall enable the reviewer to jump to a specification section by clicking the item in the list.
c. Specification Section Divider: Shop Drawings shall be divided by specification section and each section shall begin with a divider page outlining the Specification number, title, and a list of submittal items for the section. In the upper right-hand corner of the divider page, a link shall be provided returning the reviewer to the Index Page.

d. Each Submittal Item listed on the Specification Section Divider shall be linked to the specific item being submitted. Each Submittal Item shall be highlighted yellow with a note reference to the specific paragraph giving the submittal requirements.

e. Each page of the submittal shall be numbered in the bottom right corner of the page. Page numbering shall be Roman numerals for all pages before the First Specification Section. Each Specification Section page shall be numbered with the Specification Section number, a dash, and the page number in the Specification Section.

f. Specification items shall be specifically highlighted as they apply to the project rather than highlighting an entire product family. Items that do not apply to this project shall be crossed out with a red “X”.

g. The PDF file shall not be protected to prevent printing, selecting of text within the document, or extracting of pages from the document.

D. Product data sheets and Shop drawings shall be submitted complete, at one time, and with each item indexed with dividers and separated per specification section and shall include, at a minimum, the items of equipment listed below:

1. All panelboards, showing breaker arrangement with circuit numbers, relays, and panel skirts.
2. Motor starters and controls designating where items are intended to be used and equipment being controlled.
3. Disconnect Switches
4. Fuses
5. Electrical System Protective Device Study
6. Wiring Devices
7. Back Boxes
8. Coverplates
9. Raceways and Connectors
10. Fire Wall Penetration Seals
11. Cable Tray
12. Copper Wire
E. The acceptance of a manufacturer’s name or product by the Owner does not relieve the Contractor of the responsibility for providing materials and equipment which comply in all details with the requirements of the Contract Documents. The Contractor shall be solely responsible for submitting materials at such a time to allow a minimum of two (2) weeks for the Owner’s review.

PART 2 - PRODUCTS

2.01 MATERIALS

A. All materials must be of the quality herein specified. All materials shall be new, free from defects, of the best quality specification grade, used for the purpose in good commercial practice and a standard product by a reputable manufacturer or supplier. They shall be designed to ensure satisfactory operation and operational life in the environmental conditions which will prevail where they are being installed.

B. Each type of material shall be of the same make and quality. The materials furnished shall be standard products of the manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

C. All materials shall be U.L. or E.T.L. listed for the purpose for which they are used.

D. Equipment in compliance with U.L. standards but not bearing their label is not acceptable. If the manufacturer cannot arrange for labeling of an assembled unit at the factory the unit shall be field evaluated per the Washington State Administrative Code (WAC) and the electrical inspector’s requirements.

2.02 COMPLETE SYSTEM

A. All the systems mentioned shall be complete and operational in every detail except where specifically noted otherwise. Mention of certain materials in these specifications shall not be construed as releasing the Contractor from furnishing such additional materials and performing all labor required to provide a complete and operable system.

2.03 NAMEPLATES

A. Provide nameplates constructed of plastic (black on white) laminated material engraved through black surface material to white sublayer (attach with screws on NEMA 1 enclosures).

1. Panelboard Labels: Refer to Section 26 24 16.
2. Switch and Receptacle Labels: Refer to Section 26 27 26.
3. Motor Starter and Disconnect Labels: Refer to Section 26 28 16.
4. Under 600 Volt Feeder Tags: Refer to Section 26 05 19.
PART 3 - EXECUTION

3.01 GENERAL

A. Careful consideration shall be given to clearances under and over beams, pipes and ducts, to provide proper headroom in all cases. Coordinate installation of Division 26 wiring and equipment with Division 23 and other trades. Where insufficient room for proper installation appears, obtain clarification from the Owner before any installation begins.

B. Cutting and Patching:

1. Obtain permission from the Owner’s Representative prior to cutting. Locate cuttings so they will not weaken structural components. Cut carefully and only the minimum amount necessary. Cut concrete with diamond core drills except where space limitations prevent the use of such drills.

C. Damage to Work:

1. The Contractor is responsible for damage caused by execution of demolition or construction.
2. All construction materials damaged or cut into during the installation of this work must be repaired or replaced with materials of like kind and quality as original materials by skilled labor experienced in that particular building trade.
3. Repair of any damage shall be done by workmen skilled in that type of work and shall be approved by the Owner’s Representative.

3.02 COORDINATION

A. The Contractor is responsible for accomplishing work contained within Division 26. The work shall coordinate with that of the other Contractors and/or other trades doing work in the building. The contractor shall examine all drawings, including the mechanical, for construction details and necessary coordination. Specific locations of construction features and equipment shall be obtained from field measurements, and/or from the trade providing the material or equipment. No extra costs will be allowed for failure to obtain this information.

B. All conflicts shall be reported to the Owner’s Representative before installation for decision and correction. Special attention is called to the following items:

1. Location of grilles, pipes, sprinkler heads, ducts, and other mechanical equipment so that all electrical outlets and equipment are clear from and in proper relation to these items.
2. Location of cabinets, counters, and doors so that electrical outlets equipment are clear from and in proper relation to these items.
3. Type and height of ceiling.
C. The Contractor will not be paid for work requiring reinstallation due to lack of coordination or interference with other Contractors or trades. This includes, but is not limited to, removing, replacing, relocating, cutting, patching, and finishing.

3.03 CLEANING AND PAINTING
A. The Contractor shall, at all times, keep the job site free from accumulation of waste, tools, etc.
B. At the time of final cleanup, all equipment shall be cleaned and left in proper condition for their intended use.
C. All equipment, whether exposed to the weather or stored indoors shall be covered to protect it from water, dust and dirt.
D. After installing, all metal finishes shall be cleaned and polished, cleaned of all dirt, rust, cement, plaster, grease, and paint.
E. All equipment with a primer coat of paint shall be given two (2) or more coats of a finish enamel and scratched surfaces be refinished to look like new. Markings, identification, and nameplates shall be replaced.

3.04 EQUIPMENT IDENTIFICATION
A. Provide identifying engraved phenolic nameplate on all equipment, including pull boxes, to clearly indicate its use, area served, circuit identification, voltage, and any other useful data.
B. Each auxiliary system, including communications, shall be clearly labeled to indicate its function.

3.05 DEVIATION
A. Deviation from the shop drawings in construction or installation of equipment shall not be made unless Shop Drawings showing proposed deviations are submitted to and approved by the Owner’s Representative. If any equipment is furnished under this or other divisions with current, voltage, or phase ratings that differ from those shown on the submittal shop drawings, the Contractor shall notify the Owner’s Representative immediately and shall not connect said equipment until instructed as to required changes by the Architect. No extension of time will be granted as a result of such changes.

3.06 EXCAVATIONS
A. All excavations are to be conducted so that no walls or footings shall be disturbed in any way.
B. Remove all surplus earth not needed for backfilling and dispose of same as directed.

3.07 WIRING METHODS
A. All low voltage wiring shall be in raceway with junction boxes and fittings where concealed in walls, in inaccessible ceiling space, or where exposed in finished or unfinished areas.
B. Provide conduit sleeves through all walls to accommodate all low voltage cabling. Conduit sleeves shall be sized to allow for 40% future spare capacity.

C. All branch circuit wiring shall be installed in raceway with junction boxes and fittings.

D. Provide access panels as needed for pull boxes and equipment located above ceiling or behind walls.

E. Multiple feeder runs shall be rod hung, using a strut type channel with individual one-hole clamps, back plates, and machine screws.

F. Any low voltage cables that are not terminated at both ends shall be tagged and labeled per code.

3.08 PENETRATIONS OF FIRE RATED ELEMENTS
A. Penetrations of fire rated elements must be made such as to retain that rating.

3.09 HANGERS AND SUPPORTS
A. Provide hangers, brackets, and suspension rods and supplementary steel to support equipment.

B. Hangers provided under other divisions shall not be used for support of Division 26 equipment unless coordinated with other trades and approved by the Owner’s Representative.

3.10 PAINTING
A. Painting of electrical equipment in general will be limited to exposed conduit and junction boxes on the exterior and in interior finished areas of the building to match the adjacent surface, except items furnished under Division 26 that are scratched or marred in shipment or installation and shall be refinished by the Contractor.

3.11 WORKMANSHP
A. Workmanship shall be of the best quality and none but competent workers shall be employed under the supervision of a competent foreman. All completed work shall represent a neat, professional appearance.

3.12 MISCELLANEOUS
A. Provide complete seismic anchorage and bracing for the lateral and vertical support of conduit and electrical equipment, as required by the International Building Code.

B. Conduits that cross seismic separations shall be installed with flexible connection suitable to accommodate conditions. Secure raceways on each side of a separation and provide a minimum of 36” length of flexible conduit to span separation.
3.13 CABLE AND WIRING ROUTED UNDERGROUND OR UNDERSLAB

A. All cables and conductors, both line voltage and low voltage, routed underground or underslab shall be U.L. listed for installation in wet locations per NEC and WAC codes.

END OF SECTION
SECTION 26 00 05
ELECTRICAL – EXISTING SYSTEMS

PART 1 - GENERAL

1.01 WORK INCLUDED
   A. Portions of the existing electrical lighting, power and signal systems are to be removed as required to support the installation of new equipment.

1.02 RELATED DOCUMENTS
   A. Section 26 00 00 – Electrical General Conditions

PART 2 - PRODUCTS

2.01 EXISTING MATERIALS
   A. Existing materials which are a part of the building shall remain the property of the Owner, unless directed by the Owner to be removed.
   B. It is the Contractor’s responsibility to include in the bid all costs associated with necessary demolition to allow new construction required by the scope of work described in the RFP and as shown in the design/build Contractor prepared Contract Documents, unless specifically noted otherwise. The Contractor shall remove all existing receptacles, lighting fixtures, low voltage devices, backboxes, abandoned raceways, conductors, and any auxiliary items to allow for new construction and finish work to occur as complimented by the Contract Documents.
   C. Contractor is responsible for removal of electrical connections, disconnect switches, and starters for all mechanical equipment scheduled to be demolished. The Contractor shall check all demolition plans and actual field conditions for unit locations.
   D. Areas not included in the scope of work or not included as part of the phasing schedule shall remain fully operational.

2.02 EXISTING MATERIALS NOT TO BE RE-INSTALLED
   A. In coordination with the Owner’s Representative, these materials shall be made available for his inspection and decision as to whether the Owner will retain possession. Items selected for retention shall be delivered to a location on the premises selected by the Owner and turned over to him. Take reasonable care to avoid damage to this material. If the Contractor fails to conform to this requirement, he shall purchase and turn over to the Owner replacement materials of like kind and quality.
B. All material not selected for retention by the Owner and debris shall be disposed of by the Contractor. This shall include, but not be limited to, removal of PCB type ballasts and fluorescent lamps which shall be disposed of in accordance with EPA requirements.

C. Electrical Contractor shall coordinate with any required Hazardous Abatement Contractor on panelboards that may be identified by them as needing abatement and assist them in disconnecting power and notifying them when the abatement can occur.

PART 3 - EXECUTION

3.01 EXISTING CONDITIONS

A. Examine the structure, building, and conditions under which Division 26 work is to be installed for conditions detrimental to proper and timely completion of the work. Do not proceed with work until deficiencies encountered in installation have been corrected. Report any delay or difficulties encountered in installation of Division 26 work which might be unsuitable to connect with work by other divisions of this specification. Failure to report conditions shall constitute acceptance of other work as being fit and proper for the installation of Division 26 work.

B. Electrical Contractor to provide circuit tracing of all existing circuits in all areas that are to remain, be reused and/or relocated to new panels.

C. Maintain continuity of existing circuits of equipment to remain. Existing circuits of equipment shall remain energized. Circuits which are to remain but were disturbed during demolition shall have circuits, wiring, and power restored back to original condition.

D. This is a occupied facility. The Electrical Contractor is responsible to maintain full operation of all systems in the occupied portions of the facility.

3.02 DEMOLITION

A. Switchboards, panelboards, signaling systems, other electrical equipment free standing (or surface mounted), raceway (exposed) and conductors no longer in service as a result of this Contract shall be removed. Unused raceways or sleeves shall be cut flush at ceiling, floor or wall and filled with grout.

B. At the completion of the project, the end product shall have a finished appearance. All abandoned or temporarily utilized material shall be removed.

3.03 NEW DEVICES IN REMODEL AREAS

A. Provide surface mounting for devices on existing walls. Where existing boxes are to be reused, extend box as necessary and provide new devices and plates.
3.04 EXISTING PANELBOARD

A. Any modifications made to existing panels must be incorporated into the existing circuit index on the panel. If more than three circuits are modified a new typewritten index incorporating the changes to the existing index shall be installed in the existing panel.

B. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL INCLUDES
A. Excavation and Associated Grading
B. Trenching and Trench Protection
C. Backfilling and Compaction
D. Verification of Existing Utilities
E. Protection of Utilities

1.02 RELATED SECTIONS
A. Section 26 00 00 – Electrical General Conditions
B. Section 26 05 33 - Raceways

1.03 QUALITY ASSURANCE
A. Inspection of Job Conditions: Prior to starting work and during work, the Contractor shall examine the work by others, site and job conditions under which excavation, trenching, and backfilling for underground utilities work will be performed, and notify the Owner in writing of unsatisfactory conditions or work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
B. Codes and Standards: Comply with requirements of the following codes and standards (Latest Edition) except as modified herein:
   1. International Conference of Building Officials, "International Building Code".
   2. Local requirements for all utility work.
   3. OSHA and WISHA regulations.
   4. APWA Standard Specifications.

1.04 RESPONSIBILITY
A. The Contractor is solely responsible for compliance with the requirements of the RFP, design/build Contractor produced drawings, specifications, local codes and standards, proper construction coordination with work of other trades, and protection and worker's safety. Commencement of work shall indicate Contractor's acknowledgement of his expertise in this type of work. Any delay resulting from failure to comply with this procedure will not be basis for an extension of the completion date.
1.05 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced.

B. American Society of Testing and Materials (ASTM) Publications:

1. D 422-63 Particle Size Analysis of Soils.
4. D 1557-78 Moisture Density Relations of Soils using a 10 lb. (4.54kg) Rammer and 18 inches (457 mm) Drop.
5. D 2167-66 Density of Soil In-Place by the Rubber Balloon Method.

PART 2 - MATERIALS

2.01 SATISFACTORY MATERIALS

A. Materials classified as ASTM D2487, Unified Soil Classification System as SW, SP, GW, and GP are satisfactory for backfill use. Materials classified as SP-SM, GP-GM, GM, GC and ML are also satisfactory for backfill use provided that they contain moisture contents suitable for the intended use and are reasonably free of organic matter. Native material, not considered unsatisfactory as specified below, may comply. Except that no material shall have any object with a dimension exceeding 2 inches and no object shall be sharply angular.

2.02 UNSATISFACTORY MATERIALS

A. Materials classified in ASTM D2487, Unified Soil Classification System as PT, OH, and OL are unsatisfactory. Unsatisfactory materials also include man-made fills, refuse and all materials containing excessive organic matter or having moisture contents which are not suitable for the intended use, or having objects with dimensions exceeding 2 inches (boulders, etc.).

2.03 UNSTABLE MATERIAL

A. Unstable material shall consist of material too wet to properly support the utility conduit or appurtenance structure, and material identified as unsuitable in the National Electrical Code 300-5(F).
2.04 GRAVELLY SAND BORROW MATERIAL
A. Gravelly sand borrow material to provide backfill, or replace unsuitable soil, shall meet the requirements of SW, SP, GW, and GP materials, except that the maximum percentage passing the No. 200 sieve shall not exceed 5% based on the soil fraction passing the U.S. No. 4 sieve, and not contain discrete particles greater than 2 inches in diameter.

2.05 DEGREE OF COMPACTION
A. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D1557, Method D. Minimum compaction requirements shall be as specified in PART 3.

2.06 DRAINAGE GRAVEL
A. Shall be 3/4-inch washed gravel with no more than 2% passing 1/2-inch sieve opening.

2.07 SPECIAL BEDDING AND INITIAL BACKFILL MATERIAL
A. Minus 3/8-inch washed pea gravel.

PART 3 - EXECUTION
3.01 EXCAVATION
A. If workers enter any trench or other excavation four or more feet in depth that does not meet the open pit requirements of WSDOT Section 2.09.3(3)B, it shall be shored and cribbed. The Contractor alone shall be responsible for worker safety. All trench safety systems shall meet the requirements of the Washington Industrial Safety and Health Act, Chapter 49.17 RCW.

B. Excavation of every description and of whatever substances encountered shall be performed to allow the installation of all utilities at the lines and grades as required. During excavation, material satisfactory for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material.

C. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material shall be removed and replaced with satisfactory on-site or imported material from approved sources at no additional cost to the Owner.
D. Excavated material not required or not satisfactory for backfill shall be removed from the site and shall be disposed of off site, at the Contractor's expense, at the Contractor's waste area. Any excess satisfactory excavated materials shall not be mixed with unsatisfactory materials. Unsatisfactory materials shall not cover available suitable materials, or be disposed of in such a manner as to interfere with subsequent borrow operations.

E. Grading shall be done as may be necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized over-excavation shall be backfilled in accordance with paragraph 3.05 BACKFILLING at no additional cost to the Owner.

F. The Contractor shall provide dewatering as required for installation of underground work.

### 3.02 TRENCH EXCAVATION

A. The trench excavation shall meet the requirements of the National Electrical Code and local utility standards.

B. Bottom Preparation: The bottoms of trenches shall be accurately graded to provide uniform bearing and support for the bottom quadrant of each section of the conduit and for bedding. Stones of 2 inches or greater in any dimension, or as recommended by the conduit manufacturer, whichever is smaller, shall be removed to avoid point bearing.

C. Removal of Unsuitable Material: Where unsuitable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph 3.05 BACKFILLING. When removal of unsuitable material is required due to the fault or neglect of the Contractor in his performance of the work, the resulting material shall be excavated and replaced by the Contractor without additional cost to the Owner.

D. Bedding: The bedding surface for the conduit shall provide a firm foundation of uniform density throughout the entire length of the conduit. The conduit shall be bedded carefully in a soil foundation accurately shaped and rounded to conform to the lowest one-fourth of the outside portion of circular conduit or to the lower curved portion of conduit arch for the entire length of pipe or arch. When necessary, the bedding shall be taped. Provide bedding using pea gravel where noted on the drawings.
3.03 EXCAVATION FOR APPURTENANCES
   A. Excavation for manholes, handholes or similar structures below grade shall
      be sufficient to leave at least 12 inches clear between the outer structure
      surfaces and the face of the excavation or support members. When
      concrete or masonry is to be placed in an excavated area, special care
      shall be taken not to disturb the bottom of the excavation. Excavation to
      the final grade level shall not be made until just before the concrete or
      masonry is to be placed.

3.04 JACKING, BORING, AND TUNNELING
   A. Unless otherwise indicated, excavation shall be by open cut, except that
      sections of a trench may be jacked, bored, or tunneled if the raceway,
      cable or duct can be safely and properly installed and backfill can be
      properly tamped in such sections.

3.05 BACKFILLING
   A. Backfill material shall be compacted to 6" layers and as specified in
      Paragraph 3.06-Compaction.
      1. Trench Backfill: Trenches shall be backfilled to finish grade.
      2. Replacement of Unstable Material: Unstable material removed
         from the bottom of the trench of excavation shall be replaced with
         select granular material or gravel borrow placed in layers not
         exceeding 6 inches loose thickness.
      3. Bedding and Initial Backfill: Bedding shall consist of satisfactory
         materials. Initial backfill shall be in 6-inch lift.

3.06 COMPACTION
   A. Each layer of fill, or the excavated subgrade, shall be compacted to at
      least 95%, per ASTM D1557, of laboratory maximum density. Compaction
      shall be accomplished by approved tamping rollers, pneumatic-tired
      rollers, three-wheel power rollers, or other approved compaction
      equipment.

3.07 PROTECTION
   A. Newly graded excavated or bedded areas shall be protected from traffic
      and from erosion, and any settlement or washing away that may occur
      from any cause, prior to acceptance, shall be repaired and grades
      reestablished to the required elevations and slopes.

END OF SECTION
PART 1 - GENERAL

1.01 WORK INCLUDED
   A. Provide all wire, cable, and terminations complete.

1.02 RELATED DOCUMENTS
   A. Section 26 00 00 – Electrical General Conditions

PART 2 - PRODUCTS

2.01 WIRE AND CABLE (COPPER, 600-VOLT)
   A. Interior and Above Grade: All wires to be Type THW or RHW. Type THWN/THHN or XHHW wire may be utilized at Contractor's option, subject to code requirements. Wire and cables shall be brought to project in original containers bearing the underwriters label. Provide Type AVA wire where conductors are subject to temperature above 167 Degrees F.
   B. Underground: All conductors to be type USE. Increase Raceway size when necessary to accommodate conductors per code. Exception: Underground conductors completely contained in code recognized Raceway and boxes may be Type THW, THWN or XHHW.
   C. Aluminum or copper clad conductors are not to be permitted.

2.02 SPLICES
   A. Above Grade: Solderless type only. Preinsulated "twist-on" type (limited to size #10 and smaller). Bolt on compression type with application of preformed insulated cover, heat shrinkable tubing or plastic insulated tape acceptable for all sizes.
   B. Below Grade: Splices below grade shall be in handholes and shall be made watertight with epoxy resin type splicing kits similar to Scotchcast.

2.03 TERMINATIONS
   A. Compression set, bolted or screw terminal.
   B. Conductors #12 and smaller shall utilize eye or forked tongue type compression set terminator when termination is to a bolted or screw set type terminal block or terminal cabinet.

2.04 PLASTIC CABLE TIES
   A. Nylon or Equivalent, locking type.
PART 3 - EXECUTION

3.01 GENERAL
   A. Install all wiring in Raceway unless specifically authorized otherwise.

3.02 WIRE SIZE
   A. No. 12 AWG minimum for power and lighting circuits.
   B. Provide solid wire for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger (600) volts.

3.03 TESTS
   A. In addition to the factory testing of all equipment and cable, the Contractor shall test all wiring connections for continuity and ground before any fixtures or other loads are connected. Tests shall be made with a 500V minimum DC "Megger" type tester. If tests indicate faulty insulation (less that 2 megohms), such defects shall be corrected and tested again. Contractor shall provide all apparatus to make tests and shall bear all expenses of required testing. Routine operation tests shall be made on all pieces of equipment to demonstrate that working parts are in operating condition. Results of all tests shall be recorded and submitted to the Owner. The Contractor shall immediately replace all parts, which fail to pass the test.
   B. All circuits both in and out of the building shall test out free of grounds, short circuits and other defects.
   C. Check and record catalog number and ampere size of controller overload heaters installed, nameplate full-load amperes, and actual operating amperes of each motor. IMPORTANT: Submit recorded data in triplicate to the Owner. Check proper load balance on the electrical system, direction of rotation, lubrication, and overload protection of all motors before placing in operation.
   D. Provide a log of ampere reading for all panels from phase to neutral for 4 wire panels and from phase to phase for 3 wire panels. These readings shall be taken with all loads activated.
   E. Feeders shall be checked to ensure all phases are energized before connecting to their respective motors. Each motor shall rotate in the proper direction for its respective load. Prior to rotation test, all bearings shall be inspected for proper lubrication.
   F. Minimum megger test for equipment shall be as follows:

<table>
<thead>
<tr>
<th>Equipment Maximum Voltage Rating</th>
<th>Minimum Test Resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,000-Volts or less</td>
<td>2 Megohms</td>
</tr>
</tbody>
</table>
G. Provide certification of torque values for feeder and service entrance conductors per equipment manufacturer's recommendation.

3.04 PULLING
A. Use no mechanical means for pulling No. 8 AWG conductors and smaller. Powdered soap stone or approved spray cream shall be the only lubricant used.

3.05 STRIPPING INSULATION
A. Do not ring the cable, always pare or pencil.

3.06 TAPING
A. If used shall be half lapped synthetic tape.

3.07 CONDUCTORS IN PANELS
A. Conductors in panels, switchboards, and terminal cabinets shall be neatly grouped and formed in a manner to "Fan" into terminals with regular spacing.

3.08 CABLE SUPPORTS
A. Provide conductor support devices as required by code in vertical cable runs.

END OF SECTION
SECTION 26 05 26
GROUNDING

PART 1 - GENERAL

1.01 WORK INCLUDED
   A. A grounding system shall be provided for neutral ground and equipment
      ground as required by code.
   B. Provide all grounding of other systems as indicated in Divisions 26

PART 2 - PRODUCTS

2.01 GROUNDING CONDUCTORS
   A. Copper, code size, with physical protection where subject to damage.
      Bare or green insulated.

2.02 GROUND RODS
   A. 3/4" x 8'-0" copper clad steel.

PART 3 - EXECUTION

3.01 GENERAL
   A. Provide all grounding for electrical systems and equipment as required by
      codes and as specified herein.

3.02 SIZE OF GROUND WIRE
   A. As required by code. Where ground wire is exposed to physical damage
      or is used outside of the building, protect with conduit.

3.03 GROUND RODS
   A. Provide as required. Connect the ground conductor to each rod.

3.04 CONNECTION TO THE GROUND BUS
   A. Provide connections in accordance with the codes; including but not
      limited to conduit system, service neutral and electrically operated
      equipment and devices. No device or equipment shall be connected for
      electrical service which has a neutral conductor connected to a
      grounding conductor or to the frame within the device or equipment.
3.05 METHOD OF CONNECTION
   A. Make all underground ground connections and ground cable splices by thermal welding. Aboveground ground connections and ground cable splices may be by permanent compression connector. Grounding lugs, where provided as standard Manufacturer's items on equipment furnished, may be used.

3.06 FLEXIBLE RACEWAY
   A. Shall not be used for grounding. Install separate ground conductor in all flexible raceway.

3.07 PVC RACEWAY
   A. Install separate ground conductor in all PVC raceway as required per code.

END OF SECTION
SECTION 26 05 32
OUTLET AND PULL BOXES

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Provide outlet and pull boxes to enclose devices, permit the pulling of conductors and for wire splices and branches.

1.02 RELATED DOCUMENTS
A. Section 26 00 00 – Electrical General Conditions

PART 2 - PRODUCTS

2.01 INTERIOR WIRING
A. General: Outlet and pull boxes shall be pressed drawn steel, zinc coated with plaster ring where applicable. Large pull boxes shall be fabricated sheet steel, zinc coated or baked enamel finish, with return flange and screw retained cover.
B. Surface Metal Raceway: Boxes of same Manufacture and to match Raceway. Boxes to accommodate standard devices and device plate.
C. Concrete and Masonry: Boxes for casting in concrete or mounting in masonry walls shall be the type specifically designed for that purpose.
D. Install pull boxes so as to be accessible after completion of building construction.
E. Ceiling outlet boxes shall be galvanized octagonal 4 inch, 1-1/2-inch-deep (without fixture stud), 2-1/8 inches deep (with fixture stud).

2.02 EXTERIOR WIRING
A. Above Grade: Outlet and junction boxes shall be cast or malleable iron or shall be cast of corrosion resistant alloy compatible with Raceway to which it is connected. Pull boxes shall be fabricated of heavy gauge steel and hot dipped galvanized. All boxes shall have gasketed covers.
B. Below Grade: Where exposed to earth, boxes (handholes) shall be constructed of precast concrete with size, configuration, cover, grates and reinforcing as required by the particular installation.
   1. Manufacturer: Similar to Utility Vault 3030LA with base or Fogtite J11 Type 2 with base. Lid shall be H-20 rated where installed in traffic areas. Where not exposed to earth shall comply with Paragraph 2.02A above.
C. Exterior outlet boxes shall be weather resistant and rain tight, with appropriate covers, gaskets and screws.
PART 3 - EXECUTION

3.01 ANCHORING
   A. All boxes shall be firmly anchored directly or with concealed bracing to building studs or joints. Boxes must be so attached so that they will not "Rock" or "Shift" when devices are operated.

3.02 FLUSH MOUNTING
   A. Except for surface mounted boxes or boxes above accessible ceilings, all boxes shall have front edge (box or plaster ring) even with the finished surface of the wall or ceiling.

3.03 ELECTRICAL OUTLETS
   A. General: Coordinate the work of this section with the work of other sections and trades. Study all Drawings that form a part of this Contract and confer with various trades involved to eliminate conflicts between the work of this section and the work of other trades. Check and verify outlet locations indicated on Architectural Drawings, door swings, installation details, layouts of suspended ceilings and locations of all plumbing, heating and ventilating equipment.
   B. Centered on Built-In Work: In the case of doors, cabinets, recessed or similar features, or where outlets are centered between such features, such as between a door jamb and a cabinet, make these outlet locations exact. Relocate any outlets which are located off center.
   C. Vertical and Horizontal Relationships: Where more than one outlet is shown or specified to be at the same elevation or one above the other, align them exactly on centerlines horizontally or vertically. Relocate as directed all such outlets (including lighting, receptacle, power signal and thermostat outlets) which are not so installed, at no additional cost to Owner.
   D. Device Outlet Height: Measure from the finished floor.
      *Switches 4 Feet, Set Vertically, to Top of Box
      *Receptacles, Telecommunications 18 Inches, Set Vertically to Centerline
      Other As Noted or as Directed by Owner’s Representative
      *Heights may vary. See Drawings for additional information
   E. Ceiling Location: For acoustical material locate outlet either at the corner joint or in the center of a panel, whichever is closer to the normal spacing. Locate all outlets in the same room in the same panel location.
F. **Installed In Sound Walls:** Boxes installed in sound walls shall not be installed back to back. All boxes shall be separated by one stud space and shall be interconnected with flex conduit with a 90° loop. Where stud space separation is not possible, utilize sound attenuating mastic around each box. 3M Fire Barrier Moldable Putty Pads MPP+ (2.54 mm minimum) or similar.

**3.04 ELECTRICAL WORK IN COUNTERBACKS, MILLWORK AND CASEWORK**

A. Provide templates, where required, to other trades for drilling and cutting to ensure accurate location of electrical fixtures (outlets and devices) as verified with the Owner’s Representative. Provide all wiring, devices, plates and connections required by said fixture.

**3.05 CONNECTION TO EQUIPMENT**

A. For equipment furnished under this or other Divisions of the Specifications, or by others. Provide outlet boxes of sizes and at locations necessary to serve such equipment. An outlet box is required if the equipment has pigtail wires for external connection, does not have space to accommodate circuit wiring used. Study equipment details to assure proper coordination.

**3.06 BLANK COVERS**

A. Provide blank covers or plates over all boxes not covered by equipment.

**3.07 JUNCTION OR PULL BOXES**

A. Pull and junction boxes shall be installed as required, and to facilitate pulling of wire and to limit the number of bends within code requirements. Boxes shall be permanently accessible and shall be placed only at locations approved by the Owner's Representative.

B. In suspended ceiling spaces, boxes shall be supported from the structure independently from ceiling suspension system.

C. The Drawings do not necessarily show every pull or Junction Box required. The Contractor is permitted to provide boxes deemed necessary by him for his work when installed in accordance with these Specifications.

**3.08 BOXES CONTAINING MULTIPLE DEVICES**

A. Boxes containing emergency and normal devices are permitted only with steel barriers Manufactured especially for the purpose of dividing the box into two completely separate compartments.

B. Device Boxes Containing Multiple Devices and Wiring Rated Over 150 Volts to Ground and Over 300 Volts Between Conductors are permitted only with steel barrier manufactured especially for the purpose of dividing the box into separate compartments for each device having exposed live parts.
3.09 BOXES IN EARTH
   A. Provide for all wire splices and as required to pull conductors. Boxes (handholes) shall be set in place on a 3” sand bed. Coverplates shall be flush to, and match the slope of, the final surface grade.

3.10 LABELING
   A. All junction boxes installed in accessible ceiling spaces and exposed in unfinished areas shall be marked using black felt tip marker to indicate the circuit numbers contained within.

END OF SECTION
SECTION 26 05 33
RACEWAY

PART 1 - GENERAL

1.01 WORK INCLUDED
A. Provide Raceway System complete.
B. Design and provide raceway system complete and in conformance with code. Install raceways concealed in construction for all areas except mechanical and electrical equipment rooms.
C. All homeruns and above ceiling work shall be conduit. MC-Type cable may be used in walls only by written permission of the Owner.

1.02 RELATED DOCUMENTS
A. Section 26 00 00 – Electrical General Conditions

PART 2 - PRODUCTS

2.01 GALVANIZED RIGID STEEL CONDUIT (GRS)
A. General: Hot dipped galvanized.
B. Fittings: Galvanized malleable iron or noncorrosive alloy compatible with galvanized conduit. Erickson couplings, watertight split couplings (O.Z. type or equivalent) permitted. Running thread or set screw type fittings not approved.

2.02 ELECTRICAL METALLIC TUBING (EMT)
A. General: Hot dipped galvanized.
B. Fittings: Raintight; steel or malleable iron type using a split corrugated compression ring and tightening nut or stainless-steel locking disc. Steel set screw fittings are acceptable for dry locations. Indenter, drive-on and pressure cast or die cast type set screw are not acceptable.

2.03 FLEXIBLE METAL CONDUIT (FMC, LFMC)
A. Dry Locations:
   1. General: Galvanized flexible steel for dry locations only.
   2. Fittings: Malleable iron or steel, Thomas and Betts "squeeze" type or equal.
B. Damp and Wet Locations:
   1. Liquid Tight: Polyvinyl chloride (PVC) weatherproof cover over flexible steel conduit.
   2. Fittings: Thomas and Betts "liquid tight" or equal.
2.04 SURFACE METAL RACEWAY
A. Formed steel or aluminum type. Standard factory finish. Where color choice is available, consult Owner’s Representative for selection prior to ordering.

2.05 RIGID NON-METALLIC CONDUIT (PVC)
A. Schedule 40 rigid polyvinyl chloride type unless otherwise noted.

PART 3 - EXECUTION
3.01 GENERAL
A. Install Raceway concealed in construction for all finished areas unless specifically approved in writing by the Owner’s Representative.
B. Cut Raceway ends square, ream and extend maximum distance into all couplings and connectors.
C. Provide and install manufactured end caps on all Raceway ends during construction to prevent the entrance of water or dirt. Tape, as a cover, not permitted.
D. Swab out all Raceways before pulling wires.
E. All elbows for GRS and PVC Raceway shall be factory radius bends. For all other Raceway, use factory radius bends of 1-1/4” and larger diameter.
F. Raceway shall not penetrate sheet metal ducts. All sleeves shall be provided for Raceway installation.
G. Route all exposed conduits parallel or perpendicular to building lines. Alter conduit routing to avoid structural obstructions, minimizing crossovers.
H. Install UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints. Provide bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings.

3.02 GALVANIZED RIGID STEEL CONDUIT
A. All Connections shall be watertight. Install for all Raceways in concrete or where subject to damage.

3.03 ELECTRICAL METALLIC TUBING
A. Install for wiring in masonry, frame construction, furred ceilings and above suspended ceilings. May be used for exposed work in unfinished areas where not subject to damage. Where construction involves masonry work, surface cut masonry units wherever such masonry units are to remain unplastered or uncovered in complete construction.
3.04 RACEWAYS UNDERGROUND
   A. Galvanized rigid steel conduit - painted with two coats of bitumastic paint - or galvanized rigid steel conduit with 15 mil. polyvinyl chloride (PVC) jacket (repair abrasions with PVC base paint or PVC).
   B. PVC Raceways may be used for underground runs when permitted by code. Field bends, when necessary, shall be formed only with factory recommended heater. Penetrations through floor and walls shall be galvanized rigid steel (GRS) conduit. PVC, if used, shall be increased in size from that shown to include code required ground wire.
   C. All underground bends in excess of 10 degrees and all elbows shall be GRS.
   D. Arrange and slope Raceways entering building to drain away from building.
   E. Ground wires shall be provided in all PVC Raceway.

3.05 INSERTS, SHIELDS AND SLEEVES
   A. Furnish and set in place, in advance of pouring slabs and walls, all inserts and sleeves needed to execute Division 26 equipment installation.
   B. Where supports in slabs are required after wall has been poured, use a drilled-in threaded insert, installed as recommended by Manufacturer.
   C. Sleeves shall be provided for all wall penetrations.

3.06 RACEWAYS THAT STUB UP THROUGH FLOOR
   A. Install at such depth that the exposed Raceway is vertical and no curved section of the elbow is visible.
   B. PVC Raceway shall not be stubbed through floors.

3.07 SEALING OF RACEWAY PENETRATIONS
   A. Exterior Wall Surfaces Above Grade: Seal around all penetrations with caulking approved by Engineer. For concrete construction above ground level, cast Raceway in wall or core drill wall and hard pack with a mixture of equal parts of sand and cement.
   B. Exterior Surfaces Below Grade: Cast Raceway into wall (or floor) or use manufactured seal assembly (such as O.Z. type "FSK") cast in place.
   C. Roofs: Provide mopped, lead, roof jack where Raceway penetrates roof membrane.
   D. Fire Rated Floors, Walls, Ceiling/Roofs: Concrete or masonry, seal around Raceway penetration with Dow Corning 3-6548 silicone RTV foam or approved equal. Plaster or gypsum wallboard, seal around Raceway penetration with plaster, fire tape per local Fire Marshal's requirements.
3.08 SEALING OF RACEWAYS
A. Seal interior of all Raceways which pass through buildings roofs, floors or through outside walls of the building, above or below grade. Seal on the end inside the building using duct sealing mastic, non-hardening compound type, specially designed for such service to maintain the integrity of the seal of the wall, floor or roof. Pack around the wires in the Raceways.

3.09 HANGERS FOR RACEWAYS
A. In suspended ceiling spaces Contractor may, at his option, attach 1/2" or 3/4" EMT Raceways to the ceiling suspension system where such system is structurally suitable on independent wire secured at both ends; in which case, provide clips manufactured for the purpose.
B. When more than two Raceways will use the same routing, group together on a patented channel support system (such as Unistrut).

3.10 SURFACE METAL RACEWAY
A. Install parallel to building surface (i.e., wall, ceiling, floor). Fasten to surface as recommended by Manufacturer. Mount so Raceway is in the least obvious location. Shall be used in lieu of conduit in finished areas.

3.11 FLEXIBLE CONDUIT
A. Flexible conduit shall be used only for connection to motors and equipment subject to vibration with 90 degrees loop minimum to allow for isolation and for lay-in fluorescent fixtures above T-Bar ceilings. For fixture installations, one end of flex must terminate in rough-in junction box. Flex conduit shall not be installed over 6' long or used to connect from fixture to fixture. Use liquid tight for pumps, equipment which is regularly washed down, and equipment in damp locations. Provide ground wire.

3.12 PULL CORDS
A. Nylon type shall be included in all installed empty Raceway.

END OF SECTION
SECTION 26 05 34
METAL CLAD CABLE (TYPE MC) AND FITTINGS

PART 1 - GENERAL

1.01 WORK INCLUDED
   A. Provide Metal Clad (Type MC) Cable for power, control and lighting systems.
   B. Provide wiring connections and terminations.

1.02 REGULATORY REQUIREMENTS
   A. UL 1569. Products shall be tested, approved and labeled/listed by Underwriters Laboratories, Inc.

1.03 USES PERMITTED
   A. MC Cable is permitted to be used for 20amp lighting and power circuits where routing is above grade, concealed and the installation meets the requirements of NEC 330.
   B. MC Cable shall NOT be used for homerun circuits from the fixture, receptacle, or equipment to the panelboard. Hard conduit must be used from the panelboard to the nearest accessible ceiling space to the panelboard.
   C. MC Cable shall not be used for HVAC equipment.

PART 2 - PRODUCTS

2.01 CABLE ASSEMBLY
   A. Metal clad cable assemblies shall consist of 2, 3 or 4 current carrying conductors and an equipment ground conductor.
   B. Conductors: Solid Copper conductor, No. 12 AWG minimum or No. 10 AWG maximum. Installation methods shall be as specified under Part 3 - Execution.
   C. Insulation: Conductor insulation shall be rated 600-volt, Type THHN, 90°C dry.
   D. Fillers: Fillers shall be non-hygroscopic and non-wicking.
   E. Binder: Core binder shall be corrugated polyester.
   F. Sheath: The metal sheath shall be galvanized steel or aluminum. The metal sheath shall be extruded onto the cable or applied longitudinally, then wrapped and welded. The sheath shall then be corrugated for greater flexibility.
G.  Jacketing: When PVC jacketing is required, the jacket shall be flame-retardant PVC with a temperature range of -40°C to 90°C.

H.  Equipment Grounding Conductor: The equipment ground wire shall be of the same construction as specified in 2.02.A and 2.02.B and be at a minimum the same size as the current carrying conductors. The insulation color shall be green.

2.02  FITTINGS

A.  Fittings shall be UL listed and identified for such use with metal clad continuous corrugated sheath cable, with or without PVC jacketing, as is appropriate for the installation.

B.  Connectors shall be of steel or malleable iron and shall be a squeeze type clamp connector with a locknut for non-jacketed metal clad cable. Compression gland type connectors shall be used for jacketed metal clad cable.

PART 3 - EXECUTION

3.01  INSTALLATION – POWER AND LIGHTING SYSTEMS WIRING

A.  All wiring shall be installed in compliance with the latest version of the National Electrical Code and all other applicable codes and standards as indicated elsewhere in these specifications.

B.  Use of metal clad cable shall be permitted only for lighting, equipment and receptacle branch circuits. Metal clad cable shall not be permitted in locations designated to be hazardous Class I, II or III.

C.  Metal clad cable shall be permitted only for motor circuits where the motor being served is less than ½ HP and rated for 120V, single phase. Metal clad cable is not permitted for HVAC equipment and controls.

D.  Metal clad cable shall only be installed concealed within walls and above ceiling interstitial spaces. Where there is no ceiling interstitial space, metal clad cable may not be used.

E.  Metal clad cable shall not be installed between floor levels. Provide hard pipe (i.e. EMT, RGS, IMC) when routing between floors levels.

F.  Bends in corrugated sheath metal clad cable shall be made so that the cable will not be damaged. The radius of the curve of the inner edge of any bend shall not be less than seven (7) times the diameter of the metallic sheath.

G.  Metal clad cable is not permitted to connect branch circuits to fume hoods, gas storage cabinets, or chemical storage cabinets.

H.  No metal clad cable shall be installed in ventilation ducts or plenums.
I. Conductors in Enclosures: Provide neat and workmanlike installation with conductors tied with T&B Ty-Rap, Virginia Plastics, or equal, nylon wire ties in terminal cabinets, gutters and similar locations.

J. MC cable shall only be installed in dry locations.

3.02 FITTINGS

A. Fittings used for connecting metal clad cable to boxes, light fixtures or other equipment shall be UL listed and identified for such use.

B. Cable preparation for installation of fittings shall follow manufacturer’s instructions. The manufacturer’s specialized tools shall be used for preparing cable ends for installation of fittings.

C. The cable end shall be cut square to ensure flush seating of the cable into the fitting. Fitting securement screws shall be properly torqued. Cable ends shall be fitted with insulating bushings intended for the type of metal clad cable being installed.

D. For jacketed metal clad cable, the outer jacket shall be removed to the length specified by the fitting manufacturer’s instructions. Remove oils or solvent by-products from the outer jacket of the cable. The cable end shall be cut square to ensure flush seating of the cable into the fitting. The fitting gland nut shall be properly torqued to the manufacturer’s specifications.

3.03 ARRANGEMENT AND SUPPORT

A. Metal clad cables shall be run parallel with walls or structural elements. Vertical runs shall be plumb; horizontal runs level and parallel with structure, as appropriate. Groups shall be racked together neatly with both straight runs and bends parallel and uniformly spaced.

B. Metal clad cables shall be securely fastened in place at intervals of not more than six feet, with suitable clamps or fasteners of approved type, and all vertical conduits shall be properly supported to present a mechanically rigid and secure installation.

C. Metal clad cable installed parallel to framing members, such as studs, joist, or rafters, shall be supported so that the nearest outside surface of the cable is not less than 1-1/4 inches from the nearest edge of the framing member. Where this distance cannot be maintained, the cable shall be protected by a steel plate, sleeve, or equivalent that is at least 1/16-inch thick.

D. Maintain at least 6-inch clearance between metal clad cables and other piping systems. Maintain 12-inch clearance between metal clad cables and heat sources such as flues, steam pipes, and heating appliances.

E. No metal clad cable shall be fastened to other conduits or pipes or installed so as to prevent the ready removal of other pipes or ducts for repairs.
F. Individual metal clad cables hung from roof structure or structural ceiling shall be supported by split-ring hangers and wrought-iron hanger rods. Where three (3) or more metal clad cables are suspended from the ceiling in parallel runs, use steel channels, Kindorf, Unistrut or equal, hung from 1/2-inch rods to support the conduits. The conduit on these channels shall be held in place with metal clad cable clamps designed for the particular channel that is used.

G. Secure metal clad cable support racks to concrete walls and ceilings by means of cast-in-place anchors; die-cast, rustproof alloy expansion shields; or cast flush anchors. Wooden plugs, plastic inserts, or gunpowder driven inserts shall not be used as a base to secure conduit supports.

H. Metal clad cable shall be supported immediately on each side of a bend and not more that one (1) foot from an enclosure where a run of metal clad cable ends.

I. Use of Cable Tray:
   1. The sum of the cross-sectional areas of all cables shall not exceed the maximum allowable cable fill area allowed by NEC Tables 392.9, 392.9(E) and 392.9(F).
   2. Cables shall be installed in a single layer with a maintained spacing of not less than one cable diameter between cables.
   3. Ampacity of cables installed in cable tray shall meet the requirements of NEC 392.11.

3.04 INSPECTION AND TESTS

A. General: The electrical installation shall be inspected and tested to ensure safety to building occupants and operating personnel and conformity to Code

B. Measure and record insulation resistance of all power and control wiring including insulation resistance of all equipment:
   1. The insulation resistance of each circuit phase-to-phase and phase-to-ground shall be measured. For circuits rated less than 600 volts, the resistance shall not be less than 2 megohms.
   2. Systems rated above 240 volts shall be tested with a 1000-volt Megohmeter. Circuits rated 240 volts and below shall be tested with a 500-volt Megohmeter. The D.C. potential shall be applied for thirty (30) seconds.

C. The contractor shall record test readings and submit certified test to the Engineer for review and acceptance approval before energizing respective circuits.

END OF SECTION
PART 1 - GENERAL

1.01 GENERAL
   A. Conform to the General Conditions, Supplementary Conditions, and related work in other Divisions for all work in Division 26. See Division 01 for sequence of work.

1.02 RELATED SECTIONS
   A. Section 26 00 00 – Electrical General Conditions
   B. Section 26 24 16 – Panelboards
   C. Section 26 24 19 – Motor Controllers
   D. Section 26 28 13 – Fuses
   E. Section 26 28 16 – Disconnects and Fused Switches

1.03 SECTION INCLUDES
   A. This section includes the requirements for the contractor to perform electrical system studies based on the selected electrical equipment.
   B. The required studies include but are not limited to a Coordination Study and an Arc Flash Assessment Study.
   C. Each of the studies performed shall be based on the actual equipment to be installed. Any revisions of the selected equipment shall result in an updated study with the revised equipment submitted for review and approval prior to ordering equipment.
   D. If the contractor installs different equipment than was included in the approved electrical system studies, the owner reserves the right to require the contractor to replace the non-approved electrical equipment at no additional cost to the owner.
   E. The contractor shall provide all studies in agreement with all applicable codes and standards. If a specific code is applicable to the electrical system being modeled, the code shall be referenced and the portion of the electrical system impacted shall be noted.

1.04 SUBMITTAL REQUIREMENTS OF THIS SECTION
   A. During the Shop Drawing process and prior to ordering electrical equipment, the contractor shall submit an Electrical System Overcurrent Protective Device Coordination Study. The Coordination study shall be submitted with the product data for all devices included in the coordination study and shall be formatted as indicated in Paragraph 2.01.
B. After the electrical system has been installed and is ready for energization, the Contractor shall provide an Arc Flash Assessment Study. The Arc Flash Assessment shall be submitted for approval prior to substantial completion. Once the Arc Flash Assessment Study is approved, the Contractor shall print and install the approved Arc Flash notification labels on all equipment containing overcurrent protective devices. Labels installed outdoors shall be suitable for outdoor installation. The Arc Flash Assessment Study shall be assembled as outlined in Paragraph 2.02.

1.05 QUALIFICATIONS
A. All Studies shall be prepared by a qualified professional electrical engineer.

1.06 DEFINITIONS
A. For the purposes of this section, overcurrent device coordination shall be defined in two levels as follows:
   1. Coordinated = Full coordination outside of the instantaneous region of the overcurrent devices.
   2. Selectively Coordinated = Full coordination including the instantaneous region of the overcurrent devices.

1.07 OPERATION AND MAINTENANCE REQUIREMENTS OF THIS SECTION
A. The contractor shall provide to the owner the following information to be included in the Operation and Maintenance Manual:
   1. Final Arc Flash Assessment Study submitted in accordance with the requirements outlined in Specification 26 00 00 Electrical General Conditions.
   2. The electronic copy shall also include a sub-folder with the software model used to perform the calculations. The model shall include all files necessary to access and review the model electronically. The Contractor shall include a Text File in the directory labeled “MODEL_INFORMATION.TXT” which includes the following:
      a. Project Name
      b. Electrical Contractor Name
      c. Software used to model the system including version
      d. Date the model was last updated
      e. Contact information for the individual/organization who prepared the model.
PART 2 - PRODUCTS

2.01 PROTECTIVE DEVICE COORDINATION STUDY

A. The contractor shall submit an Electrical System Overcurrent Protective Device Coordination Study during the Shop Drawing submittal phase of the project prior to ordering equipment with overcurrent protective devices. The Coordination study shall be submitted with the product data for all devices included in the coordination study.

B. The Contractor shall provide and install new electrical distribution gear and overcurrent devices that coordinate to the greatest extent possible with all applicable existing distribution devices. Notify the Owner’s Representative of any existing equipment that cannot be coordinated with new electrical components.

C. For modifications/additions to existing electrical systems, at a minimum the Coordination Study shall include:

1. All new electrical equipment containing overcurrent devices
2. The existing overcurrent protective devices immediately downstream of the new electrical equipment
3. All existing overcurrent protective devices upstream of the new electrical equipment to the main electrical utility service entrance.

D. The Protective Device Coordination Study shall present the following information in an organized report:

1. Coordination Study Title Page shall include:
   a. Project Name
   b. Electrical Contractor name
   c. Date Study was performed
   d. Study Type (ie Overcurrent Device Coordination Study)
   e. Name/Company/Contact information for organization performing the study
   f. Analysis software used to perform the study including version
2. Coordination Study Executive Summary shall include a brief project description, an overall description of the electrical system, and a listing of any items that may need resolution. If specific Code requirements exist for any portion of the electrical system, they shall be noted in addition to how the requirement was implemented.
3. Coordination Study Analysis shall include a detailed outline of the overcurrent device coordination analysis. Time Current Curves shall be provided for each unique coordination path in the electrical system from the Main service protective device to the largest branch circuit breaker. Each Time Current Curve shall be uniquely labeled. The report shall include a list of the overcurrent devices included in each Time Current Curve and a description of any potential uncoordinated devices with the potential impact on the electrical system due to the lack of coordination.
4. Conclusion shall include a summary of overall protective device coordination for the electrical system being modeled. The Conclusion shall also include a table listing all devices with adjustable settings and the recommended settings based on the coordination study. Any uncoordinated electrical devices that include recommended revisions shall be listed with the proposed system revision.

5. As an Appendix, the Coordination Study shall include a one-line diagram of the modeled system with each bus and overcurrent device identified. The naming of the devices in the one-line diagram shall exactly match the device names in the report and time-current curves.

2.02 ARC FLASH ASSESSMENT STUDY

A. After the electrical system has been installed and is ready for energization, the Contractor shall provide an Arc Flash Assessment Study. The Arc Flash Assessment Study shall be submitted for approval prior to substantial completion. Once the Arc Flash Assessment Study is approved, the Contractor shall print and install the approved Arc Flash notification labels on all equipment containing overcurrent protective devices.

B. The Arc Flash Assessment Study shall include the following at a minimum:

1. Study Title Page shall include the following information:
   a. Project Name
   b. Date Study was performed
   c. Name/Company/Contact information for organization performing the study
   d. Analysis software used to perform the study including version

2. An Index shall be provided listing each Section included in the Arc Flash Assessment Report.

3. Study Executive Summary shall a brief overview of each section of the Study including any recommended revisions to the electrical system based on the results of the Study. The overview shall include at a minimum, any pieces of equipment with a calculated fault current that exceeds the equipment rating, a listing of any overcurrent devices with revised settings, a brief listing of uncoordinated equipment that necessitate revisions, and a listing of each piece of equipment with a Dangerous level of Arc Flash energy.

C. Each of the following sections and appendices shall include a dedicated Cover Page outlining the contents of the Section.
D. Section #1 Fault Analysis shall include an updated Fault Current Analysis of the entire electrical system. The Fault Analysis shall include as a minimum the following information:

1. The available fault current at the Utility for the fault analysis shall be based on the actual Utility fault current and not an assumption. For electrical distribution systems that are primary metered, the study shall include the primary electrical system back to the point of service including but not limited to actual cable lengths/sizes/types and any overcurrent protective devices. The study shall include correspondence from the utility showing the available fault current at the utility service point in the appendices.

2. Updated cable size/type/length shall be included in the report based on the installed conditions.

3. Updated transformer information based on the installed transformer nameplates

4. Current limiting fuses shall be indicated where applicable based on the actual equipment installed.

5. Large motors (>50hp) shall be included in the analysis. Smaller motors shall be grouped together at each panel/switchboard.

6. A Table shall be provided with a comparison of calculated fault current to equipment fault rating for each piece of equipment containing overcurrent protective devices. The calculated fault current shall be adjusted as necessary based on the calculated X/R ratio.

7. Any equipment that is found to have a rating less than the calculated/adjusted fault current shall be specifically indicated along with recommended corrective action.

8. The Fault Analysis shall include the system model one-line diagram with the following information indicated:
   a. Utility connection point with available fault current and X/R ratio.
   b. Cables with conductor size, length, parallel count, raceway type.
   c. Transformers with impedance, kva, X/R ratio.
   d. Large motors (>50hp). Smaller motors shall be grouped together at each panel/switchboard.
   e. Electrical equipment with overcurrent protective devices showing calculated fault current.

E. Section #2 Protective Device Coordination Study shall include an updated Coordination Study for the entire distribution system as outlined in Paragraph 2.01. The updated coordination study shall optimize settings to provide coordination while reducing the Arc Flash energy present.
F. Section #3 Arc Flash Assessment shall include a description of the method used to calculate the Arc Flash energy present and the assumptions of the study. The following additional items shall be included in the study as a minimum:

1. Table summarizing the Arc flash energy present at each pieces of equipment and the conditions under which the incident energy occurred. The table shall also include the arcing time, fault current, upstream overcurrent device, and any notes for different conditions present.
2. A template Arc Flash label with each piece of information included on the label explained.
3. Sample Arc Flash Labels for each piece of equipment in the model showing the code required information.

G. Appendix A shall include that correspondence from the electric utility providing the available fault current used in the analysis.

H. Appendix B shall include cut sheets for all electrical equipment included in the Arc Flash Assessment study.

PART 3 - EXECUTION

3.01 TESTING/VERIFICATION

A. The contractor shall provide testing of each piece of electrical equipment with adjustable overcurrent protective devices to verify proper operation in accordance with the manufacturers recommendations. The test reports shall indicate the following at a minimum:

1. Equipment name.
2. Date of the test.
3. Name and organization of the individual performing the testing
4. Test results. Any equipment failing the testing shall be replaced at no additional cost to the owner.
5. As-Left settings. These settings shall be as indicated in the Arc Flash Assessment Study. Any settings that vary from the Study shall be either updated in the Study including a revised submittal package or shall be corrected in the field and an updated test report provided.

3.02 FIELD APPLIED ARC FLASH LABELS

A. After the Arc Flash Assessment Study is approved and the electrical equipment has been successfully tested, the Contractor shall provide Arc Flash and Shock Hazard warning labels on all electrical devices containing overcurrent protection stating the following information at a minimum:

1. PPE level of protection
2. Incident energy (cal/cm²) at 24” from the equipment unless specified otherwise by the Owner/Engineer
3. Flash hazard boundary
4. Glove class
5. Limited approach distance
6. Restricted approach distance
7. Prohibited approach distance

B. Labels shall be permanently affixed to the equipment or wiring method and shall not be hand written.

C. The label shall be of sufficient durability to withstand the installed environment. Labels installed outdoors shall be suitable for outdoor installation with no degradation due to sun light or precipitation.

D. The label shall meet ANSI Z535 guidelines and requirements.

END OF SECTION
SECTION 26 24 16
PANELBOARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Section 26 00 00 – Electrical General Conditions
   B. Section 26 05 73 – Electrical System Studies

1.02 WORK INCLUDED
   A. Provide all panelboard equipment, complete; dead front type.

PART 2 - PRODUCTS

2.01 PANELBOARD TYPE
   A. Panelboards shall be rated at proper voltage and current for intended use with busbars of copper or aluminum. Panels shall be single-phase, 3-wire, 100% neutral, unless noted otherwise. Provide multiple lugs where conductors in parallel or “feed through” are required.
   B. Conductor Connectors shall be bolted to busbars using Grade 5 bolts and Belleville washers. Feeder conductor connectors shall be rated for 75 Degree C. wire when 75 Degree C. wire is indicated.
   C. Panelboards shall have a separate ground bus bonded to the panelboard frame.
   D. 120-Volt, 15- or 20-Amp breakers shall be of type rated for switching duty labeled "SWD."

2.02 ACCEPTABLE MANUFACTURERS
   A. General Electric
   B. Square-D
   C. Siemens
   D. Cutler-Hammer

2.03 CIRCUIT BREAKERS
   A. The following interrupting capacity, 10,000 AIC Symmetrical shall be considered minimum. Other ratings shall be determined by the Electrical Systems Studies specified in Section 26 05 73. Series rating of breakers is not allowed.
   B. Mount breakers in all panelboards so that breaker handles operate in a horizontal plane. Bolt in type only. Provide common trip on all multiple pole breakers.
C. Provide spare breakers, complete for future connection of wiring circuits per the requirements of the RFP. Provide all bussing and breaker mounting hardware in the panelboard, provide steel knockouts in dead front metal closure of unused part of panel. If any steel knockouts are removed, provide breakers in such spaces or approved cover plates. Open spaces are not permitted.

D. For multi-wire branch circuits, provide approved breaker handle ties where required by NEC 210.4.

2.04 CABINET FOR EACH PANELBOARD

A. Flush in finished spaces or surface in unfinished spaces; tight closing doors without play, when latched. Where two cabinets are located adjacent to each other in finished areas, provide matching trim of the same height. Where a remote controlled switch or contactor is mounted in any panelboard, mount on same frame as panelboard interior with screw retained access door in dead front shield; common door over circuit breakers and remote controlled device. Where flush mounted, provide two (2) 3/4" conduits to accessible ceiling space for future expansion.

B. All conduits for future expansion shall stub into a junction box, where located above grade, and shall be sealed in the panel.

C. Provide cabinets of sufficient dimensions to allow for future expansion and addition of circuit breakers within the panelboards as indicated on panel schedules.

D. Provide cabinet front with full-height hinged door. One door over the interior and an additional hinged dead front cover over interior and wireway (door-in-door). Full-height front cover hinged to box with concealed trim clamps. Provide flush door locks.

E. Provide lock for each cabinet door. All Electrical Distribution Equipment Locks shall be keyed identically. Key system shall match existing. Supply Owner with minimum six keys.

F. Fasten panelboard front with machine screws with oval counter-sunk heads, finish hardware quality, with escutcheons or approved trim clamps. Clamps accessible only when dead front door is open are acceptable. Surface mounted panelboards with fronts greater than 48 inches vertical dimension shall be hinged at right side in addition to hinged door over dead front.

G. Finish: Provide factory prime coat for cabinets to be located in finished areas. Where cabinets are located in unfinished areas, standard lacquer or enamel finish, gray or blue-gray color, shall be substituted for factory prime coat.
2.05 **PANELBOARD NAMEPLATE**

A. Provide engraved and filled (or color layer - engraved through outer layer) plastic nameplate with ½-inch high characters (for panel name); attached with screws to each NEMA 1 panelboard front. White on black, include voltage, phases, wires and minimum A.I.C. Rating in 3/8-inch characters.

B. Nameplate color shall be:
   1. White letters on black

**PART 3 - EXECUTION**

3.01 **MOUNTING**

A. Secure in place with top of cabinet at 6'-0", unless otherwise noted. Top of cabinet and trim shall be level. Firmly anchor cabinets directly or with concealed bracing to Building Structure. When panels are not located in or directly on a wall, provide a support frame of formed steel channel which is anchored to the floor and Ceiling Structure. Interiors shall not be installed until Structure is totally enclosed. Where panels are mounted adjacent to each other, the top edges shall be at the same height.

3.02 **CIRCUIT INDEX**

A. For each branch circuit panelboard provide a typewritten index listing each circuit in the panelboard by number with its proper load designation. Mount with a transparent protective cover inside cabinet door. Listing shall match circuit breaker arrangements, typically with odd numbers on the left and even numbers on the right. Room numbers used shall be final room numbers used in the building as verified with the Owner, and not room number assigned on Plans.

3.03 **CABINET PAINTING**

A. Cabinets furnished as prime painting shall be field painted to match color of adjacent wall.

3.04 **SPACE**

A. Verify space available with equipment sizes and Code Required Working Clearances prior to Submittal of Shop Drawings.

3.05 **FEED THROUGH AND DOUBLE LUGS**

A. Provide feed through or double lugs with amperage equal to the incoming feeder amperage.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Section 26 00 00 – Electrical General Conditions

1.02 WORK INCLUDED
   A. Work under this section includes all requirements for motor controls to be furnished under the electrical portion of the work on all electrical motor driven equipment. Individually mounted starters shall be provided by Division 26 Contractor. Motor controls shall conform to NEMA Standards for each specific purpose.

   B. The Division 26 Contractor shall furnish all motor controllers not included with equipment furnished under other divisions of these specifications or by Owner. The Division 26 Contractor shall install all motor controllers including all controllers not factory assembled into equipment furnished under other divisions of these specifications or by Owner.

1.03 MOTOR VOLTAGE INFORMATION
   A. Voltages available are 240 Volt, Single Phase, and 115 Volt Single Phase.

   B. Verify motor sizes and voltages provided under other divisions and notify Owner’s Representative immediately if any discrepancies are noted.

1.04 REGULATORY REQUIREMENTS
   A. Provide motor protection switches of the appropriate NEMA size. For units not using NEMA rating, use equivalent NEMA size.

PART 2 - PRODUCTS

2.01 MOTOR STARTERS
   A. Magnetic Motor Starters: Unless noted otherwise, shall be full voltage non-reversing with three overloads sized to suit nameplate amperes of motor served, motor "On" and "Off" pilot lights, "Hands-Off-Auto" switch, and auxiliary contacts for interlocking.

   B. Combination Motor Starter/Disconnect: Shall be fused switch type with all features of Paragraph A above. In addition, provide disconnect switch auxiliary contacts for disconnection of externally powered control circuits where applicable. Fuses shall be sized in accordance with motor manufacturer’s requirements.
C. Manual Starters: Shall be toggle switch or push-button type, lockable in the "Off" position, with overload relays, pilot light and enclosure pursuant to Paragraph D below. Manual starters shall only be used where specifically shown or called out on the drawings and only for single phase, fractional horsepower motors.

D. Enclosures: All motor controllers shall be contained in an enclosure suitable for the environment in which the controller is mounted, and shall be weatherproof when exposed to weather.

E. Overload Devices: Shall be melting alloy or bimetallic type. One overload shall be provided for each phase. Provisions shall be made for resetting the overload devices from outside the starter enclosure. Provide ambient compensated overload devices only when the motor is at a constant temperature and the controller is subject to a separate, varying temperature. Automatic reset overload devices are not permitted.

2.02 ACCEPTABLE MANUFACTURERS
   A. Square D
   B. Allen Bradley
   C. General Electric
   D. Cutler-Hammer
   E. Siemens

2.03 NAMEPLATES
   A. Pursuant to Section 26 00 00, Paragraph 2.03, provide nameplates permanently attach (with screws on NEMA 1 enclosures) on each controller, nameplates with the following information: Load served, voltage, phase, short circuit rating, panel/circuit number and where applicable fuse size and type.

2.04 FAN SHUTDOWN RELAYS
   A. Contractor shall provide relay(s) and/or duct smoke detectors with sufficient contacts to shut down all fans over 2000 cfm upon receipt of Fire Alarm.

PART 3 - EXECUTION

3.01 FINISHED AREAS
   A. In finished areas, mount motor protection switches flush and install suitable coverplates.

3.02 HEATERS
   A. Install heaters co-related with full-load current of motors provided.
3.03 OVERLOADS
   A. Set overload devices to suit motors provided.

3.04 SUPPORTS
   A. Securely mount to equipment, wall or acceptable mounting frame.

3.05 FAN SHUTDOWN WIRING
   A. Provide wiring interlock connections for all (over 2000 cfm) fan starter control circuits via Division 23 furnished fan shutdown relay to shutdown fans upon receipt of Fire Alarm.

3.06 MECHANICAL EQUIPMENT NAMEPLATE RATINGS
   A. The Division 26 Contractor shall verify that the nameplate ratings of the mechanical equipment, when they arrive on site, are consistent with the ampacity called out on the drawings. The Contractor shall bring any discrepancies to the Owner’s Representative attention prior to installation of conduit and wiring.

END OF SECTION
PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide all wiring devices and plates.
B. No push-in terminals allowed.
C. All devices color shall match existing devices in the same space (primarily ivory), unless otherwise directed by the Owner's Representative.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Hubbell
B. Pass & Seymour
C. Leviton
D. Cooper

2.02 SWITCHES

A. "Industrial Specification Grade", quiet type, rated 277-volt, 20 amp, unless noted, with plastic handle. Single pole, double pole, 3-way, or locking type as required. Meets Fed. Spec. WS-896 Provide matching styles and colors in other devices as required for the conditions of installation. Hubbell CSB120, Eaton CSB120, Leviton 1221, and P&S 20AC1

B. Motor rated switches: Switches serving as motor disconnecting means shall be horsepower rated with overload relays and meet requirements as stated above. See manual starters in Section 26 24 19, 'Manual Starters'.

2.03 RECEPTACLES

A. In All Unfinished Areas & Non-Occupy Able Spaces: Provide "Industrial Specification Grade", Duplex NEMA 5-20R configuration (20-Amp, 120-Volt) unless shown otherwise. Must have "rivetless ground" contact manufactured as an integral component of the external ground screw terminal. Meets Fed Spec. WC-596 Hubbell HBL5362, Cooper 5362, P&S 5362A, or Leviton 5362.

B. Self-Testing Ground-Fault Circuit-Interrupter (GFCI) Duplex Receptacles: 20A, 125V AC; 2-pole, 3 wire grounding; 10,000 amps current interrupting; green light indicator when power is 'on'; red light indicator when device is in the tripped position; Red "EOL" (end of life) indicator with rapid flash when the unit has reached end of life and/or cannot provide GFCI protection. Provide GFI receptacles where required by code.
C. Tamper resistant, Duplex NEMA 5-20R Configuration: Hubbell BR20ITR, Leviton 5362-SGI, or Cooper TR8300 to match style per paragraph A above.

D. Weather Resistant (WR) / Ground Fault Circuit-Interrupter (GFCI) Outdoor Duplex Receptacles: NEMA 5-20R. Hubbell GFTR201 or equal, for 20 Amp, 125-Volt AC.

2.04 DEVICE PLATES
A. Interior: Match type with existing devices in same space or as directed by the Owner’s Representative. Attachment screws shall match finish of plate. Plates for surface mounted boxes shall be of pressed stainless steel with size to fit exactly the box used.
   1. Hubbell or Cooper Type 302 stainless steel in unfinished spaces.
   2. Nylon or Thermoplastic in finished interior spaces. Color to match device.

B. Exterior: Intermatic # WP1010MC, for vertical mount and # WP1010HMC for horizontal mount, or equivalent for receptacles. Metal cover shall be raintight while-in-use.

2.05 LABELING
A. For NEMA 5-20r receptacles, each device shall be identified with a clear label with black typing stating the panel & circuit number.

PART 3 - EXECUTION

3.01 MOUNTING
A. Rigidly fasten each device to the outlet box at proper position with the wall to bring receptacle flush with plate or switch handle the proper distance through the plate.

3.02 ORIENTATION
A. Set Switches vertical with handle operating vertically, up position "ON" at +48" above finished floor.

B. Set Receptacles vertical with ground slot down at +18" above finished floor.

C. Set Exterior Receptacles horizontal at +18" above finished grade.

3.03 DEVICE PLATES
A. Install level and plumb with structure

B. Provide new covers on existing outlet boxes being reused.

3.04 GFCI AND TAMPER RESISTANT RECEPTACLES
A. Provide GFCI receptacles at all exterior locations, within 6’ of any water source and at all locations per Article 210.8 in the NEC.
B. Provide tamper resistant receptacles in all Assembly Areas per Article 406.12 and 518.2 in the NEC.

3.05 RECEPTACLE GROUNDING

A. Provide bare bonding wire between receptacle grounding terminal and box. Plaster ear screws connecting frame to the box will not be acceptable for grounding.

B. Provide green insulated grounding conductor in all branch circuits supplying ground-fault circuit-interrupter type receptacles.

3.06 HANDICAPPED ACCESS

A. Comply with requirements of Washington State Handicapped Access Code.

END OF SECTION
SECTION 26 28 13
FUSES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Section 26 00 00 – Electrical General Conditions

1.02 WORK INCLUDED
   A. Provide all fuses sized per code and equipment nameplate as required for
equipment and systems to be complete and fully operational.
   B. Provide three (3) spare of each size and type required.
   C. Fuses shall not be installed until equipment is ready to be energized. This
measure prevents fuse damage during shipment of the equipment from
the manufacturer to the jobsite or from water that may contact the fuse
before the equipment is installed.
   D. Final tests and inspections shall be made prior to energization of the
equipment. This shall include a thorough cleaning, tightening, and review
of all electrical connections and inspection of all grounding conductors.
All fuses shall be furnished by the Electrical Contractor.
   E. All fuses shall be of the same manufacturer.

PART 2 - PRODUCTS

2.01 MAINS, FEEDERS, AND BRANCH CIRCUITS
   A. Circuits 0 to 600 amperes shall be protected by current limiting BUSSMANN
LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). All
dual-element fuses shall have separate overload and short-circuit
elements. Fuse shall incorporate a spring activated thermal overload
element having a 284°F. melting point alloy and shall be independent of
the short-circuit clearing chamber. The fuse must hold 500% of rated
current for a minimum of 10 seconds and be listed by Underwriters
Laboratories, Inc., with an interrupting rating of 200,000 amperes r.m.s.
symmetrical. The fuses shall be UL Class RK1 to maintain the Engineered
protection of the system components.
B. Motor Circuits: All individual motor circuits with full load amperes ratings (FLA) of 480 amperes or less shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts). Larger H.P. motors shall be protected by BUSSMANN Type KRP-C Low-Peak Time-Delay Fuses of the ratings shown on the drawings. All other motors, (such as 1.0 service factor motors) shall be protected by BUSSMANN LOW-PEAK Dual-Element Fuses LPN-RK (250 volts) or LPS-RK (600 volts) installed in ratings of approximately 115% of the motor full load current except as noted above. The fuses shall be UL Class RK1 Dual Element Time Delay or Class L.

2.02 SPARE FUSES

A. Spare fuses shall be provided with a minimum of three of each ampere rating.

2.03 ACCEPTABLE MANUFACTURERS

A. Bussman
B. Little Fuse

PART 3 - EXECUTION

3.01 FUSES

A. Install in all fusible devices provided under this Contract.

END OF SECTION
PART 1 - GENERAL

1.01 RELATED DOCUMENTS
   A. Section 26 00 00 – Electrical General Conditions

1.02 WORK INCLUDED
   A. Provided all disconnects, fused and unfused, required by code for equipment furnished under this and other divisions of these specifications (including Division 23) or by Owner.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS
   A. General Electric
   B. Square-D
   C. Siemens
   D. Cutler-Hammer

2.02 DISCONNECTS
   A. Switch shall be heavy-duty type, shall be quick-break and shall be horsepower rated. Switch shall have blades as required to open all ungrounded conductors and shall be single throw unless required otherwise.
   B. Enclosure shall have interlocking cover to prevent opening door when switch is closed. Door interlock shall include a defeating scheme, shall be padlockable in the "Off" position.
   C. Enclosure shall be suitable for environment in which mounted. All exterior enclosures shall have a minimum raintight rating.

2.03 FUSED SWITCHES (OR FUSED DISCONNECTS)
   A. Shall be as above with addition of fuse space and clips to accept only fuses as noted in Section 26 28 13.
   B. Fuses shall be provided in all fused disconnects.
   C. Fuses shall be sized in accordance with manufacturer's requirements of protected equipment.
2.04 NAMEPLATES
   A. Provide nameplates on all enclosures and include the following information: load served, voltage and phase, and (when applicable) fuse size and type. Construct and attach in accordance with Section 26 00 00, Paragraph 2.03.

PART 3 - EXECUTION

3.01 SUPPORTS
   A. Secure solidly to wall or approved mounting frame. Disconnects supported only by Raceway are not acceptable.

3.02 SPLICES
   A. Wiring space within enclosure shall not be used as a junction box.

3.03 INSTALLATION
   A. All material installation shall be in accordance with manufacturers’ recommendations and the provisions of applicable codes.
   B. Fuses shall not be installed until equipment is ready to be energized.
   C. Location of motor disconnects shall be per code.

END OF SECTION
Supplemental Information  
June 15, 2022

City of Pacific  
100 3rd Avenue SE  
Pacific, WA 98047

Civic Campus HVAC Upgrade Project Rebid

To: All Potential Bidders

This supplement forms a part of the Contract Documents and modifies the original Specifications and Drawings, bid date **Wednesday, July 13, 2022 at 1:30 PM.**

This supplement consists of:

   One (1) pages of text (including this cover sheet).

Bidders Questions:

1. I am working on the design build HVAC system for the two buildings and after talking to equipment manufactures it appears we will not meet spec or SOW. Again the 240/1P power is the challenge and clearances.  
   *The buildings only have single phase electrical service. Equipment shall be single phase.*

2. The Senior Center Calls for ceiling cassettes. The distance from the drop ceiling to the hard ceiling does not adequately support the clearance for cassettes.  
   *Ceiling space was spot checked and there was room for most brands of ceiling cassettes. However, a mix of ceiling cassettes and wall units is acceptable. The preference is to have ceiling cassettes where there is space for them.*

3. The Community Center is requesting a single zone split system heat pump. Our estimated loads indicated the building will require more than five tons of capacity. Equipment over five tons and up are three phase unit.  
   *If the HVAC load requires more than 5 tons, 2 single zone heat pumps may be used. The designer may pair the units together with one large set of ductwork or have 2 separate systems.*
CALL UNDERGROUND UTILITY LOCATE SERVICE:
1-800-424-5555 72 HOURS BEFORE DIGGING.
CALL UNDERGROUND UTILITY LOCATE SERVICE:
1-800-424-5555 72 HOURS BEFORE DIGGING.

Room Schedule

<table>
<thead>
<tr>
<th>Room No.</th>
<th>Room Description</th>
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<tbody>
<tr>
<td>ST101</td>
<td>Storage Room</td>
</tr>
<tr>
<td>ST102</td>
<td>Storage Room</td>
</tr>
<tr>
<td>KT101</td>
<td>Kitchen</td>
</tr>
<tr>
<td>RR101</td>
<td>Restroom 1</td>
</tr>
<tr>
<td>MR101</td>
<td>Meeting Room</td>
</tr>
</tbody>
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City of Pacific
100 3rd Avenue Southeast
Pacific, WA 98047
Phone: (253)929-1110
Fax: (253)887-9910

Civic Campus HVAC Upgrade Project
Building Plan

EAST ROOM FLOOR PLAN