Project Manual
Bid Set

Melcher Street Pump Station Rehabilitation

Port Orchard, WA

Public Works Project No. PW2023-017

Produced By:

ART ANDERSON

830 Pacific Ave., Bremerton, WA, 98337

2/29/2024

COPO Accepted for Bidding
Including review of Contract
K.Chris Hammer, PE,PMP - City Engineer
2024-3-11

ADVERTISEMENT FOR BIDS

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ADVERTISEMENT FOR BIDS
CITY OF PORT ORCHARD
MELCHER STREET PUMP STATION REHABILITATION
PUBLIC WORKS PROJECT NO. PW2023-017

Notice is hereby given that sealed bids will be received at the office of the City Clerk for the City of Port Orchard, 216 Prospect Street, Port Orchard, WA 98366 until 1:00 pm on April 18, 2024 for construction of the **Melcher Street Pump Station Rehabilitation Project**, Project No **PW2023-017**. No proposals will be accepted after the above-stated time. Immediately following the above-stated time, the proposals will be publicly opened and read.

The project consists of work to be performed within 100 working days from notice to proceed, and consists of furnishing all materials, equipment, tools, labor, and other work or items incidental theretofore and as generally described as follows:

The Melcher Street Pump Station Rehabilitation Project removes the two water distribution pressure booster pump/motor sets, control valves, isolation valves, piping, controls, diesel generator, associated generator components, lighting, and electrical panels and branch circuits. The project scope includes installation of new pump/motor sets, controls valves, isolation valves, piping, controls, diesel generator and associated components, variable frequency drives, CT cabinet, automatic and manual transfer switches, portable generator connection box, power panel, lighting, and related power branch circuits, and all other work as described in the plans and specifications. All work is incidental to and included in the lump sum bid item "Pump Station Rehabilitation".

The Engineer's construction estimate for this project is $ 786,000.

Access to bidding information (plans, specifications, addenda, and Bidders List) is available through City of Port Orchard's on-line plan room www.portorchardwa.gov/bids-and-proposals/.

Free-of-charge access is provided to Prime Bidders, Subcontractors, and Vendors by going to www.bxwa.com and clicking on "Posted Projects," "Public Works," and "City of Port Orchard." This on-line plan room provides Bidders with fully usable online documents with the ability to: download, view, print, order full/partial plan sets from numerous reprographic sources, and a free online digitizer/take-off tool. It is recommended that Bidders "Register" in order to receive automatic email notification of future addenda and to place themselves on the "Self-Registered Bidders List." Bidders that do not register will not be automatically notified of addenda and will need to periodically check the on-line plan room for addenda issued on this project. Contact Builders Exchange of Washington at 425-258-1303 should you require assistance.

If you do not have access to the Web, you may make arrangements to pick up a plan set at the Port Orchard City Hall, City Clerk's Office, 216 Prospect Street, Port Orchard, WA 98366, 360-876-4407, for a NON-REFUNDABLE fee of $50.00. If you wish the bid documents mailed to you, add $10.00 to cover postage. Informational copies of any available maps, plans, specifications, and subsurface information are on file for inspection in the office of the Port Orchard Project Engineer, 216 Prospect Street, Port Orchard, WA 98366.

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 Port Orchard, 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 Port Orchard.

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

The City of Port Orchard, in accordance with Title VI of the Civil Rights Act of 1964, (78 Stat. 252, 42 U.S.C. 2000d to 2000d-4) and the Regulations, hereby notifies all bidders that it will affirmatively ensure that in any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair 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.

The City is an equal opportunity and affirmative action employer. Small and Minority-owned businesses, women-owned businesses, and labor surplus area firms are encouraged to submit bids.

All work performed on this project will be subject to state prevailing wage rates.

All contractors must be licensed in the State of Washington to Conduct business.

This project is funded through the Washington State Public Works Board program with state funds.

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 of, and without notice by, the City.

Published: Kitsap Sun – March 22, 2024, and March 29, 2024
Daily Journal of Commerce – March 22, 2024, and March 29, 2024.

NOTICE TO PROSPECTIVE BIDDERS
MELCHER STREET PUMP STATION REHABILITATION

In accordance with Section 1-02.4(1) of the Standard Specifications, it is the City of Port Orchard'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 Port Orchard Public Works Department via email at bidsandproposals@portorchardwa.gov Attention: Denis Ryan, Public Works Director.

All emails 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 email, if possible, to all prospective bidders 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 email. An addendum will be issued to all prospective bidders if a correction is needed. Addendums will be posted on the City's Website www.portorchardwa.gov/bids-and-proposals/ and Builders Exchange www.bxwa.com

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: _____

_____

Email address: _____

Fax Number: _____

INFORMATION AND CHECKLIST FOR BIDDERS

The following supplements the information in the Advertisement for Bids:

1. Pre-Bid Conference

A non-mandatory pre-bid conference will be held on-site at 1201 Sidney Avenue, Port Orchard, WA 98366 on April 2, 2024 at 2:00 PM and April 3, 2024 at 10:00 AM. All potential bidders are encouraged to attend. 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 their 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 they 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: Tony Lang, Public Works Director, and sent via email to publicworks@cityofportorchard.us or mail/drop off to 216

Prospect Street, Port Orchard, WA 98366. 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 distributed through plan holders lists at Builders Exchange www.bxwa.com, the City's Website www.portorchardwa.gov/bids-and-proposals and the City Clerk's Plan holders list 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 bond form included in these Contract Provisions 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.

   ii. The bid bond/deposit of the successful Bidder will be returned provided they execute 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 they fail or refuse to do so, the Bid Deposit or Bond shall be forfeited to the City of Port Orchard as liquidated damages for such failure.

   iii. The Owner 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. **Certification of Compliance with Wage Payment Statutes –** Must be filled in and signed.

F. **Supplemental Criteria Information Form** - Must be filled in and signed.

G. - **Subcontractors List** – Must be completed.

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** – One copy to be executed by the successful Bidder. 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.

B. **Performance/Payment Bond and Warranty Bond** – One copy of each type of bond to be executed by the successful Bidder and his surety company. These bonds cover successful completion of all work and payment of all laborers, subcontractors, suppliers, etc. and provide a warranty for the contract work. The bond forms included in these Bid Documents MUST be used; no substitutes will be accepted. If an Attorney-in-fact signs the bond(s), a certified and effectively dated copy of their Power of Attorney must accompany the bond(s).

C. **Certificates of Insurance and endorsements** – 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, 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** – Pursuant to RCW 60.28.010, 5% retainage will be retained until fulfillment of state and local compliance is documented. The retainage form should be completed by the successful bidder.

E. **Prevailing Wage Requirements** – The Contractor is required to pay, at a minimum, the applicable prevailing wage rates to those employees performing services under the Contract. The applicable wage rates are set forth in the State of Washington Department of Labor and Industries Prevailing Wage Rate Schedule, RCW 39.12.020.

The project site is located in **Kitsap County**.

The prevailing wage schedule in effect for the work under the Contract will be the one in effect upon the prime contractor's bid due date with these exceptions:

- If the project is not awarded within six (6) months of the bid due date, the award date (the date the contract is executed) is the effective date.
- If the project is not awarded pursuant to bids, the award date (the date the contract is executed) is the effective date.
- Janitorial contracts follow WAC 296-127-023.

For Project number PW2023-017 the prime contractor bid due date is April 18,2024.

Except for janitorial contracts, the rates in effect on the bid due date shall apply for the duration of the contract (unless otherwise noted in the solicitation).

It is the responsibility of the Contractor to ensure the appropriate labor classification(s) are identified and that the applicable wage and benefit rates are taken into consideration when preparing their proposal according to these specifications.

The selected Contractor must submit to the Department of Labor and Industries, a "Statement of Intent to Pay Prevailing Wages". www.lni.wa.gov/licensing-permits/public-works-projects/contractors-employers/#required-documents-for-doing-the-work A copy of the certified Intent Statement must be submitted to the City prior to payment of the first invoice. The Contractor will pay promptly, when due, all wages accruing to its employees.

All invoice or payment applications are required to bear the following signed statement: "I certify that wages paid under this contract are equal to or greater than the applicable wage rates set forth in the Washington State Prevailing Wage Rates for Public Works Contracts issued by the State of Washington Department of Labor and Industries."

The selected Contractor must submit to the Department of Labor and Industries an "Affidavit of Wages Paid" and a copy of an approved Affidavit must be submitted at the end of the contract to the City before the last payment or any retained funds will be released. www.lni.wa.gov/licensing-permits/public-works-projects/contractors-employers/#when-the-work-is-done

The cost of filing a Statement of Intent to Pay Prevailing Wages and Affidavit of Wages Paid with the Department of Labor and Industries shall be at no additional cost to the City.

The Director of the Department of Labor and Industries shall arbitrate all disputes of the prevailing wage rate, RCW 39.12.060 and WAC 296-127-060.
Look up the prevailing rates of pay, benefit, and overtime codes from this link: https://lni.wa.gov/licensing-permits/public-works-projects/prevailing-wage-rates/ A

copy of the prevailing wage rates is available for viewing at the City of Port Orchard Department of Public Works. A hard copy will be mailed upon request.

For prevailing wage questions, contact the Department of Labor & Industries at PW1@Lni.wa.gov or 360-902-5335.

7. Contractor Disqualification

A bidder will be deemed not responsible, and the proposal rejected if the bidder does not meet the following responsibility criteria set forth in RCW 39.04.350, which provides, in part, as follows:

(1) Before award of a public works contract, a bidder must meet the following responsibility criteria to be considered a responsible bidder and qualified to be awarded a public works project. The bidder must:

(a) At the time of bid submittal, have a certificate of registration in compliance with chapter 18.27 RCW;

(b) Have a current state unified business identifier number;

(c) If applicable, have industrial insurance coverage for the bidder's employees working in Washington as required in Title 51 RCW; an employment security department number as required in Title 50 RCW; and a state excise tax registration number as required in Title 82 RCW;

(d) Not be disqualified from bidding on any public works contract under RCW 39.06.010 or39.12.065(3);

(e) If bidding on a public works project subject to the apprenticeship utilization requirements in RCW 39.04.320, not have been found out of compliance by the Washington state apprenticeship and training council for working apprentices out of ratio, without appropriate supervision, or outside their approved work processes as outlined in their standards of apprenticeship under chapter 49.04 RCW for the one-year period immediately preceding the date of the bid solicitation;

(f) Have received training on the requirements related to public works and prevailing wage under this chapter and chapter 39.12 RCW. The bidder must designate a person or persons to be trained on these requirements. The training must be provided by the department of labor and industries or by a training provider whose curriculum is approved by the department. The department, in consultation with the prevailing wage advisory committee, must determine the length of the training. Bidders that have completed three or more public works projects and have had a valid business license in Washington for three or more years are exempt from this subsection. The department of labor and industries must keep records of entities that have satisfied the training requirement or

are exempt and make the records available on its web site. Responsible parties may rely on the records made available by the department regarding satisfaction of the training requirement or exemption.

(g) Within the three-year period immediately preceding the date of the bid solicitation, not have been determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of limited or general jurisdiction to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW.

The Bidder shall submit a signed statement to the City in accordance with Chapter 5.50 RCW verifying under penalty of perjury that (1) the bidder is in compliance with the responsible bidder criteria in subsection (1)(g) above; and (2) that the Contractor is not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded by any Federal department or agency in accordance with Executive Orders 12549 and 12689, 24 C.F.R. Pt. 24.

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.

8. Suspension of Work

Contract time may be suspended for procurement of critical materials (Procurement Suspension). In order to receive a Procurement Suspension, the Contractor shall, within 21 calendar days after execution by the City, place purchase orders for all materials deemed critical by the City for physical completion of the contract. The Contractor shall provide copies of purchase orders for the critical materials. Such purchase orders shall disclose the purchase order date and estimated delivery dates for such critical material.

The Contractor shall show procurement of the materials listed below as activities in the Progress Schedule. If the approved Progress Schedule indicates that the materials procurement are critical activities, and if the Contractor has provided documentation that purchase orders are placed for the critical materials within the prescribed calendar days, then contract time will be suspended upon physical completion of all critical work except that work dependent upon the below listed critical materials:

Diesel Generator Set, 230 kW Standby, 209 kW Prime, Open Frame with Base Tank

Automatic Transfer Switch, 400 amp, 277/480 volt, 3 phase, 4 wire

Charging of contract time will resume upon delivery of the critical materials to the Contractor or 448 calendar days after execution by the City, whichever occurs first.

During such time that the work is suspended, the City shall have functional use of the pump station and the existing on-site generator.

All bidders shall base their bid on a material procurement lead time of up to 61 weeks for the diesel generator set and 16 weeks for the automatic transfer switch, run concurrently. Bidders shall include in their bid the costs relating to the suspension of work, including labor and any temporary components needed to make the pump station operational with the existing on-site generator during the suspension period.

PROPOSAL
CITY OF PORT ORCHARD

MELCHER STREET PUMP STATION REHABILITATION

PROJECT NO. PW2023-017

To: Mayor and City Council

City of Port Orchard, Washington

Contractor: _____

State License No.: _____

Date: _____

Month/Day/Year

Bidder's Declaration and Understanding

The Bidder declares that they have carefully examined the Contract Documents for the construction of the project, that they have personally inspected the site, that they have satisfied themself 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 they have exercised their own judgment regarding the interpretation, of subsurface information and have utilized all data, which they believe pertinent from City and other sources and have made such independent investigations as the Bidder deems necessary in arriving at their 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 they have 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 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 of, and without notice by, the City.

Contract Execution

The Bidder agrees that if this Proposal is accepted, the bidder 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 the 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 14 calendar days of CONTRACT START DATE, they will meet with engineering personnel and begin work no earlier than N/A, and complete the construction within 100 working days of START DATE.

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.

SCHEDULE OF CONTRACT PRICES
MELCHER STREET PUMP STATION REHABILITATION PROJECT
PROJECT NO. PW2023-017

NOTE: Unit prices for all items and the total amount bid must be shown. The Project must be bid in its entirety, including all bid items as specifically listed in the Proposal, in order to be considered a responsive bid. Where conflict occurs between the unit price and the total amount named for any items, the Total Amount in Words typed or printed and entered in ink shall prevail. The Contracting Agency reserves the right to award all work bid according to the lowest qualified responsive bid tendered, available funds, and as it best serves the interest of the Contracting Agency. All work awarded will be made to the same Contractor/bidder.

Item No.	Estimated Quantity	SP / STD	Description of Item / Total Amount in Words	Unit Price	Total Amount
Base Bid					
1	Lump Sum	N/A	Mobilization, demobilization, and demolition $ _____ (Total Amount in Words)	LS $ _____	$ _____
2	Lump Sum	N/A	Pump station modifications, incl. antennae base, equipment pads, and ventilation louver $ _____ (Total Amount in Words)	LS $ _____	$ _____
3	Lump Sum	N/A	Electrical power and lighting modifications $ _____ (Total Amount in Words)	LS $ _____	$ _____
4	Lump Sum	N/A	Pumps $ _____ (Total Amount in Words)	LF $ _____	$ _____
5	Lump Sum	N/A	Piping and supports $ _____ (Total Amount in Words)	LS $ _____	$ _____
6	Lump Sum	N/A	Controls $ _____ (Total Amount in Words)	LS $ _____	$ _____

Item No.	Estimated Quantity	SP / STD	Description of Item / Total Amount in Words	Unit Price	Total Amount
7	lump Sum	N/A	Generator, Base Tank, and Silencer	LS $	$
			$ (Total Amount in Words)		
Total Base Bid					**$**
			SALES TAX (9.3%)		$
			TOTAL BID		**$**

SALES TAX

Retailing/Retail Sales Tax Rule WAC 458-20-170: Washington State Retail sales tax added as percent (%) in addition to contract bid price; sales tax shown as separate line item.

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 PORT ORCHARD
MELCHER STREET PUMP STATION REHABILITATION
PUBLIC WORKS PROJECT NO. PW2023-017

_____	_____	_____	_____
Addendum No.	Date of Receipt	Addendum No.	Date of Receipt
_____	_____	_____	_____
Addendum No.	Date of Receipt	Addendum No.	Date of Receipt

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 they have reviewed the insurance provisions of the Bid Documents and will provide the required coverage.

The undersigned Bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date for this Project, the Bidder is not a "willful" violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

OFFICIAL AUTHORIZED TO SIGN FOR BIDDER:	
"I certify (or declare) under penalty of perjury under the laws of the State of Washington that the foregoing is true and correct."	
Signature:	Date:
Printed Name and Title:	Location or Place Executed (City, State):
Business Address:	Business Telephone:

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 _____)

) ss.

COUNTY OF _____)

I certify that I know or have satisfactory evidence that _____ signed this proposal, on oath stated that they are 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 their 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 PORT ORCHARD
MELCHER STREET PUMP STATION REHABILITATION
PUBLIC WORKS PROJECT NO. PW2023-017

1. Name of Contractor:

_____

Address:

_____

2. Telephone No. (_____) _____ Fax No.: (_____)_____

Email Address_____

3. Washington State Dept. of Labor and Industries Worker's Compensation Account No.: _____

4. Washington State Dept. of Licensing Contractor's Registration No.: _____
Expiration Date: _____

5. Washington State Uniform Business Identifier No.: _____
(Must have UBI number before the contract is awarded.)

6. Does the Contractor have a City of Port Orchard Business License Yes: _____ No: _____
(A City of Port Orchard Business license is required prior to commencing work pursuant to a written Notice to Proceed)

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

8. At the time of bid submittal, did the contractor have a certificate of registration in compliance with Chapter 18.27 RCW? _____

9. Does the contractor have industrial insurance coverage for its employees working in Washington as required in Title 51 RCW? (Provide number.) _____

10. Does the contractor have an employment security department number as required in Title 50 RCW? (Provide number): _____

11. Does the contractor have a state excise tax registration number as required in Title 82 RCW? (Provide number): _____

12. Has the contractor been disqualified from bidding on any public works contract under RCW 39.06.010 or 39.12.065(3)? _____

13. If project includes Federal funding. Is the Contractor registered in Sam.gov? Yes___ No ____
    Enter Unique ID No. (UEI)_____

14. Has the contractor received training on the requirements related to public works and prevailing wage under chapters 39.04 and 39.12 RCW, as required in RCW 39.04.350(1)(f) _____

15. Within the three-year period immediately preceding the date of the bid solicitation, was the contractor (determined by a final and binding citation and notice of assessment issued by the department of labor and industries or through a civil judgment entered by a court of limited or general jurisdiction) to have willfully violated, as defined in RCW 49.48.082, any provision of chapter 49.46, 49.48, or 49.52 RCW? _____

16. Has the contractor violated the "Off-site Prefabricated Non-Standard Project Specific Items" reporting requirements more than one time as determined by the department of labor and industries? _____

17. Particular types of construction performed by your company:_____

_____

_____

_____

_____

18. Gross amount of contracts now on hand: $ _____

19. 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.):

Amount	Type	Owner's Name	Phone

20. What is the construction experience of the principal individuals to be assigned to this project?

Name	Title	Years of Construction Experience	Availability

Pursuant to RCW 39.06.020, the contractor further agrees to verify responsibility criteria for each of its subcontractors and to require each of its subcontractors to both verify responsibility criteria as described herein for its subcontractors and include instant condition for verification requirement.

By: _____

(Authorized Signature)

Title: _____

Date: _____

BID SECURITY
CITY OF PORT ORCHARD
MELCHER STREET PUMP STATION REHABILITATION
PUBLIC WORKS PROJECT NO. PW2023-017

Bid Deposit:

The undersigned Principal hereby submits a Bid Deposit with the City of Port Orchard 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 Port Orchard, 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 _____, Port Orchard, 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.

Signed, Sealed and Dated this _____ day of _____, 20____.

_____	_____
Principal	Surety
_____	_____
Signature of Authorized Official	Signature of Authorized Official
_____	By: _____
Printed Name and Title	Attorney-in-Fact (Attach Power of Attorney)

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

_____

_____

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.

DOT Form 272-036H EF
Revised 5/06

CERTIFICATION OF COMPLIANCE WITH WAGE PAYMENT STATUTES

The bidder hereby certifies that, within the three-year period immediately preceding the bid solicitation date March 15, 2024, the bidder is not a "willful" violator, as defined in RCW 49.48.082, of any provision of chapters 49.46, 49.48, or 49.52 RCW, as determined by a final and binding citation and notice of assessment issued by the Department of Labor and Industries or through a civil judgment entered by a court of limited or general jurisdiction.

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

_____

Bidder's Business Name

_____

Signature of Authorized Officer/Representative*

_____

Printed Name

_____

Title

_____ _____ _____

Date City State

Check One:

Sole Proprietorship ☐ Partnership ☐ Joint Venture ☐ Corporation/LLC ☐

State of Incorporation, or if not a corporation, State where business entity was formed:

_____

If a co-partnership, give firm name under which business is transacted:

_____

**If a corporation or limited liability company, this certificate must be executed in the entity's name by the president or vice-president (or any other corporate officer accompanied by evidence of authority to sign). If a co-partnership, this certificate must be executed by a partner.*

SUPPLEMENTAL CRITERIA INFORMATION FORM

As evidence that the Bidder meets the mandatory and supplemental responsibility criteria, the apparent two lowest Bidders must submit to the Owner by 12:00 p.m. (noon) of the second business day following the bid submittal deadline, this Supplemental Criteria Information Form verifying that the Bidder meets the Mandatory Criteria under RCW 39.04.350(1) and the Supplemental Bidder Criteria stated below. The two lowest Bidders shall also submit supporting documentation including but not limited to that detailed below (sufficient in the sole judgment of the Owner) demonstrating compliance with all mandatory and supplemental responsibility criteria. The Owner reserves the right to request such documentation from other Bidders as well, and to request further documentation as needed to assess Bidder responsibility. The Owner 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 Owner may (but is not required to) 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 Owner (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 Owner from others for whom the Bidder has worked, or other public agencies or private enterprises; and (iii) any additional information obtained by the Owner which is believed to be relevant to the matter.

If the Owner determines the Bidder does not meet the bidder responsibility criteria and is therefore not a responsible Bidder or the bid is not responsive, the Owner 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 Owner's determination by presenting its appeal and any additional information to the Owner. The Owner will consider the appeal and any additional information before issuing its final determination. If the final determination affirms that the Bidder is not responsible (or the bid is not responsive), the Owner will not execute a contract with any other Bidder until at least two business days after the Bidder determined to be not responsible (or the bid not responsive) has received the Owner'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 Owner 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 Owner 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 Owner in the Bid Documents.

For criteria with check boxes, the bidder will check either "Yes" or "No." For each "Yes" answer on the form, the Bidder shall provide a signed and dated statement providing the project information requested and explaining the extenuating circumstances.

Project Name: Melcher Street Pump Station Rehabilitation	
Part A. General Company Information	
Company Name:	
Address:	
Contact Phone:	Contact E-mail:
Years in business as a Prime Contractor:	Years in business as a subcontractor:
Years in business under Present Name:	
List any former company names under which the company, its owners, and/or its principals has operated in the past five (5) years.	
Explain reason for name change(s) in the past five (5 years)	
Part B. Delinquent State Taxes	
Is the bidder listed on the Washington State Department of Revenue's "Delinquent Taxpayer List" website: http://dor.wa.gov/content/fileandpaytaxes/latefiling/dtlwest.aspx	
Yes ☐ No ☐	
If "Yes" attach a copy of the written payment plan approved by the Department of Revenue.	
Part C. Federal Debarment	
The bidder shall not be listed as a current debarred or suspended bidder on the Federal "System For Award Management" website www.sam.gov. Is the bidder listed as debarred or suspended?	
Yes ☐ No ☐	

Sam.gov Unique Entity ID No._____
Part D. Subcontractor Responsibility
Does the bidder's standard subcontract form include the subcontractor language required by RCW 39.06.020? Does the bidder have an established procedure which it uses to validate the responsibility of each of its subcontractors? Does the subcontract form require that each of the bidder's subcontractors have and document a similar procedure for sub-tier subcontractors?
Yes ☐ No ☐
If "Yes" or "No", provide a copy of its standard subcontract form and a copy of the procedures used to validate the responsibility of subcontractors.
Part E. Prevailing Wages
In the last five (5) years, has the bidder had prevailing wage complaints filed against it or received violations as determined by the applicable state or federal government agency monitoring prevailing and/or Davis-Bacon wage compliance?
Yes ☐ No ☐
If "Yes," attach a separate signed/dated statement listing the prevailing wage violations, along with an explanation of each violation and how it was resolved. The City shall evaluate these explanations and the resolution of each violation to determine whether the violations demonstrate a pattern of failure to pay prevailing wages to workers unless there are extenuating circumstances acceptable to the City.
Part F. Claims Against Retainage and Bonds
Does the bidder have a record of any claims filed against the retainage or payment bonds for public works projects during the previous three (3) years?
Yes ☐ No ☐
If "Yes", attach a separate signed / dated statement for each project with claims which includes the following: 1) Owner and contact information for the owner; 2) a list of claims filed against the retainage and/or payment bond for the project; and 3) a written explanation of the circumstances surrounding the claim and the ultimate resolution of the claim. The City may contact previous owners to validate the information provided by the Bidder. The City shall evaluate the information to determine if it demonstrates a lack of effective management by the bidder of making timely and appropriate payments, unless there are extenuating circumstances acceptable to the City in its sole discretion.

Part G. Public Bidding Crime
Has the bidder been convicted of a crime involving bidding on a public works contract within the last five (5) years?
Yes ☐ No ☐
Part H. Termination for Cause/Termination for Default
Has the bidder had any public works contract terminated for cause by any government agency during the previous five (5) years?
Yes ☐ No ☐
If "Yes", attach a separate signed / dated statement listing each contract terminated, the government agency terminating the contract and the circumstances involving the termination for cause. The City will determine if there are extenuating circumstances acceptable to the City in its sole discretion.
Part I. Lawsuits
Has the bidder been involved in lawsuits (or arbitrations for those instances where arbitration is completed in lieu of a lawsuit) with judgments entered against the bidder for failure to meet terms on contracts in the previous five (5) years?
Yes ☐ No ☐
If "Yes", attach a list of lawsuits and/or arbitrations with judgments / arbitration awards entered against the bidder along with a written explanation of the circumstances surrounding each lawsuit and/or arbitration.
Part J. Work Experience
List at least three construction projects on the attached Work Experience Form, each of which meet all of the following criteria: • Successfully completed water distribution pump station construction or repairs, in the past 7 years. • Work includes electrical power and controls. • Contract value exceeding $500,000.00.

Part K. Signature	
I hereby certify, warrant and declare under penalty of perjury that the information included herein is correct and complete. Failure to disclose requested information or submitting false or misleading information may result in rejection of my bid, termination of my contract, and may impact my firm's ability to bid on future projects.	
Signature of Authorized Representative	Date
Printed Name of Authorized Representative	Title

Work Experience Form

List at least three construction projects on the attached Work Experience Form, each of which meet all of the following criteria:

- Successfully completed within the last seven (7) years.
- Water main pump installation, connection, and repairs.
- Electrical power and system controls
- Contract value exceeding $500,000.00.

1. _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   Contract Value $_____

2. _____
   _____
   _____
   _____
   _____
   _____
   _____
   _____
   Contract Value $_____

3. _____
   _____
   _____
   _____
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   _____
   _____
   _____
   Contract Value $_____

4. _____
_____
_____
_____
_____
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_____

Contract Value $_____

5. _____
_____
_____
_____
_____
_____
_____
_____

Contract Value $_____

SUBCONTRACTOR LIST

Per RCW 39.30.060, the bidder is required to submit as part of the bid the names of the subcontractors with whom the bidder will subcontract for performance of the work of HVAC (heating, ventilation, and air conditioning), plumbing as described in chapter 18.106 RCW, and electrical as described in chapter 19.28 RCW, or to name itself for the work and is also required to list the names of subcontractors with whom the bidder will subcontract for performance of the work of structural steel installation and rebar installation. The bidder shall not list more than one subcontractor for each category of work identified, unless subcontractors vary with bid alternates, in which case the bidder must indicate which subcontractor will be used for which alternate.

The work to be performed is to be listed below the subcontractor(s) name. The requirement to name the bidder's proposed HVAC, plumbing, electrical, structural steel installation, and rebar installation subcontractors applies only to proposed HVAC, plumbing, electrical, structural steel installation, and rebar installation subcontractors who will contract directly with the bidder submitting the bid to the public entity.

Failure to list subcontractors who are proposed to perform the work of HVAC (heating, ventilation and air conditioning), plumbing, and electrical, or to name itself to perform such work, or failing to name subcontractors who are proposed to perform structural steel installation or rebar installation, or naming more than one subcontractor to perform the same work will result in your bid being non-responsive and therefore void.

Subcontractor Name _____

Work to be Performed _____

_____

_____

_____

Subcontractor Name _____

Work to be Performed _____

_____

_____

_____

Subcontractor Name _____

Work to be Performed _____

_____

_____

_____

Subcontractor Name _____

Work to be Performed _____

_____

_____

_____

Subcontractor Name _____

Work to be Performed _____

_____

_____

_____

_____

CONTRACT DOCUMENTS

CONTRACT
CITY OF PORT ORCHARD

MELCHER STREET PUMP STATION REHABILITATION
CONTRACT NO. _____

THIS CONTRACT ("Contract") is made and entered into this ____ day of _____, 20__, by and between the City of Port Orchard, a municipality incorporated and existing under the laws of the State of Washington, hereinafter called the "City," and _____, hereinafter called the "Contractor."

WITNESSETH:

I. General Provisions.

A. Description of Work.

The Contractor, in consideration of the covenants, agreements and payments to be performed and made by the City, hereby covenants and agrees to furnish all labor, tools, materials, equipment and supplies required for, and to execute, construct and finish in full compliance with the Contract Documents, MELCHER STREET PUMP STATION REHABILITATION. The Contractor further agrees to perform all such work for the Contract Price stated in the Contractor's Bid Proposal dated _____, attached hereto and incorporated herein by this reference as if set forth in full. Contractor further represents that the services furnished under this Agreement will be performed in accordance with and as described in the attached plans and specifications and with the Port Orchard Municipal Code, the City's Public Works Standards, which includes (but is not limited to) the 2021 edition of the WSDOT Standard Specifications for Road, Bridge, and Municipal Construction (which shall apply except where noted otherwise). All of these standards are by this reference incorporated herein and made a part hereof. Contractor further represents that the services furnished under this Agreement will be performed in accordance with generally accepted professional practices within the Puget Sound region in effect at the time such services are performed.

The Contract Documents include:

Exhibit A -a confirmed copy of the Proposal made by the Contractor on_____, together with the Instructions to Bidders.

Exhibit B – The Project Manual for the MELCHER STREET PUMP REHABILITATION Project.

Exhibit C – Retainage Options

All Exhibits to this Contract are by this reference incorporated herein and made a part hereof as if set forth in full.

B. Time of Completion.

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 100 working days after the Notice to Proceed Date.

C. Liquidated Damages.

It is further agreed that the City will suffer damage and be put to additional expense in the event that the Contractor shall not have the specified portions of the work completed in all its parts in the time specified, and as it may be difficult to accurately compute the amount of such damage, the Contractor expressly covenants and agrees to pay to the City liquidated damages, the sum as calculated by the equation shown in Section 1-08.9 of the WSDOT Standard Specifications, for each and every working day said work is not complete beyond the time shown in the Proposal.

II. Non-Discrimination.

During the performance of this Contract, the Contractor, for itself, its assignees, and successors in interest agrees to comply with the following non-discrimination statutes and authorities; including but not limited to compliance with the following Pertinent Non-Discrimination Authorities:

- Title VI of the Civil Rights Act of 1964 (42 U .S.C. § 2000d et seq., 78 stat. 252), (prohibits discrimination on the basis of race, color, national origin); and 49 C.F.R. Part 21.
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 U.S.C. § 4601), (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Federal-Aid Highway Act of 1973, (23 U.S.C. § 324 et seq.), (prohibits discrimination on the basis of sex);
- Section 504 of the Rehabilitation Act of 1973, (29 U.S.C. § 794 et seq.), as amended, (prohibits discrimination on the basis of disability); and 49 C.F.R. Part 27;
- The Age Discrimination Act of 1975, as amended, (42 U .S.C. § 6101 et seq.), (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982, (49 USC§ 471, Section 4 7123), as amended, (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987, (PL 100-209), (Broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, The Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub- recipients and contractors, whether such programs or activities are Federally funded or not);

- Titles II and III of the Americans with Disabilities Act, which prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities (42 U.S.C. §§ 12131-12189) as implemented by Department of Transportation regulations at 49 C.P.R. parts 37 and 38;
- The Federal Aviation Administration's Non-discrimination statute (49 U.S.C. § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, which ensures discrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations;
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to -ensure that LEP persons have meaningful access to your programs (70 Fed. Reg. at 74087 to 74100);
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 U.S.C. 1681 et seq).

Title VI of the Civil Rights Act of 1964

The City of Port Orchard, in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d to 2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation subtitle A, Office of the Secretary, Part 21, nondiscrimination in federally assisted programs of the Department of Transportation issued pursuant to such Act, must affirmatively ensure that its contracts comply with these regulations.
Also, in accordance with Title VI, the City is required to include the following clauses in every contract subject to Title VI and its related regulations.

Therefore, during the performance of this Contract, the Contractor, for itself, its assignees, and successors in interest agrees as follows:

1. Compliance with Regulations: The Contractor will comply with the Acts and the regulations relative to Nondiscrimination in Federally-assisted programs of the U.S. Department of Transportation, Federal Highway Administration (FHWA), as they may be amended from time to time, which are herein incorporated by reference and made a part of this Contract.

2. Nondiscrimination: The Contractor, with regard to the work performed by it during this Contract, will not discriminate on the grounds of race, color, national origin, sex, age, disability, income-level, or LEP in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Acts and the Regulations as set

forth herein, including employment practices when this Contract covers any activity, project, or program set forth in Appendix B of 49 C.F.R. part 21.

3. Solicitations for Subcontracts, Including Procurements of Materials and Equipment: In all solicitations, either by competitive bidding, or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the Contractor's obligations under this Contract and the Acts and the Regulations relative to Non-discrimination on the grounds of race, color, national origin, sex, age, disability, income-level, or LEP.

4. Information and Reports: The Contractor will provide all information and reports required by the Acts, the Regulations and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the City or the FHWA to be pertinent to ascertain compliance with such Acts, Regulations, and instructions. Where any information required of the Contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the City or the FHWA, as appropriate, and will set forth what efforts it has made to obtain the information.

5. Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the Non-discrimination provisions of this Contract, the City will impose such contract sanctions as it or the FHWA may determine to be appropriate, including, but not limited to:
    1. withholding payments to the Contractor under the Contract until the Contractor complies; and/or
    2. cancelling, terminating, or suspending the Contract, in whole or in part.

6. Incorporation of Provisions: The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the City or the FHWA may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the City to enter into any litigation to protect the interests of the City. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

III. Public Records Act Chapter 42.56 RCW

Contractor understands that her/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 disclose such documents upon a request. Contractor acknowledges that they have

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 of, and without notice by, the City.

IV. Termination

The City may terminate this contract for cause or for convenience.

1. Termination for Cause. The City may, upon 7 days written notice to Contractor and to its surety, terminate (without prejudice to any right or remedy of the City) the contract, or any part of it, for cause upon the occurrence of any one or more of the following events: Contractor fails to complete the work or any portion thereof with sufficient diligence to ensure substantial completion of the work within the contract time; Contractor is adjudged bankrupt, makes a general assignment for the benefit of its creditors, or a receiver is appointed on account of its insolvency; Contractor fails in a material way to replace or correct work not in conformance with the Contract Documents, Contractor repeatedly fails to supply skilled workers or proper materials or equipment; Contractor materially disregards or fails to comply with laws, ordinances, rules, regulations, or orders of any public authority having jurisdiction; or Contractor is otherwise in material breach of any provision of the contract. Upon termination, the City may, at its option, take possession of or use all documents, materials, equipment, tools, and construction equipment and machinery thereon owned by Contractor to maintain the orderly progress of, and to finish, the work, and finish the work by whatever other reasonable method it deems expedient.

2. Termination for Convenience. The City may, upon written notice, terminate (without prejudice to any right or remedy of the City) the contract, or any part of it, for the convenience of the City.

3. Settlement of Costs. If the City terminates for convenience, Contractor shall be entitled to make a request for an equitable adjustment for its reasonable direct costs incurred prior to the effective date of the termination, plus a reasonable allowance for overhead and profit on work performed prior to termination, plus the reasonable administrative costs of the termination, but shall not be entitled to any other costs or damages, whatsoever, provided however, the total sum payable upon termination shall not exceed the Contract Sum reduced by prior payments.

V. Suspension of Work

Contract time may be suspended for procurement of critical materials (Procurement Suspension). In order to receive a Procurement Suspension, the Contractor shall, within 21 calendar days after execution by the City, place purchase orders for all materials deemed critical by the City for physical completion of the contract. The Contractor shall provide copies of purchase orders for the critical materials. Such purchase orders shall disclose the purchase order date and estimated delivery dates for such critical material.

The Contractor shall show procurement of the materials listed below as activities in the Progress Schedule. If the approved Progress Schedule indicates that the materials procurement are critical activities, and if the Contractor has provided documentation that purchase orders are placed for the critical materials within the prescribed calendar days, then contract time will be suspended upon physical completion of all critical work except that work dependent upon the below listed critical materials:

1. Diesel Generator Set, 230 kW Standby, 209 kW Prime, Open Frame with Base Tank
2. Automatic Transfer Switch, 400 amp, 277/480 volt, 3 phase, 4 wire

Charging of contract time will resume upon delivery of the critical materials to the Contractor or 448 calendar days after execution by the City, whichever occurs first.

During such time that the work is suspended, the City shall have functional use of the pump station and the existing on-site generator.

VI. Corporate Surety Bond

With this Contract, Contractor is furnishing a Corporate Surety Bond in the amount of _____ Dollars ($_____) with _____ as Surety, to ensure full compliance, execution and performance of this Contract by the Contractor in accordance with all its terms and provisions.

VII. Independent Contractor.

The parties intend that an Independent Contractor-Employer Relationship will be created by this Agreement and that the Contractor has the ability to control and direct the performance and details of its work, the City being interested only in the results obtained under this Agreement.

VIII. Employment of State Retirees.

The City is a "DRS-covered employer" which is an organization that employs one or more members of any retirement system administered by the Washington State Department of Retirement

Systems (DRS). Pursuant to RCW 41.50.139(1) and WAC 415-02-325(1), the City is required to elicit on a written form if any of the Contractor's employees providing services to the City retired using the 2008 Early Retirement Factors (ERFs), or if the Contractor is owned by an individual who retired using the 2008 ERFs, and whether the nature of the service and compensation would result in a retirement benefit being suspended. Failure to make this determination exposes the City to significant liability for pension overpayments. As a result, before commencing work under this Agreement, Contractor shall determine whether any of its employees providing services to the City or any of the Contractor's owners retired using the 2008 ERFs, and shall immediately notify the City and shall promptly complete the form provided by the City after this notification is made. This notification to DRS could impact the payment of retirement benefits to employees and owners of Contractor. Contractor shall indemnify, defend, and hold harmless the City from any and all claims, damages, or other liability, including attorneys' fees and costs, relating to a claim by DRS of a pension overpayment caused by or resulting from Contractor's failure to comply with the terms of this provision. This provision shall survive termination of this Agreement.

IX. Changes.

The City may issue a written change order for any change in the Contract work during the performance of this Agreement. If the Contractor determines, for any reason, that a change order is necessary, Contractor must submit a written change order request to the person listed in the Notice provision section of this Agreement, within fourteen (14) calendar days of the date 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. However, 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 either a written change order from the City or an oral order from the City before actually receiving the written change order. If the Contractor fails to require a change order within the time specified in this paragraph, the Contractor waives its right to make any claim or submit subsequent change order requests for that portion of the contract 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 in subsections A through E of Section IX entitled, "Claims," below.

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 accepted by Contractor as provided in this section 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.

X. Claims. 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 may file a claim as provided in this section. The Contractor shall give written notice to the City of all claims within fourteen (14) calendar days of the occurrence of the events giving rise to the claims, or within fourteen (14) calendar days of the date the Contractor knew or should have known of the facts or events giving rise to the claim, whichever occurs first. Any claim for damages, additional payment for any reason, or extension of time, whether under this Agreement or otherwise, shall be conclusively deemed to have been waived by the Contractor unless a timely written claim is made in strict accordance with the applicable provisions of this Agreement.

At a minimum, a Contractor's written claim shall include the information set forth in subsections A, items 1 through 5 below.

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

A. Notice of Claim. Provide a signed written notice of claim that provides the following information:

1. The date of the Contractor's claim;

2. The nature and circumstances that caused the claim;

3. The provisions in this Agreement that support the claim;

4. The estimated dollar cost, if any, of the claimed work and how that estimate was determined; and

5. An analysis of the progress schedule showing the schedule change or disruption if the Contractor is asserting a schedule change or disruption.

B. Records. The Contractor shall keep complete records of extra costs and time incurred as a result of the asserted events giving rise to the claim. The City shall have access to any of the Contractor's records needed for evaluating the protest.

The City will evaluate all claims, provided the procedures in this section are followed. If the City determines that a claim is valid, the City will adjust payment for work or time by an equitable adjustment. No adjustment will be made for an invalid protest.

C. Contractor's Duty to Complete Protested Work. In spite of any claim, the Contractor shall proceed promptly to provide the goods, materials and services required by the City under this Agreement.

D. Failure to Protest Constitutes Waiver. By not protesting as this section provides, the Contractor also waives any additional entitlement and accepts from the City any written or oral order (including directions, instructions, interpretations, and determination).

E. Failure to Follow Procedures Constitutes Waiver. By failing to follow the procedures of this section, the Contractor completely waives any claims for protested work and accepts from the City any written or oral order (including directions, instructions, interpretations, and determination).

XI. Limitation Of Actions.

CONTRACTOR MUST, IN ANY EVENT, FILE ANY LAWSUIT ARISING FROM OR CONNECTED WITH THIS AGREEMENT WITHIN 120 CALENDAR DAYS FROM THE DATE THE CONTRACT WORK IS COMPLETE OR CONTRACTOR'S ABILITY TO FILE THAT CLAIM OR SUIT SHALL BE FOREVER BARRED. THIS SECTION FURTHER LIMITS ANY APPLICABLE STATUTORY LIMITATIONS PERIOD.

XII. Warranty.

Upon acceptance of the contract work, Contractor must provide the City a two-year warranty bond in the amount of twenty percent (20%) of the contract price a form and amount acceptable to the City. The Contractor shall correct all defects in workmanship and materials within two (2) years from the date of the City's acceptance of the Contract work, including replacing vegetation that fails to thrive. In the event any parts are repaired or replaced, only original replacement parts shall be used—rebuilt or used parts will not be acceptable. When defects are corrected, the warranty for that portion of the work shall extend for one (1) additional year from the date such correction is completed and accepted by the City. The Contractor shall begin to correct any defects within seven (7) calendar days of its receipt of notice from the City of the defect. If the Contractor does not accomplish the corrections within a reasonable time as determined by the City, the City may complete the corrections and the Contractor shall pay all costs incurred by the City in order to accomplish the correction.

XIII. Indemnification.

Contractor shall defend, indemnify, and hold the City, its officers, officials, employees, agents and volunteers harmless from any and all claims, injuries, damages, losses or suits, including all legal costs and attorney fees, arising out of or in connection with the Contractor's performance of this Agreement, except for that portion of the injuries and damages caused by the sole negligence of the City.

The City's inspection or acceptance of any of Contractor's work when completed shall not be grounds to avoid any of these covenants of indemnification.

Should a court of competent jurisdiction determine that this Agreement 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 hereunder shall be only to the extent of the Contractor's negligence.

It is further specifically and expressly understood that the indemnification provided herein constitutes the contractor's waiver of immunity under Industrial Insurance, Title 51 RCW, solely for the purposes of this indemnification. The parties further acknowledge that they have mutually negotiated this waiver.

THE PROVISIONS OF THIS SECTION SHALL SURVIVE THE EXPIRATION OR TERMINATION OF THIS AGREEMENT.

XIV. Insurance.

The Contractor shall procure and maintain for the duration of the Agreement, 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, representative, employees or subcontractors.

No Limitation. Contractor’s maintenance of insurance as required by the agreement shall not be construed to limit the liability of the Contractor to the coverage provided by such insurance, or otherwise limit the City’s recourse to any remedy available at law or in equity.

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, stop gap liability, independent contractors, products-completed operations, 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 General Liability insurance for liability arising from explosion, collapse or underground property damage. The City shall be named as an insured under the Contractor's Commercial General Liability insurance policy with respect to the work performed for the City using ISO Additional Insured endorsement CG 20 10 10 01 and Additional Insured-Completed Operations endorsement 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.

4. Builders Risk insurance covering interests of the City, the Contractor, Subcontractors, and Sub-subcontractors in the work. Builders Risk insurance shall be on a all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including flood and earthquake, theft, vandalism, malicious mischief, collapse, temporary buildings and debris removal. This Builders Risk insurance covering the work will have a deductible of $5,000 for each occurrence, which will be the responsibility of the Contractor. Higher deductibles for flood and earthquake perils may be accepted by the City upon written request by the Contractor and written acceptance by the City. Any increased deductibles accepted by the City will remain the responsibility of the Contractor. The Builders Risk insurance shall be maintained until final acceptance of the work by the City.

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 operations aggregate limit.

3. Builders Risk insurance shall be written in the amount of the completed value of the project with no coinsurance provisions.

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 the City. Any insurance, self-insurance, or insurance pool coverage maintained by the City shall be 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.

D. Contractor's Insurance for Other Losses. The Contractor shall assume full responsibility for all loss or damage from any cause whatsoever to any tools, Contractor's employee-owned tools, machinery, equipment, or motor vehicles owned or rented by the Contractor, or the Contractor's agents, suppliers or contractors as well as to any temporary structures, scaffolding and protective fences.

E. Waiver of Subrogation. The Contractor and the City waive all rights against each other any of their Subcontractors, Sub-subcontractors, agents and employees, each of the other, for damages caused by fire or other perils to the extend covered by Builders Risk insurance or other property insurance obtained pursuant to the Insurance Requirements Section of this Contract or other property insurance applicable to the work. The policies shall provide such waivers by endorsement or otherwise.

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

G. 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. Before any exposure to loss may occur, the Contractor shall file with the City a copy of the Builders Risk insurance policy that includes all applicable conditions, exclusions, definitions, terms and endorsements related to this Project.

H. Subcontractors. Contractor shall ensure that each subcontractor of every tier obtain at a minimum the same insurance coverage and limits as stated herein for the Contractor (with the exception of Builders Risk insurance). Upon request the City, the Contractor shall provide evidence of such insurance.

XV. WORK PERFORMED AT CONTRACTOR'S RISK. Contractor shall take all necessary precautions and shall be responsible for the safety of its employees, agents, and subcontractors in the performance of the contract work and shall utilize all protection necessary for that purpose. All work shall be done at Contractor's own risk, and Contractor shall be responsible for any loss of or damage to materials, tools, or other articles used or held for use in connection with the work.

XVI. Miscellaneous Provisions.

A. Non-Waiver of Breach. The failure of the City to insist upon strict performance of any of the covenants and agreements contained in this Agreement, or to exercise any option conferred by this Agreement in one or more instances shall not be construed to be a waiver or relinquishment of those covenants, agreements or options, and the same shall be and remain in full force and effect.

B. Resolution of Disputes and Governing Law. This Agreement shall be governed by and construed in accordance with the laws of the State of Washington. If the parties are unable to settle any dispute, difference or claim arising from the parties' performance of this Agreement, the exclusive means of resolving that dispute, difference or claim, shall only be by filing suit exclusively under the venue, rules and jurisdiction of the Kitsap County Superior Court, Kitsap County, Washington, unless the parties agree in writing to an alternative dispute resolution process. In any claim or lawsuit for damages arising from the parties' performance of this Agreement, each party shall pay all its legal costs and attorney's fees incurred in defending or bringing such claim or lawsuit, including all appeals, in addition to any other recovery or award provided by law; provided, however, nothing in this paragraph shall be construed to limit the City's right to indemnification under Section XII of this Agreement.

C. Written Notice. All communications regarding this Agreement shall be sent to the parties at the addresses listed on the signature page of the Agreement, unless notified to the contrary. Any written notice hereunder shall become effective three (3) business 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 Agreement or such other address as may be hereafter specified in writing.

D. Assignment. Any assignment of this Agreement by either party without the written consent of the non-assigning party shall be void. If the non-assigning party gives its consent to any assignment, the terms of this Agreement shall continue in full force and effect and no further assignment shall be made without additional written consent.

E. Modification. No waiver, alteration, or modification of any of the provisions of this Agreement shall be binding unless in writing and signed by a duly authorized representative of the City and Contractor.

F. Entire Agreement. The written provisions and terms of this Agreement, together with any Exhibits attached hereto, shall supersede all prior verbal statements of any officer or other representative of the City, and such statements shall not be effective or be construed as entering into or forming a part of or altering in any manner this Agreement. All of the above documents are hereby made a part of this Agreement. However, should any language in any of the Exhibits to this Agreement conflict with any language contained in this Agreement, the terms of this Agreement shall prevail.

G. Compliance with Laws. The Contractor agrees to comply with all federal, state, and municipal laws, rules, and regulations that are now effective or in the future become applicable to Contractor's business, equipment, and personnel engaged in operations covered by this Agreement or accruing out of the performance of those operations.

H. Counterparts. This Agreement may be executed in any number of counterparts, each of which shall constitute an original, and all of which will together constitute this one Agreement.IN WITNESS WHEREOF the parties hereto have caused these presents to be duly executed.

CITY OF PORT ORCHARD

By: _____

Robert Putaansuu, Mayor

CONTRACTOR

By: _____

Title: _____

Address: _____

_____

ATTEST:

_____

Brandy Wallace, MMC, City Clerk

APPROVED AS TO FORM:

_____

Charlotte Archer, City Attorney

NOTICES TO BE SENT TO:

CONTRACTOR:	CITY
NAME _____	NAME: K. Chris Hammer, PE, PMP
ADDRESS _____	216 Prospect Street, Port Orchard, WA 98366
TELEPHONE _____	TELEPHONE: 360 876-4991
Email _____	Email: kchammer@portorchardwa.gov

With a copy to the City Clerk at the same address

EXHIBIT C

5% RETAINAGE INVESTMENT OPTION[1]

Contractor: _____

Project Name: _____

Date: _____ Project Number: _____

Pursuant to RCW 60.28.010, as amended, you may exercise an option as to how the 5% retainage under this contract will be invested. Please complete and sign this form indicating your preference. If you fail to do so you will miss the benefit of any interest earned. Select one of the following options:

☐ 1. **Savings Account:** Money will be placed in an interest-bearing account. The interest will be paid to you directly, rather than kept on deposit. If this is your choice, then please complete attached *SAVINGS ACCOUNT AGREEMENT.* Please state the name of your bank.

Bank: _____

☐ 2. **Escrow/Investments:** The City will deliver retainage checks to a selected bank, pursuant to an escrow agreement. The bank will then invest the funds in securities or bonds selected by you, and interest will be paid to you as it accrues. If this is your choice, then please complete attached *ESCROW AGREEMNT.*

Preferred Bank: _____

Securities/Bonds: _____

☐ 3. **Guarantee Deposit:** Retainage will be held by the City. No interest is payable to the Contractor

Retainage is normally released 45 days after final acceptance of the work or following receipt of Labor and Industries/Department of Revenue clearance, whichever date is the later. Retainage on landscaping work may be longer, due to its seasonal nature. However, if this project is subject to grant funding, then the retainage may also be held until such time as the Contractor meets its obligations to the City to provide required information and documentation for compliance with the grant funding requirements.

State law allows for limited early release of retainage in certain circumstance.

_____

Contractor's Signature

_____

Title

[1] If the Contractor opts to post a retainage bond under RCW 60.28.011, such bond shall be in a form acceptable to the City, shall be with a surety with a minimum of A.M. Best financial strength rating of a minimum of A-.

SAVING ACCOUNT AGREEMENT

TO BANK: _____ SAVINGS ACCOUNT NO: _____

BANK'S ADDRESS: _____

_____

AGENCY: CITY OF PORT ORCHARD
216 Prospect Street
Port Orchard WA 98366

CONTRACT NO: _____

PROJECT TITLE: _____

The estimated completion date of contract is: _____

The undersigned, _____, herein referred to as the CONTRACTOR, has directed the CITY OF PORT ORCHARD, Washington, hereinafter referred to as the AGENCY, to deliver to you its warrants which shall be payable to you and the CONTRACTOR jointly. Such warrants are to be held and disposed of by you in accordance with the following instructions and upon the terms and conditions hereinafter set forth.

INSTRUCTIONS

1. Warrants or checks made payable to you and the CONTRACTOR jointly upon delivery to you shall be endorsed by you and forwarded for collection. The moneys will then be placed by you in an interest-bearing savings account.
2. When and as interest on the savings account accrues and is paid, you shall collect such interest and forward it to the CONTRACTOR at its address designated below unless otherwise director by the CONTRACTOR.
3. You are not authorized to deliver to the CONTRACTOR all or any part of the principal held by you pursuant to this agreement, except in accordance with written instruction from the AGENCY. Compliance with such instructions shall relieve you of any further liability related thereto.
4. The CONTRACTOR agrees to pay you as compensation for your services hereunder as follows:
   Payment of all fees shall be the sole responsibility of the CONTRACTOR and shall not be deducted from any moneys placed with you pursuant to this agreement until and unless the AGENCY directs the release to the CONTRACTOR, whereupon you shall be granted a first lien upon such moneys released and shall be entitled to reimburse yourself from such moneys for the entire amount of your fees as provided for herein above. In the event that you are made a party to any litigation with respect to the moneys held by you hereunder, or in the event that the conditions of this agreement are not promptly fulfilled, or that you are required to render any service not provided for in these instructions, or that

there is any assignment of the interests of this agreement, or any modification hereof, you shall be entitled to reasonable compensation for such extraordinary services from the CONTRACTOR and reimbursement from the CONTRACTOR for all costs and expenses, including attorney fees occasioned by such default, delay, controversy or litigation.

5. This agreement shall not be binding until executed by the CONTRACTOR and the AGENCY and accepted by you.
6. This instrument contains the entire agreement between you, the CONTRACTOR and the AGENCY. You are not a party to nor bound by any instrument or agreement other than this. You shall not be required to take notice of any default or any other matter nor be bound by nor required to give notice or demand, nor required to take any action whatever except as herein expressly provided. You shall not be liable for any loss or damage not caused by your own negligence or willful misconduct.
7. The foregoing provisions shall be binding upon the assigns, successors, personal representative and heir of the Parties hereto.

_____	CITY OF PORT ORCHARD
Contractor	*Agency*
BY: _____	BY:_____
Title: _____	
Date: _____	Date: _____
Address: _____	

The above savings account agreement and instruction received and accepted this _____ day of _____, 20___

_____

Bank Name

_____

Authorized Bank Officer

ESCROW AGREEMENT

TO BANK: _____ ESCROW NO.: _____

BANK'S ADDRESS: _____

_____

AGENCY: CITY OF PORT ORCHARD
216 Prospect Street
Port Orchard WA 98366

CONTRACT NO.: _____

PROJECT TITLE: _____

The estimated completion date of contract is: _____

The undersigned, _____, herein referred to as the CONTRACTOR, has directed the CITY OF PORT ORCHARD, Washington, hereinafter referred to as the AGENCY, to deliver to you its warrants which shall be payable to you and the CONTRACTOR jointly. Such warrants are to be held and disposed of by you in accordance with the following instructions and upon the terms and conditions hereinafter set forth.

INSTRUCTIONS

1. Warrants or checks made payable to you and the CONTRACTOR jointly upon delivery to you shall be endorsed by you and forwarded for collection. The moneys will then be used by you to purchase, as directed by the CONTRACTOR, bonds or other securities chosen by the CONTRACTOR and approved by the AGENCY. Attached is a list of such bonds, or other securities approved by the AGENCY. Other bonds or securities, except stocks may be selected by the CONTRACTOR, subject to express written approval of the AGENCY. Purchase of such bonds or other securities shall be in a form which shall allow you alone to reconvert such bonds or other securities into money if you are required to do so by the AGENCY as provided in Paragraph 4 of this Escrow Agreement.
2. When and as interest on the securities held by you pursuant to this agreement accrues and is paid, you shall collect such interest and forward it to the CONTRACTOR at its address designated below unless otherwise directed by the CONTRACTOR.
3. You are not authorized to deliver to the CONTRACTOR all or any part of the securities held by you pursuant to this agreement (or any moneys derived from the sale of such securities, or

the negotiation of the AGENCY'S warrants) except in accordance with written instructions from the AGENCY. Compliance with such instruction shall relieve you of any further liability related thereto.

4. In the event the AGENCY orders you to do so in writing, you shall within thirty-five (35) days of receipt of such order, reconvert into money the securities held by you pursuant to this agreement and return such money together with any other moneys held by you hereunder, to the AGENCY.
5. The CONTRACTOR agrees to pay you as compensation for your services hereunder as follows: Payment of all fees shall be the sole responsibility of the CONTRACTOR and shall not be deducted from any property placed with you pursuant to this agreement until and unless the AGENCY directs the release to the CONTRACTOR of the securities and moneys held hereunder whereupon you shall be granted a first lien upon such property released and shall be entitled to reimburse yourself from such property for the entire amount of your fees as provided for herein above. In the event that are made a party to any litigation with respect to the property held by you hereunder, or in the event that the conditions of this escrow are not promptly fulfilled or that you are required to render any service not provided for in these instructions, or that there is any assignment of the interest of this escrow or any modification hereof, you shall be entitled to reasonable compensation for such extraordinary services from the CONTRACTOR and reimbursement from the CONTRACTOR for all costs and expenses, including attorney fees occasioned by such default, delay, controversy or litigation.
6. This agreement shall not be binding until executed by the CONTRACTOR and the AGENCY and accepted by you.
7. This instrument contains the entire agreement between you, the CONTRACTOR and the AGENCY with respect to this escrow and you are not a party to nor bound by any instrument or agreement other than this; you shall not be required to take notice of any default or any other matter nor be bound by nor be bound by nor required to give notice or demand , nor required to take action whatever except as herein expressly provided; you shall not be liable for any loss or damage not caused by your own negligence or willful misconduct.

The foregone provision shall be binding upon the assigns, successors, personal representative, and heir of the Parties hereto.

_____	CITY OF PORT ORCHARD
Contractor	*Agency*
By: _____	By: _____
Title: _____	
Date: _____	Date: _____
Address: _____	

The above escrow agreement and instruction received and accepted this _____ day of _____, 20__.

_____

Bank Name

_____

Authorized Bank Officer

SECURITIES AUTHORIZED BY AGENCY

1. Bills, certificates, notes or bonds of the United States;
2. Other obligations of the United States or its agencies;
3. Obligation of any corporation wholly-owned by the government of the United States;
4. Indebtedness of the Federal Nation Mortgage Association; and
5. Time deposits in commercial banks.

PERFORMANCE AND PAYMENT BOND

CITY OF PORT ORCHARD
MELCHER STREET PUMP STATION REHABILITATION
PUBLIC WORKS PROJECT NO. PW2023-017

Bond to City of Port Orchard, Washington
Bond No. _____

We, _____, and_____
(Principal) (Surety)

a _____ Corporation, and as a surety corporation authorized to become a surety upon Bonds of Contractors with municipal corporations in Washington State, are jointly and severally bound to the City of Port Orchard, Washington ("Owner"), in the penal sum of _____ Dollars ($_____), the payment of which sum, on demand, we bind ourselves and our successors, heirs, administrators, executors, or personal representatives, as the case may be. This Performance Bond is provided to secure the performance of Principal in connection with a contract dated_____, 20___, between Principal and Owner for a project entitled _____ ("Project") – Public Works Project No. _____ ("Contract"). The initial penal sum shall equal 100 percent of the Total Bid Price, including all applicable state sales tax, as specified in the Proposal submitted by Principal.

NOW, THEREFORE, this Performance and Payment Bond shall be satisfied and released only upon the condition that Principal:

Faithfully performs all provisions of the Contract and changes authorized by Owner in the manner and within the time specified as may be extended under the Contract;

Pays all laborers, mechanics, subcontractors, lower tier subcontractors, material-persons, and all other persons or agents who supply labor, equipment, or materials to the Project;

Pays the taxes, increases and penalties incurred on the Project under Titles 50, 51 and 82 RCW on: (A) Projects referred to in RCW 60.28.011(1)(b); and/or (B) Projects for which the bond is conditioned on the payment of such taxes, increases and penalties; and

Posts a two-year warranty/maintenance bond to secure the project. Such bond shall be in the amount of twenty percent (20%) of the project costs.

Provided, further that this bond shall remain in full force and effect until released in writing by the City at the request of the Surety or Principal.

The surety shall indemnify, defend, and protect the Owner against any claim of direct or indirect loss resulting from the failure:

Of the Principal (or any of the employees, subcontractors, or lower tier subcontractors of the Principal) to faithfully perform the Contract, or

Of the Principal (or any subcontractor or lower tier subcontractor of the Principal) 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.

The liability of Surety shall be limited to the penal sum of this Performance and Payment Bond.

No change, extension of time, alteration, or addition to the terms of the Contract or to the Work to be performed under the Contract shall in any way affect Surety's obligation on the Performance Bond. Surety hereby waives notice of any change, extension of time, alteration, or addition to the terms of the Contract or the Work, with the exception that Surety shall be notified if the Contract time is extended by more than twenty percent (20%).

If any modification or change increases the total amount to be paid under the Contract, Surety's obligation under this Performance and Payment Bond shall automatically increase in a like amount. Any such increase shall not exceed twenty-five percent (25%) of the original amount of the Performance and Payment Bond without the prior written consent of Surety.

This Performance and Payment Bond shall be governed and construed by the laws of the State of Washington, and venue shall be in Kitsap County, Washington.

IN WITNESS WHEREOF, the parties have executed this instrument in two (2) identical counterparts this _____ day of _____, 20 ___.

_____	_____
Principal	Surety
_____	_____
Signature of Authorized Official	Signature of Authorized Official
_____	By_____
Printed Name and Title	Attorney in Fact (Attach Power of Attorney)
Name and address of local office of Agent and/or Surety Company:	_____
	_____
	_____

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 Specifications.

ACKNOWLEDGEMENT
Corporation, Partnership, or Individual

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of_____, 20____, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared_____, to me known to be the (check one of the following boxes):

⌂ _____ of _____, the corporation,

⌂ _____ of _____, the partnership,

⌂ individual,

that executed the foregoing instrument to be the free and voluntary act and deed of said ⌂ corporation, ⌂ partnership, ⌂ individual for the uses and purposes therein mentioned, and on oath stated that they are authorized to execute said instrument.

WITNESS my hand and official seal hereto affixed the day and year first above written.

Notary Seal with Ink Stamp

_____
Print or type name

NOTARY PUBLIC,
in and for the State of Washington

Residing at _____

My Commission expires: _____

SURETY ACKNOWLEDGEMENT

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of_____, 20_____, before me, the undersigned, a Notary Public in and for the State of Washington, duly commissioned and sworn, personally appeared_____, to me known to be the _____ of_____, the corporation that executed the foregoing instrument, and acknowledged the said instrument to be the free and voluntary act and deed of said corporation, for the uses and purposes therein mentioned, and on oath stated that they are authorized to execute said instrument.

WITNESS my hand and official seal hereto affixed the day and year first above written.

Notary Seal With Ink Stamp

_____
Print or type name

NOTARY PUBLIC,
in and for the State of Washington
Residing _____
My Commission expires: _____

CITY OF PORT ORCHARD

MAINTENANCE/WARRANTY BOND

NOTE: <u>This form must be completed at Contract Completion.</u> Before the Performance Bond or the retainage can be released, the City must receive the two year Maintenance /Warranty Bond

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

RE: Project Name: _____
Owner/Developer/Contractor:_____
Project Address: _____

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 Port Orchard, Washington, in the sum of _____ dollars ($_____) 20% of the total contract amount, 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 Port Orchard; 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 acceptance 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 or better 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 bond shall be governed by the laws of the State of Washington. Venue of any litigation arising out of this bond shall be in Kitsap 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 _____, 20__.

SURETY COMPANY (Signature must be notarized)	DEVELOPER/OWNER (Signature must be notarized)
By:_____	By:_____
Its:_____	Its: _____
Business Name: _____	Business Name: _____
Business Address:_____	Business Address: _____
City/State/Zip Code: _____	City/State/Zip Code: _____
Telephone Number: _____	Telephone Number: _____

CHECK FOR ATTACHED NOTARY SIGNATURE

_____Developer/Owner (Form P-1)

_____Surety Company (Form P-2)

FORM P-1 / NOTARY BLOCK
(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 they signed this instrument, on oath stated that they are authorized to execute the instrument and acknowledged it to be their 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: _____

FORM P-2/NOTARY BLOCK
(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 they signed this instrument, on oath stated that they are authorized to execute the instrument and acknowledged it to be their free and voluntary act for the uses and purposes mentioned in the instrument.

Dated: _____

_____

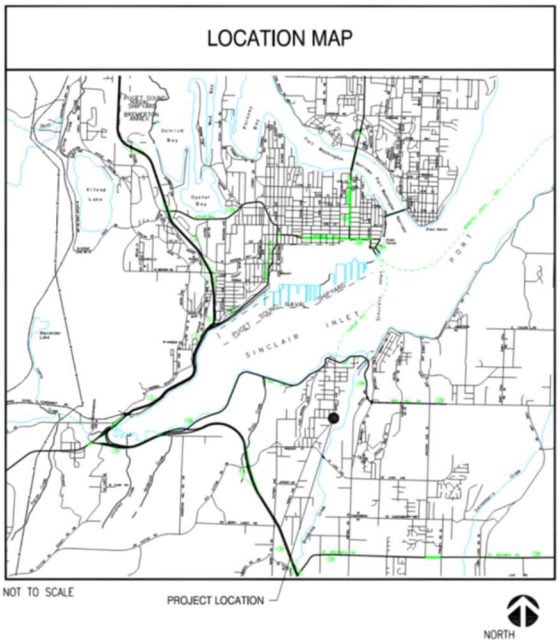
_____
(print or type name)

NOTARY PUBLIC in and for the
State of Washington, residing
at: _____

My Commission expires: _____

APPENDIX A

VICINITY MAP



APPENDIX B

MELCHER STREET PUMP STATION REHABILITIATION PROJECT

CONTRACT PROVISIONS AND SPECIFICATIONS

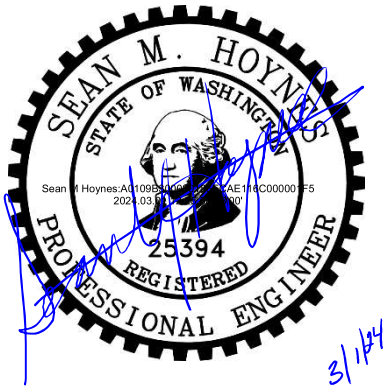


TABLE OF CONTENTS

SECTION 031000
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 RELATED DRAWINGS

A. A. Drawings and general provisions of the Contract, including General and Supplementary and Division 1 Specification Sections, apply to this section.

1.02 DESCRIPTION OF WORK

A. Work covered by this section consists of furnishing and installing formwork, embedded items and form ties for cast-in-place concrete and to produce finished concrete elements as shown on the Contract Drawings.

1.03 GENERAL REQUIREMENTS

A. A. Formwork and methods construction shall conform to the requirements of the Department of Labor and Industry of the State of Washington and OSHA Standards.

1.04 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).

B. ACI PRC-347 - Guide to Formwork for Concrete 2014 (Reapproved 2021).

C. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials 2010 (Reapproved 2015).

D. ACI SPEC-301 - Specifications for Concrete Construction 2020.

1.05 SUBMITTALS

A. When requested by the Engineer for the purposes of explaining detail or structural integrity, the Contractor shall submit six sets of formwork shop drawings. Complete descriptive literature shall be submitted for items proposed as alterntive to products specified.

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.

B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.

C. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.

D. Comply with relevant portions of ACI CODE-318, ACI PRC-347, and ACI SPEC-301.

2.02 WOOD FORM MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will produce continuous, ture, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
   1. Plywood, metal, or other approved panel materials

B. Rough-Formed Finished Concrete: Plywood, lumber, metal or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.03 FORMWORK ACCESSORIES

A. Form Ties: Removable type, galvanized metal, fixed length, free of defects.

B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.

2.04 EMBEDDED ITEMS

A. Exposed items permanently embedded in concrete shall be hot-dip galvanized.

PART 3 EXECUTION

3.01 ERECTION - FORMWORK

A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.

B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.

3.02 APPLICATION - FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

3.03 FORMWORK TOLERANCES

A. Construct formwork to maintain tolerance of +/- 1/8 inch in 10 feet.

3.04 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.

END OF SECTION

SECTION 032000
CONCRETE REINFORCING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 DESCRIPTION OF WORK

A. Work covered by this section consists of furnishing and installing reinforcing steel and accessories required for concrete.

1.03 REFERENCE STANDARDS

A. {RSTEMP#10000001}

B. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).

C. ACI SPEC-301 - Specifications for Concrete Construction 2020.

D. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2023).

E. CRSI (DA4) - Manual of Standard Practice 2018, with Errata (2019).

1.04 SUBMITTALS

A. Shop drawings: Prepare and submit six sets of complete shop drawings to the Engineer showing bending and placing diagram in accordance with ACI 315.

B. Mill tests: Furnish certified copies of mill test reports showing compliance with structural drawings and specifications.

C. Welder qualifications certificate in accorance with AWS D1.1.

D. See Section 013000 - Administrative Requirements, for submittal procedures.

PART 2 PRODUCTS

2.01 STEEL REINFORCEMENT

A. Reinforcing steel shall consist of deformed bars of the sizes called for on the Contract Drawings. Steel shall conform to the requirements of ASTM A 615. Grade 60 steel shall be used for all reinforcement unless otherwise noted.

B. Reinforcement to be welded shall conform to the requirements of ASTM A 706 Grade 60.

2.02 TIE WIRE

A. Use No. 16 gage double annealed iron wire.

2.03 ACCESSORIES

A. Bar supports to be detailed and placed according to minimum standards of Chapter 7, ACI 315. Include all devices necessary for proper placing, spacing, supporting and fastening steel reinforcement in place. Where bottom surface of concrete is concealed, use standard steel chairs and bolsters. Where exposed, use plastic-protected chairs conforming to CRSI Manual of Standard Practice, Chapter 3 (V), "Class 1 - Plastic Protected Bar Supports."

2.04 MECHANICAL SPLICES

A. Mechanical splices shall develop 125% of the specified yield strength of the bar in compression and tension, or be executed as shown on Structural Drawings.

PART 3 EXECUTION

3.01 FABRICATION

A. Clean, bend and splice reinforcement in accordance with IBC 2003 and ACI 315. Hooks shall conform to Table 2-1 of ACI 315 and CRSI Manual of Standard Practice. Do not straighten or

rebend Grade 60 reinforcement. All bars shall be bent cold. Welding shall be performed by welders certified by American Welding Society and in accordance with AWS D1.1.

3.02 BENDING SCHEDULES

A. Reinforcement shall be formed as indicated on the Contact Drawings. Except where specifically indicated otherwise, bends for all bars shall be in accordance with the requirements of ACI 318, Section 7.1 and 7.2.

3.03 PLACING REINFORCING STE

A. Reinforcing steel shall follow CRSI Manual of Standard Practice. Before being positioned reinforcing shall be cleaned of mill rust scale or other coatings that will destroy or reduce the bond. Reinforcement reduced in section may be rejected. Prior to placing concrete, the reinforcement shall be reinspected and, when necessary, cleaned to the satisfaction of the Engineer.
   1. Reinforcing steel shall not be bent or straightened without the approval of the Engineer, nor in a manner that will injure the material. Bars with kinks or bends not shown on the Contract Drawings shall not be used. Heating or welding of bars will be permitted only when the entire operation is acceptable to the Engineer.
   2. Reinforcing steel shall be positioned and secured against displacement by using annealed iron wire or suitable clips at intersections and shall be supported by concrete or metal chairs or spacers, or metal hangers.
   3. Splices where permitted, shall provide sufficient lap to transfer the stress between bars by bond and shear. Adjacent bars shall not be spliced at the same point. Where not otherwise shown, reinforcement shall be in accordance with the requirements of ACI 318.
   4. The clear distance between parallel bars shall not be less than the diameter of the bars and, unless specifically authorized, shall in no case be less than 1 inch nor less than the maximum size of coarse aggregate specified. When reinforcement in beams is placed in 2 or more layers, the clear distance between layers shall not be less than 1 inch, and the bars in the upper layers shall be placed directly above those in the bottom layer.
   5. Concrete protection for reinforcement: Reinforcement shall have a minimum cover per ACI 318-02 and as indicated on the Contract Drawings.

3.04 TOLERANCES

A. Fabricating and placing tolerances shall be in accordance with ACI 301.

3.05 SPLICES

A. General:
   1. Provide reinforcement splices of the type and in the locations shown on the Drawings and ACI 318-02.

B. Reinforcement splice types or locations other than as shown on the Drawings shall not be used except where permitted in writing by the Engineer.

C. Lap splices: Install lap splices in accordance with the Drawings and ACI 318-02.

D. Welded splices: Welded splices, other than those shown on the Drawings, shall not be used.

E. Mechanical splices: Install mechanical splices in accordance with manufacturer's requirements. Specifically verify each splice meets manufacturer's requirements. Stagger splices in adjacent bars.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specifications Sections, apply to this Section.

1.02 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:
   1. Section 03100 - Concrete formwork.
   2. Section 03200 - Concrete reinforcement.

C. Concrete curing.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.04 REFERENCE STANDARDS

A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary 2019 (Reapproved 2022).

B. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.

C. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction 2015.

D. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

E. ACI PRC-308 - Guide to External Curing of Concrete 2016.

F. ACI SPEC-301 - Specifications for Concrete Construction 2020.

G. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2023.

H. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2023.

I. ASTM C150/C150M - Standard Specification for Portland Cement 2022.

J. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

K. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019, with Editorial Revision (2022).

L. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2023, with Editorial Revision.

M. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2020a.

N. ASTM D648 - Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position 2018.

O. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics 2023.

P. ASTM D746 - Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact 2020.

Q. ASTM D1525 - Standard Test Method for Vicat Softening Temperature of Plastics 2017, with Editorial Revision.

R. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

1.05 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Mix Design: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Certificates: Signed by manufacturers certifying that each of the following items complies with requirements:
   1. Cementitious materials and aggregates.
   2. Admixtures.
   3. Waterstops.
   4. Curing materials.
   5. Bonding agents.
   6. Adhesives.

D. Test Reports: Submit report for each test or series of tests specified.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. An independent testing laboratory will be selected by the Owner to perform tests on component materials and for compressive strength of concrete specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.

D. The cost of all laboratory tests on cement, aggregates, and concrete, will be borne by the Owner. However, the Contractor shall be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. The laboratory must meet or exceed the requirements of ASTM C 1077.

E. Concrete for testing shall be supplied by the Contractor at no cost to the Owner, and the Contractor shall provide assistance to the Engineer in obtaining samples, and disposal and cleanup of excess material.

F. Field Compression Tests:
   1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the Engineer to ensure continued compliance with these Specifications. Each set of test specimens will be a minimum of 5 cylinders.
   2. Compression test specimens for concrete shall be made in accordance with Section 9.2 of ASTM C 31. Specimens shall be 6-inch diameter by 12-inch high cylinders.
   3. Compression tests shall be performed in accordance with ASTM C 39. One test cylinder will be tested at 3 days and 7 days, and 2 at 28 days. The remaining cylinder will be held to verify test results, if needed.

G. Evaluation and Acceptance of Concrete
   1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318-02, “Concrete Quality,” and as specified herein.
   2. If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.
   3. All concrete which fails to meet the ACI requirements and these Specifications, is subject to removal and replacement at the cost of the Contractor.

PART 2 PRODUCTS

2.01 FORMWORK

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I - Normal and Type II.
   1. Fly Ash: ASTM C618, Class F.

B. Normal-Weight Aggregate: , uniformly graded, and as follows:
   1. Class: Severe weathering region, but not less than 3S.
   2. Nominal Maximum Aggregate Size: 1-inch (25 mm).

C. Water: Potable and complying with ASTM C94/C94M
   1. Fine and Coarse Aggregates: ASTM C33/C33M.

2.03 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. Water Reducing Admixture: ASTM C494/C494M Type A.

D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.

2.04 SURFACE RETARDER

A. Retardant for exposing aggregates for nonformed surfaces in construction joints shall be Sika Rugasol-S, Horn Aggretex-H, Burke Company True Etch Surface Retarder, or equal. Retarder shall be applied in accordance with manufacturer's instructions sufficient to assure a minimum penetration of 1/8 inch.

2.05 FLOOR AND SLAB TREATMENTS

A. Penetrating Liquid Floor Treatment: Chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; colorless; that penetrates, hardens, and densifies concrete surfaces.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Penetrating Liquid Floor Treatment:
      a. Titan Hard; Burke Group, LLC (The).
      b. Day-Chem Sure Hard; Dayton Superior Corporation.
      c. Euco Diamond Hard; Euclid Chemical Co.
      d. Seal Hard; L&M Construction Chemicals, Inc.

2.06 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

C. Water: Potable

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18 to 22 percent solids.

E. Products: Subject to compliance with requirements, provide one of the following:
   1. Evaporation Retarder:
      a. Eucobar; Euclid Chemical Co.
      b. E-Con; L&M Construction Chemicals, Inc.
      c. Confilm; Master Builders, Inc.

d. SikaFilm; Sika Corporation.

2. Clear, Waterborne, Membrane-Forming Curing Compound:
   a. Diamond Clear VOX; Euclid Chemical Co.
   b. Dress & Seal WB; L&M Construction Chemicals, Inc.
   c. Vocomp-20; W. R. Meadows, Inc.
   d. Kure-N-Seal WB; Sonneborn, Div. of ChemRex, Inc.

2.07 RELATED MATERIALS

A. Joint-Filler Strips:
   1. Neoprene, closed cell, expanded, ASTM D 1056, Grade No. 285, with a compression deflection of 25% for a pressure range of 17 to 24 psi.
   2. Bituminous type conforming to ASTM D 1751 or sponge rubber type conforming to ASTM D 1752, Type I. For use on sidewalks and pavements. May also be used on foundation slabs below the waterstop and on backfilled walls on the backfill side of the waterstop.
   3. Bond breaker tape for use in joints in walls or elevated slabs to receive joint sealants shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the closed cell premolded joint material or concrete surface as required. The tape shall be the same width as the joint.

B. Epoxy-Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

C. Epoxy injection resin shall be “SCB Concresive 1360” as manufactured by Master Builders, “Sikadur 52” by Sika Corporation, or equal.
   1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.08 CONCRETE MIX DESIGN

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
   1. Proportioning Normal Weight Concrete: Comply with ACI PRC-211.1 and ACI SPEC-301.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

C. Class A: All concrete unless noted otherwise. Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
   2. Maximum slump: 4 inches.
   3. Maximum Slump for Concrete Containing High-Range Water-Reducing Admixture: 8 inches (200 mm) after admixture is added to concrete with 2- to 4-inch (50- to 100-mm) slump.

D. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
   1. Fly Ash
      a. Class A Concrete: 0 to 25 percent.

F. Maximum Water-Cementitious Materials Ratio:
   1. Class A Concrete: 0.45.

G. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
   1. Air Content: 6 percent for 1-inch- (25-mm-) nominal maximum aggregate size.

2. Air Content: 6 percent for 3/4-inch- (19-mm-) nominal maximum aggregate size.

H. Do not air entrain concrete to trowel-finished interior floors and suspended slabs. Do not allow entrapped air content to exceed 3 percent.

I. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

J. Admixtures: Use admixtures according to manufacturer's written instructions.
1. Use water-reducing admixture or high-range water-reducing admixture (superplasticizer) in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.09 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

2.10 GROUT

A. Drypack Grout: Drypack grout shall be a mixture of approximately one part cement, 1-1/2 to 2 parts sand, water reducing agent, and sufficient water to make a stiff workable mix.

B. Cement Grout: Cement grout shall be a mixture of one part cement, two parts sand, proportioned by volume, admixtures for pressure grouting, and sufficient water to form a workable mix.

C. Nonshrink Grout: Nonshrink grout shall be ASTM C 1107, Type B or C non-metallic aggregate grout with a minimum compressive strength of 7,000 psi in 28 days.

D. Epoxy Grout:
1. Except as noted below, epoxy grout shall be a high modulus, two-component, moisture insensitive, 100% solids, thermosetting modified polyamid epoxy compound. The consistency shall be a paste form capable of not sagging in horizontal or overhead anchoring configurations. Material shall conform to ASTM C 881 Type IV, Grade 3, such as Master Builders Concresive Liquid LPL, Sika Corporation Sikadur Hi-Mod Series, Adhesive Technology Corporation Solidbond 200 or equal, and shall have a heat deflection temperature in excess of 130 degrees F.
2. Epoxy for pressure grouting/crack injection shall be a two-component, moisture insensitive, high modulus, injection grade, 100% solids, blend of epoxy-resin compounds. The consistency shall be as required to achieve complete penetration in hairline cracks and larger. Material shall conform to ASTM C 881 Type 1 Grade 1, such as Sika Corporation Sikadur 52, Master Builders Concresive Standard LVI, Adhesive Technology Corporation SLV 300 series, or equal.

E. Polymer Concrete (for Resurfacing or Patching):
1. Polymer concrete (for resurfacing or patching) shall consist of a liquid binder and dry aggregate mixed together to make a mortar or grout of a consistency as required for the application. The liquid binder shall be a chemical and oil resistant, stress relieved, low modulus, moisture insensitive, two-component epoxy-resin compound. The consistency shall be similar to lightweight oil for proper mixing with aggregate. Material shall conform to ASTM C 881 Type 3 Grade 1, such as Sika Corporation Sikadur Lo-Mod series, Master Builders Concresive Standard LVI, Adhesive Technology Corporation 400 series, or equal.

2. Aggregate shall be oven dry in sealed packages until time of mixing, and shall be of size and consistency compatible with recommendations of manufacturer of liquid binder for intended application.

2.11 PRESSURE GROUTING EQUIPMENT

A. Pressure grouting equipment shall include a mixer and holdover agitator tanks and shall be designed to place grout at pressures up to 50 psi. Gages shall be provided to indicate pressure used. The mixer shall be provided with a meter capable of indicating to one-tenth of a cubic foot the volume of grout used.

2.12 EMBEDDED ITEMS

A. Inserts shall be as required by other trades. Attach securely to forms. Inserts within reinforcement cover thickness shall be hot-dip galvanized, nonferrous or other approved nonrusting material.

B. Embedded conduit: Rigid embedded conduit shall be of hot-dip galvanized steel. Conduit shall be approved and listed by Underwriters Laboratories, Inc. and bear the UL label.

C. Miscellaneous embedded item: Exposed items permanently embedded in concrete with concrete reinforcement thickness shall be hot-dip galvanized, nonferrous or plastic as approved, to eliminate the possibility of stained or rusty spots.

2.13 ANCHOR RODS AND CONCRETE ANCHORS

A. General:
   1. This section covers the work necessary to furnish and install, complete, all anchorage to concrete, complete with washers and nuts. Comply with the requirements of Section 04810 – Unit Masonry Assemblies for anchorage to concrete masonry.
   2. Like items of materials provided hereunder shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance, and replacement.
   3. The diameter and projection shall be as required by the equipment or machinery manufacturer. The Contractor shall verify the capacities and configurations conform to the Drawings.
   4. The Contractor shall provide design calculations, stamped by a State of Washington licensed structural engineer, for all anchor bolts and concrete anchors exceeding the capacities, or not conforming to the configurations, specifically shown on the Drawings.
   5. Submittals: Comply with requirements of Section 01300 Submittal Procedures. In addition, the following specific information shall be provided:
      a. ICBO (International Conference of Building Officials) reports verifying the products meet or exceed the capacities shown on the Drawings. Manufacturers' information showing the recommended installation equipment and procedures for the following:
         1) Epoxy anchor adhesive.
   6. Exposure Conditions: Exposure conditions shall be defined as follows:
      a. Dry: Indoor areas not subject to moisture, washdown, or chemicals.
      b. Wet: Indoor areas subject to moisture, washdown, or chemicals, or outdoor areas.
      c. Submerged: At or below a point 1 foot 6 inches above maximum fluid surface.
   7. Unless otherwise indicated, all materials shall conform to the latest issue of the following ASTM Specifications:
      a. Anchor Rods and Nuts:
         1) Carbon Steel: ASTM A 307, Grade A 36.
         2) Stainless: ASTM F 593, Type 316.
      b. Galvanized Steel Bolts and Nuts: ASTM A 153, zinc coating for ASTM A 307 or A 36.
      c. Flat Washers (Unhardened): ASTM F 844, use ASTM A 153 for zinc coating.
      d. Threaded Bars: ASTM A 36.
      e. Epoxy Anchors:
         1) Stainless-Steel Anchors: ASTM F 593, Type 316.
         2) Epoxy Adhesive: ASTM C 881, Type 1, Grade 3, Class A, B, or C.
      f. Nuts:

1) Carbon Steel: ASTM A 307.
2) Stainless Steel: ASTM F 593, Type 316.

g. Galvanizing:
1) Carbon Steel: ASTM A 153, Zinc Coating for ASTM A 307.

8. The concrete anchorage system indicated on the Drawings, or required to secure the various parts together and provide a complete installation, shall be included under this section. The tabulation of items herein is not intended to be all-inclusive, and it shall be the Contractor's responsibility to provide all metalwork and castings shown, specified, or which can reasonably be inferred as necessary to complete the project.

B. Anchor Rods
1. Unless shown otherwise on the Drawings, use 3/4-inch minimum diameter by 12-inch long and other geometry shown on the Drawings. Furnish a minimum of two nuts and a washer of the same material for each rod. Provide sleeves as shown on the Drawings for location adjustment.
2. Provide anchor rod material for the exposure conditions as noted below:
a. Equipment and Machinery:
1) Dry exposure, use galvanized steel.
2) Wet exposure, use stainless steel.
3) Submerged exposure, use coated stainless steel.
b. Fabricated Metalwork or Structural Building or Frame Components:
1) Dry Exposure, use galvanized steel.
2) Wet exposure, use stainless steel.
3) Submerged exposure, use coated stainless steel.
c. Anchor Rod Sleeve: High-density polyethylene plastic.
1) Single unit construction with deformed sidewalls such that the concrete and grout lock in place.
2) The top of the sleeve shall be self threading to provide adjustment of the threaded anchor bolt projection.
3) Material requirements shall conform to the following:
(a) Plastic: High-density polyethylene.
(b) Density: ASTM D 1505.
(c) Vicat Softening Point: ASTM D1525.
(d) Brittleness Temperature: ASTM D746.
4) Manufacturer: Sinco West, 655 East Cochran Street, Simi Valley, CA 93085, telephone 805/522-3901.

C. Concrete Anchors: Anchors shall have allowable working loads not less than those tabulated in the Structural General Notes. Provide diameter shown or required except minimum diameter of 3/8 inch.
1. Epoxy Threaded Rod Anchors: 316 stainless steel threaded rod free of grease, oil, or other deleterious material with a 45-degree chisel point.
a. Epoxy Adhesive:
1) Meet ASTM C 881, Type 1, Grade 3, Class A, B, or C.
2) Two-component, 100 percent solids, nonsag, paste, insensitive to moisture, designed to be used in adverse freeze/thaw environments, and gray in color.
3) Cure Temperature, Pot Life, and Workability: Compatible for intended use and environmental conditions.
b. Mixed Epoxy Adhesive: Nonsag paste consistency, holding the following properties:
1) Slant Shear Strength, ASTM C881/C881M, no failure in bond line, dry/moist conditions: 5,000 psi.
2) Compressive Strength, ASTM D695: 14,000 psi minimum.
3) Tensile Strength, ASTM D695: 4,500 psi.
4) Heat Deflection Temperature, ASTM D648: 135 degrees F, minimum.
c. Epoxy Adhesive Packaging:

1) Disposable, self-contained cartridge system capable of dispensing both epoxy components in the proper mixing ratio and fit into a manually or pneumatically operated caulking gun.
2) Dispense components through a mixing nozzle that thoroughly mixes components and places epoxy at base of predrilled hole.
3) Mixing Nozzles: Disposable, manufactured in several sizes to accommodate sizes of anchor rods.
4) Cartridge Markings: Include manufacturer's name, batch number, mix ratio by volume, product expiration date, ANSI hazard classification, and appropriate ANSI handling precautions.

d. Storage of Epoxy Adhesive:
1) Store epoxy cartridges on pallets or shelving in a covered storage area.
2) Control temperature above 60 degrees F and dispose of cartridges if shelf life has expired.
3) If stored at temperatures below 60 degrees F, test adhesive prior to use to determine if adhesive meets specified requirements.

e. Manufacturers: Adhesive Technology Corp., 21850 88th Place South, Kent, WA 98031; or Anchor-It Fastening Systems, HS 200 Epoxy Resin.

f. Anchors shall have allowable working loads not less than those tabulated in the Structural General Notes. Provide minimum diameter of 3/8 inch.

2. Provide concrete anchors for the exposure conditions as noted below:
a. Epoxy Anchors:
1) Dry exporsures, use stainless steel.
2) Wet exporsure, use stainless steel.
3) Submerged exposure, use coated stainless steel.
4) Epoxy anchors shall not be used in any overhead applications.

D. Stainless-Steel Fasteners Lubricant (Anti-Seizing)
1. Where stainless steel nuts and machined bolts, anchor bolts, concrete anchors, and all other threaded fasteners are used, Contractor shall apply an anti-seizing lubricant to the threads prior to making up the connections. The lubricant shall contain substantial amounts of molybdenum disulfide, graphite, mica, talc, or copper.

PART 3 EXECUTION

3.01 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
1. Class A, 1/4 inch (6 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to

prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.02 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Position in form in location shown. Do not place concrete before receiving approval of placing plan.
   2. Provide adequate support to prevent displacement during concreting.
   3. Allow other trades ample time and facilities for placing and installing embedded items.
   4. Conduits must have same cover as required for reinforcing. Do not embed conduits larger than 2-inch nominal size or any piping unless written approval of Engineer is obtained. Comply with ACI 318.
   5. No insert shall be permitted with less cover than the reinforcement unless corrosion problems are adequately resolved.

3.03 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, joists, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:
   1. At least 70 percent of 28-day design compressive strength.
   2. Determine compressive strength of in-place concrete by testing representative field- or laboratory-cured test specimens according to ACI 301.
   3. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by the Engineer.

E. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.04 SHORES AND RESHORES

A. Comply with ACI 318 (ACI 318M), ACI 301, and recommendations in ACI 347R for design, installation, and removal of shoring and reshoring.

3.05 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Concrete in each unit of construction shall be placed continuously. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by the Engineer.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.
   2. Construction joints shall be formed as specified. A rough surface of exposed concrete aggregates with a minimum amplitude of +1/4 inch shall be produced using a surface retardant at construction joints, including joints between slab and topping concrete. The limit of the treated surfaces shall be 1 inch away from the joint edges. Within 24 hours after placing, retarded surface mortar shall be removed either by high pressure water jetting or stiff brushing or combination of both so as to expose coarse aggregates. A rough surface of exposed aggregate may also be produced by sandblasting, followed by high pressure water jetting.
   3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
   4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
   5. Walls exceeding 50 feet in length shall be case in panels not to exceed 30 feet in length. Where the number of panels is three or more, the panels shall be cast in an alternating pattern, unless 5 days have elapsed between casting of adjoining panels.
   6. Slabs shall be cast in panels not to exceed 25 feet in length, not to exceed 500 square feet in area, and with a length to width ratio less than 1-1/2:1. Panels shall be cast in checkerboard patterns. Minimum lapsed time between placing adjacent panels shall be 24 hours.
   7. Vertical construction joints shall be grooved at exposed faces. Grooves subjected to wetting or weather shall be caulked with joint sealer as specified.
   8. Girders and floor slabs shall not be constructed over columns or walls until at least one hour has elapsed to allow for shrinkage in the column or wall. No joint will be allowed between a slab and a beam or girder unless otherwise specified. Waterstops shall be provided in construction joints at locations as specified.
   9. Where new concrete joins existing concrete, the existing concrete shall be cleaned and roughened as noted above and shall be coated with an epoxy bonding compound prior to placing new concrete. Existing concrete is defined as concrete more than 60 days old.

C. Control Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness, as follows:
   1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3 mm). Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

3.06 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed. Placement shall be per ACI 301 unless noted otherwise.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by the Engineer.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
   2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 degrees F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F (10 deg C) and not more than 80 degrees F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 degrees F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

H. Anchor joint fillers and devices to prevent movement during concrete placement.

I. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

3.07 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified. Use rough-formed finish where concrete is not exposed to view or in contact with waterproof membrane or PVC liner.
   1. Apply to surfaces not indicated on the Drawings or in this section to achieve a smooth formed finish.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.
   1. Apply to concrete surfaces exposed to view, contact with water or sewage or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete except for surfaces receiving waterproofing or PVC liner or in contact with sewage:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

E. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.08 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes.
   1. Apply scratch finish to surfaces indicated and to surfaces to receive concrete floor topping or mortar setting beds for ceramic or quarry tile, portland cement terrazzo, and other bonded cementitious floor finishes.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view, in contact with liquids or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system and to slabs in structures containing water, sewage or other liquids.
   2. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot- (3.05-m-) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
      a. 3/16 inch

E. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Owner before application.

3.09 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Apply to interior slabs where indicated.
   2. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   3. Do not apply to concrete that is less than seven days old.

B. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

C. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

D. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

C. Anchor Bolts and Concrete Anchors: Install per manufacturer’s recommendations. Cutting and welding shall not be permitted. Protect dissimilar metals in conformance to Section 05500 Miscellaneous Metals. Items to be embedded in concrete shall be placed accurately and held securely during placement. Anchors shall be protected after installation by coating the exposed threads with lubricant (anti-seizing) and installing the nut.
   1. Anchor Bolts: All anchor bolts shall be accurately located and held in place with templates at the time the concrete is poured.
   2. Concrete Anchors: Installation shall not begin until the concrete receiving the anchors has attained its design strength. Install in strict conformance with manufacturer’s written instructions. Use manufacturer’s recommended drills and equipment.
      a. Epoxy Anchors: Do not install when temperature of concrete is below 35 degrees F or above 110 degrees F.
      b. Furnish manufacturer’s representative, for each type of concrete anchor used, to the jobsite to conduct jobsite training for proper installation, handling, and storage of each anchor system for personnel as required. Notify the Engineer of training session schedule.
      c. Flush mounted concrete anchors shall not be used unless specifically shown on the Drawings or approved by the Construction Manager..
   3. Galvanizing and Repair:

a. The minimum pitch diameter of the threaded portion of all bolts, anchor bars, or studs shall conform to ANSI B1.1, having a Class 2A tolerance before galvanizing. After galvanizing, the pitch diameter of the nuts or other internally threaded parts may be tapped over ANSI B1.1, Class 2B tolerance by the following maximum amounts:

3/8-inch through 9/16-inch	0.016-inch oversize
5/8-inch through 1-inch	0.023-inch oversize
1-1/8-inch and larger	0.033-inch oversize

b. Galvanized surfaces that are abraded or damaged at any time after the application of the zinc coating shall be repaired by solvent cleaning the damaged area (Steel Structures Painting Council SP 2 or SP 3) the damaged areas, removing all loose and cracked coating, after which the cleaned areas shall be painted as specified in Section 09900 “High Performance Coatings”.

D. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

E. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

F. Surfaces Not in Contact with Forms:
1. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
2. Final Curing: Begin after initial curing but before surface is dry.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. Forms shall be covered and kept moist. The forms shall be loosened, as soon as possible without damage to the concrete, and provisions made for curing water to run down inside them. During form removal, care shall be taken to provide wet cover to newly exposed surfaces. If removing forms before end of curing period, continue curing by one or a combination of the methods indicated below.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the methods indicated below.

E. Curing Methods:
1. Moisture Curing: Moisture cure all Class B concrete and slabs on grade. Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
4. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.
5. Provide free access to concrete operations at project site and cooperate with appointed firm.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by the Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with drypack grout before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, drypack grout will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed, formed surfaces that affect concrete's durability and structural performance as determined by the Engineer.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least ¾-inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

6. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with drypack grout. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place drypack grout before bonding agent has dried. Compact and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Engineer's approval, using epoxy adhesive and drypack grout.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.13 GROUT

A. General
   1. Bonding compound for use with grout is specified. Primer, if required for polymer concrete, shall be provided per manufacturer's recommendation.
   2. Grout shall not be placed during freezing weather unless adequate protection is provided.

B. Drypack Grout
   1. Drypack grout shall be used for built-up surfaces, setting miscellaneous metal items and minor repairs.
   2. Surfaces required to be built up with drypack grout shall be roughened by brushing, cleaned, and coated with the bonding compound before the application of the grout. The drypack grout shall be applied immediately following the application of the bonding compound in bands or strips to form a covering of the required thickness. The covering shall be smooth. Construction joints in the grout shall be sloped and shall be cleaned and wetted before application is resumed.
   3. Drypack grout shall be cured in accordance with this Section.

C. Cement Grout
   1. Cement grout shall be used for filling nonbearing portions of equipment pads and pressure grouting.
   2. Except for the specialized equipment for pressure grouting, mixing and placing apparatus shall be similar to that normally used for cast-in-place concrete. Grout shall be mixed for a period of at least 1 minute. Diluted grout shall be agitated to keep ingredients mixed.

D. Nonshrink Grout
   1. Nonshrink grout shall be used for the bearing surfaces of machinery and equipment bases, column base plates, and bearing plates. Grout shall be placed in accordance with manufacturer's instructions.
   2. Holes required for grouting shall be blown clean with compressed air and left free of dust or standing water. Horizontal holes for grouting shall be drilled at a slight downward angle to facilitate holding the grout until setting is complete. Bolts or reinforcing steel installed in horizontal grout holes shall be bent slightly accordingly.

E. Epoxy Grout
   1. Epoxy grout shall be used for repairing cracks by pressure grouting or gravity flow, repairing structural concrete, and may be used for setting reinforcing dowels or anchor bolts into holes in concrete for grouting. Concrete shall be primed in accordance with the grout manufacturer's instructions.
   2. Use of epoxy grout for anchorage of bolts or reinforcing dowels into concrete shall be subject to the following conditions:
      a. Use shall be limited to locations where exposure, on an intermittent or continuous basis, to acid concentrations higher than 10%, to chlorine gas, or to machine or diesel oils, is extremely unlikely.
      b. Use shall be limited to applications where exposure to fire or exposure to concrete or rod temperature above the product's heat deflection temperature or 120 degrees F (whichever is less) is extremely unlikely. Overhead applications (such as pipe supports) because of the above concerns, are not allowed.

c. Approval from Engineer for specific application and from supplier of equipment to be anchored, if applicable.
d. Anchor diameter and grade of steel shall be per contract documents or per equipment supplier specifications. Anchor shall be threaded or deformed full length of embedment and shall be free of rust, scale, grease, and oils.
e. Embedment depth and hole diameter shall be as specified.
f. Holes shall have rough surfaces, such as can be achieved using a rotary percussion drill.
g. Holes shall be blown clean with compressed air and be free of dust or standing water prior to application of grout.
h. Anchor shall be left undisturbed and unloaded for full curing period.
i. Anchors shall not be placed in concrete below 25 degrees F.

F. Pressure Grouting
1. Prior to grouting, systems and holes to be grouted shall be washed clean. Washing is not required for grouting soil voids outside pipe cylinders or casing pipes. Grouting, once commenced, shall be completed without stoppage. In case of breakdown of equipment, the Contractor shall wash out the grouting system sufficiently to ensure fresh grout and adequate bond and penetration will occur upon restarting the grouting operation. Grout pressure shall be maintained until grout has set.

END OF SECTION

SECTION 055000
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated steel items.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.

C. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates 2018.

D. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength 2021.

E. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.

F. AWS B2.1/B2.1M - Specification for Welding Procedure and Performance Qualification 2021.

G. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2023).

1.04 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

B. Welders' Qualification Statement: Welders' certificates in accordance with AWS B2.1/B2.1M and dated no more than 12 months before start of scheduled welding work.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance as well as sufficient production capacity to produce required units.

B. Welder Qualifications: Welding processes and welding operators qualified in accordance with AWS D1.1/D1.1M and AWS D1.2/D1.2M and dated no more than 12 months before start of scheduled welding work.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

A. Steel Sections: ASTM A36/A36M.

B. Plates: ASTM A283/A283M.

C. Bolts, Nuts, and Washers: ASTM A307, Grade A, plain.

D. Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, plain.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

2.02 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Furnish components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.03 FABRICATED ITEMS

2.04 FINISHES - STEEL

A. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft galvanized coating.

B. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

2.05 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/16 inch.

C. Maximum Misalignment of Adjacent Members: 1/16 inch.

D. Maximum Bow: 1/8 inch in 48 inches.

E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C920 - Standard Specification for Elastomeric Joint Sealants 2018.

B. ASTM C1193 - Standard Guide for Use of Joint Sealants 2016 (Reapproved 2023).

C. SCAQMD 1168 - Adhesive and Sealant Applications 1989, with Amendment (2022).

1.03 SUBMITTALS

A. Product Data for Joint Sealants: Submit manufacturer's technical datasheets for each product to be used, and include the following:
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates that product is not compatible with.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Joint Sealants:
   1. Dow Silicones Corporation: www.dow.com/#sle.

2.02 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having low volatile organic compound (VOC) content.

2.03 NONSAG JOINT SEALANTS

A. Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: Match adjacent finished surfaces.
   3. Service Temperature Range: Minus 65 to 180 degrees F.
   4. Products:
      a. Dow; DOWSIL 758 Silicone Weather Barrier Sealant: www.dow.com/#sle.

2.04 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Provide joint sealant installations complying with ASTM C1193.

C. Install bond breaker backing tape where backer rod cannot be used.

D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

E. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

F. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 220513
COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General construction and requirements.

B. Three phase electric motors.

1.02 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2021.

B. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.03 SUBMITTALS

A. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.

B. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

C. Operation Data: Include instructions for safe operating procedures.

D. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of electric motors for municipal water system use, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.

B. Comply with NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

A. Construction:
   1. Open drip-proof type except where specifically noted otherwise.
   2. Design for continuous operation in 104 degrees F environment.
   3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.

B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.

C. Wiring Terminations:
   1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

3.02 SCHEDULES

A. See Contract Drawings

END OF SECTION

SECTION 220523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Butterfly valves.

B. Gate valves.

1.02 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.

B. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard 2020.

C. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves 2022.

D. ASME B16.34 - Valves — Flanged, Threaded, and Welding End 2020.

E. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings 2004 (Reapproved 2019).

F. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings 2017.

G. MSS SP-70 - Gray Iron Gate Valves, Flanged and Threaded Ends 2011.

H. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves 2019.

I. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

J. NSF 372 - Drinking Water System Components - Lead Content 2022.

1.03 QUALITY ASSURANCE

A. Manufacturer:
   1. Obtain valves for each valve type from single manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:
   1. Store valves in shipping containers and maintain in place until installation.
      a. Store valves indoors in dry environment.
      b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:
   1. Shutoff: butterfly, gate.

D. Domestic, Hot and Cold Water Valves:

2.02 GENERAL REQUIREMENTS

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

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

C. Valve Actuator Types:
   1. Handwheel: Valves other than quarter-turn types.
   2. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.

D. Valve-End Connections:
   1. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.

2. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.

E. General ASME Compliance:
1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.

F. Potable Water Use:
1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

2.03 BRONZE, GATE VALVES

A. General:
1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Rising Stem or OS&Y:
1. Pressure-Temperature Range: MSS SP-80, Type I.
2. Class 125:
   a. WSP Rating: 125 psi, saturated.
   b. CWP Rating: 200 psi.
3. Class 150: CWP Rating; 300 psi.
4. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
5. End Connections: Threaded or solder.
6. Stem: Bronze.
7. Disc: Solid wedge; bronze.
8. Packing: Asbestos free.
9. Handwheel Operator: Malleable iron.

2.04 IRON, GATE VALVES

A. Bolted Bonnet: OS&Y; Rising Stem:
1. Pressure and Temperature Rating: MSS SP-70, Type I.
2. Class 125: WOG Rating; 200 psi.
3. Body: ASTM A126, gray iron with bolted bonnet.
4. End Connections: Flanged.
5. Trim: Bronze.
6. Disc: Solid wedge.
7. Packing and Gasket: Asbestos free.

END OF SECTION

SECTION 221005
PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Domestic water piping.

1.02 RELATED REQUIREMENTS

A. Section 330110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250 2020.

B. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings 2021.

C. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings 2023.

D. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges 2020.

E. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast 2017, with Errata (2018).

F. AWWA C651 - Disinfecting Water Mains 2014, with Addendum (2020).

1.04 SUBMITTALS

A. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer's name and pressure rating marked on valve body.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

2.02 DOMESTIC WATER PIPING

A. Ductile Iron Pipe, Flanged Joint: AWWA C115 with 250 psi maximum rated working pressure.
   1. Fittings: Flanged joint, AWWA110, ductile iron,standard pattern.
   2. Joints: Synthetic rubber gaskets and steel bolts.

B. Ductile Iron Pipe, Mechanical Joint: AWWA C151 with mechanical joint end.
   1. Fittings: AWWA C110, ductile iron standard pattern or AWWA C13, ductile iron compact patern.
   2. Joints: Glands, Gaskets, and Bolts: AWWA C111, ductile iron glands, rubber gaskets, and steel bolts.

PART 3 EXECUTION

3.01 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction. In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:
   1. Perform hydrostatic testing for leakage prior to system disinfection.
   2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
   3. General:
      a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.

C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.04 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 330110.58.

END OF SECTION

SECTION 221123
DOMESTIC WATER PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Base mounted centrifugal

1.02 RELATED REQUIREMENTS

A. Section 220513 - Common Motor Requirements for Plumbing Equipment.

1.03 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

1.04 SUBMITTALS

A. Product Data:
   1. Provide certified pump curve with duty point marked over pump and system operating conditions and NPSH curve and power requirement by pump tag.
   2. Manufacturer's catalog sheets for fixtures, fittings, accessories, and supplies.

B. Shop Drawings: Include dimensions and performance data.

C. Test Reports: Plumbing fixture operational tests.

D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Certifications: Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc, as suitable for purpose specified and indicated.

B. Identification: Provide pumps with manufacturer's name, model number, and rated capacity identified by permanently attached label.

C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.01 BASE- OR FRAME-MOUNT, HORIZONTAL SPLIT CASE PUMPS

A. Manufacturers:
   1. Pentair Fairbanks Nijhuis

B. Performance:

C. Capacity: 950 gpm at 260.0 feet of head

D. Description: See Pump Schedule in Contract Drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Ensure that small pressure gauges are installed on both upstream and downstream ends.

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are nonoverloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

END OF SECTION

SECTION 238200
CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electric unit heaters.

1.02 SUBMITTALS

A. Product Data: Provide typical catalog of information including arrangements.

B. Warranty: Submit manufacturer's warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.03 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 ELECTRIC UNIT HEATERS

A. Manufacturers:
   1. INDEECO (Industrial Engineering and Equipment Company);
   2. Modine Manufacturing Company;
   3. Trane Technologies, PLC;

B. Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to authority having jurisdiction as suitable for purpose indicated.

C. Heating Element Assembly:
   1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.

D. Housing:
   1. Suitable for ceiling mount using provided hardware appendages.

E. Controls:

F. Electrical Characteristics:
   1. 5 kW.
   2. 240 VAC, single phase, 60 Hz.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Unit Heaters:
   1. Hang from building structure.

C. Units with Electric Heating Elements:
   1. Install as indicated including electrical devices furnished by manufacturer but not factory installed.

END OF SECTION

SECTION 260519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Nonmetallic-sheathed cable.

C. Service entrance cable.

D. Wiring connectors.

E. Electrical tape.

F. Wire pulling lubricant.

G. Cable ties.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).

C. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).

D. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

F. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.

G. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.

I. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.

J. UL 267 - Outline of Investigation for Wire-Pulling Compounds Current Edition, Including All Revisions.

K. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.

L. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.

M. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductor Material:
   1. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.

H. Conductor Color Coding:
   1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
   2. Color Coding Method: Integrally colored insulation.
      a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
   3. Color Code:
      a. 480Y/277 V, 3 Phase, 4 Wire System:
         1) Phase A: Brown.
         2) Phase B: Orange.
         3) Phase C: Yellow.
         4) Neutral/Grounded: Gray.
      b. 240/120 V, 1 Phase, 3 Wire System:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Neutral/Grounded: White.
      c. Equipment Ground, All Systems: Green.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:
    a. Cerro Wire LLC: www.cerrowire.com/#sle.
    b. Encore Wire Corporation: www.encorewire.com/#sle.
    c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
    d. Service Wire Co: www.servicewire.com/#sle.
    e. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
    a. Size 10 AWG and Smaller: Solid.
    b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.

2.04 SERVICE ENTRANCE CABLE

A. Manufacturers:
1. Copper Service Entrance Cable:
    a. Cerro Wire LLC: www.cerrowire.com/#sle.
    b. Encore Wire Corporation: www.encorewire.com/#sle.
    c. Service Wire Co: www.servicewire.com/#sle.
    d. Southwire Company: www.southwire.com/#sle.

B. Insulation Voltage Rating: 600 V.

2.05 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Terminations:
1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

2.06 ACCESSORIES

A. Electrical Tape:
1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant:
1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage wire and cable has been completed.

B. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Circuiting Requirements:
   1. Unless dimensioned, circuit routing indicated is diagrammatic.
   2. When circuit destination is indicated without specific routing, determine exact routing required.
   3. Arrange circuiting to minimize splices.
   4. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Installation in Raceway:
   1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
   2. Pull all conductors and cables together into raceway at same time.
   3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
   4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

G. Install conductors with a minimum of 12 inches of slack at each outlet.

H. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

I. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

J. Make wiring connections using specified wiring connectors.
   1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
   2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
   3. Do not remove conductor strands to facilitate insertion into connector.
   4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

K. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

L. Insulate ends of spare conductors using vinyl insulating electrical tape.

M. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

N. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION

SECTION 260526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

B. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
   1. Provide products listed, classified, and labeled as suitable for the purpose intended.
   2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
   1. Use insulated copper conductors unless otherwise indicated.
      a. Exceptions:
         1) Use bare copper conductors where installed underground in direct contact with earth.
         2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
   1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
   2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
   3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

SECTION 260533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Flexible metal conduit (FMC).

C. Liquidtight flexible metal conduit (LFMC).

D. Galvanized steel electrical metallic tubing (EMT).

E. Rigid polyvinyl chloride (PVC) conduit.

1.02 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.

E. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.

F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.

H. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.

I. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.

J. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel electrical metallic tubing (EMT).except where otherwise shown on the Drawings and as specified herein.

2.02 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
   1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.

2.05 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:
   1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
   2. Material: Use steel or malleable iron.
   3. Connectors and Couplings: Use compression/gland or set-screw type.
      a. Do not use indenter type connectors and couplings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Conduit Routing:
   1. Unless dimensioned, conduit routing indicated is diagrammatic.
   2. When conduit destination is indicated without specific routing, determine exact routing required.
   3. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
      a. Heaters.

E. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.

2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

F. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   5. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
   6. Secure joints and connections to provide mechanical strength and electrical continuity.

G. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
   6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
   7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.

H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
   2. Where conduits are subject to earth movement by settlement or frost.

I. Conduit Sealing:
   1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
      a. Where conduits enter building from outside.
      b. Where service conduits enter building from underground distribution system.
      c. Where conduits enter building from underground.
      d. Where conduits may transport moisture to contact live parts.
   2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
      a. Where conduits pass from outdoors into conditioned interior spaces.
      b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

J. Provide grounding and bonding; see Section 260526.

3.02 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

END OF SECTION

SECTION 262416
PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Lighting and appliance panelboards.

B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.

D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.

E. NEMA PB 1 - Panelboards 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.

G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.

H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.

K. UL 67 - Panelboards Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

M. UL 869A - Reference Standard for Service Equipment Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet.
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
      b. Panelboards Containing Fusible Switches: Between -22 degrees F and 104 degrees F.

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

E. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

F. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

G. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

H. Conductor Terminations: Suitable for use with the conductors to be installed.

I. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

J. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
   2. Phase and Neutral Bus Material: Aluminum.
   3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.

E. Enclosures:
   1. Provide surface-mounted enclosures as indicated.
   2. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
   1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
   2. Interrupting Capacity:
      a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
         1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
   3. Conductor Terminations:
      a. Provide mechanical lugs unless otherwise indicated.
      b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
   5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 260526.

I. Install all field-installed branch devices, components, and accessories.

J. Provide filler plates to cover unused spaces in panelboards.

3.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

C. Correct deficiencies and replace damaged or defective panelboards or associated components.

END OF SECTION

SECTION 262923
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

4.01 SECTION INCLUDES

A. Variable-Frequency Drive (VFD) units for low-voltage (600 V and less) AC motor applications.

4.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

4.03 REFERENCE STANDARDS

A. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

B. NFPA 70 - National Electrical Code.

C. UL 508A - Industrial Control Panels.

D. IEEE 519 – Standard Practices and Requirements for Harmonic Control in Electrical Power Systems

4.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate work to avoid placement of ductwork, piping, equipment, and other obstructions within dedicated equipment spaces and working clearances required by NFPA 70.
   2. Coordinate work to provide VFDs suitable for use with motors.
   3. Coordinate work to provide controllers and associated wiring suitable for interface with control devices.
   4. Coordinate arrangement of electrical equipment with dimensions and clearance requirements.
   5. Verify with manufacturer that conductor terminations are suitable for use with conductors.
   6. Notify Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

4.05 SUBMITTALS

A. Shop Drawings: Indicate dimensions, voltage, controller sizes, short circuit current ratings, conduit entry locations, conductor terminal information, list of major components, and installed features and accessories.

B. Wiring Diagrams:
   1. Power Diagram: Include amperage ratings, circuit breaker frame sizes, circuit breaker continuous amp ratings, etc. as required for approval.
   1. Control Diagram: Include disconnect devices, pilot devices, etc.

C. Derating Calculations: Indicate ratings adjusted for applicable service conditions.

D. Specimen Warranty: Submit sample of manufacturer's warranty.

E. Manufacturer's certification that products meet or exceed specified requirements.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Manufacturer’s detailed field testing procedures.

H. Operation and Maintenance Data: Include detailed information on system operation, equipment programming and setup, replacement parts, and recommended maintenance procedures and intervals.

I. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

4.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

C. The VFD and all associated optional equipment shall be UL listed or recognized.

D. The VFD shall have a UL label attached to the enclosure cabinet.

E. The VFD shall be factory pre-wired, assembled and tested as a complete package.

4.07 DELIVERY, STORAGE, AND HANDLING

A. Store in clean, dry space. Maintain factory wrapping or provide additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

4.08 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

4.09 WARRANTY

A. Provide minimum 18-month manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

5.01 MANUFACTURERS

A. Variable-Frequency Drive units:
   1. Allen-Bradley.
   2. Eaton Corporation.
   3. Rockwell Automation, Inc.

B. Source Limitations: Provide variable-frequency drive units and associated components produced by single manufacturer and obtained from single supplier.

5.02 VARIABLE-FREQUENCY DRIVES

A. Provide variable-frequency motor drives consisting of required controller assemblies, operator interfaces, control power transformers, instrumentation and control wiring, sensors, accessories, system programming, etc. as necessary for complete operating system.

B. Provide products listed, classified, and labeled as suitable for purpose intended.

C. Basis of Design: Rockwell Automation PowerFlex 753, Model 20F-_-A-G-D-125-J-A-O with NEMA/UP type 12 frame and I/O option kit 20-750-2263C-1R2T-HIM-A6, and Human Interface Module 20-HIM-A6 with communications and accessories option 20-750-ENETR.

D. Features
   1. Hardware
      a. Utilize diode bridge or SCR bridge on the input rectifier.
      b. Utilize DC bus inductor on all six-pulse VFDs only.
      c. Utilize switching logic power supply operating from the DC bus.
      d. Incorporate phase-to-phase and phase-to-ground MOV protection on the AC input line.
      e. Microprocessor based inverter logic shall be isolated from power circuits.
      f. Utilize latest generation IGBT inverter section.
      g. Battery receptacle for Lithium battery power to the Real-time Clock.
      h. Additional port for handheld and remote HIM options.
      i. Dedicated Digital Input for hardware enable.
      j. Conformal coated printed circuit boards.
      a. Optional onboard 24V DC Auxiliary Control Power Supply.

2. Control Logic
    a. Ability to operate with motor disconnected.
    b. Provide a controlled shutdown, when properly protected, with no component failure in the event of an output phase-to-phase or phase-to-ground short circuit. Provide annunciation of the fault condition.
    c. Provide multiple programmable stop modes including Ramp, Coast, DC-Brake, Ramp-to-Hold, Fast Braking, and Current Limit Stop.
    d. Provide multiple acceleration and deceleration rates.
    b. Adjustable output frequency up to 590 Hz
2. Control
    e. Ability to control outputs and manage status information locally within the VFD.
    f. Ability to function standalone or complimentary to supervisory control.
    g. Ability to speed reaction time by processing in the VFD.
    h. Ability to provide scaling, selector switches, or other data manipulations not already built into the VFD.
    i. Ability to read inputs/write outputs and exclusively control the VFD.
    j. Ability to provide an option for decision making if communication is lost with main controller.
    k. Ability to control other VFDs via a peer-to-peer EtherNet/IP network.
    l. Ability to write programs off-line.
3. Motor Control Modes
    m. Selectable sensor-less vector, flux vector, V/Hz, and adjustable voltage control modes selectable through programming.
    n. The drive shall be supplied with a Start-up and Auto-tune mode.
    o. The V/Hz mode shall be programmable for fan curve or full custom patterns.
    a. Capable of open loop V/Hz.
3. Current Limit
    a. Programmable current limit from 20 to 160% of rated output current.
    b. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
    c. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.
4. Acceleration / Deceleration
    a. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.
    b. A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.
5. Speed Profiles
    a. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S Curve" profiles that provide changing accel/decel rates.
    b. S Curve profiles shall be adjustable.
6. Adjustments
    a. A digital interface can be used for all set-up, operation and adjustment settings.
    b. All adjustments shall be stored in nonvolatile memory (EEPROM).
    c. No potentiometer adjustments shall be required.
    d. EEPROM memory for factory default values shall be provided.
    e. Software must be available for trending and diagnostics, as well as online and offline programming functionality.
7. Process PID Control
    a. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.

b. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.
c. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
d. Protection shall be provided for a loss of feedback or reference signal.

8. Skip Frequencies
   a. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
   b. The set points shall have a bandwidth adjustable from Maximum Reverse Speed to Maximum Forward Speed.
9. Fault Reset / Run
   a. When the drive is running or idle it shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
   b. The automatic mode shall not be applicable to shorted output faults and other internal microprocessor faults.
   c. The time between restarts shall be adjustable from 0.5 seconds to 30 seconds.
10. Run on Power Up
    a. A user programmable restart function shall be provided to allow restart of the equipment after restoration of power after long duration power outages. Restart time dependent on presence of incoming signal.
11. Fault Memory
    a. The last 32 fault codes shall be stored and time stamped in a fault buffer.
    b. Information about the drive's condition at the time of the last fault such as operating frequency, output current, dc bus voltage and twenty-seven other status conditions shall be stored.
    c. A power-up marker shall be provided at each power-up time to aid in analyzing fault data.
    d. The last 32 alarm codes shall be stored and time stamped for additional troubleshooting reference.
12. Overload Protection
    a. The drive shall provide internal class 10 adjustable overload protection.
    b. Overload protection shall be speed-sensitive and adjustable.
    c. A viewable parameter shall store the overload usage.
13. Auto Economizer
    a. An auto economizer feature shall be available to automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage.
    b. When the load increases, the drive shall automatically return to normal operation.
14. Terminal Blocks
    a. Separate terminal blocks shall be provided for control and power wiring.
    b. I/O terminal blocks shall be removable with wiring in place.
15. Flying Start
    a. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed. This feature is disabled by default.
16. Inputs and Outputs
    a. The Input / Output option modules shall consist of both analog and digital I/O.
    b. No jumpers or switches shall be required to configure digital inputs and outputs.
    c. All digital input and output functions shall be fully programmable.
    d. The control terminal blocks shall be rated for 115V AC.
    e. Inputs shall be optically isolated from the drive control logic.

f. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.
g. The VFD shall be capable of supporting up to 7 analog inputs, 7 analog outputs, 21 digital inputs, 7 relay outputs, 7 transistor outputs, and 3 positive temperature coefficient (PTC) inputs.
h. The Input / Output option modules shall have the following features:
    1) Analog Inputs:
        (a) Quantity two (2) differentially isolated, ±10V (bi-polar), 88k ohm input impedance, 11 bit plus sign.
        (b) Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
    2) Analog Outputs:
        (a) Quantity two (2) ±10V (bi-polar) / 11 bit & sign, 2 kΩ minimum load, 4-20 mA, 11 bit plus sign, 400 Ω maximum load.
        (b) The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
        (c) Programming shall be available to select either absolute or signed values of these parameters.
    3) Digital Inputs:
        (a) Quantity of six (6) digital inputs rated 24V DC/115V AC.
        (b) All inputs shall be individually programmable for multiple functions including: Start, Run, Stop, Auxiliary Fault, Speed Select, Jog and Process PI functions.
    4) Digital Outputs:
        (a) At least one (1) relay output (N.O. or N.C.).
        (b) For 240V AC or 24V DC, N.O. contact output ratings shall be 2 amp max., general purpose (inductive)/resistive. N.C. contact output ratings shall be 2 amp max., resistive only.
        (c) Relays shall be programmable to multiple conditions including: Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
        (d) Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.
        (e) At least one (1) transistor output.
        (f) For 24V DC, transistor output rating shall be 1 amp max, Resistive.

17. Reference Signals
    a. The drive shall be capable of using the following input reference signals:
        1) Analog inputs
        2) Preset speeds
        3) Remote potentiometer
        4) Digital MOP
        5) Human Interface Module
        6) Communication modules
18. Loss of Reference
    a. The drive shall be capable of sensing reference loss conditions.
    b. In the event of loss of the reference signal, the drive shall be user programmable to the following:
        1) Fault the drive and coast to stop.
        2) Issue a minor fault - allows the drive to continue running while some types of faults are present.
        3) Alarm and maintain last reference.

c. When using a communications network to control the drive, the communications adapter shall have these configurable responses to network disruptions and controller idle (fault or program) conditions:
    1) Fault
    2) Stop
    3) Zero Data
    4) Hold Last State
    5) Send Fault Configuration

19. Metering
    a. At a minimum, the following parameters shall be accessible through the Human Interface Module, if installed:
        1) Output Current in Amps
        2) Output Voltage in Volts
        3) Output Power in kW
        4) Elapsed MWh
        5) DC Bus Voltage
        6) Frequency
        7) Heatsink Temperature
        8) Last eight (32) faults
        9) Elapsed Run Time
        10) IGBT Temperature
20. Faults
    a. At a minimum, the following faults shall be accessible through the Human Interface Module:
        1) Power Loss
        2) Undervoltage
        3) Overvoltage
        4) Motor Overload
        5) Heat Sink Over-temperature
        6) Maximum Retries
        7) Phase-to-phase and Phase to Ground Faults
21. Predictive Diagnostics
    a. At a minimum, the following predictive diagnostic features shall be provided:
        1) Relay Output Life Cycles based on load type and amps.
        2) Hours of Fan Life based on load and ambient temperature.
        3) Motor Bearing life based on expected hours of use.
        4) Motor Lubrication schedule based on hours of use.
        5) Machine Bearing life based on expected hours of use.
22. Real-time Clock
    a. Shall be capable of providing time stamped events.
    b. Shall have the ability to be set locally or via a remote controller.
    c. Shall provide the ability to be programmable for month, day, year and local time zones in HH:MM:SS.

5.03 VFD PACKAGED SYSTEM

B. Features
1. Ratings
    a. Voltage
        1) Capable of accepting nominal plant power of 480 VAC, 60 Hz.
        2) The supply input voltage tolerance shall be ± 10% of nominal line voltage.
    b. Displacement Power Factor

1) Six-pulse VFD shall be capable of maintaining a minimum true power factor (Displacement P.F. X Distortion P.F.) of 0.95 or better at rated load and nominal line voltage, over the entire speed range.

c. Efficiency
   1) A minimum of 96.5% (+/- 1%) at 100% speed and 100% motor load at nominal line voltage.
   2) Control power supplies, control circuits, and cooling fans shall be included in all loss calculations.

d. Operating ambient temperature range without derating: 0 °C to 40 °C (32 °F to 104 °F)

e. Operating relative humidity range shall be 5% to 95% non-condensing.

f. Operating elevation shall be up to 1000 Meters (3,300 ft) without derating.

2. Sizing
   a. Systems rated at Normal Duty loads shall provide 110% overload capability for up to one minute and 150% for up to 3 seconds.
   b. Systems rated at Heavy-Duty loads shall provide 150% overload capability for up to one minute and 180% for up to 3 seconds.
3. Auto Reset/Run
   a. For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation.
4. Ride-Through
   a. The VFD system shall attempt to ride through power dips up to 20% of nominal. The duration of ride-through shall be inversely proportional to load. For outages greater than 20%, the drive shall stop the motor and issue a power loss alarm signal to a process controller, which may be forwarded to an external alarm signaling device.
5. Run on Power Up
   a. The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage. Unless indicated in the contact drawings, faults due to power outages shall be remotely resettable. The VFD system shall indicate a loss of power to a process controller, which may be forwarded to an external alarm signaling device. Upon indication of power restoration the process controller will attempt to clear any faults and issue a run command, if desired.
6. Communications
   a. VFD shall be capable of communicating on multiple networks.
   b. VFD shall be capable of supporting the following network options:
      1) DeviceNet®
      2) EtherNet/IP™
      3) ControlNet® Coax
      4) ControlNet Fiber
      5) Interbus
      6) CANopen
      7) Modbus/TCP
      8) Modbus RTU
      9) PROFIBUS DP
      10) RS-485 DF1
      11) RS-485 HVAC
      12) Remote I/O
      13) Profinet I/O
      14) BACnet/IP
7. Enclosure Door Mounted Human Interface Module (HIM)
   a. VFD shall provide a HIM with integral LCD display, operating keys and programming keys.

b. VFD-mounted HIM, rated NEMA/UL Type 1, capable of connecting via a separate cable for use as a handheld terminal.
c. The HIM shall have the following features:
1) A three (3) line by twenty-one (21) character backlit LCD display with graphics capability.
2) Shall indicate drive operating conditions, adjustments and fault indications.
3) Shall be configured to display in the following three distinct zones:
(a) The top zone shall display the status of direction, drive condition, fault / alarm conditions and Auto / Manual mode.
(b) The middle zone shall display drive output frequency.
(c) The bottom zone shall be configurable as a display for either programming menus / information or as a two-line user display for two additional values utilizing scaled units.
4) Shall provide digital speed control.
5) The keypad shall include programming keys, drive operating keys (Start, Stop, Direction, Jog and Speed Control), and numeric keys for direct entry.

C. Enclosure
1. Shall be rated NEMA/UL Type 12.
2. Shall be painted per the manufacturer's standard.
3. Shall provide entry and exit locations for power cables.
4. Drive shall contain a label indicating certification to UL in accordance with UL508C compliance
5. The drive system nameplate shall be marked with system Short Circuit Current Rating (SCCR).

D. Drive Enclosure Input Disconnect
1. Operator Handles
a. Provide externally operated main disconnect handle.
b. Handles shall be lockable with up to three lockout / tagout padlock positions.

E. Branch Circuit Protection
1. Input fusing, motor circuit protector (MCP), or inverse time circuit breaker shall be provided.

F. Control Power Transformer
1. Provide a control power transformer mounted and wired inside of the drive system enclosure.
2. The transformer shall be rated for the VFD power requirements.

G. Harmonic Mitigation Techniques
1. Drive Input Line Reactor
a. Provide a drive input line reactor mounted within the drive system enclosure for drives that are less than 100 horsepower.

H. Auxiliary Relays
1. Provide relays for Drive Alarm, Drive Fault, Drive Run, and System Status Faults (as required).
2. The relays shall be 2 N.O. & 2 N.C.. The relay contacts shall be rated for 115V AC/30V DC, 5.0 amp resistive, 2.5 amp inductive.

I. Control Interface
1. The control terminals shall be rated for 115V AC.
2. The control interface shall provide input terminals for access to VFD functions that include start, stop, external fault, speed select, and enable, as required.

J. Hand/Off/Auto Selector Switch
1. Provide a "Hand/Off/Auto" selector switch, mounted on the enclosure door.

2. The "Hand/Off/Auto" selector switch shall start the drive in the “Hand” mode and stop the drive in the “Off” mode.
3. In the “Auto” mode the drive shall be started and stopped from a remote “RUN” contact.
4. In all modes, Auxiliary and Enable inputs to the drive control interface board must be present before the drive will start.
5. When a HIM is present, the stop function shall always be available to stop the drive regardless of the selected mode (“Hand” or “Auto”). The HIM will be non-functional (except for the display and programming) when the switch is in “Off” mode. The HIM shall stop the drive if the switch is in the “Auto” mode with the remote start contact initiated.
6. The drive speed reference shall be controlled from the HIM, unless a separate door-mounted potentiometer is provided, when in “Hand” mode (factory default setting).
7. The drive speed reference shall be controlled by a remote 4…20 mA input when in “Auto” mode.

K. Drive Disable Mushroom Push Button
1. Provide a maintained mushroom style push button, mounted on the enclosure door that when pushed, will open the drive enable input.

L. Pilot Lights
1. Provide LED pilot lights, mounted on the enclosure door, for indication of the following status:
   a. Run
   b. Drive Fault
   c. Control Power On
   d. Motor Fault

M. Motor Runtime Meter
1. Provide a digital, non-resettable, door-mounted elapsed time meter.
1. The meter shall be electrically interlocked with the Drive Run relay and Bypass contactor to indicate actual motor operating hours.

PART 3 EXECUTION

3.05 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that ratings of controllers are consistent with indicated requirements.

C. Verify that mounting surfaces are ready to accept controllers.

D. Verify that conditions are satisfactory for installation prior to starting work.

6.01 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Do not exceed manufacturer's recommended maximum cable length between controller and motor.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment.

E. Install controllers plumb and level.

F. Provide grounding and bonding in accordance with Section 260526.

G. Install field-installed devices, components, and accessories.

H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

I. Set field-adjustable settings of controllers and associated components according to installed motor requirements, in accordance with recommendations of manufacturers of controller and load.

6.02 FIELD QUALITY CONTROL

A. Inspect and test in accordance with manufacturer's instructions.

B. Perform inspections and tests according to manufacturer's instructions.

C. Correct deficiencies and replace damaged or defective controllers or associated components.

3.06 START-UP-SERVICE

A. At a minimum, the start-up service shall include:
   1. Perform pre-Power Check
   2. Megger Motor Resistances: Phase-to-Phase and Phase-to-Ground
   3. Verify system grounding per manufacturer's specifications
   4. Verify power and signal grounds
   5. Check connections
   6. Check environment

B. Drive Power-up and Commissioning:
   1. Measure Incoming Power Phase-to-Phase and Phase-to-Ground
   2. Measure DC Bus Voltage
   3. Measure AC Current Unloaded and Loaded
   4. Measure Output Voltage Phase-to-Phase and Phase-to-Ground
   5. Verify input reference signal

C. All measurements shall be recorded.

D. Drive shall be tuned for system operation.

E. Drive parameter listing shall be provided.

6.03 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

6.04 TRAINING

F. Manufacturer to provide a quantity of two 4-hour sessions of on-site instruction.

G. The instruction shall include the operational and maintenance requirements of the variable frequency drive.

H. The basis of the training shall be the variable frequency drive, the engineered drawings and the user manual. At a minimum, the training shall:
   1. Review the engineered drawings identifying the components shown on the drawings.
   2. Review starting / stopping and speed control options for the controller.
   3. Review operation of the Human Interface Module for programming and monitoring of the variable frequency drive.
   4. Review the maintenance requirements of the variable frequency drive.
   5. Review safety concerns with operating the variable frequency drive.

END OF SECTION

SECTION 263213
ENGINE GENERATORS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes packaged engine-generator sets suitable for use in applications with the features as specified and indicated where the engine generators will be used as the standby power source for the system.

1.03 DEFINITIONS

A. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

B. Emergency Standby Power (ESP): Per ISO 8528: The maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 h of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output (Ppp) over 24 h of operation shall not exceed 70 % of the ESP unless otherwise agreed by the RIC engine manufacturer.

C. Prime Power (PRP): Per ISO 8528: The maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as a prescribed by the manufacturer. The permissible average power output (PPP) over 24 h of operation shall not exceed 70% of the PRP unless otherwise agreed by the RIC engine manufacturer.

1.04 ACTION SUBMITTALS

A. Product Data: For each type of packaged engine generator indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. In addition, include the following:
   1. Thermal damage curve for generator.
   2. Time-current characteristic curves for generator protective device.
   3. Sound test data, based on a free field requirement.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, and location and size of each field connection.
   1. Dimensioned outline plan and elevation drawings of engine-generator set and other components specified.
   2. Wiring Diagrams: Control interconnection, Customer connections.

C. Certifications:
   1. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location and application of the Project.

1.05 INFORMATIONAL SUBMITTALS

A. Manufacturer Seismic Qualification Certification: Submit certification that **day tank**, engine-generator set, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
   1. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source quality-control test reports.
   1. Certified summary of prototype-unit test report. See requirements in section 2.13.A. Include statement indicating torsional compatibility of components.
   2. Certified Test Report: Provide certified test report documenting factory test per the requirements of this specification, as well as certified factory test of generator set sensors per NFPA110 level 1.
   3. List of factory tests to be performed on units to be shipped for this Project.
   4. Report of exhaust emissions and compliance statement certifying compliance with applicable regulations.

C. Warranty:
   1. Submit manufacturer's warranty statement to be provided for this Project.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Manufacturer Qualifications: A qualified manufacturer. Maintain, within **200 miles** of Project site, a service center capable of providing training, parts, and emergency maintenance repairs.

C. Source Limitations: Obtain packaged generator sets and auxiliary components through one source from a single manufacturer.

D. Comply with NFPA 37 (Standard For the Installation and Use of Stationary Combustion Engines and Gas Turbines).

E. Comply with NFPA 70 (National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702).

F. Comply with NFPA 110 (Emergency and Standby Power Systems) requirements for Level **1** emergency power supply system.

G. Comply with UL 2200.

H. Noise Emission: Comply with applicable state and local government requirements.

1.07 PROJECT CONDITIONS

A. Environmental Conditions: Engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
   1. Ambient Temperature: Minus 15 to plus 40 deg C.
   2. Relative Humidity: 0 to 95 percent.
   3. Altitude: Sea level to 1000 feet (300 m).

1.08 WARRANTY

A. Base Warranty: Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months for Standby product and twelve (12) months for Prime/Continuous product from registered commissioning and start-up.

B. Extended Warranty: Manufacturer shall offer extended coverage of 5 years from date of registered commissioning and start-up.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Only approved bidders shall supply equipment provided under this contract. Equipment by other named suppliers that meets the requirement of this specification are acceptable if approved not less than 2 weeks before scheduled bid date. Other suppliers are not acceptable.

1. Cummins Power Generation
2. Caterpillar
3. Kohler

2.02 ENGINE-GENERATOR SET

A. Factory-assembled and -tested, engine-generator set.

B. Mounting Frame: Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments.
   1. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

C. Capacities and Characteristics:
   1. Power Output Ratings: Continuous electrical output power rating of 230 kW for standby/ 209 kW for prime operation at 80 percent lagging power factor, 480/277-volt, three phase, 4-wire, 60 hertz.
   2. Alternator shall be capable of accepting maximum load in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.
   3. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of component. The engine-generator nameplate shall include information of the power output rating of the equipment.

A. Generator-Set Performance:
   4. Steady-State Voltage Operational Bandwidth: 0.5 percent of rated output voltage from no load to full load.
   5. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.
   6. Steady-State Frequency Operational Bandwidth: 0.25 percent of rated frequency from no load to full load.
   7. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
   8. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.
   9. Output Waveform: At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.
   10. Sustained Short-Circuit Current: PMG-excited alternator. For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds without damage to generator system components.
   11. Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements. Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.
   12. Noise Output: Engine generator shall be tested by the manufacturer per ANSI S12.34. Data documenting performance shall be provided with submittal documentation.

2.03 ENGINE

A. Fuel: ASTM-D975 #2 Ultra Low Sulfur Diesel Fuel

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: The following items are mounted on engine or skid:
   1. Lube oil pump: shall be positive displacement, mechanical, full pressure pump.
   2. Filter and Strainer: Provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used.
   3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Engine Fuel System: The engine fuel system shall be installed in strict compliance to the engine manufacturer's instructions.
   1. Main Fuel Pump: Mounted on engine. Pump ensures adequate primary fuel flow under starting and load conditions.

E. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance.
   1. Designed for operation on a single **480**-volt AC, single phase, 60 hertz power connection. Heater voltage shall be shown on the project drawings.
   2. Provided with a 12VDC thermostat, installed at the engine thermostat housing

F. Governor: Adjustable isochronous, with speed sensing.

G. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine-generator-set mounting frame.
   1. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40C.
   2. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
   3. Size of Radiator overflow tank: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
   4. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
   5. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
   6. Duct Flange: Generator sets installed indoors shall be provided with a flexible radiator duct adapter flange.

H. Muffler/Silencer: Selected with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

I. Air-Intake Filter: Engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.

J. Starting System: 12VDC, as recommended by the engine manufacturer; electric, with negative ground.
   1. Components: Sized so they will not be damaged during a full engine-cranking cycle with ambient temperature at maximum specified in Part 1 "Project Conditions" Article.
   2. Cranking Cycle: As required by NFPA 110 for level 1 systems**.**
   3. Battery Cable: Size as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.
   4. Battery Compartment: Factory fabricated of metal with acid-resistant finish.
   5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

6. Battery Chargers: Unit shall comply with UL 1236 and include the following features:
    a. Operation: Equalizing-charging rate of 10 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg C to plus 60 deg C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.04 FUEL OIL STORAGE

A. Comply with NFPA 30.

B. Sub Base-Mounted Fuel Oil Tank: Provide a double wall secondary containment type sub-base fuel storage tank. The tank shall be constructed of corrosion resistant steel and shall be UL 142 listed and labeled. The fuel tank shall include the following features:
    1. Capacity: Fuel for 24 hours' continuous operation at 100 percent rated power output.
    2. Tank rails and lifting eyes shall be rated for the full dry weight of the tank, genset, and enclosure.
    3. Electrical stub up(s)
    4. Normal & emergency vents
    5. Lockable fuel fill
    6. Mechanical fuel level gauge
    7. High and low level switches to indicate fuel level
    8. Leak detector switch
    9. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.
    10. Fill port with overfill prevention valve
    11. 5 gallon fill/spill dam or bucket [Internal or external]
    12. Tank design shall meet the regional requirements for the Project location
    13. All fuel tank vents must extend a minimum of 10 ft above finished grade to meet fire codes.

2.05 CONTROL AND MONITORING

A. Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit

B. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation

of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

C. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

D. Configuration: Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.

E. Indicating and Protective Devices and Controls: As required by NFPA 110 for Level 1 system, and the following:
   1. AC voltmeter (3-phase, line to line and line to neutral values).
   2. AC ammeter (3-phases).
   3. AC frequency meter.
   4. AC kVA output (total and for each phase). Display shall indicate power flow direction.
   5. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
   6. Emergency Stop Switch: Switch shall be a red “mushroom head” pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
   7. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
   8. DC voltmeter (alternator battery charging).
   9. Engine-coolant temperature gage.
   10. Engine lubricating-oil pressure gage.
   11. Running-time meter.
   12. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)
   13. AC Protective Equipment: The control system shall include over/under voltage , over current, short circuit, loss of voltage reference, and over excitation shut down protection. There shall be an overload warning, and overcurrent warning alarm.
   14. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.
   15. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.
   16. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
   17. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control, and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).
   18. Minimum output signals (individual, mechanical, relay-based) from the generator to the Control Panel PLC shall include:
      a. Generator Fault
      b. Generator Warning
      c. Generator Running

d. Low Fuel
e. Fuel Leak (Basin Rupture).

19. Monitoring signals (individual, mechanical, relay-based) shall also include:
    a. ATS in Utility
    b. ATS in Emergency

F. Remote Emergency-Stop Switch: Flush; wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

2.06 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Overcurrent Protection: The generator set shall be provided with a UL Listed/CSA Certified protective device that is coordinated with the alternator provided to prevent damage to the generator set on any possible overload or overcurrent condition external to the machine. The protective device shall be listed as a utility grade protective device under UL category NRGU. The control system shall be subject to UL follow-up service at the manufacturing location to verify that the protective system is fully operational as manufactured. Protector shall perform the following functions:
    1. Initiates a generator kW overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms.
    2. Under single phase or multiple phase fault conditions, or on overload conditions, indicates an alarm conditions when the current flow is in excess of 110% of rated current for more than 10 seconds.
    3. Under single phase or multiple phase fault conditions, operates to switch off alternator excitation at the appropriate time to prevent damage to the alternator.
    4. The operator panel shall indicate the nature of the fault condition as either a short circuit or an overload.
    5. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot greater than 120% of nominal voltage.
    6. The protective system provided shall not include an instantaneous trip function.

B. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground-fault. Integrate ground-fault alarm indication with other generator-set alarm indications.

2.07 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Class H Electrical Insulation shall be used for systems of under 690V.

D. Temperature Rise: 105 C over a 40C environment.

E. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

F. Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance on all alternators rated 30kVA and larger.

G. Enclosure: Drip-proof.

H. Voltage Regulator: Separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted.

I. Windings: Two-thirds pitch stator winding.

J. Subtransient Reactance: 15 percent maximum, based on the rating of the engine generator set.

2.08 AUTOMATIC TRANSFER SWITCH

A. Application: utility to genset

B. Amperage rating: 400

C. Voltage rating: up to 600 VAC

D. Phase(s): 3

E. Frequency: 60 Hz

F. 4-pole switched neutral

G. UL type 4 enclosure.

H. Lug capacity: 300, 400 amp
   1. Qty 1 wire, 3/0-600 MCM CU-AL
   2. Qty 2 wires 3/0-250 MCM CU-AL

I. Lug capacity: 600 amp
   1. Qty 2 wires, 250-500 MCM CU

J. Wire bending space conforming to National Electric Code (NFPA 70).

K. UL 1008 certified.

2.09 VIBRATION ISOLATION DEVICES

A. Vibration Isolation: Generators installed on grade shall be provided with elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.
   1. IBC Compliance: Isolators complying with IBC requirements shall be specified in the equipment documentation, as well as the installation requirements for the unit.

2.10 FINISHES

A. Indoor Components: Powder-coated and baked over corrosion-resistant pretreatment and compatible primer. Manufacturer’s standard color or as directed on the drawings.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

B. Project-Specific Equipment Tests: Before shipment, factory test engine-generator set manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:
   1. Test engine generator set manufactured for this Project to demonstrate compatibility and functionality.
   2. Full load run.
   3. Maximum power.
   4. Voltage regulation.
   5. Steady-state governing.
   6. Single-step load pickup.
   7. Simulated safety shutdowns.
   8. Provide 14 days' advance notice of tests and opportunity for observation of tests by Owner's representative.
   9. [Additional testing requirements may be added to this section]

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with packaged engine-generator manufacturers' written installation, application, and alignment instructions and with NFPA 110.

3.02 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

3.03 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

3.04 SERVICE AGREEMENT:

A. The supplier shall include in the base price, a one-year service agreement. The maintenance shall be performed by factory authorized service technicians capable of servicing both the engine-generator set and the transfer switch (es). This agreement shall include the following:

B. Generator supplier must have an in-house rental fleet with equipment sized to back up this project site.

C. All engine maintenance as recommended by the service manual.

D. All electrical controls maintenance and calibrations as recommended by the manufacturer.

E. All auxiliary equipment as a part of the emergency systems.

F. The supplier shall guarantee emergency service.

G. All expendable maintenance items are to be included in this agreement.

H. A copy of this agreement and a schedule shall be given to the Owner at the time of his acceptance, showing what work is to be accomplished and when.

END OF SECTION

SECTION 265100
INTERIOR LIGHTING

PART 1 GENERAL

4.01 SECTION INCLUDES

A. Interior luminaires.

4.02 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.

I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 1598 - Luminaires; Current Edition, Including All Revisions.

4.03 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

4.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

4.05 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

4.06 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

4.07 WARRANTY

A. Provide 3-year manufacturer warranty for LED luminaires, including drivers.

PART 2 PRODUCTS

5.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

5.02 LUMINAIRE TYPES

A. Furnish products as specified below.

B. Type: Linear flush mount wraparound LED
   1. Housing: Steel, painted white.
   2. Nominal Size: 4 feet.
   3. Lumens: 7200LM.
      a. Color Temperature: 4,000 K.
   4. CRI: 80.
   5. Voltage: Universal 120-277 V.
   6. Listings:
   7. Mounting: Surface mount.
   8. Dimming: No dimming
   9. Watts: 62

5.03 LUMINAIRES

A. Manufacturers:
   1. Acuity Brands, Inc;
   2. Cooper Lighting;
   3. Paraflex;
   4. RAB Lighting.

B. Provide products that comply with requirements of NFPA 70.

C. Provide products that are listed and labeled as complying with UL 1598, where applicable.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

F. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

G. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

PART 3 EXECUTION

6.01 INSTALLATION

A. Coordinate locations of outlet boxes as required for installation of luminaires.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Install lamps in each luminaire.

END OF SECTION

SECTION 330110.58
DISINFECTION OF WATER UTILITY PIPING SYSTEMS

PART 1 GENERAL

7.01 SECTION INCLUDES

A. Disinfection of site domestic water lines and site fire water lines specified in Section 331416.

7.02 RELATED REQUIREMENTS

A. Section 331416 - Site Water Utility Distribution Piping.

7.03 REFERENCE STANDARDS

A. AWWA B300 - Hypochlorites 2018.

B. AWWA B301 - Liquid Chlorine 2018.

C. AWWA B302 - Ammonium Sulfate 2023.

D. AWWA B303 - Sodium Chlorite 2018.

E. AWWA C651 - Disinfecting Water Mains 2014, with Addendum (2020).

7.04 SUBMITTALS

A. Test Reports: Indicate results comparative to specified requirements.

B. Certificate: From authority having jurisdiction indicating approval of water system.

7.05 QUALITY ASSURANCE

A. Testing Firm: Company specializing in testing potable water systems, certified by governing authorities of Washington.

PART 2 PRODUCTS

8.01 DISINFECTION CHEMICALS

A. Chemicals: AWWA B300 Hypochlorite, AWWA B301 Liquid Chlorine, AWWA B302 Ammonium Sulfate, and AWWA B303 Sodium Chlorite.

PART 3 EXECUTION

9.01 DISINFECTION

A. Use method prescribed by the applicable state or local codes, or health authority or water purveyor having jurisdiction, or in the absence of any of these follow AWWA C651.

B. Provide and attach equipment required to perform the work.

C. Inject treatment disinfectant into piping system.

D. Maintain disinfectant in system for 24 hours.

E. Flush, circulate, and clean until required cleanliness is achieved; use municipal domestic water.

F. Replace permanent system devices removed for disinfection.

END OF SECTION